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Florian Hälg

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Essays in Globalisation and the Welfare State

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FLORIAN HÄLG

M.A. in Economics, University of Zurich
B.Sc. in Economics, University of Bern

born on 22.04.1984

citizen of St. Gallen

accepted on the recommendation of

Prof. Dr. Jan-Egbert Sturm, examiner

Prof. Dr. Niklas Potrafke, co-examiner

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Zurich, December 2019

Florian Hälg

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Abstract

This dissertation is a collection of four articles on current issues related to globalisation and its impact on the welfare state.

The first chapter (co-authored with Savina Gygli, Niklas Potrafke and Jan-Egbert Sturm) concerns the measurement of globalisation. We introduce a composite indicator that aims at measuring globalisation for every country in the world along the economic, social and political dimensions of globalisation. The index combines 43 different variables by the means of principal components analysis. We introduce the distinction between de facto and de jure measures of globalisation along the different dimensions of globalisation. Furthermore, we disentangle trade and financial globalisation within the economic dimension of globalisation. In an application, we demonstrate the use of the index by examining the effects of globalisation on economic growth. We show that de facto and de jure globalisation influence economic growth differently.

The second chapter (co-authored with Niklas Potrafke and Jan-Egbert Sturm) examines the determinants of the size of the welfare state. Many theories have been proposed to describe why public social expenditure has increased in industrialised countries. Determinants include globalisation, political-institutional variables such as government ideology and electoral motives, demographic change and economic variables such as unemployment. We employ extreme bounds analysis and Bayesian model averaging to examine robust predictors of social expenditure. Our results identify variables that are negatively, and variables that are positively associated with social expenditure. For example, we find that social expenditure increased under left-wing governments when de facto trade globalisation was pronounced.

Our findings show that policymakers still have leeway in designing social policies when globalisation exerts pressure on domestic governments.

In the third chapter, I study how the removal of technical barriers to trade affects different margins of exporting. I study two different trade liberalisation policies between Switzerland and the European Union: the harmonisation of technical regulations and mutual recognition of conformity assessments. The results show that harmonisation increase Swiss exports at the extensive and intensive margin, while mutual recognition increase exports predominantly at the intensive margin. Product-sectors with relatively high regulatory intensity profit more from removing technical barriers to trade.

The fourth chapter concerns international financial integration. I investigate on the roles of different information transmission channels in mitigating informational frictions and promoting financial globalisation. I exploit measures of information transmission derived from the KOF Globalisation Index. Using a panel of 132 countries for the years 1985-2016 and controlling for standard variables of international financial integration, I show that financial globalisation is positively associated with measures of personal contacts, but not associated with measures of information flows and cultural proximity. I propose that personal contacts are important to overcome cross-border informational frictions that restrict international financial integration.

Zusammenfassung

Diese Dissertation besteht aus vier Forschungsarbeiten zu aktuellen Themen der Globalisierung und deren Auswirkung auf den Wohlfahrtsstaat.

Das erste Kapitel (verfasst mit Savina Gygli, Niklas Potrafke und Jan-Egbert Sturm) behandelt die Messung von Globalisierung. Wir stellen einen Indikator vor, der den Grad der Globalisierung, unterteilt in die ökonomische, soziale und politische Globalisierung, für jedes Land der Welt misst. Der Index kombiniert 43 verschiedene Variablen anhand der Hauptkomponentenanalyse. Wir unterscheiden zwischen Aspekten der de facto und de jure Globalisierung in den einzelnen Dimensionen der Globalisierung. Zusätzlich unterscheiden wir zwischen der Handelsglobalisierung und der finanziellen Globalisierung in der ökonomischen Dimension der Globalisierung. Wir zeigen auf, wie der Index angewendet werden kann, um die Auswirkungen der Globalisierung auf das Wirtschaftswachstum zu messen. Die Resultate deuten darauf hin, dass de facto und de jure Aspekte der Globalisierung unterschiedlich auf das Wirtschaftswachstum wirken.

Das zweite Kapitel (verfasst mit Niklas Potrafke und Jan-Egbert Sturm) widmet sich den Determinanten des Wohlfahrtsstaates. Verschiedene Theorien wurden vorgeschlagen, um den Anstieg der staatlichen Sozialausgaben in den Industrieländern zu erklären. Als Bestimmungsfaktoren wurden Globalisierung, politisch-institutionelle Faktoren wie beispielsweise Regierungsideologie oder Wahlmotive, der demographische Wandel, oder ökonomische Faktoren wie Arbeitslosigkeit genannt. Wir wenden die Grenzwertanalyse und die Bayesianische Modelldurchschnittsmethode an, um robuste Determinanten des Wohlfahrtsstaates zu bestimmen. Wir identifizieren unterschiedliche Variablen, die positiv oder negativ mit den Sozialausgaben

korrelieren. So steigen die Sozialausgaben beispielsweise unter linken Regierungen stärker an, wenn die de facto Handelsglobalisierung hoch ist. Unsere Ergebnisse zeigen, dass die politischen Entscheidungsträger in den einzelnen Staaten weiterhin Spielraum besitzen um die Sozialpolitik zu gestalten, auch wenn Regierungen durch die Globalisierung unter Druck geraten.

Im dritten Kapitel untersuche ich, wie der Abbau technischer Handelshemmnisse auf unterschiedliche Exportkanäle wirkt. Ich untersuche die Handelsliberalisierung zwischen der Schweiz und der Europäischen Union anhand zweier Handelspolitiken: Die Harmonisierung technischer Vorschriften und die gegenseitige Anerkennung von Konformitätsbewertungen. Die Resultate zeigen, dass die Harmonisierung technischer Vorschriften die Exporte am intensiven und extensiven Rand erhöhen, während die Anerkennung von Konformitätsbewertungen die Exporte nur am intensiven Rand erhöhen. Produktsektoren mit einer hohen Regulierungsdichte profitieren stärker vom Abbau technischer Handelshemmnisse.

Das vierte Kapitel behandelt die internationale Finanzintegration. Ich untersuche, wie verschiedene Kanäle des Informationsaustausches die finanzielle Globalisierung fördern. Ich verwende dabei Indikatoren für verschiedene Informationskanäle aus dem KOF Globalisierungsindex. Anhand eines Paneldatensatzes mit 132 Ländern für die Jahre 1985-2016 zeige ich, dass die finanzielle Globalisierung positiv mit Indikatoren für persönliche Kontakte korreliert, jedoch kein Zusammenhang mit Indikatoren für Informationsaustausch und kulturelle Nähe besteht. Die Resultate zeigen auf, dass persönliche Kontakte wichtig sind um Informationsfriktionen zu beheben und die internationale finanzielle Integration voranzutreiben.

Introduction

This dissertation combines four articles directed to current issues related to globalisation and its impact on the welfare state. Globalisation was proceeding rapidly for a long time and it was hard to believe that globalisation would be pushed back. However, the recent years have seen a return to protectionism unprecedented in the postwar era. In 2018, the United States enacted several rounds of tariff hikes, which increased import tariffs from 2.6% to 16.6% (Fajgelbaum et al., 2019). The US president intimidated his Western allies giving rise to the question of whether new political alliances are likely to be established. Citizens in the United Kingdom voted to leave the European Union (Brexit). The United Kingdom and the European Union negotiate a withdrawal agreement. It is conceivable that a new era of globalisation has begun.

To examine causes and consequences of globalisation in more detail, we need to measure globalisation. Single indicators, such as trade as percentage of GDP, are frequently used in the empirical literature, but fail to capture the multidimensional aspect of globalisation. The first chapter of this dissertation introduces a composite index measuring globalisation for every country in the world along the economic, social and political dimension. The index is based on principal components analysis that combines 43 different variables. The index is an attempt to capture the multidimensional nature of globalisation. Compared to an older version of the index, we introduce the distinction between de facto and de jure measures of globalisation along the different dimensions of globalisation. We also differentiate between trade and financial globalisation within the economic dimension of globalisation. Finally, we introduce time-varying weighting of the variables. Figure 1 displays the results

of the index for the year 2016 for every country in the world. The index allows for flexible aggregation of different dimensions and characteristics of globalisation and researchers are able to extract the dimension and aggregation levels that is relevant to their research question. In an application, we demonstrate the use of the index by examining the effects of globalisation on economic growth. The results corroborate the findings from the literature that globalisation promotes economic growth, especially in developing countries. However, we show that de facto and de jure globalisation influence economic growth differently.

Figure 1: Level of globalisation as measured by the KOFGI in 2016
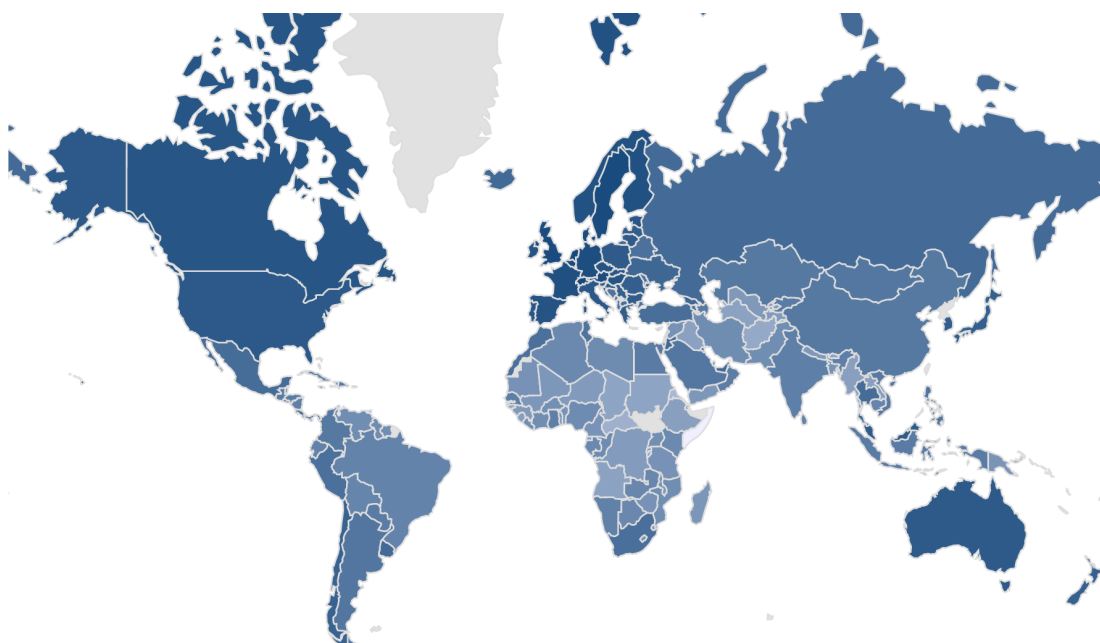
Notes: Worldwide level of globalisation in 2016 as measured by the KOF Globalisation Index (KOFGI). Dark-blue shaded areas indicate higher levels of globalisation. Light-blue shaded areas indicate lower levels of globalisation. Grey areas indicate missing data.

In the second chapter, we portray determinants of the size of the welfare state in OECD countries. What determines the size of the welfare state is one of the most important questions in public finance. In recent years, many industrialised countries have witnessed an increase in social expenditure, as measured by the share of

GDP. In particular, social expenditure increased rapidly during the Great Recession of 2008-09. In many OECD countries, social expenditure assumes the lion's share of general government expenditure. Large budget shares for social expenditure give rise to smaller budget shares for other types of expenditure such as public goods, a phenomenon which has been described as social dominance (Schuknecht and Zemanek, 2020). Many theories have been proposed to describe why social expenditure has increased in industrialised countries. Determinants include globalisation, political-institutional variables such as government ideology and electoral motives, demographic change and economic variables such as unemployment. We employ extreme bounds analysis and Bayesian model averaging to examine robust predictors of social expenditure. Our results identify variables that are negatively, and variables that are positively associated with social expenditure. For example, we find that social expenditure increased under left-wing governments when de facto trade globalisation was pronounced. We conclude that policymakers in individual countries still have leeway in designing social policies when globalisation exerts pressure on domestic governments

In the third chapter of this dissertation, I study how the removal of technical trade barriers affects different margins of exporting. Technical trade barriers constitute one of the most pervasive non-tariff barriers to trade between industrialised countries today and reducing them has become a top priority in international trade liberalisation initiatives. However, empirical evidence on the trade effects of different policies of regulatory cooperation is still relatively scant. I study two different trade liberalisation policies between Switzerland and the European Union directed to removing technical trade barriers: harmonisation of technical regulations and mutual recognition of conformity assessments. My identification strategy exploits the fact that the selection of product-sectors subject to the policies is exogenous for Switzerland because it followed the European Economic Area agreement that was negotiated ten years earlier, but rejected by Switzerland in a popular vote. I apply difference-in-differences estimations on a detailed dataset of Swiss product-level exports for the years 1992-2012. I exploit product-country-time variation in the trade

policies and control for an extensive set of fixed effects. My results show that regulatory harmonisation increased exports at the intensive and extensive, while mutual recognition increased exports at the intensive margin. Product-sectors with relatively high regulatory intensity profit more from removing technical trade barriers. I also point to important interdependencies between the different trade policies.

The fourth chapter concerns international financial integration. I investigate on the roles of different information transmission channels in mitigating informational frictions and promoting financial globalisation. The geography of information has been described as the main determinant of the pattern of international financial transactions (Portes and Rey, 2005). In my empirical analysis, I exploit different measures of information transmission derived from the social dimension of the KOF Globalisation Index. Using a panel of 132 countries for the years 1985-2016 and controlling for standard variables of international financial integration put forward in the literature, I show that financial globalisation is positively associated with measures of personal contacts, but not associated with measures of information flows and cultural proximity. I propose that personal contacts are important to overcome cross-border informational frictions that restrict international financial integration.

Chapter 1

The KOF Globalisation Index – revisited[1]

1.1 Introduction

How globalisation influences our daily lives is still a controversial issue. In fact, globalisation was proceeding rapidly for a long time and it was hard to believe that globalisation would be pushed back. In 2018, however, US president Donald Trump re-introduced tariffs and initiated tariff wars. Trump did what he promised during his election campaign and what many citizens and scholars did not believe a Republican president would do: protectionist policies. Trump also intimidated his Western allies at the G7 and NATO summits, giving rise to the question of whether new political alliances are likely to be established. Citizens in the United Kingdom voted to leave the European Union (Brexit). The United Kingdom and the European Union negotiate the withdrawal agreement. It is conceivable that a new era of globalisation has begun in 2018.

To examine consequences and causes of globalisation in more detail, we need to measure globalisation. Single indicators, often reflecting openness, such as trade as a percentage of GDP, are frequently used as a proxy for globalisation. Globalisation

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[1]This chapter is based on Gygli et al. (2019).

is, however, a multifaceted concept that encompasses much more than openness to trade and capital flows. It also includes citizens of different countries communicating with each other and exchanging ideas and information, or governments working together to tackle political problems of global reach. Consequently, scholars need to account for manifold facets of globalisation. Composite indicators, such as the KOF Globalisation Index, are cases in point because they allow combining different variables, measuring different aspects of globalisation, into one index. Several composite indicators measuring globalisation have been proposed. The KOF Globalisation Index, introduced by Dreher (2006) and updated in Dreher et al. (2008), measures globalisation along the economic, social and political dimension for almost every country in the world since 1970. It has become the most widely used globalisation index in the academic literature (Potrafke, 2015).

We introduce the second revision of the KOF Globalisation Index. We propose an index that allows for flexible aggregation of different dimensions and characteristics of globalisation. The revised version of the KOF Globalisation Index distinguishes between de facto and de jure globalisation. While de facto globalisation measures actual international flows and activities, de jure globalisation measures policies and conditions that, in principle, enable, facilitate and foster flows and activities. Quinn et al. (2011) show, for example, that the decision to use either de facto or de jure measures of financial openness gives rise to systematically different findings in the financial openness-economic growth nexus. We propose a separate de facto and de jure globalisation index and maintain this distinction within every dimension and sub-dimension of the index. The overall KOF Globalisation Index combines de facto and de jure globalisation (Table 1.1 shows the individual components). We thus follow related studies such as Feld and Voigt (2003) and Voigt et al. (2015) that have shown how important it is to distinguish between de facto and de jure elements of institutions, policies and their potential outcomes.

The revision of the KOF Globalisation Index also includes other new components: we disentangle trade and financial globalisation within the economic dimension of globalisation, we allow the weights of the underlying variables to vary over time and we define cultural globalisation in a broader way. Some variables from the

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2007 version of the KOF Globalisation Index are replaced, and many new variables, especially measuring de jure characteristics of globalisation, are introduced. The total number of underlying variables had increased from 23 to 43 compared to the previous version of the index.

Table 1.1: Structure of the KOF Globalisation Index

KOF Globalisation Index, de facto	Weights	KOF Globalisation Index, de jure	Weights
Economic Globalisation, de facto	33.3	*Economic Globalisation,* de jure	33.3
Trade Globalisation, de facto	50.0	*Trade Globalisation,* de jure	50.0
Trade in goods	38.8	Trade regulations	26.8
Trade in services	44.7	Trade taxes	24.4
Trade partner diversity	16.5	Tariffs	25.6
		Trade agreements	23.2
Financial Globalisation, de facto	50.0	*Financial Globalisation,* de jure	50.0
Foreign direct investment	26.7	Investment restrictions	33.3
Portfolio investment	16.5	Capital account openness	38.5
International debt	27.6	International investment agreements	28.2
International reserves	2.1		
International income payments	27.1		
Social Globalisation, de facto	33.3	*Social Globalisation,* de jure	33.3
Interpersonal Globalisation, de facto	33.3	*Interpersonal Globalisation,* de jure	33.3
International voice traffic	20.8	Telephone subscription	39.9
Transfers	21.9	Freedom to visit	32.7
International tourism	21.0	International airports	27.4
International students	19.1		
Migration	17.2		
Informational Globalisation, de facto	33.3	*Informational Globalisation,* de jure	33.3
Used internet bandwidth	37.2	Television access	36.8
International patents	28.3	Internet access	42.6
High technology exports	34.5	Press freedom	20.6
Cultural Globalisation, de facto	33.3	*Cultural Globalisation,* de jure	33.3
Trade in cultural goods	28.1	Gender parity	24.7
Trade in personal services	24.6	Human capital	41.4
International trademarks	9.7	Civil liberties	33.9
McDonald's restaurants	21.6		
IKEA stores	16.0		
Political Globalisation, de facto	33.3	*Political Globalisation,* de jure	33.3
Embassies	36.5	International organisations	36.2
UN peace keeping missions	25.7	International treaties	33.4
International NGOs	37.8	Treaty partner diversity	30.4

Notes: Weights in percent for the year 2016. Weights for the individual variables are time variant. Overall indices for each aggregation level are calculated by the average of the respective de facto and de jure indices.

Following Dreher (2006), we use the new index to examine the effect of globalisation on economic growth. The results suggest that de facto and de jure globalisation influence economic growth in different manners. Future research should use the new KOF Globalisation Index to re-examine other important consequences of globalisation and why globalisation was proceeding rapidly in some countries, such as South Korea, but less so in others. The rest of the chapter is structured as follows. Section 1.2 deals with measuring globalisation and summarises related literature while focusing on as of how to improve the KOF Globalisation Index. Section 1.3 describes how the new version of the KOF Globalisation Index is constructed. Section 1.4 describes differences between the previous and new version. Section 1.5 includes our application to economic growth. Section 1.6 concludes.

1.2 Measuring globalisation

1.2.1 Defining globalisation

Designing a composite indicator measuring globalisation requires a definition of globalisation. Our definition of globalisation stems from Dreher (2006) and is based on Clark (2000) and Norris (2000):

Globalisation describes the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through a variety of flows including people, information and ideas, capital, and goods. Globalisation is a process that erodes national boundaries, integrates national economies, cultures, technologies and governance, and produces complex relations of mutual interdependence.

We follow Dreher (2006), who, based on Nye and Keohane (2000), distinguishes between three different dimensions of globalisation. Economic globalisation characterises long distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges. Social globalisation expresses the spread of ideas, information, images and people. Political globalisation characterises the diffusion of government policies.

Scholte (2008) and Caselli (2012) propose that globalisation differs from similar concepts such as internationalisation, liberalisation, universalisation or Westernisation. According to them globalisation is the spread of trans-planetary or supra-territorial connections between people. Internationalisation refers to an increase in transactions and interdependencies between countries. Liberalisation denotes the process of removing officially imposed restrictions on movements of resources between countries. Universalisation describes the process of dispersing various objects and experiences to people at all inhabited parts of earth. Westernisation is interpreted as a particular type of universalisation, in which social structures of Western societies are spread across earth. All of these concepts are close to each other and sometimes used interchangeably. A clear distinction would be helpful, but is difficult to achieve. We therefore agree with Figge and Martens (2014), who claim that a distinction of all these concepts is not needed, when a pluralistic and multi-scale definition of globalisation is employed.

1.2.2 Literature and critique

Previous measures of globalisation

Scholars were active in constructing encompassing indicators of globalisation since the early 2000s (for an overview of some of the most popular globalisation indices, see Table 1.2). The A.T. Kearney/Foreign Policy Globalisation Index (ATK/FP) was one of the first globalisation indices, launched in 2001 and continued until 2006, and has served as a prototype for many later indices (A.T. Kearney/Foreign Policy 2001). Developed almost simultaneously, the KOF Globalisation Index followed in 2002 and was updated in 2007 (Dreher, 2006; Dreher et al., 2008). The Centre for the Study of Globalisation and Regionalisation (CSGR) at the University of Warwick produced the CSGR Globalisation Index for the years 1982 to 2004, measuring the economic, social and political dimension of globalisation using 16 variables and determining the weights by the means of principal components Lockwood and Redoano (2005). A distinguishing feature of the CSGR Globalisation Index is that variables measuring openness are adjusted for country characteristics such as initial population size, land

area and whether a country is landlocked or not. It therefore measures a country's level of globalisation conditional on its potential.

Table 1.2: Globalisation Indices - Overview and main characteristics

Measure	Countries, Years, Indicators	Description	Characteristics
KOF Globalisation Index - 2018 Version	203, 1970-2016, 43	Comprehensive indicator covering the economic, social and political aspects of Globalisation distinguishing between de facto and de jure.	Distinction between de facto and de jure Globalisation for each dimension and sub-dimension of the index. Differentiation between trade and financial globalisation. Wide coverage in terms of countries and years.
KOF Globalisation Index - 2007 Version	207, 1970-2015, 23	Comprehensive indicator covering the economic, social and political aspects of Globalisation.	Wide coverage in terms of countries and years. Hybrid-measure. No clear distinction between trade and financial Globalisation.
Maastricht Globalisation Index (MGI), 2012 Edition	117, 2000, 2008, 2012, 11	Comprehensive indicator covering the political, economic, social and cultural, technological and environmental domain of Globalisation.	Includes an environmental dimension. Only covers three years.
A.T. Kearney/ Foreign Policy Globalisation Index (ATK/ FP)	62, 2002-2007, 14	First composite indicator measuring Globalisation. Covers political engagement, technology, personal contact and economic integration on a global scale.	Used as benchmark by many alternative indices.
GlobalIndex	97, 1970-2002, 31	Sociological index of Globalisation covering the economic, sociotechnical, cultural and political dimensions of Globalisation.	Extends existing indices by additional dimensions and indicators representing a sociological concept of Globalisation.
CSGR Globalisation Index	119, 1982-2004, 16	Composite index measuring the economic, political and social aspects of Globalisation. Weights of variables are determined by principal components analysis.	Variables measuring openness are corrected for by fixed country characteristics (initial population size, land area and if a country is landlocked).
New Globalisation Index (NGI)	70, 1995-2005, 21	Comprehensive indicator measuring the economic, political and social aspects of Globalisation controlling partly for geographical distances between countries.	Controlling for geographical distance helps to some extend to distinguish Globalisation from regionalisation.
DHL Connectedness Indicator (GCI)	140, 2005-2015, 12	Composite indicator measuring depth and breadth of country's integration with the rest of the world. Covers international flows of goods and services, capital, information and people.	Distinction between depth and breadth of integration.

Kluver and Fu (2004) calculated the Cultural Globalisation Index, which measured the global spread of ideas by trade in media related goods between countries. Raab et al. (2008) attempted to include the sociological concept of globalisation and extended the cultural dimension of globalisation with variables related to the international convergence of norms and values in their so-called GlobalIndex. The Maastricht Globalisation Index (MGI) included the environmental dimension, represented by the ecological footprint of exports and imports as a share of biocapacity Figge and Martens (2014). The New Globalisation Index (NGI) introduced distance weighting of some of the variables to better distinguish globalisation from regionalisation Vujakovic (2010). The DHL Connectedness Index, measuring connectedness rather than globalisation, distinguished between depth and breadth of integration along the different dimensions of globalisation Ghemawat and Altman (2016).

The KOF Globalisation Index is arguably the most popular globalisation index. It encompasses a large panel dataset including 203 countries and territories and spans from 1970-2016. The data is easily accessible and a yearly update increases its timespan annually.[2] Potrafke (2015) reviews 120 empirical studies that use the 2007 version of the KOF Globalisation Index.

Scholars are also active in discussing a suitable definition of globalisation and characteristics that have to be accounted for when measuring globalisation.[3] We describe different issues concerning the measurement of globalisation defined by Martens et al. (2015) to arrive at how we design the revised KOF Globalisation Index: (i) the focus of measurement, (ii) the unit of measurement, (iii) the dimensions of globalisation, (v) the differentiation between globalisation and regionalisation and, (vi) the transformation of variables in the light of country-specific factors.

Focus of measurement: De facto globalisation and globalisation policies

Globalisation indices differ by their focus of measurement such as de facto globalisation or globalisation policies and conditions, also called de jure measures. While

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[2]The KOF Globalisation Index is available at `http://www.kof.ethz.ch/globalisation`.

[3]See, among others, Dreher et al. (2008), Dreher et al. (2010), OECD (2010), Caselli (2012) and Martens et al. (2015).

de facto globalisation measures actual flows and activities, de jure globalisation measures policies, resources, conditions and institutions that, in principle, enable or facilitate actual flows and activities. Most globalisation indices focus on de facto globalisation. Exceptions are the 2007 version of the KOF Globalisation Index and the GlobalIndex by Raab et al. (2008). Both combine de facto and de jure measures, labelled as actual flows and restrictions, within the economic dimension of globalisation.[4]

Martens et al. (2015) advocate a sharp distinction between de facto and de jure measures of globalisation. De facto and de jure measures may well differ substantially, when, for example, a policy is strict on paper, but toothless in practice (Kose et al., 2009). When investigating the relationship between financial openness and economic growth, Quinn et al. (2011) show that the choice of financial openness indicators influences the results a great deal. De jure financial openness was positively correlated with economic growth, de facto financial openness lacked statistical significance. In the revised KOF Globalisation Index, we propose to disentangle de facto and de jure measures of globalisation in all dimensions and sub-dimensions of the index

Unit of measurement: National, subnational or individual

The KOF Globalisation Index focuses, as most other globalisation indices, on measuring globalisation at the national level. This has drawbacks: it omits all within country transactions and often neglects the geographical distribution of linkages (Martens et al., 2015). Moreover, concentrating on the national perspective conflicts with the notion that globalisation erodes national borders, reducing the importance of nation states. Given the distinct feature of globalisation being its supra-territoriality, as opposed to internationalisation, Scholte (2008) raises the question

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[4]In the 2007 version of the KOF Globalisation Index, the sub-dimension actual flows includes variables on trade and capital flows, clearly a de facto measure of globalisation. The sub-dimension restrictions, includes variables on import barriers and tariff rates and can be categorised as de jure measure of globalisation.

on how to justify using the nation state as the main unit of measurement. Consequently, indices that depart from the perspective of nation states have been proposed, such as the Person-Based Globalisation Index (PBGI) by Caselli (2013) and the Global Cities Index (GCI) by A.T. Kearney (2018). They provide new perspectives and additional insights to the multidimensional concept of globalisation. There are, however, some good reasons to focus on the national perspective when measuring globalisation. National governments remain the main actors in shaping the globalisation process and nations continue to be the reference points for most people today (Martens et al. 2015). Finally, data availability is highest at the national level.

Dimensions of Globalisation: Economic, social and political dimension

The KOF Globalisation Index distinguishes between the economic, social and political dimensions of globalisation. Economic globalisation includes trade and financial globalisation. Social globalisation includes interpersonal, informational and cultural globalisation. Figge and Martens (2014) propose two additional dimensions in the Maastricht Globalisation Index: technological and ecological globalisation. While technological globalisation includes measures of communication technology that overlap with the social dimension of the KOF Globalisation Index, the ecological dimension is a distinct feature of the Maastricht Globalisation Index.

Cultural globalisation as part of social globalisation is the most difficult dimension to grasp. The initial definition of cultural globalisation in the KOF Globalisation Index goes back to Saich (2000) and Rosendorf (2000) who defined it as the international dispersion of Western and in particular American values. This view has been criticised as being too much focused on Western cultural peculiarities and its global spread (Raab et al., 2008; Dreher et al., 2010; Martens et al., 2015). Raab et al. (2008) take a more refined look at cultural globalisation, trying to abstain from focusing too much on Western culture. Following sociological studies on international cultural diffusion, the authors include variables measuring the spread of values and standards of rationalism around the world. They interpret the diffusion of such values as globalisation in cultural affairs. Kluver and Fu (2004) note that

transmission of cultural values is closely related to sharing cultural goods and services such as movies, TV series, music and other works of art across borders. Disdier et al. (2010) use bilateral trade in cultural goods as a proxy for countries' cultural proximity. Hellmanzik and Schmitz (2015) use trade in audio-visual services based on bilateral hyperlinks and bilateral website visits as a proxy for cultural proximity. In the revised KOF Globalisation Index, we propose a broader definition of cultural globalisation inspired by Raab et al. (2008) and include additional variables compared to the previous version of the index.

Globalisation versus Regionalism: Accounting for distances, intensities and networks

Most globalisation indices do not consider distances, intensities and network sizes in the calculation of their index. In that sense, globalisation can often not be distinguished from related concepts such as openness or regionalism (Vujakovic, 2010; Martens et al., 2015). A classic example is trade, usually employed as the sum of total exports and imports in percent of GDP. A country may increase its trade to GDP ratio by trading a great deal with neighbouring countries (Mexico for example exports over 80% of its goods to the United States) or by trading with many countries at larger global distances. While trading with neighbouring countries rather describes regionalism, trading with many countries at larger distances can be regarded as globalisation. To account for these shortcomings, Vujakovic (2010) proposes to weight trade data with the bilateral distance between the capital cities. Greater distances give rise to higher weighted trade, which indicates a higher degree of globalisation.

The DHL Connectedness Index is a more recent attempt to account for networks in the definition of globalisation (Ghemawat and Altman, 2016). The DHL Connectedness Index defines globalisation as the concentration of relationships across borders. Countries maintaining smaller numbers of international connections are assigned lower levels of globalisation than countries that maintain connections with many partners, independent of locations or distances. Babones and Farabee-siers

(2008), Lombaerde and Iapadre (2008) and OECD (2010) propose to include variables that indicate a country's trading partner concentration, calculated using the Herfindahl-Hirschmann concentration index, as a proxy for the trading partner network.

The drawback of all methods that account for the geographical distribution of linkages is that bilateral data is needed for the calculation. However, bilateral information is only available for few variables, such as trade in goods or bilateral treaties. In the revised KOF Globalisation Index, we account for network effects to some extent, by including variables measuring trading partner diversity and treaty partner diversity in the economic and political dimension, respectively. Both diversity variables are calculated as the inverse of the Herfindahl-Hirschmann concentration index.

Transformation of variables: Accounting for country-specific factors

The outcome of many variables, in particular most de facto variables, is influenced by exogenous and country-specific factors. Larger countries exhibit, for example, higher trade volumes in absolute terms. Landlocked countries are less integrated in world markets than countries with access to the sea because of higher transport costs. Hence, constructing a globalisation index includes deciding on how to deal with the influence of such exogenous factors. The 2007 version of the KOF Globalisation Index accounts for the size of a country by dividing variables by GDP or population size. This procedure is maintained in the revised version of the index. Lockwood (2004) proposes a more rigorous way of controlling for geographical characteristics of a country: he regresses each variable on exogenous factors such as population, land area and whether a country is landlocked. The residuals of such regressions, which describe the difference between the predicted value based on geographical characteristics and the actual value of the variable, are included in the index. Lockwood and Redoano (2005) use this technique to transform all economic variables related to openness in the CSGR Globalisation Index. Vujakovic (2010) also transforms different variables included in her globalisation index. She shows that the transformation favours bigger countries, assigning them higher levels

of globalisation than they otherwise would have had. However, it goes beyond the treatment of variables that is suggested by the definition of globalisation in Clark (2000), Norris (2000) and Nye and Keohane (2000). These authors describe globalisation as a process that connects actors, which does not call for more than a correction of size effects.

1.3 The KOF Globalisation Index revisited

1.3.1 Content of the revision

Whereas this revision does lead to some substantial changes as compared to the previous version of the KOF Globalisation Index, we are still constrained by a number of factors in the selection of the variables. While we wish to consider as many individual variables as possible to portray the multifaceted concept of globalisation and to exploit their variation when using principal component analysis, we rely on variables with a broad coverage that are updated regularly. We need variables that cover basically all countries in the world from 1970 onwards. This excludes many variables that are, for example, collected for OECD countries only. Because we continue to release an update of the KOF Globalisation Index on a yearly basis, we need variables of which we know that these will be regularly updated and published. Furthermore, using principal components analysis to determine the weights of the individual variables requires a minimum number of variables. As we do not want a single variable to dominate one particular sub-dimension, we employ the rule that for each sub-dimension we need at least three variables. Distinguishing between de facto and de jure globalisation in every sub-dimension (trade, financial, interpersonal, informational, cultural and political) requires a minimum set of 36 variables.

Distinction between de facto and de jure globalisation

The new KOF Globalisation Index distinguishes between de facto and de jure measures of globalisation. We compute a separate index for the de facto and de jure

economic, social and political dimensions of globalisation. On the sub-dimensional level, we compute a separate index for de facto and de jure trade, financial, interpersonal, informational and cultural globalisation. Some variables in the 2007 version of the KOF Globalisation Index measure the possibility for information exchange between international actors. These variables include access to television and internet and are reclassified as de jure indicators in the revised KOF Globalisation Index. Many new variables, especially measuring de jure globalisation, are introduced.

Distinction between trade and financial globalisation

The economic dimension of the revised KOF Globalisation Index consists of the two sub-dimensions: trade globalisation and financial globalisation. We consider this a key advantage over the 2007 version of the KOF Globalisation Index and other globalisation indices. The distinction between trade and financial liberalisation has already been employed in previous studies. Jaumotte et al. (2013), for example, examine how trade and financial globalisation influence income distribution within a country. The results show that trade globalisation was negatively associated with income inequality, and financial globalisation was positively associated with income inequality.[5] Kose et al. (2009) find that both trade and financial globalisation influence the nexus between output volatility and growth. The effect tends to be stronger for trade globalisation. Other studies, however, show that trade and financial globalisation go hand in hand (see, for example, Lane and Milesi-Ferretti (2008a).

Measuring cultural globalisation more broadly

Another feature of the revised KOF Globalisation Index is to measure cultural globalisation more broadly. We include more variables that do not rely on individual value concepts. The original selection of variables in the 2002 version of the KOF

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[5]de Haan and Sturm (2017) and de Haan et al. (2018) confirm that financial development, financial liberalisation and banking crises all increase income inequality. The level of financial development and the quality of political institutions thereby condition the impact of financial liberalisation on inequality.

Globalisation Index was based on an understanding of cultural globalisation based on Saich (2000), which defines modern cultural globalisation largely as the dispersion of American values. It was measured by the number of McDonald's restaurants in a country. The focus on American values was somewhat relaxed in the 2007 version of the index by including the number of IKEA stores and trade in books as additional variables. In any event, the KOF Globalisation Index has been criticised for rather measuring Westernisation than cultural globalisation in general. In the revised version of the KOF Globalisation Index, we include three new de facto variables measuring cultural globalisation, of which none relies on an individual value concept. These variables measure trade in cultural goods, trademark applications of non-residents and trade in personal, cultural and recreational services. The variables McDonald's restaurants and IKEA stores are still included in the index.

Time-varying weights for the aggregation

The revised KOF Globalisation Index includes time-varying weighting of the individual variables in the aggregation process. As in the 2007 version of the KOF Globalisation Index, we use principal component analysis to determine the weights of the individual variables for the lowest aggregation level of the index. However, we no longer use the full sample years to determine time-invariant weights, but instead apply principal component analysis on rolling windows of 10 years to calculate time-varying weights. This procedure has the advantage of letting the weights adjust over the years to account for changes in the role of individual variables in serving as proxies for globalisation.

We reassess the ability of some variables contained in the 2007 KOF Globalisation Index to measure flows of information and communication over the entire time span. Some variables in the 2007 version of the index, such as international letters, trade in newspapers and trade in books, are strongly affected by the digitalisation and the internet and are gradually replaced by different information and communication channels. Ideally, we would like to include variables measuring those new channels alongside with the variables measuring the traditional channels to capture some of the substitution between the two variables over time. However, when no measures

for those new means of communication are readily available for many countries, we exclude some of the previous variables. Still including these variables would indicate that social globalisation is decreasing, while in fact only the means of communication are changing.

1.3.2   Dimensions of the index and variable selection[6]

De facto economic globalisation

De facto trade globalisation: The sub-dimension de facto trade globalisation refers to the exchange of goods and services over long distances. This is measured using the variables exports and imports of goods and exports and imports of services, both measured as a share of GDP. To account for the geographical distribution of trade linkages, we include a variable that measures trade partner diversity. It is computed as the inverse of the average over the Herfindahl-Hirschmann trade partner concentration index for exports and imports of goods. That is, indexing countries by i and their trade partners by j, the Herfindahl-Hirschmann index is equal to $HHI_i = \sum_{j=1}^{n}(a_j^i)^2$, where a_j^i is the share of trade partner j in country i's exports or imports. The more dispersed exports and imports of a country over different trade partners are, the lower HHI_i and the higher the value of our variable. The variable trade partner diversity favours countries whose export and import structure is globally oriented as compared to countries that primarily trade regionally. Due to data limitations, we compute trade partner diversity only for trade in goods.

De facto financial globalisation: De facto financial globalisation is measured by capital flows and stocks of foreign assets and liabilities. We thus use a quantity-based measure as opposed to a price-based or news-based measure of financial globalisation (Baele et al., 2004). Kose et al. (2009) propose to focus on the sum of stocks of foreign assets and liabilities instead of flows to mitigate the problem of volatility and measurement errors in the flow variables. Following Lane and

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[6]The full definition and source of all variables used in the KOF Globalisation Index can be found online: www.kof.ethz.ch/globalisation.

Milesi-Ferretti (2007, 2018), we include variables on foreign direct investments, portfolio investments, international debt and international reserves (excluding gold). All variables are calculated as the sum of stocks of assets and liabilities and normalised by GDP. We also include the sum of primary income payments and receipts as a share of GDP. It comprises earnings and payments arising mainly from the cross-border provision of labour and capital. For historical values of all stock variables, we rely on the updated and extended dataset External Wealth of Nations by Lane and Milesi-Ferretti (2018), which comprises information about the composition of the international financial position of a large sample of countries.

De facto social globalisation

De facto interpersonal globalisation: This sub-dimension captures direct interactions among citizens living in different countries. The interaction can occur by the means of personal calls across borders. Personal calls are measured as international voice traffic in minutes per capita using fixed or mobile telephones. Personal contact with foreign citizens is the most likely form of direct interactions, which we measure using three variables. Migration, measured as the stock of foreign-born persons in a country, is the most persistent form, while tourism and foreign students (both counted as inbound and outbound) can be regarded as some form of temporary migration. Finally, international transfers paid and received always include some sort of personal interactions. All variables are normalised by domestic population.

De facto informational globalisation: While interpersonal globalisation is intended to capture personal interactions, informational globalisation is meant to measure the actual flow of ideas, knowledge and images. De facto informational globalisation is measured using three variables. Internet bandwidth measures the used capacity of international internet bandwidth and serves as a proxy for international digital information in- and outflows. International patents, measured as the stock of patent applications made by non-residents, describe international flows of technology, scientific knowledge and related information OECD (2010). High technology exports describe flows of technological and scientific information. While

international patents mainly describe an inflow of information, high technology exports mainly represent the outflow of information. All variables are normalised by domestic population.

De facto cultural globalisation: Cultural globalisation is the most difficult dimension to measure. Following Saich (2000) and Dreher et al. (2008), it refers to some extent to the domination of U.S. cultural products, measured using the number of McDonald's restaurants. The definition has been expanded to western countries being trendsetter in much of the cultural realm, represented by the introduction of the number of IKEA stores to the index. In the revised version of the index, the definition is extended and new variables that do not follow an individual value concept are introduced. The stock of trademark applications by non-residents, representing the exchange of foreign trademarks, are introduced. The variable is conceptually very close to McDonald's restaurants or IKEA stores. However, it does not focus on American or any other individual culture. We also include two variables that describe the transmission of cultural values by the means of sharing cultural goods and services. Following Disdier et al. (2010), we include trade in cultural goods based on the definition by UNESCO (2009). Following Hellmanzik and Schmitz (2015), we introduce trade in personal, cultural and recreational services, a subcomponent in the Balance of Payments. It includes, for example, services related to provision of cultural goods such as production of motion pictures or musical records, organisation of sport events or operation of museums. Both variables are measured as the sum of exports and imports and normalised by domestic population.

De facto political globalisation

De facto political globalisation captures the diffusion of government policies. It is measured using the variables participation in UN Peacekeeping missions, the number of embassies and international NGOs in a country. The presence of embassies implies foreigners acting in their home country's interest. Hence, it is an indication of how much a government accepts foreign sovereign governmental influence and resources. International NGOs are counted as the number of internationally oriented NGOs active in a country. Similar to an embassy, the presence of international NGOs

involves the influence of foreigners with political or social motives in one's own territory, which is interpreted as political influence from abroad.

De jure economic globalisation

De jure trade globalisation: The sub-dimension de jure trade globalisation relates closely to the sub-dimension economic restriction in the 2007 version of the KOF Globalisation Index Dreher et al. (2008). It refers to policies that facilitate and promote trade flows between countries. It is measured using variables on trade regulation, trade taxes, tariff rates and free trade agreements. Trade regulation includes the average of two subcomponents: prevalence of non-tariff trade barriers and compliance costs of exporting.[7] The variable trade taxes measures the income of taxes on international trade as a share of total income in a country. The variable tariff rates refers to the unweighted mean of tariff rates. The variables trade regulation, trade taxes and tariff rates are calculated as the inverse of the normalised values such that higher values relate to a higher level of de jure trade globalisation. Free trade agreements refer to the stock of multilateral and bilateral free trade agreements.

De jure financial globalisation: The sub-dimension de jure financial globalisation measures the openness of a country to international financial flows and investments. The IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) is the primary source for most measures of de jure financial globalisation (see, for example, Quinn et al. (2011). It measures the openness of the capital account of a country. We include the most widely used index based on the AREAER reports: the Chinn-Ito index.[8] The second variable measures investment restrictions based on the WEF Global Competitiveness Report. To account for

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[7]Non-tariff trade barriers are based on the WEF Global Competitiveness Reports survey question: in your country, do tariff and non-tariff barriers significantly reduce the ability of imported goods to compete in the domestic market.

[8]The Chinn-Ito index is the first principal component of four variables: the foreign exchange regime, export proceeds, capital account and current account. A drawback of the Chinn-Ito index is that it is calculated as a five-year rolling average, which tends to introduce delays in the measurement of liberalisation policies (Karcher and Steinberg, 2013).

policies that are potentially favourable to capital flows, we include the number of international investment agreements, which covers bilateral investment agreements and treaties with investment provisions.

De jure social globalisation

De jure interpersonal globalisation: De jure interpersonal globalisation refers to policies and resources that enables direct interactions among people living in different countries. The variables we have chosen are conceptually close to the ones we use for de facto interpersonal globalisation. We use the number of mobile phone and telephone subscriptions per capita. Movement of people across borders, such as migrants, tourists or students, count for a substantial amount of de facto personal contact. The variable freedom to visit represents restrictions on international travel. It measures the percentage of countries for which a country requires a visa from foreign visitors. Travel visas, alongside passports, are key control instruments of population movements by modern states (Czaika et al., 2018). The number of airports hosting international flights, normalised by population, is a measure for international connectivity.

De jure informational globalisation: De jure informational globalisation refers to the ability to share information across countries. It is measured by the number of television sets per capita. It is also measured by the number of people having access to the internet. Additionally, the press freedom index captures the availability of news related information.[9] The index aims at portraying media independence and assessing the degree of print, broadcast, and digital media freedom.[10]

De jure cultural globalisation: The sub-index de jure cultural globalisation refers to openness towards and the ability to understand and adopt foreign cultural

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[9]In the 2007 KOF Globalisation Index, the variable trade in newspapers was used to proxy information flows. With the advent of the internet, trade of newspapers are continuously replaced by the exchange of digital media. Although we no longer directly include this variable, we use press freedom to proxy the potential availability of news related information in the de jure part on informational globalisation.

[10]This index does not distinguish between national and international press. Hence, the validity of including the indicator rests on the assumption that national and international media is not treated differently when it comes to censoring.

influences. It is inspired by the GlobalIndex (Raab et al., 2008). The authors justify their choice of variables by highlighting their key role in quantifying the spread of common values of rationalism and hence cultural assimilation across the world. Three factors are important to measure the ability of understanding and accepting foreign cultural values. A great part of today's international culture is influenced by an egalitarian view on the role of woman in society. Consequently, we assume that having an equally egalitarian view intensifies cultural assimilation. As an approximation of such views, we include the gender parity index on gross primary school enrolment. It is an indication of parity of boys and girls and as such a strong indicator of the equality of men and women. Secondly, as a measure of education that is assumed to foster the spread of common values, we use the human capital index calculated in the Penn World Tables. Third, we include the civil freedom index, an assessment of civil liberties published in the freedom of the world report. It quantifies aspects of civil freedom such as expression and belief, associational and organisational rights, rule of law and personal autonomy and individual rights. We assume these are important elements supporting cultural globalisation.

De jure political globalisation

De jure political globalisation refers to the ability to engage in international political cooperation. It is measured using the number of multilateral treaties signed since 1945, the number of memberships in international organisations and a measure for the treaty partner diversity. The number of treaties and memberships in international organisations describe the communication and meetings of negotiators, with the intention to influence future relationships. They therefore rather characterise the willingness of creating networks than actual manifestation of flows. Partner constellations are informative when examining how a country influences global politics. Having the same number of treaties with a smaller number of partners rather reveals strong individual relationships than willingness to create global political networks. The variable treaty diversity measures the concentration of partners in international treaties. We use bilateral and not international treaties because we believe that negotiating a bilateral treaty indicates that each party was actively involved, which is

not necessarily the case for international treaties. Because there is no encompassing database on bilateral treaties, we use bilateral investment treaties.

1.3.3 Method of calculation

The 2018 KOF Globalisation Index is based on 43 individual variables, which are aggregated to a de facto and a de jure index of five sub-dimensions (trade, financial, interpersonal, informational and cultural globalisation), three dimensions (economic, social and political globalisation) and one total index. We distinguish between 18 different indices if we maintain the distinction between de facto and de jure. We also report the overall index for the total, for each of the three dimensions, and each of the five sub-dimensions. The overall index is calculated as the average of the de facto and the de jure index. This increases the total number of indices to 27. This broad variety allows researchers to fine-tune towards those dimensions that they consider relevant for the individual research question they would like to examine.

Imputation of missing data

The KOF Globalisation Index is calculated on a yearly basis from 1970 to 2016 and for 203 countries and territories. The selection of countries and territories relies on the definitions by the World Bank. However, not all variables are available for all countries and years. Missing observations within a series are imputed using linear interpolation. Missing observations at the beginning or the end of a series are substituted by the closest observation available. Specifically, this implies that we carry the last non-missing observation backwards in case of missing observations at the beginning of a series and forward in case of missing observations at the end of a series. Data coverage increases for most variables over time, which means that imputation of missing data is more prevalent in earlier years of our sample.

Normalising the data

Normalising the data implies that each variable is transformed to an index with a scale from one to one hundred, where one hundred is assigned to the observation with

the highest value across the whole sample of countries and years. The remaining observations are ranked according to the percentiles of the distribution. This panel normalisation is different to annual normalisation, where observations are normalised within a given year only. Panel normalisation is not sensitive to outliers, which is a clear advantage over the original series. The disadvantage is that changes in the data in any year possibly affect the index value of countries in all years.

Determining the weights

We employ principal components analysis on a 10-year rolling window to determine time-varying weights for the individual variables. We use observations for $t-10$ until $t-1$ to compute the weights for time t. The weights for the years 1970 to 1979 are set equal to the weights of the year 1980, given the shorter time window. Principal components analysis partitions the variance of the variables in each sub-group and the weights are determined in a way that maximises the variation of the resulting principal component. We calculate the weights using the entire sample of countries. By applying time-varying weights as opposed to fixed weights determined over the observations of all years, we account for structural changes in the relevance of individual variables to capture globalisation over time. While the weights of individual variables vary over years, the weights of the sub-indices are determined by giving equal weights to each component and are held fixed over the sample period. Economic globalisation includes trade and financial globalisation, both of which receive a weight of 50 percent within the economic dimension. Social globalisation consists of interpersonal, informational and cultural globalisation, each of them contributing a third to the social globalisation index. Economic, social and political globalisation are aggregated to the Globalisation Index using again equal weights. The overall globalisation indices are calculated as the average of the de facto and the de jure indices. Table 1 shows the weights of the different levels of the indices.

Aggregation to indices

Once the weights are determined, the aggregation consists of adding up individual weighted variables to the desired level of aggregation. Each aggregation level is

calculated from the individual variables instead of using the aggregated lower-level indices. Doing so has the advantage that variables can be used in higher aggregation levels of the index, even if the value of a sub-index is not reported because of missing data. A disadvantage is that the higher ordered dimensions can only be replicated using lower ordered dimensions for countries for which all variables are available. Observations of indices are reported missing if more than 40 percent of the underlying variables are missing or at least two out of three sub-indices cannot be calculated.

1.4   Some first comparisons and robustness checks

1.4.1   Comparing the 2018 and 2007 versions

To compare the 2018 version with the 2007 version of the KOF Globalisation Index, we recalculate the 2007 version with the most recent data.[11] Clearly, our perception of globalisation did not change and despite the limitations of the earlier version of the index, the outcome of the two indices should be comparable. We calculate overall globalisation and its dimensions as the unweighted average over all countries. The upper left panel in Figure 1.1 shows the overall KOF Globalisation Index computed using the methodologies underlying the 2018 and 2007 versions. While the 2018 version shows a somewhat higher level of globalisation than the 2007 version, the two series exhibit very similar patterns over time. Both measures suggest that globalisation has increased most strongly between 1990 and 2007.

The increase in economic globalisation between 1990 until the onset of the financial crisis 2007 is somewhat less pronounced in the 2018 version than in the 2007 version. The reason being that economic globalisation in the 2018 version contains more variables reflecting de jure economic globalisation than in the previous version. In particular, de jure financial globalisation did not keep up with progresses in de

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[11]The 2018 vintage of the 2007 version is available on the website: `http://www.kof.ethz.ch/globalisation/`.

Figure 1.1: KOF Globalisation Index - 2007 version vs. 2018 version
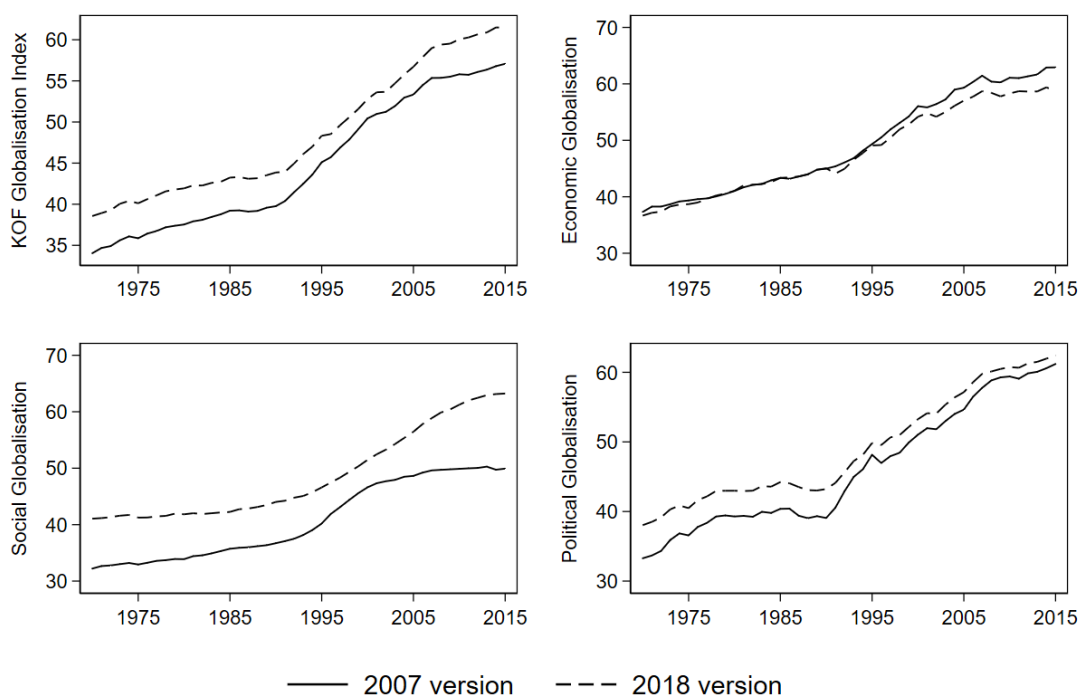
facto financial globalisation. The 2018 version exhibits higher levels of social glob-
alisation. While in the 2007 version, social globalisation did not increase after 2000,
the 2018 version record continuing increases because many variables from the pre-
vious version are excluded or replaced to account for new channels of international
communication. Political globalisation shows the smallest differences between the
2007 and the 2018 version.

To compare individual years of the 2007 and 2018 index, we examine overlap
statistics of the rankings of countries in our index. We restrict ourselves to countries
that are present in both rankings. These overlap statistics are an indication of
similarity. They specify the share of identical countries within the same range in
both rankings. The overlap statistics of the comparison of the country rankings
of the 2007 and the 2018 version of the KOF Globalisation Index are shown in

Figure 1.2: Overlap statistics of the 2007 and 2018 versions of the KOF Globalisation Index and its dimensions
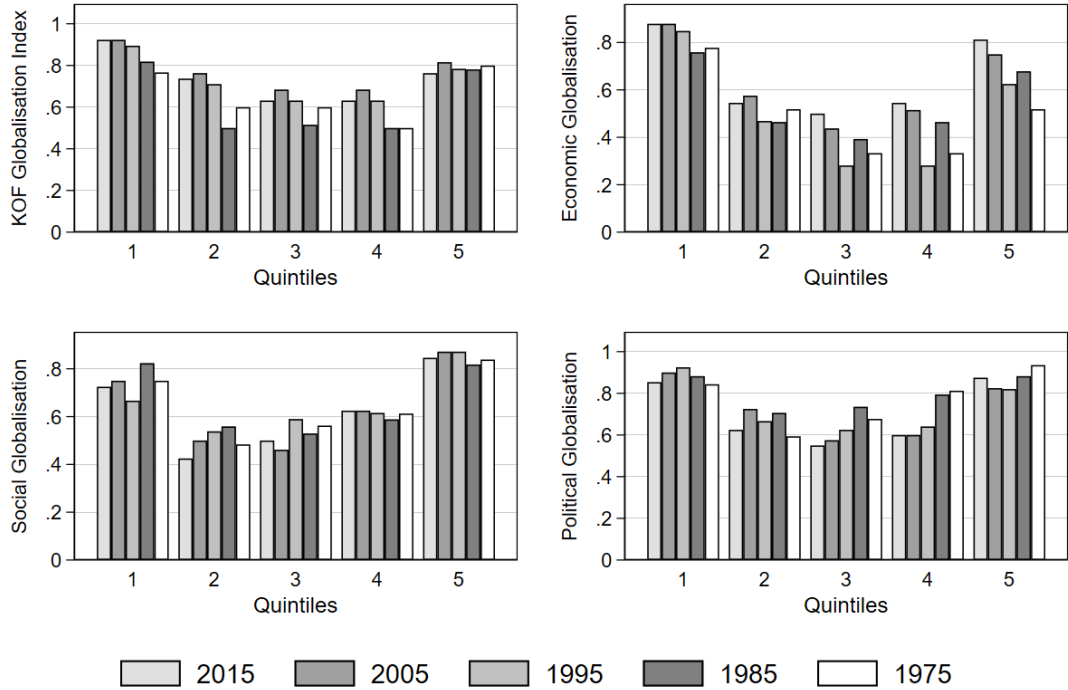
Figure 1.2. For each index, we show the similarity of country composition in the different quintiles of the ranking for five selected years. The first panel displays the overlap statistics of the two different versions of the overall KOF Globalisation Index. Overlap in the first quintile is equal or greater than 80 percent in all years but 1975, which means that 80 percent of countries in the top quintiles of the index are the same in both versions. The overlap is also high in the bottom quintile with values close to 80 percent. In the quintiles 2-4, overlap is lower because countries in the middle of the rankings have index values that lie much closer together. Consequently, any changes from the 2007 to the 2018 version are likely to have the greatest impact on the position of countries that are in the middle part of the ranking.

1.4.2 Comparing the de facto and de jure dimensions

Developments of de facto and de jure globalisation are somewhat different over time (Figure 1.3). Until 1995, the world averages of de facto and de jure globalisation evolve fairly similar. They start to diverge afterwards, when de jure globalisation grows considerable faster than de facto globalisation.

Figure 1.3: KOF Globalisation Index - de facto versus de jure globalisation
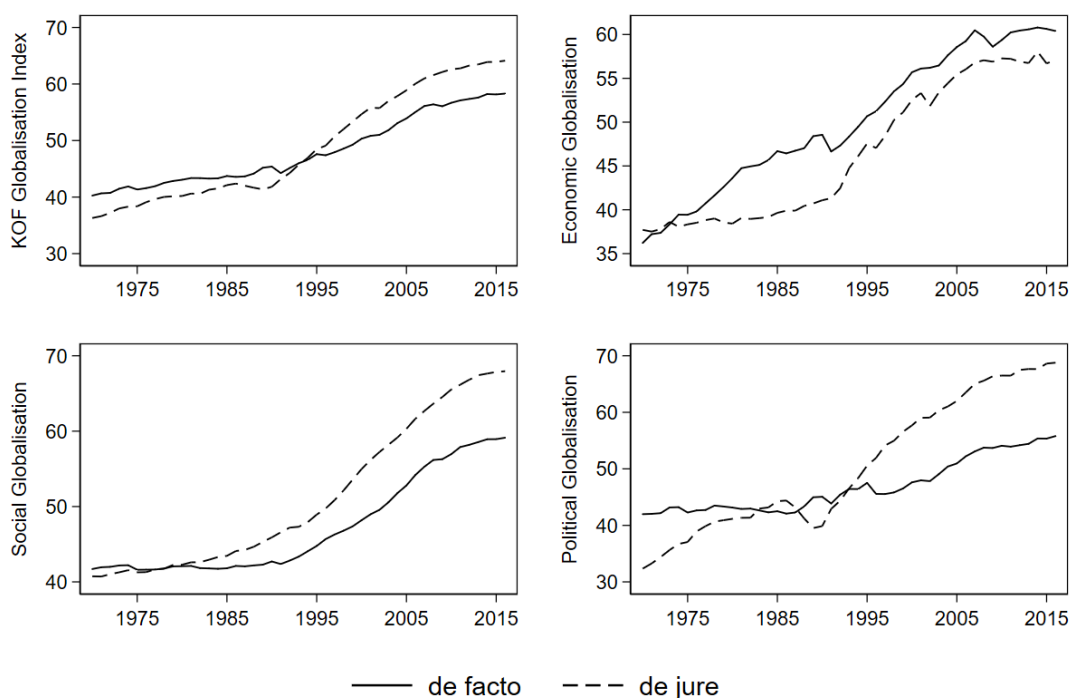
For economic globalisation, both indices measure a steeper increase in de facto than in de jure globalisation. While in the sub-dimension trade globalisation both de facto and de jure indices increase hand-in-hand over time, de facto financial globalisation increased strongly, whereas de jure financial globalisation hardly increased (not shown). For social and political globalisation, de jure globalisation increases much more compared to de facto globalisation, especially after 1990 and 1995.

The overlap statistics between the de jure and de facto indices confirm that both differ somewhat and give rise to distinct country rankings (Figure 1.4). The highest overlap is achieved in the top quintiles: countries that are most globalised in the de facto indices also tend to be most globalised in the de jure indices. On the contrary, overlap in the middle quintiles is low. With a value below 50 percent, overlap tends to be lowest for social and economic globalisation. Overall, the low overlap statistics do confirm that de facto and de jure globalisation describe different characteristics of globalisation resulting in distinct country rankings.

Figure 1.4: Overlap statistics of de facto and de jure measures of the KOF Globalisation Index and its dimensions
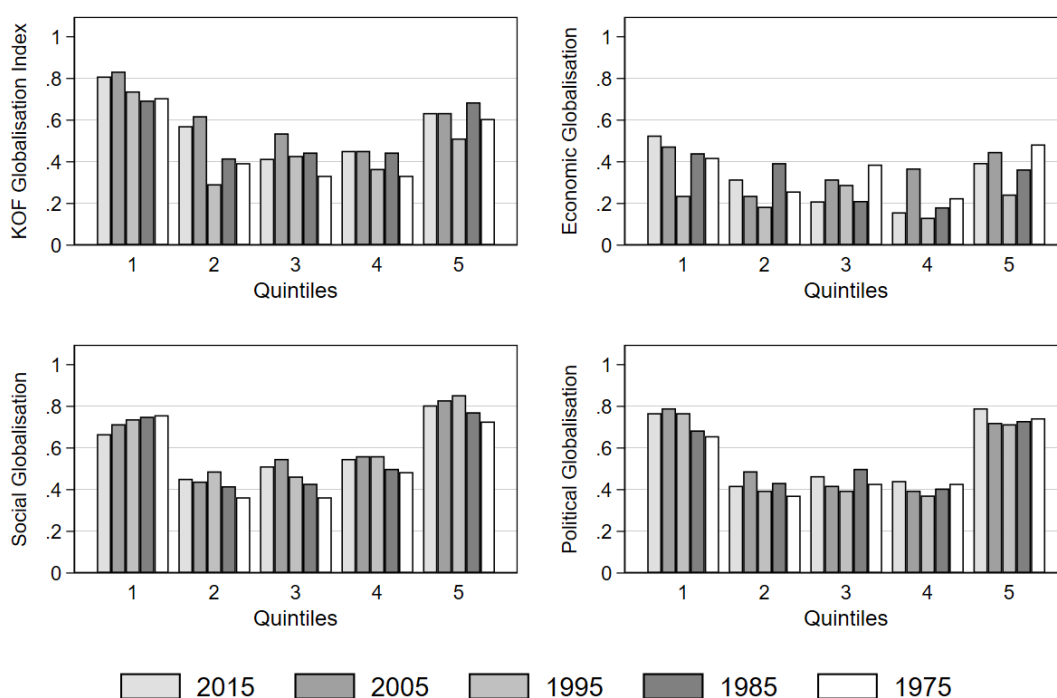
1.4.3 Comparing time-varying and constant weights

To assess the robustness of the new feature of time-varying weights, we compute the index using constant weights and compare it with the index value using time-varying weights. Overall, the index is robust to the use of constant versus time-varying weights. The two indices are strongly correlated. Time-varying weights compared to constant weights raise the extent of globalisation in earlier years.[12] The overlap statistics show that the difference between the two indices are greatest in the economic dimension of globalisation.[13]

1.4.4 Excluding cultural globalisation

Cultural globalisation is arguably the most contested sub-dimension of the index. We assess the robustness of the index to the exclusion of cultural globalisation. To do so, we recalculate the index without the cultural globalisation sub-dimension. In this alternative index, the social dimension of globalisation only contains inter-personal and informational globalisation, each receiving equal weights. Figure 1.7 of the appendix shows that de facto globalisation is somewhat lower with the cultural globalisation dimension than without. Moreover, the comparison between de jure globalisation with and without cultural globalisation shows that cultural globalisation developed more slowly than other dimensions of the index. The overlap statistics show that differences between the two indices are greater in the de facto part than in the de jure part.[14] Overall, the index is robust to the exclusion of cultural globalisation. The correlation coefficient between the two versions for the whole panel amounts to 0.99 for the overall index and 0.98 for the social globalisation index.

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[12]See Figure 1.5 in the appendix.
[13]See Figure 1.6 in the appendix.
[14]See Figure 1.8 in the appendix.

1.5 Globalisation and economic growth

Just as Dreher (2006), we use the new KOF Globalisation Index to examine the relationship between globalisation and economic growth. We thereby show how the two new features of the revised KOF Globalisation Index - disentangling de facto and de jure globalisation and trade and financial globalisation - are useful to arrive at new insights.

Globalisation is expected to promote economic growth for manifold reasons (e.g. Grossman and Helpman, 2015). First, international knowledge spillovers will certainly help to increase economic growth. They occur when knowledge acquired in one country may also be used in another country. Citizens exchange knowledge across borders. Knowledge exchange and information flows are facilitated by better infrastructure to do so: in previous decades, fax and telephones were prime examples of such infrastructure; internet access is arguably most important in this regard today. Clearly, the actual (de facto) exchange of knowledge and information flows promote economic growth rather than institutions that facilitate information flows (de jure). Second, entrepreneurs have access to larger potential markets in open than closed economies. An entrepreneur, who used to serve the domestic market of its home country, enjoys much more opportunities to attract customers in foreign countries when governments abolish tariffs and capital account restrictions and international trade and investments in foreign countries become more attractive. Economic globalisation also increases competition because foreign investors enjoy the very same benefits than domestic entrepreneurs and enter domestic markets. Third, entrepreneurs may well exploit comparative advantages and receive gains from specialisation during globalisation. Production will become more efficient and increase a country's economic growth.

Theoretical predictions about whether de facto globalisation influences economic growth to a larger extent than de jure globalisation (or vice versa) are difficult to arrive at. De jure globalisation is often a prerequisite for de facto globalisation. For example, tariffs need to be reduced or abolished to promote international trade. Infrastructure such as internet access needs to be available to exchange information and ideas. International agreements need to be signed and embassies built to enable

political collaboration. When de jure globalisation has occurred, de facto globalisation proceeds. Goods and services need to be traded, information exchanged, and policies in line with international agreements implemented. It remains an empirical question how de facto and de jure globalisation influence economic growth. Future theoretical research may help making more fine-grained predictions that are tested empirically.

Empirical studies suggest that globalisation promote economic growth. The first study using the 2002 version of the KOF Globalisation Index to measure globalisation was Dreher (2006). His sample includes 123 countries over the period 1970-2000. The results suggest that overall globalisation was quite strongly and positively correlated with economic growth. Disentangling the aspects of globalisation suggests that especially actual economic flows, restrictions in developing countries and information flows increase growth. Other previous studies suggest that rather developing instead of industrialised countries enjoy economic growth during globalisation. In countries of the Organization of Islamic Cooperation (OIC), for example, economic globalisation (as measured by the 2007 KOF Globalisation Index) has been shown to promote economic growth (Samimi and Jenatabadi, 2014). For instance, Bergh and Karlsson (2010) present evidence for OECD countries.

We use the new KOF Globalisation Index to examine whether globalisation promotes economic growth. The sample includes 137 developed and developing countries over the period 1975-2010. We follow related studies such as Dreher (2006) and estimate the model based on five-year averages. The baseline panel data model has the following form:

$$EconomicGrowth_{it} = \alpha_j Globalisation_{ijt} + \sum_k \gamma_{jk} X_{ikt} + \eta_i + \epsilon_t + u_{ijt} \qquad (1.1)$$

with $i = 1, ..., 137$; $j = 1, ..., 27$; $k = 1, ..., 9$; $t = 1, ..., 9$. The dependent variable $EconomicGrowth_{it}$ is the average annual growth rate of GDP per capita within a five-year period in country i and period t. $Globalisation_{ijt}$ is the KOF Globalisation Index averaged over each five-year period. We run the regression for all 27 sub-indices j of the KOF Globalisation Index. $\sum_k X_{ikt}$ contains nine control variables, η_i is a fixed country effect, ϵ_t is a fixed period effect and u_{ijt} is the error term. We

follow Dreher (2006) main specification for the selection of the control variables. The initial level of GDP per capita at each of the five-year periods measures the conditional rate of convergence to the steady state growth rate. We employ the human capital index published by the Penn World Tables (Feenstra et al., 2015) as an indicator of human capital. The log of life expectancy is included for the same reason. Since higher population growth should directly give rise to lower per capita economic growth, the log of the fertility rate is also included. Higher domestic investment as a share of GDP should give rise to higher growth rates, whereas the effect of higher government consumption is not obvious a priori. On the one hand, a large government sector may induce inefficiencies and crowd out the private sector. On the other hand, the provision of an efficient infrastructure and a proper legal framework may promote growth (de Haan and Sturm, 2000). To account for the quality of the legal system and the enforceability of property rights, we use the rule of law index as part of the economic freedom index constructed by Gwartney et al. (2018). Better institutions are likely to promote growth. Finally, the change in a country's terms of trade and its rate of inflation are included. Both have been shown to have a significant effect on growth in some previous studies. Table 1.7 of the appendix shows descriptive statistics for all the variables.

Column (1) of Table 1.3 reports the result of the main specification: the KOF Globalisation Index has a positive effect on medium-term growth. Although the sample using the new index includes 137 instead of 123 countries, the most important coefficient estimates remain of similar size and significance. In their robustness analysis, Sturm and de Haan (2005) report that in these growth regressions in particular initial income and the investment share are found to be robust and consistent across many specifications. This is, once again, confirmed here. We, in line with Dreher (2006), also find that the rule of law index and life expectancy plays some positive role. Most importantly, though, our key variable of interest, the point estimate of the KOF Globalisation Index, is positive and statistically significant at the 1% level.

Columns (2) to (4) report results when each of the underlying economic, social and political indices are used separately. In line with Dreher (2006), the results

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Table 1.3: Growth regressions, baseline results

VARIABLES	(1) Overall	(2) Economic	(3) Social	(4) Political
KOF Globalisation Index	0.164***	0.0774***	0.166***	0.0581**
	(0.0498)	(0.0284)	(0.0474)	(0.0277)
log(Initial level of GDP per capita)	-6.428***	-6.294***	-6.551***	-6.001***
	(0.891)	(0.896)	(0.945)	(0.836)
Human capital index	0.627	1.198	0.254	0.873
	(1.594)	(1.582)	(1.599)	(1.576)
log(life expectancy)	5.122**	5.491**	3.984*	4.838*
	(2.468)	(2.489)	(2.233)	(2.639)
log(fertility rate)	-0.0864	-0.835	-0.00398	-0.549
	(1.033)	(0.953)	(1.016)	(1.003)
Investment (% of GDP)	0.132***	0.142***	0.131***	0.135***
	(0.0327)	(0.0325)	(0.0323)	(0.0329)
Government consumption (% of GDP)	0.0352	0.0339	0.0300	0.0430
	(0.0363)	(0.0371)	(0.0363)	(0.0366)
Rule-of-law index	0.222	0.226*	0.255*	0.266*
	(0.139)	(0.136)	(0.145)	(0.139)
Inflation rate	0.00677	0.0115	0.000767	0.00730
	(0.0212)	(0.0223)	(0.0217)	(0.0215)
Growth rate of terms of trade	0.0519	0.0500	0.0542	0.0553
	(0.0408)	(0.0401)	(0.0409)	(0.0419)
Observations	823	823	823	823
R-squared	0.364	0.354	0.361	0.347
Number of countries	137	137	137	137

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

show that all three dimensions are relevant for growth, whereby the coefficient size of the social dimension is roughly twice that of the other two dimensions.

In contrast to the previous versions of the KOF Globalisation Index, we are now able to distinguish between de facto and de jure dimensions. The first two columns of Table 1.4 suggest that it is the de jure dimension that is driving the positive relationship between globalisation and growth. The coefficient estimate for the de facto overall measure is positive, but of smaller size and only statistically significant at the 10% level. The coefficient estimate of the de jure part is almost double in size and statistically significant at the 1% level. A ten-point increase in the de jure measure of globalisation is associated with an increase in the annualised growth rate of about 1.4 percentage points.

Columns (4) and (8) suggest that this de jure result is driven by both the economic and political dimensions - the de jure parts of these are both statistically significant at the 1% level. As these de jure measures most likely reflect slowly developing institutional changes and therefore can be assumed to be relatively exogenous, this hints at a causal relationship between globalisation and growth. The de jure KOF Social Globalisation Index does, on the other hand, not turn out to be statistically significant. Within the social dimension, it is actually the de facto part that matters, both qualitatively and quantitatively. The coefficient estimate of de facto globalisation is 0.13 and statistically significant at the 1% level. A higher degree of social de facto globalisation goes hand in hand with higher growth. We believe that this result is very well in line with the international knowledge spillover theory. Citizens need to actually exchange knowledge and information across borders to promote growth. Just having institutions established to exchange knowledge and information does not yet give rise to effects on economic growth.

Digging one level deeper and looking at the sub-dimensions of economic and social globalisation allows us to distinguish between, first, trade-related and financial globalisation and, second, interpersonal, informational and cultural globalisation. Table 1.5 indicates that every sub-dimension is important for growth. While the coefficient has the same size for trade and financial globalisation, it appears that interpersonal globalisation has the biggest effect on growth within the social dimension of globalisation.

Table 1.4: Growth regressions, de jure vs. de facto

VARIABLES	(1) Overall de facto	(2) Overall de jure	(3) Economic de facto	(4) Economic de jure	(5) Social de facto	(6) Social de jure	(7) Political de facto	(8) Political de jure
KOF Globalisation Index	0.0730	0.146***	0.0275	0.0600***	0.144***	0.0682*	-0.00825	0.0828***
	(0.0453)	(0.0306)	(0.0234)	(0.0160)	(0.0390)	(0.0397)	(0.0205)	(0.0206)
log(Initial level of GDP per capita)	-6.102***	-6.517***	-5.980***	-6.433***	-6.643***	-6.139***	-5.959***	-6.043***
	(0.871)	(0.879)	(0.859)	(0.857)	(0.969)	(0.880)	(0.857)	(0.844)
Human capital index	0.835	0.841	1.041	1.439	0.757	0.598	1.193	0.900
	(1.561)	(1.587)	(1.561)	(1.550)	(1.681)	(1.582)	(1.556)	(1.602)
log(life expectancy)	4.640*	5.605**	4.832*	5.690**	4.828**	4.090*	4.793*	5.670**
	(2.571)	(2.354)	(2.568)	(2.404)	(2.226)	(2.448)	(2.533)	(2.658)
log(fertility rate)	-0.909	0.378	-1.234	-0.314	-0.144	-0.603	-1.105	-0.178
	(0.968)	(0.974)	(0.975)	(0.948)	(0.981)	(1.006)	(0.981)	(0.935)
Investment (% of GDP)	0.140***	0.127***	0.143***	0.139***	0.139***	0.134***	0.143***	0.130***
	(0.0326)	(0.0327)	(0.0324)	(0.0329)	(0.0319)	(0.0331)	(0.0330)	(0.0326)
Government consumption (% of GDP)	0.0382	0.0350	0.0376	0.0357	0.0298	0.0366	0.0393	0.0416
	(0.0367)	(0.0367)	(0.0370)	(0.0376)	(0.0361)	(0.0370)	(0.0371)	(0.0362)
Rule-of-law index	0.272*	0.192	0.274*	0.206	0.265*	0.265*	0.279**	0.248*
	(0.143)	(0.136)	(0.140)	(0.138)	(0.146)	(0.140)	(0.138)	(0.136)
Inflation rate	0.00682	0.00917	0.00947	0.0115	-0.00140	0.00694	0.00904	0.00782
	(0.0218)	(0.0210)	(0.0223)	(0.0219)	(0.0214)	(0.0221)	(0.0221)	(0.0210)
Growth rate of terms of trade	0.0503	0.0583	0.0512	0.0545	0.0464	0.0579	0.0546	0.0570
	(0.0414)	(0.0404)	(0.0410)	(0.0399)	(0.0406)	(0.0411)	(0.0412)	(0.0421)
Observations	823	823	823	823	823	823	823	823
R-squared	0.346	0.369	0.343	0.354	0.367	0.344	0.340	0.364
Number of countries	137	137	137	137	137	137	137	137

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1.5: Growth regressions, economic and social sub dimensions

VARIABLES	(1) Trade	(2) Financial	(3) Interpersonal	(4) Informational	(5) Cultural
KOF Globalisation Index	0.0541**	0.0438**	0.146***	0.0669**	0.0764**
	(0.0239)	(0.0205)	(0.0467)	(0.0293)	(0.0346)
log(Initial level of GDP per capita)	-6.150***	-6.186***	-6.363***	-6.322***	-6.151***
	(0.876)	(0.884)	(0.876)	(0.900)	(0.903)
Human capital index	1.298	1.086	0.651	0.976	0.366
	(1.554)	(1.590)	(1.582)	(1.598)	(1.580)
log(life expectancy)	4.420*	5.842**	5.087**	4.198*	4.103*
	(2.467)	(2.561)	(2.364)	(2.376)	(2.370)
log(fertility rate)	-0.622	-1.150	-0.336	-0.421	-0.692
	(0.956)	(0.964)	(1.012)	(1.023)	(0.909)
Investment (% of GDP)	0.141***	0.142***	0.127***	0.137***	0.140***
	(0.0330)	(0.0323)	(0.0327)	(0.0333)	(0.0321)
Government consumption (% of GDP)	0.0379	0.0348	0.0269	0.0368	0.0368
	(0.0372)	(0.0371)	(0.0375)	(0.0373)	(0.0360)
Rule-of-law index	0.271*	0.226*	0.265*	0.288*	0.243*
	(0.140)	(0.133)	(0.142)	(0.146)	(0.139)
Inflation rate	0.0102	0.0107	0.00545	0.00307	0.00595
	(0.0224)	(0.0220)	(0.0216)	(0.0222)	(0.0216)
Growth rate of terms of trade	0.0552	0.0488	0.0459	0.0571	0.0561
	(0.0402)	(0.0407)	(0.0410)	(0.0411)	(0.0419)
Observations	823	823	823	823	823
R-squared	0.350	0.347	0.363	0.347	0.349
Number of countries	137	137	137	137	137

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1.6 distinguishes between de facto and de jure in the sub-dimensions. The first four columns of Table 1.6 indicate that institutional liberalisation appears to have a positive impact on growth for the trade and financial dimension of globalisation. This corroborates the results from Quinn et al. (2011) for financial globalisation. As to be expected given the results in Table 1.4 in which de facto social

globalisation appear more influential than its de jure part, all three de facto sub-dimensions within social globalisation have a significantly positive impact on growth. In any event, the de jure interpersonal globalisation measure is statistically significant at the 5% level. De jure cultural globalisation, on the other hand, has a negative impact on growth, albeit lacks statistical significance. The relative importance of de facto over de jure measures again confirm the international knowledge spillover theory: having the infrastructure available to exchange persons, information or culture is not necessarily sufficient to foster growth. Needed are actual flows.

We have also estimated subsamples for OECD and non-OECD countries. The results show that overall, economic, social and political globalisation promoted economic growth in non-OECD countries. The four globalisation indices are statistically significant at the 5% level. By contrast, the results do not suggest that globalisation promote economic growth in OECD countries: the four globalisation indices lack statistical significance. This result corroborates previous studies such as Bergh and Karlsson (2010) and Dreher (2006). For OECD and non-OECD countries, de jure economic globalisation is statistically significant, while de facto economic globalisation is not. In the social dimension, the results show that the positive effect of de facto social globalisation is driven by non-OECD countries. De jure social and de facto political globalisation lack statistical significance in both sub-samples as in the full sample.

Table 1.6: Growth regressions, economic and social sub dimensions, de jure vs. de facto

VARIABLES	(1) Trade de facto	(2) Trade de jure	(3) Financial de facto	(4) Financial de jure	(5) Interpersonal de facto	(6) Interpersonal de jure	(7) Informational de facto	(8) Informational de jure	(9) Cultural de facto	(10) Cultural de jure
KOF Globalisation Index	0.0210	0.0415***	0.0161	0.0338***	0.122***	0.0758**	0.0370**	0.0301	0.0765***	-0.00300
	(0.0222)	(0.0134)	(0.0158)	(0.0123)	(0.0397)	(0.0300)	(0.0144)	(0.0271)	(0.0246)	(0.0213)
log(Initial level of GDP per capita)	-5.920***	-6.322***	-6.015***	-6.198***	-6.386***	-6.105***	-6.127***	-6.165***	-6.427***	-5.964***
	(0.838)	(0.845)	(0.872)	(0.864)	(0.866)	(0.866)	(0.872)	(0.889)	(0.955)	(0.850)
Human capital index	1.091	1.447	1.061	1.225	0.892	0.782	1.080	1.045	0.861	1.189
	(1.556)	(1.535)	(1.572)	(1.572)	(1.586)	(1.582)	(1.638)	(1.554)	(1.623)	(1.582)
log(life expectancy)	4.426*	4.858**	5.083**	5.709**	5.582**	4.556*	4.195*	4.692*	5.420**	4.804*
	(2.609)	(2.369)	(2.554)	(2.519)	(2.583)	(2.367)	(2.474)	(2.430)	(2.109)	(2.623)
log(fertility rate)	-1.007	-0.478	-1.297	-0.694	-1.029	-0.331	-0.510	-0.914	-0.715	-1.067
	(0.937)	(0.937)	(1.017)	(0.940)	(0.956)	(1.022)	(0.976)	(0.959)	(0.902)	(0.937)
Investment (% of GDP)	0.140***	0.143***	0.144***	0.137***	0.135***	0.130***	0.138***	0.141***	0.151***	0.142***
	(0.0332)	(0.0328)	(0.0321)	(0.0332)	(0.0322)	(0.0329)	(0.0331)	(0.0329)	(0.0316)	(0.0327)
Government consumption (% of GDP)	0.0390	0.0387	0.0380	0.0362	0.0279	0.0337	0.0416	0.0358	0.0283	0.0398
	(0.0371)	(0.0377)	(0.0371)	(0.0373)	(0.0383)	(0.0369)	(0.0368)	(0.0381)	(0.0356)	(0.0377)
Rule-of-law index	0.285*	0.253*	0.269*	0.219	0.257*	0.279**	0.287**	0.279*	0.251*	0.280**
	(0.145)	(0.140)	(0.137)	(0.134)	(0.144)	(0.140)	(0.142)	(0.142)	(0.141)	(0.140)
Inflation rate	0.00838	0.0116	0.00985	0.00945	0.00613	0.00696	0.00388	0.00758	0.00419	0.00877
	(0.0221)	(0.0224)	(0.0224)	(0.0217)	(0.0216)	(0.0219)	(0.0220)	(0.0221)	(0.0213)	(0.0221)
Growth rate of terms of trade	0.0536	0.0571	0.0514	0.0523	0.0398	0.0547	0.0568	0.0551	0.0477	0.0542
	(0.0410)	(0.0404)	(0.0411)	(0.0406)	(0.0411)	(0.0412)	(0.0415)	(0.0411)	(0.0416)	(0.0420)
Observations	823	823	823	823	823	823	823	823	823	823
R-squared	0.342	0.349	0.341	0.348	0.358	0.352	0.345	0.342	0.361	0.339
Number of countries	137	137	137	137	137	137	137	137	137	137

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.6   Conclusions

This chapter has introduced the third version of the KOF Globalisation Index, a composite index measuring globalisation for every country in the world since 1970. In line with its previous two versions, the third version of the KOF Globalisation Index distinguishes between economic, social and political globalisation. The new KOF Globalisation Index has been improved in many ways as compared to the previous 2007 version. We have increased the number of underlying variables from 23 to 43 variables to measure the encompassing concept of globalisation more precisely. The two major innovations are (a) distinguishing between de jure and de facto globalisation and (b) introducing a separate index within the dimension of economic globalisation measuring financial globalisation. We also allow the weights of the underlying variables to slowly change over time by incorporating time-varying weights in the aggregation procedure.

We have used the new 2018 KOF Globalisation Index to look into the effects of globalisation on economic growth. The results corroborate previous studies showing that countries enjoy economic growth when globalisation is proceeding rapidly. Economic, social and political globalisation are positively associated with economic growth, especially in developing countries. In contrast to previous research, we are able to distinguish between de facto and de jure globalisation and find that these have different effects: economic growth increases when de jure economic and political globalisation and de facto social globalisation are more pronounced. Countries that reduce institutional restrictions to trade in goods and services and financial flows and that are politically integrated enjoy on average higher economic growth. The effect of de facto social globalisation corroborates that the informational knowledge spill-over theory: citizens need to exchange knowledge and information to promote economic growth; institutions and infrastructure that may potentially be used for exchanging knowledge, but in fact is not, do not help to increase economic growth.

De jure globalisation is often a prerequisite for de facto globalisation. There is a good case to make why both de jure and de facto globalisation are likely to influence outcomes such as economic growth. Future research should develop theories

describing under which conditions de jure and/or de facto globalisation is expected to influence outcomes such as economic growth.

Including manifold variables in an encompassing index always gives rise to discussions about whether individual variables are suitable. We believe that distinguishing between de facto and de jure globalisation is useful for all three aspects of economic, social, and political globalisation. Because we use principal component analysis, we need at least three individual variables to measure de facto and de jure globalisation in every dimension. By providing in total 27 different measures of globalisation, we, however, do allow researchers to pick those that appear most relevant for their particular research question. Hence, when scholars disagree about the suitability of some individual subcomponents included, they may well concentrate on other parts of the revised KOF Globalisation Index.

On the other hand, some might argue that we should have included even more variables. However, as this globalisation indicator will be updated on a yearly basis, it is important that only variables are included that are regularly updated as well. Next to our aim to cover as many countries and years as possible, this limits the number of potential variables that we can use considerably.

We hope that by providing this new version of the KOF Globalisation Index, the research community will be in a better position to examine the consequences and the underlying drivers of globalisation. Especially distinguishing between de facto and de jure measures and allowing for a clear separation between trade and financial globalisation are in our view important and new assets that hopefully allow us to dig even deeper than before.

1.7 Appendix

Figure 1.5: Robustness of KOF Globalisation Index calculated with time-varying and constant variable weights
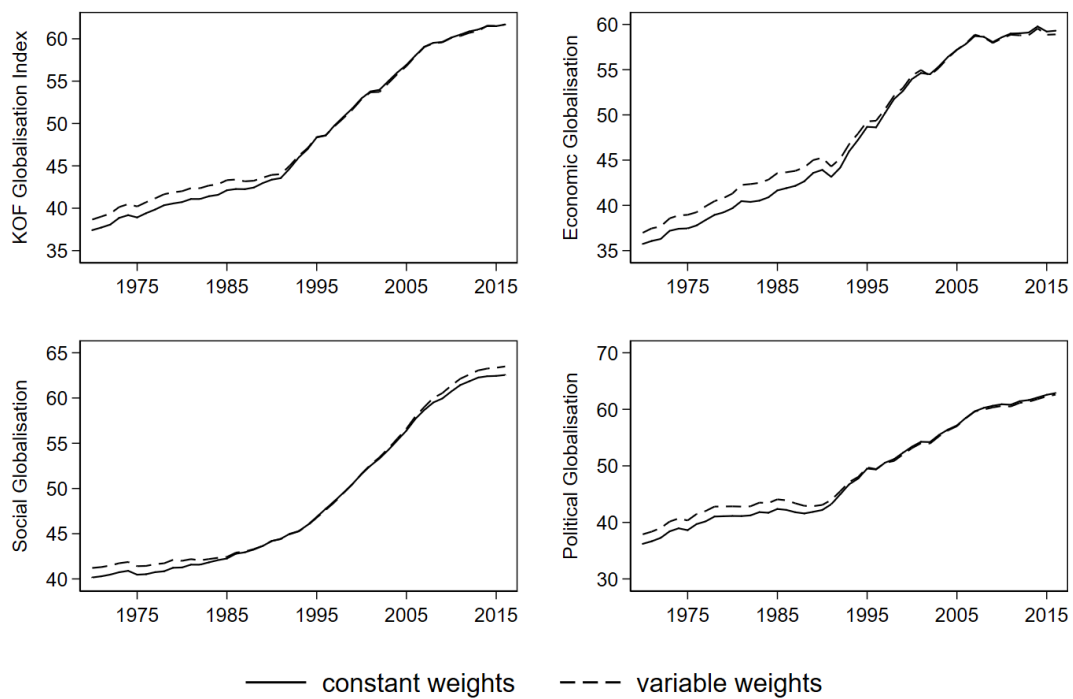
Figure 1.6: Overlap statistics of KOF Globalisation Index calculated with time-varying and constant variable weights
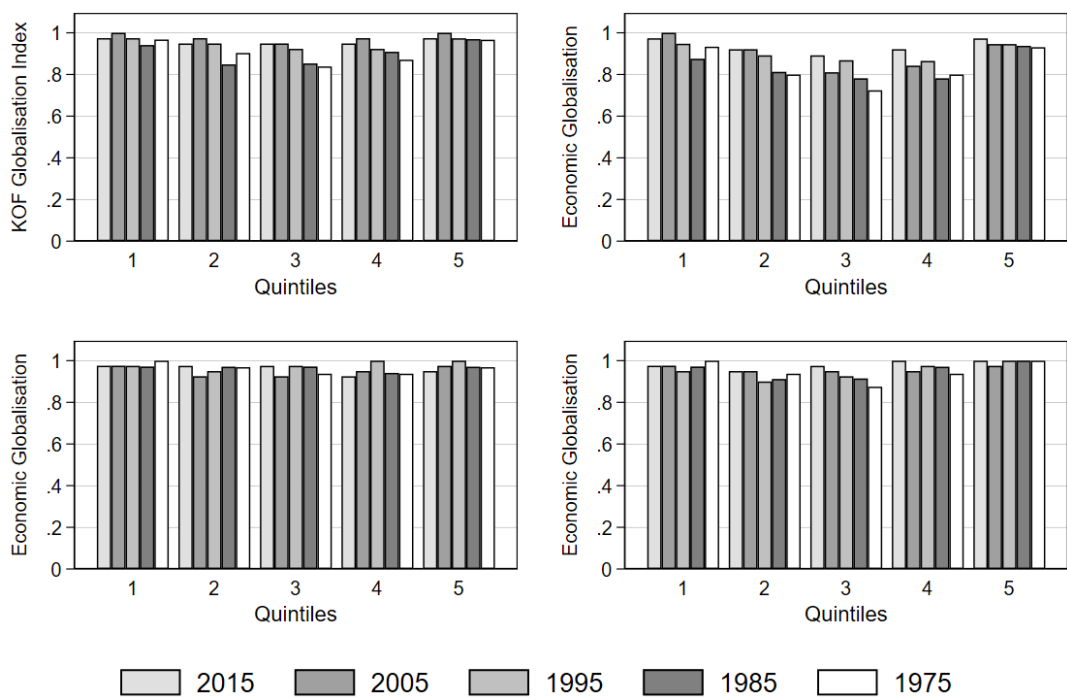
Figure 1.7: Robustness of the KOF Globalisation Index with and without the cultural globalization dimension
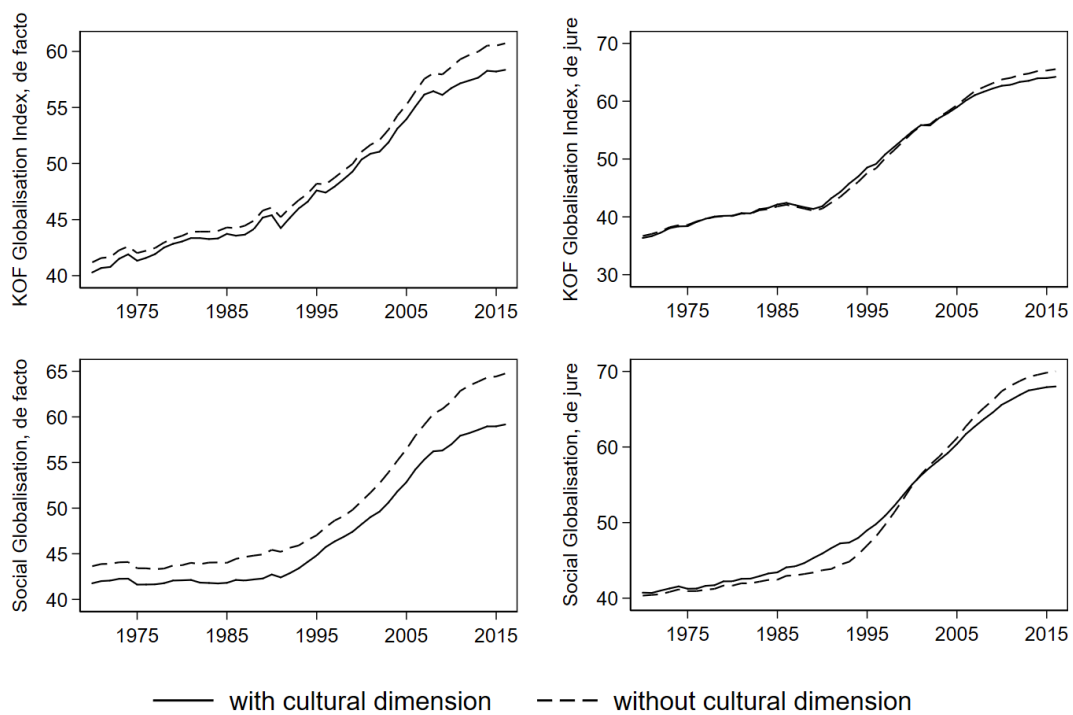
Figure 1.8: Overlap statistics of KOF Globalisation Index with and without the cultural globalization dimension
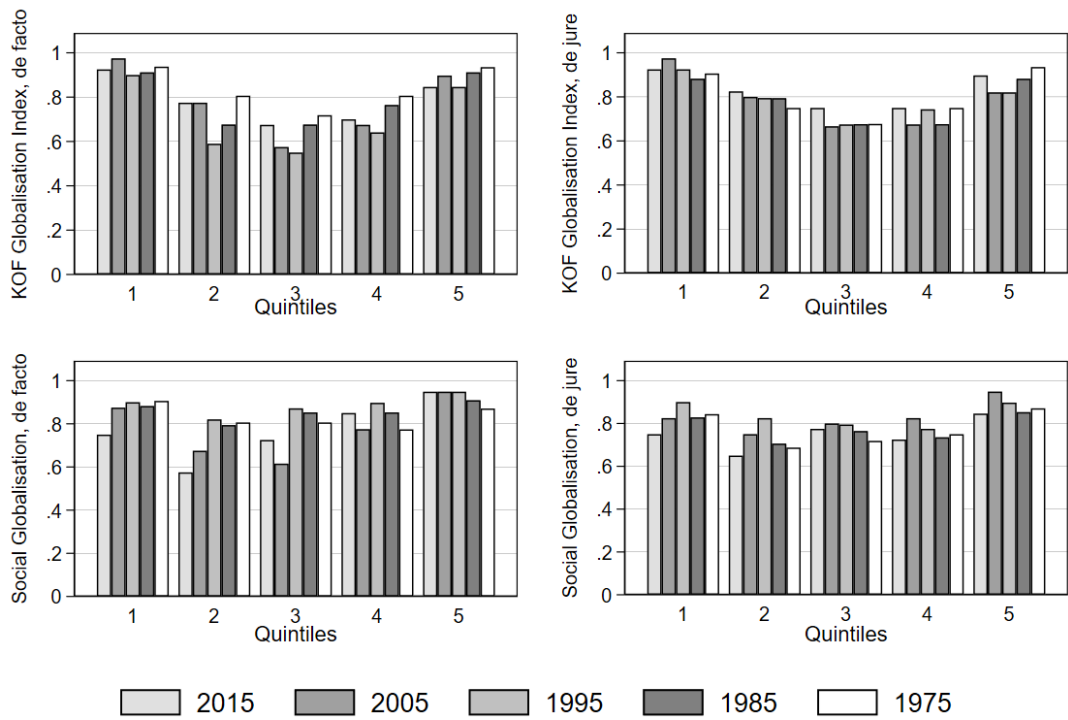
Table 1.7: Descriptive statistics

	Observations	Mean	Std. Dev.	Min	Max
GDP per capita growth	823	1.90	3.14	-13.41	23.01
log(Initial level of GDP per capita)	823	8.96	1.17	6.02	12.26
Human capital index	823	2.28	0.69	1.02	3.70
log(life expectancy)	823	4.19	0.17	3.38	4.41
log(fertility rate)	823	1.09	0.55	-0.07	2.07
Investment (% of GDP)	823	21.52	9.12	1.65	60.24
Government consumption (% of GDP)	823	18.51	8.62	3.10	64.36
Rule-of-law index	823	5.00	1.86	0.99	9.07
Inflation rate	823	4.29	6.67	-16.26	29.78
Growth rate of terms of trade	823	0.72	2.97	-14.86	28.32
KOF Globalisation Index	823	55.15	16.11	21.87	89.88
KOF Economic Globalisation Index	823	50.70	16.97	14.56	94.70
KOF Social Globalisation Index	823	50.51	21.83	6.54	91.02
KOF Political Globalisation Index	823	64.15	18.05	16.70	98.45
KOF Trade Globalisation Index	823	48.65	18.41	10.65	96.57
KOF Financial Globalisation Index	823	52.75	18.14	5.74	96.68
KOF Interpersonal Globalisation Index	823	48.51	21.40	5.00	90.85
KOF Informational Globalisation Index	823	52.56	22.60	3.04	94.54
KOF Cultural Globalisation Index	823	50.46	23.81	7.26	94.60
KOF Globalisation Index, de facto	823	53.68	15.73	19.31	91.62
KOF Globalisation Index, de jure	823	56.64	17.55	15.61	93.12
KOF Economic Globalisation Index, de facto	823	49.48	18.54	8.71	98.39
KOF Economic Globalisation Index, de jure	823	51.92	20.15	12.68	95.32
KOF Social Globalisation Index, de facto	823	48.22	23.72	3.54	96.67
KOF Social Globalisation Index, de jure	823	52.78	20.95	7.46	91.27
KOF Political Globalisation Index, de facto	823	63.10	20.12	19.16	97.45
KOF Political Globalisation Index, de jure	823	65.19	18.84	2.50	99.57
KOF Trade Globalisation Index, de facto	823	47.56	19.99	5.23	99.16
KOF Trade Globalisation Index, de jure	823	49.70	24.72	6.71	96.75
KOF Financial Globalisation Index, de facto	823	51.40	20.94	6.23	98.99
KOF Financial Globalisation Index, de jure	823	54.07	19.87	3.50	95.41
KOF Interpersonal Globalisation Index, de facto	823	47.08	24.31	2.82	96.56
KOF Interpersonal Globalisation Index, de jure	823	49.98	20.26	4.20	91.52
KOF Informational Globalisation Index, de facto	823	52.90	24.44	2.61	98.31
KOF Informational Globalisation Index, de jure	823	52.21	22.72	2.55	97.61
KOF Cultural Globalisation Index, de facto	823	44.55	26.39	2.04	96.85
KOF Cultural Globalisation Index, de jure	823	56.16	23.58	5.88	96.84

Chapter 2

Determinants of social expenditure in OECD countries[1]

2.1 Introduction

For a long time, social expenditure has increased in many industrialised countries. Public social expenditure relative to GDP increased from 14.4% in 1980 to 20.5% in 2016 in OECD countries (see Figure 2.1). In particular, social expenditure relative to GDP was rapidly increasing during the Great Recession of 2008-2009. Since the year 2009, social expenditure is decreasing in about two thirds of the OECD countries. There is variance across OECD countries in social expenditure in both levels and over time: in continental countries, such as Italy, social expenditure tends to increase. In countries with a large size and scope of government, it typically assumes a relatively high share of GDP. It has fluctuated between 25% and 30% since 1980 in countries such as Finland, or even decreased, as for example in the Netherlands. In countries enjoying economic freedom like the United States, social expenditure typically assumes relatively low values but increased somewhat in recent years (see Figure 2.2; see also Figure 2.7 in the appendix). In many OECD countries, social

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[1]This chapter is based on Hälg et al. (2020).

expenditure assumes the lion's share of general government expenditure. Governments need to set priorities when designing budgets. Clearly, large budget shares for social expenditure give rise to smaller budget shares for other types of expenditure such as public goods, a phenomenon that has been described as "social dominance" (e.g. Schuknecht and Zemanek, 2020).

Figure 2.1: Social expenditure in the OECD, 1980-2016
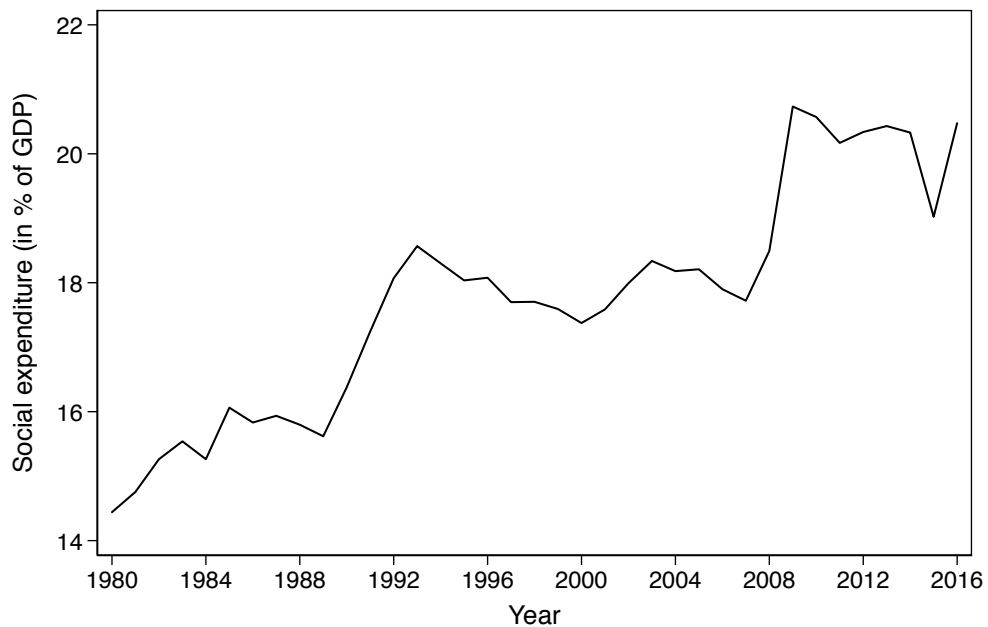
Notes: Unweighted average of 31 OECD countries, excluding Chile, Mexico, Israel, Turkey and Korea.

Scholars examine determinants of social expenditure. Theories include political-economic, institutional, demographic and economic approaches. Globalisation is, for example, expected to influence social expenditure. Advocates of the dark side of globalisation describe that globalisation puts pressure on national governments that need to decrease tax rates and, in turn, have decreasing public expenditure at hand to redistribute income. Consequently, globalisation may well decrease social expenditure (race-to-the-bottom hypothesis). Others maintain, by contrast, that globalisation increases social expenditure because citizens demand more insurance

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and income redistribution (compensation hypothesis). The partisan theories suggest, for example, that left-wing governments increase social expenditure to a larger extent than right-wing governments because left-wing governments favour income redistribution and tend to gratify low-income citizens. The political business cycle theories suggest that election-motivated politicians increase social expenditure before elections. Social expenditure is more visible to the voters than investment expenditure for roads and schools. Election-motivated politicians are also not likely to decrease social expenditure after elections; they rather leave it at the pre-election level. The influence of globalisation on domestic governments puts the partisan theories and the political business cycle theories into question: do domestic governments have any leeway in designing social policies when globalisation exerts pressure on domestic governments? We return to this issue below.

Increases in social expenditure may also be quite mechanical. During the demographic change, the working age population must take care of a growing number of senior citizens. When less citizens work and provide contributions to social security systems, and simultaneously, more citizens enjoy social security benefits, social expenditure increases, ceteris paribus. In recessions, unemployment benefits increase and GDP decreases. It is quite clear therefore that social expenditure as a share of GDP increases in recessions. Overall, however, the empirical evidence supporting individual theories is mixed. We discuss theories and previous empirical studies in section 2.2.

Panel data models for OECD countries need to handle concerns about endogenous explanatory variables. Important sources of endogeneity are omitted variables and reverse causality between the dependent and the explanatory variable.

Explanatory variables are endogenous when omitted variable bias is present, that is there are third (observed or unobserved) variables that are both correlated with the dependent variable and the main explanatory variable. Panel data studies consider many explanatory variables at once and disentangle which explanatory variables explain changes in social expenditure conditional on other variables. Previous empirical studies on social expenditure suffer, however, from omitted variable bias when significant predictors of social expenditure are not considered. We include

Figure 2.2: Social expenditure in selected OECD countries, 1980-2016
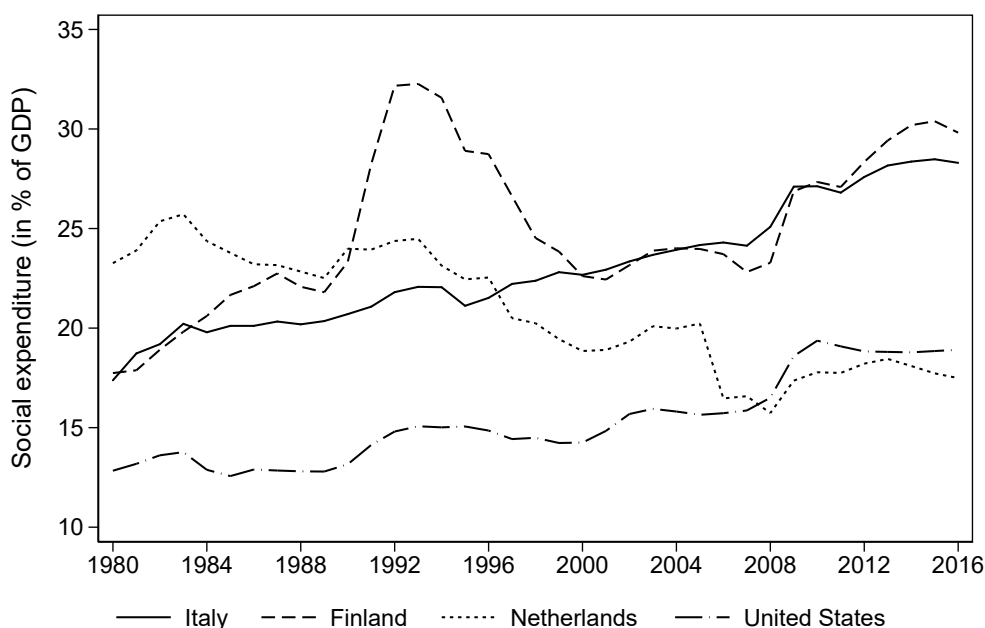
many explanatory variables that have been proposed to predict social expenditure to mitigate concerns about omitted variable bias and employ extreme bounds analysis (EBA) and Bayesian model averaging (BMA) to portray robust predictors of social expenditure. Clearly, employing EBA and BMA does not rule out but it helps to mitigate omitted variable bias.

Another important reason for endogeneity is reverse causality between the dependent and the explanatory variables. For example, social policies and how social expenditure develops may well influence voting behaviour. When citizens disagree with social policies, they will vote incumbent governments out of office. Government ideology changes. We handle concerns about reverse causality by considering lagged values of the explanatory variables in both EBA and BMA. We also employ 5-year averages of our variables instead of yearly observations as a robustness check.

We nevertheless realize that we can only safely say to report conditional correlations between individual explanatory variables and social expenditure and not causal effects. The term "effect" that we use in our study thus relates to conditional

correlations – in our empirical analysis and often when we portray results of related studies. Our sample includes 31 OECD countries over the period 1980-2016. The results suggest that budget deficits, trade globalisation and fractionalisation of the party system were negatively associated with social expenditure. Ageing, unemployment, social globalisation, coalition governments and public debt were positively associated with social expenditure. Moreover, social expenditure increased under left-wing governments when de facto trade globalisation was pronounced. Results based on Bayesian model averaging corroborate the relationships found between banking crisis, de facto trade globalisation, social globalisation, legislative fractionalisation, budget deficits, and public debt on the one hand and social expenditure on the other. We conclude that policymakers in individual countries use domestic measures to design social policies – globalisation, ageing and business cycles notwithstanding.

2.2 Theories and previous empirical evidence

2.2.1 Economic and demographic determinants

Economic determinants: Social expenditure will increase in recessions, as measured by low GDP growth and pronounced unemployment rates (e.g., Garrett and Mitchell, 2001). A difficulty with estimating the effect of GDP growth on social expenditure is that GDP represents the denominator of our dependent variable. An increase in GDP mechanically decreases the social expenditure to GDP ratio. To measure the business cycle effect of GDP, Schuknecht and Zemanek (2020) employ GDP growth minus the trend component as an explanatory variable.[2] Regarding unemployment, they extract the trend component from the unemployment rate as measure of the structural unemployment rate.

Demography: Manifold hypotheses juxtapose how population ageing influences the welfare state. The median voter hypothesis predicts that the size of the welfare state increases during demographic changes. When the median voter becomes older,

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[2]Filtering is carried out using the Hodrick-Prescott-Filter (HP).

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the older generation will lobby for higher social transfers. Ageing induces, however, a pure mechanical effect: the larger the number of pensioners, the larger are pension expenditures (Breyer and Craig, 1997; Potrafke, 2009; Tepe and Vanhuysse, 2009). The political economic and the mechanic effect notwithstanding, ageing is expected to increase the size of the welfare state. An alternative hypothesis predicts that ageing reduces the size of the welfare state because ageing reduces the profitability of the pay-as-you-go social security systems and the younger generation refuses to pay higher pension benefits when labour supply is endogenous (Breyer and Stolte, 2001; Razin et al., 2002; Galasso and Profeta, 2007; Shelton, 2008).

Scholars have studied empirically how ageing has influenced welfare state expenditures in OECD countries. The empirical evidence shows that ageing as measured for example by the dependency ratio hardly influenced overall social expenditure, public pension and health expenditures (Breyer and Craig, 1997; Potrafke, 2009; Tepe and Vanhuysse, 2009). Razin et al. (2002) even report a negative influence of the dependency ratio on the labour tax rate and social transfers.

2.2.2 Globalisation-welfare state nexus

Two theories describe how globalisation influences social expenditure: the race-to-the-bottom (disciplining or efficiency theory) and the compensation theory. The race-to-the-bottom theory suggests that globalisation mitigates the welfare state. The most important reason is system competition between national governments (e.g. Sinn, 1997, 2004). National governments are expected to compete for foreign direct investments and try to keep national champions within their borders by offering attractive investment conditions. When competition among countries increases, national governments decrease tax rates for relatively mobile tax bases such as corporate profits and capital (see Devereux et al., 2002, 2008) and high-income labour (see Kleven et al., 2014; Egger et al., 2019) to remain competitive. Governments reduce trade regulations and tariffs, abolish capital account restrictions and collaborate with other countries in international organisations. The more competition between national governments there is, the more tax rates are expected to decrease.

With small tax rates on interest income and small corporate tax rates, public expenditures must be financed by a smaller range of tax bases. Tax revenues might decline, which, in turn mitigates public good provision and especially transfers such as social expenditure.[3]

The compensation theory, by contrast, describes that social expenditure increases when economic globalisation is proceeding rapidly (Cameron, 1978; Rodrik, 1998).[4] [5] Citizens who are exposed to increasing income insecurity and uncertainty in the course of globalisation will demand more social expenditure and a larger size and scope of the government. In particular, social expenditure is likely to increase to compensate for uncertainty and risks. Important examples include generous unemployment and health insurance that may well help those citizens who do not enjoy the benefits of globalisation.[6]

The empirical evidence on the globalisation-welfare state nexus is mixed (see, for example, Schulze and Ursprung, 1999; Ursprung, 2008; Dreher et al., 2008; Meinhard and Potrafke, 2012; Onaran et al., 2012; Gaston and Rajaguru, 2013; Onaran and Boesch, 2014; Potrafke, 2015; Bove et al., 2017). Studies show that citizens' demand for welfare spending depends on countries' income. In Asia, for example, citizens in high-income countries such as Japan and Singapore demand a larger welfare state when exposed to globalisation than citizens in poorer economies (Lim and Burgoon, 2018). Citizens in low-income Asian countries, for instance, hardly demand a large welfare state, the level of exposure to globalisation notwithstanding (Potrafke, 2019b). In OECD countries, the effect of globalisation on social spending also seems to depend on countries' income and welfare state regimes. Social expenditure tends

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[3]Egger et al. (2019) find that during globalisation, higher levels of public expenditures are financed by a smaller range of tax bases, such as middle class labour income.

[4]Cameron (1978) hypothesised that countries that are more open are also more heavily unionised which, through collective bargaining, increases social spending. Rodrik (1998) showed that the correlation between openness and social spending is also found in developing countries with low levels of unionisation. Social spending serves as a form of insurance against uncertainty and risks related to openness.

[5]For the link between globalisation and the size of government, see also Alesina and Wacziarg (1998) and Epifani and Gancia (2009).

[6]Colantone et al. (2019) show, for example, how import competition induces workers' mental distress.

to increase in high-income (West) European countries and to decrease in low-income (East) countries when globalisation proceeds rapidly (Leibrecht et al., 2011; Onaran and Boesch, 2014; Onaran et al., 2012). The globalisation-induced effects also differ across welfare state regimes supporting the compensation effect in social democratic, conservative and Mediterranean welfare state regimes and the efficiency effect in liberal welfare state regimes (Yay and Aksoy, 2018).

The race-to-the-bottom hypothesis considers globalisation to be a quite exogenous phenomenon: national governments have hardly any means to respond to globalisation than by just implementing market-oriented policies. In fact, national governments do have a choice when implementing national policies: they decide, for example, whether they wish to decrease business tax rates or abolish tariffs on traded goods and services. Clearly, some national policies such as abolishing tariffs on traded goods and services or capital account and investment restrictions facilitate de facto globalisation by encouraging trade and investment flows. By contrast, fiscal policies such as decreasing business tax rates are rather domestic, especially when markets are not integrated. Decreasing business tax rates hardly promote trade of goods and services and investment flows when the national economy is protected by tariffs and capital account restrictions. One may therefore want to disentangle the extent to which globalisation and its consequences are based on market-oriented policies to integrate an economy in the world's market (de jure globalisation by reducing tariffs etc.) and the extent to which globalisation and its consequences are based on actual flows of goods and investments (de facto globalisation).

De jure globalisation is often the prerequisite for de facto globalisation: de facto globalisation such as trade of goods and services and attracting foreign direct investments require that national governments have implemented policies that enable trade and investment flows. It remains as an empirical question how de facto and de jure globalisation influence the welfare state.

2.2.3 Political-institutional determinants

Government ideology: The partisan theories describe that left-wing governments implement more expansionary economic policies and are inclined towards more income

redistribution from high-income to low-income citizens than right-wing governments. The purpose is to gratify the needs of the individual constituencies (e.g. Hibbs, 1977; Chappell and Keech, 1986; Alesina, 1987). Left-wing governments have also been described to implement more protectionist policies than right-wing governments (Dutt and Mitra, 2005, 2006). Policies of left-wing governments towards social spending may be reinforced by powerful labour unions (Garrett, 1998). On the other hand, welfare cuts are unpopular and both left-wing and right-wing parties see retrenchment as undesirable (see, for example, Starke, 2006); welfare expansion has created well-organised interest groups such as pensioner lobbies; and welfare states create path dependencies that ensure that new measures reflect those in place.

Many empirical studies examining the determinants of social expenditure include government ideology and find evidence for ideology-induced policy-making (e.g. Kittel and Obinger, 2003; Potrafke, 2009; Bove et al., 2017; see Potrafke, 2017, 2018 for surveys). Ideology-induced welfare policies retired to the background in many OECD countries (e.g. Iversen, 2011; Kittel and Obinger, 2003). New studies show, however, that the global financial crisis of 2007-2008 gave rise to re-emerging partisan effects on social expenditure in OECD and European countries (Schmitt, 2016; Herwartz and Theilen, 2017; Savage, 2019; McManus, 2019). In particular, the financial crisis deteriorated social and economic conditions and challenged social policy approaches, resulting in higher political polarisation (Mian et al., 2014).

Common pool problems: Institutions and types of government influence policy formation and budget composition, especially social spending. Redistributive transfers are likely to be higher in majoritarian voting systems, because they are more explicitly targetable to voting districts in which narrow results are expected (Persson et al., 1998). On the other hand, redistributive transfers increase in proportional voting systems, because proportionally elected representatives define their constituency along social lines, which are more easily targeted by redistributive transfers, for example unemployment benefits (Milesi-Ferretti et al., 2002). Regarding the legislative structure, the model by Persson and Tabellini (1999) predicts that the

separation of power, a defining feature of presidential as opposed to parliamentary regimes, gives rise to smaller and more efficient governments and hence lower redistribution.

Other theories portray how the political system affects the behaviour of policy makers. They show that government spending increases when a government is not stable. Government instability is measured by frequent government changes (Grilli et al., 1991; de Haan and Sturm, 1994) or the number of elections (Saunders and Klau, 1985). Sources of instability may be a high degree of political polarisation (Alesina and Tabellini, 1990), the fractionalisation of government (de Haan et al., 1999) and minority governments. Minority governments, for example, are often believed to be less stable and durable than majority governments (Warwick, 1979; Lijphart, 1984; Saalfeld, 2013). The parties forming minority governments do not have majorities in parliament and need to organise them for individual laws they want to pass. Compromises need to be negotiated and log-rolling between the minority government and opposition parties supporting individual laws may well give rise to a large size and scope of government. Public spending is likely to increase with minority governments because every party wants to get satisfied.[7] Empirical evidence does however not suggest that fiscal policies of minority governments differed from fiscal policies of majority governments (Potrafke, 2019a).

Another strand of literature focuses on disagreement among agents in the decision-making process (e.g., Alesina and Drazen, 1991. The deeper the conflicts among such agents, the greater the difficulties encountered when, for example, reducing budget deficits. Such policy conflicts are more prominent with coalition governments (de Haan et al., 1999). Disagreement among agents in the decision-making process is therefore likely to increase overall budget size and, thus, also likely to increase social expenditure.

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[7]On the other hand, theories describe that public expenditure are not likely to be higher under minority than majority governments because minority governments are expected to be strong and stable when it consists of one large centrally located party (Crombez, 1996; Tsebelis, 2002). The size of the government may even be smaller under minority governments because minority governments can choose among various potential partners and choose the least costly alternative.

Electoral motives: Political business cycle (PBC) theories suggest that politicians' electoral motives influence public spending (Nordhaus, 1975; Rogoff and Sibert, 1988; Rogoff, 1990; Persson and Tabellini, 2002; Shi and Svensson, 2006; see de Haan and Klomp, 2013; Dubois, 2016 for surveys). Election-motivated politicians are expected to increase public expenditure before elections. In particular, expenditure that is visible to the voters is likely to be increased. Social expenditure is a prime example.

Empirical research on conditional political budget cycles suggests that political budget cycles depend on the electoral rules (whether voting takes place according to proportional or majoritarian rules) and the form of governmental system (parliamentary or presidential system) (Persson and Tabellini, 2003), the level of development (Shi and Svensson, 2006), the quality of the institutional environment (Shi and Svensson, 2006), the age and level of democracy (Gonzalez, 2002; Brender and Drazen, 2005), the transparency of the political process (Alt and Lassen, 2006b,a), the presence of checks and balances (Streb and Torrens, 2013) and credible fiscal rules (Rose, 2006; Alt and Rose, 2009).

Income inequality: The median voter theorem put forward by Meltzer and Richard (1981) predicts that income inequality increases income redistribution and, in turn, social expenditure. If a linear income tax finances a lump-sum redistribution, the amount of redistribution is positively related to the ratio of mean to median income. For the median voter, who decides on the amount of redistribution, the cost of taxation is proportional to his income while the benefits are proportional to the mean income. On the other hand, high-income inequality may reduce voters' willingness to support taxation and public expenditures (e. g. Pecoraro, 2017). Some models even suggest, that residents cannot agree on the composition of public goods in heterogeneous societies (Bénabou, 1996, 2000). Empirical evidence on the relationship between income inequality and the size of the welfare state is mixed (e.g. Milanovic, 2000; Borge and Rattsø, 2004; Ostry et al., 2014). Velthoven et al. (2018) show that income inequality that is caused by financial development, financial liberalisation and banking crisis gives rise to more redistribution than inequality caused by other factors.

Political participation: Political participation affects policies if it is not randomly distributed across population. Increasing voter turnout in elections is expected to increase welfare spending. This is because with raising voter turnout, the structure of the electoral shift towards the relatively poor and less educated voters, that previously abstained from voting (Lijphart, 1997). Voter turnout affects the welfare state if low educated voters have different preferences on social spending than higher educated voters.

Empirical evidence on the link between voter turnout and social expenditure is mixed. Some studies find a positive relationship between voter turnout (especially after increasing suffrage) and social expenditure consistent with the median voter theorem (e.g. Abrams and Settle, 1999; Mueller and Stratmann, 2003; Cascio and Washington, 2014; Fujiwara, 2015; for a survey see Borck, 2019). In Switzerland, lower voting costs after the introduction of postal voting, which increase voter turnout and decrease average education of participants, lowered government welfare expenditures (Hodler et al., 2015). In Austria, however, the increased voter turnout after the introduction of compulsory voting laws did not influence government expenditures (Hoffman et al., 2017). In France, increasing voter costs (that decreased voter turnout) even increased investment expenditure (Godefroy and Henry, 2016).

Fragmentation: Becker (1957) proposes that citizens have stronger feelings of empathy towards their own group. Ethnic and linguistic fragmentation decreases social expenditure because achieving consensus necessary for redistribution to the needy is more difficult in ethnically diverse societies (Alesina et al., 2003). Ethnic fractionalisation and redistribution are also negatively correlated (Desmet et al., 2009, 2012; Sturm and de Haan, 2015; Pleninger and Sturm, 2020).

Income: Wagner's law describes that the size of the public sector relatively to the private sector rises with per capita income. There are two mechanisms at work: first, as countries become richer, their society becomes more complex which increases the need for public regulatory and protective actions. Secondly, individual public goods such as education have traits of luxury goods and are consumed more heavily with higher income.

2.2.4 Political-economic determinants

Budgeting procedures or *fiscal rules* may well influence the sustainability of fiscal policy (see, for example, von Hagen, 1991).[8] Budgeting procedures and fiscal rules are introduced to enforce fiscal discipline; inquiring negative consequences for social spending (see Heinemann et al., 2018 for a survey on fiscal rules). However, the empirical evidence on fiscal rules is mixed. In the US states, fiscal rules and welfare spending were hardly correlated. Welfare belongs to the 'entitlement spending', which cannot be cut easily Penner and Weisner (2001). On the other hand, Nerlich and Reuter (2013), for instance, report that fiscal rules have a strong negative impact on expenditures on social protection in the EU, while Dahan and Strawczynski (2013) found that fiscal rules decreased the ratio of social transfers to government consumption in OECD countries. 'Hard' rules reduce redistribution and increase income inequality (Hartwig and Sturm, 2019).

International institutions also influence domestic welfare spending (e.g. Kittel and Obinger, 2003; Herwartz and Theilen, 2014; McManus, 2019). In the EU, the Maastricht Treaty of debt and deficit requirements for euro area members, for example, affect national budgets, which has consequences for domestic policies such as social spending.

Public debt and budget deficit: The increased government indebtedness in many industrialized countries since the 1980s imposed constraints on the expansion and maintenance of social expenditure. High levels of debt especially restrain partisan effects on social expenditure. Authors have shown that social expenditure is negatively correlated with public debt (in % of GDP) (Kittel and Obinger, 2003) and budget deficits (net lending, in % of GDP) (Herwartz and Theilen, 2014).

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[8]Fiscal rules are rules according to which budgets are drafted by the government, amended and passed by the parliament, and implemented by the government.

2.3 Data

2.3.1 Social expenditure in OECD countries

We use data on total public social expenditure from the OECD Social Expenditure Database (SOCX) for the years 1980-2016 for 31 OECD countries.[9] The SOCX includes public benefits with a social purpose, grouped along the following areas: old age pensions, health, incapacity-related benefits, family support, survivors, active labour market programmes, unemployment and housing.[10] Spending on old age pensions and health amount to around two thirds of overall social expenditure (see Figure 2.8 in the appendix).

Figure 2.3: Social expenditure (in % of GDP) in the year 2016

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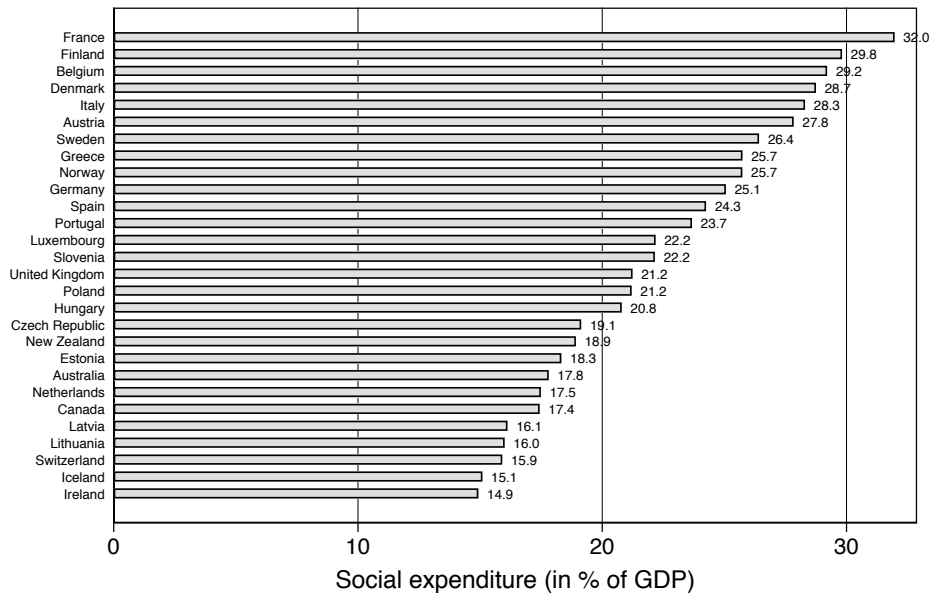
[9]Of the 36 OECD countries, we exclude Chile, Israel, Korea, Mexico, and Turkey because data for some explanatory variables is not available for those countries.

[10]It includes public spending on early childhood education and care up for children under age six, but excludes public spending on education beyond that age.

Public social expenditure was highest in France in 2016, amounting to 32% of GDP. It was lowest at around 15% in liberal welfare state regimes such as Ireland, Iceland and Switzerland, and in Baltic countries such as Lithuania and Latvia. On average, social expenditure was 20.5% in the OECD countries in 2016 (see Figure 2.3). Social expenditure increased from 14.4% in 1980 to 20.5% in 2016. Social expenditure increased in every OECD country between 1980 and 2016, except in the Netherlands and Ireland (Figure 2.4).

Figure 2.4: Social expenditure in the years 1980 and 2016; including 45°-line
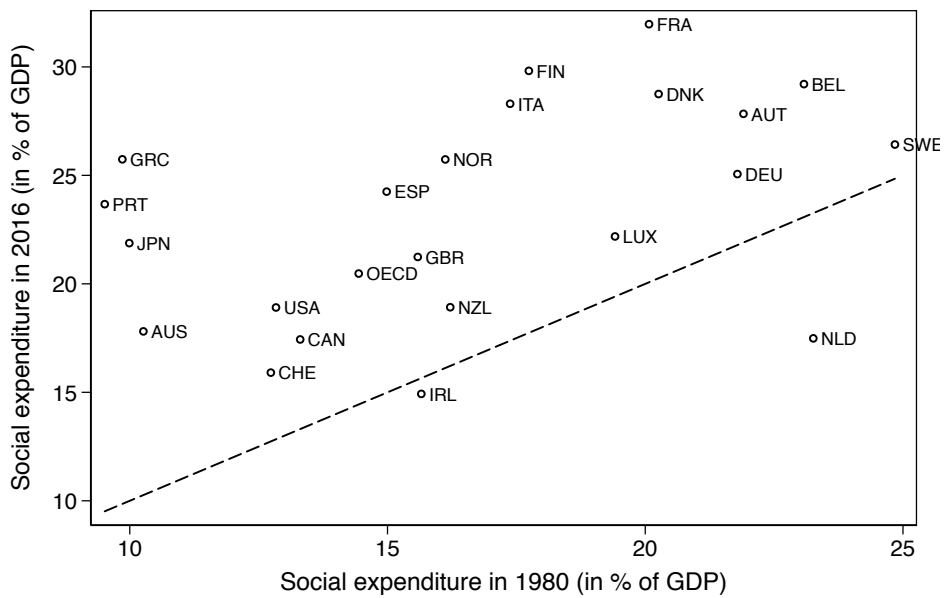
2.3.2 Explanatory variables

Descriptive statistics of the explanatory variables are shown in Table 2.1. The sources of the explanatory variables and their expected effect on social expenditure are shown in Table 2.7 in the appendix.

Economic determinants include the unemployment rate measured as percentage of the labour force and GDP per capita (log). We also include a variable measuring banking crisis in general and the Global Financial Crisis (GFC) in particular. We

use the dataset on systematic banking crisis from Laeven and Valencia (2018) and compute the average output loss per year to account for the severity of the crisis. *Demographic determinants* include the old age and the young age dependency ratio.

We measure *globalisation* by six sub-indices of the revised KOF Globalisation Index (Dreher, 2006; Dreher et al., 2008; Gygli et al., 2019). The new KOF index distinguishes between the dimensions (economic, social and political) of globalisation and disentangles the economic dimension of globalisation into a trade and financial subcomponent. For example, when trade globalisation results in higher uncertainty and risks for domestic workers than financial globalisation, we expect a stronger compensation effect for trade than for financial globalisation. The new KOF index also helps to disentangle the effects of de jure and de facto globalisation on social expenditure. We include de facto and de jure indices for trade and financial globalisation, as well as the overall index for social and political globalisation in our empirical analysis.

We include several *political-institutional determinants* and interaction terms between individual variables. To measure government ideology, we include the government ideology indicator by Cruz et al. (2018). They provide a measure on the political ideology of the chief executive, which assumes the value 1 for right-wing, 2 for centre, and 3 for left-wing chief executives. We compute a dummy variable for left-wing governments.

We also include the interaction terms between left-wing governments and the individual globalisation indices. The new distinction between de facto and de jure globalisation in the KOF Globalisation Index is suitable to examine the correlation between government ideology and economic globalisation: when left-wing governments are active in protectionist policies, especially de jure economic globalisation should be less pronounced under left-wing than right-wing governments. De facto economic globalisation is also expected to be less pronounced under left-wing than right-wing governments. Clearly, left-wing governments have less means in directly influencing de facto economic globalisation but especially foreign investors may hesitate in investing in a country with a newly elected government that is expected to implement, for example, business tax increases.

As suggested by McManus (2019), we also include the interaction term between left-wing governments and our variable measuring banking crisis. As suggested by Garrett (1998), we include union density and the interaction term between left-wing governments and union density to account for governments responding to pressure from unions (Visser, 2019).

We include variables related to the common pool problem that are expected to influence social spending. This includes measures of the electoral system and the legislative structure of a country. In particular, proportional voting and a presidential system are expected to be positively correlated with social expenditure. However, these effects are mostly subsumed in the country fixed effects because the electoral system and legislative structure is time-invariant in most countries. We further include variables measuring the ideological gap between incoming and outgoing governments, the fractionalisation of the party system and dummy variables for coalition governments, minority governments and single-party cabinets (Armingeon et al., 2018).[11]

To examine electoral cycles in social expenditure, we include a dummy variable that equals one for years in which elections for national parliament (lower house) are held. The variable is calculated based on the dataset of Armingeon et al. (2018). To account for conditional electoral cycles, we employ interaction terms between the election cycle dummy variable and measures that have been shown to mitigate electoral cycles: the electoral system and legislative structure, the level of development measured as per capita GDP, institutional quality measured using the ICRG index, the level of democracy measured using the POLITY2 database and the fiscal expenditure rule dummy.[12]

Ethnic fragmentation is calculated as the Herfindahl index of ethnic fractionalisation of politically relevant groups in a country based on data from the Ethnic Power Relations (EPR) Core Dataset (Cederman et al., 2010; Vogt et al., 2015). We employ the market Gini coefficient from the SWIID data base (Solt, 2009) as

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[11] The fractionalisation of the party system is measured as proposed by Rae (1968): $fract = 1 - \sum_{i=1}^{n} s_i^2$, where s is the share of seats for party i and m is the number of parties.

[12] Inferences do not change when we measure political institutions using data provided by Gruendler and Krieger (2016, 2018); Bjornskov and Rode (2019).

measure of inequality. To identify a potential effect of higher political participation on social expenditure, we include voter turnout in elections compiled by Armingeon et al. (2018).

Political-economic determinants are measured by four variables. To account for budgetary procedures and fiscal rules, we employ a fiscal rules indicator based on Lledó et al. (2017). This variable accounts for the presence of expenditure rules, debt rules, budget balance rules, and revenue rules. To account for international institutions, we introduce dummy variables for European Union membership. Finally, we include public debt as a percentage of GDP and budget deficits as measured by net lending as a percentage of GDP.

Table 2.1: Descriptive Statistics

	Mean	SD	Min.	Max.	N
Dependent variable					
Public social expenditure (% of GDP)	20.2	4.8	9.5	34.2	954
Economic and demographic determinants					
Unemployment rate (% of labour force)	7.6	4.1	0.2	27.5	950
GDP per capita (log)	10.4	0.6	8.6	11.6	954
Banking crisis (average output loss per year)	0.9	3.2	0.0	21.5	954
Old age dependency ratio	22.5	4.2	13.2	42.7	954
Young age dependency ratio	27.5	5.2	19.7	51.6	954
Globalisation-welfare state nexus					
KOF Trade Globalisation Index, de facto	53.5	19.1	18.4	89.0	951
KOF Financial Globalisation Index, de facto	71.3	18.8	18.7	99.8	951
KOF Trade Globalisation Index, de jure	83.4	10.6	39.8	97.8	951
KOF Financial Globalisation Index, de jure	76.2	12.3	31.1	98.3	951
KOF Social Globalisation Index	78.7	8.0	51.2	92.1	951
KOF Political Globalisation Index	85.0	11.4	43.1	98.7	951
Political-institutional determinants					
Left-wing government	0.3	0.5	0.0	1.0	954
Union density (in %)	36.7	21.3	4.4	98.7	950
Proportional voting	1.7	0.6	0.0	2.0	950
Presidential system	0.4	0.7	0.0	3.0	950
Ideological gap between cabinets	-0.0	0.9	-3.0	3.0	951
Legislative fractionalisation	0.7	0.1	0.4	0.9	954
Coalition governments	0.6	0.5	0.0	1.0	954
Minority governments	0.2	0.4	0.0	1.0	954
Single party cabinets	0.2	0.4	0.0	1.0	954
Election year	0.3	0.4	0.0	1.0	954
Ethnic fractionalisation	18.8	21.0	0.0	59.7	951
Gini coefficient	0.5	0.0	0.4	0.5	940
Voter turnout (in %)	74.3	13.2	38.2	96.8	954
Political-economic determinants					
Fiscal rule	0.4	0.5	0.0	1.0	954
European Union member	0.6	0.5	0.0	1.0	954
Public debt (% of GDP)	63.3	36.1	4.6	218.3	941
Deficit (net lending, % of GDP)	-2.6	4.5	-32.1	18.7	935

Notes: For variable definitions and sources, see Table 2.7 in the appendix.

2.4 Methodology

To examine the determinants of public social expenditure in OECD countries, we apply extreme bounds analysis (EBA), suggested by Leamer (1985); Levine and Renelt (1992).[13] This approach has been widely used in the economic growth literature. The central difficulty in this research - which also applies to our study - is that several different models may all seem reasonable given the data but yield different conclusions about the parameters of interest. Equations of the following forms are estimated:

$$Y = \alpha \mathbf{M} + \beta \mathbf{F} + \gamma \mathbf{Z} + u \qquad (2.1)$$

where Y is the dependent variable; M is a vector of 'standard' explanatory variables; F is the variable of interest; Z is a vector of up to three possible explanatory variables, which the literature suggests may be related to the dependent variable; and u is an error term. The extreme bounds test for variable F states that if the lower extreme bound for β - the lowest value for β minus two standard deviations - is negative and the upper extreme bound for β - the highest value for β plus two standard deviations - is positive, the variable F is not robustly related to Y.

It is rare in empirical research that one model dominates all other possibilities in all dimensions (Temple, 2000). We therefore discuss how sensitive the findings are to alternative modelling choices. EBA provides a relatively simple means of portraying sensitivity to alternative modelling choices. Still, the approach has been criticised. Sala-I-Martin (1997) describes, for example, that the test applied poses too rigid a threshold in most cases. Assuming that the distribution of β has at least some positive and some negative support, the estimated coefficient changes signs if enough specifications are considered. We therefore report the smallest and largest coefficient estimates, the extreme bounds and the percentage of the regressions in which the coefficient of the variable F is significantly different from zero at the 5%-level. Moreover, instead of investigating just the extreme bounds of the estimates of the coefficient of an individual variable, we follow the suggestion of Sala-I-Martin

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[13]Parts of this section rely upon previous works like Hartwig and Sturm (2014); Moser and Sturm (2011); Sturm and Williams (2010); Dreher et al. (2009a,b).

(1997) to examine the entire distribution of the coefficients. Following this suggestion, we investigate the (unweighted) average parameter estimate of β and its average standard deviation, and the (unweighted) cumulative distribution function of the parameter estimate. In particular, we are interested in the fraction of the distribution function lying on one side of zero: CDF(0).[14]

Including interaction effects in EBA is not straightforward. This is because we need to make sure that we control for the individual variables additional to the interaction term. We include interaction terms and the individual variables in the F-vector, leaving the control variables in the Z-vector unchanged. Hence, we are using the same set of variables as before to test for the robustness of the interaction term. Furthermore, we need to test the significance of the interaction term and the individual variables simultaneously. This is done with an F-test.

2.5 Results

2.5.1 Baseline model

In the baseline model, we regress social expenditure only on our two 'M vector' variables, the standard explanatory variables. We include the unemployment rate and the old age dependency ratio as standard variables. The reason being the mechanical link between these variables and social expenditure: the larger the number of unemployed workers and pensioners, the larger are unemployment and pension expenditures. Given these standard variables, our dataset includes annual data for 31 OECD countries and 37 years. As a baseline model, we regress social expenditure (*socx*) on the unemployment rate (*unemp*) and the old age dependency

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[14]For simplicity, this term is used for the distribution on both sides of zero, that is for CDF(0) and 1-CDF(0). Sala-I-Martin (1997) proposes using the (integrated) likelihood to construct a weighted CDF(0). However, the varying number of observations in the regressions due to missing observations in some of the variables poses a problem. Sturm and de Haan (2001) show that this goodness-of-fit measure may not be a good indicator of the probability that a model is the true model, and the weights constructed in this way are not equivariant to linear transformations in the dependent variable. Hence, changing scales result in rather different outcomes and conclusions. We thus restrict our attention to the unweighted version.

ratio (*dependency*), and country (*i*) and year (*t*) fixed effects. Standard errors are clustered at the country level.

$$socx_{it} = \alpha + \underset{(0.056)}{0.36}\, unemp_{it} + \underset{(0.083)}{0.34}\, dependency_{it} + \mu_i + \gamma_t + \epsilon_{it} \qquad (2.2)$$

The result of the regression is shown in equation 2.2. It confirms the positive link between both the unemployment rate and ageing, and social expenditure. The coefficients of both variables are positive and, as the standard errors in brackets suggest, statistically significant at the 1%-level. A one-percentage point higher unemployment rate and dependency ratio, is associated with a 0.36 and 0.34 percentage point higher social expenditure ratio.

2.5.2 Extreme Bounds Analysis

We now turn to the extreme bounds analysis. The results of the extreme bounds analysis excluding interaction terms are shown in Table 2.2. For every variable of interest (F-variable), we estimate 3003 models including up to three additional explanatory variables (Z-variables). The two standard explanatory variables (M-variables) are included in every regression. The first two columns in Table 2.2 report the (unweighted) average of the estimated β-coefficients (β) and the average standard error (SE) over all models for the particular variable of interest. Column (3) reports the percentage of the regressions in which the coefficient on the variable of interest differs significantly from zero at the 5%-level (%Sign.). Our main attention is on column (4). It displays the fraction of the cumulative distribution function of the estimated coefficients, laying on either side of zero (CDF(0)). We follow Sala-i-Martin (1997) and apply the criterion that $CDF(0) \geq 0.95$: If 95% of the density lays on one side of zero, we regard this variable as a robust determinant of social expenditure. Furthermore, columns (5) and (6) report the estimated lower (Min.) and upper bound (Max.). They are defined as the lowest and highest estimated coefficients plus or minus two times their standard deviation (SD).

Applying the rule $CDF(0) \geq 0.95$ for robust determinants, we find that both the standard explanatory variables determine social expenditure. The estimated

Table 2.2: Extreme Bounds Analysis: Results

Variables	Avg. β	Avg. SE	% Sign.	CDF (0)	Min.	Max.
Standard explanatory variables						
Unemployment rate (% of labour force)	0.35	0.06	1.00	**1.00**	0.10	0.56
Old age dependency ratio	0.29	0.09	0.86	**0.99**	-0.20	0.61
Economic and demographic determinants						
GDP per capita (log)	-1.95	1.84	0.07	0.82	-10.75	4.14
Banking crisis (avg. output loss per year)	0.12	0.05	0.86	**0.99**	-0.04	0.26
Young age dependency ratio	-0.03	0.10	0.00	0.67	-0.37	0.34
Globalisation-welfare state nexus						
KOF Trade Globalisation Index, de facto	-0.09	0.03	0.99	**0.99**	-0.19	0.01
KOF Financial Globalisation Index, de facto	0.03	0.03	0.03	0.85	-0.05	0.12
KOF Trade Globalisation Index, de jure	-0.03	0.05	0.00	0.72	-0.18	0.12
KOF Financial Globalisation Index, de jure	0.06	0.03	0.27	0.94	-0.03	0.16
KOF Social Globalisation Index	0.27	0.14	0.46	**0.97**	-0.08	0.71
KOF Political Globalisation Index	0.03	0.06	0.00	0.71	-0.14	0.20
Political-institutional determinants						
Left-wing governments	0.15	0.25	0.00	0.72	-0.46	0.80
Union density (in %)	0.01	0.04	0.00	0.64	-0.09	0.12
Ideological gap between cabinets	-0.10	0.06	0.10	**0.95**	-0.28	0.07
Legislative fractionalisation	-7.72	3.06	0.99	**0.99**	-17.25	1.02
Coalition governments	0.60	0.34	0.28	**0.95**	-1.18	2.05
Minority governments	-0.33	0.41	0.01	0.79	-2.08	1.56
Single party governments	-0.49	0.48	0.09	0.81	-2.71	1.62
Election year	-0.03	0.06	0.00	0.69	-0.20	0.17
Ethnic fractionalisation	-0.06	0.09	0.01	0.74	-0.67	0.32
Gini index	-22.51	17.84	0.00	0.89	-65.85	25.27
Voter turnout (in %)	0.01	0.04	0.00	0.60	-0.19	0.11
Political-economic determinants						
Fiscal rules	-0.66	0.47	0.02	0.91	-1.92	0.65
EU membership	-0.83	0.68	0.15	0.86	-3.35	1.49
Public debt (in % of GDP)	0.03	0.02	0.63	**0.97**	-0.02	0.07
Deficit (net lending, in % of GDP)	-0.20	0.04	1.00	**1.00**	-0.30	-0.06

Notes: For variable definitions and sources, see Table 2.7 in the appendix. Bold numbers indicate variables for which $CDF(0) \geq 0.95$.

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coefficient for the unemployment rate has an estimated coefficient that is positive and statistically different from zero in every estimation. The dependency ratio is statistically different from zero in 89% and the coefficient is positive in 99% of all estimations.

The EBA results in Table 2.2 report eight other robust explanatory variables. We find that social expenditure is positively correlated with banking crisis, social globalisation, coalition governments and public debt. Social expenditure is negatively correlated with trade globalisation (de facto), the ideological gap between cabinets, the legislative fractionalisation and government deficits. We thus find mixed evidence regarding the effect of globalisation on social expenditure: the negative coefficient for trade globalisation corroborates the race-to-the-bottom theory. Trade globalisation is shown to predict social expenditures in all regressions. The estimated coefficient is negative in all estimated models. On the other hand, the results show that social globalisation increases social expenditure. It is conceivable that citizens in an individual country observe social policies in other industrialized countries (e.g., pension or family benefits) and therefore demand similar benefits in their own country. Social globalisation is measured by increasing information exchange between citizens and promotes learning from other countries. Furthermore, social expenditure increased during the Great Financial Crisis (GFC) in many industrialized countries.

The results also suggest that the more the political landscape is fragmented, the smaller is social expenditure: legislative fractionalisation, meaning that the parliament seats are distributed to more parties, and the ideological gap between cabinets are negatively associated with social expenditure. On the other hand, politically working together in the form of coalition governments is positively associated with social expenditure.

Public debt and budget deficits are found to be robust predictors for social expenditure. Higher debt levels are associated with higher levels of social expenditure, while budget deficits exert pressure to cut on social spending.

2.5.3 Extreme Bounds Analysis: Interaction terms

In Table 2.3 and Table 2.4, we present the results for the individual interaction terms. We report the results for each set of individual variables and interaction term. The first two columns in both tables report the (unweighted) average of the estimated β-coefficients (Avg. Beta) and the average standard error (Avg. SE) over all models for the particular variable of interest. Column (3) reports the share of the regressions in which the coefficient on the variable of interest differs significantly from zero at the 5%-level (%Sign). The last column reports the percentage of models with an $F - test$ for joint significance at the 5%-level (%F-Sign).

The results suggest that the combinations of left-wing governments, de facto trade globalisation and their interaction, as well as the combinations of left-wing governments, banking crisis and their interaction are - each as a group - always significant and therefore robust determinants of social expenditure. This is because the percentage of models with F-tests for joint significance at the 5%-level (%F-Sign) is in both cases equal to one. The remaining groups of each three variables do not turn out to be robust predictors of social expenditure.

However, we find that the interaction term between left-wing governments and banking crisis is almost never statistically significant. Hence, the significance of the F-tests appears to be driven by the banking crisis variable itself. The interaction term between left-wing governments and de facto trade globalisation, on the other hand, is positive and the coefficient for trade globalisation negative. This suggests, that under centre and right-wing governments, de facto trade globalisation was negatively associated with social expenditure, while under left-wing governments, the negative effect is smaller.

The left panel of Figure 2.5 shows how government ideology is associated with social expenditure conditional on trade globalisation. The level of trade globalisation conditions the influence of left-wing governments on social expenditure: left-wing governments had no effect on social expenditure when de facto trade globalisation was low. Social expenditure increased, however, under left-wing governments when trade liberalisation was pronounced. This result suggests that left-wing governments were more active to protect domestic citizens from rapidly proceeding globalisation

Table 2.3: Extreme Bounds Analysis: Results for interaction terms, partisan effects

Variables	Avg. β	Avg. SE	% Sign.	CDF (0)	% F-Sign.
Left-wing governments	-1.23	0.63	0.44	0.97	**1.00**
KOF Trade Globalisation Index, de facto	-0.09	0.03	**1.00**	1.00	**1.00**
Interaction term	0.03	0.01	**1.00**	0.99	**1.00**
Left-wing governments	-1.25	0.83	0.09	0.92	0.01
KOF Financial Globalisation Index, de facto	0.02	0.02	0.02	0.77	0.01
Interaction term	0.02	0.01	0.34	0.96	0.01
Left-wing governments	-2.88	1.51	0.44	0.97	0.00
KOF Trade Globalisation Index, de jure	-0.05	0.05	0.01	0.81	0.00
Interaction term	0.04	0.02	0.62	0.97	0.00
Left-wing governments	0.07	1.12	0.00	0.68	0.00
KOF Financial Globalisation Index, de jure	0.06	0.03	0.26	0.94	0.00
Interaction term	0.00	0.01	0.00	0.67	0.00
Left-wing governments	-1.67	2.32	0.00	0.76	0.00
KOF Social Globalisation Index	0.26	0.14	0.42	0.96	0.00
Interaction term	0.02	0.03	0.00	0.78	0.00
Left-wing governments	-0.58	2.04	0.00	0.62	0.00
KOF Political Globalisation Index	0.03	0.06	0.00	0.69	0.00
Interaction term	0.01	0.02	0.00	0.64	0.00
Left-wing governments	0.07	0.24	0.00	0.62	**1.00**
Banking crisis	0.11	0.06	0.58	0.97	**1.00**
Interaction term	0.12	0.08	0.08	0.94	**1.00**
Left-wing governments	0.32	0.46	0.00	0.75	0.00
Union density (in%)	0.01	0.04	0.00	0.66	0.00
Interaction term	0.00	0.01	0.00	0.64	0.00

Notes: For variable definitions and sources, see Table 2.7 in the appendix. Bold numbers indicate variables for which the share of regressions in which the coefficient differs significantly from zero (%Sign.) or the interaction term and its individual variables are jointly significant (%F-sign.) is equal or greater than 0.95.

than centre and right-wing governments - an effect that is well in line with the core idea of partisan politics and previous empirical studies (Potrafke, 2009).

Table 2.4: Extreme Bounds Analysis: Results for interaction terms, political business cycles

Variables	Avg. β	Avg. SE	% Sign.	CDF (0)	% F-Sign.
Election year	-0.21	0.16	0.00	0.90	0.00
Proportional voting	-0.22	0.55	0.00	0.71	0.00
Interaction term	0.11	0.09	0.00	0.88	0.00
Election year	0.08	0.05	0.08	0.92	0.43
Presidential system	0.01	0.16	0.00	0.66	0.43
Interaction term	-0.26	0.10	0.93	0.99	0.43
Election year	0.10	1.21	0.00	0.66	0.00
GDP per capita (log)	-1.98	1.84	0.07	0.82	0.00
Interaction term	-0.01	0.12	0.00	0.66	0.00
Election year	0.13	0.32	0.00	0.72	0.00
Institutional quality	1.98	4.54	0.00	0.67	0.00
Interaction term	-0.20	0.38	0.00	0.73	0.00
Election year	-1.24	3.88	0.00	0.62	0.03
Level of democracy	1.48	0.78	0.40	0.96	0.03
Interaction term	0.12	0.39	0.00	0.62	0.03
Election year	-0.10	0.08	0.02	0.87	0.00
Fiscal rules; expenditure rules	-0.70	0.48	0.03	0.92	0.00
Interaction term	0.16	0.13	0.00	0.89	0.00

Notes: For variable definitions and sources, see Table 2.7 in the appendix. Bold numbers indicate variables for which the share of regressions in which the coefficient differs significantly from zero (%Sign.) or the interaction term and its individual variables are jointly significant (%F-sign.) is equal or greater than 0.95.
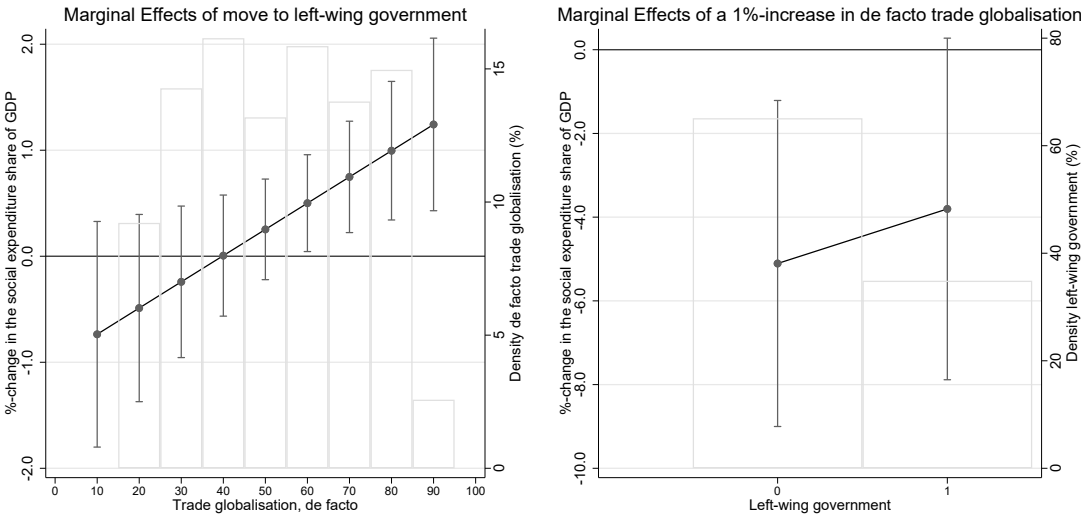
Figure 2.5: Marginal effects of government ideology and trade globalisation on social expenditure

2.5.4 Bayesian model averaging

We check the robustness of our results by performing Bayesian model averaging (BMA) as described by Magnus et al. (2010), an approach that follows Sala-I-Martin et al. (2004). The statistical framework includes two sets of explanatory variables. The so called focus regressors are included in every model. As in the EBA, we chose the unemployment rate and the old age dependency ratio as focus regressors, because of the mechanical link between these variables and social expenditure. The auxiliary regressors k contain our additional explanatory variables.

BMA addresses model uncertainty related to the choice of the auxiliary regressors by estimating models for all possible combinations and taking a weighted average over all models. It attaches prior probabilities to the different models and averages them based on derived posterior probabilities. The probability that model j, M_j, is the 'true' model given the data y, i.e. the posterior model distribution given a prior model probability, is defined as

$$P(M_j/y) = \frac{P(y/M_j)P(M_j)}{\sum_{i=1}^{2^k} P(y/M_i)P(M_i)} \tag{2.3}$$

where $P(y/M_j)$ is the marginal likelihood of model M_j given data y, and $P(M_j)$ is the prior model probability. The weight for a given model is normalized by the sum of the weights of all models, represented in the denominator in equation (2) (given the number of auxiliary regressors k, the total number of models amounts to 2^k). We employ the Bayesian estimator by Magnus et al. (2010), which uses conventional non-informative priors on the focus regressors and the error variance, and a multivariate Gaussian prior on the auxiliary regressors.

The results of the BMA are shown in Table 2.5. Column 2 and 3 display the estimated coefficient and their standard error (mean and standard deviation of the posterior distribution), t-ratios are shown in column 4. Column 5 reports the posterior inclusion probability (*pip*). It is the sum of the posterior model probability for all models wherein a regressor was included and can be interpreted as the likelihood that a regressor is included in the true model. A one standard error band to the coefficient is reported in the last two columns.

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Table 2.5: Bayesian Model Averaging: Results

Variables	Avg. β	Avg. SE	t	pip	-SD	+SD
Standard explanatory variables						
Unemployment rate (% of labour force)	0.20	0.03	**6.47**	1.00	0.14	0.27
Old age dependency ratio	0.07	0.04	**1.58**	1.00	-0.02	0.15
Economic and demographic determinants						
GDP per capita (log)	-5.65	1.05	**-5.36**	**1.00**	-7.71	-3.58
Banking crisis (avg. output loss per year)	0.05	0.03	**1.44**	**0.75**	-0.02	0.11
Young age dependency ratio	0.02	0.04	0.60	0.32	-0.05	0.10
Globalisation-welfare state nexus						
KOF Trade Globalisation Index, de facto	-0.08	0.01	**-6.58**	**1.00**	-0.10	-0.05
KOF Financial Globalisation Index, de facto	0.04	0.01	**4.30**	**1.00**	0.02	0.06
KOF Trade Globalisation Index, de jure	-0.05	0.02	**-3.08**	**0.97**	-0.09	-0.02
KOF Financial Globalisation Index, de jure	0.08	0.01	**6.79**	**1.00**	0.05	0.10
KOF Social Globalisation Index	0.32	0.04	**8.69**	**1.00**	0.24	0.39
KOF Political Globalisation Index	0.00	0.00	-0.05	0.03	-0.01	0.01
Political-institutional determinants						
Left-wing governments	0.00	0.02	0.04	0.03	-0.04	0.05
Union density (in %)	0.00	0.00	0.09	0.04	0.00	0.01
Ideological gap between cabinets	-0.1	0.04	-0.35	0.14	-0.10	0.07
Legislative fractionalisation	-5.03	1.33	**-3.78**	**0.99**	-7.65	-2.42
Coalition governments	0.33	0.28	**1.17**	**0.65**	-0.22	0.87
Minority governments	-0.04	0.16	-0.25	0.14	-0.36	0.28
Single party governments	-0.18	0.32	-0.57	0.30	-0.80	0.44
Election year	0.00	0.02	-0.10	0.04	-0.05	0.04
Ethnic fractionalisation	-0.15	0.07	**-2.23**	**0.91**	-0.29	0.02
Gini index	-15.71	3.94	**-3.99**	**1.00**	-23.45	-7.98
Voter turnout (in %)	0.00	0.00	0.18	0.06	-0.01	0.01
Political-economic determinants						
Fiscal rules	-0.24	0.26	-0.95	0.54	-0.75	0.26
EU membership	-0.85	0.38	**-2.24**	**0.91**	-1.60	-0.10
Public debt (in % of GDP)	0.01	0.01	**1.38**	**0.73**	0.00	0.02
Deficit (net lending, in % of GDP)	-0.18	0.02	**-8.46**	**1.00**	-0.22	-0.14

Notes: For variable definitions and sources, see Table 2.7 in the appendix. t refers to the t-ratio, *pip* refers to the posterior inclusion probability, and $-SD$ and $+SD$ denotes lower and upper bounds of an error band of one standard deviation. Bold numbers indicate variables for which $pip > 0.5$ and $|t| > 1$. pip equals one for the unemployment rate and old age dependency ratio by definition.

The estimation does not provide p-values of the t-ratios for testing the significance of the estimated parameters, because the Bayesian counterpart is not straightforward. A regressor is robustly correlated with the independent variable if the corresponding absolute t-ratio is greater than one, in which case the mean squared error (MSE) of the restricted OLS estimator is lower than the MSE of the restricted OLS estimator. Alternatively, as a rough guideline, a posterior inclusion probability of 0.5 corresponds approximately to a t-ratio of one in absolute value Magnus et al. (2010).

The results in Table 2.5 confirm our EBA results that the unemployment rate and the old age dependency ratio are robust predictors of social expenditure, the t-ratio of both focus regressors is greater than one, while the posterior inclusion probability (pip) is one by definition.

For the auxiliary regressors, we focus on the posterior inclusion probability (pip), which is interpreted as the probability that the respective auxiliary regressor belongs to the true model. The results for the BMA confirms our previous results that the following variables are robust predictors of social expenditure: banking crisis, de facto trade globalisation, social globalisation, legislative fractionalisation, coalition governments, public debt, and budget deficits. The BMA does not confirm the previous results for the ideological gap between cabinets. However, contrary to the EBA, we find additional robust determinants of social expenditure. In particular, we find that de jure financial globalisation (both de facto and de jure) is positively associated with social expenditure. We also find that GDP per capita, de jure trade globalisation, ethnic fractionalisation, inequality (Gini index) and EU membership are negatively associated with social expenditure.

Turning to the interaction terms, we employ BMA to check the robustness of our results for interaction effects based on the EBA. For each set of individual variables and interaction term, we include them in our set of focus regressors to ensure that all of the three are included in all models. We carry out the BMA using the remaining variables as auxiliary regressors. The posterior inclusions probability (pip) is thus one for each variable in the set by definition. We consider the t-ratio to determine robust predictors of social expenditure.

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Table 2.6: Bayesian Model Averaging: Results for interaction terms

Variables	Avg. β	Avg. SE	t	pip	-SD	+SD
Left-wing governments	-0.88	0.37	2.40	1.00	**-1.61**	-0.16
KOF Trade Globalisation Index, de facto	-0.08	0.01	**-6.87**	1.00	-0.10	-0.06
Interaction term	0.02	0.01	**2.62**	1.00	0.00	0.03
Left-wing governments	-0.06	0.13	-0.49	1.00	-0.31	0.18
Banking crisis (avg. output loss per year)	0.05	0.02	**2.16**	1.00	0.00	0.09
Interaction term	0.12	0.04	**2.85**	1.00	0.04	0.21

Notes: For variable definitions and sources, see Table 2.7 in the appendix. t refers to the t-ratio, *pip* refers to the posterior inclusion probability, and $-SD$ and $+SD$ denotes lower and upper bounds of an error band of one standard deviation. Bold numbers indicate variables for which $|t| > 1$. *pip* equals one for individual variables and interaction terms by definition to ensure that the set is included in all models.

The results in Table 2.6 confirm the results from the robust EBA in the previous section. In particular, we confirm the positive effect of the interaction between left-wing governments and de facto trade globalisation. The results for the full list of interaction terms are presented in Table 2.8 and Table 2.9 in the appendix.

2.6   Robustness tests

A potential source for endogeneity is reverse causality between the dependent and the explanatory variables. For example, social policies and how social expenditure develops may well influence voting behavior. When citizens disagree with social policies, they will vote incumbent governments out of office. Government ideology changes. To address potential endogeneity from reverse causality, we re-estimate EBA and BMA with lagged control variables. Lagged control variables should at least attenuate potential reverse causality. We also estimate EBA and BMA using averages over 5-year non-overlapping periods to isolate medium- to long-term determinants of social expenditure, and 5-year periods with lagged dependent variables.

Figure 2.6: Coefficient plots for robust determinants from EBA and BMA for contemporaneous effects, lagged effects and 5-year periods
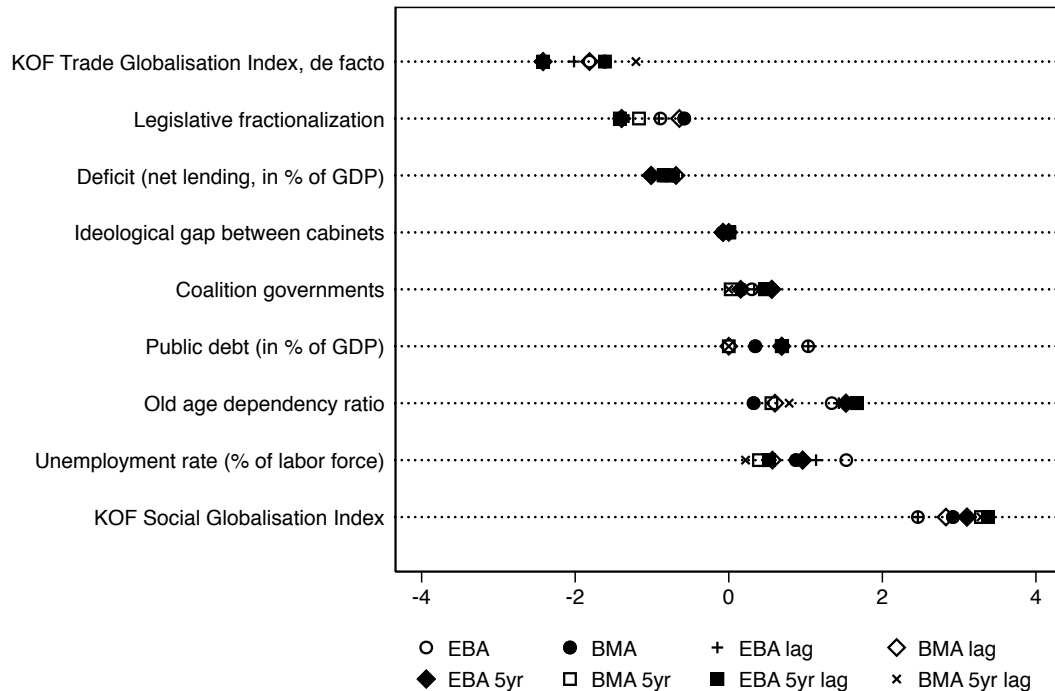
Notes: Standardized coefficients of the individual models for robust determinants of social expenditure according to EBA (see Table 2.2). Coefficients plots for all determinants are shown in Figure 2.9. Coefficients are rescaled by the sample standard deviation of the variable (semi-standardization). EBA: Extreme bounds analysis; BMA: Bayesian model averaging; lag: 1-year lagged control variables; 5yr: Averages over non-overlapping 5-year periods.

Figure 2.6 shows the standardized coefficients of the baseline model and the models using dependent variables lagged by one period (lag), averages of 5-year periods (5yr) and 5-year periods with lagged depended variables (5yr lag) for extreme bounds analysis (EBA) and Bayesian model averaging (BMA), respectively. The coefficients are standardized by the sample standard deviation of the individual variable to make them comparable to each other. The figure shows the coefficients for the robust determinants of social expenditure as found by the baseline model for of the extreme bounds analysis. The coefficients for all determinants are shown in Table A.3 in the appendix.

As Figure 2.6 shows that the point coefficients of the models are comparable in size. For social globalization, for example, we find that a one standard deviation increase in the KOF index of social globalization is associated with an increase in social expenditure between 2.5 and 3.4 percentage points on average. An increase in the KOF index of trade globalization by one standard deviation, on the other hand, is associated with a decrease in social expenditures between 1.2 and 2.4 percentage points. Overall, the coefficients of our baseline models for EBA and BMA are robust to using lagged dependent variables and 5-year periods with and without lagged dependent variables.

2.7 Conclusion

We portray robust determinants of social expenditure in OECD countries. Determinants include globalisation, political-economic variables such as government ideology and electoral motives, demographic change and economic variables such as unemployment. Employing EBA in a sample of 31 OECD countries over the period 1980-2016, our results suggest that budget deficits, trade globalisation and fractionalisation of the party system were negatively associated with social expenditure. Ageing, unemployment, social globalisation, coalition governments and public debt were positively associated with social expenditure. We furthermore introduce interaction effects into an EBA framework and find that the interaction of government ideology and trade globalisation is a robust determinant of social expenditures. Social expenditure increased under left-wing governments when de facto trade globalisation was pronounced. We have also used Bayesian model averaging: the results corroborate the relationships found between banking crisis, de facto trade globalisation, social globalisation, legislative fractionalisation, budget deficits, and public debt on the one hand and social expenditure on the other.

The large budget shares on social affairs often seem to be predetermined and exogenous to what policymakers influence: globalisation puts pressure on domestic policies, demographic change and recessions have mechanic effects on social expenditure. Consequently, domestic policymakers have hardly any means to design

spending on social affairs. Our results confirm that ageing, unemployment and de facto globalisation predict social expenditure. The results also suggest, however, that policymakers in individual countries still have leeway to influence social policies; and the policymakers use their leeway. Advocates of a large size of government may therefore proceed in supporting policymakers who are likely to extend the welfare state.

2.8   Appendix

Figure 2.7: Social expenditure in different welfare state regimes according to Esping-Andersen, 1980-2016.
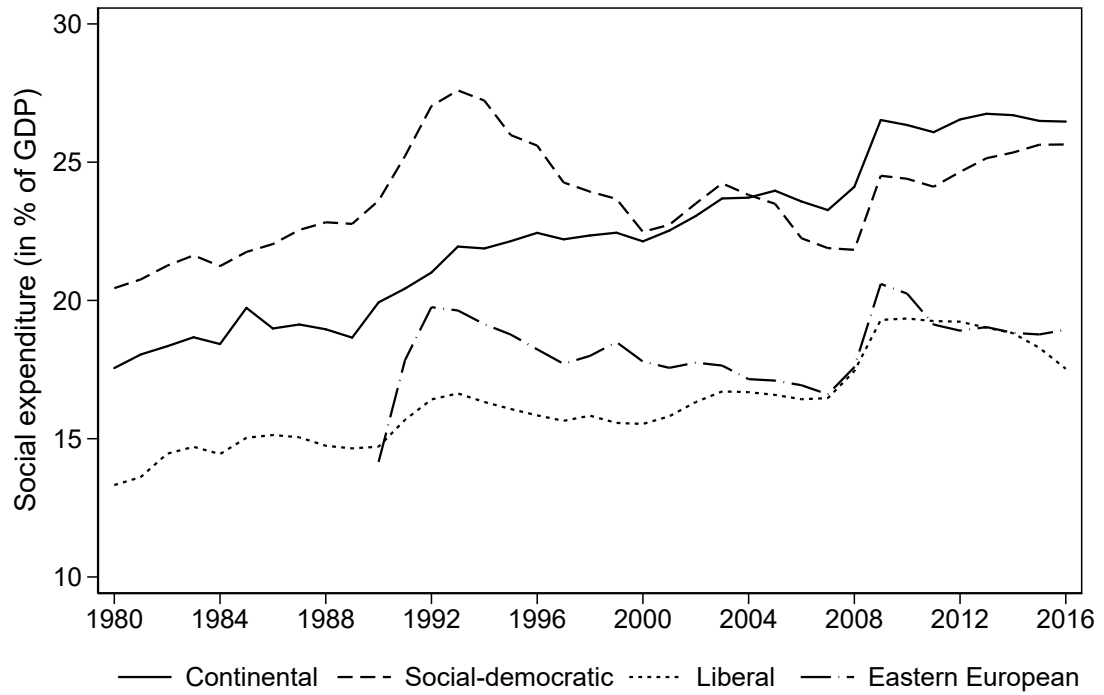
Figure 2.8: Composition of social expenditure in OECD countries.
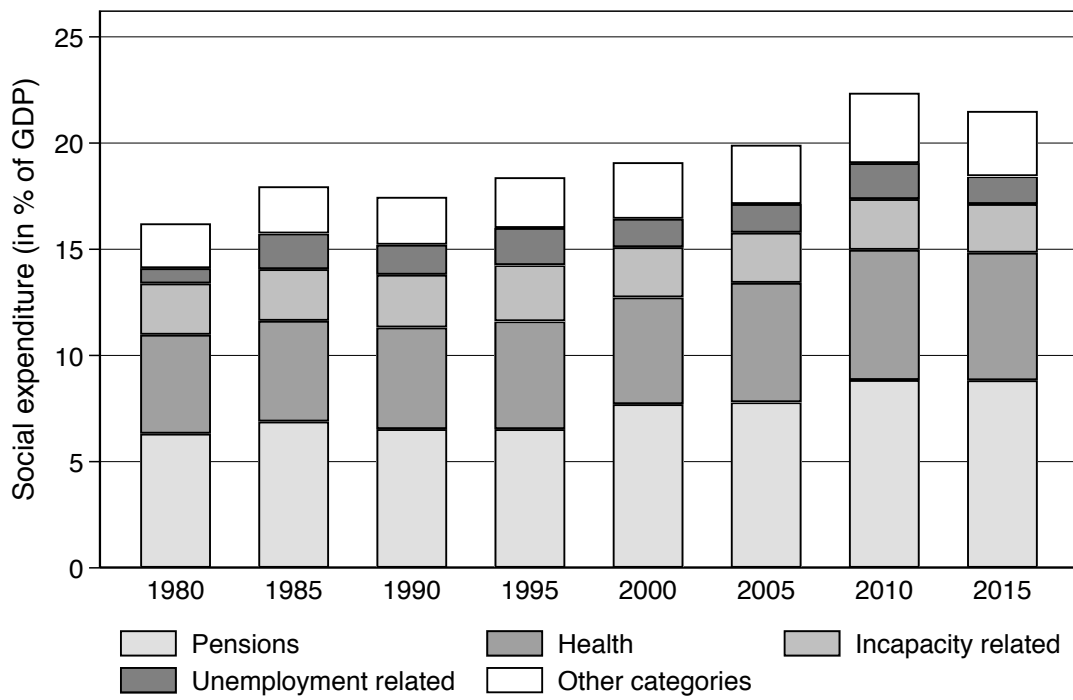
Figure 2.9: Coefficient plots, all determinants
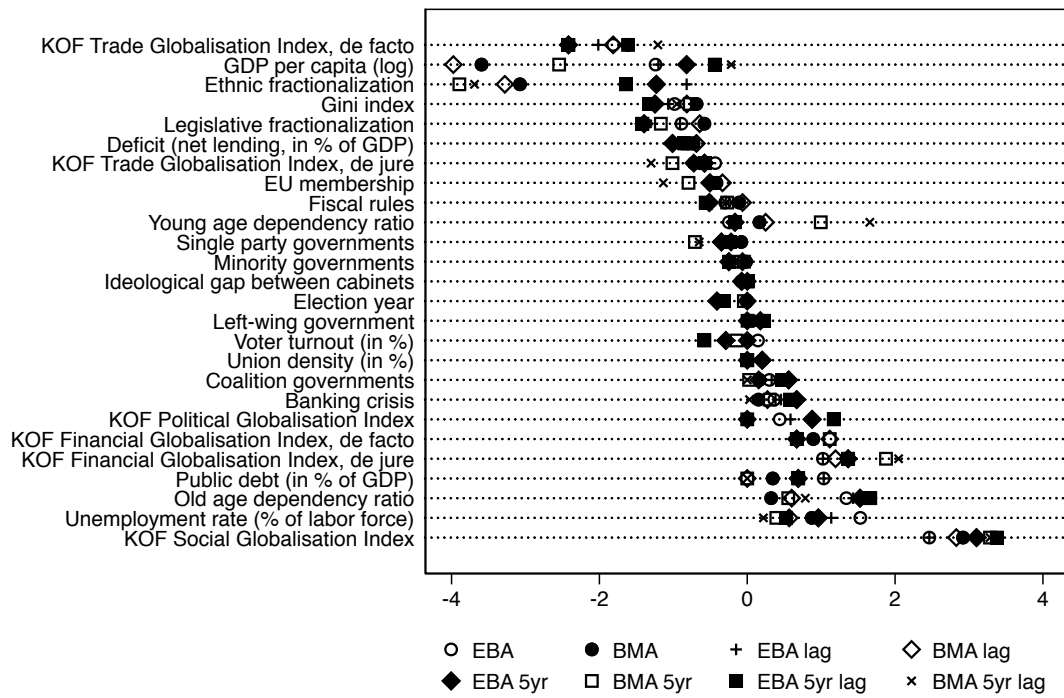
Notes: Standardized coefficients of different estimation models. Coefficients are rescaled by the sample standard deviation of the variable (semi-standardization). EBA: Extreme bounds analysis; BMA: Bayesian model averaging; lag: 1-year lagged control variables; 5yr: Averages over non-overlapping 5-year periods.

Table 2.7: Explanatory variables for social expenditures suggested in the literature

Variable	Suggested by	Effect	Data source
Dependent variable			
Public social expenditure (% of GDP)			OECD SOCX
Economic and demographic variables			
Unemployment rate (% of labour force)	Garrett and Mitchell (2001)	+	Armingeon et al. (2018)
GDP per capita (log)	Wagner's Law	+/-	World Bank WDI
Banking crisis (avg. output loss per year)	McManus (2019)	+	Laeven and Valencia (2018)
Old age dependency ratio		+	World Bank WDI
Young age dependency ratio		+	World Bank WDI
Globalisation-welfare state nexus			
KOF Trade Globalisation Index, de facto	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
KOF Financial Globalisation Index, de facto	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
KOF Trade Globalisation Index, de jure	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
KOF Financial Globalisation Index, de jure	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
KOF Social Globalisation Index	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
KOF Political Globalisation Index	Schulze and Ursprung (1999)	+/-	Gygli et al. (2019)
Political-institutional determinants			
Left-wing governments	Kittel and Obinger (2003)	+	Cruz et al. (2018)
Union density	Garrett (1998)	+	Visser (2019)

Proportional voting	Persson et al. (1998); Milesi-Ferretti et al. (2002)	+/-	Armingeon et al. (2018)
Presidential system	Persson and Tabellini (1999)	-	Armingeon et al. (2018)
Ideological gap between cabinets	Alesina and Tabellini (1990)	-	Armingeon et al. (2018)
Legislative fractionalisation	de Haan et al. (1999)	+	Armingeon et al. (2018)
Coalition governments	de Haan et al. (1999)	+	Armingeon et al. (2018)
Minority governments		+	Armingeon et al. (2018)
Single-party cabinets	Armingeon (2012)	-	Armingeon et al. (2018)
Election year	Rogoff and Sibert (1988)	+	Armingeon et al. (2018)
Ethnic fragmentation	Alesina et al. (2003)	-	Cederman et al. (2010); Vogt et al. (2015)
Gini Index	Alesina et al. (2003)	+	Solt (2009)
Voter turnout (in %)	Lijphart (1997)	+	Armingeon et al. (2018)
Political-economic determinants			
Fiscal rules: Expenditure rule	von Hagen (1991)	-	Lledó et al. (2017)
Fiscal rules: Debt rule	von Hagen (1991)	-	Lledó et al. (2017)
Fiscal rules: Budget balance rule	von Hagen (1991)	-	Lledó et al. (2017)
Fiscal rules: Revenue rule	von Hagen (1991)	-	Lledó et al. (2017)
EU membership	McManus (2019)	-	Armingeon et al. (2018)
EMU membership		-	Armingeon et al. (2018)
Public debt (% of GDP)	Kittel and Obinger (2003)	-	Armingeon et al. (2018)

| Budget deficit (net lending, % of GDP) | Herwartz and Theilen (2014) | - | Armingeon et al. (2018); Mauro et al. (2015) |

Table 2.8: Bayesian Model Averaging: Results for interaction terms, partisan effects

Variables	Avg. β	Avg. SE	t	pip	-SD	+SD
Left-wing governments	-0.88	0.37	-2.40	1.00	-1.61	-0.16
KOF Trade Globalisation Index, de facto	-0.08	0.01	-6.87	1.00	-0.10	-0.06
Interaction term	0.02	0.01	2.59	1.00	0.00	0.03
Left-wing governments	-1.15	0.47	2.44	1.00	-2.08	-0.22
KOF Financial Globalisation Index, de facto	0.04	0.01	3.52	1.00	0.02	0.06
Interaction term	0.02	0.01	2.59	1.00	0.00	0.04
Left-wing governments	-1.86	0.96	-1.94	1.00	-3.75	0.02
KOF Trade Globalisation Index, de jure	-0.07	0.02	-4.24	1.00	-0.10	-0.04
Interaction term	0.02	0.01	−0.11	1.00	-0.02	0.02
Left-wing governments	0.12	0.82	0.14	1.00	-1.50	1.73
KOF Financial Globalisation Index, de jure	0.08	0.01	6.49	1.00	0.05	0.10
Interaction term	0.00	0.01	-0.11	1.00	-0.02	0.02
Left-wing governments	-2.58	1.19	-2.17	1.00	-4.90	-0.25
KOF Social Globalisation Index	0.30	0.04	8.08	1.00	0.23	0.37
Interaction term	0.03	0.02	2.21	1.00	0.00	0.06
Left-wing governments	-1.53	1.15	-1.33	1.00	-3.78	0.72
KOF Political Globalisation Index	-0.01	0.02	-0.65	1.00	-0.05	0.02
Interaction term	0.02	0.01	1.37	1.00	-0.01	0.04
Left-wing governments	-0.06	0.13	-0.49	1.00	-0.31	0.18
Banking crisis	0.05	0.02	2.16	1.00	0.00	0.09
Interaction term	0.12	0.04	2.85	1.00	0.04	0.21
Left-wing governments	0.39	0.24	1.61	1.00	-0.09	0.87
Union density (in%)	0.01	0.01	0.97	1.00	-0.01	0.04
Interaction term	-0.01	0.01	-1.70	1.00	-0.02	0.00

Notes: t refers to the t-ratio, pip refers to the posterior inclusion probability, and $-SD$ and $+SD$ denotes lower and upper bounds of an error band of one standard deviation. For variable definitions and sources, refer to Table 2.7.

Table 2.9: Bayesian Model Averaging: Results for interaction terms, political business cycles

Variables	Avg. β	Avg. SE	t	pip	-SD	+SD
Election year	-0.20	0.30	-0.65	1.00	-0.79	0.40
Proportional voting	-0.42	0.43	-0.98	1.00	-1.26	0.42
Interaction term	0.08	0.17	0.47	1.00	-0.26	0.42
Election year	0.04	0.13	0.30	1.00	-0.21	0.28
Presidential system	-0.32	0.27	-1.19	1.00	-0.85	0.21
Interaction term	-0.25	0.16	-1.57	1.00	-0.57	0.06
Election year	-0.49	2.10	-0.24	1.00	-4.61	3.62
GDP per capita (log)	-5.65	1.06	-5.34	1.00	-7.73	-3.57
Interaction term	0.04	0.20	0.21	1.00	-0.35	0.44
Election year	-0.10	0.69	-0.15	1.00	-1.45	1.24
Institutional quality	-0.22	1.32	-0.16	1.00	-2.81	2.38
Interaction term	0.05	0.80	0.06	1.00	-1.51	1.61
Election year	-2.30	3.64	-0.63	1.00	-9.45	4.85
Level of democracy	0.31	0.36	0.88	1.00	-0.39	1.02
Interaction term	0.23	0.37	0.61	1.00	-0.50	0.95
Election year	-0.19	0.15	-1.30	1.00	-0.47	0.10
Fiscal rules	-0.53	0.18	-2.94	1.00	-0.88	-0.18
Interaction term	0.28	0.21	1.29	1.00	-0.14	0.70

Notes: t refers to the t-ratio, *pip* refers to the posterior inclusion probability, and $-SD$ and $+SD$ denotes lower and upper bounds of an error band of one standard deviation. For variable definitions and sources, refer to Table 2.7.

Chapter 3

Mutual recognition, harmonisation and exporting: Evidence from Swiss-EU trade integration

3.1   Introduction

The rapid elimination of tariffs on industrial goods in the last decades has shifted the focus of trade liberalisation initiatives to non-tariff measures (NTM). One of the most prevalent source of NTMs are technical barriers to trade (TBT), which refer to diverging technical regulations and conformity assessments procedures.[1] Technical regulations prescribe requirements for products to be sold in the domestic market and are introduced to correct for market failures, such as negative externalities of products or asymmetric information between producers and consumers.[2]

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[1]The other two important NTMs are sanitary and phytosanitary measures and contingent trade-protective measures. The standard taxonomy of the different non-tariff measures is provided by UNCTAD (2012).

[2]Negative externalities may arise from the risk of a product or production process to the health of consumers, workers, and the environment. To correct for negative externalities, regulations restrict for example the use of toxins in children's toys, or define maximum levels of lead in petrol. Asymmetric information between producers and consumers may pose problems with respect to the quality of a product. The quality of a bicycle helmet, for example, is difficult to assess for consumers.

Conformity assessments, on the other hand, verify that products meet the relevant regulations and are a prerequisite to introduce a product to the market. Although regulations and conformity assessments are not protectionist per se, they introduce compliance costs for exporters and translate into trade barriers if they differ substantially between countries (Essaji, 2008; Fontagné et al., 2015).[3]

Countries increasingly engage in regulatory cooperation to reduce the potential trade inhibiting effects of TBTs. As Figure 3.1 shows, a growing number of preferential trade agreements (PTA) include provisions on technical barriers to trade. Regulatory cooperation includes, among others, the harmonisation and mutual recognition of regulations and conformity assessments. While harmonisation aims at reducing the regulatory divergence between trade partners, mutual recognition facilitate market access by eliminating duplicate testing and certification procedures (for an overview of regulatory cooperation, see de Brito et al., 2016 and OECD, 2017).

The empirical evidence on the trade effects of technical trade barriers and regulatory cooperation is still relatively scarce. One important reason being the lack of well-established measures of regulation intensities and regulatory cooperation (Goldberg and Pavcnik, 2016; Ederington and Ruta, 2016). The literature tries to overcome this shortcoming by analysing the trade effects of TBT notifications and specific trade concerns raised at the WTO (e.g. Fontagné et al., 2015; Fontagné and Orefice, 2018), international regulatory standards diffusion (e.g. Schmidt and Steingress, 2019), and TBT provisions in bilateral trade agreements (e.g. Chen and Mattoo, 2008).

In the present study, I contribute to the latter by providing empirical evidence on the trade effects of regulatory harmonisation and mutual recognition of conformity assessments from Swiss-EU trade integration. Although not a member of the European Union (EU), Switzerland is linked to the EU by a series of bilateral market access agreements that allows the country to participate in the single market to

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[3]Compliance costs stem from identifying and processing the information on relevant regulations (information costs), from the need to adjust the product or production process to the regulations (adaption costs) and from verifying and providing evidence that these required regulations are actually met (conformity assessment costs)(von Lampe et al., 2016; Cadot et al., 2018).

Figure 3.1: Technical barriers to trade provisions in preferential trade agreements
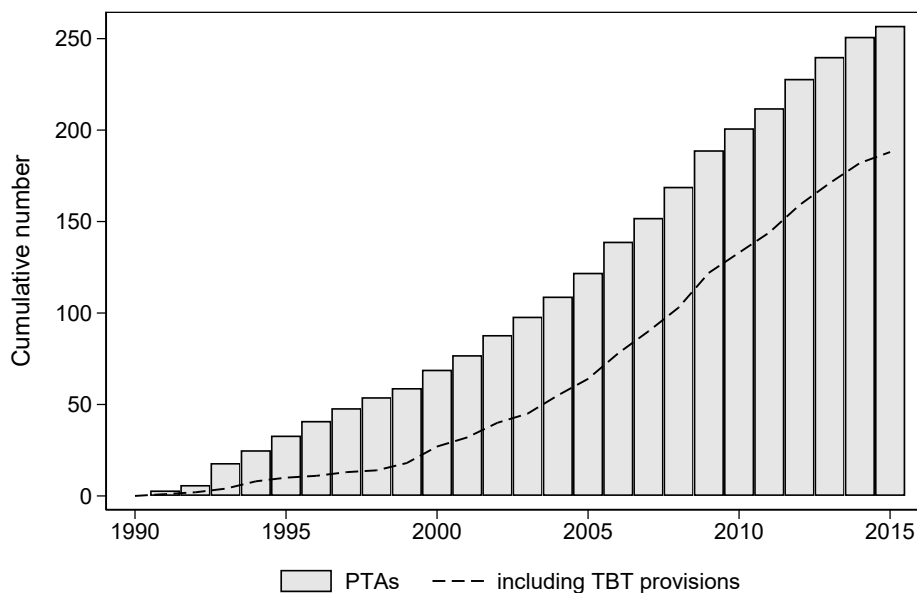
Notes: The figure displays the cumulative number of preferential trade agreements (PTA) in force worldwide and the number that includes TBT provisions. *Source:* Hofmann et al. (2017).

a certain extent. One of these agreements includes mutual recognition of conformity assessments (mutual recognition agreement, MRA) and came into force in 2002. The MRA states that, for a selected group of product-sectors, a single conformity assessment is sufficient for marketing approval of a product in both Switzerland and the EU. Before entering into negotiations with the EU, Switzerland unilaterally harmonised its technical regulations with the EU for many product-sectors in 1996 and the following years.

This episode of Swiss-EU trade integration is an interesting case in point to analyse the effects of regulatory harmonisation and mutual recognition on trade. Both trade liberalisation policies vary over product-sectors covered, countries affected, and years in place and I exploit this variation in my empirical analysis. Furthermore, the selection of product-sectors into treatment is exogenous from the standpoint of

Switzerland. This is because the selection of product-sectors subject to trade liberalisation followed the European Economic Area (EEA) agreement of 1992 that was negotiated between members of the European Free Trade Association (EFTA) and the European Community (EC), but was ultimately rejected by Switzerland in a popular vote. Finally, the introduction of the trade policies are well defined in time and the scope of the policies is, at least for Switzerland, substantial.

I estimate difference-in-differences regressions of harmonisation and mutual recognition dummies on different export margins. I employ detailed product-level trade data for Switzerland that covers exports of over 4000 products to 57 trade partners for the years 1992 to 2012. I exploit the product-country-time variation in the trade policies, which allows me to control for an extensive set of fixed effects. In particular, I account for product-level time trends, which might be correlated with the trade policies. The results suggest that regulatory harmonisation increased exports at the intensive and extensive margin, while mutual recognition increased exports predominantly at the intensive margin. I estimate that harmonisation increased Swiss exports of affected products by 7-8% and mutual recognition increased exports by 3-4% on average. Additionally, I find that product-sectors with a relatively high regulatory intensity profit more from removing technical barriers to trade.

Overall, the results indicate that the bilateral market access agreement between Switzerland and the EU had a profound effect on Swiss exports and the probability of exporting. Large parts of these gains, however, were realised not because of the agreement itself, but because of regulatory harmonisation that took place before the agreement came into force and which was a prerequisite to start the negotiations on the agreement. This result highlights important interdependencies between different trade liberalisation policies that countries need to take into account when negotiating trade agreements directed towards reducing technical barriers to trade.

The rest of the chapter is organised as follows: Section 3.2 reviews the related literature. Section 3.3 presents the institutional framework of the trade liberalisation policies. Section 3.4 describes the data. Section 3.5 describes the empirical

methodology and presents first results. Section 3.6 includes robustness checks and additional estimates. The last section concludes.

3.2   Related literature

Diverging technical regulations between domestic and foreign markets are prevalent non-tariff barriers to trade because they affect the marginal and fixed costs of production for exporting firms. This is contrary to tariffs, which, for most products, effectively raise the marginal cost of production (Baldwin et al., 2000). In a heterogeneous firms model along the lines of Melitz (2003), conforming to regulations in a destination market constitutes a fixed-entry cost. It may also be part of the variable trade costs if, for example, more costly inputs need to be used to comply with the regulation. A similar reasoning applies to conformity assessments that have to be provided upon exporting. The models of Chaney (2008) and Bernard et al. (2011) generate predictions about the effects of product-destination-specific fixed and variable costs of exporting: While variable trade costs affect both export values (intensive margin) and export probability (extensive margin), fixed trade costs affect the extensive margin but not the intensive margin. Higher costs may ultimately result in higher export prices (price margin) (Baldwin and Forslid, 2010).

Despite the theoretical foundations, whether and to what extent technical barriers to trade affect the different trade costs and hence the different margins of exporting remains an empirical question. However, estimating the trade effects of diverging regulations and costly conformity assessments is not straightforward because of the lack of a well-established measures of regulation intensity (Goldberg and Pavcnik, 2016; Ederington and Ruta, 2016). To circumvent the problem, one strand of the literature employs measures based on TBT notifications and specific trade concerns (STC) raised at the WTO.[4] It shows that restrictive regulations have a detrimental effect on trade (e.g. Bao and Qiu, 2012; Bao and Chen, 2013; Fontagné

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[4]WTO rules require members to notify whenever a proposed or adopted regulation is not in accordance with an international regulation and may affect trade of other members (Chen and Novy, 2012).

et al., 2015; Fernandes et al., 2019; for a review of the older literature, see Swann, 2010).

Using French firm level data, Fontagné et al. (2015) show that regulations entail compliance costs for firms, which raises unit values of exports and inhibits entry. Given the additional trade costs, smaller firms react more strongly to foreign regulations than bigger firms. If firms serve multiple destinations, there is evidence that the introduction of regulations in one market can discourage firms from exporting and leads them to diverge to markets with less stringent measures (Fontagné and Orefice, 2018). Further evidence show that technical barriers to trade are more harmful if tariffs are low (Orefice, 2017), and that they act as substitutes for tariffs (Kee et al., 2009; Beverelli et al., 2014). Additionally, there is empirical evidence that the enforcement of compliance with regulations is used actively as a protectionist measure (Grundke and Moser, 2019).

I contribute to the literature on regulatory cooperation to overcome technical barriers to trade by the means of regulatory harmonisation and mutual recognition. Harmonisation and mutual recognition are typically assumed to reduce trade costs and enhance trade by allowing the realisation of economics of scale and a more efficient resource allocation. Furthermore, harmonisation is expected to be more beneficial to trade than mutual recognition because common regulations increase the homogeneity and substitutability between products, lower information costs, and increase trust in imported products quality (Disdier et al., 2019). On the other hand, harmonisation potentially reduces the number of product varieties and generate compliance costs that vary across countries (Cadot et al., 2018). Mutual recognition agreements can work in different directions. First, they reduce the fixed and variable costs of exporting because only one conformity assessment is needed for all markets. On the other hand, there might also be interactions between MRA and domestic regulations and that the MRA ultimately work in favour of harmonising technical regulations (de Brito et al., 2016).

Analysing the harmonisation and mutual recognition contained in the EU harmonisation directives, Chen and Mattoo (2008) find that harmonisation and MRAs raise both the likelihood and the volume of trade between participating countries.

However, they find a negative effect on excluded third party countries, especially if both harmonisation and mutual recognition contains restrictive rules of origin. Jang (2018) shows that the trade effects of MRAs depend on the intensity of technical barriers to trade in a sector. Baller (2007) analyses harmonisation and mutual recognition in the telecommunication equipment and pharmaceutical industries and finds that while mutual recognition promotes both margins, the effects of harmonisation are less clear. Analysing trade effects of different mechanism of regulatory cooperation included in preferential trade agreements (PTA), Disdier et al. (2019) finds that mutual recognition of conformity assessments have, along with transparency provisions and legal enforceability, a significant impact on trade.

Related to this literature are the papers studying the trade effects of international standards. There is increasing evidence that international standards promote trade more than national standards (Swann, 2010; Shepherd, 2007; Czubala et al., 2009; Clougherty and Grajek, 2014). Schmidt and Steingress (2019), for example, show that the introduction of harmonised industry standards increase trade especially at the intensive margin.

The effect of regulatory harmonisation and mutual recognition on trade flows is also measured through price variations. Cadot and Gourdon (2016) find that mutual recognition agreements and, to a lesser extent, regulatory harmonisation, tend to reduce the price-raising effect of technical barriers to trade. Looking at sanitary and phytosanitary regulations (SPS) only, Fontagné et al. (2015) find that higher levels of regulation in a destination market are associated with higher export prices in the source market.

This is not the first study of the mutual recognition agreement between Switzerland and the EU and its effect on the Swiss economy. Very closely related to this work is the paper of Loridan (2008), which is a first attempt to quantify the effects of harmonisation and mutual recognition between the EU and Switzerland on imports of Switzerland. His results point to potential trade diversion effects from imports from other countries to imports from EU countries in the case of harmonisation, while mutual recognition benefits imports from both types of trade partners. Schwarzer (2017) finds positive effects of the MRA on the extensive margin of Swiss

exports. However, both studies fail to address the potential endogeneity of the trade policies in a rigorous way. More generally, Bühler et al. (2013) analyse the effects of the MRA on employment growth in Switzerland and find a positive effect on employment at the plant-level. Bühler and Burghardt (2015) document a negative effect of the agreement on the probability of a firm to be vertically integrated. More recently, Bello and Galasso (2020) exploit the variation in the MRA over product-sectors affected, to study the effect of trade liberalisation on retirement decisions in Switzerland.

3.3   Institutional framework

3.3.1   Historical background

The intention of the European Community (EC) to create a single market for people, goods, services, and capital by the end of 1992, led to the establishment of the European Economic Area (EEA) between the EC and members of the European Free Trade Association (EFTA). In Switzerland, an EFTA member, the government decided to join the EEA to ensure market access to the single market for domestic firms and to harmonise the internal market. An integral part of the EEA was the harmonisation of product regulations between member countries. A number of directives laid out the regulations member countries had to transpose into their national law. With the planned accession to the EEA, Switzerland prepared to make significant adjustments to the federal law to comply with the rules of the single market. However, Swiss people voted against joining the EEA on December 6, 1992 by a very small margin.[5]

Despite the popular vote, the federal council decided to implement many of the proposed legislations to approximate the Swiss to the European law and facilitate future bilateral arrangements. These legislations were proposed by the government already in February 1993 and accepted by the parliament the same year. The

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[5]The result was 50.3% against and 49.7% in favour of joining the EEA. Voter turnout amounted to 78.7%, the highest rate since the introduction of women's suffrage.

legislations contained the mandate to review the compatibility of all Swiss technical regulations with those of the EC. In the following, Switzerland harmonised technical regulations in many product-sectors with the EC in 1996 and the following years. The process of unilateral harmonisation of Swiss with EC regulations was formalised in the federal law on technical barriers to trade (THG). The THG states that not only existing, but also newly introduced regulations have to be aligned with those of the EC and ensures that once harmonised the regulations remain approximated.

Besides the unilateral approximation of Swiss to EC law, the government pursued bilateral market access agreements with the EU to ensure non-discriminatory access of domestic firms to the single market. After the rejection of the EEA, the Swiss government initiated negotiations with the EC on bilateral market access in different areas that included mutual recognition of conformity assessment.[6] The EU was willing to negotiate with Switzerland, but an important premise was that the agreements are based on the acquis communautaire. The negations were only concluded by the end of 1998, because they were not prioritised by the EU. Switzerland was thus clearly the junior partner in the negotiations which makes it unlikely that the country was able to influence the selection of product-sectors that were affected by the agreement. The Swiss-EU mutual recognition agreement and the other six bilateral market access agreements were finally signed in June 1999, submitted to approval by popular vote in Switzerland in May 2000 and entered into force in June 2002.[7]

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[6]Switzerland proposed market access agreements in fifteen different areas. The EU was only willing to negotiate if free movement of persons was included on the list. Switzerland was initially reluctant to grant EU citizens free movement of labour. For a good introduction to the historical background of the Swiss-EU bilateral agreements, see Lipp (2012).

[7]The seven market access agreements are known as the bilateral agreements 1 and include separate agreements on the subject of free movements of persons, mutual recognition of conformity assessments, public procurement, agriculture, overland transport, civil aviation and research. The agreements are linked to each other by a guillotine clause, stipulating that they only take effect together. The second round of agreements, the bilateral agreements 2, were signed in 2004 and extended the cooperation between Switzerland and the EU.
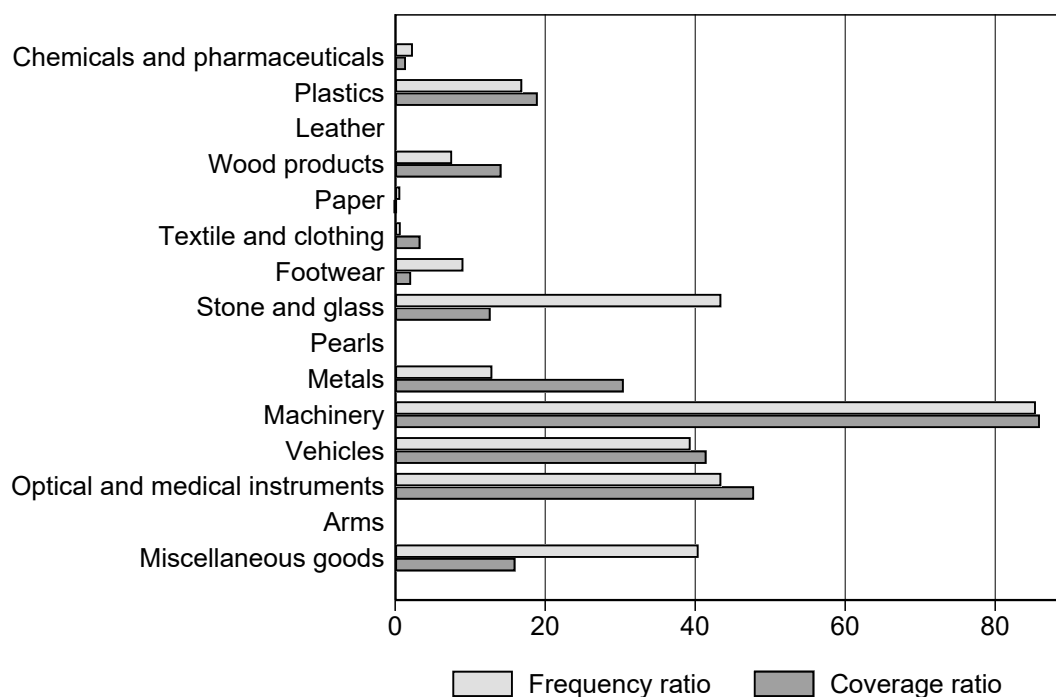
3.3.2   The mutual recognition agreement

The mutual recognition agreement between Switzerland and the EU provides reciprocal recognition of conformity assessments between the two trade partners for product-sectors with sufficiently harmonised technical regulations. With the agreement, a producer of a medical instrument, for example, can certify the conformity of the product with domestic technical regulations in front of a domestic Conformity Assessment Body (CAB) and is granted equivalent access to the trade partners market. The exporter does not have to repeat the costly process in front of a CAB designated by the country of destination. Mutual recognition lowers costs of exporting considerably because conformity assessments are expensive. Estimates range the costs related to conformity assessments from 2-10% of overall production costs (Lesser, 2007), to 0.5-1% of product values (Meier and Hertig, 2008). The mutual recognition agreement applies to a subset of product-sectors which are described in different chapters of the sectoral annex to the agreement (see Table 3.7 in the appendix). While most product-sectors were included in the original agreement of 2002, additional product-sectors were included between 2002 and 2012. The mutual recognition agreement affects primarily exporters of products that fall in the category of machinery, electronics and instruments. Figure 3.2 displays for every industry the share of products (frequency ratio) and the share of exports to the EU (coverage ratio) that were included in the agreement. These industries benefit from mutual recognition through the agreement and from harmonisation which is a prerequisite for including an industry in the agreement. As the figure shows, 86.2% of exports of machinery to the EU benefit from harmonisation and mutual recognition. Other affected industries are optical and medical instruments (48.4% of exports), vehicles (41.5%), metals (28.5%), plastics (18.5%), miscellaneous goods (16%), and products of stone and glass (13.9%).

The sectoral breadth of the agreement and the inclusion of additional product-sectors over time introduces product-time variation in the trade policy. The left panel of Figure 3.3 shows the time-line of the agreement in terms of product-sectors affected over the period 1992-2012. The right panel shows the corresponding export share of these product-sectors. When the mutual recognition agreement came into

Figure 3.2: Industries that benefit from harmonisation and mutual recognition

force in 2002, 22.2% of all product-sectors (corresponding to 943 product-sectors) measured at HS 6-digit level benefited from mutual recognition with the EU. They accounted for 20.3% of total Swiss exports. More product-sectors were added to the agreement in 2008, 2011 and 2012, which raised the share of affected sectors to 25.7% in 2012. The mutual recognition agreement includes product-sectors with sufficiently harmonised technical regulations. Switzerland harmonised its technical regulations unilaterally with the EU in 1996 and the following years. Figure 3.3 shows the introduction of regulatory harmonisation over time. In 1992 only a small fraction of 1.6% of all product-sectors in Switzerland were subject to regulations

Figure 3.3: Share of products and exports subject to harmonisation and mutual recognition over time (in %)
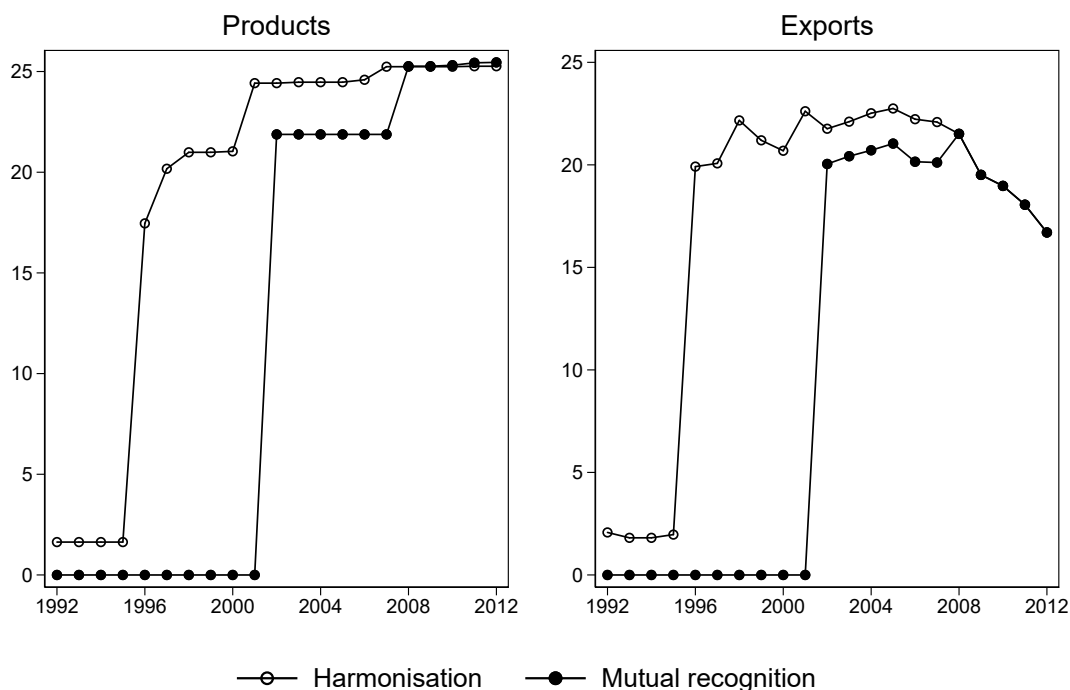
Notes: Shares of Swiss product-sectors (left panel) and export values (right panel) subject to regulatory harmonisation and mutual recognition with the EU over time (in %). Product-sectors are measured at HS 6-digit level. After 2008, the export share decreases while the product share remains constant. The likely reason being that treated products exported to the EU have relatively higher demand elasticities than treated products exported to non-EU countries and suffered from sluggish demand in the EU following the Great Financial Crisis (GFC) and the strong appreciation of the Swiss franc versus the Euro. *Source:* Own calculations based on data from SCA and SECO (see Section 3.4).

regarded equivalent to the EU. The introduction of many harmonisation directives in 1996 effectively raised the share of product-sectors in Switzerland subject to harmonised regulations with the EU to 17.6%. By 2012, regulations of 26.1% of all product-sectors were harmonised with the EU.

3.4 Data

3.4.1 Trade data

I employ a detailed dataset of Swiss product-level exports for the years 1992-2012 from the Swiss Customs Administration (SCA). The years in the sample are chosen to span ten years before and ten years after the introduction of the MRA. However, I also apply much shorter time-windows to obtain a cleaner identification of the effects of the trade policies as a robustness check. My dataset contains 4164 different product-sectors from HS sections 6 to 20 at 1992 HS 6-digit level (agricultural products, minerals and oils, and artworks and antiques are excluded from the sample). The sample includes 57 trade partners that account for 93% of Swiss exports and 98% of imports of industrial products in 2012.[8]

Table 3.1 shows descriptive statistics of the data. The average export value amounts to 495'540 CHF. The intensive margin of exporting is measured by taking the natural logarithm of exports, Export (log). The extensive margin is measured using a dummy variable, Export (dummy), equal to one if a positive export value is reported for a given product-country-year combination. A positive export value is reported for 36% of all observations. For the price margin, I compute unit values in 1'000 CHF per kg as a measure for export prices. Unit values are only available if positive export quantities are recorded, which is the case for 1.700 Mio. observations.[9] Furthermore, I use information from the SCA about the reliability of each tariff line (8-digit level) for the construction of unit value indices and construct two alternative unit value series (see Section 3.8 in the appendix). The average unit value amounts to 5'200 CHF per kg.

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[8]The sample includes all countries that are member of the EU28, EFTA, OECD, BRICS, APEC and MERCOSUR. Belgium and Luxembourg are counted as one trade partner.

[9]The minimum of exports and unit values are zero in the table because of rounding.

Table 3.1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Exports (in 1000 CHF)	4975980	495.54	11410.24	0	4849382
Exports (log)	1782224	10.13	3.13	0	22
Exports (dummy)	4975980	0.36	0.48	0	1
Unit values (1000 CHF per kg)	1700383	5.20	661.56	0	417040
MRA (dummy)	4975980	0.12	0.33	0	1
Harmonisation (dummy)	4975980	0.19	0.39	0	1
EU (dummy)	4975980	0.35	0.48	0	1
EU15 (dummy)	4975980	0.24	0.43	0	1
TBT EU	3251394	2.95	6.22	0	117
HS6 identifier	4975980	2082.50	1202.04	1	4164
Country identifier	4975980	29.00	16.45	1	57

3.4.2 Trade policy

Information on the trade liberalisation policies on HS 6-digit levels is compiled from the agreement text of the MRA, using an unofficial document from the State Secretary of Economic Affairs (SECO), the state agency that negotiated the agreement. Different sectoral chapters of the annex of the agreement describe verbally the product-sectors affected by mutual recognition and the date the chapter enters into force (see Table 3.7 in the appendix). The matching procedure leaves room for interpretation as the agreement text does not always state particular product-sectors. The agreement also lists the directives that introduced harmonisation of regulations with the EU for a particular product-sector. I extract the year in which the first harmonisation directive came into force and identify it as year of harmonisation. Later directives that amended or updated existing regulations are disregarded.

I only consider sectoral chapters of the agreement that relate to regulations that can be directly attributed to products. This excludes chapters that describe process regulations, such as chapters related to good laboratory and manufacturing practice.

Because I exclude process regulation in the empirical analysis, the present estimates are considered conservative estimates of the true effect of the agreement.[10]

A drawback of relying on the agreement text for information about the harmonisation directives is that I am only able to identify directives that are targeted at products included in the MRA. This means, I am not able to identify products that are subject to harmonised regulations, but are not subject to mutual recognition.

Matching the agreement text to HS 6-digit trade data results in two dummy variables. The dummy variable MRA_{kt} is equal to one for products k and years t the mutual recognition agreement applies to. The dummy variable $harmo_{kt}$ is equal to one if technical regulations in Switzerland are harmonised with EU regulations for a product-sector k in a given year t. Both dummies equal to one after the introduction of mutual recognition and harmonisation and remain one for the sample period. As Table 3.1 shows, the variable MRA (dummy) equals to one in 12% and the variable Harmonisation (dummy) equals to one in 19% of all observations.
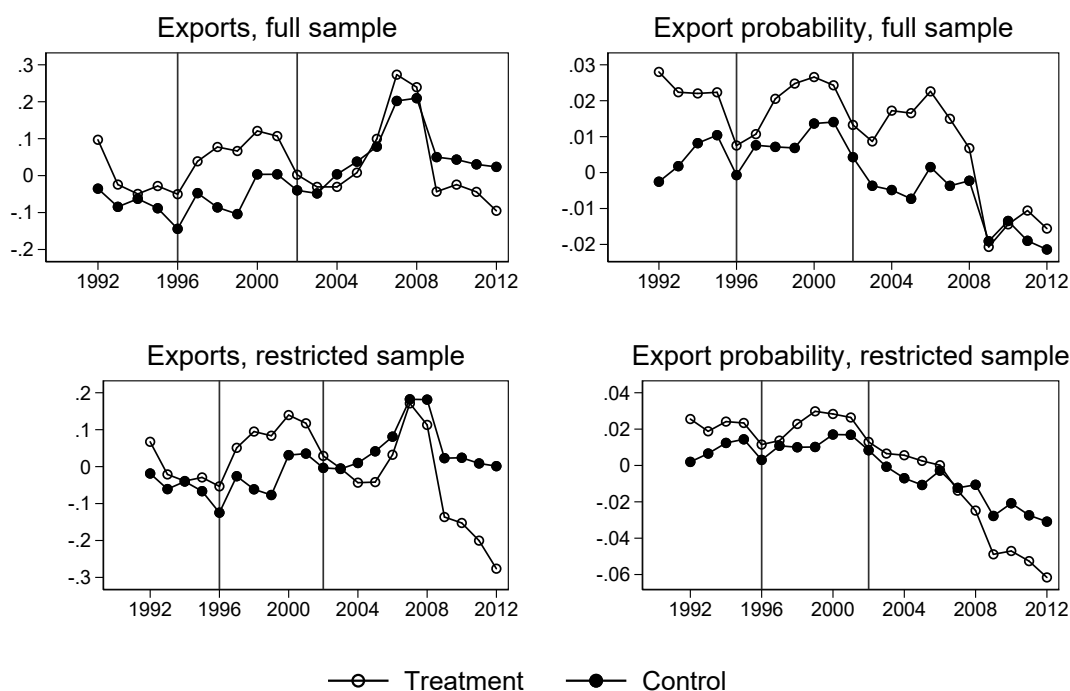
Figure 3.4 provides descriptive evidence for the effects of regulatory harmonisation and mutual recognition on the different export margins. It shows the average exports (in logs) and export probability of treated and untreated country-product combinations from their sample average. The treatment group contains products-sectors that are subject to harmonisation and mutual recognition during the sample period and are exported to EU countires. The vertical lines denote the years in which the majority of regulatory harmonisation initiatives were introduced (1996) and the introduction of the mutual recognition agreement (2002), respectively.

The top panels show the results for the full sample covering all products and countries. The lower panels show the results for a restricted sample, covering only products harmonised in 1996 and 1997 and subject to mutual recognition since 2002, and exported to EU-15 countries in the treatment group (see Section 3.6). The top

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[10]In particular, Chapter 14 related to Good Laboratory Practice (GLP) and Chapter 15 related to Good Manufacturing Practice (GMP) are not included in the empirical analysis (see Table 3.7 in the appendix). Both chapters are potentially relevant for the production of chemical and pharmaceutical products. If other chapters of the agreement would apply to this sector, the effect of these chapters would be overestimated as they take up the effects of chapter 14 and 15. However, no other chapters are relevant for the industry and exports of chemicals and pharmaceutical products are subsumed in the control group.

Figure 3.4: Average exports, export probability and unit values by treatment status

Exports, full sample

Export probability, full sample

Exports, restricted sample

Export probability, restricted sample

Treatment   Control

Notes: Exports (in logs) and export probability of individual product-country combinations demeaned by dividing by their sample average before constructing average deviations by treatment group. The treatment group contains product-country combinations subject to harmonisation and/ or mutual recognition during the sample period that are traded with an EU country. The control group contains the remaining product-country combinations. The restricted sample includes only products subject to harmonisation in 1996 and 1997 and mutual recognition in 2002, traded with EU-15 countries; the control group remains the same (see Section 3.6). The vertical lines denote the regulatory harmonisation initiatives of 1996 and the introduction of mutual recognition in 2002. *Source:* SCA.

and bottom left panels indicate that exports of the treated and the control group followed the same trend before harmonisation in the full and restricted sample. Once regulations have been harmonised for the treatment group starting in 1996, exports of treated products increased relative to products in the control group. The top and bottom right panel indicate that harmonisation and mutual recognition increased the export probability of treated products relative to products in the control group. However, parallel trends before harmonisation are found for the restricted, but not for the full sample.

3.5 Empirical analysis and first results

I estimate the effects of harmonisation and mutual recognition on different margins of Swiss exports using a difference-in-differences methodology that exploits product-country-time variation in the two trade policies. That is, I compare values, probabilities and unit values of treated products exported to EU-countries before and after the introduction of harmonisation and mutual recognition, relative to two control groups: Treated products exported to non-EU countries and untreated products to EU-countries. The estimation specification takes the following form

$$y_{ikt} = \beta_1 harmo_{kt} * EU_{it} + \beta_2 MRA_{kt} * EU_{it} + f_{it} + f_{ik} + f_{kt} + \epsilon_{ikt} \qquad (3.1)$$

where y_{ikt} is the outcome variable. For the intensive margin, $y_{ikt} = log(Y_{ikt})$, where Y_{ikt} are exports to country i of product k in year t in CHF. For the extensive margin, $y_{ikt} = Prob(Y_{ikt} > 0)$, is a dummy variable equal to one if positive export values are reported for a given country-product-year combination ikt and zero otherwise.

The effects of harmonisation and mutual recognition are estimated using two interaction terms: $harmo_{kt} * EU_{it}$ is the interaction between the dummy variable $harmo_{kt}$, equal to one if regulations are harmonised for a particular product-sector in a given year, and EU_{it}, equal to one if a country is a EU member. Similarly, $MRA_{kt} * EU_{it}$ is the interaction between the dummy variable MRA_{kt}, equal to one for products and years the mutual recognition applies to, and the EU-dummy.

I also control for a number of fixed effects. In particular, I include product-year fixed effects, f_{kt}, to account for product-level time trends, which might be correlated with the trade policies. They also account for product-specific supply and demand effects. Furthermore, I include country-year fixed effects, f_{it}, to control for all destination-time specific factors such as the business cycle situation in the destination country. Time-invariant country-product fixed effects, f_{ik}, subsumes the remaining fixed effects on country-product level. The fixed effects also subsumes the individual effects of the interaction terms.

For the intensive margin, I estimate Equation 3.1 by OLS using the estimator by Guimares and Portugal (2010) to cope with the high dimensional fixed effects. For

the extensive margin, I estimate Equation 3.1 using a simple linear probability model (LPM) rather than non-linear probit, to avoid the incidental parameter problem due to the high number of fixed effects. Furthermore, the LPM provides a simple direct estimate of the sample average marginal effect. Standard errors are clustered at the product-country level to deal with potential heteroscedasticity and serial correlation (see Bertrand et al., 2004).

Table 3.2: Effects of harmonisation and mutual recognition on exports

VARIABLES	(1) ln(export) full sample	(2) ln(export) 1992-2001	(3) ln(export) 1998-2006	(4) d(export) full sample	(5) d(export) 1992-2001	(6) d(export) 1998-2006
Harmo*EU	0.071***	0.078***		0.011***	0.027***	
	(4.655)	(4.099)		(5.497)	(9.911)	
MRA*EU	0.036**		0.039**	-0.001		0.005*
	(2.200)		(2.041)	(-0.368)		(1.927)
Observations	1,759,173	768,289	676,946	4,975,980	2,206,112	1,898,622
R-squared	0.808	0.854	0.859	0.685	0.712	0.744
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
it-FE	✓	✓	✓	✓	✓	✓
ik-FE	✓	✓	✓	✓	✓	✓
kt-FE	✓	✓	✓	✓	✓	✓

Notes: Regression estimates of different export margins on harmonisation and mutual recognition indicators. The dependent variables are (log) exports and a dummy for positive exports, respectively. Harmonisation and mutual recognition indicators equal one for products and years the policies apply to. *EU* is an EU dummy. Individual effects of the interaction terms are subsumed in the fixed effects. Standard errors are clustered at the product-country level and robust t-statistics are reported in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

The results of the regression of harmonisation and mutual recognition indicators on the different margins of exporting are reported in Table 3.2. The first column reports the results for the intensive margin for the full sample. The coefficient for the interaction of regulatory harmonisation and EU countries is positive and statistically significant at the 1%-level. I find that harmonisation of technical regulations increased Swiss exports of affected product-sectors on average by 7.1%. The coefficient for the interaction of mutual recognition and EU countries is positive and statistically significant at the 5%-level. The results suggest that mutual recognition increased exports of treated product-sectors by 3.6% on average.

The fourth column of Table 3.2 reports the estimation results for the extensive margin for the full sample. The estimated coefficient for harmonisation is 0.011 and statistically significant at the 1%-level. The result indicates that regulatory harmonisation increased the probability of exporting a product to a EU-country by 1.1%. The estimated coefficient for mutual recognition is small and statistically not significant.[11]

It is well known that trade policy is often endogenous to economic outcomes (e.g. Trefler, 1993). While it is still informative to study the effects of observed trade policies without correcting for endogeneity, it poses a threat to causal identification (Goldberg and Pavcnik, 2016). Therefore, I conduct a series of robustness checks, that includes restricting the sample to isolate the effects more precisely and testing for parallel trends between treatment and control group before harmonisation.

3.6 Robustness checks and additional estimates

3.6.1 Restrictive sample

The baseline specification employs estimation on the full sample that covers many years, many trade partners and many products. Although taking the full sample yields numerous benefits, it renders a clean identification of the trade effects more difficult. This is because different potential overlapping factors confound the effects of the trade policies. To isolate the potential trade effects of harmonisation and mutual recognition more precisely, I estimate the baseline specification on sub-samples, that restrict the full sample in the following dimensions.

Products: I concentrate on the product-sectors that benefited by the main waves of harmonisation in 1996 and 1997, and mutual recognition in 2002. I drop all products from the sample that were harmonised in years other than 1996 or 1997, and were included in the mutual recognition agreement in years other than 2002.

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[11]I also estimate the effects of harmonisation and mutual recognition on the price margin, measured by export unit values. The results are shown in Table 3.8 in the appendix. I find no effects on unit values of exported products.

The control group contains products that do not benefit from harmonisation and mutual recognition, and remains unchanged compared to the full sample.

Years: I restrict the sample to four years before and after the introduction of the trade policies. This means, I restrict the sample to 1992 to 2001 to analyse hamronisation, and to 1998 to 2006 to analyse mutual recognition. I estimate the effects of the two trade policies using two different samples.

Countries: The accession of new EU member countries confounds my estimates in the baseline model for two reasons. First, EU accession might positively affects imports from Switzerland because of reasons associated with EU membership, that are allocated entirely to harmonisation and mutual recognition in the full sample. Second, I am not able to differentiate between the effects of harmonisation and mutual recognition for countries that became member of the EU after the mutual recognition agreement came into force in 2002. For these countries, harmonisation and mutual recognition is introduced in the same year. Therefore, I restrict the sample to EU-15 countries in the treatment group. The control group consists of non-EU countries and remain unchanged compared to the baseline sample.

I obtain two separate samples to estimate the effects of harmonisation and mutual recognition. For the intensive margin, the regression results for harmonisation and mutual recognition are shown in the second and third column of Table 3.2, respectively. I find that the estimated coefficients hardly change in the restricted sample as compared to the full sample. The main findings on the effects of harmonisation and mutual recognition on the intensive margin remain robust.

For the extensive margin, the results for harmonisation and mutual recognition using the restricted sample are shown in the fifth and sixth column of Table 3.2, respectively. I find that the magnitude of the estimated coefficients is larger in the restricted sample as compared to the full sample. Using the restricted sample, harmonisation is found to increase the export probability by 2.7%, compared to 1.1% in the full sample. Mutual recognition is found to increase export probability by 0.5%, compared to no effect in the full sample.

Overall, the results indicate that harmonisation increases exports both at the intensive and extensive margin, while mutual recognition increases exports predominantly at the intensive margin. The results also hold for the most restrictive specification for harmonisation and are larger for mutual recognition. The results indicate that both trade liberalisation policies reduce the variable costs of exporting, while harmonisation also seems to reduce fixed costs of exporting. The effects for harmonisation are much stronger than for mutual recognition.

3.6.2   Parallel trends assumption

The identification strategy relies on the assumption that the selection of products into the trade liberalisation policies is exogenous to the exports and export probability as measured by the dependent variables of the estimation equations. That is, I assume that the product-sectors in the treatment and control group follow parallel trends. If the assumptions fails to hold, the difference-in-differences estimator simply picks up different pre-trends between the two groups.

Different pre-trends arise, for example, if product-sectors that exhibit high export growth are more likely to be subject to trade liberalisation. The reason could be, for example, if these product-sectors have a higher influence in the political process and could push for the inclusion of its products into the agreement (Topolova and Khandelwal, 2011). I argue that this is unlikely for two reasons. First, the mutual recognition agreement followed closely the EEA agreement that was negotiated between members of the European Community and EFTA in 1992. Furthermore, Switzerland was the junior partner in the negotiations with the EU and it is unlikely that the country was able to influence the sectoral breadth of the agreement. Secondly, the long history of the agreement makes reverse causality unlikely. The EU decided already in 1985 on the industries for which technical regulations should be harmonised in the EU. However, the negotiations between Switzerland and the EU on the mutual recognition agreement were only concluded in 1998, and the agreement came into force in 2002.

The concern that products in the treatment and control groups follow different time trends are attenuated by the inclusion of product-year fixed effects in my

Table 3.3: Parallel-trends and anticipatory effects

VARIABLES	(1) ln(export) full sample	(2) ln(export) 1992-2001	(3) ln(export) full sample	(4) ln(export) 1992-2001
Harmo*EU	0.058**	0.071**	0.064***	0.065***
	(2.550)	(2.056)	(3.647)	(2.841)
MRA*EU	0.036**		0.056***	
	(2.193)		(3.348)	
Harmo*EU (t-1)			0.011	0.031
			(0.632)	(1.226)
Harmo*EU (t-2)			-0.002	-0.019
			(-0.117)	(-0.738)
Harmo*EU (t-3)			0.034*	-0.005
			(1.815)	(-0.209)
Harmo*EU (t-4)			-0.031	0.017
			(-1.499)	(0.292)
Pre-harmo*EU	-0.018	-0.006		
	(-0.944)	(-0.227)		
Observations	1,759,173	768,289	1,435,463	768,289
R-squared	0.808	0.854	0.820	0.854
Estimation	OLS	OLS	OLS	OLS
it-FE	✓	✓	✓	✓
ik-FE	✓	✓	✓	✓
kt-FE	✓	✓	✓	✓

Notes: Regression estimates of different export margins on harmonisation and mutual recognition indicators. The dependent variables are (log) exports. Harmonisation and mutual recognition indicators equal one for products and years the policies apply to. *EU* is an EU dummy. Individual effects of the interaction terms are subsumed in the fixed effects. Standard errors are clustered at the product-country level and robust t-statistics are reported in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

estimations. Product-year fixed effects control for product-specific time trends. To check specifically whether there is a difference in time trends between the treatment and control groups before harmonisation takes place, I conduct a robustness test by including an additional regressor in my intensive margin estimation, $pre-harmo_{ikt}$, which equals to one for the four years before harmonisation of treated products takes place and zero otherwise. The estimation results are shown in the first and second column of Table 3.3 for the full and restricted sample, respectively. There is no evidence of differential time trends in exports between treatment and control

groups before harmonisation. The main findings on the effects of harmonisation and mutual recognition remain robust.

Furthermore, I investigate on the existence of pre-harmonisation effects by including leads for harmonisation. I estimate a model that includes leads for 1 to 4 years before harmonisation (Equation 3.2) to check for anticipatory effects. Leads of four years are chosen because the majority of harmonisation legislations were introduced in 1996 and the data starts in 1992.

$$log(Y_{ikt}) = harmo_{kt} * EU_{it} + MRA_{kt} * EU_{it}+$$
$$\sum_{n=1}^{4}(harmo * EU)_{ik(t-n)} + f_{it} + f_{ik} + f_{kt} + \epsilon_{ikt} \quad (3.2)$$

The estimation results are shown in the third and fourth column of Table 3.3 for the full and restricted sample, respectively. There is no evidence of anticipatory effects for harmonisation. The magnitude of the coefficients of harmonisation and mutual recognition are comparable to the baseline specification.

3.6.3   Outlier robust estimates

The standard deviation of exports is substantial. As Table 3.1 shows, the average exports by country-product-year combination is 495'540 CHF, but the highest export value in the sample is 4.849 Mrd. CHF, which refers to exports of medicaments (HS-6 sub-heading 300490) to the USA in 2012. To address the concern that my results are affected by some outlying observations, I use a sub-sample that excludes the top and bottom 1% of positive export values before constructing log exports and export dummies for the intensive and extensive margin, respectively. The estimation results excluding outliers for the full and restricted samples are shown in Table 3.4. The magnitude of the effects of harmonisation and mutual recognition are somewhat larger for the intensive margin when we exclude outliers. The results for the extensive margin remain unchanged. I find that the effects are not driven by outliers. The regression results in Table 3.4 show the robustness of my earlier results.

Table 3.4: Outlier robust estimates

VARIABLES	(1) ln(export) full sample	(2) ln(export) 1992-2001	(3) ln(export) 1998-2006	(4) d(export) full sample	(5) d(export) 1992-2001	(6) d(export) 1998-2006
Harmo*EU	0.073***	0.092***		0.011***	0.028***	
	(4.653)	(4.687)		(5.677)	(9.916)	
MRA*EU	0.044***		0.052***	-0.002		0.005*
	(2.616)		(2.632)	(-0.883)		(1.828)
Observations	1,709,267	748,210	655,782	4,926,137	2,186,066	1,877,501
R-squared	0.783	0.836	0.839	0.680	0.707	0.740
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
it-FE	✓	✓	✓	✓	✓	✓
ik-FE	✓	✓	✓	✓	✓	✓
kt-FE	✓	✓	✓	✓	✓	✓

Notes: Regression estimates of different export margins on harmonisation and mutual recognition indicators. The dependent variables are (log) exports and a dummy for positive exports, respectively. Harmonisation and mutual recognition indicators equal one for products and years the policies apply to. *EU* is an EU dummy. Individual effects of the interaction terms are subsumed in the fixed effects. Standard errors are clustered at the product-country level and robust t-statistics are reported in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
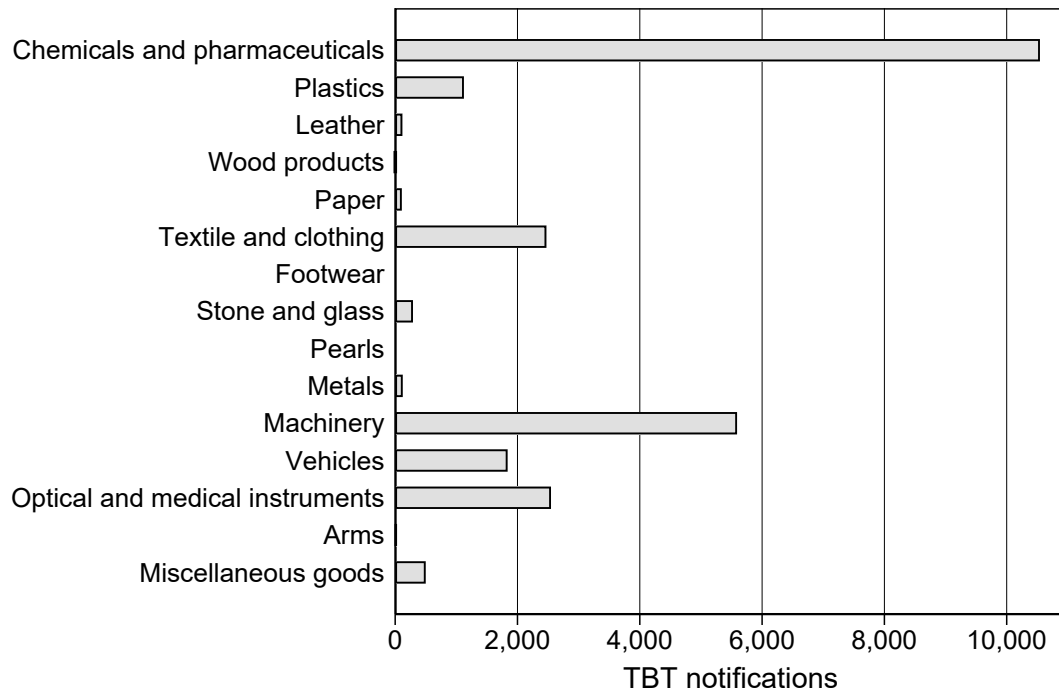
3.6.4 Controlling for regulatory intensity

Product-sectors with a relatively high regulatory intensity profit more from harmonisation and mutual recognition, because the scope of liberalisation is higher for this industries. I test this hypothesis by interacting the mutual recognition and harmonisation dummies with an indicator of technical regulatory intensity at the product-level. Measuring regulatory intensity by product is not straightforward and different approaches are used in the literature (Chen and Novy, 2012).

I follow Essaji (2008) and use the number of notifications of technical barriers to trade by the EU reported to the WTO at the product-sector level as proxy for regulatory intensity.[12] The data is obtained from Ghodsi et al. (2017). The authors

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[12]The use of notifications data from the WTO suffers from several shortcomings. Most importantly it only measures changes to existing regulations (Chen and Novy, 2012). This poses a problem, if regulations change more often in certain industries than in others and if this change is linked to export performance. A similar, but alternative method would be to count the number of international standards per industry. However, this sort of data is difficult to obtain. Alternatively, measures of ad-valorem equivalents (AVE) of technical trade barriers are estimated by

Figure 3.5: Regulatory intensity by industry

extract all NTM notifications, accessed through the WTO I-TIP database and match them to HS 6-digit products. Based on this information, I am able to calculate the variable TBT EU, which refers to the stock of trade restricting technical regulations in the EU at the HS 6-digit product level in a given year.

There exists large variation in the regulatory intensity in different industries. Figure 3.5 displays the cumulative number of TBT notifications at HS 6-digit product level within the different HS sections for the year 2012. As the figure shows, the most heavily regulated industries are chemicals and pharmaceuticals. Machinery,

comparing the price of a product in the presence of technical trade barriers with the price of a similar product in markets without TBT (Cadot and Gourdon, 2016; Cadot et al., 2018).

optical and medical instruments, textile and clothing, and vehicles follow in the list. The least regulated industries are leather, wood products, paper, footwear, pearls, metals, and arms.

Table 3.5: Estimation results for different export margins, controlling for regulatory intensity

VARIABLES	(1) ln(export) full sample	(2) ln(export) 1992-2001	(3) ln(export) 1998-2006	(4) d(export) full sample	(5) d(export) 1992-2001	(6) d(export) 1998-2006
Harmo*EU	0.096***	0.077***		0.009***	0.022***	
	(0.017)	(0.021)		(0.002)	(0.003)	
Harmo*EU*TBT	-0.004	0.013***		-0.000	0.003***	
	(0.004)	(0.005)		(0.001)	(0.001)	
MRA*EU	0.013		0.013	-0.002		0.006*
	(0.019)		(0.021)	(0.002)		(0.003)
MRA*EU*TBT	0.018***		0.010**	0.001		0.001
	(0.004)		(0.005)	(0.001)		(0.001)
Observations	1,423,310	634,237	565,074	3,786,955	1,695,480	1,468,192
R-squared	0.812	0.856	0.862	0.677	0.705	0.735
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
it-FE	✓	✓	✓	✓	✓	✓
ik-FE	✓	✓	✓	✓	✓	✓
kt-FE	✓	✓	✓	✓	✓	✓

Notes: The table reports regression estimates of different export margins on trade liberalisation policies. The dependent variables are (log) exports and a dummy for positive exports, respectively. The trade liberalisation policy variables MRA and harmonisation equal one for products and years the policies apply to. *EU* is an EU dummy. TBT is a proxy for regulatory intensity at the product-level, measured as the stock of trade restricting technical regulations in the EU notified to the WTO. Individual effects of the interaction terms are subsumed in the fixed effects. Standard errors are clustered at the product-country level and robust t-statistics are reported in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Results for the regression of exports on the interaction of mutual recognition and harmonisation dummies and measure for regulatory intensity are shown in Table 3.5. The columns 1-3 show the results for the intensive margin, columns 4-6 for the extensive margin. Overall, I find that at the intensive margin, harmonisation and mutual recognition is beneficial for sector with a high regulatory intensity. However, the effects are less clear at the extensive margin.

3.6.5 Industry specific effects

Finally, the harmonisation and mutual recognition dummies are nested by industry. Estimation results including industry specific effects are reported in Table 3.6. I differentiate between three industries that are most heavily affected by the trade policies: Machinery, vehicles and instruments, and a rest category that subsumes the remaining industries that are treated. The estimated effects are compared to the control group of products in untreated industries. The results reveal that har-

Table 3.6: Industry specific effects

VARIABLES	(1) ln(export) 1992-2001	(2) ln(export) 1998-2006	(3) d(export) 1992-2001	(4) d(export) 1998-2006
Harmo, machinery	0.076*** (3.642)		0.027*** (8.669)	
Harmo, vehicles	0.161** (2.198)		0.095*** (9.945)	
Harmo, instruments	-0.062 (-1.074)		0.006 (0.519)	
Harmo, rest	0.126*** (2.756)		0.005 (0.764)	
MRA, machinery		0.023 (1.060)		0.005 (1.585)
MRA, vehicles		0.061 (0.743)		0.024** (2.433)
MRA, instruments		0.026 (0.736)		0.012** (2.263)
MRA, rest		0.151*** (2.959)		-0.008 (-1.167)
Observations	768,289	676,946	2,206,112	1,898,622
R-squared	0.854	0.859	0.712	0.744
Estimation	OLS	OLS	OLS	OLS
it-FE	✓	✓	✓	✓
ik-FE	✓	✓	✓	✓
kt-FE	✓	✓	✓	✓

Notes: Regression estimates of different export margins on harmonisation and mutual recognition indicators. The dependent variables are (log) exports and a dummy for positive exports, respectively. Harmonisation and mutual recognition indicators equal one for products and years the policies apply to. *EU* is an EU dummy. Individual effects of the interaction terms are subsumed in the fixed effects. Standard errors are clustered at the product-country level and robust t-statistics are reported in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

monisation increases exports of vehicles, the rest category and machinery, and the export probability of vehicles and machinery. Mutual recognition increases exports of the rest category and export probability of vehicles and instruments.

3.7   Conclusion

I study the effects of mutual recognition and harmonisation of technical regulation between Switzerland and the EU on different margins of exporting. I exploit the fact that both trade policies have been introduced for different product-sectors in different years and for different trade partners. Using difference-in-differences estimations on a detailed dataset of Swiss exports at the product-level, I find that harmonisation increased exports at the extensive and intensive margin, while mutual recognition increased exports predominantly at the intensive margin. Product-sectors with a relatively high regulatory intensity profit more from removing technical barriers to trade. I conclude that the mutual recognition agreement was successful in promoting Swiss exports and the export probability of affected product-sectors. However, large part of the gains were realised because of regulatory harmonisation that was a prerequisite to the agreement and not by the mutual recognition itself. The results points to important interdependencies between different trade liberalisation policies that countries need to take into account when negotiating trade agreements directed towards reducing technical barriers to trade.

3.8 Appendix

The Swiss-EU mutual recognition agreement

An overview of the sectoral chapters in the annex to the mutual recognition agreement between Switzerland and the EU is provided in Table 3.7. The table includes the number of the chapter, the description of the product-sector, the date the chapters came into force, and how the chapter is treated in the empirical analysis. The initial agreement of 2002 contains fifteen chapters that includes, among others, machinery, medical devices, electronic equipment and motor vehicles. Between 2002 and 2012, more chapters have been added and the agreement included more product-sectors, such as construction products in 2008, lifts in 2009, cableways in 2011 and explosives in 2012.

I only consider sectoral chapters of the agreement that relate to regulations that can be directly attributed to products. This excludes chapters that describe process regulations, such as chapters related to good laboratory and manufacturing practice. Because I exclude process regulation in the empirical analysis, the present estimates are considered conservative estimates of the true effect of the agreement. In particular, chapter 14 related to Good Laboratory Practice (GLP) and chapter 15 related to Good Manufacturing Practice (GMP) are not included in the empirical analysis. Both chapters are potentially relevant for the production of chemical and pharmaceutical products. If other chapters of the agreement would apply to this sector, the effect of these chapters would be overestimated as they take up the effects of chapter 14 and 15. However, no other chapters are relevant for the industry and exports of chemicals and pharmaceutical products are subsumed in the control group.

Table 3.7: Chapters of the Swiss-EU mutual recognition agreement

Chapter	Product or product-sector	into force	coding
1	Machinery	01.06.2002	2002
2	Personal Protective Equipment	01.06.2002	2002
3	Toys	01.06.2002	2002
4	Medical Devices	01.06.2002	2002
5	Gas appliances and hot water boilers	01.06.2002	2002
6	Pressure vessels	01.06.2002	2002
7	Radio Equipment and Telecommunication Terminal Equipment	01.06.2002	2002
8	Equipment and protective systems intended for use in potentially explosive atmospheres	01.06.2002	2002
9	Electrical equipment	01.06.2002	2002
10	Construction plant and equipment	01.06.2002	2002
11	Measuring instruments and pre-packages	01.06.2002	2002
12	Motor vehicles	01.06.2002	2002
13	Agricultural and forestry tractors	01.06.2002	2002
14	Good Laboratory Practice - GLP	01.06.2002	-
15	Medicinal products, Good Manufacturing Practice (GMP), inspection batch and certification	01.06.2002	-
16	Construction products	12.03.2008	2008
17	Lifts	21.12.2009	2010
18	Biocidal products	18.10.2010	2011
19	Cableways	20.12.2011	2012
20	Explosives for civil use	17.12.2012	2013

Notes: Sectoral chapters of the MRA that cover the different product-sectors, the date of entry into force and the coding of the year into force for the empirical analysis. Only chapters that relate to product regulations that can be assigned to product-level trade statistics are considered. This excludes chapters 14 and 15 from the empirical analysis which relate to process regulations. *Source:* SECO.

Estimation results for price margins

The first column in Table 3.8 show the effect of harmonisation and mutual recognition on the price margin proxied by unit values of exports. The estimated coefficients are small and statistically insignificant. A well-known problem of using unit values as proxies for prices is that they do not control for changes in the product quality. This is problematic in the present case because the trade policies at hand have potential opposite effects on prices and quality (negative for prices, but positive for the quality of products), which might cancel out by using unit values. I check the results for different unit value calculations by exploiting information of the SCA about the reliability of the different products for unit value calculation. In particular, I use information from the SCA about the reliability of each tariff line (8-digit level) for the construction of unit value indices. Based on statistical properties, the SCA labels tariff lines as unreliable if, for example, only few observations are available or if the series exhibits high volatility. Using this information, I compute unit values based on HS 6-digit level products, for which all underlying tariff lines are labelled reliable (unit values 1). I compute a second measure of unit values based on HS 6-digit, for which more than half of the underlying tariff lines are labelled reliable for unit value calculation by the SCA (unit values 2). The results for the price margin are not sensitive to the different unit value calculations.

Table 3.8: Estimation results for different unit values calculation

| VARIABLES	(1) Price margin UnitValues all	(2) Price margin UnitValues 1	(3) Price margin UnitValues 2
Harmonisation*EU	0.002	-0.010	-0.008
	(0.009)	(0.011)	(0.010)
MRA*EU	-0.013	0.016	0.013
	(0.010)	(0.011)	(0.011)
Observations	1,676,300	1,066,710	1,157,918
R-squared	0.804	0.814	0.810
Estimation	OLS	OLS	OLS
it-FE	✓	✓	✓
ik-FE	✓	✓	✓
kt-FE	✓	✓	✓

Chapter 4

Drivers of Financial Globalisation: The Role of Informational Frictions

4.1 Introduction

Financial globalisation proceeded rapidly in high and upper-middle-income countries, especially between 1990 and 2010, and somewhat slower in lower middle and low-income countries (see Figure 4.1). Today, the differences in financial globalisation across countries are large. In 2016, the sum of outward and inward stocks of foreign direct investments (FDI), for example, accounted to over 10 times GDP in the financially most open countries such as Luxembourg, Mauritius, Malta, Cyprus, the Netherlands and Hong Kong. In the same year, it amounted to less than 10% of GDP in hardly globalised countries such as Bangladesh, Kiribati and Afghanistan. A similar pattern emerges when examining cross-border stocks of equity investments or debt instruments.

What explains the differences in financial globalisation across countries? Empirical studies propose many factors that drive the international financial integration of a country: economic development, openness to trade, domestic financial development, capital account openness, institutional quality and informational frictions

Figure 4.1: Evolution of financial globalisation by income groups
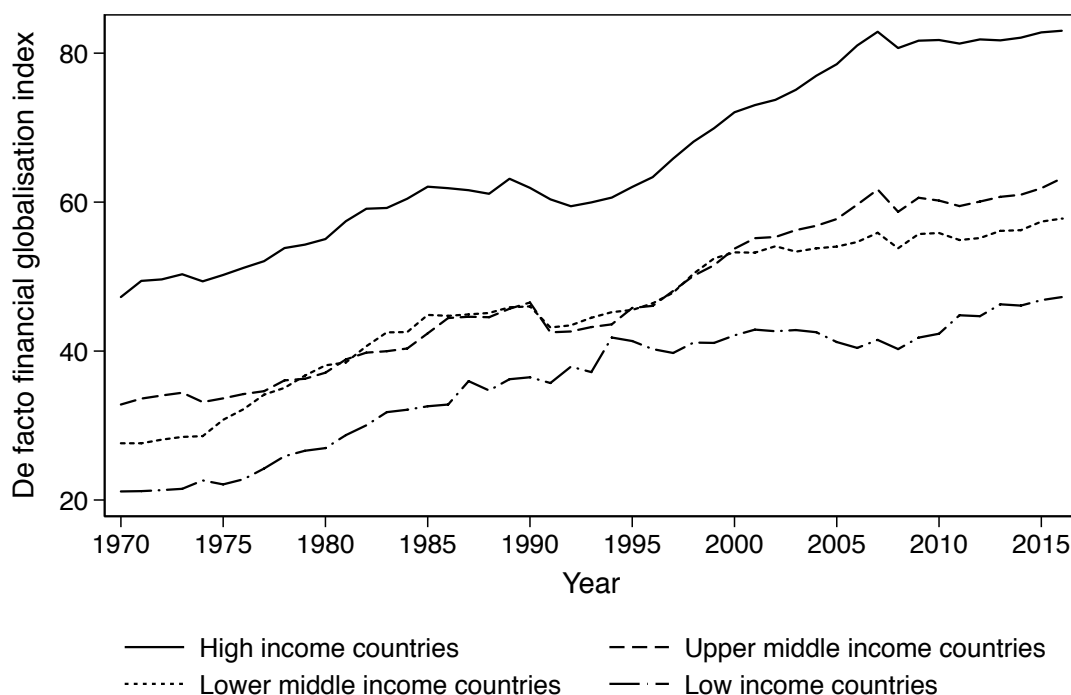
(see for example Lane and Milesi-Ferretti, 2008a). One of the most pervasive factors shaping financial globalisation are informational frictions. Portes and Rey (2005) describe that, "*...the geography of information is the main determinant of the pattern of international [financial] transactions*". The cost to obtain information constitutes a significant barrier to cross-border investment and the resulting informational asymmetries between domestic and foreign investors is a main explanation for the home bias in capital allocation (Coeurdacier and Rey, 2013).[1] Conversely, different channels of information transmission reduce cross-border informational frictions

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[1]The other ones being transaction costs and hedging motives.

and promote financial integration. Migration for example facilitates the exchange of cross-border information and supports financial integration (for example Leblang, 2010; Kugler et al., 2018). Telephone traffic measures direct information exchange and is found to be correlated with international investments (for example Andrade and Chhaochharia, 2010). In a similar vein, cultural similarities attenuate the problem of informational frictions and are associated with a higher intensity of bilateral investment. Previous studies have shown that investment is higher between countries that share the same language, a common legal origin or a common colonial past (Lane and Milesi-Ferretti, 2008b), but also between countries that are culturally closer to each other based on shared beliefs and values (Guiso et al., 2009; Siegel et al., 2011; Ahern et al., 2015).

Scholars investigate the channels of how information transmission influences financial globalisation. However, most studies rely on single channels of information transmission. I examine how information transmission influences financial globalisation based on the components of the new KOF Globalisation Index (KOFGI). By using the KOFGI, I am able to disentangle the different effects of information transmission on financial globalisation. In particular, the KOFGI distinguishes between three aspects of social globalisation, which represents three channels of information transmission: personal contacts, information flows and cultural proximity. Personal contacts, labelled interpersonal globalisation in the KOFGI, measure cross-border personal contacts. Information flows, labelled informational globalisation, refer to the flows of ideas, knowledge and images across borders. Cultural proximity, labelled cultural globalisation in the KOFGI, refers to the dispersion of common (mostly western) values. The three variables are described in more detail in section 4.3.

My dataset includes 132 countries for the period 1985 to 2016.[2] I estimate fixed effects dynamic panel data models that include the three information transmission measures. The results show that financial globalisation is positively associated with personal contacts, whereas it is, surprisingly, unrelated to information flows and cultural proximity. The results are robust to alternative measures of financial globalisation. The results are also robust to different specifications controlling for the

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[2]Table 4.5 lists all the countries in the sample.

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potential endogeneity of the regressors. Personal contacts are measured as the first principal component of the degree of migration, international tourism, international students, international calls and transfers in a country. I therefore show that personal contacts are associated with lower informational frictions and higher levels of financial globalisation. In that sense, this paper contributes to the literature on the drivers of financial globalisation and highlights the importance of personal contacts.

I show that components of the new KOF Globalisation Index may be used to study different questions related to globalisation. The KOF Globalisation Index measures the degree of globalisation along the economic, social and political dimension (the original index is introduced in Dreher (2006) and Dreher et al. (2008)). It is the most widely used globalisation index in the literature (Potrafke, 2015). The revised version of the index introduces important features, which are exploited in the empirical specification. It distinguishes between trade and financial globalisation within the economic dimension of globalisation and between measures of de facto and de jure globalisation in every component of the index. While de facto globalisation represents actual flows and activities, de jure globalisation represents policies that enable and support actual flows and activities (Gygli et al., 2019).[3] I use the sub-index for de facto financial globalisation as dependent variable, but apply other standard measures of financial integration, such as the sum of foreign assets and liabilities, in the robustness analysis. The index combines data on foreign direct investment, equity and debt investments, international reserves and cross-border income payments into a single composite indicator. It captures the multidimensional aspect of financial globalisation, which is an advantage over most papers that rely on single indicators for financial integration.

The remainder of this chapter is organised as follows. Section 4.2 describes the background of the study and presents testable hypothesis. Section 4.3 describes the data and section 4.4 describes the empirical model. First results are discussed in

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[3]The differentiation between de facto and de jure measures is best described within the economic dimensions. While de facto trade globalisation refers to actual flows of goods and services across borders, de jure trade globalisation refers to policies that enables trade flows such as tariff rates, trade regulations and free trade agreements.

section 4.5. Robustness tests and endogeneity concerns are addressed in sections 4.6 and 4.7, respectively. The last section concludes.

4.2 Background and hypothesis

Information transmission reduces informational frictions and promotes international financial integration.[4] Many studies show that informational frictions restrict financial integration.[5] Using geographical distance and time zone differences as proxies for all sorts of bilateral information frictions, the negative effect of informational frictions on bilateral financial flows has been documented for cross-border FDI (Stein and Daude, 2007), equity flows (Portes and Rey, 2005), mutual fund investments (Chan et al., 2005), and bank lending (Mian, 2006; Cerutti et al., 2015). Consequently, international informational frictions give rise to information asymmetries between domestic and foreign investors which helps to explain the home bias in international capital allocation (Coeurdacier and Rey, 2013).[6]

Information transmission reduce informational frictions between countries and promote financial globalisation. The literature has identified different channels of information transmission that are beneficial to financial integration. Measures that involve personal interactions and direct information flows include telephone traffic and overlap of trading hours (Portes and Rey, 2005), the stock of migrants in a country (Leblang, 2010; Javorcik et al., 2011; Kugler et al., 2018), and the access to the internet (Emery and Gulen, 2019).

Informational frictions may also result because of cultural differences. Conversely, cultural similarity or cultural affinity is associated with smaller informational frictions. It has been shown that bilateral investment is higher between countries

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[4] Besides informational frictions, financial globalisation has been shown to be related to international trade (Obstfeld and Rogoff, 2001; Aviat and Coeurdacier, 2007; Lane and Milesi-Ferretti, 2008a), financial frictions (Reinhardt et al., 2013), financial development (Martin and Rey, 2004; Lane and Milesi-Ferretti, 2008b) and institutional quality (Alfaro et al., 2008; Papaioannou, 2009).

[5] The notion that information is a key friction is also found to be true for international trade (for example Rauch, 1999; more recently Chaney, 2014).

[6] It has also been shown that FDI and loans are more prone to the negative effect of the information asymmetry than investments in portfolio equity and debt securities (Daude and Fratzscher, 2008).

that share the same language, a common legal origin or a common colonial past (for example Lane and Milesi-Ferretti, 2008b), but also between countries that are culturally closer to each other based on beliefs and shared values. This has been shown for measures of bilateral trust calculated from the Eurobarometer survey (Guiso et al., 2009), a country's cultural orientation towards egalitarianism (Siegel et al., 2011), and measures of cultural distance based on answers from the World Value Survey (Ahern et al., 2015). More recent attempts include measures of social interconnectedness using Facebook data (Bailey et al., 2018).

Measures of information transmission and cultural similarity may also interact with each other. It has been shown that migration exerts a positive effect on bilateral financial flows and the effect seems to be stronger for countries, in which different languages are spoken (Lücke and Stöhr, 2018) and which are culturally more distant in general (Kugler et al., 2018).[7]

My hypotheses to be examined empirically is: information transmission reduces informational frictions and promote financial globalisation. I empirically test for different channels of information transmission using the KOF Globalisation Index, which allows me to assess the importance of the different channels in a unified framework.

4.3 Data

4.3.1 Financial globalisation

I estimate the effects of different information transmission channels on financial globalisation using the revised KOF Globalisation Index (Gygli et al., 2019).[8] In

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[7]Kugler et al. (2018) introduce migration to the gravity and show that that the effect of migration on financial flows are larger when informational imperfections, measured by cultural proximity, are more pervasive.

[8]Most empirical papers focus on aspects of financial globalisation, such as foreign direct investments, international equity flows or debt flows. The literature often distinguishes between inflows and outflows, or stocks of foreign assets and liabilities, or it focuses on specific drivers of financial globalisation. Other papers define financial globalisation as the regulatory openness towards international financial flows. I refer to such measures as de jure financial globalisation. This includes,

particular, I use the sub-index for de facto financial globalisation as the main dependent variable. The index takes a value between 1 (minimum) and 100 (maximum level of globalisation). It is calculated as the first principal component of the panel normalised values of the following variables: foreign direct investment, portfolio investment, international debt and international reserves, all measured as sum of stocks of foreign assets and liabilities in percent of GDP, and international income payments and receipts in percent of GDP. All variables except income payments and receipts are taken from Lane and Milesi-Ferretti (2018) and are corrected for valuation effects. The index is available for 203 countries over the period 1970-2016. However, due to smaller data coverage of the control variables, the sample is restricted to 132 countries over the period 1985-2016. Table 4.1 presents descriptive statistics for the dependent variable.

4.3.2 Information transmission

I employ the three different sub-components of the KOFGI for de facto social globalisation, which are proxies for personal contacts, information flows and cultural proximity. The different sub-components for de jure social globalisation are used as instruments for de facto social globalisation in parts of the empirical analysis. Personal contacts, labelled interpersonal globalisation in the KOFGI, measure cross-border personal contacts. Information flows, labelled informational globalisation, refer to the flows of ideas, knowledge and images across borders. Cultural proximity, labelled cultural globalisation in the KOFGI, refers to the dispersion of common (mostly western) values. Again all variables take a value between 1 (minimum) and 100 (maximum level of globalisation). Table 4.1 presents descriptive statistics for all three variables.

Personal contacts measure direct interactions among citizens living in different countries. The index is calculated as the first principle component of the following panel normalised variables: international telephone calls, migration, incoming

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for example, indicators that measure the degree of capital account openness (for example Chinn and Ito, 2006). Related to de jure financial globalisation is the notion of financial frictions. A high degree of financial frictions would imply a relatively low degree of de jure financial globalisation.

Table 4.1: Descriptive Statistics

| Variable	Obs.	Mean	Std. Dev.	Min.	Max.
KOFGI Financial, de facto	3922	57.53	19.79	4	100
KOFGI Interpersonal, de facto	3922	50.42	24.53	5	97
KOFGI Informational, de facto	3922	55.10	24.00	2	100
KOFGI Cultural, de facto	3922	46.32	27.18	1	97
KOFGI Trade, de facto	3922	50.82	20.10	4	100
KOFGI Financial, de jure	3922	56.92	19.31	5	98
KOFGI Interpersonal, de jure	3922	53.51	20.43	3	95
KOFGI Informational, de jure	3922	58.02	22.94	3	99
KOFGI Cultural, de jure	3922	57.67	23.42	5	99
log(GDP per capita)	3922	8.13	1.65	5	12
Financial development	3922	0.32	0.22	0	1
Quality of government (ICRG)	3922	0.56	0.22	0	1
Old age dependency ratio	3922	11.68	7.52	1	44
Oil rents (% of GDP)	3922	4.51	10.00	0	68
European Union (dummy)	3922	0.15	0.36	0	1
Financial Openness (EWN)	3753	431.88	1866.84	7	37088
Chinn-Ito-Index	3769	0.34	1.61	-2	2
Trade-GDP ratio	3713	79.28	50.12	0	442

Notes: Descriptive statistics for the variables used in the empirical analyis. For the data sources of the individual variables, see sections 4.3 for the KOFGI variables and 4.4.2 for the other control variables.

and outgoing international tourists and students, and international transfers. All variables are normalised by population. Strongly globalised in the area of personal contacts in the year 2016 are Luxembourg, Singapore and Bahrain. Less globalised countries in our sample are Tanzania, Madagascar and the Democratic Republic of Congo.

Information flows refer to the flow of ideas, knowledge and images across borders. The index is calculated as the first principle component of the following panel normalised variables: used internet capacity, international patent applications and high technology exports. All variables are normalised by population. Strongly globalised in the area of information flows in the year 2016 are Singapore, Luxembourg and South Korea. Less globalised countries in our sample are Sierra Leone, Sudan and Tanzania.

Cultural proximity refers to the dispersion of common, mostly western, values. The index is calculated as the first principal component of the following panel normalised variables: trade in cultural goods, trade in personal services, applications of international trademarks, number of McDonald's restaurants and IKEA stores in a country. All variables are normalised by population. Strongly culturally globalised in the year 2016 are Switzerland, Singapore and Qatar. Less globalised countries in our sample are Ethiopia, Guinea and Yemen.

Figure 4.2: Unconditional correlations between financial globalisation and aspects of social globalisation
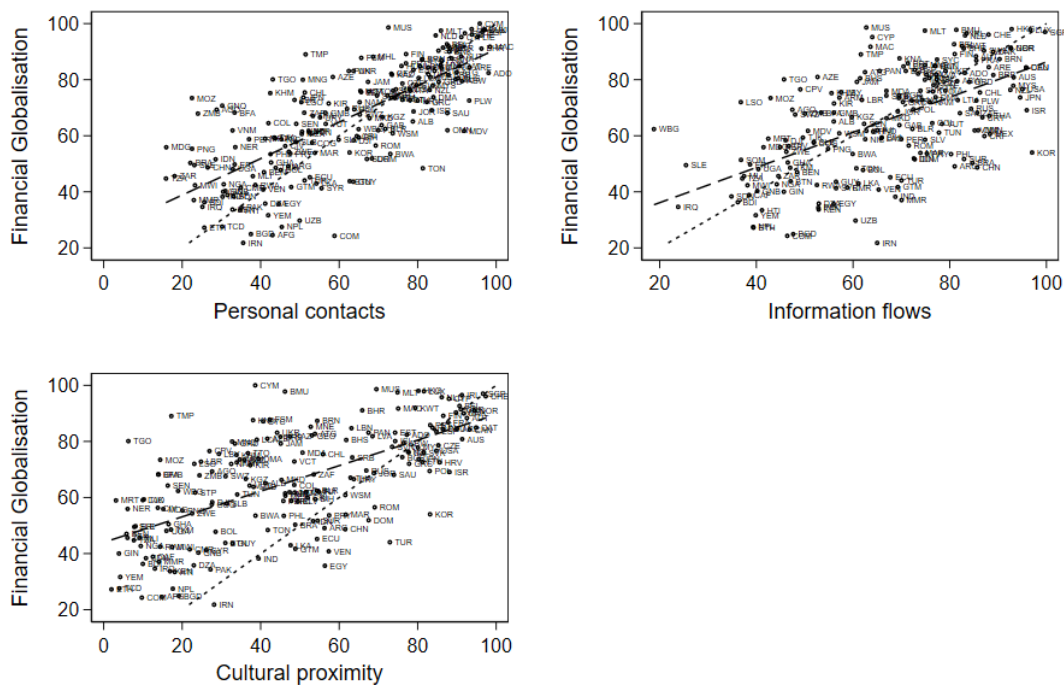
Notes: Data for the year 2016. Linear fit (dashed line) and 45Âř-line (dotted line) included. All variables taken from the KOF Globalisation Index. The social globalisation index consists of the three sub-indices for interpersonal, informational and cultural globalisation, which refer to personal contacts, information flows and cultural proximity, respectively.

4.3.3 Unconditional correlations

I show unconditional correlations between financial globalisation and the measures of information transmission in Figure 4.2. The upper left panel displays the unconditional correlation between financial globalisation and personal contacts for the year 2016. The coefficient of unconditional correlation is 0.76 based on our sample of 3922 country-year observations. The upper right panel displays the unconditional correlation between financial globalisation and information flows, which is 0.59. The lower left panel displays correlation between financial globalisation and cultural proximity, which is 0.65.

4.4 Empirical model

4.4.1 Estimation equation

To investigate on the effect of the different information transmission channels in driving financial globalisation, I estimate versions of the following equation:

$$Y_{it} = \alpha_i + \alpha_t + \rho Y_{t-1} + \alpha_j info_{ijt-1} + X'_{it}\beta_i + \epsilon_{it} \tag{4.1}$$

with $j = 1, ..., 3$; $i = 1, ..., 132$ and $t = 1, ..., 32$.

Where Y_{it} is financial globalisation, measured using the value of the KOFGI for de facto financial globalisation. It takes a value between 1 (minimum level) and 100 (maximum level). $info_{ijt-1}$ includes our three information transmission variables (indexed by j): personal contacts, information flows and cultural proximity, measured using the values of the respective components of the (de facto) KOF Globalisation Index (interpersonal, informational and cultural globalisation). To avoid estimating a purely contemporaneous relationship between information transmission and financial globalisation, I lag the variables by one period. The vector of controls X_{it} includes variables that drives financial integration according to the empirical literature and are described below in more detail; α_i and α_t are country and year fixed effects, controlling for time invariant country specific factors such as whether a country is a financial centre and the overall time trend of financial globalisation.

I estimate equation 4.1 by using standard fixed-effects methods using Driscoll and Kraay (1998) standard errors that correct for the presence of cross-sectional dependence.[9] I use annual data for the years 1985 to 2016. The direct effect of the information transmission variable on financial globalisation is given by α_j, the lagged effect after $h \geq 1$ years is given by $\rho^h * \alpha_j$ and the long-run effect is given by $\alpha_j * 1/(1 - \rho)$.

Alternatively, I estimate equation 4.1 using 5-year averages of all variables, which is often done in the literature to capture the steady state relationship between two variables. Despite lowering the sample size, taking 5-year averages has the advantage of alleviating the problem of noisy data. Furthermore, the direction of causation is more likely to be identified. Estimating the model using 5-year averages is done as a robustness analysis.

In any event, a problem in my framework might be that the information variables are endogenous to financial globalisation. This is because information transmission embodied in financial flows gives rise to potential reverse causality. In attempting to mitigate potential endogeneity, I estimate equation 4.1 using instrumental variable estimations and the system-GMM estimator put forward by Blundell and Bond (1998) (see Roodman, 2009 for a discussion). To instrument for de facto information transmission, I use the corresponding de jure variables from the KOF Globalisation Index.

4.4.2 Control variables

Following the empirical literature on the drivers of financial globalisation, especially Lane and Milesi-Ferretti (2008a), I include control variables for financial frictions, trade openness, economic development, financial sector development, the quality of institutions, ageing, oil rents and EU membership in the estimation equation.[10]

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[9]Applying the CD-test for cross-sectional dependence described in Pesaran (2004, 2015), reveals that the Null-hypothesis of no cross-sectional independence is rejected. Cross-sectional dependence arises because of spill-overs or spatial effects among countries or because of common (unobserved) factors.

[10]I refrain from including cyclical drivers of international financial flows such as push (e.g. risk aversion, interest rates, output growth in originating countries) and pull factors (e.g. output

Descriptive statistics for all control variables employed in the empirical specifications are presented in Table 4.1. Unconditional correlations between the variables are shown in Table 4.6 in the appendix.

Trade openness is expected to be positively correlated with financial globalisation. Several studies argue that financial openness and trade openness go hand in hand. The gains to international portfolio diversification are increasing in the importance of tradable consumption (Obstfeld and Rogoff, 2001). Tighter trade integration ameliorates the default risk (Rose and Spiegel, 2004). And, trade transaction directly generates cross border financial flows. I use the KOFGI for de facto trade globalisation as a proxy for trade openness. It is the principal component of the panel normalised variables trade in goods and trade in services (both measured as sum of exports and imports in percent of GDP) and a variable measuring trade partner diversity.[11] As a robustness test, I replace the KOFGI variable with the trade-to-GDP ratio from WDI that is often used in the literature.

Financial frictions are expected to hinder financial globalisation. Reinhardt et al. (2013), for example, show that net capital flows are negatively associated with current account openness. As a measure of financial frictions in general and capital account restrictions in particular, I include the sub-index of the KOF Globalisation Index that measures de jure financial globalisation. De jure financial globalisation is measured as the first principal component of the panel normalised values of the variables investment restrictions, capital account openness and international investment treaties. Because restrictions enter inversely into the index, a higher value in the de jure financial globalisation index indicates smaller financial frictions. The de jure financial globalisation is therefore expected to be positively correlated with

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growth in recipient countries, asset returns, country risk) according to the schema introduced by Calvo et al. (1993). I consider financial globalisation as a slow moving process that is measured by the stock instead of flows of international investment.

[11]The KOF Globalisation Index reports de facto and de jure measures for every dimension and sub-dimension of the index. I estimate the effect of de jure trade globalisation on de facto financial globalisation. De jure trade globalisation is calculated as the principal component of trade regulations, trade taxes, tariff rates and trade agreements. As expected, the coefficient for de jure trade globalisation is statistically insignificant. The results are not shown here.

de facto financial globalisation. As a robustness test, I replace the KOFGI variable with the Chinn-Ito-Index (Chinn and Ito, 2006) that is often used in the literature.

Financial sector development is expected to be positively correlated with financial globalisation (for example Martin and Rey, 2004; Lane and Milesi-Ferretti, 2008b). As a measure of financial sector development, I employ the index of financial development by the International Monetary Fund (IMF) (Svirydzenka, 2016). The variable is an indicator of broad based financial development and is measured on a scale from 0 to 1.[12]

The effect of economic development on financial globalisation is ambiguous. On the one hand, in the presence of fixed costs or learning costs of international assets trade or if risk aversion is declining in the level of wealth and international investments are perceived as riskier, financial integration is higher in the level of economic development. On the other hand, returns to capital might be higher in developing countries than in developed countries, presenting an incentive for international investment. To account for economic development, I include the log of GDP per capita as a control variable.

The quality of institutions is expected to be positively correlated with financial globalisation (for example Alfaro et al., 2008; Papaioannou, 2009). I use the indicator for the quality of institution by Teorell et al. (2018), which is based on the International Country Risk Guide (ICRG). It is calculated as the mean value of the ICRG variables corruption, law and order and bureaucracy quality and takes a value between 0 and 1.

I also control for demographic variables. An ageing society is typically characterised by a high savings rate, which leads to a current account surplus if domestic investment is limited. This in turn leads to a build-up of the stock of foreign financial assets. To control for demographics, I employ the old age dependency ratio, defined as the ratio of people older than 64 to the working-age population (aged 15-64) from the World Development Indicators (WDI) from the World Bank (2018).[13]

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[12]Alternative measures of financial development arising from the literature are the ratio of private credit to GDP and of stock market capitalisation to GDP. However, using these alternative measures yields similar results (which are not shown here).

[13]Alternatively, population growth could be used.

The old age dependency ratio is expected to be positively correlated with financial globalisation.

Oil rents are expected to be positively correlated with financial globalisation because it allows a country to run persistent current account surpluses and accumulate a positive foreign investment position. I include oil rents (as % of GDP) as taken from WDI.

EU integration and, in particular, the Euro Area is expected to be positively correlated with financial globalisation (e.g. Kalemli-Ozcan et al., 2010). The single currency reduces currency risks and integrates money and credit markets regulatory convergence for financial services increases depth and liquidity in the market. I control for EU-membership in the specification using dummy variables.

Country size arguably has a negative effect of financial globalisation because larger economies allow for more domestic portfolio diversification. These effects are however subsumed in the country fixed effects. On the other hand, the left-hand side variable of financial globalisation is based on variables that are normalised by GDP.

4.5   Baseline results

Table 4.2 shows the results for equation 4.1 using a fixed effects panel data regression including the lagged dependent variable with annual data from 1985 to 2016. The first column shows the results for the regression without the variables for information transmission. Financial globalisation is positively associated with trade globalisation and de jure financial globalisation. It is negatively associated with GDP per capita and positively associated with financial development. The controls for the quality of government, demography and oil rents have the expected positive coefficient, however lack statistical significance. EU membership is positively and statistically significantly associated with financial globalisation.

Column 2 to 4 introduces the variables measuring information transmission. I find that the variable for personal contacts is positively associated with financial globalisation at the 1%-significance level. The coefficients for information flows and

Table 4.2: Regression results: Dynamic panel data models with lagged information transmission

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lagged dependend variable	0.810***	0.803***	0.810***	0.810***	0.805***
	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)
De facto trade globalisation	0.080***	0.072***	0.076***	0.078***	0.070***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)
De jure financial globalisation	0.037***	0.038***	0.034***	0.035***	0.036***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
Personal contacts (lagged)		0.111***			0.099***
		(0.022)			(0.022)
Information flows (lagged)			0.033**		0.017
			(0.014)		(0.015)
Cultural proximity (lagged)				0.028*	0.014
				(0.015)	(0.014)
log(GDP per capita)	-2.149***	-2.776***	-2.390***	-2.328***	-2.922***
	(0.392)	(0.409)	(0.385)	(0.444)	(0.456)
Financial development	11.535***	11.335***	11.614***	11.141***	11.204***
	(1.743)	(1.772)	(1.731)	(1.781)	(1.775)
Quality of government	0.485	0.533	0.510	0.453	0.526
	(0.792)	(0.775)	(0.766)	(0.755)	(0.749)
Old age dependency ratio	0.066	0.059	0.096	0.050	0.067
	(0.086)	(0.079)	(0.074)	(0.082)	(0.063)
Oil rents (percent of GDP)	0.015	0.023	0.019	0.016	0.025
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
European Union	1.185**	1.007**	1.513***	1.174**	1.196***
	(0.450)	(0.434)	(0.372)	(0.464)	(0.349)
Observations	3,821	3,821	3,821	3,821	3,821
Number of groups	132	132	132	132	132
Fixed country effects	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes
R-squared within	0.865	0.866	0.866	0.865	0.867

Notes: Dependent variable is de facto financial globalisation as measured by the KOF Globalisation Index. Period: 1985-2016. Dynamic fixed-effects panel data regression of financial globalisation on different channels of information transmission (personal contacts, information flows, and cultural proximity). Driscoll-Kraay standard errors in brackets (robust to cross-sectional dependence). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

cultural proximity are much smaller and significant at the 10%-level. Column 5 displays the results of a model that includes all information transmission variables. It confirms the result for personal contacts. The results from the preferred model

in column 2 suggest a direct effect of personal contacts on financial globalisation of 0.111. This indicates that an increase in the index of de facto interpersonal globalisation by one standard deviation (24.53) is associated with a 2.7 point higher value in the financial globalisation index. The long-run effect of personal contacts on financial globalisation translates to $0.111 * 1/(1 - 0.805) = 0.57$. A higher value in the index of de facto interpersonal globalisation by one standard deviation is associated with a 14 points higher value in the financial globalisation index in the long run.

I estimate equation 4.1 using 5-year averages of all variables to capture the steady state relationship between information transmission and financial globalisation and alleviate potential noise in the data. Results for the estimations using 5-year averages and contemporaneous information transmission variables are shown in Table 4.7 in the appendix. Taking 5-year averages does not change inference of my results.[14]

4.6   Robustness

I check the robustness of my results by using different control variables for de facto trade and de jure financial globalisation that are not taken from the KOFGI. In particular, I control for trade openness using the trade-to-GDP ratio provided by the World Bank, and for de jure financial openness using the indicator by Chinn and Ito (2006). The results using the alternative control variables are shown in column 1-3 of Table 4.3. Replacing the control variables from the KOFGI with alternative measures leaves the results mostly unchanged.

I employ an alternative measure of financial globalisation as dependent variable. In particular, I use the indicator for financial openness from the External Wealth of Nations database (EWN) (Lane and Milesi-Ferretti, 2007, 2018), arguably the most heavily used indicator in the literature.[15] Financial openness is calculated as

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[14]Estimation results using yearly variables and contemporaneous information transmission variables instead of lagged variables are shown in Table 4.8 in the appendix.

[15]An overview of existing measures and their assessment is provided by Quinn et al. (2011) and Gräbner et al. (2018).

the sum of foreign assets and liabilities in percent of GDP. Figure 4.3 shows the correlation between the measures for financial globalisation from the KOFGI and EWN, which is 0.85 over the whole sample.

Results for the estimations using financial openness from EWN as dependent variable are depicted in columns 4 to 6 in Table 4.3. Financial openness is measured in logs. The coefficient of personal contacts is 0.004 and statistically significat at the 1%-level. The result suggests that an increase in interpersonal globalisation by one standard deviation, increases the share of foreign assets and liabilities of GDP by 9.8 percent. In the long-run, the effect is 23.3 percent. I find no effects for information flows, and only weak effects for cultural proximity on financial openness. The estimation results using an alternative measure for financial globalisation based on EWN thus corroborates my results from the baseline specification.

Figure 4.3: Comparison of financial globalisation measures
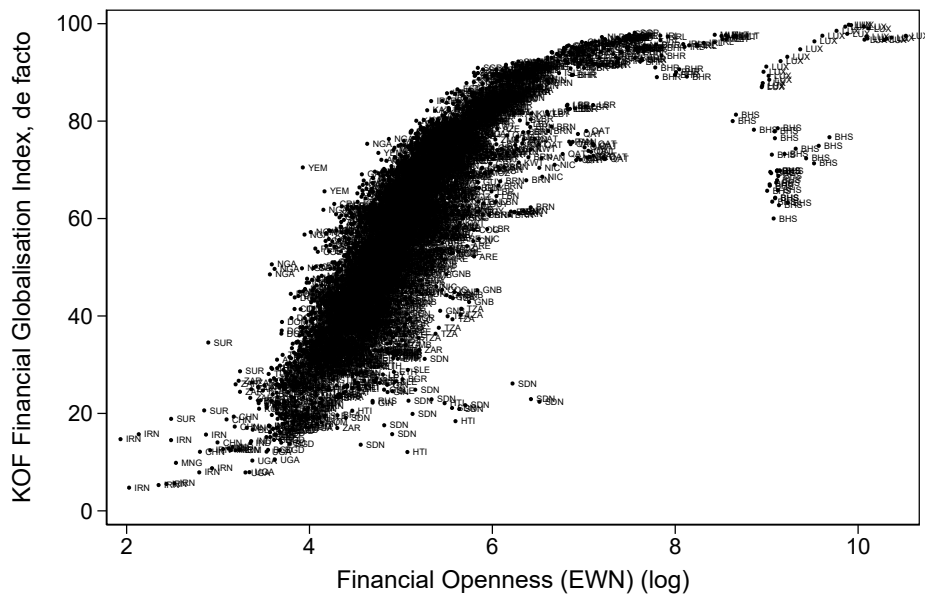
Notes: Correlation between de facto KOF Financial Globalisation Index and (log) financial openness measure from External Wealth of Nations (EWN) (Lane and Milesi-Ferretti, 2007, 2018). The correlation is 0.85.

Table 4.3: Regression results: Dynamic panel estimation using different measures of globalisation

VARIABLES	(1) KOFGI	(2) KOFGI	(3) KOFGI	(4) EWN	(5) EWN	(6) EWN
Lagged dependend variable	0.805***	0.812***	0.811***	0.859***	0.860***	0.860***
	(0.019)	(0.019)	(0.020)	(0.018)	(0.018)	(0.018)
De facto trade globalisation				0.001	0.001**	0.001*
				(0.001)	(0.000)	(0.001)
De jure financial globalisation				0.001***	0.001***	0.001***
				(0.000)	(0.000)	(0.000)
Personal contacts (lagged)	0.139***			0.004***		
	(0.028)			(0.001)		
Information flows (lagged)		0.039**			0.001	
		(0.015)			(0.000)	
Cultural proximity (lagged)			0.049***			0.001**
			(0.014)			(0.001)
Trade-GDP ratio	0.027***	0.026***	0.028***			
	(0.008)	(0.008)	(0.008)			
Chinn-Ito-Index	0.164	0.191*	0.153			
	(0.103)	(0.111)	(0.105)			
log(GDP per capita)	-3.269***	-2.907***	-2.902***	-0.104***	-0.088***	-0.091***
	(0.475)	(0.413)	(0.488)	(0.028)	(0.024)	(0.027)
Financial development	12.753***	13.277***	12.384***	0.487***	0.496***	0.478***
	(1.699)	(1.596)	(1.622)	(0.090)	(0.089)	(0.089)
Quality of government	0.439	0.516	0.489	-0.067	-0.066	-0.068
	(0.650)	(0.619)	(0.595)	(0.044)	(0.046)	(0.045)
Old age dependency ratio	0.072	0.105	0.050	0.005	0.006	0.004
	(0.078)	(0.074)	(0.080)	(0.004)	(0.004)	(0.004)
Oil rents (percent of GDP)	0.035	0.034	0.029	-0.002*	-0.002*	-0.002*
	(0.025)	(0.027)	(0.026)	(0.001)	(0.001)	(0.001)
European Union	0.782	1.339***	0.963*	0.061***	0.075***	0.069***
	(0.500)	(0.454)	(0.540)	(0.020)	(0.018)	(0.021)
Observations	3,482	3,482	3,482	3,648	3,648	3,648
Number of groups	129	129	129	132	132	132
Fixed country effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared within	0.852	0.851	0.851	0.878	0.878	0.878

Notes: Dependent variable is de facto financial globalisation as measured by the KOF Globalisation Index in column 1-3. It is (log) financial openness from EWN in column 4-6. Period: 1985-2016. Dynamic fixed-effects panel data regression of financial globalisation on different channels of information transmission (personal contacts, information flows, and cultural proximity). Driscoll-Kraay standard errors in brackets (robust to cross-sectional dependence). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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4.7 Endogeneity

Endogeneity of my information transmission variables is a threat to my empirical specification. In particular, information transmission embodied in financial flows gives rise to potential reverse causality. In attempting to mitigate potential endogeneity of my regressors, I estimate equation 4.1 using the system Generalized Methods of Moments (GMM) model by Blundell and Bond (1998). I introduce additional instruments which are the de jure KOFGI indicators for personal contacts, information flows and cultural proximity, respectively. I transform instruments using forward orthogonal deviations and use robust standard errors with Windmeijer's finite-sample correction for the two-step covariance matrix. I deal with the bias introduced by the instrument count by collapsing the instruments as suggested by Roodman (2009). Columns 1 to 3 in Table 4.4 show the results for equation 4.1 using the system-GMM estimator. The results confirm the results for personal contacts from the fixed effects regression in Table 4.2. The AR(1) test yields a p-value of 0.000. The AR(2) test yields a p-value of 0.110 for the model including our measure of personal contact (column 1), which means that we cannot reject the null hypothesis of no second-order serial correlation. The results also reveal a Hansen J-statistic test of over-identification with a p-value of 0.265 and as such, we cannot reject the hypothesis that our instruments are valid. The system GMM estimator makes the additional exogeneity assumption that any correlation between our endogenous variables and the unobserved (fixed) effect is constant over time. We test this assumption directly using a difference- in-Hansen test of exogeneity. The test reveals that we cannot reject the hypothesis that the additional subset of instruments used in the system GMM estimates is exogenous.

Columns 4 to 6 in Table 4.4 show the results for equation 4.1 instrumenting the information variable by the respective de jure dimension in the KOFGI and estimating two-stage least squares. That is, I instrument the de facto index for interpersonal globalisation by the de jure index for interpersonal globalisation, the de facto index for informational globalisation by the de jure index for informational globalisation, and the de facto index for cultural globalisation by the de jure index for cultural globalisation. The use of these instruments rely on the assumption that

Table 4.4: Regression results: System GMM and Instrumental variable estimations

VARIABLES	(1) GMM	(2) GMM	(3) GMM	(4) IV	(5) IV	(6) IV
Lagged dependend variable	0.916***	0.904***	0.884***	0.799***	0.811***	0.810***
	(50.763)	(41.040)	(37.850)	(36.077)	(38.434)	(36.606)
De facto trade globalisation	0.022	0.055***	0.065***	0.067***	0.069***	0.078***
	(1.261)	(4.546)	(4.448)	(4.464)	(3.846)	(3.746)
De jure financial globalisation	0.018**	0.023**	0.035***	0.039***	0.030**	0.035*
	(2.122)	(2.192)	(2.731)	(3.181)	(2.422)	(1.888)
Personal contacts (lagged)	0.082**			0.188**		
	(2.145)			(2.231)		
Information flows (lagged)		0.005			0.084	
		(0.234)			(1.001)	
Cultural proximity (lagged)			-0.017			0.028
			(-0.373)			(0.156)
log(GDP per capita)	-1.240**	-0.284	0.037	-3.208***	-2.770***	-2.328*
	(-2.486)	(-0.975)	(0.069)	(-4.768)	(-3.917)	(-1.921)
Financial development	4.601***	3.500***	2.997**	11.197***	11.739***	11.142***
	(3.864)	(3.223)	(2.441)	(6.385)	(6.857)	(3.592)
Quality of government	-0.452	-0.549	0.037	0.567	0.550	0.453
	(-0.541)	(-0.592)	(0.040)	(0.424)	(0.437)	(0.357)
Old age dependency ratio	0.076***	0.093***	0.090***	0.053	0.142	0.051
	(3.637)	(4.506)	(2.649)	(0.954)	(1.333)	(0.435)
Oil rents (percent of GDP)	0.037**	0.036**	0.032*	0.030	0.025	0.016
	(2.565)	(2.045)	(1.711)	(0.856)	(0.687)	(0.420)
European Union	-0.376	-0.163	-0.091	0.884	2.030**	1.174**
	(-1.206)	(-0.570)	(-0.334)	(1.461)	(2.003)	(1.991)
Observations	3,821	3,821	3,821	3,821	3,821	3,821
Number of countries	132	132	132	132	132	132
Fixed country effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.000	0.000	0.000			
AR(2)	0.110	0.103	0.104			
Hansen test	0.265	0.052	0.067			
Sargan test	0.026	0.001	0.054			
R-squared within				0.866	0.865	0.865

Notes: Dependent variable is de facto financial globalisation as measured by the KOF Globalisation Index. Period: 1985-2016. System GMM and IV estimations of financial globalisation on different channels of information transmission (personal contacts, information flows, and cultural proximity). Robust t-statistics in parentheses. p-values reported for AR(1), AR(2), Hansen and Sargan tests. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

de jure levels have a strong indication of the de facto level of a country, which is confirmed by the first stage regressions. The exclusion restriction condition that denotes that the instruments being uncorrelated with the error term ϵ in Equation 4.1 is arguably satisfied. The results for GMM and instrumental variable regressions in Table 4.4 confirm the effect of personal contacts on financial globalisation.

4.8 Conclusion

What is the role of different information transmission channels in driving financial globalisation? I revisit this question by the means of the newly revised KOF Globalisation Index. I control for factors that are known to drive international financial integration and investigate three variables that represent channels of information transmission that help to overcome informational frictions and are expected to drive financial globalisation. These variables are interpersonal globalisation (proxy for personal contacts), informational globalisation (proxy for information flows) and cultural globalisation (proxy for cultural proximity) and represent different components of the KOF Globalisation Index. I find that personal contact is important to reduce informational frictions and to ultimately promote financial globalisation. Personal contacts occur through migration, tourism, student exchanges. The results are robust to alternative measures of financial globalisation. The results are also robust to controlling for potential endogeneity in the information transmission variables. Additionally, I show the potential of the revised KOF Globalisation Index as measure of financial globalisation.

4.9 Appendix

Table 4.5: Countries in the sample

Income groups	Countries
High income	Argentina, Australia, Austria, The Bahamas, Bahrain, Brunei Darussalam, Canada, Chile, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Qatar, Saudi Arabia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay. **#49**
Upper middle income	Albania, Algeria, Armenia, Azerbaijan, Belarus, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Gabon, Guatemala, Guyana, Islamic Republic of Iran, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Mexico, Namibia, Paraguay, Peru, Romania, Russian Federation, Serbia, South Africa, Suriname, Thailand, Turkey, Venezuela. **#35**
Lower middle income	Angola, Bangladesh, Bolivia, Cameroon, Republic of Congo, Côte d'Ivoire, Arab Republic of Egypt, El Salvador, Ghana, Honduras, India, Indonesia, Kenya, Moldova, Mongolia, Morocco, Myanmar, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Sudan, Tunisia, Ukraine, Vietnam, Zambia. **#28**
Low income	Burkina Faso, Democratic Republic of Congo, Ethiopia, The Gambia, Guinea, Guinea-Bissau, Haiti, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Senegal, Sierra Leone, Syrian Arab Republic, Tanzania, Togo, Uganda, Republic of Yemen. **#20**

Notes: Income groups according to World Bank. Low income: GNI per capita equal or less than $995 in 2017; lower middle income: $996 to $3'895; upper middle income: $3'896 to $12'055; high income: $12'056 or more.

Table 4.6: Correlation matrix of all variables employed in baseline specification

	KOFFiGIdf	KOFTrGIdf	KOFFiGIdj	KOFIpGIdf	KOFInGIdf	KOFCuGIdf	lngdppc	FD	icrg_qog	dpnd	oilrents	eu
						(1)						
KOFFiGIdf	1											
KOFTrGIdf	0.604***	1										
KOFFiGIdj	0.550***	0.241***	1									
KOFIpGIdf	0.705***	0.518***	0.584***	1								
KOFInGIdf	0.584***	0.319***	0.612***	0.773***	1							
KOFCuGIdf	0.643***	0.332***	0.683***	0.842***	0.859***	1						
lngdppc	0.613***	0.258***	0.617***	0.865***	0.868***	0.913***	1					
FD	0.576***	0.198***	0.613***	0.673***	0.780***	0.818***	0.811***	1				
icrg_qog	0.462***	0.188***	0.551***	0.631***	0.644***	0.739***	0.720***	0.748***	1			
dpnd	0.427***	0.127***	0.548***	0.560***	0.630***	0.712***	0.643***	0.656***	0.616***	1		
oilrents	0.0609***	0.0941***	-0.186***	0.0681***	-0.105***	-0.0673***	0.0905***	-0.143***	-0.141***	-0.317***	1	
eu	0.425***	0.180***	0.499***	0.463***	0.382***	0.520***	0.478***	0.499***	0.459***	0.664***	-0.183***	1
N	3922											

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.7: Regression results: Dynamic panel data models, 5-year averages, contemporaneous information transmission

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lagged dependend variable	0.457***	0.452***	0.459***	0.458***	0.455***
	(7.888)	(7.706)	(7.880)	(7.901)	(7.601)
De facto trade globalisation	0.184***	0.169***	0.178***	0.191***	0.173***
	(7.618)	(8.208)	(9.505)	(8.979)	(11.246)
De jure financial globalisation	0.105***	0.105***	0.103***	0.113***	0.114***
	(7.514)	(6.429)	(7.809)	(7.142)	(6.702)
Personal contacts		0.160**			0.169**
		(2.604)			(3.016)
Information flows			0.029		0.021
			(0.866)		(0.598)
Cultural proximity				-0.071	-0.094*
				(-1.555)	(-2.031)
log(GDP per capita)	-4.553***	-5.438***	-4.758***	-4.137**	-5.084***
	(-4.495)	(-6.080)	(-5.854)	(-3.661)	(-5.309)
Financial development	34.057***	33.889***	34.375***	34.928***	35.255***
	(9.913)	(9.553)	(9.844)	(10.857)	(10.237)
Quality of government	2.450**	2.401**	2.459**	2.532**	2.513**
	(2.757)	(2.647)	(2.948)	(2.779)	(2.838)
Old age dependency ratio	0.343	0.331	0.362	0.375	0.387
	(1.130)	(1.141)	(1.265)	(1.288)	(1.542)
Oil rents (percent of GDP)	0.400***	0.410***	0.405***	0.388**	0.399***
	(3.786)	(3.935)	(3.861)	(3.683)	(3.979)
European Union	4.615**	4.456**	4.976***	4.566**	4.640***
	(3.234)	(3.109)	(3.804)	(3.174)	(4.053)
Observations	828	828	828	828	828
Number of groups	132	132	132	132	132
Fixed country effects	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is de facto financial globalisation as measured by the KOF Globalisation Index. Period: 1985-2016. Dynamic fixed-effects panel data regression of financial globalisation on different channels of information transmission (personal contacts, information flows, and cultural proximity). Driscoll-Kraay standard errors in brackets (robust to cross-sectional dependence). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.8: Regression results: Dynamic panel data models, contemporaneous information transmission

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lagged dependend variable	0.810***	0.805***	0.810***	0.810***	0.805***
	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)
De facto trade globalisation	0.080***	0.072***	0.077***	0.079***	0.071***
	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)
De jure financial globalisation	0.037***	0.038***	0.035***	0.036***	0.037***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
Personal contacts		0.101***			0.095***
		(0.021)			(0.022)
Information flows			0.022		0.009
			(0.016)		(0.016)
Cultural proximity				0.013	0.002
				(0.015)	(0.013)
log(GDP per capita)	-2.149***	-2.722***	-2.312***	-2.233***	-2.767***
	(0.392)	(0.422)	(0.391)	(0.435)	(0.461)
Financial development	11.535***	11.441***	11.601***	11.379***	11.450***
	(1.743)	(1.805)	(1.730)	(1.811)	(1.825)
Quality of government	0.485	0.525	0.485	0.463	0.520
	(0.792)	(0.769)	(0.771)	(0.775)	(0.761)
Old age dependency ratio	0.066	0.063	0.087	0.059	0.070
	(0.086)	(0.081)	(0.075)	(0.086)	(0.068)
Oil rents (percent of GDP)	0.015	0.021	0.017	0.015	0.022
	(0.020)	(0.019)	(0.020)	(0.020)	(0.020)
European Union	1.185**	1.036**	1.433***	1.183**	1.140***
	(0.450)	(0.449)	(0.360)	(0.460)	(0.359)
Observations	3,821	3,821	3,821	3,821	3,821
Number of groups	132	132	132	132	132
Fixed country effects	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes
R-squared within	0.865	0.866	0.865	0.865	0.866

Notes: Dependent variable is de facto financial globalisation as measured by the KOF Globalisation Index. Period: 1985-2016. Dynamic fixed-effects panel data regression of financial globalisation on different channels of (t-1) lagged information transmission (personal contacts, information flows, and cultural proximity). Driscoll-Kraay standard errors in brackets (robust to cross-sectional dependence). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Curriculum Vitae

Personal Details

Name: Florian Hälg

Date of Birth: April 22, 1984

Citizenship: Swiss

Status: Married, one daughter

Current Position

Researcher, KOF Swiss Economic Institute, ETH Zurich, Switzerland, since 06/2013

Education

Ph.D. candidate in Economics, ETH Zurich, Switzerland, since 01/2014

M.A. in Economics, University of Zurich, Switzerland, 2010–2012

B.Sc. in Economics University of Bern, Switzerland, 2005–2008
Exchange semester at Toulouse School of Economics, 2008

Working Experience

KOF Swiss Economic Institute, ETH Zurich, Economic Forecasting Division, researcher, 2013–present

Embassy of Switzerland in Singapore, academic intern, 2013

University of Zurich, Chair of Macroeconomics and Political Economics of Fabrizio Zilibotti, student research assistant, 2011–2012

Swiss National Bank (SNB), Financial Markets Analysis, intern, 2009

Academic publications

Gygli, S., F. Hälg, N. Potrafke and J.-E. Sturm (2019): The KOF Globalisation Index – Revisited, *Review of International Organizations*, 14(3), 543-574.

Other publications

Abrahamsen, Y., F. Hälg, A. Rathke, S. Sarferaz and J.-E. Sturm (various years): Prognosen für den Schweizer Tourismus, *KOF Studies*, ETH Zürich.

Hälg, F. (2020): The KOF Globalisation Index – A Multidimensional Approach to Globalisation, *Journal of Economics and Statistics*, 240(5), 691-696.

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Working papers

Hälg, F., N. Potrafke, and J.-E. Sturm (2020). Determinants of social expenditure in OECD countries. KOF Working Paper, No. 475.

Languages

German (native), English (advanced), French (advanced), Italian (basic)

Computer skills

Stata, R, ArcGIS

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ETH Zurich
KOF Swiss Economic Institute
LEE G 116
Leonhardstrasse 21
8092 Zurich, Switzerland

Phone +41 44 632 42 39
Fax +41 44 632 12 18
kof@kof.ethz.ch
www.kof.ethz.ch
#KOFETH