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TRADE INTEGRATION, GLOBAL CAPITAL
FLOWS AND THE LINK TO INSTITUTIONAL
QUALITY FROM A NORTH-SOUTH
PERSPECTIVE

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Declaration of Co-Authorship

Chapter 2: The Effect of North-South Trade Agreements on the Quality of Institutions in the South: Panel Data Evidence

The text in this chapter is my own work.

Chapter 3: Formation of North-South Trade Agreements: The Role of Institutional Distance and the Content of Trade

The text in this chapter is my own work.

Chapter 4: Explaining the Global Landscape of Foreign Direct Investment: Knowledge Capital, Gravity, and the Role of Culture and Institutions

The text of this chapter comes from joint work with Konstantin M. Wacker (University of Groningen). The idea and cross-validation has been developed and conducted by Konstantin Wacker. The collection of the data mainly was my own work. The development of hypotheses and estimation strategy were developed through joint discussions and the Modeling FDI section is also joint work. The Institutional and Cultural Aspects, the Results of Individual Models and Discussion and Conclusion sections are my own work.

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Chapter 1

Introduction

June 24, 2016, The Guardian: *“UK votes to leave EU after dramatic night divides nation”* (Asthana et al., 2016)

January 30, 2019, The Conversation: *“EU-Japan trade deal comes into force to create world’s biggest trade zone”* (Kirchner, 2019)

May 30, 2019, The President of the United States (U.S.) Donald J. Trump on Twitter: *“On June 10th, the United States will impose a 5% Tariff on all goods coming into our Country from Mexico, until such time as illegal migrants coming through Mexico, and into our Country, STOP. The Tariff will gradually increase until the Illegal Immigration problem is remedied,..”*

May 30, 2019, africanews.: *“Historic African free trade zone comes into force”* (Africanews, 2019)

1.1 Motivation

The four quotes above mark recent events showing the controversial developments of the current time with regard to global trade policy. June 24, 2019 marks the day after the United Kingdom (UK) held a referendum to decide whether the UK should leave or remain in the European Union (EU) and therefore also to decide whether to be part of the EU free trade zone or not. The country voted to leave the EU with a thin majority of 51.9 percent towards 48.1 percent voting to remain. This narrow result already shows the large opposing forces which coexist at the moment. While the exit of the UK from the EU, in the media referred to as “Brexit”, is probably one of the most prominent topics in the European media, rising nationalism occurs also in other European countries where right-wing parties gain support as for example the Freedom Party in Austria, the Alternative for Germany or the National Rally in France. They all unite the believe of individually negotiating trade agreements and that the sovereignty of their country would make their economies stronger than today. Furthermore, we see the president of the United States, Donald J. Trump, pursuing a nationalist strategy by withdrawing from the Trans Pacific Partnership (TPP), which would have been the world’s largest free trade zone, only ten days after his inauguration on 20 January 2017 and announcing on Twitter to impose tariffs on imports from Mexico on 30 May 2019.

At the same time we can observe an ongoing trend of regional integration and the signing of new trade agreements. One recent example is the EU-Japan Economic Partnership Agreement, which entered into force on February 1, 2019 and which is the largest free trade area in the world. Together, the EU and Japan account for more than 25 percent of world gross domestic product (GDP). On May 30, 2019, which is just the same day as when US President announces to

impose tariffs towards Mexico, the African Continental Free Trade Agreement (AfCFTA) became effective, which is now the world's largest free trade zone between African countries. This shows how closely related in time the opposing trends are.

If the UK leaves the EU, it will have to negotiate a new trade agreement with the EU to secure trade flows with its European trading partners. Furthermore, leaving the EU results in the loss of trade access for the UK arising from EU trade agreements with third countries around the world. As the UK's market is much smaller compared to the EU, the UK will have to negotiate trade agreements with a different bargaining position compared to the EU to gain market access to large markets, as for example with the United States, which might result in challenging trade talks. Another way of defining unequal trading partners is by the difference regarding their per capita income. Trade agreements between countries with a different per capita income are often considered as "North-South" trade agreements. More precisely, they describe trade agreements between developed countries with a high income level, the global North, and the global South, including developing countries with a relatively lower income level. Trade agreements between similar countries are signed between developed countries from the North or between developing countries from the South, considered as "North-North" and "South-South" trade agreements, respectively. The number of signed North-South trade agreements has constantly increased in the past years since the beginning of the 1990s. Recent examples are trade agreements between Australia and China in 2015, the EU and Côte D'Ivoire in 2016 or between the member states of the "European Free Trade Association" (EFTA) and Georgia in 2017.

1.1. MOTIVATION

One major difference characterizing countries from the North towards countries from the South is the quality of institutions, which plays a central role in explaining differences in economic performance (c.f. Acemoglu et al., 2005,0; La Porta et al., 1997; Rodrik, 2007). Institutions are constraints established by humans to form the interaction of humans in their society. They can be formal or informal. While formal institutions officially set rules, like the rule of law, the constitution of a country or trade agreements, informal institutions are norms, traditions and culture. Both dimensions help a society to organize life and to build incentives (North, 2005, pp.3 ff).

The global South typically has inferior institutions compared to the North. While in general people in the North are well educated, have a higher life expectancy and entrepreneurs can do business and investments, which are secured by the presence of appropriate laws and an effective judicial system, people in the South live a different life. Their weak judicial systems leads to high rates of crime making business opportunities risky and thus making growth less likely. The population of the global South has gained a higher awareness of these inequalities through the increased availability of internet, social networks and mobile phones in those countries. This awareness has finally lead to the uprisings of the population of North Africa and Middle East during the “Arab Spring”. This process of revolution showed that change in institutions is possible and has raised my personal interest in the drivers of institutional change and institutions as a factor of development.

1.2 Contribution

This thesis contributes to the actual controversial development of trade cooperation in view of the newly signed large trade agreements on the one hand, as opposed to the increase in nationalist and protective policies on the other hand. In this regard, I also address the rise of trade agreements between developed and developing countries. I analyze factors and effects of trade agreements distinguishing between asymmetric (North-South) and symmetric (North-North and South-South) trading partners. I argue that the quality of institutions is an important characteristic, which distinguishes countries from the North relative to countries from the South, which also drives the characteristics of today's trade and investment flows and the existence of trade agreements.

Throughout this dissertation, I focus on preferential trade agreements (PTAs) and refer to the definition in line with Limão (2016) who defines a PTA as “*an international treaty with restrictive membership and including any articles that (i) apply only to its members and (ii) aim to secure or increase their respective market access.*” The main characteristics of PTAs correspondingly are (i) the discriminatory nature of such an agreement including rules which apply to its member countries and (ii) the inclusion of rules generating market access at least to some extent.

My analysis contains three essays, which I present in chapter 2 to 4, followed by a conclusion where I summarize and discuss my results. In chapter 2, I analyze the effects of North-South preferential trade agreements (PTAs) on the institutional quality in the South, while in chapter 3 I examine the factors of the formation of PTAs, distinguishing between North-South, North-North and South-South and in chapter 4 I extend my analysis with regard to factors of global integration on

1.2. CONTRIBUTION

global capital flows in the form of foreign direct investment (FDI) focusing on institutional quality.

Table 1.1 lists the topics, the main research questions and the applied methods of the three essays of this dissertation, which I summarize in the following.

Table 1.1: Overview of topics

| Essay | Topic | Research question | Estimation method |
|--------------|--|--|--|
| 1 | North-South Trade Agreements and the Quality of Institutions: Panel Data Evidence | Do deep North-South trade agreements promote institutions in the South? | Generalized method of moments (GMM) |
| 2 | Formation of North-South Trade Agreements and Institutional Distance | Does institutional distance promote the formation of North-South trade agreements? | Linear probability model (LPM) |
| 3 | Explaining the Global Landscape of FDI: Knowledge Capital, Gravity, and the Role of Culture and Institutions | What are the general drivers of global FDI? | Pseudo maximum likelihood (PPML) estimation & cross-validation of models |

In the first essay, in chapter 2, I refer to PTAs as an institutional setting, including rules which organize the trade relationship between its member states. In the past years, PTAs have become deeper in the way that they include more comprehensive rules, which go way beyond tariff reductions, such as property rights, competition or investment provisions. Such behind-the-border rules apply in the respective partner countries and thus should also affect the domestic institutions of the partner country. I argue that especially in North-South trade agreements there is a diffusion of institutional quality from developed countries,

where institutions are typically advanced, to developing countries, where institutional quality is typically low. First, a PTA may affect institutions because it can serve as a network for political exchange and second, the regulations and commitments stipulated in it may affect local institutions in the South.

To examine if there is a diffusion of institutional quality resulting from PTA membership, I empirically investigate if there are positive effects of being a member in a PTA on the quality of institutions in developing countries by accounting for the number and the depth of PTAs. For my analysis I use the Design of Trade Agreements (DESTA) database, established by Dür, Baccini and Elsig (2014), which includes a large set of trade agreements and data on their content by creating an index measuring the depth of a PTA. I create a large panel data set covering a long period of 32 years to account for endogeneity of several controls and the fact that institutions need time to develop. I use the generalized method of moments (GMM) estimator to account for endogeneity and provide several robustness checks with regard to the type of rules covered by the used measure of depth, the underlying choice of countries in the sample and the choice of instruments to support my results.

In chapter 3, I analyze the drivers of PTA formation focusing on institutional quality. I argue that the increased prevalence of complex production networks raises the risk that contracts cannot be enforced and that PTAs can serve as a legal instrument to alleviate that risk of institutional quality. This motive behind PTAs seems to be particularly relevant for trade relationships that involve (i) a high share of trade in contract-intensive goods where the hold-up problem is more severe and (ii) developing countries where institutional quality is typically low.

A high level of contract-intensity is related to a high share of relationship-specific intermediate inputs, for which there is only a low number of potential buyers, resulting in an increased probability of hold up and increased gains from the formation of a trade agreement. For my empirical estimation I create a large bilateral data set including 132 countries over 21 years and create a measure for the contract-intensity of exports between two country pairs. I estimate a linear probit model and create instruments for the potentially endogenous explanatory variables. I compare the factors for the formation of PTAs between North-North, North-South and South-South country pairs to see whether the factors are specifically important for the emergence of North-South trade agreements.

In the forth chapter, which is joint work with Konstantin Wacker, we also address institutional quality as a factor for FDI but take a more general view compared to the previous chapter with respect to PTA determinants. We use a novel data set on bilateral FDI positions with extensive coverage of emerging and developing economies to empirically re-assess the question which key theoretical models and motives are most suitable to explain global FDI. We assess the performance of the gravity model and the knowledge capital (KK) model and add cultural, institutional and financial factors as suggested by other theories on the determinants of FDI.

1.3 Related research

The chapters 2 and 3 relate to the general literature on trade agreements, which has focused on three main areas, (1) the motives of trade agreements, (2) the

design and institutions of trade agreements and, (3) regional trade agreements.

One strand of the literature on the motives of trade agreements argues that inefficiencies resulting from externalities in the absence of trade agreements constitute motives to sign trade agreements (Bagwell and Staiger, 2004; Ossa, 2011,1). Another strand argues that trade agreements represent commitment devices to promote the implementation of domestic policies (Limão and Tovar, 2011; Maggi and Rodríguez-Clare, 1998; Maggi and Rodríguez-Clare, 2007).

The literature on the design of trade agreements results from the presence of transaction costs, which lead to the presence of incomplete and inefficient contracts. Without transaction costs contracts would be complete and the design of contracts and trade agreements would be redundant. The literature differentiates two types of frictions, (1) contract frictions as analyzed by Helpman and Razin (1991), Bagwell and Staiger (2001) or Maggi and Staiger (2011), and (2) imperfect enforcement, meaning the lack of external enforcement, which requires that trade agreements need to be self-enforcing. This second type of friction is addressed for example by Maggi (1999) or Bagwell et al. (2007), who study the optimal design of enforcement rules.

The first two essays can be allocated to the third research area focusing on regional trade agreements. This research area includes the determinants and impacts of regional trade agreements. Regional trade agreements (RTAs) in this regard characterizes the exclusiveness of a trade agreement, which applies to two or more member states while there are also nonmember states, where the rules do not apply. In this regard this definition is in line with the definition of PTAs used in the following analysis. The first essay contributes to the empirical

1.3. RELATED RESEARCH

literature on the effects of PTAs. Existing empirical studies focus on the effects of RTAs on external tariffs, as for example Estevadeordal et al. (2008); Limão (2006) and Karacaovali and Limão (2008). But so far, to my knowledge, there is only one study by Busse et al. (2007), which examines empirically the effects of trade agreements on institutions and which is part of the general empirical literature on the drivers of institutional change. They test several factors, which drive the change in institutional quality and in this regard also test for the effects of the implementation of NAFTA on Mexico and of the EU accession on the accessing countries. I add on this literature by including a more comprehensive set of countries and include the depth dimension with regard to trade agreements, arguing that the content of trade agreements is what matters in addition to the sole membership in a trade agreement.

The second essay is part of the literature on the determinants of trade agreements and based on the first empirical study analyzing the economic determinants of PTAs by Baier and Bergstrand (2004), which intends to serve as a benchmark empirical model, which can be extended by political factors. This benchmark model has subsequently been applied by other empirical studies on the determinants of PTAs, such as the study by Egger and Larch (2008) who account for interdependence of already existing PTAs and the formation of new PTAs. The empirical studies, which are most closely related to the second essay are the two papers by Manger (2012) and Orefice and Rocha (2014), since they differentiate between North and South member countries of PTAs and focus on the content of trade between the respective partner countries. While Manger (2012) finds that vertical intra-industry trade between North-South trading partners promotes the formation of PTAs, Orefice and Rocha (2014) find that the presence of production networks measured as traded intermediate goods lead to

deeper integration. Although Orefice and Rocha (2014) analyze the effects on the depth of trade agreements they also apply the benchmark model by Baier and Bergstrand (2004). They analyze the effect for North-South, North-North, South-North and South-South PTAs but focus mainly on Asian countries. So far, to my knowledge, only Baier and Bergstrand (2004) have accounted for institutional and political factors by including nine additional measures, which include market orientation, common legal origin or common language but find no significant effects. I add on that literature by accounting for the institutional quality arguing that institutional differences matter specifically in North-South relationships where institutional differences are large so that PTAs serve as a legal instrument and furthermore, relate these effects to the trade in goods which are sensitive to the quality of institutions.

The third essay focuses on explaining international capital flows and contributes to the literature analyzing the determinants of FDI flows, which have, so far, focused either on horizontal (Brainard, 1997; Helpman et al., 2004) or vertical motives (Alfaro and Charlton, 2009; Badinger and Egger, 2010). But until now there is no consensus on one general model which explains global FDI. As emphasized by Davies (2008), to detect vertical motives a sufficiently large set of developing countries needs to be included in the analysis. But so far the literature has focused on explaining FDI flows using data on certain regions, specifically Asian and African countries as for example Abeliatsky and Martinez-Zarzoso (2019); Chen et al. (2017); Gold et al. (2017). Papers focusing on specific factors of FDI such as cultural and institutional factors (e.g. Azemar et al. (2012); Benassy-Quere et al. (2007); Beugelsdijk et al. (2018); Cuervo-Cazurra and Genc (2008); Demir and Hu (2016)) often focus on specific geographic regions, while van Hoorn and Maseland (2016) emphasize, that

1.3. RELATED RESEARCH

comprehensive bilateral variation is required to detect effects of cultural and institutional factors. We add on that literature by using a new data set including a broad set of countries of different income levels, which we apply for testing and evaluating a global FDI model accounting for FDI from and to the North and South, respectively.

This chapter motivated and summarized the topics and research questions addressed in the three essays, which are presented in the following three chapters, and set them into context of the related literature and pointed out the knowledge gap or missing research. After the presentation of the three essays I summarize the main results in the final chapter and provide concluding remarks drawn from the results and finally provide a short outlook.

Chapter 2

The Effect of North-South Trade Agreements on the Quality of Institutions in the South: Panel Data Evidence

2.1 Introduction

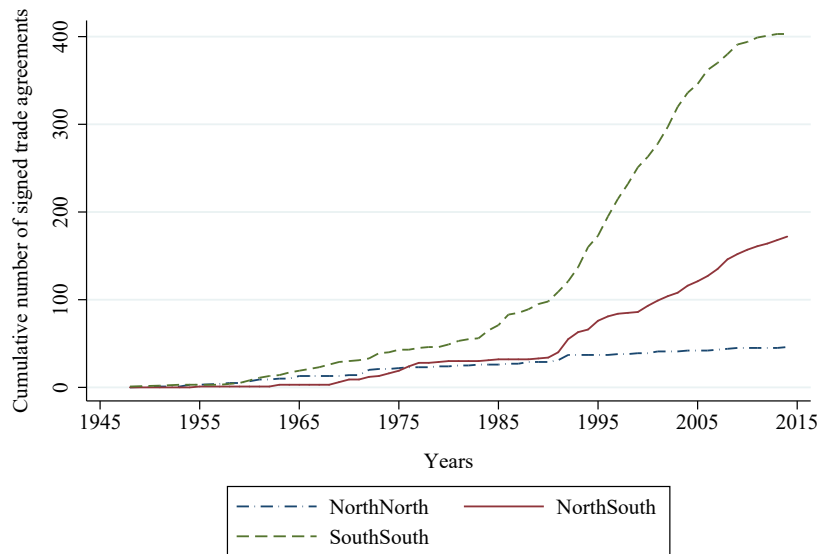
Since the early 1990s, a surge in the number of preferential trade agreements (PTAs)¹, signed per year, can be observed. While there were 161 PTAs signed until 1990, the cumulative number of trade agreements increased to 621 agreements in 2015. Figure 2.1 shows the cumulative number of PTAs which have been signed since 1948 until 2015 by stance of development of the trading partners involved, i.e. between developed countries, North-North, between developing countries, South-South, and between developed and developing countries,

¹In this paper, PTAs are referred to all types of preferential trade agreements, including regional trade agreements.

2.1. INTRODUCTION

North-South. The overall number has risen but especially North-South trade agreements (solid line), and South-South trade agreements (short-dashed line) show the largest increases.

Figure 2.1: Number of Signed Trade Agreements by Region



Source: Author's calculations based on DESTA database.

What is the motive to enter a PTA? In the first place, regional integration happens due to economic reasons. Gaining market access is the traditional motive, as for example stated by Hillman and Moser (1996). In accordance to this, since the establishment of the General Agreement on Tariffs and Trade (GATT), which later became the World Trade Organization (WTO), tariffs have been decreasing on a multilateral level so that even developing countries enjoy tariff-free market access to important markets. Zero most-favored-nation (MFN) tariffs have led to increased trade by developing countries (United Nations, 2013). On average, developed countries have lower levels than developing countries. But the latest WTO round of negotiations, the Doha Round, which has started

in 2001, has come to a halt, while regional integration continues to accelerate (Limão, 2016).

It seems that market access plays a more important role in symmetric agreements, that is in North-North and South-South relations. This can also be seen in the actual debate between the US and the EU and the US-President's threat to increase tariffs on EU products to gain more favorable trade terms. Freund (2004) argues that countries with similar cost structures are likely to require reciprocal trade liberalization to be self-enforcing. This is less the case in North-South trade agreements. She finds empirical evidence that reciprocity is important in symmetric trade agreements while there is only modified reciprocity in North-South trade agreements. North countries, in general, gain more market access compared to developing countries.² At the same time, developing countries already have good market access generated by the "Everything but Arms" (EBA) provision by the EU or the Generalized System of Preferences (GSP), where developing and least developed countries are provided additional tariff concessions, which do not fall within the scope of the most favored nation (MFN) principle. So this cannot explain the ongoing increase in signature rates of PTAs.

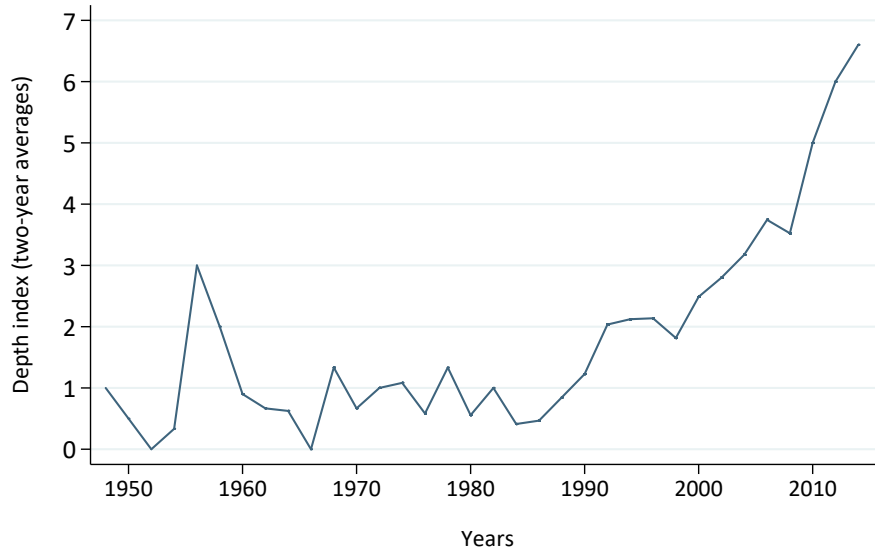
Besides the increase in the number of trade agreements, it can be observed that the newly signed PTAs tend to include a broader set of provisions, which go beyond at-the-border rules, like the reduction of tariffs, export subsidies or taxes and beyond WTO rules. There are "WTO+" rules, which expand or deepen existing WTO rules and countries define beyond-market-access commitments in areas, which do not directly affect trade flows, such as intellectual

²A ten percent reduction of a tariff in a developing country leads to a tariff reduction in the developed country of only 2 percent (Freund, 2004).

2.1. INTRODUCTION

property rights, competition policy, anti-corruption and human rights, public administration, innovation policies, data protection and statistics and industrial cooperation (World Trade Organization, 2016, p. 129).

Figure 2.2: Depth of Trade Agreements over Time



Mean depth index of all agreements where depth index is available. For the whole period in total 618 agreements are included.
Source: Author's calculation using DESTA database.

These commitments are behind-the-border rules and affect domestic policies. The more provisions are defined, which go beyond at the border rules, the deeper are the agreements. In other words, the depth of an agreement indicates the extend of the commitments, which the member states have bargained on. The more rules are specified in different areas of an agreement and the more those rules regulate the cooperation between the member states, the deeper is this agreement. Figure 2.2 shows the development of the mean depth of all signed trade agreements where data on depth is available. This measure is calculated on the basis of an additive index created by Dür et al. (2014), adding up the

key provisions, which can be included in a PTA. One point is added if a PTA is more than a partial scope agreement or if it includes substantive provisions in one of the six areas: (1) services, (2) investments, (3) standards, (4) public procurement, (5) competition and (6) intellectual property rights. The index can range from 0 (when a PTA is only a partial scope agreement and does not include any provisions in one of the above areas) to 7 (for PTAs, which are more than a partial scope agreement and includes substantive provisions in all areas). A substantive provision is a definite regulation in one of the areas, while for example the desire to start trading in the services area is not treated as a substantive provision. So, while there has been a sideways movement to a higher number of PTAs there is a parallel movement to an increase in depth starting only slightly earlier in the mid 1980s.

The increased depth of PTAs provides additional motives for the formation of PTAs. One motive for developing countries, is that trade agreements have become an instrument to promote development. They intend to implement domestic reforms, which go beyond trade liberalization and import higher policy standards to foster growth. Schiff and Winters (1998) argue that developing countries might use PTAs to lock in policies because there is a higher credibility of enforcement in those agreements. Developing countries may chose a partner, who helps them to credibly promote policy agendas, accompanied by financial and knowledge transfers. Compared to multilateral agreements, PTAs offer less coordination effort and a targeted choice of a partner. Levy (2009) investigates the function of a PTA to increase a country's commitment to better governance by having a particular look at the United States-Peru Free Trade Agreement. Peru has gone through a period of very poor political and economic management and thus has an urgent motive to achieve credibility in pursuing better

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policies and reforms. He finds that Peru was preferably interested in locking in policies instead of gaining market access, since it already had virtually free market access to the US. Interviews with Peruvian officials, academics and businessmen showed clearly that the agreement was expected to have a significant improvement on the rule of law and a better investment environment. This case study suggests that countries from the South sign PTAs with the North to promote the international attractiveness as well as domestic and foreign investment.

Also countries from the North aim at promoting the development process in countries from the South (Limão, 2016, p.50). They intend to improve institutions and governance in developing countries because the legal system in those countries is poor and often there are no secured property and human rights, missing democratic structures and courts, while political leaders are corrupt. Many RTAs contain regulations on pro-competitive practices, transparency, stronger anti-corruption and intellectual property rights, movement of capital and labor and investment. The North American Free Trade Agreement (NAFTA), for example, represents a very broad and far-reaching agreement with a depth index of 7. Besides chapters on trade in goods and technical barriers to trade, it contains chapters on investment, services, administrative and institutional provisions and intellectual property. Article 1110 of the investment chapter, for instance, interdicts expropriation of any investment of any party and regulates exceptions and compensations. The Cotonou Agreement on the other hand remains more general and only has a depth index of 1. It focuses on the aim to gradually remove all trade barriers, cooperate politically and promote dialog and poverty reduction without a concrete schedule. Article 17(2), for example, states that the agreement commits to the promotion of democratic processes through dialogue and consultation and to promote institutional reform. Still, this shows

that PTAs now also serve as a promoter of institutions and political change.

The intention of this paper is to analyze whether trade agreements between North and South do affect the quality of institutions in the South. First, I argue that the membership in a PTA, without considering the depth, may improve institutions in the South because PTAs can serve as a platform where politicians can discuss policies and interchange political experience and skills. Often political leaders in a developing country lack experience and skills when they come into position (Afegbua and Adejuwon, 2012). Especially African countries lack competent leaders (Adeyemi, 2017). One reason might be that patrimonialism is persistent (Acemoglu and Robinson, 2010) and new political leaders lack a previous political career. The exchange of knowledge is especially intensive in the period when the agreement is negotiated, so already before it is actually signed and an effect should be seen in the period afterwards. Second, the deeper the agreement, the higher the improvement in institutional quality. That means, rules as, for example, defined in the investment chapter of NAFTA, might positively affect the institutional quality in the South. These rules compensate for missing institutions in the developing country, which are standard in the North.

In the literature, institutions play a prominent role in explaining economic performance and growth (Acemoglu et al., 2005,0; La Porta et al., 1997; Rodrik, 2007) or trade pattern (Anderson and Marcouiller, 2002; Berkowitz et al., 2006; de Groot, Henry L. F. et al., 2004; Nunn, 2007). Thus it is important to determine the factors of good institutions. The research on drivers of institutional change is growing. There are studies focusing on political factors of institutional change, such as free media (Brunetti and Weder, 2003; Norris, 2008) or foreign aid (Ear, 2007; Knack, 2004; Tavares, 2003) and on economic factors like

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trade (Busse et al., 2007; Islam and Montenegro, 2002; Levchenko, 2013) or FDI (Larrain and Tavares, 2004; Pinto and Zhu, 2016). Most of those studies use cross-sectional data. The paper most closely related to the present analysis is Busse et al. (2007). They also investigate the effect of trade agreements on institutions but focus on the effects of NAFTA on Mexico and of the EU accession on the accessing countries, while I work with a comprehensive country sample. Furthermore they model the agreements as a single dummy variable, while the depth of the trade agreements plays a central role in my analysis.

For the analysis, I utilize the Design of Trade Agreements (DESTA) database by Dür et al. (2014) for measures relating to PTAs and the International Country Risk Guide (ICRG) to measure institutional quality. I create a data set including PTAs between North and South and concentrate on the effects on the institutional quality in the developing country. The use of a comprehensive data set allows for more general conclusions. Furthermore, I work with a panel data set covering a period of 32 years. The time dimension is useful in an econometric sense to correct for endogeneity and the long period of time includes more changes in the institutional quality, which only slowly develop. For the main explanatory variables I include the number of signed PTAs and the depth for each developing country and period.

I find that depth is an important driver, which positively affects institutional quality. However, the results differ with respect to the type of agreement and regions included.

As the literature on institutions suggests, institutions play an important role for development and thus the analysis of factors of change in institutions may

provide important insides for politicians of developing countries or developed countries who promote development abroad or for international organizations.

The rest of the paper proceeds as follows. The next chapter summarizes the related literature on the factors of change in institutional quality and outlines related work on learning and the diffusion of knowledge and political reform. Chapter 2.3 presents the estimation framework, the data used for the estimation, and the discussion of results. The final chapter concludes.

2.2 Related Literature

The related empirical literature on the factors of change in institutions sheds light on important control variables to be included in the empirical analysis. Furthermore, the literature on learning provides an intuition why PTAs are a suitable instrument to transfer knowledge and experience.

An important part of the related literature reveals the critical factors of institutional quality, which need to be included in the empirical analysis. It can be seen that most of the related empirical literature uses cross-sectional data. Factors of change can broadly be divided into political, social, geographic and economic factors. One strand of the cross-sectional literature relate the initial conditions of a country to its subsequent level of institutional quality. These studies explain why institutions in some countries are well-developed, while in other countries institutions are weak. Acemoglu et al. (2001), for example, use settler mortality rates and other controls (latitude, climate, religion and natural resources) to explain the level of current institutional quality. European colonialism is also linked to differences in institutional quality by referring to the associated legal

2.2. RELATED LITERATURE

system. La Porta et al. (1997), Straub (2000) and Chong and Zanzi (2000) analyze the effects of different legal origins on the quality of institutions and find that inferior institutions are developed in countries with a French legal origin, where the government is much more interventionist and investor protection is weakest. La Porta et al. (1999) also show that ethnic heterogeneity is related to poor institutions.

However, these factors do not explain how institutions change over time and thus are inappropriate for the empirical analysis over time. Important drivers of institutional quality, which include a time dimension are mainly political and economic ones. The freedom of the press as, for example, revealed by Norris (2008) and Brunetti and Weder (2003), is an important political driver. Foreign aid is also analyzed as a factor of change in a number of papers but its effect is inconclusive. While Tavares (2003) results indicate that foreign aid has a positive effect on corruption, meaning a reduction of corruption, Knack (2001), Ear (2007) and Djankov et al. (2008) find a negative effect of aid on different measures of institutions, including corruption. With respect to economic determinants, empirical work focuses on openness and FDI, which are often related to corruption. The effects of FDI on institutions do not show clear results. Larrain and Tavares (2004) and Okada and Samreth (2012) study the effects of FDI on corruption and show that FDI reduces corruption, while Pinto and Zhu (2016) also account for the development level of host countries, which reveals that FDI increases corruption in least developed countries while there are no effects resulting from FDI in all remaining countries. Ades and Di Tella (1999) and Wei (2000) show that more open economies tend to have lower corruption levels due to higher competition. Busse et al. (2007); Giavazzi and Tabellini (2005); Islam and Montenegro (2002); Rigobon and Rodrik (2005) find a posit-

ive and significant effect of openness on different measures of institutions. But Knack and Azfar (2003) show that the results for openness are very sensitive to the choice and number of countries. For data sets including more countries than those used by other authors the effect of openness is no longer present.

In all studies, income and population size represent essential further control variables for institutional quality, which change over time. Busse et al. (2007), Gassebner et al. (2011) and Quazi and Alam (2015) add to the literature by including the time dimension in their empirical work. These panel studies add human capital and political freedom as further controls, which change over time. Another part of the related literature focuses on the diffusion of knowledge and policies between economies and provides intuition for the link between trade agreements and institutional reform. First, it is stated, for example, by Islam and Montenegro (2002) that policies can diffuse from one country to another, especially when countries trade with each other. They argue that the risk that arises from trading with unknown partners increases the incentive to improve domestic institutions as domestic and foreign firms demand for reform. Then, open economies learn from trading partners where successful and effective institutions are implemented. Second, Simmons et al. (2006) explain this process of learning by the theory of Bayesian updating and outline the factors, which play a role for successful transmission of knowledge or reform. They explain that learning from other economies is based on the successful outcome of policies abroad, which is then transferred to the domestic country. The success of this transmission depends on the availability of information on the outcome and the expertise and experience to evaluate the information. The diffusion of policies is more effective, the closer countries are linked to each other so that a better communication is possible. By signing trade agreements, countries intensify their relationship and facilitate communication for a better exchange of knowledge.

Empirical evidence for the diffusion of reforms is provided by Gassebner et al. (2011), who study whether implemented economic reforms in one country affect the reforms in other countries. They find empirical support for reform spillovers and furthermore, find that trade itself is not promoting diffusion of political reform while cultural and geographic proximity are important drivers. The positive effect of spacial proximity for learning is supported by the results of Mancusi (2008) who analyzes the effect of knowledge spillovers on innovation on a sectoral level. She finds evidence that knowledge spillovers are fostered due to technical and spacial proximity between source and recipient. These results show that spatial proximity promotes the ability of spillovers and supports the argument that trade agreements promote these effects. PTAs can serve as a communication network where information and knowledge is exchanged. When countries negotiate on a PTA, spatial proximity is reduced and knowledge exchange is possible.

2.3 Empirical Analysis

2.3.1 Data

The purpose of this study is to analyze the impact of trade agreements between North and South on the quality of institutions in the South over the period of 1984 until 2015. To account for the effects of the sole membership in a PTA I introduce the number of PTAs, signed by a country from the South.³ To capture the effects of the depth of PTAs, I use the additive index from DESTA,

³In the Appendix, I include a list of all North and South countries, as well as a description of all variables and sources.

which measures the amount and extent of commitments included in a PTA. As noted above, there are important other determinants of the quality of institutions, which I include as further controls. For the choice of controls, I refer to the related literature on the determinants of institutional change with a focus on those determinants, which change over time. These controls include income, population, education, freedom of the press and the presence of conflicts.

Dependent Variable

The measure for the quality of institutions comes from the International Country Risk Guide (ICRG) database. There are further available measures for institutions, like the World Governance Indicators (WGIs) by the World Bank or the Economic Freedom of the World (EFW) Index by the Fraser Institute. But the ICRG data set is the most comprehensive data set covering 141 countries and starting in the year 1984. It includes the largest number of observations without gaps.

The ICRG data set measures the risk of a country in three categories, political, financial and economic risk. Each category consists of components, which are added together to an index for each category and finally to an overall risk rating for each country. To achieve consistency of the rating between countries and over time, a number of basic questions are predefined to create the index. All categories consist of several components, which have a minimum value of zero, indicating the highest risk and the maximum value indicating the lowest potential risk. The maximum values, varying from 4 to 12, represent the importance with respect to the overall risk, measured for each category. Table 2.1 lists the 12 components of the Political Risk rating and its maximum points,

Table 2.1: Political Risk Components

| Component | Points (max.) |
|---------------------------|----------------------|
| Government Stability | 12 |
| Socioeconomic Conditions | 12 |
| Investment Profile | 12 |
| Internal Conflict | 12 |
| External Conflict | 12 |
| Corruption | 6 |
| Military in Politics | 6 |
| Religious Tensions | 6 |
| Law and Order | 6 |
| Ethnic Tensions | 6 |
| Democratic Accountability | 6 |
| Bureaucracy Quality | 4 |
| Total | 100 |

adding up to a total score of 100 points. While “Bureaucracy Quality” for example is assessed least important with 4 maximum points, “Government Stability”, “Socioeconomic Conditions”, “Investment Profile”, “External Conflict” and “Internal Conflict” are considered most important with a maximum of 12 points, when assessing the overall risk.

In this analysis the Political Risk component “Investment Profile” is used to measure the institutional quality. It accounts for institutional aspects, which are particularly important with regard to trade or foreign direct investment and consequently are expected to be affected by trade agreements and their contents. It measures the general risk to investment and is composed of three sub-components. One component is “Contract Viability/Expropriation”, which

quantifies the potential risk that any contracts are modified or completely canceled or the risk that foreign owned assets are expropriated. This reflects an important risk for exporting firms, having contracts with foreign firms or for investors, investing in foreign countries. Another component measures “Profits Repatriation”. This component assesses how well profits can be transferred out of the host country and thus also evaluates the bureaucratic efficiency, the banking system and exchange controls, all of which are aspects, trading firms and foreign investors have to deal with. The third component, measures “Payment Delays”, which is also affected by a poor banking system and an inefficient bureaucratic system. In addition, this component assesses other factors, which influence delays in payments, like foreign exchange position and formal and informal government policies or motivations. The overall component sums up over the sub-components and has a maximum score of 12 points.

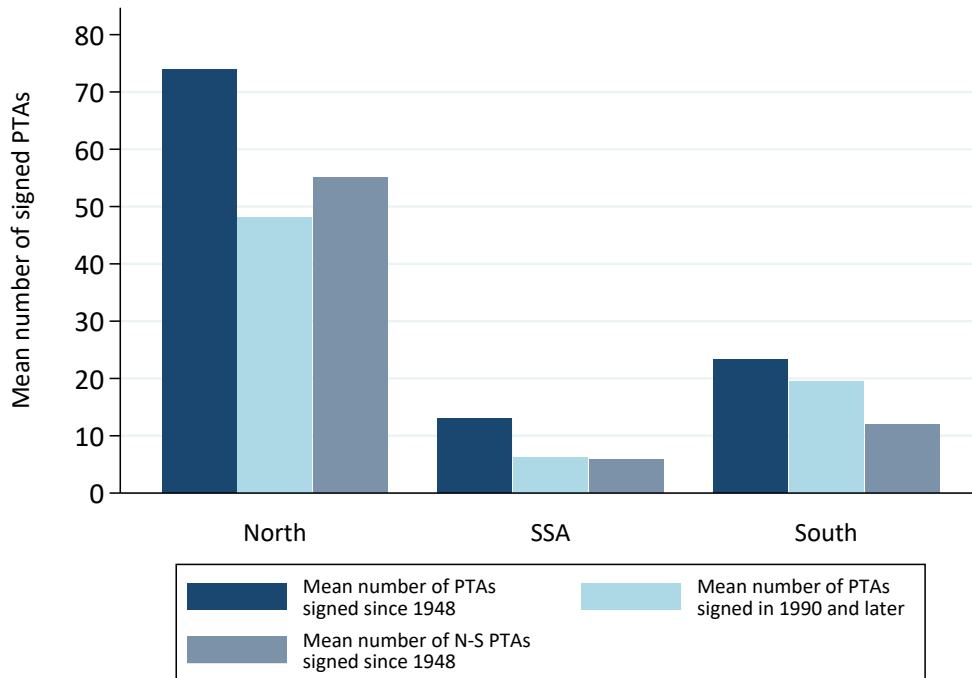
Data on Trade Agreements

For measures related to trade agreements, i.e. for the number of PTAs signed and their depth, the DESTA database Dür et al. (2014) is used. The data set not only provides a comprehensive list of trade agreements, but also includes detailed information on various characteristics of each agreement, especially on the scope of the specified provisions, (i.e. the depth of an agreement). In the most recently available data set, a total number of 810 trade agreements are listed in DESTA over a period between 1948 and 2015. Detailed information on the depth of trade agreements and other information like the type of agreement in terms of integration level, membership (i.e. bilateral, plurilateral, plurilateral-bilateral, etc.), number of member states, regional dummies, and information on the language is available for 618 PTAs. Furthermore, for each PTA, all member

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states are listed, which is required to get country-level data. To create a variable that counts the number of signed PTAs for each country and year, the data was transformed accordingly. In a next step, for each country the cumulative sum of signed agreements in each year was calculated. There are some countries, who have already signed PTAs before the first period, which is covered in this analysis. So not all countries start with zero PTAs.

Figure 2.3: Number of PTAs Signed on Average by a Country from Different Regions between 1948 until 2015



Source: Authors calculations using DESTA database

Figure 2.3 shows the number of PTAs, countries with a different status of development or from different regions (North, South or SSA) have signed on average (1) over the whole period included in the DESTA data set, which means since 1948 (dark blue bar), (2) since 1990, the period when the overall signature rates

of trade agreements increases (light blue bar), and (3) all PTAs, signed only between North and South (North-South) since 1948 (mid blue bar). South includes all countries from the South excluding countries from Sub-Saharan Africa (SSA). SSA plays a specific role as it performs poorly in economic and political development compared to other developing countries. Its role is discussed in more detail in chapter 2.3.3. It can be observed that, on average, countries from the North sign most PTAs compared to countries from the South and that Sub-Saharan African countries on average sign less PTAs than other developing countries. Furthermore, the figure shows that for North and South most of the PTAs were signed since 1990. Only for SSA this trend is not identifiable. For a developing country (excluding SSA), about half of the signed PTAs is with a country from the North. This reveals that North-South PTAs depict a substantial part of PTAs for the South.

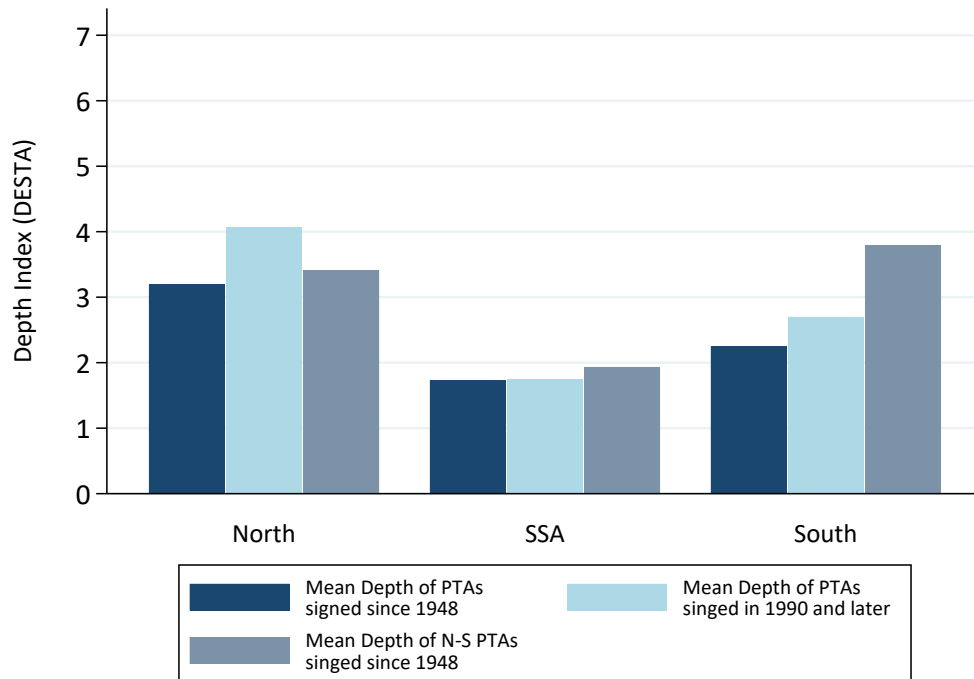
For the depth of a PTA, the additive depth index from DESTA is used.⁴ The index consists of seven subordinate variables, which take values of either zero or one. The first variable takes the value one, if the agreement is more than a partial scope, i.e. if the agreement is a full free trade agreement and zero otherwise. The other six variables indicate whether the agreements contain substantive provisions in the areas (1) services, (2) investments, (3) standards, (4) public procurement, (5) competition and (6) intellectual property rights by a value of one or zero if this is not the case. So if an agreement includes substantive provisions in all areas and foresees the elimination of all tariffs, the value for the depth index adds up to seven. Since there are many countries, which have signed several PTAs per year, the mean of the depth index is calculated for each

⁴DESTA also provides a second measure of depth, using a latent trait analysis, which was conducted for binary data. As in the following analysis binary data is not used, the additive index is applied as a measure of depth

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year.

Figure 2.4: Mean Depth by Region over all PTAs (since 1948) and over all PTAs Signed since 1990



Source: Authors calculations using DESTA database

Figure 2.4 shows, again for North, South and SSA, the mean depth of signed PTAs since 1948 (dark blue bar), since 1990 (light blue bar) and of North-South (N-S) PTAs since 1948 (mid blue bar). It reflects that, on average, PTAs signed after 1990 are deeper compared to all PTAs signed since 1948. But this is only the case for North and South but not for countries in SSA. Furthermore, North-South PTAs are, on average, deeper compared to other PTAs. Especially, when looking at countries from the South, agreements signed with the North are distinctly deeper, with an average index of almost 4, than the average depth index of all agreements signed since 1948, which takes a value slightly above 2.

This suggests that potential effects of deep trade agreements are expected to be present especially in North-South PTAs.

Further controls

Further explanatory variables are the number of armed conflicts, freedom of the press, income, population, inflation and education. These controls are relevant in this context and have been investigated in related empirical studies.

Conflicts are expected to affect institutions negatively. To measure conflicts, the UCDP Monadic Conflict Onset and Incidence data set from the Uppsala Conflict Data Program (UCDP) and the Study of Civil War at the International Peace Research Institute in Oslo (PRIO) is used. This data set is a country-year version of the UCDP/PRIO Armed Conflict data set v.4-2014, which is structured for a quantitative analysis. For this analysis, I use a variable, which measures the incidence of at least one active intrastate conflict as a dummy for each country-year. Intra-state conflicts refer to all conflicts between a government and a non-governmental party without intervention from other countries, which result in no less than 25 battle-related deaths per year.

Data on the press freedom is taken from Freedom House. It measures the degree of press freedom in three categories, i.e. no press freedom (taking the value 0), partly free (taking the value 1) or completely free (taking the value 2). I expect that a higher press freedom positively affects the level of institutional quality as it can reveal bad institutions and inform the public about missing rules or the violation of rules and how institutions can be improved.

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For income, education and population, I use data from the World Bank. Income is measured as the log of GDP per capita in current US dollars. Data is available for the period between 1960 and 2015 for 217 countries (World Bank, 2016). For income, I expect a positive effect on institutions as with a higher available income, people demand better institutions, and at the same time, more financial resources are available to build them up.

Population is measured by the size of a country, which I measure as the total number of people in million for each country. The effects on institutional quality are ambiguous. On the one hand, in a larger country it might be more likely to push through reforms and necessary rules, as it has a critical financial mass. On the other hand, a larger population increases transaction costs and ethnic conflicts might be more intensive, which constitutes a burden on the ability to promote institutions.

Years of schooling are used as a proxy for education. I expect a positive effect on the quality of institutions, since a well-educated population has a higher interest in political participation and reform and will demand good institutions.

2.3.2 Estimation Framework

The final data set includes 123 countries, 101 Southern and 22 Northern countries, over 8 periods starting from 1984 until 2015. To analyze long term effects and to reduce business cycle effects, 4-year averages are used. For the estimation framework, I stick closely to the related empirical literature analyzing the effects on institutions. I estimate the effect of the number of PTAs and the depth of PTAs on the quality of institutions in a linear dynamic panel model using the

following baseline equation:

$$INST_{it} = \beta_1 INST_{i,t-1} + \beta_2 PTAs_{i,t-1} + \beta_3 Depth_{i,t-1} + \beta_4 PTAs_{i,t-1} * Depth_{i,t-1} + \gamma' X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (2.1)$$

The dependent variable, $INST_{it}$, measures the quality of institutions of country i in period t . A lagged dependent variable, $INST_{i,t-1}$, is included to capture the persistence of institutional quality since only small adjustments are possible in one period and a process of adaption is needed to implement better institutions. That is, if the quality of institutions is low in the former period, a country will not be able to improve institutions to a high level immediately in the next period.

The main explanatory variables are $PTAs_{it}$, indicating the cumulative number of trade agreements, which a country has signed until period t and $Depth_{it}$, measuring the mean depth of all agreements signed until period t . Furthermore, an interaction term of the two variables $PTAs_{it} \times Depth_{it}$ is included to test if the effect of one of the variables differs if the value of the other one changes. It could be, for example, that the more trade agreements a country has signed, the larger or smaller the effect of depth might be. Similarly, the deeper trade agreements are, the greater might be the effects of the number of signed PTAs. X_{it} includes a number of time-varying control variables, which are commonly used in the literature as determinants of institutional change. μ_i represents individual specific effects (here country fixed effects) and δ_t denotes time dummies for all periods. Finally ε_{it} is the idiosyncratic error term, capturing all other omitted factors.

Estimating this equation using pooled ordinary least squares (OLS) will lead to

biased results as the lagged dependent variable correlates with the individual specific effect, which is part of the error term, i.e. $E(\mu_i|Y_{it-1}) \neq 0$ which is referred to as the “dynamic panel bias” or “Nickell-bias” (Nickell, 1981). This makes OLS inconsistent and leads to an upward bias in the coefficients. Furthermore, results are biased due to other endogenous variables.

Most explanatory variables are likely to be endogenous. There are two potential sources of endogeneity. First, endogeneity may arise from omitted variables bias. The inclusion of country fixed effects deals with this source of endogeneity. Second, endogeneity arises due to simultaneity. The number of PTAs is potentially endogenous with respect to β_1 and β_2 because of reverse causality arising from the quality of institutions, which are not only affected by the number of PTAs but, which might affect the number of PTAs itself. North countries might want to sign more PTAs with countries, which have a higher level of institutional quality. This problem of reverse causality might also occur with respect to the depth of PTAs since the level of institutional quality in the South might affect how deep a PTA is. If institutions are poor in the country from the South, a trading partner from the North may seek to compensate for missing institutions by forming a deeper PTA to protect domestic firms. The other control variables, namely income, freedom of the press and conflicts are also expected to be endogenous due to simultaneity. Obviously, if institutions are poor and there are no rules defined which secure (physical and intellectual) property, this also produces a risk to the freedom of the press and may also result in conflicts.

Acemoglu et al. (2005) argue that institutions are a source of economic growth. In endogenous growth models it is the amount of resources allocated to innovation, which explains differences in income. Innovation activities highly depend

on property rights. If property rights for the technology of the innovation are not secured, there are no incentives for innovation.⁵ And if there are secure property rights, this depends on the implemented institutions. So institutions also affect income. Empirical evidence for a causal relationship of institutions on growth is provided, for example by Dollar and Kraay (2003), Glaeser et al. (2004) and Levine (2005).

Education and population are assumed to be exogenous. Education is not expected to be endogenous because the current level of institutions may only affect the educational system of future periods and then primarily the part of pupils, newly entering school but less those who are already enrolled in school and it should not have any effect on the current educational system.⁶

The difference generalized method-of-moments (GMM) estimator, proposed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991) as well as the system GMM, developed by Arellano and Bover (1995) and Blundell and Bond (1998) address the above noted problems. The estimator is constructed for linear dynamic panel equations with a small number of periods and a large number of individuals, a dynamic dependent variable, which is influenced by its past values, further endogenous explanatory variables, fixed individual effects and heteroscedasticity and autocorrelation within individuals but not across them (Arellano and Bover, 1995; Blundell and Bond, 1998). Furthermore, it is assumed that the only instruments available are internal, i.e. they are based on lags of the

⁵See also North (1990) for a detailed discussion of the importance of institutions for economic development.

⁶For example, the German schooling system had a reform, where pupils could earn the diploma “Abitur” after 12 years instead of 13 years. But this affected only pupils newly entering high school and it took at least another 8 years until the first students graduated (Huebner and Marcus, 2017).

instrumented variables. This is an important characteristic as it appears to be very difficult to find suitable instruments for endogenous variables from outside the model. These instruments have to be highly correlated with the endogenous variables, but at the same time, they need to be uncorrelated with the quality of institutions and to vary over time. The model to be estimated takes the following general form of an autoregressive panel data model, which is used to explain the estimation framework:

$$y_{it} = \alpha y_{i,t-1} + \gamma X_{i,t-1} + \zeta X_{it} + \mu_i + \varepsilon_{it} \quad (2.2)$$

The basic idea which is incorporated in the difference GMM is to remove the individual fixed effects and thus the potential for omitted variable bias by taking first differences as in equation (3). By this transformation, the lagged dependent variable $\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2}$ is still related to the error term $\Delta \varepsilon_{it} = \varepsilon_{it} - \varepsilon_{i,t-1}$ via the terms $y_{i,t-1}$ and $\varepsilon_{i,t-1}$ and thus needs to be instrumented. But now $\Delta y_{i,t-2}$ and $y_{i,t-2}$ become valid instruments, which are related to the lagged dependent variable but not to the error term as long as the errors are not serially correlated. Other explanatory variables also remain endogenous and need to be instrumented by their lags. After instrumenting, the transformed equation can be estimated using GMM.

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \gamma \Delta X_{i,t-1} + \zeta \Delta X_{it} + \Delta \mu_i + \Delta \varepsilon_{it} \quad (2.3)$$

This estimation is performed by creating a system of equations of moment conditions as in equation (4), which indicates that all instruments are uncorrelated with the errors. With z being a vector of j instruments, there is a system of equations equal to the number of instruments.

$$E(\varepsilon|z) = 0 \tag{2.4}$$

If there are more instruments, i.e. more equations than parameters to be estimated, in general, there is no solution. The system is over-identified and usually all moment conditions cannot be satisfied. The GMM estimator now estimates equation (3) by minimizing the vector $E_N(z\varepsilon)$ of N observations, that is, forcing the empirical moments as close to zero as possible. For this minimization problem, the one-step GMM estimator defines a weighting matrix, which weighs each moment condition. That means, in the optimal case, large weights are provided to moments with small variances, while instruments with large variances are deemphasized by smaller weights. Through this procedure, the information from instruments with relatively small variances is not lost. In infinite samples the GMM estimator is consistent and efficient.⁷ So when N increases the weighting matrix converges to the optimal matrix. But as the sample size is limited, the instruments are expected to correlate at least slightly with the endogenous part of the regressors. So in a finite sample it is crucial not to include too many instruments.

Estimating GMM using a second step can lead to a gain in precision. The two step GMM estimator uses the estimated residuals from the first step to create a covariance matrix of estimated residuals and then does the GMM estimation again. In difference GMM, two step GMM generally leads to lower bias and lower standard errors compared to one step GMM. But in small samples, the two step estimator can produce severely downward biased standard errors, which indicate a deceptive precision. This is due to the second step, where the efficient weight matrix is constructed using parameter estimates without accounting for their

⁷See Hansen (1982).

variability. Windmeijer (2005) derives a small-sample correction term, which corrects for the extra variation in a small sample.

Blundell and Bond (1998) find that in small samples, which include a persistent and short time-series the results of the difference GMM contain a small sample bias and lose precision. As already suggested by Arellano and Bover (1995), one reason is that lagged levels incorporate little information about future changes if the dependent variable is close to a random walk and thus lagged levels are poor instruments for differenced endogenous regressors. They are the first to propose the use of lagged differenced instruments for the levels equation. Blundell and Bond (1998) show that additional moment conditions for the levels equation, which create a system of equations, contain information even when data is persistent and instruments for the first-difference transformed equation are poor. They formalize necessary assumptions to instrument endogenous variables in the levels equation. The additional moment conditions indicate that changes in any instrumenting variable z are orthogonal to the individual specific effects μ_i : $E(\Delta z_{it} | \mu_i) = 0$. As long as the ε_{it} are not serially correlated $\Delta z_{i,t-1} = z_{i,t-1} - z_{i,t-2}$ can be used as an instrument for the endogenous variable $z_{i,t-1}$, which does not correlate with the idiosyncratic error ε_{it} in the levels equation. As the levels equation still includes fixed effects, the assumption that the change in the instrumenting variable Δz_i is orthogonal to the fixed effects, μ_i , is not obvious.

But Blundell and Bond (1998) show that under certain conditions this assumption is satisfied. Specifically, they show that the initial conditions process of the data, generating the dependent variable, is crucial. In the long run, based on μ_i , the initial value of a dependent variable y in a simple auto-regressive model,

where the coefficient of the lagged dependent variable is smaller than 1, y_{i1} converges to $\mu_i/(1 - \alpha)$ with ε_{it} indicating the deviation from this long-run level: $y_{i1} = \mu_i/(1 - \alpha) + \varepsilon_{it}$. Then, the necessary assumption is fulfilled if the deviation from the long-run level is not correlated with the level itself. In other words, the assumption holds if the original series have a constant correlation over time with the individual specific effects, also referred to as the “mean stationarity” assumption.

However, the performance is reduced if the coefficient of the lagged dependent variable approaches unity. When the constant correlation assumption is violated, taking first differences does not completely remove the unobserved individual-specific effect and lagged differenced instruments for the levels equation will not be exogenous anymore. As a result, the system GMM will not be valid anymore. In general, the Sargan or Hansen test statistic provide information on the validity of used instruments. Details on the appropriate range, which suggest the validity of instruments are given in the following chapter, where the results are discussed.

Using system GMM, the two-step estimator is, in general, more efficient than one-step, when Windmeijer (2005) corrected standard errors are applied. Then the standard covariance matrix is robust to panel-specific autocorrelation and heteroscedasticity. Taking the efficiency gains of the system GMM into account, the two-step system GMM is used for the analysis. In the two-step GMM estimates, the Windmeijer (2005) finite sample correction for standard errors is employed. To test appropriate lags as instruments for each endogenous variable, first stage regressions were implemented for all endogenous variables and lags. All results are presented in the following section.

2.3.3 Results

A useful check for the GMM estimation are the estimation results from OLS and within transformation, which can be interpreted as a bound for the true estimate of the lagged dependent variable (Bond, 2002). While the OLS estimate is upward biased, the estimate resulting from the within transformation is downward biased as it does not remove the dynamic panel bias completely. As the within transformation subtracts the mean of each variable over all periods, the transformed terms still include parts of the lagged dependent variable, which are correlated with the error term. The true parameter estimates should lie within the range of the coefficients of OLS and the within transformation.

In a first step, the quality of institutions is regressed on the lagged dependent variable and the main controls, which earlier empirical studies proved to be significant determinants of institutions, namely, the natural logarithm of population, the natural logarithm of GDP per capita (income), press freedom, conflicts and education. I implement three different estimations using the OLS estimator (OLS), the within estimator (FE) and the system GMM estimator (sysGMM). The results are reported in table 2.2.

The estimate of the lagged dependent variable, 0.433, lies within the bound of the OLS and FE (0.492 and 0.293, respectively) and is significant at the one percent level. So system GMM can be applied as a consistent and efficient estimator.

While first order serial correlation in differenced residuals is expected, as $\Delta\varepsilon_{i,t} =$

Table 2.2: Comparison of System GMM Results with OLS and FE

| | (1) OLS | (2) FE | (3) sysGMM |
|-----------------|---------------------|---------------------|---------------------|
| INST (t-1) | 0.492*** (0.038) | 0.293*** (0.035) | 0.433*** (0.062) |
| Ln(Population) | 0.053 (0.034) | -0.426 (0.438) | 0.099 (0.082) |
| Ln(GDPpc) | 0.367*** (0.053) | 0.874*** (0.294) | 0.525*** (0.140) |
| Press Freedom | 0.216*** (0.070) | 0.009 (0.164) | 0.156 (0.197) |
| Conflicts | -0.257* (0.149) | -0.193 (0.328) | -0.490 (0.438) |
| Education | -0.006 (0.004) | -0.004 (0.007) | -0.010 (0.007) |
| Obs. | 493 | 493 | 493 |
| Countries | | 87 | 87 |
| No. Instruments | | | 77 |
| Lags | | | t-3, t-4, t-5 |
| AB(2) p-value | | | 0.021 |
| AB(3) p-value | | | 0.944 |
| Hansen p-value | | | 0.227 |

(i) Robust standard errors in parentheses

(ii) Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively.

(iii) All models include year fixed effects.

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$\varepsilon_{i,t} - \varepsilon_{i,t-1}$ and $\Delta\varepsilon_{i,t-1} = \varepsilon_{i,t-1} - \varepsilon_{i,t-2}$ both contain $\varepsilon_{i,t-1}$, the p-value of the Arellano-Bond test of second order serial correlation in differences, AB(2) p-value, of 0.021 shows that there is also second order serial correlation. That is, $\Delta\varepsilon_{i,t}$ correlates with $\Delta\varepsilon_{i,t-2}$, which indicates first-order correlation in levels as these terms show the relationship between $\varepsilon_{i,t-1}$ and $\varepsilon_{i,t-2}$. This makes the first lag inappropriate as an instrument since the first lag is now endogenous.

Table 2.3 presents the first estimations of system GMM, where PTAs and depth of PTAs is included. The Hansen p-value, which is reported in every column, is used to assess the applied set of instruments. It indicates if the applied instruments are valid. If a model is over-identified, which means that too many instruments are included, the test will show unreliably high p-values. Such high values reveal a very good instrument set by mistake, since the test is weakened by too many instruments. One has to be cautious if the p-value becomes too large, while on the other hand too small values would indicate that instruments are invalid. Roodman (2009) suggests, one should be cautious about values below 0.1 and values well above 0.25. Although this does not constitute a strict threshold, it provides a range of reference.

Table 2.3 presents the results when the number of PTAs of the previous period (*PTAs (t-1)*) and depth of PTAs signed in the previous period (*Depth (t-1)*) are included separately in model (1) and (2) and together in the third model and, finally, when both variables are interacted in the fourth model. In the first regression, lag 4 is used for instrumenting, which leads to a p-value of 0.173 and a suitable set of instruments. If lag 3 is used for this estimation, the Hansen p-value becomes (0.095), which gives rise for invalid instruments. In models (2) to (4) lag three is used for instrumenting. In all regressions of table 2.3 instru-

Table 2.3: Two-step System GMM Results

| | (1) | (2) | (3) | (4) |
|----------------------|---------------------|---------------------|---------------------|---------------------|
| INST (t-1) | 0.364*** (0.082) | 0.420*** (0.095) | 0.369*** (0.084) | 0.363*** (0.067) |
| Ln(Population) | 0.138* (0.082) | 0.151* (0.082) | 0.116 (0.078) | 0.107 (0.071) |
| Ln(GDPpc) | 0.583*** (0.221) | 0.561*** (0.201) | 0.656*** (0.153) | 0.614*** (0.165) |
| Press Freedom | 0.424* (0.245) | -0.040 (0.200) | 0.217 (0.245) | 0.108 (0.229) |
| Conflicts | -0.735 (0.596) | -0.647 (0.564) | -0.329 (0.515) | -0.232 (0.447) |
| Education | -0.014 (0.009) | -0.007 (0.008) | -0.013 (0.008) | -0.007 (0.007) |
| PTAs (t-1) | -0.024 (0.026) | | -0.023 (0.024) | 0.080 (0.091) |
| Depth (t-1) | | 0.151*** (0.044) | 0.118** (0.046) | 0.175*** (0.059) |
| PTAs(t-1)×Depth(t-1) | | | | -0.032 (0.028) |
| Obs. N | 493 | 493 | 493 | 493 |
| Countries | 87 | 87 | 87 | 87 |
| # Instruments | 49 | 59 | 69 | 79 |
| Lags | t-4 | t-3 | t-3 | t-3 |
| AB(2) p-value | 0.027 | 0.010 | 0.010 | 0.005 |
| AB(3) p-value | 0.990 | 0.915 | 0.948 | 0.882 |
| Hansen p-value | 0.173 | 0.225 | 0.204 | 0.216 |

Notes:

(i) Windmeijer-corrected cluster-robust standard errors in parentheses.

(ii) Significance at the 10, 5, and 1 percent level is denoted by

*, ** and ***, respectively.

(iii) All models include country and year fixed effects

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ments are uncollapsed.⁸

Even when the instruments are collapsed, the significance levels of the variables in any regression reported in table 2.3 remain basically the same. In model (2) *Depth* remains highly significant, when instruments are collapsed. When *Depth(t-1)* is included together with PTAs in column (3) the significance level of *Depth(t-1)* is reduced and in column (4), where the interaction term is included, *Depth(t-1)* becomes insignificant.⁹ The Hansen p-values reported in table 2.3 are within the range, which is not too close to 0.1 but still not too large, that is well above 0.25. The overall results show that the depth of PTAs matters for institutions. That means higher levels of depth can lead to better institutions, while the number of PTAs itself does not have any effect on institutions. *PTAs(t-1)* is never significant, which indicates that changes in the number of signed trade agreements do not significantly explain changes in the institutional quality. That means, simply signing trade agreements does not help to promote institutions.¹⁰

The other coefficients have the expected signs except for *Education*, which is negative and significant at the 5 percent level. *PressFreedom* is positive and

⁸In section 3.3.3 the estimates of the main significant variables, for which conclusions are drawn, are presented when also different lag structures are used as instruments and when all instruments are collapsed, to test whether the results are robust to different sets of instruments.

⁹The results where, for each model, instruments are collapsed is reported in the Appendix (table 2.A.4).

¹⁰I also checked for different ranges of the number of signed PTAs. That means, one can argue that the first 5 or 10 PTAs may affect institutions but there might be a threshold where an additional PTA might not have any significant effect anymore. In other words, signing an additional 11th or 21st PTAs may not have the same effect as signing the first, 5th or 10th PTA. I test for this by interacting the number of PTAs with dummy variables for having signed PTAs of the following ranges: one PTA, between 2 and 5 PTAs, between 6 and 10 PTAs, between 11 and 20 and between 21 and 30 PTAs. The results do not show any significant effect. So there is no evidence that there is a threshold for the number signed PTAs.

significant only at the 10 percent level. All else equal, a one within standard deviation (0.318) in the press freedom would lead to a 0.103 point increase in institutional quality. *Conflicts*, is negative but also only significant at the 10 percent level. A highly significant effect at the one percent level is shown by income, $\ln(GDPpc)$, which positively affects the institutions. The effect is more than three times larger compared to *PressFreedom*. A one within standard deviation (0.536) increase in $\ln(GDPpc)$ would lead to a 0.332 increase in the institutional quality.

In the following regressions (columns (2) to (4)), when $Depth(t-1)$ is included, *PressFreedom* is no longer significant. Depth might absorb some of the variation of the two variables. When $Depth(t-1)$ is included without $PTAs(t-1)$ in column (2), it shows a positive effect on institutions, which is highly significant at the one percent level. An increase of a one within standard deviation (1.411) of $Depth(t-1)$ would lead to a 0.213 point increase in the level of institutional quality. When the number of trade agreements and depth are both included, $PTAs(t-1)$ still does not show any effect on the quality of institutions and, although the significance level and the effect is reduced, the effect of depth is still positive and significant at the 5 percent level. The reduction in significance levels for depth and also for population, which is not significant anymore, can be a result of the reduction in the degrees of freedom due to additional regressors. In the final column, an interaction term of $PTAs$ and $Depth$ is included additionally to analyze whether changes in $PTAs$ ($Depth$) influence the effect of $Depth$ ($PTAs$) on institutions. The results do not indicate a joint effect of depth and the number of trade agreements. The effect for depth now becomes larger again and highly significant. Except for $\ln(GDPpc)$, all other controls remain insignificant.

Check for heterogeneity of countries

So far, the regressions include all developing countries. But looking at different country groups, it can be seen that SSA performs very poorly with respect to several factors of development and institutions compared to other developing countries.

Figure 2.5: Investment Profile and GDP per capita by Region (2001-04)

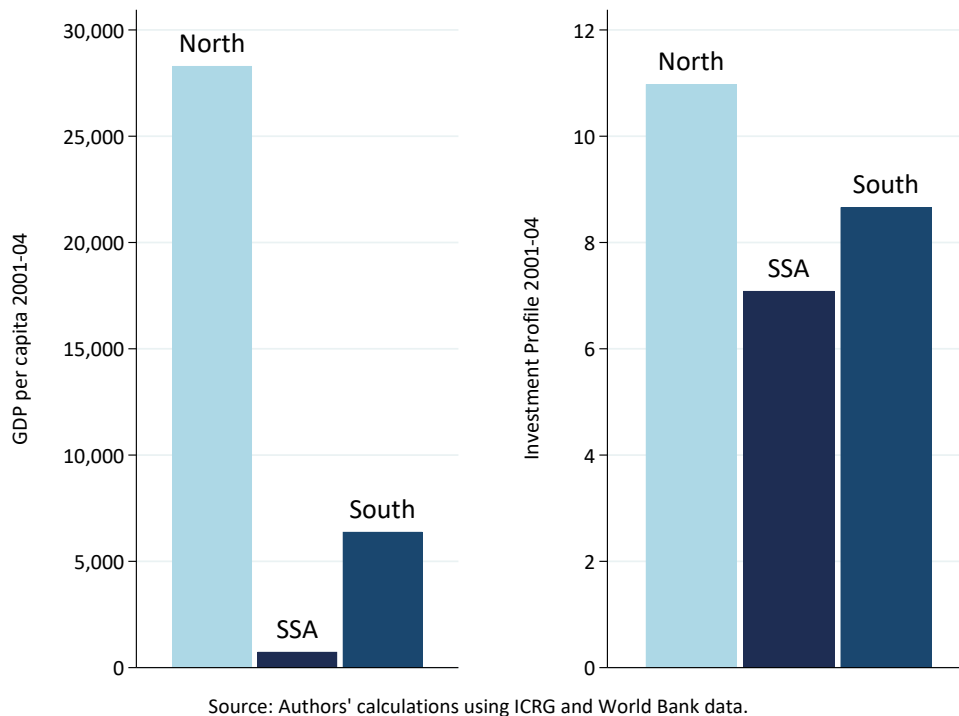


Figure 2.5 shows the means of institutional quality and GDP per capita for the years 2001 to 2004 for SSA, compared to all other developing countries (South) without SSA and developed countries (North). It shows the poor performance of SSA with respect to institutions and income. Among the group of all developing countries, SSA lags behind, which constitutes a persistent situation, which

does not change in other periods covered in the sample. Furthermore, the same pattern can be observed for all other dimensions of institutions of the ICRG data, like law and order, corruption or government stability. With respect to GDP per capita, this deficit is even more severe.

Table 2.4: Mean for Main Variables by Region

| Variable | SSA | South | North |
|---------------|---------|----------|-----------|
| INST | 6.552 | 7.601 | 9.340 |
| Education | 63.735 | 88.786 | 104.095 |
| Conflicts | 0.218 | 0.217 | 0.035 |
| Press Freedom | 0.659 | 1.097 | 1.978 |
| GDPpc | 991.536 | 7049.104 | 32556.290 |
| Depth | 1.983 | 1.965 | 2.584 |
| PTAs | 4.806 | 2.940 | 26.725 |
| TIPs | 2.554 | 0.860 | 3.339 |

This situation, of low income with a low level of institutions is not specific for Sub-Sahara Africa, but it is the region with the highest density of the poorest economies in the world. Better levels of institutional quality cannot be observed for any developing country exhibiting as low per capita income levels as in SSA. Because they have such poor institutions, it might be more difficult for a country from SSA to implement reforms in general, as well as provisions of very deep trade agreements.

Beside the bad economic situation, those countries have to deal with a lot of other problems like intra- and interstate conflicts, diseases and bad infrastructure. Table 2.4 reveals that SSA performs poorer compared to other developing countries with respect to factors, which are also included in this analysis. The

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Press Freedom is distinctly lower than in other developing countries. A higher press freedom might serve as a provider of information and as a control on government policies and thus can also promote the successful implementation of policies. Low press freedom instead impedes this positive effect. There is much lower school enrollment, while the presence of conflicts is similarly large as the South without SSA. But in this context, it should be pronounced that this variable does not provide information on the intensity of conflicts.

Overall, this shows the poor performance of SSA and it can be expected that SSA governments do not have the capacity to address all issues at once and even processes in general might be less efficient. Furthermore, a country needs to have some basic rules implemented before other rules, which are included in a PTA, can be implemented. Moreover SSA countries tend to sign a larger number of PTAs compared to other developing countries. Until the final period of this data set, the mean number of agreements signed by SSA countries lies above the average of other developing countries. Up to period 5 the mean is even more than twice as large. Over the whole period observed, on average a SSA country signs almost 5 trade agreements while other developing countries on average sign three PTAs. So SSA seems to sign relatively more PTAs, whereby this even might increase the burden on the national institutions to implement the agreements properly. Following these considerations, I expect, that the effects of *Depth (t-1)* and *PTAs(t-1)* are different for SSA countries.

Table 2.5 reports the results of a regression, where *PTAs(t-1)* and *Depth(t-1)* are now interacted with dummies, indicating SSA countries (*PTAs SSA (t-1)*, *Depth SSA (t-1)*) and all other developing countries without SSA (*PTAs w/o SSA (t-1)*, *Depth w/o SSA (t-1)*), respectively. All other control variables (ex-

Table 2.5: Effects of PTAs and Depth by Country Group

| | (1) |
|---------------------|---------------------|
| PTAs w/o SSA (t-1) | -0.041 (0.037) |
| Depth w/o SSA (t-1) | 0.181*** (0.051) |
| PTAs SSA (t-1) | 0.258** (0.111) |
| Depth SSA (t-1) | -0.310 (0.295) |
| Obs. N | 595 |
| Countries | 90 |
| # Instruments | 32 |
| Lags | t-3, t-4 |
| AB(2) p-value | 0.001 |
| AB(3) p-value | 0.749 |
| Hansen p-value | 0.157 |

Notes:

- (i) Windmeijer-corrected cluster-robust standard errors in parentheses.
- (ii) All models include country and year fixed effects.
- (iii) Instruments are collapsed.
- (iv) Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively.

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cept for *Education*) are included but not shown.¹¹ Education is not significant in any regression where *Depth (t-1)* and *PTAs (t-1)* are included. To have more observations education is excluded. Due to the additionally included interaction terms, which need to be instrumented, all instruments are collapsed to avoid a too high instruments count, which would lead to too large p-values for the Hansen test statistic.

For developing countries without SSA, it can be seen that the positive effect of depth becomes larger compared to the effect of all developing countries including SSA and it is significant at the one percent level. A one within standard deviation increase in the depth index now leads to an increase in the institution index by 0.254 points. The effect of the number of signed PTAs for this group remains insignificant. For SSA, the effect of depth is not significant, while the effect of the number of signed PTAs now becomes positive and significant at the 5 percent level. This supports the argument that even if those countries sign deep PTAs, they are not able to implement them effectively. On the other hand, for all other developing countries without SSA the positive effect of deep trade agreements becomes even larger compared to regressions when SSA is included. While for SSA simply signing trade agreements has an effect, this supports the argument that simply joining networks with trading partners has a positive effect in these countries.

Finally, it should be noted that the different effects, when SSA is excluded, do not only result from an overall lower institutional quality related to SSA but other factors related to SSA must play a role. I also check, whether the effects of *PTAs(t-1)* and *Depth(t-1)* for all developing countries differ with regard to

¹¹For detailed results including all control variables see in the Appendix (table 2.A.5).

different levels of institutional quality. For this, I perform regressions, where $PTAs(t-1)$ and $Depth(t-1)$ are interacted with a dummy for having an institutional quality index larger (smaller) than 5, 7 or 8 but this interaction term never becomes significant.

Check for heterogeneity of agreements

At this point all types of PTAs are included, which have the potential to liberalize trade in any form. This includes partial scope agreements as well as full free trade agreements.

Besides the number of PTAs, signatures of (bilateral) investment treaties have increased, especially in the course of the 1990s. The main motive to sign investment treaties is to protect foreign investment. This is why developed countries were the initiators of those agreements. They are typically exporting capital into developing countries where the legal system usually is less developed and standards are lower compared to the laws, that investors are used to rely on in their domestic country. By the means of an investment treaty, countries can set additional legal standards, which are missing in the host country. This protects the domestic investors, while, for the developing country, this will promote investment inflows, which are beneficial for development. Consequently, investment treaties might play an important role in developing the legal institutions in a developing country and it should be analyzed at this point if treaties, including essential provisions with regard to investment, are the driving factor in promoting institutions or, if the effect does not differ from other PTAs.

To address this question, a new variable, $TIPs(t-1)$, is included. For each country and year, it sums up all signed treaties with investment provisions (TIPs). This means, that these agreements include a chapter with substantive provisions

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in investment. Now the variable *Depth (t-1)* changes to *Depth w/o IP (t-1)* as this depth index now does not include investment provisions (IPs). *Depth w/o IP (t-1)* now only varies from 0 to 6 instead of a range from 0 to 7. For each of the provisions, which are covered in the six areas intellectual property rights (IPRS), procurement, standards, services or competition a value of one is added. So, if an agreement includes provisions in all areas a depth index of 6 is assigned. *PTAs w/o IP (t-1)* similarly now only includes PTAs without any provisions in investment.

The results are presented in table 2.6. Now only the third lag is used as an instrument and the instruments are collapsed to avoid too large Hansen p-values. The first column shows that, when TIPs are considered separately, the number of trade agreements signed without investment provisions becomes negative and significant. A one standard deviation increase in *PTAs w/o IP (t-1)* leads to a 1.038 point reduction in the quality of institutions. This value is relatively large compared to the effects from previous regressions. An explanation for this negative effect can be that the effort, dedicated to the signature of PTAs, might reduce the efficiency of government policies with regard to other areas such as investment. Furthermore, the significant, positive effect of depth now disappears. This means that the provisions in areas, like intellectual property rights or standards do not affect institutions, while trade agreements containing investment provisions seem to play a crucial role. The effect is positive and significant at the 5 percent level. Now also *PressFreedom* has a positive and significant effect. All else equal, an increase in one within standard deviation of the *PressFreedom* (0.318) results in an increase of 0.516 points in institutions. The effect of *TIPs (t-1)* is only slightly smaller with a 0.458 points increase due to a one within standard deviation increase (1.483), but larger than the effect

Table 2.6: Effects for PTAs with and without Investment Provisions (IPs)

| | (1) | (2) |
|---|----------------------|---------------------|
| INST (t-1) | -0.440*** (0.117) | 0.435*** (0.113) |
| Ln(Population) | -0.022 (0.139) | 0.034 (0.146) |
| Ln(GDPpc) | 0.586*** (0.204) | 0.748*** (0.233) |
| Press Freedom | 1.622*** (0.557) | 1.448*** (0.592) |
| Conflicts | 2.575 (1.665) | 2.615 (1.632) |
| PTAs w/o IP (t-1) | -0.206*** (0.067) | -0.072 (0.224) |
| Depth w/o IP (t-1) | 0.035 (0.127) | 0.048 (0.134) |
| PTAs w/o IP \times Depth w/o IP (t-1) | | -0.043 (0.072) |
| TIPs (t-1) | 0.309** (0.124) | 0.333*** (0.115) |
| Obs. N | 595 | 595 |
| Countries | 90 | 90 |
| # Instruments | 22 | 24 |
| Lags | t-3 | t-3 |
| AB(2) p-value | 0.082 | 0.056 |
| AB(3) p-value | 0.514 | 0.557 |
| Hansen p-value | 0.136 | 0.224 |

Notes:

(i) Windmeijer-corrected cluster-robust standard errors in parentheses.

(ii) All models include country and year fixed effects.

(iii) Instruments are collapsed.

(iv) Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively.

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of $\ln(GDPpc)$, where an increase of one within standard deviation (0.536) leads to an increase of 0.314 in the institutional quality. *Conflicts* and *Population* do not show a significant effect on institutions.

Column (2) shows that PTAs and depth are independent. The included interaction term of *PTAs w/o IP (t-1)* and *Depth w/o IP (t-1)* is not significant. The same regression as in column (1) is done with *PTAs w/o IP (t-1)*, *Depth w/o IP (t-1)* and *TIPs (t-1)* being interacted with dummies for SSA and all other developing countries without SSA. The respective results are presented in table 2.7.

A problem, which arises here, is that the inclusion of another control variable, *TIPs(t - 1)*, and additional interaction terms lead to an increase in the instrument count. To reduce the number of instruments, only the third lag is used and the instruments are collapsed. Again, all other control variables are included with the exception of *Education*.¹²

For countries from SSA, distinguishing between different types of agreements, leads to insignificant effects. Signing PTAs with or without investment provisions does not show an effect on institutions. The depth of PTAs without investment provisions, as in previous regressions, where investment chapters are included, is not significant. But for all other developing countries without SSA the positive effect of TIPs increases slightly. Now a one standard deviation increase in *TIPs(t - 1)* (1.719) leads to an increase in institutions by 0.543 points. The negative effect of PTAs without investment provisions also becomes larger. A one within standard deviation increase amounts to a 1.144 point reduction in the institutions index. This is an important result, which suggests that the

¹²A table with the respective results with all included explanatory variables is included in the Appendix (table 2.A.6).

Table 2.7: Effects for PTAs with and without Investment Provisions for SSA and without SSA

| | (1) |
|-----------------------------|----------------------|
| PTAs w/o IP (t-1) × no SSA | -0.195*** (0.064) |
| Depth w/o IP (t-1) × no SSA | 0.145 (0.112) |
| TIPs (t-1) × no SSA | 0.316*** (0.113) |
| PTAs w/o IP (t-1) × SSA | 0.297 (0.379) |
| Depth w/o IP (t-1) × SSA | 0.142 (0.437) |
| TIPs (t-1) × SSA | -0.131 (0.374) |
| Obs. N | 595 |
| Countries | 90 |
| # Instruments | 28 |
| Lags | t-3 |
| AB(2) p-value | 0.019 |
| AB(3) p-value | 0.702 |
| Hansen p-value | 0.402 |

Notes:

(i) Windmeijer-corrected cluster-robust standard errors in parentheses.

(ii) All models include country and year fixed effects.

(iii) Instruments are collapsed.

(iv) Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively.

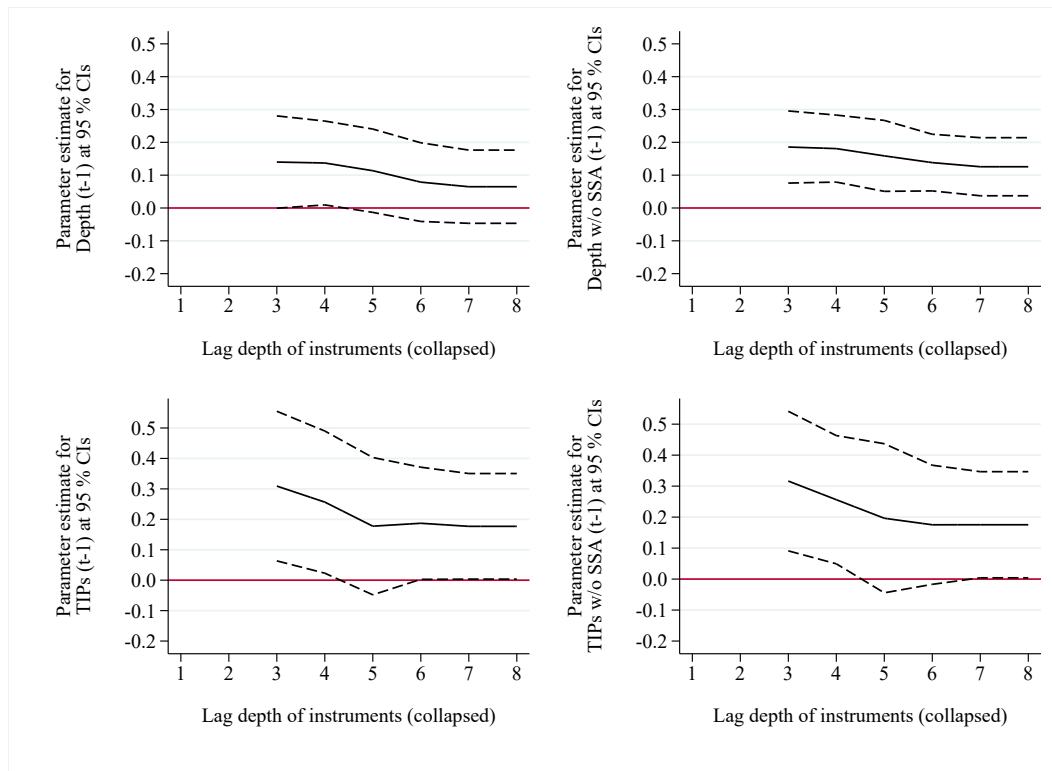
negative effect of signing a large number of PTAs is more severe than the positive effect, which results from the number of TIPs. So the overall effects, when differentiated between the type of trade agreement, again show different results when SSA is excluded.

Check for robustness of instruments

As discussed in chapter 2.3.2, using system GMM raises the risk of instrument proliferation, which causes the Hansen test to show implausibly high p-values close to one and thus fails to indicate that the model is over-fitted due to a high number of instruments, resulting in too small standard errors. Consequently, using different lag structures can affect the results. To show how the results develop for *Depth (t-1)* and *TIPs (t-1)* using different numbers of lags as instruments, figure 2.6 shows the parameter estimates for both variables (graphs on the left) and when interacted with a dummy for the South without SSA *Depth w/o SSA (t-1)* and *TIPs w/o SSA(t-1)*, respectively on the right) using different lag lengths as instruments.

The estimates for *Depth (t-1)* and *Depth w/o SSA (t-1)* are based on the results presented in table 2.3 column (3) and table 2.5, respectively. The estimates for *TIPs (t-1)* and *TIPs w/o SSA(t-1)* are based on the regressions shown in the first column of table 2.6 and in table 2.7, respectively. The solid lines indicate the parameter estimates, while the dashed lines indicate 95 percent confidence intervals (CIs). At the very left point of the solid line *Depth (t-1)* is instrumented with the difference lagged by three periods, now with collapsed instruments. Moving from here to the right along the solid line, an additional lagged difference is included in the set of instruments, up to a total of differ-

Figure 2.6: Robustness of Estimates using Different Lags as Instruments



ences, lagged by 8 periods. The estimate for *Depth (t-1)* varies more, relative to uncollapsed instruments. But when instruments are uncollapsed, including more than one lag leads to an increase instruments, leading to a suspiciously large Hansen p-value. The parameter estimates become smaller the more lags are included. It varies from 0.140 when only lag 3 is used, leading to a number of 21 instruments, to 0.065 when lags 3 to 8 are used, which leads to 45 instruments in total. Moreover, the estimates are not significant anymore when lags 6 and longer are included.

The estimate *Depth w/o SSA (t-1)* depicts the point on the solid line at lag depth 4 in the top right graph, where differences lagged by period 3 and 4 are included in the instrument set. At lag depth 8 all periods from 3 to 8 are used as

instruments. The estimates of *Depth w/o SSA (t-1)* vary only little and remain relatively stable. It ranges from 0.186, when only lag 3 is used, to 0.126, when all lags are used, starting in period 3 and leading to a total number of 36 instruments. The effect remains highly significant at the 1 percent level, independent of the lag length.

The estimates of *TIPs (t-1)* and *TIPs w/o SSA(t-1)* depict the starting point of the solid line at lag length 3. So the estimation results, which I report above, are already very conservative with respect to the set of instruments since the minimum number of instruments is included. Increasing the lag length from 3 to 5 periods, the estimates for *TIPs (t-1)* and *TIPs w/o SSA(t-1)* reduce by more than 0.1 points, but then remain stable and significant, independent from the lag length used for the instrument set.

2.4 Conclusion

The phenomenon of the increase in signature rates of trade agreements since the 1990s, has experienced a lot of attention in the academic research. A substantial part of the agreements is between developing and developed countries i.e. between North and South. Almost simultaneously, the content of trade agreements has changed. PTAs have become deeper. They distinctly exceed regulations from the WTO. PTAs more and more specify political cooperation and include “behind-the-border” rules in different areas such as investment, intellectual property, competition policy or the rule of law. It can be observed that North-South PTAs on average are deeper compared to other types of PTAs, i.e. North-North and South-South PTAs. This development is one result of missing or poor institutions in developing countries trading with developed countries,

where firms can do business in a good institutional environment.

This paper provides evidence on whether trade agreements can serve as a driver of institutional quality in developing countries by accounting for the number of signed PTAs as well as the depth of PTAs. I build the analysis on the comprehensive DESTA database, including a very broad set of trade agreements and a measure for the content of PTAs. I am specifically looking at the effects on the quality of institutions with regard to investment, since these institutions play an important role for trading firms and firms investing abroad. Rules affecting this type of institutions are expected to be essential in trade agreements. I use a long panel to account for the changes over time and to address endogeneity issues.

The results confirm that deep trade agreements have a positive effect on institutions. But at the same time, the effects differ with regard to different regions. SSA appears to play a specific role. Compared to other developing countries, in SSA the economic and political performance is distinctly poorer. The results show that signing deep PTAs does not have any effect on institutions in SSA. Focusing on developing countries excluding SSA, the positive effect of depth becomes even larger, compared to the effect when SSA is included, it is highly significant and robust to different lag structures of instruments.

When looking at different types of trade agreements, investment treaties, i.e. those agreements, including substantive investment provisions (TIPs), show to be the important drivers of change in institutional quality. However, signing PTAs in general has no effect. The positive effect of TIPs on institutions even exceeds the overall effect of the deep PTAs. This effect, again, is not present

2.4. CONCLUSION

for SSA, where the signing of neither TIPs nor deep PTAs does have an effect on institutional quality.

These results reveal positive aspects of the increase in the number of signed North-South trade agreements, especially those including investment provisions. It can be a chance for developing countries to improve domestic institutions, which again has a positive effect on the overall development of the country. However, it should be emphasized, that the analysis focuses on specific institutions related to trade and investment abroad. Besides, this paper has also highlights once more, the specific role of SSA as a region of developing countries, which performs poorer relative to other developing countries with regard to political and economic variables.

2.A Appendix

Table 2.A.1: Description of Variables and Sources

| Variable | Description | Source |
|---------------|--|---|
| INST | Investment Profile, component of the International Country Risk Guide (ICRG) | ICRG database by PRS Group (2016) |
| PTAs | Cumulative sum of the number of signed trade agreements for each country | Design of Trade Agreements (DESTA) database by Dür, Baccini and Elsig (2014) |
| Depth | Average depth of all agreements signed | Design of Trade Agreements (DESTA) database by Dür, Baccini and Elsig (2014) |
| TIPs | Number of signed Treaties with investment provisions | Authors calculations based on: Design of Trade Agreements (DESTA) database by Dür, Baccini and Elsig (2014) |
| Education | Gross enrollment ratio, primary and secondary, both sexes (in percent) | The World Bank (2016) |
| Conflicts | Conflicts of intrastate conflict. Coded 1 in all country-years with at least one active conflict | The UCDP/PRIO Armed Conflict Dataset: Gleditsch et al. (2002); Allansson et al. (2017) |
| Population | Population (in million) | The World Bank (2016) |
| Press Freedom | Degree of the freedom of the press, 0 (not free), 1 (partly free), 2 (completely free) | Freedom House (2016) |
| GDPpc | GDP per capita (current USD) | The World Bank (2016) |

Table 2.A.2: List of Countries Categorized as North or South

| | |
|--------------------|---|
| Northern countries | Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States |
| Southern countries | Albania, Algeria, Angola, Bahamas, Bahrain, Bangladesh, Botswana, Brunei Darussalam, Bulgaria, Burkina Faso, Cameroon, Chile, China, Colombia, Democratic Republic of Congo, Republic of Congo, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Israel, Jamaica, Jordan, Kenya, Rep. of Korea, Kuwait, Latvia, Lebanon, Liberia, Lithuania, Madagascar, Malawi, Malaysia, Mali, Malta, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Qatar, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovak Republic, Slovenia, Somalia, South Africa, Sri Lanka, Sudan, Suriname, Syrian Arab Republic, Taiwan, Province of China, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, Vietnam, Zambia, Zimbabwe |

Table 2.A.3: Summary Statistics

| Variable | | Obs. | Mean | Std. Dev. | Min | Max |
|-----------------|---------|------|-------|-----------|--------|--------|
| INST | overall | 761 | 7.09 | 2.27 | 0.50 | 12.00 |
| | between | | | 1.56 | 2.44 | 10.55 |
| | within | | | 1.66 | 1.66 | 10.29 |
| PTAs | overall | 792 | 3.18 | 3.33 | 0.00 | 33.50 |
| | between | | | 2.49 | 0.03 | 15.03 |
| | within | | | 2.23 | -11.85 | 21.65 |
| Depth | overall | 792 | 1.80 | 1.61 | 0.00 | 7.00 |
| | between | | | 0.75 | 0.00 | 4.61 |
| | within | | | 1.43 | -2.81 | 6.51 |
| TIPs | overall | 792 | 1.30 | 1.56 | 0.00 | 10.75 |
| | between | | | 1.20 | 0.00 | 3.84 |
| | within | | | 0.99 | -1.94 | 8.81 |
| Education | overall | 652 | 80.45 | 20.95 | 14.60 | 113.28 |
| | between | | | 19.56 | 17.20 | 103.63 |
| | within | | | 9.43 | 46.28 | 113.45 |
| Conflicts | overall | 768 | 0.20 | 0.37 | 0.00 | 1.00 |
| | between | | | 0.31 | 0.00 | 1.00 |
| | within | | | 0.20 | -0.58 | 1.05 |
| Ln (Population) | overall | 783 | 16.01 | 1.66 | 12.33 | 21.03 |
| | between | | | 1.66 | 12.55 | 20.93 |
| | within | | | 0.21 | 15.13 | 17.06 |
| Press Freedom | overall | 714 | 0.85 | 0.73 | 0.00 | 2.00 |
| | between | | | 0.65 | 0.00 | 2.00 |
| | within | | | 0.35 | -0.55 | 1.85 |
| Ln (GDPpc) | overall | 747 | 7.58 | 1.47 | 4.19 | 11.41 |
| | between | | | 1.36 | 5.28 | 10.39 |
| | within | | | 0.54 | 6.17 | 9.46 |

Table 2.A.4: Two-step System GMM Results (Baseline with Collapsed Instruments)

| | (1) | (2) | (3) | (4) |
|----------------------|----------|----------|----------|----------|
| | inv_prof | inv_prof | inv_prof | inv_prof |
| INST (t-1) | 0.314* | 0.383*** | 0.341*** | 0.280** |
| | (0.169) | (0.096) | (0.108) | (0.128) |
| Ln(Population) | 0.206 | 0.079 | -0.033 | -0.012 |
| | (0.177) | (0.080) | (0.091) | (0.104) |
| Ln(GDPpc) | 0.716** | 0.442** | 0.460** | 0.381 |
| | (0.318) | (0.200) | (0.232) | (0.268) |
| Press Freedom | 0.245 | 0.320 | 0.592 | 0.955 |
| | (0.873) | (0.410) | (0.490) | (0.659) |
| Conflicts | -1.104 | 0.135 | 0.413 | 0.955 |
| | (2.226) | (0.886) | (1.017) | (1.182) |
| Education | -0.017 | -0.003 | -0.005 | -0.008 |
| | (0.012) | (0.009) | (0.012) | (0.013) |
| PTAs (t-1) | -0.007 | | -0.028 | -0.203 |
| | (0.060) | | (0.039) | (0.128) |
| Depth (t-1) | | 0.200*** | 0.140* | 0.074 |
| | | (0.068) | (0.071) | (0.085) |
| PTAs(t-1)×depth(t-1) | | | | 0.057 |
| | | | | (0.035) |
| Obs. N | 493 | 493 | 474 | 474 |
| Countries | 87 | 87 | 86 | 86 |
| # Instruments | 19 | 19 | 21 | 23 |
| Lags | t-4 | t-3 | t-3 | t-3 |
| AB(2) p-value | 0.098 | 0.008 | 0.019 | 0.096 |
| AB(3) p-value | 0.872 | 0.885 | 0.596 | 0.395 |
| Hansen p-value | 0.196 | 0.266 | 0.026 | 0.134 |

Notes:

- (i) Windmeijer-corrected cluster-robust standard errors in parentheses.
- (ii) All models include country and year fixed effects.
- (iii) Instruments are collapsed.
- (iv) Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively.

Table 2.A.5: Effects for Sub-Sahara Africa (SSA) and all other Southern Countries without SSA (w/o SSA)

| | (1) |
|---------------------|---------------------|
| INST (t-1) | 0.371*** (0.084) |
| ln(Population) | 0.096 (0.119) |
| ln(GDPpc) | 0.667*** (0.235) |
| Press Freedom | 0.372 (0.303) |
| Conflicts | 0.106 (1.005) |
| PTAs w/o SSA (t-1) | -0.041 (0.037) |
| Depth w/o SSA (t-1) | 0.181*** (0.051) |
| PTA SSA (t-1) | 0.258** (0.111) |
| Depth SSA (t-1) | -0.310 (0.295) |
| Obs. N | 595 |
| Countries | 90 |
| # Instruments | 32 |
| Lags | t-3, t-4 |
| AB(2) p-value | 0.001 |
| AB(3) p-value | 0.749 |
| Hansen p-value | 0.157 |

Notes:

(i) Windmeijer-corrected cluster-robust standard errors in parentheses.

(ii) All models include country and year fixed effects.

(iii) Instruments are collapsed.

(iv) Significance at the 10, 5, and 1 percent level is denoted by

*, ** and ***, respectively.

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Table 2.A.6: Effects for PTAs with and without Investment Provisions without SSA and for SSA

| | (1) |
|---------------------------|----------------------|
| INST (t-1) | 0.423*** (0.098) |
| ln(Population) | -0.038 (0.133) |
| ln(GDPpc) | 0.578* (0.301) |
| Press Freedom | 1.199** (0.470) |
| Conflicts | 2.577 (1.553) |
| PTAs w/o IP (t-1)×no SSA | -0.195*** (0.064) |
| Depth w/o IP (t-1)×no SSA | 0.145 (0.112) |
| TIPs (t-1)×no SSA | 0.316*** (0.113) |
| PTAs w/o IP (t-1)×SSA | 0.297 (0.379) |
| Depths w/o IP (t-1)×SSA | -0.142 (0.437) |
| TIPs (t-1)×SSA | -0.131 (0.374) |
| Obs. N | 595 |
| Countries | 90 |
| # Instruments | 28 |
| Lags | t-3 |
| AB(2) p-value | 0.002 |
| AB(3) p-value | 0.667 |
| Hansen p-value | 0.189 |

Notes:

(i) Windmeijer-corrected cluster-robust standard errors in parentheses.

(ii) All models include country and year fixed effects.

(iii) Instruments are collapsed.

(iv) Significance at the 10, 5, and 1 percent level is denoted by

*, ** and ***, respectively.

Chapter 3

Formation of North-South Trade Agreements: The Role of Institutional Distance and the Content of Trade

3.1 Introduction

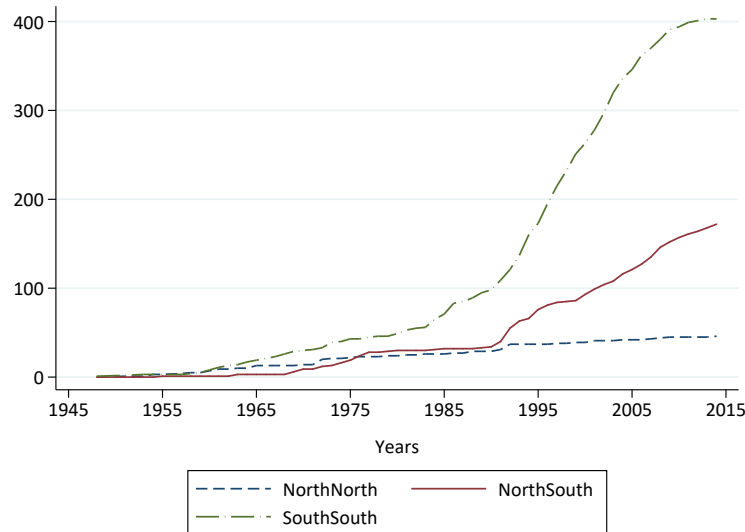
Although today there is a prominent debate about disintegration due to the daily report about the withdrawal of the United Kingdom (UK) from the European Union (EU), the “Brexit”, we see a constantly increasing number of signed trade agreements at the same time.

Figure 3.1 shows the cumulative number of signed trade agreements since 1948, differentiated according to the income level of its member countries. Here North is denoted as industrialized countries and South as developing countries with a GDP per capita below 11,115. At the beginning of the 1990s there is a

3.1. INTRODUCTION

substantial increase in overall signature rates. Although most agreements are signed between countries of similar income, between industrialized countries (North-North, dashed line) and between developing countries (South-South, long-dashed line), trade agreements between asymmetric countries (North-South, solid line) have increasingly been signed and are still being signed. The largest increase is attributed to South-South agreements. But still there is a substantial number of North-South trade agreements with almost 200 agreements between developed (North) and developing (South) countries.

Figure 3.1: Cumulative Number of Trade Agreements in Force



Source: Author's own illustration based on the Design of Trade Agreements (DESTA) database by Dür et al. (2014).

Only recently different types of trade agreements were implemented. With the EU-Japan Economic Partnership Agreement, which entered into force in February 2019, the largest free trade zone has been established between Northern countries. In June 2018, with the EFTA-Philippines Free Trade Agreement,

a new North-South trade agreement went into force between the European Free Trade Association (EFTA, including Iceland, Liechtenstein, Norway and Switzerland) and the Philippines. This was only about one year after the most recent South-South trade agreement between Peru and Honduras went into force in January 2017.

Besides the increase in the number of PTAs, the content of PTAs has changed. There are rules and commitments included in PTAs, which go beyond market access rules but cover provisions referring to investment, protection of intellectual, industrial or commercial property rights, or competition policy (Dür et al., 2014). This shows that trade agreements are not only related to trade integration but also political and legal aspects.

In this paper, I examine empirically the determinants of preferential trade agreements (PTAs) and argue that institutional distance plays an important role in the formation of PTAs. Furthermore, I argue that the effect of institutional distance is specifically relevant if trade includes (i) a high share of contract-intensive goods where the risk of potential hold-up is high and (ii) developing countries where institutions are typically weak.

I refer to PTAs following Limão (2016), who defines a PTA as “*an international treaty with restrictive membership and including any articles that (i) apply only to its members and (ii) aim to secure or increase their respective market access.*” On the one hand, this definition describes the discriminatory nature of a treaty since it includes rules which apply only to its members. On the other hand, it implies that only treaties, which provide market access at least to some extent, are included while treaties which only refer to trade-related topics without gen-

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erating additional market access are not covered.

Institutional distance, describes the difference in institutional quality between a country pair. The focus of institutional quality in the following analysis will be on a country's legal system and the implementation of the law and on financial aspects, assessing the ability to enforce contracts, transfer secure payments and the general risk of expropriation.

Contract-intensity refers to a measure created by Nunn (2007), which specifies for each good the share of the intermediate inputs that require relationship-specific investments. Relationship-specificity refers to the market thickness of a product. That means, if an input is highly relationship-specific the market is not thick and there is only a very low number of potential buyers.

So far, there is little empirical research on the determinants of PTAs. Baier and Bergstrand (2004) constitute the first empirical examination in this regard and they develop a benchmark model of economic determinants of free trade agreements.

Since then we can observe an increase in the complexity of global production networks (Johnson and Noguera, 2017; Timmer et al., 2014). Since the beginning of the 1990s and with the exception of a short downturn during the financial crisis, we can observe an expansion of global value chains where large producers allocate their production phases all over the world. Low unit labor costs have made developing countries become attractive participants in global value chains (Degain et al., 2017). We can see this in an increase in exports of manufactured goods from low-income to high-income countries (The World Bank, 2017). This

leads to a high interdependence between developed and developing countries and their domestic firms, which may generate a factor for the formation of PTAs, specifically between asymmetric countries.

To some extent the literature on the determinants of PTAs addresses this issue by accounting for vertical intra-industry trade (VIIT) and production networks as factors for PTA formation and specifically consider North-South PTAs (Manger, 2012; Orefice and Rocha, 2014).

To my knowledge, no empirical research links institutional distance and the characteristics of traded goods as factors to explain the formation of PTAs. The following analysis relates to the fact that global production networks involve multiple agents and countries where different legal systems apply, which leads to a higher complexity of contracting and an increase in the risk of incomplete contracts and hold-up. As argued by Dollar and Kidder (2017), well-developed legal and enforcement institutions of the trading partner reduces these risks. Good legal institutions support commercial transactions by effectively implementing the law and mechanisms for contract enforcement and by securing property.¹

I argue that institutional differences between country pairs and poor enforcement institutions in the partner country can increase the probability that two countries form a PTA because a PTA can serve as a legal instrument to compensate for missing institutions. Since PTAs include an increasing set of laws and commitments, which regulate domestic policies and institutions, they constitute a good mechanism to incorporate missing institutions. This positive effect may not be linear. If distance in institutional quality is too large a con-

¹Rubin (2008), for example, illustrates the importance of legal institutions for transactions, the protection of property rights and investment.

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tract in the form of a PTA may become too complex, resulting in a potentially negative effect at a certain level of institutional distance.

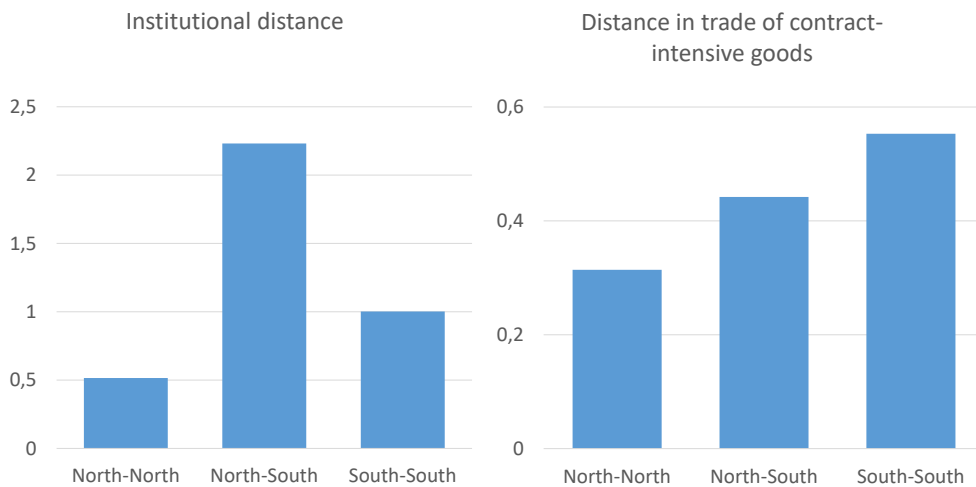
I expect that two factors potentially promote the positive effect of institutional distance. First, if one partner trades a large share of contract-intensive goods this further increases the risk of hold-up since the market thickness for those goods is low, which makes well-implemented enforcement institutions specifically important. Thus, trading contract-intensive goods increases the demand for good enforcement institutions and reinforces the need for a PTA when institutional distance is large. Antràs and Staiger (2012) for example address the link of relationship-specific goods and the arising problem of hold-up in connection with off-shoring, arguing that increases in global off-shoring require effective trade agreements and deep integration. I create a bilateral measure of distance in contract-intensive goods, which accounts for large one-way trade of contract-intensive goods, which is related to a high need of institutional quality.²

Second, institutional distance is specifically present between North-South country pairs because institutions in developing countries are on average weaker compared to developed countries. The left panel of figure 3.2 shows exactly this pattern. Institutional distance on average is larger between North-South country pairs compared to country pairs with similar incomes (that is, North-North and South-South). The right panel of figure 3.2 also reveals that large distances in trade of contract-intensive goods are specifically present in North-South relationships. Industrialized countries from the North typically trade more contract-intensive goods (like aircraft, automobile or computer manufacturing) compared to the South, which is reflected in the large mean value for

²A more detailed description of this measure is provided in chapter 3.3.2.

North-South country pairs, while the difference for North-North trade is relatively small.

Figure 3.2: Mean Institutional Distance and Distance of Contract-intensive Goods Traded for Different Groups of Country Pairs (North-North, North-South, South-South)



Source: Author's illustration based on data from the International Country Risk Guide (ICRG) and COMTRADE database.

For my empirical analysis I create a bilateral data set of 132 countries including 89 developing countries and 3495 trade agreements between unique country pairs notified over 21 years. I differentiate between different types of PTAs with respect to the income level of the member countries. The empirical findings support the existence of an interdependence between institutional distance and trade in contract-intensive goods. Institutional distance promotes the likelihood of PTA formation, although the effect is nonlinear and it is reinforced by the distance of trade in contract-intensive goods. The positive effect of institutional distance is only present when developing countries are involved and

it is strongest for North-South country pairs. The joint effect of institutional distance and trade in contract-intensive goods is also most relevant in a North-South relationship, but is mainly driven by members of the European Union (EU), which export large shares of contract-intensive goods.

The paper continues in the next section with an overview of the previous research in the field of international trade agreements focusing on the empirical literature of the determinants of trade agreements. In section 3.3, I present the estimation framework, the data and data sources and the estimation results. The final section concludes.

3.2 Related Literature

According to Maggi (2014) the literature on international trade agreements can be categorized into three main research streams, namely (1) the motives for trade agreements, (2) the design of rules and institutions and (3) regional trade agreements. The three areas cannot be regarded as completely separate categories. To some extent they are all interrelated.

Studies dealing with the motives of trade agreements focus on two main strands. On the one hand, they demonstrate the externalities, which lead to inefficiencies, which disappear or diminish in the presence of PTAs and thus explain why governments want to sign PTAs. These externalities include terms-of-trade externalities (Bagwell and Staiger, 2004) or imperfect competition, which appears in the new trade theory with firm delocation (Bagwell and Staiger, 2004; Ossa, 2011) or profit shifting (Ossa, 2012). On the other hand, PTAs constitute

an instrument to help implement domestic policies. It can be a commitment device helping countries to stick to certain policies, which is based on models by Maggi and Rodríguez-Clare (1998), Maggi and Rodríguez-Clare (2007) or Limão and Tovar (2011) or as Limão and Maggi (2015) state, PTAs can serve as an instrument to reduce uncertainty arising from an unstable economic or political environments.

The research on the design of trade agreements originates from the presence of frictions or transaction costs, which provide reasons for why governments are not able to write complete and fully efficient contracts. The literature categorizes two types of frictions. One type focuses on contract frictions as for example Horn et al. (2010) or Bagwell and Staiger (2001) who differentiate between ‘deep’ and ‘shallow’ agreements and Maggi and Staiger (2011) who analyze how to complete an agreement. Another type of frictions is the self-enforcement of trade agreements. In this regard, Maggi (1999) and Bagwell et al. (2007) examine the optimal design of trade trade agreements.

The third stream of literature focuses on regional trade agreements (RTAs), including the determinants and the impacts of trade agreements. The impacts of RTAs deal with the effects they have on its member countries compared to the “outsiders”. This already relates to the definition of RTAs, which implies that integration does not take place on a multilateral basis but applies only to a “region” excluding nonmembers, which is also the main focus of this strand of the literature. According to the World Trade Organization (WTO) RTAs are reciprocal trade agreements including two ore more partners, and thus this definition is in line with the definition of a PTA, which I use in this analysis.³ A

³Different sources use different definitions of PTAs or RTAs. The WTO differentiates between “regional trade agreements”, which, according to the WTO, are reciprocal while

3.2. RELATED LITERATURE

large strand of theoretical literature deals with this topic. Driving work which focuses on the effects of member countries, is done by Richardson (1993), Bagwell and Staiger (1999), Limão (2007) and Ornelas (2005), while Levy (1997) and Krishna (1998) allow for the effects of RTAs on a multilateral level. Empirical studies include Estevadeordal et al. (2008), Limão (2006) and Karacaovali and Limão (2008).

The focus of this analysis can mainly be allocated to the determinants of trade agreements. The theoretic research on the economics of trading blocs is primarily based on competitive and monopolistic competition frameworks by Baldwin and Venables (1995) and Krugman (1991). While Grossman and Helpman (1995) analyze if trade agreements promote global welfare, Krishna (1998) focuses on the profits of domestic firms and claim that trade agreements only arise if profits in both countries increase, which appears to be more likely if there is trade-diversion. Krugman et al. (1995) state that PTAs are more likely among ‘natural’ trading partners where gains from mutual trade liberalization are specifically large, that is, if they are close in geographical distance or because of their comparative advantage structure.

Freund (2000) analyzes the interrelation of multilateral trade liberalization with the formation of PTAs in a model with imperfect competition and finds that multilateral tariff reductions should be followed by an increase in signature rates of PTAs.

As summarized in table 3.1, five main empirical studies drive the empirical work on the determinants of PTA formation.

“preferential trade arrangements” are non-reciprocal. In this analysis PTAs are reciprocal and in line with WTO’s definition of RTAs.

Table 3.1: Literature on the determinants of trade agreements.

| Reference | Main Topic | Most important ideas/findings |
|-----------------------------|---|---|
| Baier and Bergstrand (2004) | <ul style="list-style-type: none"> Economic determinants of the formation of preferential trade agreements (PTA) | <ul style="list-style-type: none"> Trade-creating and trade-diverting factors are important determinants of a PTA Creation of a benchmark model |
| Egger and Larch (2008) | <ul style="list-style-type: none"> Extension of approach by Baier and Bergstrand (2004) Determinants of PTAs Highlights the importance of the interdependence of PTAs by drawing on spatial econometrics | <ul style="list-style-type: none"> Pre-existing PTAs increase the probability of bilateral PTAs formation The effect is reduced if geographical distances are increased |
| Mansfield and Milner (2012) | <ul style="list-style-type: none"> Analysis of importance of domestic politics as a factor for the formation of trade agreements Political economy of PTA formation | <ul style="list-style-type: none"> Democracies are more likely to enter PTAs Number of veto players reduces likelihood of entering a PTA |
| Manger (2012) | <ul style="list-style-type: none"> Vertical intra-industry trade and PTA formation North-South PTAs | <ul style="list-style-type: none"> Vertical intra-industry trade in a North-South relation promotes the formation of a PTA |
| Orefice and Rocha (2014) | <ul style="list-style-type: none"> Production networks and deep integration North versus South PTAs (with focus on Asia) | <ul style="list-style-type: none"> Positive effect of production networks Effect mainly driven by Asia |

Source: Author's illustration and summary of empirical studies.

The first empirical study to name is by Baier and Bergstrand (2004). They are the first to analyze empirically the economic determinants of the formation of PTAs. With their work they create a benchmark model of economic determinants, which can be extended by further explanatory variables such as political factors. Based on a general equilibrium model with monopolistic competition and intercontinental and intracontinental transport costs, they estimate a cross-section of 54 countries in the year 1996. They find that overall, trade-creating and trade-diverting factors are important determinants in explaining the probability of an FTA. Their results further show that the probability of two country pairs forming an FTA increases (1) the closer the distance between the two countries is, (2) the larger the distance of two continental trading partners is to the rest of the world (ROW), (3) the larger or more similar in economic size the countries are, (4) the more different capital-labor ratios are between the potential members and (5) the higher the similarity of their capital-labor ratios are with respect to the ROW.

Egger and Larch (2008) extent the approach by Baier and Bergstrand (2004) and address the interdependence of the formation of free trade agreements (FTAs) with other trading blocs and already existing trade agreements. They highlight the importance of joining existing FTAs and build on the "domino theory of regionalism" introduced by Baldwin (1997). Furthermore, they allow for the case that two countries form a new agreement if joining an existing agreement is no opportunity due to political reasons. They add the time dimension and use a data set of 145 countries over a period of 1955-2005. They find that already existing FTAs positively affect the formation of bilateral FTAs. This effect becomes smaller as geographic distance increases.

Mansfield and Milner (2012) focus on the importance of domestic politics for the formation of PTAs. In their analysis they include 194 countries over a period from 1950 to 1999. Their results suggest that democracies have a higher probability to enter PTAs. But the effect declines in the number of veto players.

Manger (2012) and Orefice and Rocha (2014) add on the literature on the determinants of trade agreements by looking at PTAs between asymmetric countries. Manger (2012) examines the reasons why countries of different economic size and development status form a PTA. He argues that a main factor of the increase in PTA formation between asymmetric countries is the specialization in manufacturing exports according to the development level of a trading partner. He builds a framework where he includes vertical production specialization. He argues that while developing countries specialize in relatively labor-intensive goods, developed countries do so in relatively capital-intensive goods. This increases the incentive of two countries to form a trade agreement. He builds a panel data set of nine developed and 148 developing and transition countries for the period from 1995 until 2007. To measure the effects of vertical production specialization he includes his key explanatory variable, measuring the share of vertical intra-industry trade in the bilateral trade between a North and South country in a given year. The results indicate that higher vertical specialization increases the probability of PTA formation.

Although Orefice and Rocha (2014) do not study the determinants of the formation of trade agreements, they rely on the benchmark model suggested by Baier and Bergstrand (2004) to examine the factors of the integration level of trade agreements. Thus the empirical approach is closely related to the other em-

empirical studies on PTA formation. They argue that production networks trade drive the level of integration of PTAs. Similar to Manger (2012), they distinguish between North and South and analyze whether the effect of production networks trade is larger for North-South country pairs and especially look at countries in the Asian region. They find that a higher share of production networks trade relative to overall trade increases the probability of signing a deeper trade agreement. For North-South agreements this effect is even larger. They use cross-sectional data and include the share of trade in parts and components over total trade as their main variable of interest.

In the next chapter, I present the empirical model and estimation framework including potential identification threats, the data and the results of the estimation and some robustness checks.

3.3 Empirical Analysis

3.3.1 Estimation Framework

The econometric framework to estimate the determinants of PTAs builds on the qualitative choice model by McFadden (1975) and McFadden (1976), which is derived from a latent variable model. Here, the dependent variable for preferential trade agreements, PTA_{ij}^* , reflects differences in the utility of membership versus non-membership for each country-pair. As utility cannot be observed, it is modeled as a binary variable, taking the values 0 or 1. As indicated by equation (1), it takes the value 1, if there is a positive utility change for country i and j from entering a trade agreement and zero otherwise:

$$PTA_{ij}^* = \min(\Delta U_i, \Delta U_j) \quad (3.1)$$

$$PTA_{ij} = 1, \quad \text{if } PTA^* > 0$$

$$PTA_{ij} = 0, \quad \text{if } PTA^* \leq 0$$

The dependent variable shown in the set of equations (1) takes the form of a binary response model, which seeks to explain the effects of an explanatory variable x_{ijt} on the response probability $p(X_{ijt}) \equiv P(PTA = 1|X_{ijt})$, where X_{ijt} can include time-varying and time-invariant regressors, interactions and time dummies. A binary response model with panel data could be estimated using a pooled probit model, which is also in line with previous literature on PTA formation (Baier and Bergstrand, 2004; Egger and Larch, 2008). As I will discuss in the following, the framework to be estimated makes nonlinear regressions much more complicated and subject to very strong assumptions, so that here a linear probability model is applied. Following Egger and Larch (2008), the panel data is pooled over all periods and the following equation is estimated:

$$PTA_{ijt} = \alpha + \beta X_{ijt} + \bar{\beta} \bar{X}_{ij} + \epsilon_{ijt}. \quad (3.2)$$

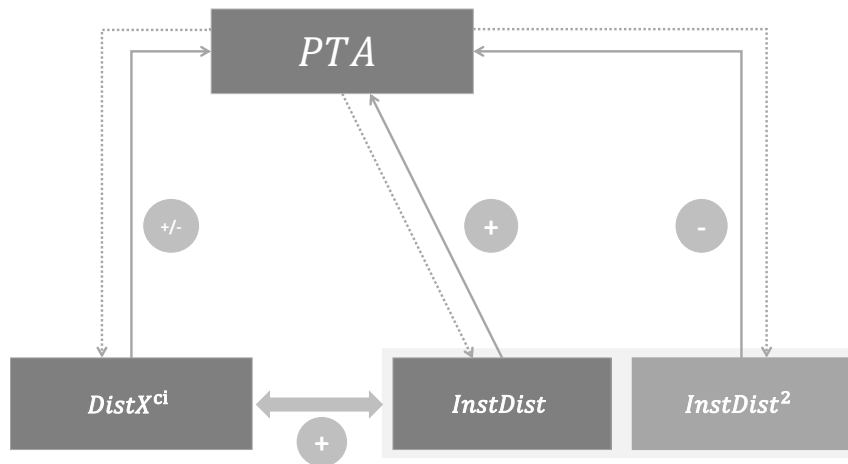
X_{ijt} reflects a matrix of the bilateral explanatory variables including the main variables of interest and further bilateral controls from the benchmark model by Baier and Bergstrand (2004). According to Chamberlain (1980) and Wooldridge (2002) one way to correct for the possibility that time-varying explanatory variables correlate with time-invariant parts of the error term, is to include averages of all regressors over all periods for each country pair as additional variables. \bar{X}_{ij} reflects this procedure and denotes a vector of the mean of all time-varying independent variables over all periods by country pair. In line with Egger and

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Larch (2008), I assume that the time-invariant geographical variables are uncorrelated with the error term.

The following analysis focuses on the effects of institutional quality and contract-intensive goods traded between two countries on their likelihood to form a PTA. To estimate this relationship, I create two bilateral variables: (i) institutional distance ($InstDist$) and (ii) the distance of contract-intensive exports ($DistX^{ci}$) between each country pair. The effects on the likelihood that a country pair forms a PTA is visualized in figure 3.3.

Figure 3.3: Relationship of Institutional Distance and Distance in Relationship-specific Goods Traded



As argued above, for institutional distance I expect a positive effect on PTA formation. An increase in institutional distance should lead to an increase in the demand for a PTA as a legal instrument to reduce institutional discrepancies. Additionally, I expect that this relationship is nonlinear and turning negative for large values of institutional distance, which I account for by includ-

ing a squared term ($InstDist^2$).

To account for the joint effect of institutional distance and distance in contract-intensive goods, I interact distance in contract-intensive goods ($DistX^{ci}$) with institutional distance ($InstDist$) and the squared term ($InstDist^2$) to examine whether the positive effect of institutional distance is promoted by a higher distance in trade of contract-intensive goods and whether it can reduce a potential negative effect of large institutional distances.

For distance in trade of contract-intensive goods alone the effect is unclear. If it is small both country pairs are trading contract-intensive goods, which could promote a utility increase for both countries if a PTA is formed since specific regularities can be implemented, which secure those trade flows. On the other hand, if distance in trade of contract-intensive goods is large, one partner is exporting or importing more contract-intensive goods relative to the other country. Then the effect is expected to become specifically important if it is related to institutional distance. If distance in trade of contract-intensive goods and institutional distance are large at the same time, the need for a contract, which compensates for missing institutions, is enhanced. So a positive joint effect is expected.

The estimation equations including institutional distance ($InstDist$) and distance of traded contract-intensive goods ($DistX^{ci}$) become:

$$PTA_{ijt} = \alpha + \beta Z_{ijt} + \bar{\beta} \bar{Z}_{ij} + \gamma InstDist_{ijt} + \delta InstDist_{ijt}^2 + \zeta DistX_{ijt}^{ci} + \eta InstDist \times DistX_{ijt}^{ci} + \epsilon_{ijt}$$

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where institutional distance is interacted with the distance of contract-intensive goods traded, and

$$PTA_{ijt} = \alpha + \beta Z_{ijt} + \bar{\beta} \bar{Z}_{ij} + \gamma InstDist_{ijt} + \delta InstDist_{ijt}^2 + \zeta DistX_{ijt}^{ci} + \theta InstDist^2 \times DistX_{ijt}^{ci} + \epsilon_{ijt}$$

where squared institutional distance ($InstDist^2$) and distance of contract-intensive goods traded are interacted. This set of estimations is implemented for the whole set of PTAs and for different types of country pairs (North-North, North-South and South-South) to see whether the expected effects are especially important in North-South relationships.

Threats to identification

The dotted lines in figure 3.3 indicate that there is a potential problem of reverse causality resulting from institutional distance and distance in trade of contract-intensive goods. Being part in a trade agreement can also influence both partners' level of institutional quality, i.e. institutional distance. The rules and commitments included in a PTA and the cooperation and communication resulting from negotiations and meetings between the partner countries can lead to the implementation of better institutions and convergence of institutional quality between the member countries and thus affect institutional distance. Furthermore, being part in a trade agreement can influence the composition of imports and exports between both trading partners and thus can also have an effect on the distance in the share of contract-intensive exports.

As suggested by Wooldridge (2002), the null of exogeneity can be tested by the

t-statistics of predicted residuals from the first stage regressions. The results of the first-stage regressions confirm the assumption of endogeneity. To correct for this simultaneity bias, an instrumental variable (IV) approach is implemented.

In a panel, however, an IV approach is very demanding.⁴ According to Wooldridge (2002), in the case of a binary response model with endogenous regressors, a linear probability model (LPM) estimated by two stage least squares (2SLS) can be a good estimate near the average values of the probit estimated partial effects and LPM is standardized.

The main difference of the LPM compared to probit is that it assumes constant marginal effects, while probit assumes diminishing marginal scales of the partial effects. In other words, LPM assumes the same effects of a variable independent from its initial value and the values of the other regressors. That means, independent from how large differences in institutional quality are, a one point increase is associated with the same effect on the probability of PTA formation as when differences are small.

Using probit one can compute partial effects at different values of explanatory variables. This makes specifically sense in the case of binary explanatory variables, when it is useful to plug in zero or one and compare the effects. In this analysis the focus lies on the interpretation of the effects of continuous variables, for which it is useful to see the average effects. Furthermore, the nonlinear conditional expectation function (CEF) is approaching linearity in the middle so that the probit model is expected to generate average marginal effects which are close

⁴In a binary response model with continuous endogenous explanatory variables the reduced form and structural form error need to have a zero mean, follow a bivariate normal distribution and need to be independent of the other regressors (c.f. Wooldridge (2002)).

to OLS and 2SLS in the case of included endogenous regressors. Consequently, the relationship can be appropriately estimated by a LPM. Moreover, analyzing the effects for different country groups (North-North, North-South and South-South) also accounts for the different effects of different levels of means.

One major disadvantage of using an LPM is that, different from a probit model where a standard normal distribution is assumed, estimates do not necessarily lie within a 0 to 1 range, but in practice this shows to be less of a problem and also in the following analysis the main variables of interest are within this range (c.f. Wooldridge (2002)). So in the following analysis, I estimate the model using 2SLS.⁵ Following Orefice and Rocha (2014), I use the average lagged values as instruments for endogenous explanatory variables.

3.3.2 Data

The data set consists of 132 countries over 21 years from 1995 until 2015 including 43 developed countries (North) and 89 developing countries (South).⁶ Over the whole period 3.495 trade agreements between unique country pairs are notified. All country pairs appear only once in each period t . That means, a country pair like “Chile-Peru” is the same country pair as “Peru-Chile”.

In the following, I explain in detail the data on trade agreements for the dependent variable and the measures and data sources on institutions and contract-intensive goods traded. Furthermore, I summarize basic control variables, which I include, as suggested in the benchmark model by Baier and Bergstrand (2004)

⁵In chapter 3.3.3 the LPM results are compared to the probit estimates to show that using LPM provides good estimates in this setting.

⁶A complete list of all countries from North and South is in the Appendix table 3.A.1

and, which have also been applied in previous empirical studies analyzing the determinants of PTAs.⁷

Trade agreements

The data on trade agreements is taken from the Design of Trade Agreements (DESTA) database by Dür et al. (2014). They have collected a very large and detailed data set on trade agreements including many characteristics on each agreement for the periods from 1948 until 2015. Figure 3.4 shows the total number of PTAs in the data set for all unique country pairs (left column) and for different types of PTAs (that is, North-North, North-South and South-South). Countries are classified into North and South according to their income level. The following analysis uses the classification of income levels defined by the World Bank, where countries are classified as high income (HI), upper middle income (UMI), lower middle income (LMI) and low income (LI). In this analysis a threshold of GDP per capita of 11,115 current US-\$ in 2006 is used to classify countries into North and South. According to this threshold all high income countries are categorized as North and all countries with a GDP per capita in 2006 below this threshold are categorized as South. Using this classification, there are 89 countries from the South and 43 countries from the North.

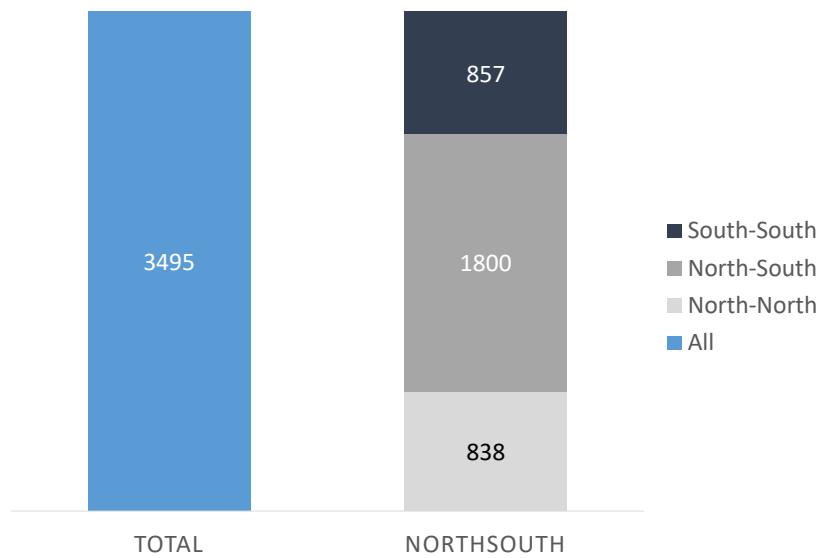
The DESTA database is the most comprehensive data set in terms of the number of trade agreements covered. While the Regional Trade Agreements Information System (RTA-IS) by the World Trade Organization (WTO) has notified 428 agreements until 2015, DESTA covers 805 treaties.⁸

⁷An overview of all explanatory variables with summary statistics is presented in the appendix table 3.A.4.

⁸The version of the data set used for this analysis is from February 2016.

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Figure 3.4: Number of PTAs Between Country Pairs by Different Types of Country Pairs (North-North, North-South and South-South)



Note: All high income countries (with a GDP per capita of 11,115 current US-\$ in 2006 and higher) are classified as North and all other countries below that income level are classified as South. Source: Author's illustration and calculation based on trade agreements data from DESTA database by Dür et al. (2014)

Since the data set, used for this analysis, is a bilateral data set, multilateral agreements appear as separate agreements between a pair of two countries, which leads to more positive outcomes ($PTA = 1$) than agreements covered in the original DESTA data set. Correspondingly, a country entering the European Community (EC) is represented in the data as several agreements with each country of the EC. Since in 1958 the European Commission decided to negotiate trade agreements of its members, this means that by one conclusion of a PTA with the EC a country enters the market to several new trading partners, which are members of the EC. As a robustness check all EU members are excluded from the sample.

Furthermore, it is possible that there are multiple agreements between the same country pair in the same year, e.g. the Cotonou Agreement and the CARIFORUM EC EPA are two agreements, which have both been signed by the same country pairs in the same year. In 28 cases there are two agreements signed or accessions of agreements between the same pair of countries. In those cases the binary character of the dependent variable accounts only for one agreement. This is mainly due to the Cotonou Agreement and the agreement between the EU and South Africa, the Trade, Development and Cooperation Agreement which was originally concluded in 1999. In the years 2003 and 2005 several European countries entered both agreements at the same time. The same is true for the EC Turkey Association Agreement and the EC Syria Agreement, signed in 1963 and 1977, respectively. Furthermore, Vietnam, Japan and New Zealand formed two different agreements, each pair one bilateral and a plurilateral or region-region agreement in the same year (i.e. 2008 for New Zealand and Malaysia and 2009 for Japan and Vietnam).

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In the period covered, after 1995, there are 12 cases of withdrawals, which I account for in the data. In 1995 Austria, Finland and Sweden leave EFTA. In 2004, the Czech Republic, Hungary, Poland, Slovak Republic and Slovenia withdraw from the Central European Free Trade Agreement (CEFTA) before entering the European Union (EU), followed by Bulgaria and Romania in 2006. While also in 2006 Venezuela quits 5 agreements with South American partners. Furthermore, Romania leaves the Global System of Trade Preferences (GSTP) in 2007. In three others cases of withdrawal the leaving countries, namely Mauritania, Rwanda and Georgia, are not part of the final sample. A list of all withdrawals is presented in the appendix table 3.A.3. After creating the dependent binary variable for PTAs between each unique country pair, for each year where a country pair is in an agreement, the variable PTA takes the value one. If a country is leaving, PTA becomes zero again.

Institutional Distance

The data to create institutional distance is taken from the International Country Risk Guide (ICRG). Compared to other available databases measuring institutional quality (like the World Governance Indicators by the World Bank or the Economic Freedom of the World Index by the Heritage Foundation), this database covers the highest number of countries, with 141 countries for the longest period of time, i.e. from 1984 until 2015.

The ICRG data set measures the risk of a country in three categories, (i) political, (ii) financial, and (iii) economic risk. Each category consists of sub-components, which are added together to an index for each category and finally to an overall risk rating for each country. To achieve consistency of the rating between countries and over time a number of basic questions are predefined

Table 3.2: Political Risk Components

| Component | Points (max.) |
|---------------------------|----------------------|
| Government Stability | 12 |
| Socioeconomic Conditions | 12 |
| Investment Profile | 12 |
| Internal Conflict | 12 |
| External Conflict | 12 |
| Corruption | 6 |
| Military in Politics | 6 |
| Religious Tensions | 6 |
| Law and Order | 6 |
| Ethnic Tensions | 6 |
| Democratic Accountability | 6 |
| Bureaucracy Quality | 4 |
| Total | 100 |

to create the index. All categories consist of several components, which are weighted variables with the highest number indicating the lowest potential risk and the lowest number indicating the highest risk. The maximum number of the components is set according to its importance with respect to the overall risk of a country. The political risk rating consists of 12 components, adding up to a total score of 100 points, as shown in table 3.2.

For the calculation of institutional distance, I follow Demir and Hu (2016), who adopt the method of Kogut and Singh (1988) to calculate a measure for cultural distance. It is computed as the arithmetic average of the squared difference of each dimension d of institutional quality between two countries relative to the variance of each dimension. The exact formula is given as:

$$InstDist_{ijt} = \frac{1}{2} \sum_{d=1}^2 \frac{(Inst_{dit} - Inst_{djt})^2}{V_d} \quad (3.3)$$

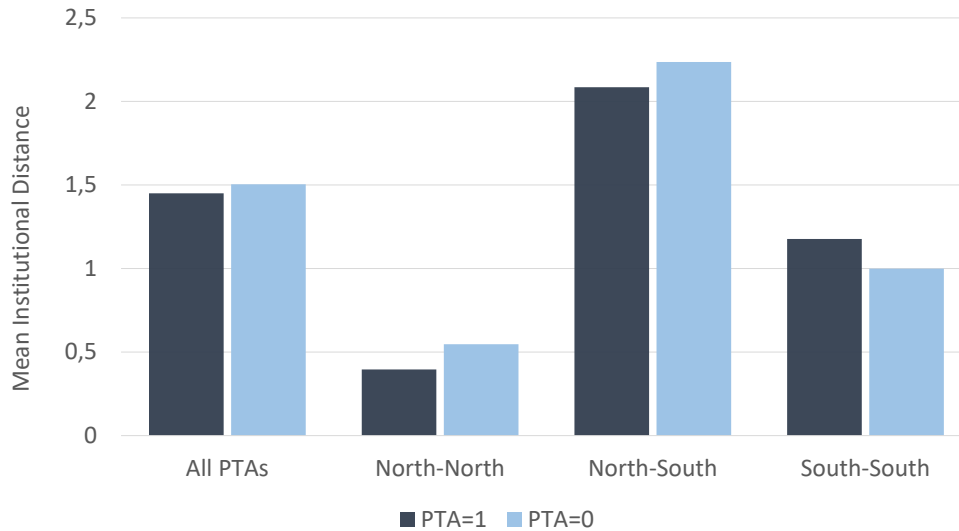
where d indicates the dimension (component) of the political risk index, $Inst_{dit}$ and $Inst_{djt}$ denote the score of dimension d of country i and j , respectively, in year t and V_d is the variance of the d th dimension of the index.

As argued above and following Nunn (2007) when trading contract-intensive goods both, contract enforcement and a well-functioning judicial system, are especially important with regard to institutional quality. Thus, I focus on institutions with regard to contract enforcement and the judicial quality and create institutional distance including the two dimensions ‘Investment Profile’ and ‘Law and Order’ of the Political Risk rating.

The ‘Investment Profile’ has a maximum score of 12 points, assessing the risk to investment, which is not covered by any of the other components or categories of the index. This component itself is composed of three sub-components, (i) contract viability/expropriation, (ii) profits repatriation and (iii) payment delays. ‘Law and Order’ consists of two elements, each varying from 3 (high rating) to 1 (low rating), summing up to a maximum score of 6 points. (i) ‘Law’ assesses whether there exists a well-established legal system, and (ii) ‘Order’, measures if the law is applied and ignorance of the law is sanctioned.

Figure 3.5 shows the average institutional distance for being in a PTA compared to not being in a PTA for all PTAs and for different sub-samples including only North-North, North-South, or South-South country pairs. Overall, it can be seen that average institutional distance is smaller when a country pair is in a PTA than otherwise. Only for PTAs between country pairs from the South, on average institutional distance is larger when pairs are in a PTA compared

Figure 3.5: Mean Institutional Distance by Country Pair Being in a PTA vs. not Being in a PTA



Source: Author's calculation based on ICRG data and DESTA.

to those which are not in a PTA. This supports that for South-South country pairs there may be a positive relationship between institutional distance and South-South PTA formation. For North-South country pairs the data suggest a negative relationship but this may also be due to a negative effect of large institutional distances, while it could still be the case that for smaller levels of institutional distance the effect might be positive. Independent of being in a PTA or not, on average largest institutional differences are between North-South country pairs.

Distance of contract-intensive trade

To create the share of contract-intensive goods traded the measure of contract intensity from Nunn (2007) is used. He uses Rauch's (1999) classification to define, which inputs are relationship-specific. Rauch categorizes goods on a

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disaggregated level of three to four digits of the Standard International Trade Classification (SITC) as commodities, which are either sold on organized exchange, which have a reference price or, which are differentiated.

If an input is sold on organized exchange there are enough potential buyers and even in the case that a buyer wants to renegotiate a lower price, there is enough demand from alternative buyers to which the input is sold at the current price. If the product's reference price is not quoted on organized exchange but listed in a trade publication there are still a number of potential buyers which make hold-up less likely. So this product has an intermediate level of relationship-specificity. The highest levels of relationship-specificity refer to differentiated inputs, which are neither sold on organized exchanges nor listed in trade publications.

Nunn aggregates Rauch's original 1,189 industries, which are classified according to the 4-digit SITC Rev. 2 system, into 342 industries, classified according to the Bureau of Economic Analysis (BEA) input-output (I-O) industry classification. For this aggregation he first uses a concordance from 4-digit SITC to the 10-digit Harmonized System (HS10) and in a second step he uses a concordance from the HS10 to I-O industry classification from BEA. Finally, he creates a measure of contract-intensity across industries, z_k^{rs} , which measure the proportion of relationship-specific (rs) intermediate inputs of a final good for each I-O industry classification k :

$$z_k^{rs} = \sum_s \theta_{ks} R_s^{neither} \quad (3.4)$$

θ_{ks} denotes the value of input s used in industry k (u_{ks}) relative to all inputs used in industry k (u_k), i.e. $\theta_{ks} \equiv u_{ks}/u_k$. $R_s^{neither}$ is the proportion of input s

which is neither sold on organized exchange nor reference priced and thus has a high level of relationship-specificity. To create the bilateral measure for this analysis, I link the industries with different shares of contract-intensity to trade data, following Nunn (2007), and calculate the distance of the contract-intensity of exports between two country pairs i and j in period t ($DistX_{ijt}^{ci}$).

First, I create a measure for the share of contract-intensive exports. For this, Nunn's data set on contract-intensity, categorized by 6-digit input-output (I-O) industries need to be linked to trade data, which is available at the Harmonized System (HS) 6-digit level from 1992. Trade data is taken from COMTRADE data from the French research center Centre d'Etudes Prospectives d'Informations Internationales (CEPII). To link input-output categories to HS industries, the I-O 1997 classification to HS10 1996 concordance from the Bureau of Economic Analysis (BEA) is used. Then the last four digits of the 10-digits are cut to have the international 6-digit level for which trade data is available for most countries. Then a HS 1996 to HS 1992 concordance from UN Trade Statistics is used to get HS codes for 1992.

At this stage for several cases one 6-digit HS industry code maps into different I-O categories at the same time. So these HS codes need to be matched manually to the I-O industry categories. If possible, 6-digit HS codes, which map into more than one industry code, are allocated to those industry codes, where HS codes are allocated most frequently. If this is not possible, for those industries, the simple average of the share of relationship-specific intermediate inputs of each I-O category is calculated and assigned to this industry.

In the end 4,876 6-digit HS codes can be allocated to 381 I-O industry codes of a final good used by Nunn (2007). Now, each industry is categorized according

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Table 3.3: The Twenty Least Contract-intensive Industries

| Least contract-intensive: lowest $z_i^{r,s}$ | |
|--|--|
| $z_i^{r,s}$ | Industry description |
| 0.024 | Poultry processing |
| 0.024 | Flour milling |
| 0.036 | Petroleum refineries |
| 0.036 | Wet corn milling |
| 0.053 | Aluminum sheet, plate & foil manuf. |
| 0.058 | Primary aluminum production |
| 0.087 | Nitrogenous fertilizer manufacturing |
| 0.099 | Rice milling |
| 0.111 | Prim. nonferrous metal, excl. copper & alum. |
| 0.132 | Tobacco stemming & redrying |
| 0.144 | Other oilseed processing |
| 0.171 | Oil gas extraction |
| 0.173 | Coffee & tea manufacturing |
| 0.180 | Fiber, yarn, and thread mills |
| 0.184 | Synthetic dye & pigment manufacturing |
| 0.190 | Synthetic rubber manufacturing |
| 0.195 | Plastics material & resin manuf. |
| 0.196 | Phosphatic fertilizer manufacturing |
| 0.200 | Ferroalloy & related products manuf. |
| 0.200 | Frozen food manufacturing |

Source: Nunn (2007)

to its contract-intensity, for which trade data is available.

Tables 3.3 and 3.4 present the least and most contract-intensive industries, respectively. The categorization in both cases appears reasonable. The least contract intensive industries include mostly primary goods for which the market is thick, which means that there are a lot of potential buyers in all types of countries, not only industrialized countries. In contrast to the least contract-intensive industries, the most contract intensive-industries contain highly differentiated industries like automobile, aircraft or computer manufacturing, which have inputs requiring a large share of relationship-specific investments, and thus are highly sensitive to enforcement institutions.

Using the contract-intensity of each industry, the contract-intensive exports can

Table 3.4: The Twenty Most Contract-intensive Industries

| Most contract-intensive: highest $z_i^{r,s}$ | |
|--|--|
| $z_i^{r,s}$ | Industry description |
| 0.980 | Automobile & light truck manuf. |
| 0.977 | Heavy duty truck manufacturing |
| 0.956 | Electronic computer Manufacturing |
| 0.904 | Audio & video equipment manuf. |
| 0.901 | Other computer peripheral equip. manuf. |
| 0.893 | Aircraft manufacturing |
| 0.891 | Broadcast & wireless comm. equip. manuf. |
| 0.888 | Search, detection, & navig. instr. manuf. |
| 0.880 | Telephone apparatus manufacturing |
| 0.873 | Electricity & signal testing instr. manuf. |
| 0.872 | Aircraft engine & engine parts manuf. |
| 0.854 | Musical instrument Manufacturing |
| 0.851 | Breweries |
| 0.840 | Book publishers |
| 0.831 | Packaging machinery manuf. |
| 0.826 | Other electronic component manuf. |
| 0.824 | Other engine equipment manuf. |
| 0.822 | Analytical laboratory instr. manuf. |
| 0.819 | Air & gas compressor manuf. |
| 0.810 | Photographic & photocopying equip. manuf. |

Source: Nunn (2007)

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be calculated for each country to create a bilateral measure denoting the absolute difference of the share of contract-intensive exports (X_{ijt}^{ci} , X_{jit}^{ci}) relative to total exports (X_{ijt} , X_{jit}). It is calculated as:

$$DistX_{ijt}^{ci} = \left| \frac{X_{ijt}^{ci}}{X_{ijt}} - \frac{X_{jit}^{ci}}{X_{jit}} \right| \quad (3.5)$$

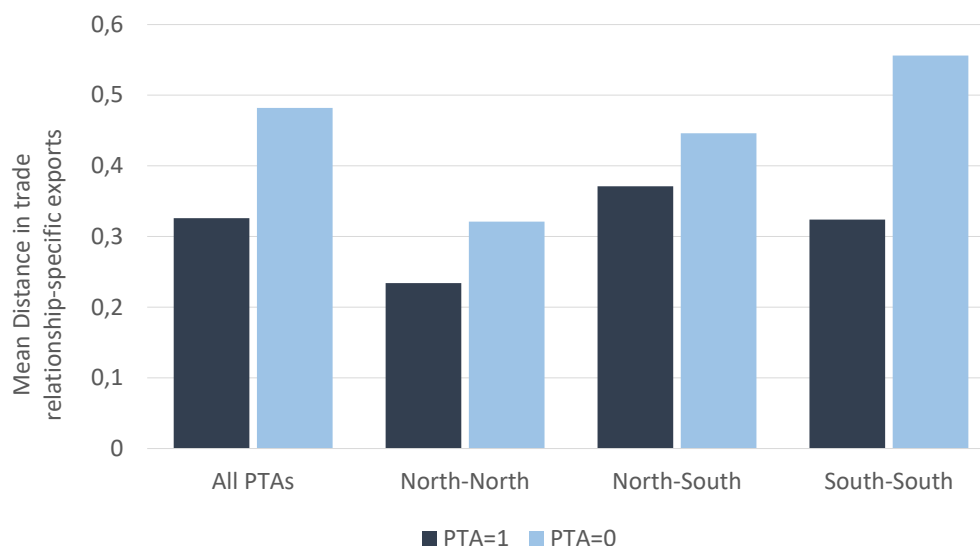
For all country pairs of i and j , contract-intensive exports are calculated as the sum of all exports of each country over industries k , to which a specific value of relationship-specificity (z_k^{rs}) is assigned:

$$X_{ijt}^{ci} = \sum_k X_{ijt}^k, \quad z_k^{rs} > median(z_k^{rs}), \quad (3.6)$$

while only those exports are summed up where z_k^{rs} is larger than the median over all industries. For those country pairs where there is no trade at all the difference was set to 1.

Figure 3.6 shows the average distance in contract-intensive trade for different types of country pairs and PTAs analogously to figure 3.5. Overall, it can be seen that on average distance of contract-intensive trade between two country pairs is smaller for being a member in a PTA compared to nonmembership. This is true for all types of PTAs (North-North, North-South and South-South). Largest average differences can be observed for North-South country pairs, while the difference between being in a PTA and not being in a PTA is smallest for North-South relationships. The largest difference for PTA membership versus nonmembership is between countries from the South, indicating a negative relationship of distance in contract-intensive goods traded and PTA formation between pairs from the South.

Figure 3.6: Mean Distance of Contract-intensive Goods Traded by Pair Being in a PTA vs. no PTA



Source: Author's calculation based on COMTRADE data from CEPII and Nunn (2007).

Further controls

Further control variables are taken from the benchmark model by Baier and Bergstrand (2004). They find that in general trade-creating and trade-diverting factors play an important role in explaining the probability of a PTA:

- $DCONT_{ij}$ is a dummy taking the value one if a country pair is on the same continent and zero otherwise.
- $natural_{ij}$ is the natural logarithm of the inverse of the geographic distance between two partners i and j . It accounts for lower transport costs for trading partners which are closer in geographical distance, and thus can consume and trade more. Correspondingly, the expected effect on the likelihood of PTA formation is positive.
- $remote_{ijt}$ measures the remoteness of the pair from all other countries. It

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is calculated as the simple average of the natural logarithms of the mean distance of country i (j) to all its trading partners, c , except for country j (i). Thus, it measures the distance of two countries situated on the same continent to other countries but takes the value zero if a country pair is situated on different continents. The more remote a country pair is, the higher is the expected probability that this pair is in a PTA.⁹

- $rGDPsum_{ijt}$ is the total relative market size, measured as the log of the sum of both countries' real GDP ($rGDP$, in constant 2010 US-\$) in period t . Baier and Bergstrand (2004) introduce this measure to control for absolute factor endowments of trading partners. Larger economies trade higher volumes of varieties, which increases gains from a PTA. So the expected effect is positive.¹⁰
- $rGDPsim_{ijt}$ indicates the similarity of the two countries in economic size, i.e. in real GDP ($rGDP$). The larger differences in economic sizes are, the larger is the loss due to lower trade for the larger country. If one of the trading partners' welfare is declining the lower is the probability that a joint PTA is formed. Thus, a positive relationship of similarity in real GDPs is expected.¹¹
- DKL_{ijt} measures the absolute difference in real GDP per capita as a proxy for the relative factor endowments of i and j , i.e. $DKL_{ijt} = [\log(rGDP_{it}/POP_{it}) - \log(rGDP_{jt}/POP_{jt})]$. The reason to include this variable is that an increase in the relative factor endowments should en-

⁹The exact formula is given as $remote_{ijt} = DCONT * 1/2 * \log(\sum_{c \neq j} Distance_{ic}/n_t - 1) + \log(\sum_{c \neq i} Distance_{cj}/n_t - 1)$, with n_t indicating the number of unique pairs in year t of the sample.

¹⁰The exact formula is given by $rGDPsum_t = \log(rGDP_{it} + rGDP_{jt})$.

¹¹It is measured as $rGDPsim_{ijt} = \log[1 - [rGDP_{it}/(rGDP_{it} + rGDP_{jt})]^2 - [rGDP_{jt}/(rGDP_{it} + rGDP_{jt})]^2]$.

hance the probability of a PTA, but only up to a certain point.

- $DKL_{ijt}^2 = (DKL_{ijt})^2$ is the square of DKL_{ijt} . This variable is introduced to account for a nonlinear relationship of DKL_{ijt} . The effect should be negative.
- $DROWKL_{ijt} = 0,5 \{ (\sum_{ct \neq it} rGDP_{ct} / \sum_{ct \neq it} POP_{ct}) - \log(rGDP_{it} / POP_{it}) \} + [\log(\sum_{ct \neq jt} rGDP_{ct} / \sum_{ct \neq jt} POP_{ct}) - \log(rGDP_{jt} / POP_{jt})]$ measures the difference of any country pairs' relative factor endowment (RFE) with respect to the rest of the world (ROW). It accounts for the economic size of the ROW. If the size of the ROW reduces, the losses, which result from lower consumption of varieties from the ROW due to a PTA between i and j , reduce as well.

Finally, it is controlled for cultural aspects by including two bilateral variables, *Col45*, a dummy for having a common colonizer after 1945 and *Comlang_off*, which is a dummy for having a common official or primary language.

3.3.3 Empirical Results

In the following chapter, I first compare the results of the probit estimation with the results of the linear probability model (LPM) and show that the LPM provides a suitable estimation model. I then present all additional estimation results using the LPM, for the whole sample and for different sub-samples of country pairs and finally show some robustness checks.

Probit versus LPM

As noted in section 3.3.1, I implement a linear probability model (LPM) to estimate the determinants of PTA formation. Table 3.5 contrasts the results from a simple OLS regression to those obtained from a probit estimation.

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Heteroscedasticity-robust standard errors are shown in parenthesis, which are clustered over unique country pairs.

The first column shows the coefficients of the LPM, which is estimated by simple ordinary least squares (OLS). The second column shows the probit coefficients and the third column shows the marginal effects, which are evaluated at the average values of the independent variables and which can be interpreted as the effect of the respective variable on the conditional probability of new PTA formation $P(PTA = 1|\bar{x})$ keeping all other variables at their mean. In the linear probability model the estimated coefficients can be directly interpreted as the change in the conditional probability by percentage points due to a one unit increase in x , regardless of the initial value of x . The estimates of the marginal effects can be compared to the estimates of the linear model. The values of the coefficients of both models are very close, which suggests that the LPM provides good estimates of the average effect.

Almost all estimates of the probit and LPM have the same signs and significance levels. Only being on the same continent and being remote have significance levels, which are slightly lower when estimating probit and the effect of the difference in real GDP turns negative when estimating OLS but is still very close to the probit marginal effect.¹²

The marginal effect of the squared difference in real GDP (0.006) is almost identical to the OLS coefficient (0.007). The positive effects of being on the same continent, having a similar real GDP, difference in real GDP and being natural trading partners are in line with theory. That means, country pairs,

¹²Egger and Larch (2008) also find a small but negative effect for the difference in real GDP.

which are more similar in size or, which are situated on the same continent have a higher probability to form a PTA compared to others. Similarly, being closer in geographic distance increases the probability of a country pair signing a joint PTA. Furthermore, country pairs, which have a larger difference in real GDPs than other country pairs tend to sign a PTA more likely than other pairs. In contrast to the expectation, the effect of the difference in RFE with respect to the ROW is positive, which is in line with Egger and Larch (2008) where all PTAs are included, and the effect of the sum of real GDPs is negative.

Two-stage Least Square results

Table 3.6 presents the 2SLS results of the probability of PTA formation including all variables of interest. The cluster-robust standard errors (shown in parenthesis) account for the assumption of independence and identical distribution of the standard errors of the reduced form and the second stage estimation. In all models the control variables, suggested by Baier and Bergstrand (2004), are included.

Overall, the effects do not differ from the results of table 3.5 except for the sum of real GDP, for which the effect is positive in the first two models where institutional distance and the squared term of institutional distance is included. But this effect is not significant and in model (2) only significant at the 10 percent level. The effects, which are most important for this analysis are presented in columns (1) and (2) and in columns (5) and (6), where institutional distance and squared institutional distance are interacted with the distance in contract-intensive (CI) goods traded. The model where the distance of trade in contract-intensive goods is included alone is only shown for completeness and to see how this effect develops when interacted with institutional distance. In all models

Table 3.5: Comparison of Probit and OLS Estimation

| Dep. var. PTA | OLS | Probit | |
|------------------------|----------------------|----------------------|----------------------|
| | (1) | (coeff.) (2) | (marg. eff.) (3) |
| Same continent | 1.734*** (0.315) | 3.397** (1.526) | 0.503** (0.226) |
| Sum of real GDP | -0.011*** (0.010) | -0.144*** (0.033) | -0.021*** (0.005) |
| Similarity of real GDP | 0.048*** (0.008) | 0.089*** (0.027) | 0.013*** (0.004) |
| Diff. in real GDP | -0.008*** (0.003) | 0.097*** (0.035) | 0.014*** (0.005) |
| Sq. diff. in real GDP | 0.007*** (0.001) | 0.038*** (0.007) | 0.006*** (0.001) |
| Natural | 0.172*** (0.006) | 0.807*** (0.020) | 0.120*** (0.003) |
| Remote | -0.187*** (0.011) | -0.374** (0.160) | -0.055** (0.024) |
| Diff. of RFE wrt. ROW | 0.099*** (0.004) | 0.319*** (0.046) | 0.047*** (0.007) |
| Observations | 344953 | 344953 | |
| Log pseudolikelihood | | 63233.5 | |
| p-value Chi^2 | | 0.000 | |
| R-squared | 0.235 | | |
| Year FE | Yes | Yes | |

Heteroscedasticity-robust standard errors (in parentheses) are clustered over unique country-pairs. Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively. Country pair-specific mean over all periods of the time-variant variables are included but not shown. Marginal probit effects are evaluated at explanatory variable mean values.

the coefficients are estimated using 2SLS. Adding institutional distance to the estimation leads to a loss of observations since for many developing countries, which are included in the sample no data on institutional distance is available.

In all models the effect of institutional distance is positive, meaning that an increase in institutional distance between two country pairs positively affects the probability that this country pair signs a PTA, while the squared term is negative. Both effects are significantly different from zero at the one percent level. The size of the effects only hardly changes and significance levels remain at 1 percent in the other models when distance of trade in contract-intensive goods and the interaction terms are included.

When included alone, an increase of institutional distance by one unit, all else equal, would increase the probability of PTA formation by 3.8 percentage points.¹³ The inclusion of a squared institutional distance term leads to an increase in the effect of institutional distance but at the same time shows that the effect is nonlinear and that if institutional quality becomes very large the effect on the probability of PTA formation turns negative.

Taking the partial derivative of model (2) with respect to institutional distance (*InstDist*) one can calculate the threshold when the effect of institutional distance turns negative. The effect of institutional distance is zero at the value 4.381. This means for institutional distances larger than 4.381 an increase reduces the probability of PTA formation. Until that threshold the effect of a marginal increase in institutional distance on the conditional probability of a PTA is positive. Using the derivative the average marginal effect on the condi-

¹³A one unit increase in institutional distance happened for example between Burkina Faso and Chile over a period of ten years between 2001 and 2011.

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tional probability of PTA formation is 0.121, while at one unit above the mean (at 2.503) the positive effect is reduced to 0.079.¹⁴

The significant coefficient of the interaction term of squared institutional distance and distance of trade in contract-intensive goods ($DistX^{ci}$) indicates that there is a joint effect which is positive. Consequently, if institutional distance between a country pair is large and depending on the level of distance of trade in contract-intensive goods, an increase in $DistX^{ci}$ increases the probability of PTA formation and potentially compensates the negative effect of large institutional distances.

Taking again the derivative with respect to institutional distance the overall marginal effect (holding $DistX^{ci}$ also at its mean) is 0.147 and thus is larger compared to model (2).¹⁵

Assuming constant effects of $DistX^{ci}$ and holding $DistX^{ci}$ at 1, meaning that there is one-way contract-intensive trade, which means all exports (or imports) of one trading partner are contract-intensive, while the other one does not trade any contract-intensive goods, the effect increases to 0.201. This supports the argument that a larger share of trade in contract-intensive goods promotes the conditional probability of PTA formation where institutional distance between a country pair is large. At the mean value of $DistX^{ci}$ the overall effect of institutional distance becomes negative at 4.327, while at larger values this threshold increases up to 6.25 when $DistX^{ci}$ is equal to 1.

¹⁴ $\frac{\delta PTA}{\delta InstDist} = \hat{\beta}_{InstDist} + 2\hat{\beta}_{InstDist^2}InstDist = 0.184 + 2 * (-0.021) * 1.503 = 0.121$

¹⁵ $\frac{\delta PTA}{\delta InstDist} = \hat{\beta}_{InstDist} + 2 * \hat{\beta}_{InstDist^2}InstDist + 2 * \hat{\beta}_{interact}DistX^{ci} * InstDist = 0.147$

Table 3.6: 2SLS Results for the Probability of Forming a PTA

| Dep. var. PTA | (1) | (2) | (3) | (4) | (5) | (6) |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Same continent | 1.935*** (0.154) | 1.940*** (0.572) | 1.911*** (0.409) | 1.743*** (0.576) | 1.639*** (0.424) | 1.684*** (0.575) |
| Sum of real GDP | 0.010 (0.006) | 0.024* (0.013) | -0.126*** (0.017) | -0.042** (0.020) | -0.043*** (0.014) | -0.036* (0.019) |
| Sim. of real GDP | 0.066*** (0.009) | 0.067*** (0.010) | -0.018 (0.011) | 0.040*** (0.013) | 0.039*** (0.010) | 0.041*** (0.013) |
| Diff. in real GDP | -0.022*** (0.008) | -0.061*** (0.011) | -0.007 (0.010) | -0.079*** (0.013) | -0.075*** (0.011) | -0.076*** (0.013) |
| Sq. diff. in real GDP | 0.009*** (0.002) | 0.021*** (0.003) | -0.001 (0.003) | 0.019*** (0.004) | 0.018*** (0.003) | 0.019*** (0.003) |
| Natural | 0.207*** (0.006) | 0.206*** (0.006) | 0.147*** (0.004) | 0.180*** (0.006) | 0.178*** (0.005) | 0.179*** (0.006) |
| Remote | -0.207*** (0.060) | -0.208*** (0.060) | -0.206*** (0.043) | -0.187*** (0.061) | -0.176*** (0.045) | -0.181*** (0.060) |
| Diff. of RFE wrt. ROW | 0.106*** (0.013) | 0.078*** (0.015) | 0.124*** (0.016) | 0.078*** (0.020) | 0.083*** (0.015) | 0.082*** (0.020) |
| Institutional distance | 0.038*** (0.003) | 0.184*** (0.034) | | 0.238*** (0.036) | 0.212*** (0.047) | 0.225*** (0.036) |
| Sq. institutional distance | | -0.021*** (0.004) | | -0.027*** (0.004) | -0.025*** (0.003) | -0.033*** (0.005) |
| Dist. of trade in CI goods | | | -2.038*** (0.239) | -0.986*** (0.243) | -1.001*** (0.231) | -0.988*** (0.241) |
| Institutional dist. × Dist. of trade in CI goods | | | | | 0.014 (0.051) | |
| Sq. institutional dist. × Dist. of trade in CI goods | | | | | | 0.015*** (0.004) |
| Observations | 178233 | 178233 | 317974 | 167713 | 167713 | 167713 |
| Kleibergen-Paap (p-value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 st -stage F-Stat. (p-value) | | | | | | |
| Institutional dist. | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 |
| Sq. institutional dist. | | 0.000 | | 0.000 | 0.000 | 0.000 |
| Dist. of trade in CI goods | | 0.000 | | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | | | 0.000 | 0.000 | 0.000 | 0.000 |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | 0.000 | 0.000 |

Column (1) is estimated using OLS all other models are estimated using 2SLS. Heteroscedasticity-robust standard errors (in parentheses) are clustered over unique country pairs. Significance at the 10, 5, and 1 percent level is denoted by *, **, and ***, respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included.

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The overall effect of $DistX^{ci}$ shows to be negative, but its size cannot be interpreted directly as it takes values close to one. Taking the partial derivative of model (6) with respect to $DistX^{ci}$ the effect is -0.954.¹⁶ Setting this partial derivative equal to zero gives the threshold of institutional distance when a marginal increase in $DistX^{ci}$ compensates the negative effect of large institutional distance on the probability of PTA formation, under the assumption that the effect of the distance in trade of contract-intensive goods is constant. This threshold is at 8.116. For institutional distances larger than 8.116 an increase in $DistX^{ci}$ positively affects PTA membership.

The p-values of the LM Kleibergen-Paap test statistic, which is robust to non independently and identically distributed standard errors, indicate that the excluded instruments are valid in all estimations.¹⁷ The test is an underidentification test whether the excluded instruments are relevant meaning that the instruments correlate with the endogenous regressors. This test jointly tests for all instruments at the same time. The first stage F-statistics by Angrist and Pischke (2009) are tests of under- and weak identification for regressions with more than one endogenous regressor. It tests whether one of the endogenous regressors is under- or weakly identified. The p-values are also reported for each endogenous regressor. The results suggest that all endogenous regressors are sufficiently identified by their instruments. The first-stage regression results of model (6) are reported in the appendix table 3.A.6.

¹⁶ $\frac{\delta PTA}{\delta DistX^{ci}} = -0,988 + 0,015 \overline{InstDist}^2 = -0,988 + 0,015 * 1,503^2$

¹⁷ A rejection of the null means that the model is identified.

North-South PTA formation

Table 3.7 presents the results of the probability of forming a PTA between North and South countries. The first column reports the OLS coefficients of the basic model based on Baier and Bergstrand (2004) now without the dummy of being on the same continent. When including the dummy in the probit estimation, the model does not converge and in some specifications of the sub-sample it perfectly predicts the outcome. This problem is persistent in all estimations using sub-samples of North-North, North-South or South-South country pairs. So in all subsequent estimations the variable for being on the same continent is excluded.

Columns (2) to (7) present the same models as in columns (1) to (6) of table 3.6, but now for a sub-sample of North-South country pairs. The effects of the variables from the benchmark model are close to the effects from the estimation based on the full sample. Difference in real GDP is not significant anymore in the first two models but is significant and negative again when included with institutional distance and the squared term of institutional distance. Being a natural trading partner, that is, being close in geographic distance has the strongest positive effect compared to the other variables. The effect is even larger than for the full sample, while remoteness of a continental country pair to the rest of the world is again negative. The effects of all controls are relatively stable in all models.

Table 3.7: 2SLS Results for the Probability of Forming a North-South PTA

| Dep. var. | North-South PTA | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--|-----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sum of real GDP | | -0.084*** (0.009) | -0.037* (0.019) | -0.023 (0.022) | -0.246*** (0.033) | -0.137*** (0.042) | -0.133*** (0.040) | -0.130*** (0.041) |
| Sim. of real GDP | | 0.019*** (0.007) | 0.070*** (0.016) | 0.077*** (0.018) | -0.016 (0.015) | 0.059*** (0.023) | 0.060*** (0.025) | 0.055*** (0.023) |
| Diff. in real GDP | | -0.018 (0.013) | 0.004 (0.025) | -0.164*** (0.039) | -0.004 (0.022) | -0.224*** (0.044) | -0.215*** (0.045) | -0.215*** (0.043) |
| Sq. diff. in real GDP | | 0.010*** (0.002) | 0.018*** (0.004) | 0.038*** (0.005) | 0.012*** (0.004) | 0.047*** (0.006) | 0.046*** (0.006) | 0.045*** (0.006) |
| Natural | | 0.192*** (0.006) | 0.233*** (0.009) | 0.232*** (0.009) | 0.163*** (0.007) | 0.201*** (0.010) | 0.198*** (0.010) | 0.201*** (0.010) |
| Remote | | -0.017*** (0.001) | -0.018*** (0.002) | -0.018*** (0.002) | -0.017*** (0.001) | -0.017*** (0.002) | -0.017*** (0.002) | -0.017*** (0.002) |
| Diff. of RFE wrt. ROW | | 0.086*** (0.018) | -0.039 (0.052) | 0.075 (0.063) | -0.005 (0.037) | 0.018 (0.072) | 0.011 (0.069) | 0.029 (0.070) |
| Institutional distance | | | 0.375*** (0.007) | 0.312*** (0.057) | | 0.353*** (0.060) | 0.350*** (0.095) | 0.344*** (0.060) |
| Sq. institutional distance | | | | -0.033*** (0.006) | | -0.038*** (0.006) | -0.035*** (0.006) | -0.045*** (0.007) |
| Dist. of trade in CI goods | | | | | -2.172*** (0.394) | -1.108*** (0.376) | -0.991* (0.513) | -1.125*** (0.384) |
| Inst. dist. × Dist. of trade in CI goods | | | | | | | -0.038 (0.108) | |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | | | 0.018*** (0.006) |
| Observations | | 145432 | 80440 | 80440 | 133066 | 75160 | 75160 | 75160 |
| Kleibergen-Paap LM (p-value) | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 st -stage F-Statistic (p-value) | | | | | | | | |
| Institutional distance | | | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 |
| Sq. institutional distance | | | | | | | | |
| Dist. of trade in CI goods | | | | | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | | | | | | | | |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | | | 0.000 |

Column (1) is estimated using OLS all other models are estimated using 2SLS. Robust standard errors (in parentheses) are clustered over unique country pairs. Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

Including institutional distance reduces the number of observations by 65,000 since specifically for developing countries data on institutions is not available. The coefficient of institutional distance remains very similar in all estimated models and is always significantly different from zero at the one percent level. The same is true for the squared term. Only when squared institutional distance is interacted with distance of trade in contract-intensive goods the negative effect increases. The results show that institutional distance, again, has a non-linear effect and that institutional distance is related to the distance in trade of contract-intensive goods. The marginal effect of institutional distance at its mean ($\overline{InstDist} = 2.232$) in model (3) is 0.165, which is 4.4 percentage points larger for North-South country pairs compared to the average marginal effect of institutional distance for all country pairs. Without considering the effect of distance in trade of contract-intensive goods, the effect turns negative at an institutional distance level of 4.727. This threshold is larger compared to the sample where all countries are included (4.381).

Again, as in the full sample, interacting distance in trade of contract-intensive goods with institutional distance (column 6) does not have an effect which is significantly different from zero, while the interaction with squared institutional distance (column 7) is significant at the one percent level. Taking model (7), a marginal increase in institutional distance at the average (2.232), holding $DistX^{ci}$ also at its mean ($\overline{DistX^{ci}} = 0.444$), leads to an increase in the probability of the formation of a PTA between North and South by 0.179, which is 3.2 percentage points larger compared to the effect based on the full sample. Comparing this effect to the extreme case where all traded goods of one trading partner are contract-intensive, the overall effect increases to 0.223, while having a low difference in trade of contract-intensive goods the effect is reduced

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to 0.143. This suggests that the compensating effect of distance in contract-intensive goods is more effective in North-South relationships. Using model (7) and holding $DistX^{ci}$ at the mean, the negative effect of institutional distance appears at 4.649, which is near the threshold calculated from model (2). Assuming constant effects of $DistX^{ci}$, the threshold where a marginal increase in $DistX^{ci}$ would offset the negative effect of institutional distance is at 7.906 and thus appears at a lower distance compared to the full sample. Again, the p-values of the Kleibergen-Paap test and the first-stage F statistics indicate that all instruments are relevant and correlated with the endogenous regressors.

Table 3.8 reports the same results for a sub-sample where only country pairs from the North are included. For HI countries data on institutional quality is available for most countries and periods, which is why the number of observations does not reduce so much when institutional distance is included compared to the models without institutional distance (columns (1) and (4)). The main change with regard to the benchmark control variables is that the effect of being remote has now turned positive, as expected, while the joint country size has a negative effect.

With regard to institutional distance the effect is now clearly negative in all models (columns (2) to (7)). When interacting institutional distance with $DistX^{ci}$ the nonlinear effect is no longer significant. When included without the distance of traded contract-intensive goods the squared term is still significant although not at a high level.

The overall marginal increase in institutional distance at the mean induces a decrease of the conditional probability of PTA formation between countries from

the North by 0.392. The effect turns positive at an institutional distance level larger than 5.986. When institutional differences become larger a PTA appears to be more likely and the effect also shows to be related to contract-intensive trade between the country pairs. $DistX^{ci}$ alone has a negative effect when added to the basic controls in column (4), but it becomes insignificant when the interaction term is added, while the joint effect of institutional distance and distance in contract-intensive goods traded is significant.

When interacting $DistX^{ci}$ with institutional distance this effect dominates the effect of squared institutional distance. A larger distance in trade of contract-intensive goods reduces the negative effect of institutional distance but does not fully compensate it. At $\overline{DistX^{ci}}$ the overall effect of a marginal increase in $InstDist$ is -0.261. Even if $\overline{DistX^{ci}}$ takes the maximum value of 1 the effect remains negative (-0.014).

In table 3.9, I present the estimates of the same models for the sub-sample of country pairs from the South. Again, having a large number of countries from the South in this sub-sample, results in a loss of more than half of the observations due to the inclusion of institutional distance.

Table 3.8: 2SLS Results for the Probability of Forming a North-North PTA

| Dep. var. | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sum of real GDP | -0.196*** (0.040) | -0.417*** (0.065) | -0.438*** (0.066) | -0.232*** (0.050) | -0.377*** (0.069) | -0.352*** (0.066) | -0.379*** (0.070) |
| Sim. of real GDP | -0.117*** (0.027) | -0.314*** (0.036) | -0.324*** (0.037) | -0.103*** (0.030) | -0.294*** (0.042) | -0.282*** (0.041) | -0.294*** (0.043) |
| Diff. in real GDP | -0.091*** (0.029) | 0.033 (0.054) | 0.039 (0.051) | -0.067* (0.036) | -0.008 (0.053) | -0.011 (0.055) | -0.005 (0.053) |
| Sq. diff. in real GDP | -0.040*** (0.014) | -0.146*** (0.035) | -0.144*** (0.033) | -0.046** (0.018) | -0.105*** (0.033) | -0.095*** (0.034) | -0.107*** (0.033) |
| Natural | 0.178*** (0.013) | 0.185*** (0.015) | 0.187*** (0.015) | 0.127*** (0.015) | 0.129*** (0.016) | 0.128*** (0.016) | 0.129*** (0.016) |
| Remote | 0.011*** (0.003) | 0.022*** (0.004) | 0.022*** (0.004) | 0.016*** (0.003) | 0.027*** (0.003) | 0.027*** (0.003) | 0.027*** (0.003) |
| Diff. of RFE wrt. ROW | 0.335*** (0.056) | 0.646*** (0.087) | 0.673*** (0.087) | 0.284*** (0.062) | 0.600*** (0.087) | 0.563*** (0.084) | 0.602*** (0.087) |
| Institutional distance | | -0.404*** (0.078) | -0.431*** (0.090) | | -0.277*** (0.096) | -0.376*** (0.117) | -0.284*** (0.104) |
| Sq. institutional distance | | | 0.036*** (0.011) | | 0.019* (0.011) | 0.005 (0.010) | 0.024 (0.016) |
| Dist. of trade in CI goods | | | | -0.667** (0.331) | | 0.007 (0.354) | 0.131 (0.329) |
| Inst. dist. × Dist. of trade in CI goods | | | | | | 0.362*** (0.123) | -0.005 (0.008) |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | | |
| Observations | 30695 | 20160 | 20160 | 27365 | 18404 | 18404 | 18404 |
| Kleibergen-Paap (p-value) | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 st -stage F-Stat. (p-value) | | | | | | | |
| Institutional distance | | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 |
| Sq. institutional distance | | | | | 0.000 | 0.000 | 0.000 |
| Dist. of trade in CI goods | | | | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | | | | | 0.000 | 0.000 | 0.000 |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | 0.000 | 0.000 |

Column (1) is estimated using OLS all other models are estimated using 2SLS. Robust standard errors (in parentheses) are clustered over unique country pairs. Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

Table 3.9: 2SLS Results for the Probability of Forming a South-South PTA

| Dep. var. | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sum of real GDP | 0.037*** (0.009) | 0.052*** (0.014) | 0.043*** (0.014) | -0.030 (0.018) | -0.067 (0.041) | -0.041* (0.025) | -0.034 (0.029) |
| Sim. of real GDP | 0.039*** (0.005) | 0.069*** (0.009) | 0.059*** (0.009) | -0.066*** (0.021) | -0.068 (0.049) | -0.049 (0.031) | -0.044 (0.036) |
| Diff. in real GDP | -0.009** (0.004) | -0.032*** (0.006) | -0.033*** (0.006) | -0.015* (0.008) | -0.049*** (0.012) | -0.043*** (0.010) | -0.041*** (0.010) |
| Sq. diff in real GDP | 0.018*** (0.001) | 0.027*** (0.002) | 0.028*** (0.002) | 0.011*** (0.003) | 0.021*** (0.005) | 0.021*** (0.005) | 0.021*** (0.005) |
| Natural | 0.131*** (0.002) | 0.155*** (0.002) | 0.155*** (0.002) | 0.111*** (0.002) | 0.129*** (0.003) | 0.130*** (0.003) | 0.130*** (0.003) |
| Remote | 0.003*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | 0.003*** (0.000) | 0.003*** (0.001) | 0.003*** (0.001) | 0.003*** (0.001) |
| Diff. of RFE wrt. ROW | 0.015 (0.010) | 0.020 (0.015) | 0.009 (0.016) | 0.027 (0.017) | -0.065** (0.028) | -0.045* (0.025) | -0.037 (0.023) |
| Institutional distance | | 0.027*** (0.005) | 0.091*** (0.020) | | 0.210*** (0.039) | 0.113 (0.077) | 0.185*** (0.035) |
| Sq. institutional distance | | | -0.014*** (0.003) | | -0.033*** (0.006) | -0.031*** (0.006) | -0.050*** (0.011) |
| Dist. of trade in CI goods | | | | -1.530*** (0.304) | -1.259** (0.535) | -1.297*** (0.500) | -1.222*** (0.456) |
| Inst. dist. × Dist. of trade in CI goods | | | | | | 0.136 (0.112) | |
| Sq. Inst. dist. × Dist. of trade in CI goods | | | | | | | 0.031*** (0.011) |
| Observations | 168826 | 77633 | 77633 | 157543 | 74149 | 74149 | 74149 |
| Kleibergen-Paap (p-value) | | 0.000 | 0.000 | 0.008 | 0.008 | 0.001 | 0.002 |
| 1 st -stage F-Stat. (p-value) | | | | | | | |
| Institutional distance | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sq. institutional distance | | | | | | | |
| Dist. of trade in CI goods | | | | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | | | | | 0.000 | 0.000 | 0.000 |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | 0.000 | 0.000 |

Column (1) is estimated using OLS all other models are estimated using 2SLS. Robust standard errors (in parentheses) are clustered over unique country pairs. Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

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Looking at the basic explanatory variables, different from the results of the North-North and North-South sub-samples, the size of a potential market resulting from a PTA and having a similar real GDP show a positive and significant effect when included without distance of trade in contract-intensive goods. In the other models the effect of $DistX^{ci}$ and its joint effect with institutional distance seems to dominate the sum and similarity of GDPs of country pairs from the South. Being remote to the rest of the world and being natural trading partners has, as expected, a positive and significant effect on the probability of PTA formation between South-South country pairs.

With regard to institutional distance the results show the same pattern as in the North-South sub-sample and the sample where all countries are included. There is evidence for a nonlinear effect of institutional distance as shown in model (3). The overall marginal effect of institutional distance at the mean is positive but smaller, with a value of 0.063. Furthermore, there is evidence for a joint effect of $InstDist^2$ and $DistX^{ci}$ (as shown in model (7) of table 3.9), which, at mean values, compensates the negative effect of institutional distance. The overall marginal effect of institutional distance on the probability of South-South PTA formation, when distance of trade in contract-intensive goods is at its mean value, is 0.119. Compared to the full sample the effect is 2.8 percentage points smaller and compared to the North-South sub-sample the effect is 6.0 percentage points smaller.

In table 3.10, I provide an overview of the marginal effects of institutional distance for all samples at mean values. It shows that the likelihood of PTA formation due to a marginal increase in institutional distance is particularly large for North-South country pairs where institutional distance is relatively large. The marginal effect at the mean increases the conditional

Table 3.10: Overview of Marginal Effects and Thresholds for Different Samples

| | All | N-S | S-S | N-N |
|--|-------|-------|-------|--------|
| Marginal effect of $InstDist$ | | | | |
| w/o interaction at $\overline{InstDist}$ | 0.121 | 0.165 | 0.063 | -0.392 |
| w/ interaction at $\overline{InstDist}$ & $\overline{DistX^{ci}}$ | 0.147 | 0.179 | 0.119 | -0.261 |
| Threshold when $InstDist$ effect turns negative at $\overline{DistX^{ci}}$ (positive in N-N sub-sample) | | | | |
| $InstDist >$ | 4.327 | 4.649 | 2.800 | 4.868 |

probability of North-South PTA formation by 16.4 on average. Furthermore, a large distance of trade in contract-intensive goods between pairs of countries where developing countries are included reinforces this effect. For North-South country-pairs the effect amounts to 17.9 percent. Distance in institutional quality for pairs of industrialized countries on average reduces the likelihood that a country forms a PTA with another industrialized country. Finally, holding distance of trade in contract-intensive goods at its mean value, the results indicate that the negative effect of institutional distance appears at a larger distance for North-South country pairs (that is for values larger than 4.649).

Robustness checks

When considering institutional differences, it is reasonable to account for historical institutional differences or similarities, which are rooted in cultural differences. I account for this historical relationship between country pairs by including indicator variables for having a common official or primary language and for being in a colonial relationship after 1945. Including common language and common colonial history as control variables is standard to explain bilateral trade flows in gravity equations.¹⁸ Speaking a common language facilitates

¹⁸Since Baier and Bergstrand (2004) find that in general trade-creating and trade-diverting factors determine the formation of PTAs it provides another argument to include common

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the ability to communicate and negotiate contracts, understand the local law or do business in general. When communicating about law and business, the use of the language becomes very specific and complex, which makes it essential to know the language very well. Consequently, negotiating trade agreements is easier if country pairs have the same official language.

Being in a colonial relationship after 1945 can positively affect PTA formation because a colonizer potentially has established similar organizations and legal structures as domestic ones (c.f. La Porta et al. (1998)), which would again facilitate trading and doing business and thus promote PTA formation. Furthermore, there is evidence that a past colonial history leads to higher levels of trade (c.f. Rose (2004)), while on the other hand, Mayer et al. (2010) state that trade gradually decreases, on average, 4 decades after independence trade between country pairs with a past colonial history declines by more than 60 percent, which would give reason to expect a negative effect on PTA formation.

I extend the preferred estimation models for the sub-samples North-North, North-South, and South-South, which include the interaction term of institutional distance and distance of trade in contract-intensive goods (models (7) for North-South and South-South and model (6) for North-North), which are presented in the first three columns of table 3.11.

language and common colonial history as additional control variable.

Table 3.11: Comparison of Sub-Samples with Cultural Factors (including and excluding EU)

| | extend. model | | | w/o EU | | |
|--|----------------------|----------------------|---------------------|----------------------|---------------------|----------------------|
| | N-S | N-N | S-S | N-S | N-N | S-S |
| Institutional distance | 0.338*** (0.060) | -0.373*** (0.116) | 0.183*** (0.059) | 0.150*** (0.035) | -0.181* (0.097) | 0.132** (0.058) |
| Sq. institutional distance | -0.045*** (0.007) | 0.005 (0.010) | -0.039** (0.015) | -0.016*** (0.004) | 0.002 (0.010) | -0.038*** (0.013) |
| Dist. of trade in CI goods | -1.132*** (0.378) | -0.023 (0.349) | -0.487 (0.578) | 0.155 (0.157) | -0.127 (0.212) | -0.990*** (0.375) |
| Inst. dist. × Dist. of trade in CI goods | | 0.366*** (0.123) | | | 0.145** (0.072) | |
| Sq. inst. dist. × Dist. of trade in CI goods | 0.018*** (0.006) | | 0.014 (0.015) | -0.002 (0.003) | | 0.027*** (0.010) |
| Common language | 0.057*** (0.019) | 0.021 (0.034) | 0.103*** (0.016) | 0.174*** (0.018) | 0.103*** (0.040) | 0.126*** (0.016) |
| Com. colonial hist. post 1945 | 0.193*** (0.050) | -0.015 (0.089) | 0.212 (0.161) | | | |
| Observations | 75160 | 18404 | 74149 | 42389 | 6165 | 70361 |
| Kleibergen-Paap (p-value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 st -stage F-Stat. (p-value) | | | | | | |
| Institutional distance | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sq. institutional distance | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Dist. of trade in CI goods | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | | 0.000 | | | 0.000 | |
| Sq. inst. dist. × Dist. of trade in CI goods | 0.000 | | 0.000 | 0.000 | | 0.000 |

Robust standard errors (in parentheses) are clustered over unique country-pairs. Significance at the 10, 5, and 1 percent level is denoted by *, ** and ***, respectively. The sub-samples include North-South, North-North and South-South, which are denoted by N-S, N-N and S-S, respectively. Basic control variables from Baier and Bergstrand (2004), year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

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In a next step, I estimate the model excluding the EU. In all estimations so far the EU is included, since entering the EU should be represented in the data. But as noted above, since the EU negotiates all trade agreements with third countries, it is useful to check for the effects when the EU is excluded. In the estimations excluding the EU, the dummy for being in a colonial relationship is excluded, since most colonialists are EU countries and drop from the sample. Doing this primarily affects the number of observations of the North-North and North-South sub-sample since most included EU countries are categorized as North. For better readability table 3.11 does not include the results for the Baier and Bergstrand (2004) control variables.¹⁹

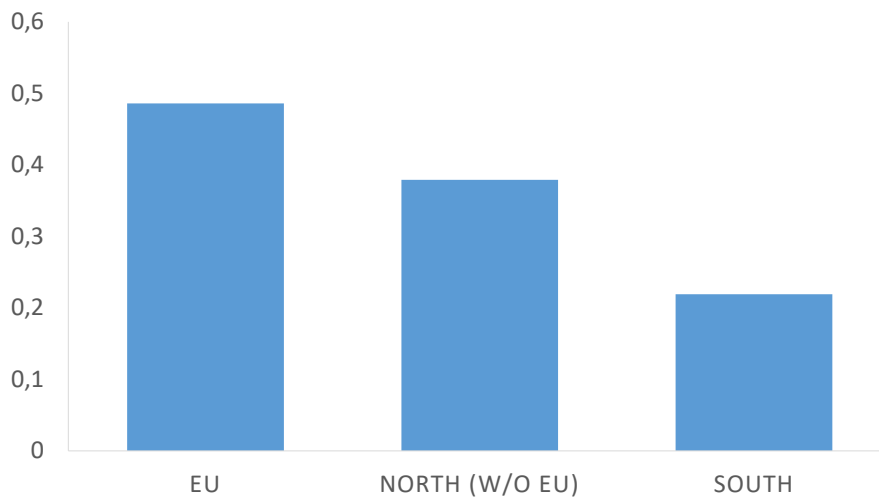
The results for institutional distance in the North-South sample are almost identical to the results presented in table 3.7. Having a common language has the expected positive effect and is significant at the one percent level. Being in a colonial relationship after 1945 is also positive and significant. This effect is much larger compared to having the same official language. This result is similar to the effects of a colonial link in explaining bilateral trade flows in the gravity estimation, where typical gravity variables are included and where the effects also appear to be very large (Head and Mayer, 2014).

Without the EU the results change and the joint effect of institutional distance and trade in contract-intensive goods is no longer significant. An explanation for this result is that the EU drives significantly the joint effect of distance in contract-intensive goods and institutional distance. This is reasonable as the EU is an important exporter of contract-intensive goods.

¹⁹The results with the full set of control variables is included in the appendix.

In figure 3.7, the share of contract-intensive exports of the EU is compared to the share of contract-intensive exports from the North without the EU and from the South. With almost 50 percent the share is clearly larger compared to industrialized countries outside the EU.

Figure 3.7: Share of Contract-intensive Exports of the EU Compared to the North (w/o EU) and the South



Source: Author's calculation based on data from CEPII and Nunn (2007).

For the North-North sample the effects of institutional distance in the extended model almost do not differ from the model without common language and common colonial history. Having a common language does not significantly affect the probability of PTA formation. But without the EU the effect becomes significant. An explanation for this result is that the EU includes countries, which differ a lot with regard to language. So a common language may not be one of the driving forces for joining the EU or forming a PTA with the EU. Consequently, excluding the EU from the sample can result in this significant effect. This significant change in the results is not surprising because the exclusion of the EU leads to a substantial reduction of the sample, which is more than half

of the observations in the sample with the EU.

At the same time the significance and size of the negative effect of institutional distance and its joint effect with $DistX^{ci}$ is reduced. Although the effect of the interaction term is positive the overall marginal effect of institutional distance at the mean of $\overline{DistX^{ci}}$ (0.418) remains negative (-0.120). But this effect is smaller compared to the effect using the sample including the EU.

More surprising is the effect when EU countries are dropped from the South-South sample. Although, only about 4000 observations drop out, the interaction term, which becomes insignificant in the extended model, now turns significant again. The only countries, which drop out are Bulgaria, Lithuania, Latvia and Poland. With regard to common official language, the effect is always positive and highly significant. Having a colonial link does not show an effect. But the main reason for this, is probably that most colonizers are from the North.

3.4 Conclusion

This paper broadens the empirical analysis of the determinants of trade agreements. It builds on the growing signature rates of PTAs during the past three centuries continuing today, and the emergence of complex global production networks, where developing countries play an increasing role.

The focus lies on institutional differences between country pairs as a determinant of trade agreements. I analyzed whether differences in institutional quality between country pairs positively affect the likelihood that those two countries

form a PTA and whether this effect is nonlinear and turns negative at very large differences. I focus on legal and enforcement institutions because this type of institutions is specifically relevant for international trade, as it has been found by Nunn (2007). In my analysis, I examine the effect of institutional distance in two dimension, that is, whether the effect is especially relevant (i) between developed and developing countries (North-South) where institutional distances are specifically large and (ii) when contract-intensive goods are traded.

These effects, I investigate using a sample of 132 countries, including 89 developing countries categorized as global South, which leads to 8,646 unique country pairs and in total between 1995 and 2015, 3,495 incidences of PTA membership between bilateral country pairs. I estimate a linear probability model for discrete choice panel data and show that the results are in line with the marginal effects generated from a probit model. To account for endogeneity I implement an IV approach. To test the relevance of institutional quality, I estimate the models for different sub-samples of countries according to their income level (North-North, North-South, and South-South) and create a measure of distance in contract-intensive exports.

There is significant support for a positive effect of institutional distance on the likelihood that a country pair forms a PTA. At very large distances the effect turns negative. Furthermore, the effect is particularly large for North-South country pairs and also depends on the characteristics of traded goods. Large shares of one-sided contract-intensive trade between North and South reinforce the positive effect of institutional distance and can compensate the negative effect of institutional distance.

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But the effect of trade in contract-intensive goods is mainly driven by trade involving EU countries. When excluding the EU the effect disappears, while the positive effect of institutional distance is robust.

For the South-South sub-sample I find similar results but institutional distance is not as important as in the case of North-South relationships. For North-North country pairs differences in institutional quality, on average, show a negative effect on the likelihood of PTA formation. Only if the difference becomes large enough, institutional distance promotes PTA formation.

The results highlight the important role of trade agreements, which provide a legal framework beyond market access rules, promoting trade by reducing transaction costs. Signing PTAs with developed countries can thus be a way for developing countries to strengthen domestic institutions.

Further research may take a deeper look into the effects of institutional distance on the depth of trade agreements similar to the approach by Orefice and Rocha (2014), who focus on production networks trade. One could extend their approach and include institutional distance as an additional factor. Another aspect is the way of measuring institutional distance and accounting for neighboring countries' institutional quality, by creating a measure of surrounding institutional quality or institutional quality of a country relative to its neighbors. In this regard, it would be interesting to investigate the determinants of trade agreements which include some countries of a specific region while some neighboring countries are nonmembers. What is the role of institutional distance here?

3.A Appendix

Table 3.A.1: List of Countries

| | |
|----------------------|--|
| North (HI) | Australia, Austria, Bahamas, Bahrain, Belgium, Brunei Darussalam, Canada, China Hong Kong SAR, Croatia, Cyprus, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Malta, Netherlands, New Zealand, Norway, Oman, Portugal, Qatar, Rep. of Korea, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States |
| South (UMI, LMI, LI) | Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Bolivia, Brazil, Bulgaria, Burkina Faso, Cameroon, Chile, China, Colombia, Congo, Costa Rica, Cuba, Côte d'Ivoire, Dominican Rep., Ecuador, Egypt, El Salvador, Ethiopia, Fmr Sudan, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Latvia, Lebanon, Liberia, Libya, Lithuania, Madagascar, Malawi, Malaysia, Mali, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Rep. of Moldova, Russian Federation, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Suriname, Syria, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, United Rep. of Tanzania, Uruguay, Venezuela Vietnam, Yemen, Zambia, Zimbabwe |

3.A. APPENDIX

Table 3.A.2: Description of Variables and Sources

| Variable | Description | Source |
|------------------------------|--|--|
| PTA_{ijt} | Dummy Variable equal to 1 if country i and j form a trade agreement in period t . | Design of Trade Agreements (DESTA) database by Dür, Baccini and Elsig (2014) |
| $DistX_{ijt}^{ci}$ | Difference of the share of contract-intensive exports | Authors calculations based on: COMTRADE |
| $X_{ijt}^{ci}, X_{jit}^{rs}$ | Share of contract-intensive exports from i (j) to j (i) in period t | COMTRADE, Nunn |
| $InstDist_{ijt}$ | Institutional distance | The International Country Risk Guide (ICRG) by the PRS Group (2016) |
| $DCONT_{ij}$ | Dummy variable, which takes the value 1 if country i and j are on the same continent and 0 otherwise. | The World Bank (2016) |
| $rGDP_{sum}$ | Total relative market size (measured as the logarithm of the sum of both countries' real GDP (in constant 2010 USD) in period t). | Author's calculations based on CEPII Gravity Dataset |
| $rGDP_{sim}$ | Similarity of the economic size (real GDP) of the two trading partners. | Author's calculations based on CEPII Gravity Dataset |
| DKL | Absolute difference in real GDP per capita between i and j at time t . | Author's calculations based on CEPII Gravity Dataset |
| $natural$ | Natural logarithm of the inverse of the distance between to potential trading partners i and j . | Author's calculations based on CEPII Gravity Dataset |
| $remote$ | Remoteness of i (j) from all trading partners but j (i). | Author's calculations based on CEPII Gravity Dataset |
| $DROWKL$ | Difference of the trading partners' relative factor endowment with respect to the factor endowment of the ROW. | Author's calculations based on CEPII Gravity Dataset |
| $Col45$ | Dummy variable, which is equal to one if a country pair i and j is in a colonial relationship after 1945 and zero otherwise. | CEPII Gravity Dataset |
| $Comlang_off$ | Dummy variable, which is equal to one if country i and j have a common official or primary language and zero otherwise. | CEPII Gravity Dataset |

Table 3.A.3: List of Withdrawals from PTAs

| Year | Agreement | Leaving country | Member states (ISO numeric-3 codes) |
|------|---|--|--|
| 1995 | EFTA | Austria, Finland, Sweden | 246, 352, 578 756 438 40 752 |
| 2000 | Economic Community Of West African States (ECOWAS) | Mauritania (not in the sample) | 204 854 132 384 270 288 624 430 466 562 566 686 694 768 478 |
| 2004 | Central European Free Trade Agreement (CEFTA) | Czech Republic, Hungary, Poland, Slovak Republic, Slovenia | 642 100 191 203 348 616 705 703 |
| 2006 | Andean Community Brazil withdrawal | Venezuela | 170 218 604 76 862 |
| 2006 | Andean Group Cartagena Agreement | Venezuela | 68 170 218 604 862 152 |
| 2006 | Group of Three | Venezuela | 170 484 862 |
| 2006 | Group of Three Auto Agreement | Venezuela | 170 484 862 |
| 2006 | Andean Community Auto Agreement | Venezuela | 170 218 862 |
| 2007 | Central European Free Trade Agreement (CEFTA) | Bulgaria and Romania | 8 70 191 807 498 499 688 900 100 642 |
| 2007 | Economic Community of Central African States (ECCAS-CEEAC) PTA/FTA/CU | Rwanda (not in the sample) | 24 108 120 140 178 266 226 678 148 180 646 |
| 2007 | Global System of Trade Preferences (GSTP) | Romania | 12 32 24 50 204 68 76 120 152 170 192 408 410 218 818 288 324 328 332 356 360 364 368 434 458 484 504 508 558 566 586 604 634 608 702 144 736 764 780 788 834 858 862 704 716 180 688 642 |
| 2009 | Commonwealth of Independent States (CIS) | Georgia (not in the sample) | 51 31 112 417 398 498 643 762 795 804 860 268 |

Table 3.A.4: Summary Statistics

| | Mean | Std. dev. | Obs. | Min | Max |
|----------------------------|--------|-----------|--------|--------|--------|
| PTA | 0.203 | 0.402 | 167713 | 0.00 | 1.00 |
| DistXêi | 0.479 | 0.479 | 167713 | 0.00 | 1.00 |
| Institutional distance | 1.503 | 1.597 | 167713 | 0.00 | 13.80 |
| Sq. Institutional distance | 4.811 | 11.167 | 167713 | 0.00 | 190.78 |
| Same continent | 0.235 | 0.424 | 167713 | 0.00 | 1.00 |
| Sum of real GDP | 26.032 | 1.694 | 167713 | 20.16 | 30.92 |
| Sim. of real GDP | -2.000 | 1.380 | 167713 | -10.26 | -0.69 |
| Diff. in real GDP | 1.839 | 1.300 | 167713 | 0.00 | 6.47 |
| Sq. diff. in real GDP | 5.070 | 6.078 | 167713 | 0.00 | 41.80 |
| Natural | -8.674 | 0.795 | 167713 | -9.89 | -4.09 |
| Remote | 2.223 | 4.016 | 167713 | 0.00 | 10.01 |
| Diff. of RFE wrt. ROW | 1.441 | 0.651 | 167713 | 0.01 | 3.97 |
| Common colonizer post 1945 | 0.008 | 0.090 | 167713 | 0.00 | 1.00 |
| Common language | 0.122 | 0.327 | 167713 | 0.00 | 1.00 |

Table 3.A.5: IV-probit Results for the Probability of Forming a PTA

| Dep. Var <i>PTA</i> | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Same continent | 3.397** (1.526) | 3.517* (1.906) | 3.413* (1.832) | 2.528*** (0.888) | 2.002 (1.233) | 1.719 (1.272) | 0.910 (0.607) |
| Sum of real GDP | -0.144*** (0.033) | -0.018 (0.051) | 0.033 (0.055) | -0.261*** (0.025) | -0.155*** (0.053) | -0.153*** (0.048) | -0.029 (0.045) |
| Sim. of real GDP | 0.089*** (0.027) | 0.206*** (0.044) | 0.202*** (0.042) | -0.048* (0.026) | 0.060 (0.054) | 0.069 (0.052) | 0.045 (0.036) |
| Diff. in real GDP | 0.097*** (0.035) | 0.002 (0.043) | -0.143*** (0.051) | 0.057** (0.026) | -0.138*** (0.045) | -0.117*** (0.045) | -0.218*** (0.039) |
| Sq. diff. in real GDP | 0.038*** (0.007) | 0.051*** (0.009) | 0.095*** (0.011) | 0.007 (0.007) | 0.056*** (0.020) | 0.055*** (0.018) | 0.052*** (0.011) |
| Natural | 0.807*** (0.020) | 0.834*** (0.026) | 0.799*** (0.031) | 0.341*** (0.057) | 0.434*** (0.087) | 0.451*** (0.083) | 0.216*** (0.015) |
| Remote | -0.374** (0.160) | -0.381* (0.200) | -0.370* (0.193) | -0.274*** (0.094) | -0.218* (0.130) | -0.188 (0.134) | -0.099 (0.064) |
| Diff. of RFE wrt. ROW | 0.319*** (0.046) | 0.232*** (0.065) | 0.122* (0.074) | 0.187*** (0.037) | 0.061 (0.061) | 0.086 (0.060) | -0.089* (0.052) |
| Institutional distance | | 0.147*** (0.043) | 0.685*** (0.151) | | 0.629*** (0.158) | 0.456* (0.250) | 1.041*** (0.136) |
| Sq. institutional distance | | | -0.079*** (0.017) | | -0.071*** (0.018) | -0.062*** (0.015) | -0.145*** (0.016) |
| Dist. of trade in CI goods | | | | -3.712*** (0.222) | -3.144*** (0.485) | -3.324*** (0.767) | -3.719*** (0.171) |
| Institutional dist. × Dist. of trade in CI goods | | | | | | 0.175 (0.238) | 0.060*** (0.000) |
| Sq. inst. dist. × Dist. of trade in CI goods | | | | | | | |
| Observations | 344953 | 178233 | 178233 | 317974 | 167713 | 167713 | 167713 |
| p-value χ^2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| p-value Wald test | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Robust standard errors (in parentheses) are clustered over unique country-pairs to account for a lack of independence in the standard errors. Significance at the 10, 5, and 1 percent level is denoted by *, ** and *** respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

3.A. APPENDIX

Table 3.A.6: First-Stage Estimation results - Model (6) of Table 3.6

| Dep. variables | (1) <i>InstDist</i> | (2) <i>InstDist</i> ² | (3) <i>DistX</i> ^{ci} | (4) <i>InstDist</i> ² × <i>DistX</i> ^{ci} |
|---|------------------------|-------------------------------------|-----------------------------------|---|
| Lrm <i>InstDist</i> | -0.018*** (0.004) | -1.198*** (0.038) | -0.000 (0.001) | -0.626*** (0.047) |
| Lrm <i>InstDist</i> ² | 0.087*** (0.002) | 0.819*** (0.008) | -0.002*** (0.000) | 0.251*** (0.011) |
| Lrm <i>DistX</i> ^{ci} | -0.017 (0.016) | 0.095 (0.071) | 0.052*** (0.005) | -0.764*** (0.083) |
| Lrm <i>InstDist</i> ² × <i>DistX</i> ^{ci} | -0.005 (0.002) | -0.007 (0.013) | 0.005*** (0.000) | 0.324*** (0.017) |
| DCONT | -0.152** (0.074) | 2.064*** (0.479) | -0.044 (0.030) | 2.162*** (0.749) |
| Sum of real GDP | -0.233*** (0.021) | -0.801*** (0.080) | -0.050*** (0.006) | -0.775*** (0.075) |
| Sim. of real GDP | -0.118*** (0.019) | -0.536*** (0.064) | -0.027*** (0.006) | -0.402*** (0.057) |
| Diff. in real GDP | 0.137* (0.020) | -0.433*** (0.077) | -0.005 (0.006) | -0.243*** (0.071) |
| Sq. diff. in real GDP | -0.013*** (0.005) | 0.250*** (0.024) | -0.006*** (0.001) | 0.112*** (0.022) |
| Natural | -0.009*** (0.001) | 0.019** (0.007) | 0.001 (0.000) | -0.013 (0.012) |
| Remote | -0.118** (0.008) | -0.221*** (0.050) | 0.005 (0.003) | -0.229*** (0.012) |
| Diff. of RFE wrt. ROW | 0.254*** (0.023) | 0.161** (0.073) | 0.028*** (0.008) | 0.052 (0.072) |
| Observations | 167713 | 167713 | 167713 | 167713 |
| F test excl. instr. (p-value) | 0.000 | 0.000 | 0.000 | 0.000 |

The dependent variables for the first stage regressions are shown in the first line of the respective column (1) to (4).

Robust standard errors (in parentheses) are clustered over unique country-pairs. Significance at the 10, 5, and 1 percent level is denoted by *, **, and ***, respectively. Country pair-specific mean over all periods of the time-variant variables are included but not shown.

Table 3.A.7: Comparison of Sub-samples with Cultural Factors (including and excluding EU)

| | extend. model /w EU | | | extend. model w/o EU | | |
|--|----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
| | NS | NN | SS | NS | NN | SS |
| Sum of real GDP | -0.132*** (0.040) | -0.352*** (0.065) | -0.003 (0.039) | 0.022 (0.022) | 0.065 (0.076) | -0.091*** (0.034) |
| Sim. of real GDP | 0.053** (0.023) | -0.279*** (0.041) | 0.008 (0.047) | -0.012 (0.013) | -0.019 (0.054) | -0.099*** (0.031) |
| Diff. in real GDP | -0.212*** (0.043) | -0.009 (0.055) | -0.037*** (0.013) | -0.088*** (0.032) | 0.015 (0.071) | -0.001 (0.013) |
| Sq. diff. in real GDP | 0.044*** (0.006) | -0.096*** (0.034) | 0.026*** (0.007) | 0.010*** (0.003) | -0.008 (0.040) | -0.008* (0.004) |
| Natural | 0.198*** (0.010) | 0.128*** (0.016) | 0.125*** (0.009) | 0.106*** (0.010) | 0.173*** (0.019) | 0.116*** (0.009) |
| Remote | -0.017*** (0.002) | 0.027*** (0.003) | 0.001 (0.001) | 0.002 (0.002) | -0.003 (0.004) | 0.004** (0.001) |
| Diff. of RFE wrt. ROW | 0.027 (0.070) | 0.562*** (0.084) | -0.035 (0.032) | 0.037 (0.061) | 0.023 (0.110) | -0.105*** (0.035) |
| Institutional distance | 0.338*** (0.060) | -0.373*** (0.116) | 0.183*** (0.059) | 0.150*** (0.035) | -0.181* (0.097) | 0.132*** (0.058) |
| Sq. institutional distance | -0.045*** (0.007) | 0.005 (0.010) | -0.039*** (0.015) | -0.016*** (0.004) | 0.002 (0.010) | -0.038*** (0.013) |
| Dist. of trade in CI goods | -1.132*** (0.378) | -0.023 (0.349) | -0.487 (0.578) | 0.155 (0.157) | -0.127 (0.212) | -0.990*** (0.375) |
| Institutional dist. × Dist. of trade in CI goods | | 0.366*** (0.123) | | | 0.145** (0.072) | |
| Sq. inst. dist. × Dist. of trade in CI goods | 0.018*** (0.006) | | 0.014 (0.015) | -0.002 (0.003) | | 0.027*** (0.010) |
| Common language | 0.057*** (0.019) | 0.021 (0.034) | 0.103*** (0.016) | 0.174*** (0.018) | 0.103*** (0.040) | 0.126*** (0.016) |
| Common colonizer post 1945 | 0.193*** (0.050) | -0.015 (0.089) | 0.212 (0.161) | | | |
| Observations | 75160 | 18404 | 74149 | 42389 | 6165 | 70361 |
| Kleibergen-Paap (p-value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 st -stage F-Stat. (p-value) | | | | | | |
| Inst. distance | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sq. inst. distance | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Dist. of trade in CI goods | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Inst. dist. × Dist. of trade in CI goods | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sq. inst. dist. × Dist. of trade in CI goods | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

All models are estimated using 2SLS. Robust standard errors (in parentheses) are clustered over unique country-pairs. Significance at the 10, 5, and 1 percent level is denoted by *, **, and ***, respectively. Year-fixed effects and country pair-specific mean over all periods of the time-variant variables are included but not shown.

Chapter 4

Explaining the Global Landscape of Foreign Direct Investment: Knowledge Capital, Gravity, and the Role of Culture and Institutions¹

4.1 Introduction

Foreign direct investment (FDI) is a key category of international capital flows that largely reflects investment of multinational enterprises. According to the updated and extended data set of Lane and Milesi-Ferretti (2007), FDI stocks accounted for 21 percent of global cross-border liabilities in 2010; in more than a third of countries, FDI is the source of over 50 percent of foreign financing.

¹This chapter is joint work with Konstantin M. Wacker.

In this paper, we use a previously un(der)used bilateral data set on FDI stocks to evaluate the performance of the key ‘big theories’ that have emerged over the last decades to explain global FDI patterns. Notably, we apply a cross-validation exercise to assess the out-of-sample performance of the gravity model, which Kleinert and Toubal (2010) have shown to accommodate horizontal (‘market seeking’) and vertical (‘efficiency seeking’) motives, the knowledge-capital model (Carr et al., 2001; Markusen et al., 1996), which integrates horizontal and vertical motives into a joint general equilibrium framework, theories motivated by international finance aspects like exchange rate and taxation considerations, and theories that emphasize the role of institutional and cultural proximity. Moreover, we take cross-country interdependencies in the form of export-platform motives into account (Blonigen et al., 2007; Ekholm et al., 2007; Yeaple, 2003).

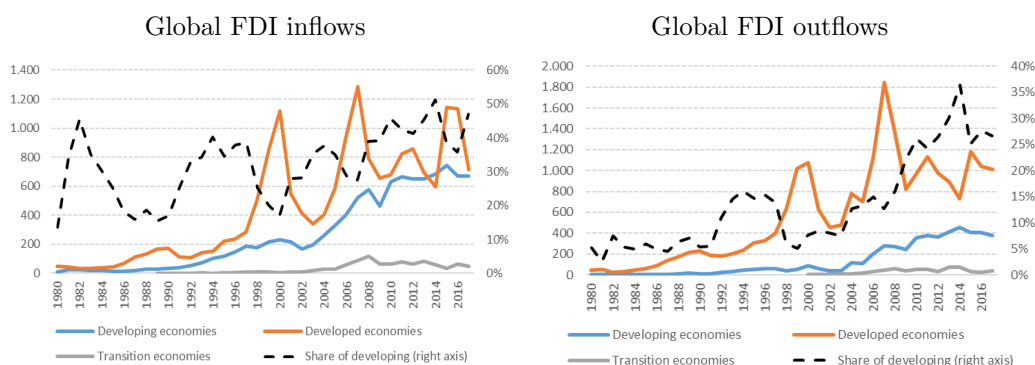
For this purpose, we draw on the IMF’s ‘Coordinated Direct Investment Statistics’ (CDIS), which have a much more comprehensive country coverage than bilateral FDI data sets previously used in the literature, especially for developing countries. This comprehensive coverage provides important advantages over previous empirical macro exercises on FDI determinants for at least three reasons.

First, there is a traditional interest in evaluating the horizontal vs. vertical motives in FDI. While earlier studies have emphasized the importance of horizontal FDI motives looking at US outward FDI activities (Brainard, 1997; Helpman et al., 2004), other contributions have highlighted that vertical motives might be at least as important but more difficult to find in the data (Alfaro and Charlton, 2009; Badinger and Egger, 2010). Notably, Davies (2008) has emphasized that detecting vertical motives in aggregate data requires a sufficiently

large difference in endowment structures and development levels between host and source countries.

Second, the global landscape of FDI has considerably changed over the last decades, with more FDI flowing to developing countries, often referred to as the ‘South’, and particularly more FDI originating from those countries. This trend is depicted in figure 4.1. Today, ‘Southern’ economies are the source of over 1/4 of global FDI and account for about 40 % of global FDI inflows. The share of intra-developing-country (South-South) flows in global FDI has grown from 3 % of global FDI flows at the beginning of the millennial to 14 % in the subsequent decade (OECD, 2014: figure 3.1). While UNCTAD (2006) provided an early picture documenting the rising importance of FDI from developing and transition economies, recent systematic studies on the subject are rare and mostly focused on certain regions, mostly on FDI either from China and/or to Africa (e.g. Abeliansky and Martinez-Zarzoso (2019); Chen et al. (2017); Gold et al. (2017)).

Figure 4.1: Global FDI Inflows and Outflows by Country Groups (in billion US-\$)



Source (including country classification): UNCTAD.

Third, studies from international business and more recently international economics have emphasized the role of cultural and institutional distance for FDI (e.g. Azemar et al. (2012); Benassy-Quere et al. (2007); Beugelsdijk et al. (2018); Cuervo-Cazurra and Genc (2008); Demir and Hu (2016)). Empirical studies in that literature were often constrained by focusing on only few or even a single source country. As van Hoorn and Maseland (2016) emphasize, comprehensive bilateral variation is needed to properly identify such factors as cultural or institutional distance.

The comprehensive bilateral FDI data coverage in our paper helps to resolve all of those three issues. Our results can be summarized as follows: We find most support for horizontal FDI motives in the gravity and KK model. A driving force to gain market access is the surrounding market potential. The results of the cross-validation reveal that the best-performing model is the heterogeneous gravity model including surrounding market potential and that specifically financial and cultural factors improve the performance of the models. Best performing model reduce the mean absolute prediction error by 25 percent compared to the benchmark model.

It ought to be clarified that our econometric application is not a standard identification exercise. Given the wide range of explanatory variables suggested by various theoretical FDI models, our focus is not on pinning down all the structural model variables and resolve endogeneity biases that economists typically have in mind. We are rather interested in an empirical assessment how far we have come in explaining the macroeconomic factors driving global FDI decisions and whether it is possible to discriminate among existing theories. Our results thus help inform the theoretical macro literature on FDI but also provide some

revelatory insights for empirical modeling of global FDI. We finally note that by allowing for potential parameter heterogeneity in our econometric candidate models, we address a potential endogeneity problem that ranks prominently in the recent statistical literature but is often neglected by economists (see e.g. Bester and Hansen (2016)) and has been mentioned as a potential problem for empirical FDI studies previously by Blonigen and Wang (2005).

The remainder of our paper is organized as follows: we start with a description of our used CDIS data set for bilateral FDI stocks in section 4.2. In section 4.3 we explain our econometric modeling approach and discuss the related literature and explanatory variables. We thereby move model-by-model. Given the sometimes technical discussions in the related literature this combination of modeling, literature, and data seems the most logical presentation in our view. Section 4.4 provides a short discussion of estimation results for the individual models. Section 4.5 explains the setup and provides the results of our cross-validation exercise. The final section 4.6 concludes.

4.2 The CDIS FDI Data

Drawing a comprehensive picture of FDI determinants in a global perspective requires bilateral data. Most empirical studies to date have used UNCTAD's Bilateral FDI Statistics that provide flow and stock data for 206 economies over the period 2001 to 2012.²

²OECD also reports bilateral FDI positions but does not cover a relevant sample of developing countries. The data, used among others by Benassy-Quere et al. (2007), hence potentially underestimates vertical FDI motives and does not allow to draw a global picture of FDI that investigates determinants most relevant to South FDI.

4.2. THE CDIS FDI DATA

More recently, the International Monetary Fund (IMF) has put substantial effort into compiling disaggregated bilateral FDI stock data in its ‘Coordinated Direct Investment Survey’ (CDIS) that uses consistent definitions and best practices in collecting FDI stock data. This data set, which starts with 2009 data,³ allows for new dimensions of macroeconomic studies of FDI motives because of its improved quality and coverage compared to the UNCTAD data set. However, except for two papers of Haberly and Wójcik (2014) and Haberly and Wójcik (2015) that focus on the very specific question of offshore FDI networks and tax havens, the data have not been used in systematic empirical investigations yet.

CDIS data reporting templates have built-in validation tools for national compilers before they submit FDI data to the IMF. The IMF Statistics Department then uses ‘mirror data’ of reported FDI partners to check consistency of the bilateral data and reaches out to national compilers in case of large bilateral asymmetries in data reported by source and host country (see (IMF, 2015, ch: 6), for details).

Following standard convention, we focus on using the inward position of FDI, which is usually more reliable. After dropping all values that are marked as “confidential”, the CDIS allows us to fill missing values with the “derived” inward position from the ‘mirror data’.

This further contributes to the advantage of comprehensive coverage of the CDIS data. Before merging the FDI stock data with other variables, we observe 212,844 bilateral FDI positions, out of which 8,255 are negative and 118,536 are 0. For comparison, the UNCTAD data set only provides 65,729 bilateral

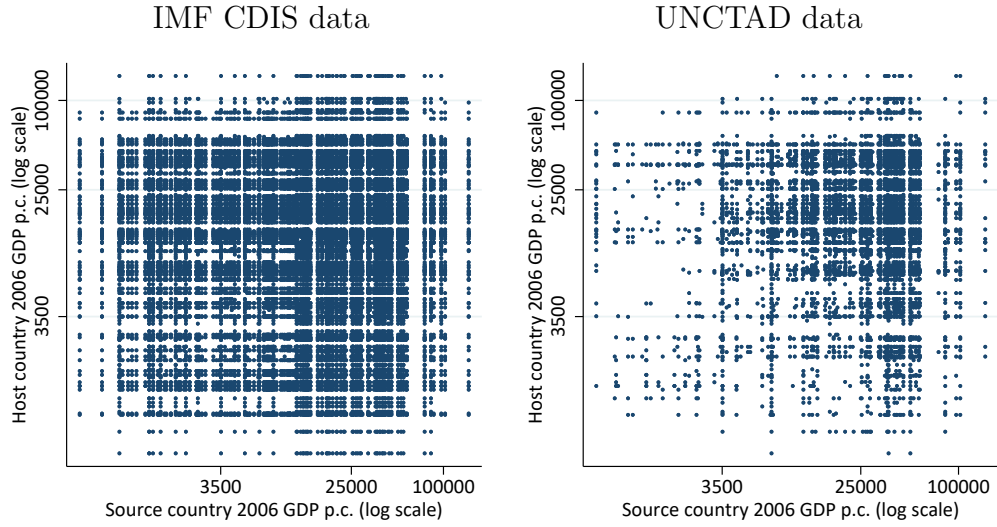
³CDIS includes some 2008 observations for Malaysia.

observations, out of which 1,926 are negative and 19,479 are 0. This difference is not only of quantitative relevance. Figure 4.2 depicts the coverage of the IMF's CDIS data set compared to UNCTAD. The vertical and horizontal axes show the 2006 GDP p.c. of the FDI host and source country, respectively (on a log scale). A dot indicates that for each country pair, at least one FDI observation (that might as well be 0) exists. As one can infer, both show a strongly balanced pattern in the sense that if one observes an inward stock in country A from country B, there is also an inward observation in country B originating in country A, although detailed inspection shows that this is not always the case (and need not be). Comparing both panels of figure 4.2 one can clearly see the higher bilateral coverage of the CDIS data in the left panel. But most importantly, this coverage extends considerably further into the developing world, i.e. countries with a lower GDP p.c. level. Given the above-mentioned necessity of a sample of countries with sufficiently large differences in factor endowments, this is a clear advantage of the CDIS data set over all other previously used data. We finally note that despite discrepancies in FDI values for years and country pairs where both data sets overlap, the correlation coefficient of the 20,581 overlapping observations is 0.73.

We constrain our analysis to host or source countries with a population above one million in a given year, which also means that small island states that are often centers for offshore FDI are dropped. The overall FDI amount covered by our remaining CDIS data set is depicted in table 1 and compared to other sources (for the year 2010). Overall, CDIS covered 23 trillion US\$ inward stocks, which is almost identical with the number provided by the "External Wealth of Nations" database by Lane and Milesi-Ferretti (2007) and about 3 trillion US\$ above the aggregate data reported by UNCTAD Stat (which are not identical

4.2. THE CDIS FDI DATA

Figure 4.2: Coverage of CDIS (left panel) vs. UNCTAD (right panel) Data



with the more constrained bilateral UNCTAD data). Out of those 23 trn US\$, 16.4 are comprised by our final sample, which includes 6,680 observations in 2010 after dropping small countries and observations with negative FDI stock values (which our PPML estimator cannot facilitate). This means that our most comprehensive sample covers more than 70% of global FDI and includes important economies such as Brazil, China, France, Germany, Japan, Mexico, Russia, UK, and the US among many other source and host countries.

Table 4.1: Global FDI Stocks Covered by Different Data Sets

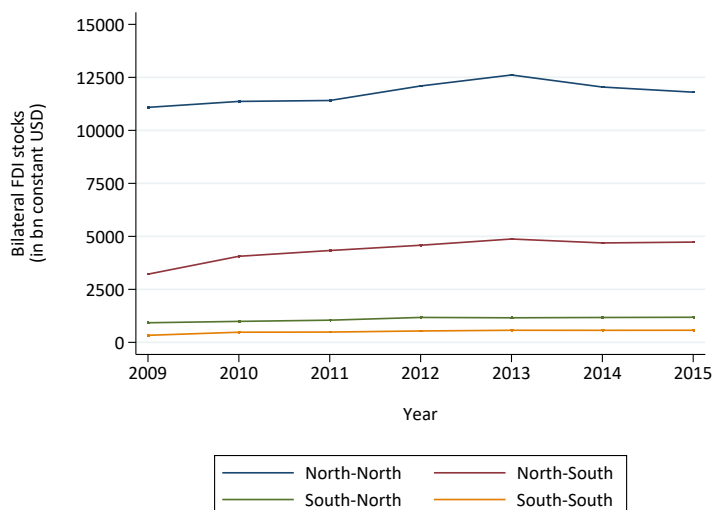
| | EWN (Lane and Milesi-Ferretti, 2007) | UNCTAD Stat | CDIS World | CDIS sample |
|-----------|--------------------------------------|---------------|---------------|----------------------|
| (inward) | | | | |
| FDI stock | 23,8 trn US\$ | 20,3 trn US\$ | 23,0 trn US\$ | 16,4 trn US\$ |

For our econometric analysis, we have deflated CDIS (and UNCTAD) FDI data by the US GDP deflator (using the PWT9.0 series pl_gdpo) and use the data in

millions in our regressions.⁴

Figure 4.3 depicts overall bilateral FDI positions from CDIS over time, broken down by different country-groups.⁵ Two key features are worth highlighting. First, there is little variation over the years since 2009. Second, figure 4.3 reveals that the large majority of FDI positions exist between ‘Northern’ countries, followed by North-South FDI. Although this is generally well-known, the magnitude is still worth highlighting.

Figure 4.3: FDI Stocks by Income Groups over Time



Source: Authors’ illustration based on CDIS data

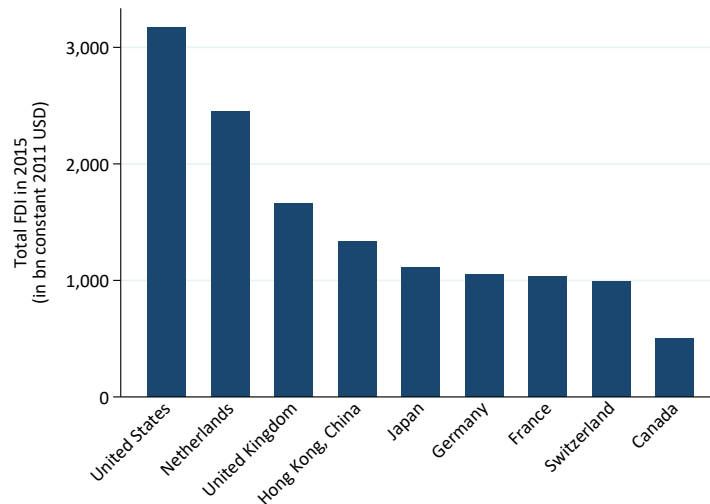
⁴One may argue that year fixed effects account for global inflation. This is incorrect if the model includes a combination of ‘real’ variables (like education, institutions etc.) and nominal variables, like in our case. It is thus necessary to bring both to a common level. We presume that the price level of US output-side GDP is the most appropriate simple deflator for global asset prices.

⁵We code economies as South if they are classified as ‘emerging market’ or ‘low income country’ by the IMF and as North otherwise. Country-group doubles are ordered as ‘source-to-host’, e.g. ‘South-North FDI’ is FDI from a Southern source country to a Northern host country.

4.2. THE CDIS FDI DATA

Figures 4.4 and 4.5, respectively, show the top-10 source and host countries of FDI in our sample for the year 2015. There are little surprises in those figures which contain large industrialized economies like US, UK, Japan, Germany, and France. The existence of relatively small countries like the Netherlands and Switzerland as FDI hubs is as much known as the round-tipping of FDI via its Hong Kong SAR (and Singapore) or the peculiar situation of Ireland as a host for FDI. Japan is still relatively closed to FDI; it is thus consistent that it only shows up as a top-10 source country but not as a top-10 host.

Figure 4.4: Top-10 FDI Source Countries (in absolute terms)

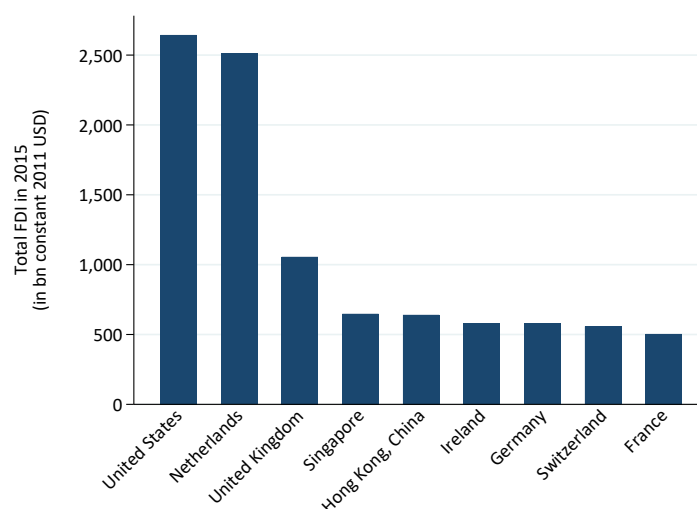


Source: Authors' illustration based on CDIS data

Those descriptive statistics generally support the notion that our sample is an adequate representation of global FDI patterns, with all their drawbacks.⁶ We

⁶For general discussions about the adequacy of FDI data, refer to Beugelsdijk et al. (2010) and Wacker (2016). The key finding of those studies is that there are some discrepancies between FDI data and the economic concepts that researchers often presume or intend to measure with these data but that these discrepancies to wide extent have a meaningful economic interpretation.

Figure 4.5: Top-10 FDI Host Countries (in absolute terms)



Source: Authors' illustration based on CDIS data

think that economics still needs to be explain FDI peculiarities like Ireland or round-tipping in Asia but also want to avoid that individual outliers considerably distort our analysis of determinants of global FDI. We hence create identifiers for outliers that enter our model as bilateral fixed effects in the following way: we first regress FDI stocks on all variables contained in the ‘homogeneous gravity’ and ‘homogeneous KK’ model (explained below). The residuals of this regression are plotted against predicted FDI in figure 4.A.1 in the appendix. Outliers are visually identified and must additionally fall into the bottom 1% or top 99% of the residual distribution. Not surprisingly, the resulting outlier identifiers involve UK, Netherlands, US, Ireland, Hong Kong SAR of PRC, and China.⁷

Having introduced our FDI stock variable, we now move to the econometric model used to explain global bilateral FDI positions including its relevant vari-

⁷More precisely, UK-Netherlands 2015, Netherlands-UK 2009&2010, US-Netherlands 2011-2016, US-Ireland 2015-2016, HK-China 2010-2016.

ables.

4.3 Modeling FDI: Theory and Related Literature

Our paper aims to assess how certain variables collected in the matrices X_1 , X_2 , Z influence FDI positions at year t between source and host countries s and h , respectively. Formally, this can be written as:

$$FDIstock_{sht} = X_{1,st}\beta_s + X_{2,ht}\beta_h + Z_{sht}\delta + a_s + a_h + d_t + \epsilon_{sht}, \quad (4.1)$$

where a_s , a_h , and d_t are source-, host-, and time-fixed effects, respectively, and ϵ is an idiosyncratic error term.⁸

The notation of our variables highlights that identification of the parameters in β_s , β_h , δ results from three different types of variation: identification of β_s (β_h) comes from variation of source (host) country variables in X_1 (X_2) over time, while identification of δ comes from variation of Z between source and host countries over time and over country pairs. The former, for example, includes source country GDP which is the same for all host countries, whereas the latter includes differences in GDP that varies over country pairs.

⁸We are aware of the fact that gravity literature in trade uses more restrictive fixed effect settings but this is not meaningful in our setup because of the short time dimension and particularly the little over-time variation in many variables, notably FDI stocks as depicted in section 4.2. As previously stated, our goal is not a structural identification exercise, thus the individual parameters of our estimations should be interpreted with some caution. We are willing to take that cost for the benefit of providing a global assessment how well key theories explain global FDI and for being able to give an informed judgement how non-time-varying factors (such as cultural distance) matter in this context.

We estimate equation 4.1 using PPML, following the standard literature (Benassy-Quere et al., 2007; Demir and Hu, 2016; Kleinert and Toubal, 2010). Moreover, we allow for some heterogeneity in the parameters β_s , β_h , δ as we detail below. Note that a homogeneity restriction of parameters, which is often implicitly assumed in econometric applications, will lead to biased estimates if the true data-generating process is heterogeneous. Conversely, allowing for heterogeneity will inflate the variance of estimates. Our cross-validation exercise allows an assessment of this standard bias-variance tradeoff that receives increasing attention in the heterogeneous panel literature (e.g. Bester and Hansen (2016)).

In the remainder of this section, we explain which variables enter X_1 , X_2 , Z according to the different theoretical models of FDI, and how they are measured.

4.3.1 Gravity model

Kleinert and Toubal (2010) have shown that structural models for horizontal and vertical FDI motives can be assessed in reduced form by substituting

$$b_{s1} \ln(GDP_{st}) + b_{h1} \ln(GDP_{ht}) + \delta_1 \ln(D_{sh}) + \delta_2 RSkE_{sht} + \delta_3 \ln(GDP_{st} + GDP_{ht})$$

into equation (4.1). We measure GDP by the *rgdpna* series from PWT9.0, which is most appropriate to track GDP developments in countries over time (Feenstra et al., 2015), D by population-weighted distance from the CEPII gravity data set, and relative skill endowment $RSkE$ as:

$$RSkE_{sht} := \ln \left(\frac{skilled_{st}}{skilled_{st} + skilled_{ht}} \right) - \ln \left(\frac{unskilled_{st}}{unskilled_{st} + unskilled_{ht}} \right),$$

where ‘skilled’ is the sum of ‘secondary completed’ and ‘tertiary total’ in the

Barro and Lee (2010) data set, and ‘unskilled’ is defined as 100-‘skilled’.⁹ $RskE_{sht} > 0$ hence indicates that the source country is more skilled in year t .

The first three terms in equation (4.2) are well-known gravity components, whereas the latter two represent vertical motives. More precisely, Kleinert and Toubal (2010) show that parameter restrictions as depicted in table 4.2 apply for the horizontal and vertical model, respectively.¹⁰ Kleinert and Toubal (2010) derive the gravity equation (i) from a proximity-concentration model explaining the emergence of horizontal FDI, which is negatively related to distance costs and (ii) from the factor proportions theory, implying vertical motives for FDI, which suggests that multinational enterprises fragment their production processes into stages, located globally according to international differences in factor prices. Fragmentation takes place when different production stages use different factors intensively and countries have different endowments.

Table 4.2: Predictions for Parameters in the Horizontal and Vertical Model

| | horizontal model | vertical model |
|------------|------------------|----------------|
| b_{s1} | = 1 | < 0 |
| b_{h1} | = 1 | > 0 |
| δ_1 | < 0 | < 0 |
| δ_2 | 0 | > 0 |
| δ_3 | 0 | = 1 |

Source: Kleinert and Toubal (2010).

One concern in estimating the gravity component is the likely possibility that horizontal motives may be more present in one part of the sample (notably in

⁹Barro-Lee data were interpolated since they only come in 5-year intervals. Our measure essentially follows the idea of Kleinert and Toubal (2010) but we have to take educational attainment instead of occupational task data to gauge skill levels because the latter (provided by the ILO) are available for much less countries.

¹⁰Note that Kleinert and Toubal (2010) derive their predictions for affiliate sales. Since the respective parameters are elasticities, the same predictions can be applied to FDI data if the latter are a homogeneous function of the former, as Wacker (2016) suggests.

“North-North” FDI), whereas vertical motives may be more important in other parts of the sample where factor price differences are larger (such as “North-South” FDI). Putting a homogeneity restriction on the parameters b_{s1} , b_{h1} , δ_2 , δ_3 may thus be restrictive and mask the true FDI motives. We hence allow for heterogeneity in those 4 parameters among the North-North, North-South, South-North, and South-South pairs and label the respective model the ‘heterogeneous gravity’ model.

4.3.2 KK model

Given the analytical complexity of the knowledge-capital (KK) model, which already involves 30 non-linear (in)equalities for a bare-bone partial equilibrium representation, deriving a testable reduced-form equation is not straightforward and has been subject to some debate in the literature (Blonigen et al., 2003; Carr et al., 2001). The core of the argument concerns the non-symmetry in the parameter for skill differences depending on whether one looks at FDI relationships where the host or source country is more skill-intensive. Davies (2008) thus suggests substituting the following terms into equation (4.1):

$$\begin{aligned} & \delta_4(GDP_{st} + GDP_{ht}) + \delta_5(GDP_{st} - GDP_{ht})^2 + \delta_6(skilled_{st} - skilled_{ht}) + \\ & \delta_7(skilled_{st} - skilled_{ht})^2 + \delta_8(skilled_{st} - skilled_{ht})(GDP_{st} - GDP_{ht}) + \\ & \delta_9 D_{sh} + \delta_{10}(skilled_{st} - skilled_{ht})^2 tradecost_{ht} + \beta_3 tradecost_{st} + \\ & + \beta_4 tradecost_{ht} + \beta_5 investmentbarriers_{ht}. \end{aligned} \quad (4.2)$$

We measure GDP , D , and $skilled$ as defined above, $tradecost$ by $100 \times [1 - X/GDP + M/GDP]$ using the export and import shares csh_x and $csh_m \times (-1)$ from PWT9.0, and $investmentbarrier$ by investment freedom from the Heritage

Foundation, where 100 indicates the highest freedom.

As the KK component (4.2) indicates, the knowledge-capital model is ‘global’ in the sense that differences in GDP and skill/factor endowments rank prominently within the model, such that a split along the “North” and “South” dimension (as for the gravity model) does not appear meaningful. However, to account for the above-mentioned non-symmetry in the skill-difference parameters, we allow for a ‘heterogeneous KK’ model variant, where parameters for variables involving skill differences are allowed to differ between skill-intensive host vs. source country pairs.

The KK model combines motives for horizontal and vertical FDI. First, horizontal FDI arises to reduce trade costs by serving the foreign market through local production and head quarter costs by jointly using headquarter activities in all subsidiaries. Since production of a multinational firm is skill-intensive relative to non-FDI sectors, increasing skill differences reduce the presence of horizontal FDI. Second, vertical FDI emerges to exploit factor price differences, which arise when skill differences increase.

Accounting for both motives the KK model implies a nonmonotonic relationship between skill differences and FDI. In the presence of reasonably large trade costs, moving from a negative skill difference of source relative to host (skill abundant host), to larger values of skill differences, total FDI, which is now horizontal, increases as skill differences become less negative, that is skill endowments of the countries become more similar. After a peak of FDI, increasing positive skill differences of source relative to host (skill abundant source) leads to a decrease in (horizontal) FDI, while vertical FDI starts to become profitable due to emer-

ging factor prize differences. Vertical and horizontal FDI coexist, until vertical FDI dominates as skill differences go to infinity.

Consequently, for a negative skill difference (skill-intensive host), we expect a positive relationship of skill difference, while for a positive skill difference (skill-intensive source), we expect a nonmonotonic effect, meaning a negative coefficient for δ_6 and a positive effect for δ_7 .

For the *sum of real GDPs* and the *squared difference in real GDPs* we expect a positive and negative effect, respectively. The coefficient of the interaction term of skill difference and real GDP difference (δ_8) should be negative. Distance (D) is included to account for transport costs and thus should show a negative relationship, too. The coefficient of the interaction term of squared skill difference and trade costs in the host country (δ_{10}) captures the effect of host trade costs promoting horizontal FDI but not vertical FDI, while horizontal FDI is most important when skill differences are small. Thus, we expect a negative effect. Correspondingly, the coefficient of trade costs in the host should be positive. For the effect of trade costs in the source, we anticipate a negative effect, as an increase in trade costs of the source reduces the incentive to ship back, goods produced by a subsidiary located abroad. Finally, we capture investment barriers by investment freedom which should positively affect FDI.

4.3.3 Export platform FDI

The literature has highlighted possible spatial interdependencies in FDI motives (see Blonigen et al. (2007), and Antràs and Yeaple (2014), for summaries). Probably the most common among them is ‘export platform FDI’ (Ekholm et al., 2007; Yeaple, 2003), which is essentially an extension of horizontal motives to

countries surrounding the host country, can hence quite easily be included in our reduced form exercise. Export-platform FDI depicts the investment activity of a parent country in a particular host with the aim to serve ‘third’ markets by exporting final goods produced by the affiliate in the host. Formally, we include the term $\beta_{h2} \ln(SMP_{sht})$ into our model, where ‘surrounding market potential’ is calculated as:

$$SMP_{sht} := \sum_{s_i \neq s}^S \frac{GDP_{s_i t}}{D_{s_i h}},$$

where GDP and D are defined as above.

4.3.4 Institutional and cultural aspects

While FDI generally requires some form of market imperfection that gives rise to an internalization argument, an interesting literature for our purpose has focused on the specific similarity of market imperfections across source and host countries (e.g. Azemar et al. (2012); Cuervo-Cazurra and Genc (2008); Darby et al.; Desbordes et al.. Their rationale can be summarized as follows: while FDI is generally distracted by weak institutions, firms’ previous experience with institutional risk at home lets them develop the skills that render similar problems overseas less problematic which creates an advantage for those firms to invest in other host countries with potentially weak institutional environments, thus creating a strong incentive for South-South FDI.¹¹ Recent work by Demir and Hu (2016) is, in our view, the most elaborate empirical assessment of this idea. They investigate whether institutional distance has heterogeneous effects on FDI flows with respect to institutional development and the direction of flows from and to developing and developed countries. Their results show that the

¹¹Relatedly, Dippenaar (2009) argues that Southern firms may face less risk of expropriation since they may not be tackled as colonizing companies by populist leaders.

effects of institutional distance depend on the direction of FDI flows and development level of host and source. Although institutional differences appear as an entry barrier for investment flows in both North-South and South-North directions, this effect is smaller if the source country is from the South. On the other hand, South-South flows show to be positively driven by institutional differences, which can be an explanation for the increase in South-South FDI.

To some of the econometric models, we hence add

$$\delta_{11}InstDist_{sht} + \delta_{12}\mathbf{1}(InstDist)_{h>s,t} \times InstDist_{sht}, \quad (4.3)$$

where $\mathbf{1}(InstDist)_{h>s,t}$ is a dummy variable that equals 1 if institutional quality is higher in the host country than in the source country (in year t). We expect $\delta_{12} > 0 > \delta_{11}$ because institutional distance should generally have a negative effect on FDI but this effect should be mitigated with increasing institutional development of the host economy (conditional on all other factors).

Our measure for institutional distance aggregates the 12 dimensions d of the ICRG political risk index $Inst$, following Demir and Hu (2016):

$$InstDist_{sht} = \frac{1}{12} \sum_{d=1}^{12} \frac{(Inst_{dst} - Inst_{dht})^2}{V_d},$$

where V_d is the variance of each dimension d .

Similarly, especially the international business literature has emphasized that cultural distance makes firm integration more difficult and thus detracts FDI (e.g. Beugelsdijk et al. (2018)). We thus control for a number of cultural factors

including the dummy variables common colonizer, common official language, colonial relationship after 1945 from the CEPII gravity data set, and two dimensions of cultural distance, calculated as the values of host-source values of the Hofstede et al. (2010) measures for ‘long-term orientation vs. short-term orientation’ and ‘indulgence vs. restraint’. Note that those measures do not vary over time and the latter two have been selected due to the fact that they have wider availability than the other 3 cultural dimensions of Hofstede et al. (2010). Nevertheless, the Hofstede et al. (2010) measure is the key sample constraint in our data set.

Similar to the model component (4.3) we additionally interacted both Hofstede et al. (2010) measures with a dummy variable equal 1 if the value in the host country exceeded the value in the source to allow for asymmetry.

4.3.5 International finance aspects

An interesting aspect of FDI research is that it allows to combine trade aspects, which are generally ‘real’ (as opposed to monetary) and often studied from a general equilibrium perspective, with international finance aspects that by definition include a monetary and thus frictional aspect. A close integration of the two is still at its infancy (see Foley and Manova (2015); Manova et al. (2015), for important contributions) but the international finance perspective generally suggests inclusion of the following variables.

Exchange rates are important as they influence international asset prices (Blonigen, 1997; Froot and Stein, 1991). We thus include the series *xr* for source and host from PWT9.0.

Similarly exchange rate volatility and thus the *exchange rate regime* may matter, as discussed extensively in Harms and Knaze (2018). We hence include their bilateral de jure regime measure in our regressions.

It is also well-known and extensively studied that tax considerations play an important role in FDI allocation.¹² To gauge this effect, we include the difference in *corporate tax rates*, extracted from KPMG documents, into the ‘international finance’ specification of our model.¹³ Again, we additionally interact this difference with a dummy variable equal 1 if the host tax rate is higher than the source tax rate.

Donaubauer et al. (2016) discuss why and how *financial development* matters for bilateral FDI. To gauge this effect, we take differences between source and host country’s aggregate “broad-based index of financial development” developed and provided by the IMF, which again is additionally included with a dummy variable interaction indicating higher financial development in the host country.

4.4 Results for Individual Models

The first two tables report the results for the gravity and KK model, respectively. Each starts with the homogeneous model, then adds (surrounding market potential) SMP, then heterogeneous model, then adding SMP to that. All presented models include a full set of time, source and host country fixed effects.

¹²see Davies et al. (2018), for a recent contribution and references

¹³We interpolate some missing values of corporate tax rates.

In table 4.2, we summarize the results of the homogenous and heterogenous gravity model. For the homogenous model we do not find strong support for the theoretical predictions. The GDPs of source and host are both positive but only host GDP is significant and it is different from the expected value of unity. Only the negative and significant effect of distance is in line with theory. The negative coefficients of relative skill endowment and joint size of source and host do not support horizontal FDI but also do not have the appropriate sign to explain vertical FDI. More interesting is that the inclusion of surrounding market potential in column (2) shows a positive effect, which is significant at the 10 percent level and which leads to a reduction of the size and significance of host GDP. Thus, we find supportive evidence for horizontal FDI driven by the incentive of export-platform foreign investment activity.

While the inclusion of SMP in the homogenous model does not improve the overall model fit, allowing for heterogeneity in country pairs, leads to an improve of almost 5 percentage points, as reported in columns (3) and (4). Again, source GDP is not significant, while host is positive and significant but different from one. When adding SMP to our model we see again a reduction of the significance and size of the effect of host GDP for North-North and South-North pairs where we expect market access motives to be particularly present.

We find that relative skill endowment seems to play a significant role for North-South FDI but the negative effect is hard to explain. In line with theory relative skill endowment does not drive FDI between symmetric countries, that is between North-North and South-South, where we expect horizontal motives to matter most and factor price differences to be small. Consistent with these findings and in support for the presence of horizontal FDI motives we see pos-

itive and highly significant effects of the surrounding market potential for pairs of symmetric countries (North-North and South-South) and also for FDI from developing countries to industrialized countries (South-North), which aim at gaining access to a large market. The importance of the surrounding market for South-North FDI seems to dominate the positive effect of host GDP, which disappears in the model with SMP.

With regard to the joint size of source and host we do not find a significant impact on FDI as predicted by the factor proportions model, which suggests a coefficient of unity. This result is nevertheless in line with the findings by Kleinert and Toubal (2010).

In the next step we move to the results of the KK model where we present our findings in a similar structure as in table 4.3, but now differentiating between different skill levels in the heterogenous model.

Table 4.3: Results Gravity Model

| VARIABLES | (1) | (2) | (3) | (4) |
|-----------------------------|------------------|------------------|--------------------|-------------------|
| | Hom. PPML | Hom. PPML SMP | Het. PPML | Het. PPML SMP |
| Ln (Source GDP) | 0.541 (0.811) | 0.518 (0.818) | | |
| Ln (Source GDP) North-North | | | 0.992 (0.775) | 1.060 (0.768) |
| Ln (Source GDP) North-South | | | 0.593 (0.846) | 0.627 (0.839) |
| Ln (Source GDP) South-North | | | 0.357 (0.629) | 0.105 (0.658) |
| Ln (Source GDP) South-South | | | -0.0846 (0.620) | -0.287 (0.651) |

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4.4. RESULTS FOR INDIVIDUAL MODELS

Table 4.3 – *Continued from previous page*

| VARIABLES | (1) | (2) | (3) | (4) |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Hom. PPML | Hom. PPML SMP | Het. PPML | Het. PPML SMP |
| Ln (Host GDP) | 1.361*** (0.486) | 0.902* (0.536) | | |
| Ln (Host GDP) North-North | | | 2.212*** (0.534) | 1.443** (0.569) |
| Ln (Host GDP) North-South | | | 1.732*** (0.508) | 1.757*** (0.572) |
| Ln (Host GDP) South-North | | | 1.114** (0.546) | 0.392 (0.576) |
| Ln (Host GDP) South-South | | | 1.215** (0.482) | 1.214** (0.547) |
| Ln (Bil. Distance) | -0.824*** (0.0303) | -0.881*** (0.0319) | -0.823*** (0.0238) | -0.891*** (0.0311) |
| Rel. skill endowment (BL) | -0.383*** (0.0986) | -0.388*** (0.0989) | | |
| Rel. sk. endowm. (BL) North-North | | | -0.104 (0.0743) | -0.130* (0.0753) |
| Rel. sk. endowm. (BL) North-South | | | -0.710*** (0.0894) | -0.727*** (0.0920) |
| Rel. sk. endowm. (BL) South-North | | | 0.219 (0.158) | 0.333* (0.175) |
| Rel. sk. endowm. (BL) South-South | | | -0.201 (0.127) | -0.162 (0.128) |
| Ln (Sum GDP) | -0.179** (0.0799) | -0.161** (0.0806) | | |
| Ln (Sum GDP) North-North | | | -0.641*** (0.0698) | -0.625*** (0.0708) |
| Ln (Sum GDP) North-South | | | -0.0678 (0.147) | -0.0691 (0.151) |
| Ln (Sum GDP) South-North | | | 0.420*** (0.116) | 0.483*** (0.123) |
| Ln (Sum GDP) South-South | | | 0.433*** (0.0928) | 0.431*** (0.0875) |
| Ln (sur. market pot.) | | 0.986*** (0.294) | | |
| Ln (sur. market pot.) North-North | | | | 1.249*** (0.316) |
| Ln (sur. market pot.) North-South | | | | 0.368 |

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Table 4.3 – *Continued from previous page*

| VARIABLES | (1) | (2) | (3) | (4) |
|-----------------------------------|-------------------|-------------------|-------------------|---------------------|
| | Hom. PPML | Hom. PPML SMP | Het. PPML | Het. PPML SMP |
| Ln (sur. market pot.) South-North | | | | 1.807*** (0.310) |
| Ln (sur. market pot.) South-South | | | | 1.002*** (0.331) |
| Constant | -11.89 (13.29) | -15.49 (13.22) | -11.01 (10.78) | -18.03* (10.76) |
| Observations | 57,687 | 57,687 | 57,687 | 57,687 |
| R-squared | 0.836 | 0.836 | 0.882 | 0.883 |
| Source Country FE | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| outlier pair FEs | Yes | Yes | Yes | Yes |

The dependent variable is Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.4 presents the results of the homogenous KK model in the first two columns (including the surrounding market potential (SMP) in column (2)). We cannot find evidence for the KK model in the differences of skill endowment itself. Only squared skill difference is significant but shows the wrong sign with regard to theoretical expectations.

In line with theory, the effect of the squared difference in real GDPs and the joint effect of difference in GDPs and skill difference are negative. The effect of distance shows to be negative indicating that monitoring and investment costs, that are increasing in distance and leading to a reduction in FDI matter more. As predicted by the KK model the joint effect of squared skill difference and trade costs is negative, suggesting that even if trade costs are large (and thus providing incentives for horizontal FDI), an increase in skill difference reduces FDI (as horizontal motives only matter if countries have a similar skill endow-

ment). Trade costs and investment barriers do not show any significant effect on FDI.

As shown in column (2) the inclusion of SMP leads to unexpected results similar to what Blonigen et al. (2007) find. It shows a significant negative effect. But here the effect is still significant although including a set of country dummies, which control for time-invariant unobserved country-specific effects. Since the surrounding market potential should be very stable over time, the country dummies can potentially subsume its effects over time. But the results reveal that this is not the case. An explanation for these results is that our sample includes a considerable number of developing and transition economies, and Blonigen et al. (2007) find export platform FDI to be present primarily in European OECD countries but not in non-OECD countries, which includes developing countries.

With regard to the heterogeneous KK model, differentiating between positive and negative skill difference does not distinctly improve the model fit. But together with the inclusion of the squared term of skill difference it can potentially reveal the presence of vertical FDI. For the negative skill difference, where host is skill-abundant, we find a positive sign of the coefficient as suggested by theory. As skill difference in both countries becomes more similar, this leads to an increase in (horizontal) FDI. Although the effect for skill difference for the skill-abundant source is negative it is only significant at the 10 percent level in the model where we account for surrounding market potential. Since the effect of squared skill difference turns out to be negative, we do not find supporting evidence for the presence of vertical FDI when skill differences become sufficiently large.

Trade costs of source and investment barriers do not show any significant effect. Trade costs in the host show a positive effect, which is significant only at the 10 percent level and in the model without surrounding market potential. This is in line with theory suggesting that an increase in trade costs in the host provides a motive for FDI to serve the foreign market to save trade costs. But the effect diminishes in the model with SMP. The effects of the surrounding market potential do not distinctly differ from the homogeneous model.

Table 4.4: Results KK Model

| VARIABLES | (1) | (2) | (3) | (4) |
|--------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | Hom. PPML | Hom. PPML SMP | Het. PPML | Het. PPML SMP |
| Sum of GDPs | 1.58e-08 (4.02e-08) | 2.43e-08 (3.96e-08) | | |
| Sum GDP (skilled host) | | | 1.34e-08 (3.48e-08) | 2.29e-08 (3.45e-08) |
| Sum GDP (skilled source) | | | 1.15e-09 (3.70e-08) | 8.94e-09 (3.68e-08) |
| Sq. diff. of GDPs | -0.000*** (0.000) | -0.000*** (0.000) | | |
| Sq. diff. GDP (skilled host) | | | -0.000*** (0.000) | -0.000*** (0.000) |
| Sq. diff. GDP (skilled source) | | | -0.000* (0.000) | -0.000** (0.000) |
| Skill Difference sh | 0.00482 (0.00371) | 0.00360 (0.00359) | | |
| Skill diff. (skilled host) | | | 0.0144*** (0.00400) | 0.0129*** (0.00387) |
| Skill diff. (skilled source) | | | -0.00578 (0.00380) | -0.00665* (0.00381) |
| Sq. skill difference | -0.000127*** (2.55e-05) | -0.000121*** (2.50e-05) | | |
| Sq. skill diff. (skilled host) | | | -0.000523*** (9.96e-05) | -0.000522*** (9.68e-05) |

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4.4. RESULTS FOR INDIVIDUAL MODELS

Table 4.4 – *Continued from previous page*

| VARIABLES | (1) | (2) | (3) | (4) |
|---|----------------------------|----------------------------|----------------------------|----------------------------|
| | Hom. PPML | Hom. PPML SMP | Het. PPML | Het. PPML SMP |
| Sq. skill diff. (skilled source) | | | -0.000212** (9.10e-05) | -0.000187** (9.10e-05) |
| Sk. diff. (BL) × GDP diff. | -1.13e-09*** (1.18e-10) | -1.19e-09*** (1.15e-10) | | |
| Skill diff. × diff. GDP (skilled host) | | | -4.93e-10** (2.50e-10) | -5.47e-10** (2.38e-10) |
| Skill diff. × diff. GDP (skilled source) | | | -1.15e-09*** (1.64e-10) | -1.22e-09*** (1.68e-10) |
| Weighted distance | -0.000209*** (4.97e-06) | -0.000202*** (5.32e-06) | -0.000203*** (4.64e-06) | -0.000197*** (5.19e-06) |
| Sq. skill diff. × trade costs host | -2.54e-06*** (3.03e-07) | -2.50e-06*** (2.90e-07) | | |
| Sq. skill diff. × trade costs host (skilled host) | | | -3.79e-06*** (3.23e-07) | -3.72e-06*** (3.09e-07) |
| Sq. skill diff. × trade costs host (skilled source) | | | 3.95e-07 (7.04e-07) | 2.67e-07 (7.03e-07) |
| Trade costs source | 0.000313 (0.00178) | 7.94e-05 (0.00183) | 0.00113 (0.00164) | 0.000958 (0.00168) |
| Trade costs host | 0.00241 (0.00177) | 0.00217 (0.00171) | 0.00256* (0.00152) | 0.00234 (0.00148) |
| Investment freedom host | -0.00190 (0.00368) | -0.00138 (0.00365) | -0.00236 (0.00356) | -0.00192 (0.00352) |
| Sur. market potential | | -2.62e-05** (1.07e-05) | | -2.52e-05*** (9.63e-06) |
| Constant | 5.930*** (0.295) | 6.823*** (0.512) | 5.925*** (0.285) | 6.785*** (0.462) |
| Observations | 57,687 | 57,687 | 57,687 | 57,687 |
| R-squared | 0.884 | 0.884 | 0.894 | 0.894 |
| Source Country FE | Yes | Yes | Yes | Yes |
| Host Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| outlier pair FEs | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Augmented models

We now move to the augmented model – that is ‘best performing’ from first stage of cross validation (see below) augmented with all other factors. In each case, the first column reports the results of the benchmark model without augmenting factors. This is important because the sample considerably changes due to the fact that augmented variables are not available for all countries/years. Most observations we lose are from developing countries.

The reduction of the sample changes the results of the benchmark model, slightly. Again, we see more evidence for horizontal FDI than for vertical FDI. Source GDP now shows significant positive effects for all country pairs. Host GDP does not show a significant effect for FDI going from South to North. The sum of GDPs does not matter for FDI from the South suggesting mostly horizontal motives for foreign investment originating from developing countries. The sample reduction also leads to an insignificant effect of surrounding market potential for South-South FDI, while FDI going to the North appears to be driven by the surrounding market potential.

With regard to the added explanatory variables, we find that financial and cultural factors play a role for FDI, while institutional differences between host and source do not seem to matter.

Especially the bilateral de-jure exchange rate regime significantly affects FDI. The negative effect supports what we expect. An increase in distance, which indicates a more flexible regime in the host and thus is expected to involve a higher exchange rate volatility and consequently leads to lower FDI. Similarly, the distance in corporate tax negatively affects FDI when interacted with the

4.4. RESULTS FOR INDIVIDUAL MODELS

dummy indicating a higher tax of the host relative to source. This is also what we expect as higher taxes drive up the costs and thus reduce attractiveness of the respective market for investment.

The most important cultural factors are *having the same official language* and *being in a colonial relationship (post 1945)*. Both variables have the expected positive sign. The cultural measures by Hofstede also play a significant role, although the coefficients are smaller compared to common language and colonial relationship. But considering that Hofstede's indices take values between 0 and 100, there is more variation compared to the dummy variables and thus smaller coefficients translate into larger effects.

Table 4.5: Results Augmented Gravity Model

| VARIABLES | (1) | (2) |
|-----------------------------|---------------------|---------------------|
| | Het. PPML | Het. PPML |
| Ln (Source GDP) North-North | 1.515** (0.671) | 1.394** (0.612) |
| Ln (Source GDP) North-South | 1.370** (0.670) | 1.194* (0.615) |
| Ln (Source GDP) South-North | 1.644*** (0.579) | 1.797*** (0.583) |
| Ln (Source GDP) South-South | 1.508*** (0.531) | 1.695*** (0.541) |
| Ln (Host GDP) North-North | 1.573** (0.635) | 1.721*** (0.590) |
| Ln (Host GDP) North-South | 2.971*** (0.431) | 3.459*** (0.400) |

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Table 4.5 – *Continued from previous page*

| VARIABLES | (1) | (2) |
|-----------------------------------|-----------------------|-----------------------|
| | Het. PPML | Het. PPML |
| Ln (Host GDP) South-North | 0.852 (0.656) | 1.065* (0.606) |
| Ln (Host GDP) South-South | 2.544*** (0.439) | 3.099*** (0.410) |
| Ln (Bilateral Distance) | -0.769*** (0.0237) | -0.680*** (0.0267) |
| Rel. sk. endowm. (BL) North-North | -0.135* (0.0750) | -0.0753 (0.0745) |
| Rel. sk. endowm. (BL) North-South | -0.840*** (0.101) | -0.675*** (0.0939) |
| Rel. sk. endowm. (BL) South-North | -0.419* (0.217) | -0.286 (0.219) |
| Rel. sk. endowm. (BL) South-South | -0.503*** (0.157) | -0.338** (0.157) |
| Ln (Sum GDP) North-North | -0.693*** (0.0746) | -0.629*** (0.0933) |
| Ln (Sum GDP) North-South | -0.549*** (0.0793) | -0.432*** (0.0798) |
| Ln (Sum GDP) South-North | -0.169 (0.283) | -0.105 (0.273) |
| Ln (Sum GDP) South-South | -0.159 (0.149) | -0.103 (0.155) |
| Ln (sur. market pot.) North-North | 1.039*** (0.287) | 0.851*** (0.276) |
| Ln (sur. market pot.) North-South | -0.388 (0.298) | -1.378*** (0.303) |
| Ln (sur. market pot.) South-North | 1.746*** (0.303) | 1.406*** (0.299) |
| Ln (sur. market pot.) South-South | 0.0783 | -1.112*** |

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4.4. RESULTS FOR INDIVIDUAL MODELS

Table 4.5 – *Continued from previous page*

| VARIABLES | (1) | (2) |
|--|-----------|-------------|
| | Het. PPML | Het. PPML |
| | (0.338) | (0.344) |
| Institutional distance (t-1) | | -0.00615 |
| | | (0.0437) |
| $D_{h>s} \times$ Institutional distance (t-1) | | 0.111 |
| | | (0.0709) |
| Dist. financial dev. (host-source) | | 0.513 |
| | | (0.514) |
| $D_{h>s} \times$ Dist. financial dev. (host-source) | | -0.452 |
| | | (0.427) |
| Bil. de-jure exchange rate regime | | -0.0234*** |
| | | (0.00715) |
| Exchange rate (nat. cur./US-\$) source | | -0.000271** |
| | | (0.000136) |
| Exchange rate (nat. cur./US-\$) host | | -3.53e-05 |
| | | (5.48e-05) |
| Dist. corporate tax (host-source) | | 0.0213*** |
| | | (0.00701) |
| $D_{h>s} \times$ Dist. corporate tax (host-source) | | -0.0214*** |
| | | (0.00755) |
| Common language | | 0.589*** |
| | | (0.0504) |
| Common colonizer (post 1945) | | -0.161 |
| | | (0.146) |
| Pair in col. relationship (post 1945) | | 0.474*** |
| | | (0.0946) |
| Dist. Hofstede short-term vs. long-term orient. | | 0.0231 |
| | | (0.0774) |
| $D_{h>s} \times$ Dist. Hofstede short-term vs. long-term orient. | | 0.0110*** |
| | | (0.00294) |

Continued on next page

Table 4.5 – *Continued from previous page*

| VARIABLES | (1) | (2) |
|--|----------------------|-------------------------|
| | Het. PPML | Het. PPML |
| Dist. Hofstede indulgence vs. restraint | | -0.578 (0.467) |
| $D_{h>s} \times$ Dist. Hofstede indulgence vs. restraint | | -0.0163*** (0.00236) |
| Constant | -42.87*** (8.968) | -41.58*** (8.981) |
| Observations | 21,596 | 21,596 |
| R-squared | 0.883 | 0.898 |
| Source Country FE | Yes | Yes |
| Host Country FE | Yes | Yes |
| Year FE | Yes | Yes |
| outlier pair FEs | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The major difference with regard to the results of the KK model in the reduced sample is that joint size of country pairs is now positive and significant for skilled source and skilled source, which is in line with the KK model. Another aspect that changes in the reduced sample is that skill difference and squared skill difference do not show any significant effects anymore, suggesting that those effects are related to the inclusion of a sufficiently large number of developing countries in the analysis as also noted by Davies (2008).

Extending the KK model reveals that in this framework institutional distance plays a role. Although in general institutional distance does not show any significant effect if we do not distinguish between positive and negative institutional

4.4. RESULTS FOR INDIVIDUAL MODELS

distance of host/source. Including a dummy for a higher institutional quality of host relative to source, reveals a positive effect of institutional distance, which is in line with our expectations that better institutions in the host country promote investment.

With regard to financial aspects, distance in financial development and distance in the corporate tax rates show significant effects on FDI. The negative effect of distance in financial development when interacted with a dummy indicating higher financial development in the host, makes sense in the way that we expect financial development in the source to be higher than in the host. So small distances should promote investment. Furthermore, a positive distance in the corporate tax rate with regard to the host negatively affects FDI, which is in line with our expectations. If taxes in the host increases this prevents foreign investment.

The importance of cultural distance are in line with the overall results of the augmented gravity model.

Table 4.6: Results Augmented KK Model

| VARIABLES | (1) | (2) |
|--------------------------------|---------------------------|---------------------------|
| | Het. PPML | Het. PPML |
| Sum GDP (skilled host) | 1.78e-07*** (4.96e-08) | 1.46e-07*** (4.92e-08) |
| Sum GDP (skilled source) | 1.82e-07*** (5.13e-08) | 1.55e-07*** (4.99e-08) |
| Sq. diff. GDP (skilled host) | -0.000*** (0.000) | -0.000*** (0.000) |
| Sq. diff. GDP (skilled source) | -0.000*** | -0.000** |

Continued on next page

Table 4.6 – *Continued from previous page*

| VARIABLES | (1) | (2) |
|--|--------------|--------------|
| | Het. PPML | Het. PPML |
| | (0.000) | (0.000) |
| Skill diff. (skilled host) | 0.000890 | 0.00297 |
| | (0.00541) | (0.00589) |
| Skill diff. (skilled source) | -0.00260 | -0.00627 |
| | (0.00553) | (0.00492) |
| Skill diff. \times diff. GDP (skilled host) | -6.55e-10* | -8.31e-10* |
| | (3.65e-10) | (4.59e-10) |
| Skill diff. \times diff. GDP (skilled source) | -4.73e-10** | -4.61e-10** |
| | (2.00e-10) | (2.00e-10) |
| Sq. skill diff. (skilled host) | -0.000181 | -5.54e-05 |
| | (0.000114) | (0.000122) |
| Sq. skill diff. (skilled source) | -0.000127 | 3.75e-05 |
| | (0.000102) | (8.54e-05) |
| Sq. skill diff. \times trade cost (skilled host) | -2.99e-06*** | -2.09e-06** |
| | (7.35e-07) | (8.20e-07) |
| Sq. skill diff. \times trade cost (skilled source) | -1.18e-06 | -1.22e-06 |
| | (8.41e-07) | (7.60e-07) |
| Trade cost host | -0.00116 | -0.00101 |
| | (0.00157) | (0.00162) |
| Trade cost source | -0.00183 | -0.00158 |
| | (0.00118) | (0.00118) |
| Investment freedom host | -0.00606* | -0.00673** |
| | (0.00319) | (0.00299) |
| Weighted distance | -0.000183*** | -0.000172*** |
| | (3.86e-06) | (4.08e-06) |
| Institutional distance (t-1) | | -0.0516 |
| | | (0.0393) |
| $D_{h>s} \times$ Institutional distance (t-1) | | 0.150** |
| | | (0.0659) |

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4.4. RESULTS FOR INDIVIDUAL MODELS

Table 4.6 – *Continued from previous page*

| VARIABLES | (1) Het. PPML | (2) Het. PPML |
|--|------------------|-------------------------|
| Dist. financial dev. (host-source) | | 1.003** (0.444) |
| $D_{h>s} \times$ Dist. financial dev. (host-source) | | -1.073*** (0.281) |
| Bil. de-jure exchange rate regime | | -0.00228 (0.00660) |
| Exchange rate (nat. curr./US-\$) source | | -0.000237 (0.000159) |
| Exchange rate (nat. curr./US-\$) host | | 6.53e-06 (5.54e-05) |
| Dist. corporate tax (host-source) | | 0.0343*** (0.00728) |
| $D_{h>s} \times$ Dist. corporate tax (host-source) | | -0.0619*** (0.00715) |
| Common language | | 0.760*** (0.0462) |
| Common colonizer (post 1945) | | -0.108 (0.142) |
| Pair in col. relationship (post 1945) | | 0.386*** (0.0906) |
| Dist. Hofstede short-term vs. long-term orient. | | 0.0889*** (0.0144) |
| $D_{h>s} \times$ Dist. Hofstede short-term vs. long-term orient. | | 0.00742*** (0.00280) |
| Dist. Hofstede indulgence vs. restraint | | 0.0667*** (0.0159) |
| $D_{h>s} \times$ Dist. Hofstede indulgence vs. restraint | | -0.0130*** (0.00227) |

Continued on next page

Table 4.6 – *Continued from previous page*

| VARIABLES | (1) | (2) |
|-------------------|---------------------|---------------------|
| | Het. PPML | Het. PPML |
| Constant | 5.960*** (0.307) | 6.807*** (0.313) |
| Observations | 21,596 | 21,596 |
| R-squared | 0.897 | 0.907 |
| Source Country FE | Yes | Yes |
| Host Country FE | Yes | Yes |
| Year FE | Yes | Yes |
| Outlier pair FEs | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.5 Cross Validation

The main goal of our paper is to assess the performance of key theories explaining global FDI. Put differently, how well do the models presented so far explain bilateral FDI positions? This requires analyzing their predictive power out of sample, because an in-sample analysis would either lead to overfitting or rely on the restrictive assumptions for asymptotic model selection criteria (see e.g. (Zucchini, 2000), for an overview on the issue). The natural tool to use for such a purpose is cross validation, which splits the data set into one part, where estimation is performed, and another part, used to assess the predictive power of the estimated model.

More precisely, the following procedure is applied for all our candidate models:

4.5. CROSS VALIDATION

1. From the original sample, randomly draw an ‘estimation sample’ (without replacement) that consists of 90 percent of the original observations.¹⁴
2. Use this ‘estimation sample’ to estimate the parameters for each candidate model.
3. Apply the estimated parameters to predict $\widehat{FDIstock}_{sht}$ for each candidate model in the remaining 10 percent of observations (the ‘calibration sample’).
4. For each model and calibration observation calculate the residual

$$\hat{\epsilon}_{sht} \equiv FDIstock_{sht} - \widehat{FDIstock}_{sht} \quad (4.4)$$

and their ‘mean absolute deviation’ (MAD) per model over all calibration observations:

$$MAD \equiv \frac{1}{N_c} \sum_i^{N_c} |\hat{\epsilon}_i|, \quad (4.5)$$

where $i = 1, \dots, N_c$ are all s, h, t combinations that are part of the calibration sample.

5. Repeat 1 to 4 100 times and calculate the average MAD over all 100 iterations.

In a first step, we consider each of the following candidate models with and without surrounding market potential: a homogeneous gravity model, a heterogeneous gravity model (North-North, North-South, South-North, South-South),

¹⁴We do not put any restrictions on the drawing procedure. This is motivated by the fact that ‘wild’ procedures generally perform well for iterative inference methods such as bootstrapping. The ‘original sample’ includes all observations for which all the variables from all respective candidate models are non-missing.

a homogeneous KK model, and a heterogeneous KK model (host skilled, source skilled). Out of these 8 models evaluated, the ‘best performing’ gravity and KK model (with the lowest MAD) proceed to a second stage.

In the second stage, the ‘best performing’ models from the first step are augmented with the following variables, respectively:¹⁵

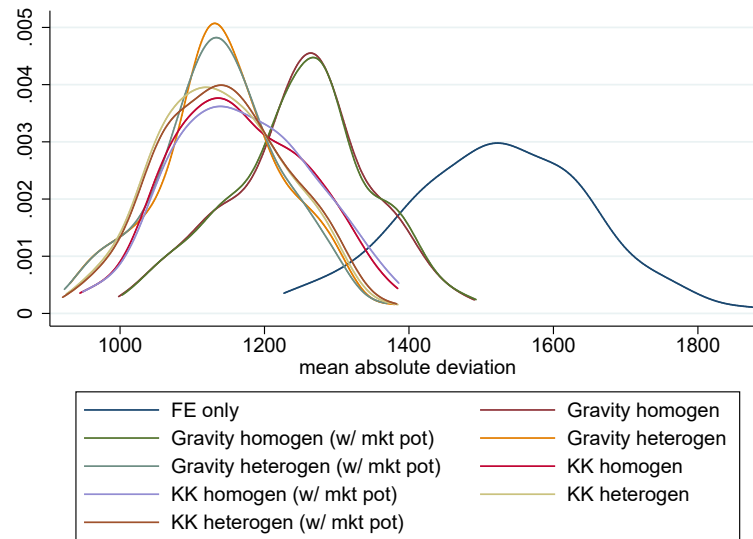
- A. Institutions
- B. Financial development, exchange rate, & de-jure exchange rate regime, corporate tax rate
- C. A & B
- D. A, B, common colonizer, common language, & pair in colonial relationship
- E. D, & Hofstede cultural distance (smallest sample)

At both stages, we compare the model performance relative to a ‘fixed effect only’ model, which only includes the respective fixed effects and outlier identifiers. Moreover, we compare the models in the second stage to a ‘pure institutions’ model, which includes $InstDist$, $\mathbf{1}(InstDist)_{h>s,t} \times InstDist$, $ComLang$, $ComCol$, $Col45$, and the ‘FE only’ parameters.

Table 4.7 and figure 4.6 summarize the results from the first stage. Looking at figure 4.6 one can see three clusters of model performance. Clearly, the FE model performs worst. Even in the best cases (i.e. ‘most favorable’ sample draws), the FE model performs barely better than the next class of models on average, which are the homogeneous gravity models (with and without market

¹⁵Note that due to the increase in variables in the second stage, the ‘original sample’ considerably shrinks (and is limited by all observations in the sample for model E).

Figure 4.6: Distribution of MAD across Models (1st stage)



potential). In the ‘best performing’ cluster on the left in figure 4.6, we see that the heterogeneous gravity model (with and without SMP) and all variants of the KK model perform equally well but that the MADs of the heterogeneous gravity models are much more narrowly distributed, suggesting that their estimation risk with respect to the sample is lower. Close inspection of figure 4.6 reveals that overall the heterogeneous gravity model with surrounding market potential performs best by a tight margin. Within the KK models considered, the heterogeneous KK model without SMP performs best. Both of those models thus move as ‘benchmark’ to the second stage.

What can we say about the overall performance of those models in describing global bilateral FDI positions? Generally, the best-performing models decrease the mean absolute prediction error compared to a pure fixed effect model with additional outlier control by about 25 %. While non-negligible, one may argue that this is a rather disappointing magnitude. Without rejecting this negative

interpretation, we remind that the fixed effects per se already explain quite a good part of variation in bilateral FDI positions. To interpret the results of our assessment how well prevailing models of FDI explain global bilateral data, consider the heterogeneous gravity model with SMP. Its average MAD of 1,137 suggests that on average one would expect this model's out-of-sample prediction for a randomly chosen bilateral observation to make an error equal to 52.8 % of mean FDI. In other words, the sample's mean bilateral FDI position is about twice as large as the MAD of the best-performing model.

Table 4.7: Cross Validation Results (1st stage)

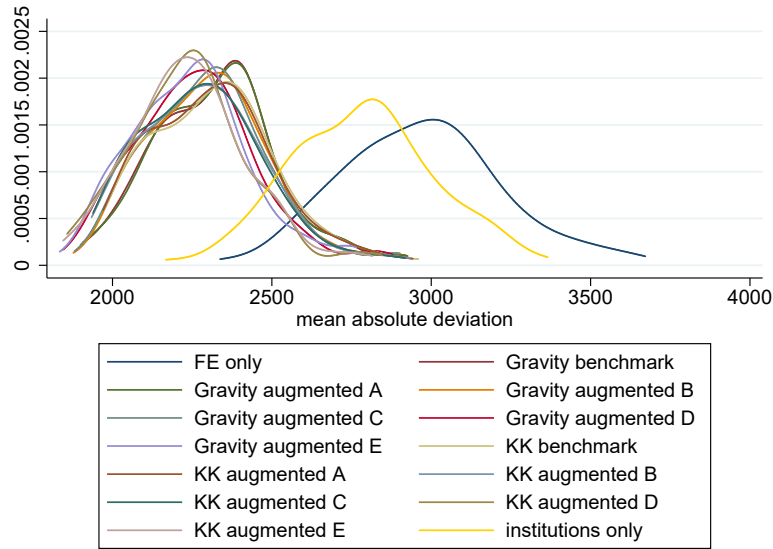
| | MAD | SD(MAD) | RMAD |
|--------------------------|-------|---------|--------|
| FE only | 1,523 | 127 | 100.0% |
| KK homo (w/o SMP) | 1,167 | 96 | 76.7% |
| KK homo (w/ SMP) | 1,171 | 97 | 76.9% |
| KK hetero (w/o SMP) | 1,140 | 91 | 74.9% |
| KK hetero (w/ SMP) | 1,144 | 91 | 75.1% |
| Gravity homo (w/o SMP) | 1,248 | 99 | 82.0% |
| Gravity homo (w/ SMP) | 1,249 | 100 | 82.0% |
| Gravity hetero (w/o SMP) | 1,140 | 89 | 74.8% |
| Gravity hetero (w/ SMP) | 1,137 | 88 | 74.7% |

MAD stand for mean of the Mean Absolute Deviation of cross validation. All criteria based on the same sample of 57,687 observations. MAD derived from 100 iterations with an estimation sample of $0.9 \times 57,687$. RMAD is MAD relative to 'FE only' model.

Table 4.8 and figure 4.7 summarize the results from the second stage. As one can see, all models except for the 'institutions only' model perform much better than

4.5. CROSS VALIDATION

Figure 4.7: Distribution of MAD across Models (2nd stage)



the fixed effect only model. This is not really surprising given that we consider augmented versions of the models performing best in the first stage. It is nevertheless assuring given that the sample size non-randomly shrinks by more than 60 %. Again, the best-performing models have a mean absolute prediction error by about 25 % smaller than a pure fixed effect model with additional outlier control, although this improvement is now somewhat smaller for the benchmark models that performed best in the first stage. The best-performing models in the second stage are variants D and E of the heterogeneous KK model, followed by variant E of the gravity model with surrounding market potential. Performances in out-of-sample prediction between those models are not different in a statistical sense. One may suspect that the higher MAD of the second stage indicates a worse performance of those models but this effect is driven by the fact that the mean of bilateral FDI positions in this considerably smaller sample is considerably higher. In effect, the best-performing model's MAD equals 47.5 % of mean FDI in that sample, indicating a somewhat better out-of-sample pre-

Table 4.8: Cross Validation Results (2nd stage)

| | MAD | SD(MAD) | RMAD |
|----------------------|-------|---------|--------|
| FE only | 2,972 | 253 | 100.0% |
| KK hetero | 2,318 | 199 | 78.0% |
| KK hetero A | 2,311 | 197 | 77.8% |
| KK hetero B | 2,286 | 198 | 76.9% |
| KK hetero C | 2,281 | 196 | 76.7% |
| KK hetero D | 2,240 | 189 | 75.4% |
| KK hetero E | 2,240 | 186 | 75.4% |
| Gravity hetero SMP | 2,322 | 195 | 78.1% |
| Gravity hetero SMP A | 2,323 | 195 | 78.2% |
| Gravity hetero SMP B | 2,303 | 193 | 77.5% |
| Gravity hetero SMP C | 2,297 | 193 | 77.3% |
| Gravity hetero SMP D | 2,263 | 195 | 76.2% |
| Gravity hetero SMP E | 2,245 | 188 | 75.5% |
| Institutions only | 2,783 | 224 | 93.6% |

MAD stand for mean of the Mean Absolute Deviation of cross validation. All criteria based on the same sample of 21,596 observations. MAD derived from 100 iterations with an estimation sample of $0.9 \times 21,596$. RMAD is MAD relative to 'FE only' model.

diction than in the best models in the first stage (in relative terms).

4.6 Discussion and Conclusion

In this analysis we use the new 'Coordinated Direct Investment Statistics' (CDIS) data by the IMF to evaluate the performance of the main theories which have been applied to determine global FDI. We assess the gravity model and the knowledge capital (KK) model accounting for horizontal and vertical motives of FDI and extend the models by factors suggested by theory such as financial, cultural and institutional factors and third country effects in the form of surrounding market potential (SMP) as driving forces of FDI.

The CDIS data set has a large bilateral country coverage, including a large share of developing and transitions economies compared to bilateral FDI data used in previous studies. These characteristics of the CDIS data set account for three challenges, which arise when evaluating the performance of the key theories explaining global FDI. First, to detect vertical FDI it is substantial to have a sufficiently large share of developing countries included, where factor price differences arise. Second, the global South plays an important role in FDI activity, which has not been part in empirical studies as a global region. Third, including institutional and cultural factors in the estimation requires sufficient cross-country variation, which is achieved by the balanced coverage of countries of different income levels.

We follow the standard method applied by previous studies and use the PPML to estimate the different models allowing for heterogeneity with respect to different regions and skill-endowment. We compare the performance of the models in a cross-validation by calculating the mean absolute deviation of the predicted values over all calibration observations in two stages. In the first step we evaluate the homogeneous and heterogeneous gravity and KK model with and without surrounding market potential and in the second step we extend the best-performing models from the first step by financial, cultural and institutional factors.

We find more supporting evidence for (horizontal) market-seeking motives for FDI in the gravity and KK model. Export-platform FDI shows to be an important channel in the gravity model to gain market access. The heterogeneous gravity model reveals that this channel is particularly present for FDI to the

North or for FDI from and to the South. North-South FDI is not driven by the surrounding market potential. This is also in line with theory as we expect North-South FDI to be mostly driven by vertical motives.

Our cross validation procedure reveals that overall the heterogeneous gravity model including SMP performs best, while the KK model performs best when SMP is excluded. Evaluating the extended models reveals that the best-performing models include financial, cultural and institutional factors, while gravity model performs best when including the Hofstede cultural measures. However including institutional factors alone results in the poorest performance compared to the inclusion of financial factors which improve the performance distinctly. In both steps, the best-performing models lead to a reduction of the mean absolute prediction error by about 25 percent compared to our benchmark model.

With regard to institutional distance although we do not find a significant effect in the gravity model, one may argue that the effects depend on the type of country pair, that is North-North, North-South, South-North or South-South. However, we find that in the global KK model there is a significant effect suggesting that a higher quality of institutions in the host promotes FDI.

4.A Appendix

Figure 4.A.1: Outlier Identification

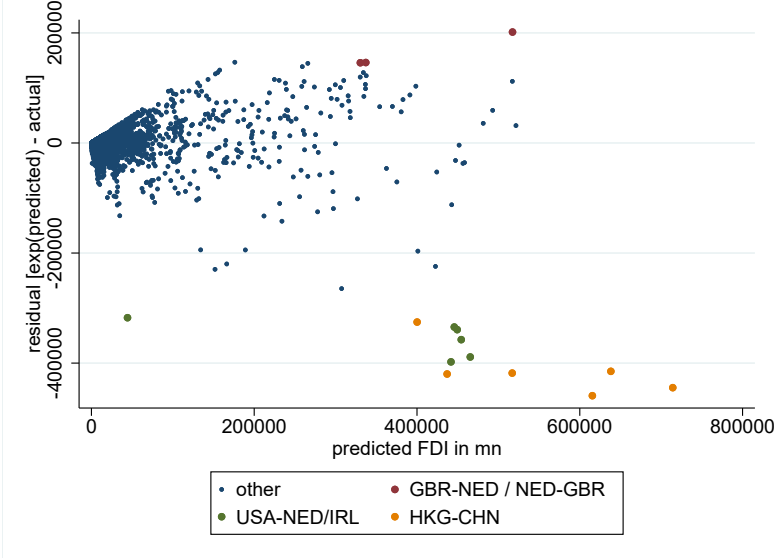


Table 4.A.1: List of Variables

| Variable | Description | Source |
|---------------------------------|--|--|
| Variables of Baseline Models | | |
| FDI stock | Inward FDI stocks (in million constant 2011 US\$). | CDIS data from IMF |
| GDP | Real GDP at constant 2011 national prices (in million 2011 US\$). | 'rgdpna' series of the Penn World Tables (PWT) 9.0 |
| Weighted distance (D) | Population weighted distance between a country pair. | CEPII gravity data set |
| Relative skill endowment (RskE) | Measured as the natural logarithm of 'skilled' in source relative to 'skilled' in source and host minus the natural logarithm of 'unskilled' in host relative to 'unskilled' in source and host, where: 'skilled' is the sum of 'secondary completed' and 'tertiary total' for source and host. | Barro and Lee (2010) |
| Trade costs | Trade costs measured as $100 \times (1 - \frac{X}{GDP} + \frac{M}{GDP})$, while $\frac{X}{GDP}$ and $\frac{M}{GDP}$ denote the export and import shares (' $cs h_x$ ' and ' $cs h_m$ ' series from PWT9.0) of merchandise export and imports at PPP. | PWT 9.0 |
| Investment barriers | Investment barriers are proxied for by the investment freedom index which measures the regulations imposed on investment and which takes values between 0 (where the number and scope of restrictions is so high that investment freedom is eliminated) and 100 (where no restrictions are imposed and firms can move capital freely). | The Heritage Foundation |

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4.A. APPENDIX

Table 4.A.1 – *Continued from previous page*

| Variable | Description | Source |
|---|--|---|
| Sur. market potential (SMP) | The surrounding market potential is defined as the sum of inverse-distance-weighted GDPs of all other surrounding countries except for home and host (which are included as separate regressors in the model) for each year. | Based on GDP data from PWT 9.0 and distance from CEPII's gravity data set |
| Institutional and Cultural Factors | | |
| Institutional distance (InstDist) | Institutional distance, measured as the arithmetic average of the squared difference of each dimension d of the political risk rating (by the ICRG) between two countries relative to the variance of each dimension. | The International Country Risk Guide (ICRG) by the PRS Group (2016) |
| Common colonizer (post 1945) | Dummy variable equal to one if a pair had a common colonist after 1945 and zero otherwise. | CEPII's gravity data set |
| Common off. language | Dummy variable equal to one if a pair has a common official or primary language and zero otherwise. | CEPII's gravity data set |
| Colonial relationship (post 1945) | Dummy variable equal to one if a pair had a colonial relationship after 1945 and zero otherwise. | CEPII's gravity data set |
| Dist. of long-term vs. short-term orientation | Measures the difference of one dimension of national culture by Hofstede et al. (2010), i.e. long-term versus short term orientation index created by of host minus source. The dimension relates to the people's choice of focus with regard to their efforts and determines if they are driven by the past, present or future. It varies from zero to 100 with scores near zero indicating shorter and near 100 longer term orientation. | Hofstede et al. (2010) |

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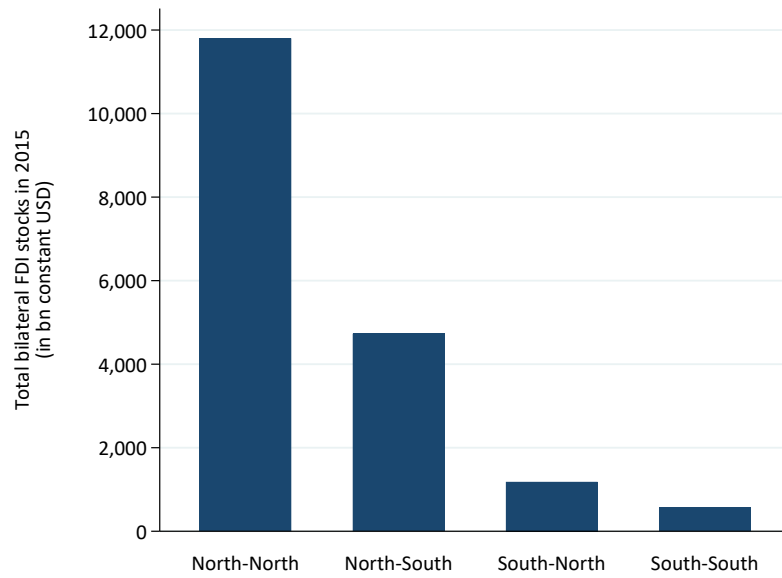
Table 4.A.1 – *Continued from previous page*

| Variable | Description | Source |
|-----------------------------------|---|--------------------------|
| Dist. of indulgence vs. restraint | Measures the difference of one dimension of national culture by Hofstede et al. (2010), i.e. indulgence versus restraint of host minus source. The index relates to the people’s gratification versus control of basic human desires relative to enjoying life. Higher values (close to 100) indicate societies which are more indulgent compared to small values where societies are more restraint. | Hofstede et al. (2010) |
| International Financial Aspects | | |
| Exchange rate | Exchange rate reports the exchange rate for each period in national currency relative to US\$. Estimated values are used if exchange rates are misaligned. | ‘xr’ series from PWT 9.0 |
| Bil. exchange rate regime | Bilateral de-jure exchange rate regime based on the IMF AREAER. It varies from 1 to 10, with the lowest value denoting hard pegs and the maximum value representing free floating regimes. | Harms and Knaze (2018) |
| Dist. in corporate tax rate | Distance in the corporate tax rate of host minus source. Missing values are interpolated. | KPMG documents |
| Dist. financial development | Financial development is proxied by the “Broad based index of financial development”, which is an aggregate index measuring the development of financial institutions and financial markets in terms of their depth, access and efficiency. It is a continuous index varying between zero and one with larger values representing higher development. The distance of financial development subtracts the index of host minus source. | IMF; Svirydzenka (2016) |

Table 4.A.2: Summary Statistics

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|--|-------------|-------------|------------------|------------|------------|
| FDI stocks (in mn) | 57,687 | 2152.9 | 20064.6 | 0.0 | 1158873 |
| GDP | 57,687 | 977523.3 | 2409277 | 2711.3 | 1.83e+07 |
| Rel. skill endowment | 57,687 | -0.031 | 1.0 | -3.5 | 4.0 |
| Weighted distance | 57,687 | 7382.6 | 4317.2 | 114.6 | 19648.5 |
| Trade costs host | 57,687 | 32.5 | 54.8 | -419.0 | 103.9 |
| Trade costs source | 57,687 | 26.8 | 59.3 | -419.0 | 103.9 |
| Investment freedom host | 57,687 | 58.7 | 21.6 | 0.0 | 95.0 |
| Sur. market potential | 57,687 | 22577.1 | 9841.4 | 6.3 | 58628.0 |
| Institutional distance | 48,977 | 1.7 | 1.1 | 0.1 | 875.149 |
| Common colonizer (post 1945) | 57,687 | 0.1 | 0.2 | 0.0 | 1.0 |
| Common language | 57,687 | 0.1 | 0.3 | 0.0 | 1.0 |
| Pair in colonial rel. (post 1945) | 57,687 | 0.0 | 0.1 | 0.0 | 1.0 |
| Dist. of long-term vs. short-term orient. | 26,998 | -1.1 | 32.6 | -96.0 | 96.0 |
| Dist. indulgence vs. restraint | 25,668 | -1.0 | 30.4 | -100.0 | 100.0 |
| Exchange rate host | 57,687 | 563.8 | 2268.8 | 0.3 | 33468.9 |
| Exchange rate source | 57,687 | 507.6 | 2313.0 | 0.3 | 33468.9 |
| Bil. de jure exchange rate regime | 53,989 | 9.0 | 2.1 | 1.0 | 10.0 |
| Corp. tax rate host | 48,715 | 25.1 | 7.3 | 0.0 | 55.0 |
| Corp. tax rate source | 48,986 | 25.3 | 7.4 | 0.0 | 55.0 |
| Dist. of financial dev. | 56,842 | -0.0 | 0.4 | -0.9 | 0.9 |

Figure 4.A.2: FDI Stocks by Income Groups



Source: Author's illustration based on CDIS data

Chapter 5

Conclusion

5.1 Summary

This thesis addresses the actual developments regarding trade agreements and global investment flows. Specifically, I build on the fact that we see an ongoing integration and newly signed trade agreements where more and more developing countries participate on the one hand and more protectionist policies on the other hand. At the same time we can observe that trade agreements have become deeper and today include a comprehensive set of “behind-the-border-rules” which affect domestic policies of the member countries. In the whole thesis, I refer to preferential trade agreements (PTAs) which include all types of trade agreements between two countries or more and, which include rules liberalizing trade at least to some extent. In my analysis I look at the factors determining the formation of PTAs and the effects of PTAs and I look at the factors explaining global FDI flows. In each part of the analysis I inspect the role of institutional quality focusing on political aspects, specifically institutions related to investment and the rule of law. In the respective chapters I argue why those institutions are specifically important when considering the effect or

factors of trade agreements and global investment flows.

In the analysis of the second chapter, I create a panel data set of North-South PTAs building on the comprehensive database on the design of trade agreements (DESTA) by Dür et al. (2014). I analyze the effects of the depth and number of PTAs signed on the quality of institutions in the ‘South’ measured as the political risk component ‘investment profile’ of the ICRG database. I show that the system GMM is the appropriate estimator to apply for my empirical analysis to account for various sources of endogeneity. I find that signing deep PTAs between ‘North’ and ‘South’ positively affects institutions in the ‘South’. Taking a deeper look at the effect for different regions reveals that in Sub-Saharan African (SSA) countries, where institutional quality and economic indicators perform specifically poor, signing deep PTAs does not have any effect on the local institutions. Isolating the effect for ‘Southern’ countries without SSA shows that the positive effect of deep PTAs becomes even larger and highly significant. As a robustness check I use different lags as instruments for the system GMM and show that the effect remains highly significant and positive independent from the used instruments. Another result is that simply signing a large number of PTAs ignoring the depth does not have any effect on domestic institutions, while focusing on PTAs, which include substantive rules with regard to investment (TIPs), shows that the membership in such agreements has a positive and significant effect on institutions. The results show that developing countries from the ‘South’, which typically show poor institutions, can benefit from the recent trend that PTAs have become deeper with regard to the quality of their domestic institutions. As highlighted by the growth literature good institutions are a central factor for the economic development of a country and thus promoting institutions should be a central goal in development economics.

So signing deep PTAs can constitute a long-run development strategy for developing countries and for developed countries as part of their development policy.

The third chapter deals with the determinants of PTAs focusing on institutional distance as a driving factor and regarding PTAs as an instrument to compensate for missing institutions. I argue that the effect of institutional distance is specifically important (1) in a North-South trade relationship where institutional distance is particularly large and (2) if countries trade a large share of contract-intensive goods. For this analysis I create a panel data set including a large number of developing countries and a variable to measure the difference of the share of bilateral contract-intensive exports and show that a linear probability model for discrete choice panel data is a suitable estimator to be used. I address endogeneity using an instrument variable (IV) approach. In general, the results show that institutional distance promotes the formation of PTAs. Comparing this effect for North-North, North-South, and South-South country pairs reveals that the positive effect of institutional distance on the probability of PTA formation is specifically high for the formation of North-South PTAs. Furthermore, I find that the effect is nonlinear. At very large distances of institutional quality the effect turns negative. I also find support for the argument that trading contract-intensive goods reinforces the positive effect of institutional distance for the formation of North-South PTAs. Robustness checks with regard to the underlying sample reveal that the effect of institutional distance is driven by North-South relationships involving the EU. For country pairs where both partner are developing countries, that is South-South country pairs, the effect is also positive, while for North-North country pairs the effect is negative and only turns positive if institutional distance is large enough. The results support the argument that trade agreements can serve as a legal instrument and that the

formation of new PTAs are not only driven by market-access motives, but also to compensate for poor institutions, specifically for unequal trading partners with different income levels.

Finally, chapter 4 is dedicated to global investment flows and aims at deriving a global model to determine the factors of foreign direct investment (FDI) by considering investment flows between and within ‘North’ and ‘South’. We empirically estimate and assess global FDI models, namely the gravity and knowledge capital (KK) model, based on the new CDIS data set by the IMF, which includes a large number of developing and transition countries. This allows us to detect potential vertical motives for FDI and to address the global trend of increasing FDI from and to the global ‘South’. We account for vertical and horizontal motives and add financial, cultural and institutional factors as suggested by theory and account for third country effects by including surrounding market potential. In our cross validation we test the prediction of the models and calculate the average mean absolute deviation as a performance indicator. We find that the heterogeneous gravity model including surrounding market potential and the KK model without surrounding market potential perform best, and lead to a reduction of the mean absolute prediction error by more than 25 percent. A closer inspection of the models including additional controls reveals that including cultural factors lead to the best performance of the KK model and the gravity model. Somehow disappointing is the performance of the model including institutional factors, which does not lead to substantive improvements in the performance although we find a positive effect of institutional quality in the host, which is in line with our expectations. But institutions do not show to be an important driver for the explanation of global FDI.

5.2 Final Words

The main conclusion from the second chapter is that deep PTAs can potentially promote institutions in the ‘South’ and in the long run promote the economic development of developing countries. It should be noted in this regard, that this conclusion only refers to the positive effects resulting from increased institutional quality. But with regard to unequal trading partners an important aspect to be noted is the potentially unequally distributed bargaining power of North-South trading partners, which constitutes a notable challenge for developing countries during the negotiation of such agreements as noted for example by (Gruber, 2000) or Weintraub (2004) and may thus impede development in the South. On that account, Sahakyan (2016) however finds that already existing North-South agreements can potentially raise the bargaining power of Southern countries for subsequent agreements. And even though the bargaining power is potentially unequally distributed between North and South, the positive effect on domestic institutions resulting from a potential North-South agreement may foster the long term economic development.

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KO-AUTORENERKLÄRUNG DECLARATION OF CO-AUTHORSHIP

(Für kumulative Dissertationen)

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Explaining the global landscape of foreign direct investment: Knowledge capital, gravity, and the role of culture and institutions

- nicht eingereicht (*not submitted*)
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