LUND UNIVERSITY
School of Economics and Management

Master's Program in International Economics with a Focus on China

Inequality and Trade:

Import Penetration from China and Income Inequality in Europe

by

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The effects of trade between low-income and high-income countries has been a long-discussed topic in the age of globalization. This thesis investigates the impact of trade with China on income inequality in fifteen European countries. The aim of the research is to discern effects of trade on income inequality by utilizing the case of vast increase in imports from China. The time span is from 1995 to 2016, since it captures the period of vast growth of China during which it established itself as the main global exporter of manufactured goods. To estimate the effect of increased import penetration on income inequality this paper uses a panel dataset on fifteen European countries and several econometric models. The results indicate a positive relationship between import penetration from China and income inequality—proxied by the Gini coefficient. Findings in this paper could have policy implications as they might explain the recent increase in anti-globalization and anti-trade sentiments among parts of society in the developed nations.

EKHS51
Master's Thesis (15 credits ECTS)
May 2019
Supervisor: Anna Missiaia
Examiner: Tobias Axelsson
Word Count: 12.053

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1 Introduction

1.1 Research Problem

Adverse effects of trade have been one of the most discussed research topics in the age of globalization. It is commonly argued that the aggregate effects of trade stimulate economic growth and development of countries, and globalization has benefited the world through many different channels. However, a large stream of research has set out to investigate the redistributive effects of trade, both in developed and developing countries. With the recent happenings as the ongoing trade war between China and the US, this topic has gained even more attention. The possible implications of this trade war for the world economy is one of the reasons that make this topic relevant. Existing research on the effects of trade has mostly focused on the trade between China and the US. Seminal research of Autor et al. (2013) tackles the effects of what he refers to as the China trade shock on local labor markets in the US. With China's vast growth in the last three decades, world income inequality has also gained attention. With increasing globalization, economic growth and converging trade, also came unequal income distribution. However, previous research has mostly focused on trade's impact on the labor markets, and to the best of my knowledge, no one has tried to assess its direct effect on income inequality utilizing the case study between China and Europe. It is notoriously difficult to discern causal relationships in economic research since the data is observational. Nevertheless, this paper alleviates some of these issues as it uses data which captures the immense growth in Chinese exports during a relatively short time period. Hence, as argued by Autor et al. (2013), we can think of other variables as being kept constant during this time span. This paper uses a panel dataset on fifteen European countries and the China trade shock during the period 1995-2016 to discern the effect of trade on income inequality.

When synthesizing the theories and previous research on trade and inequality, it is reasonable to believe that there is a relationship between trade and income inequality. One of the main conclusions of the Heckscher-Ohlin model of trade—the Stolper-Samuelson theorem—is that the owners of the countries' relatively abundant factor of production will benefit from trade—their wages will increase, whereas the owners of the other factor of production will be harmed

(Krugman et al. 2015). Many high-income economies are relatively abundant in high-skilled labor, whereas low income economies are relatively abundant in low-skilled labor. Thus, trade with low income countries will suppress the wages of the unskilled in high income economies. Therefore, we set a following research question:

What is the effect of trade with China on interpersonal income inequality?

The research question is further developed with the following hypothesis:

There is a positive relationship between income inequality and import penetration from China in the fifteen European countries between 1995 and 2016.

To investigate this surmise, this paper will utilize the vast increase in import penetration from China, to explore income inequality in the fifteen European economies in the period between 1995 and 2016.

1.2 Aim and Scope

The aim of this thesis is to discern effects of trade on income inequality by investigating the relationship between trade with China and income distribution in fifteen European countries. The time period from 1995 to 2016 was selected because of the rising trends in trade with China in the last couple of decades. First, trade with China took off in 1992 with the pursuit of socialist market economy (Autor et al. 2016). Second, this trend accelerated further with China's accession to the World Trade Organization (WTO) in 2001. Moreover, the data before 1995 is very scarce, nonetheless, this time frame would still be convenient to examine and capture the effects of trade with China, assuming that there was a lagged effect of China's opening. This thesis aims to explore the relationship between income inequality and trade. Similar to Autor et al. (2013), among other research, we intent to infer a ceteris paribus effect (i.e. all else equal) of trade, due to the vast surge in trade activity from China, by utilizing the characteristics of the China trade shock. This research could contribute to the existing literature on effects of trade, particularly its effect on income inequality. Furthermore, the results have important policy implications, since they contribute to the understanding of effects of trade. This is a relevant topic since the world has witnessed surge in anti-globalization sentiments recently, with populist movements emerging in the US and the EU countries.

This thesis is organized as followed. In section 2, relevant critical literature review of recent and general literature on trade and inequality is conducted. Furthermore, theoretical framework with a main model of trade, as well as the main theory on income inequality, which will be utilized further in the analysis, will be explained. The econometric methods and empirical model is explained in section 3. The data that will be utilized for the analysis will be described in section 4. Results will be discussed in section 5, and the discussion about the findings will be developed in section 6. Finally, main conclusions will be stated in section 7.

2 Theory

2.1 Literature Review

This study relies on two separate stands of literature, one concerning trade, and the other on income inequality. Thus, the theory section in this thesis will be divided into three different streams of research: literature on trade, literature on income inequality, and literature on trade and income inequality, since our topic covers the intersection of these.

2.1.1 Trade Theories

The Heckscher-Ohlin Model

One of the most prominent models of trade, the Heckscher-Ohlin model, builds upon the Ricardian model of trade, which introduced the concept of comparative advantage (Krugman et al. 2015). A country has a comparative advantage in the production of a good if it has a lower opportunity cost of producing the good. Hence, a country that has a comparative advantage in the production of a good relative to another country, should specialize in the production of that good and export it in return for other goods (Feenstra 2002). This model was then further elaborated by Eli Heckscher and Bertil Ohlin. In their factor proportions model, they expand on the concept of comparative advantage and argue that it is determined by factor abundance, which refers to resources in countries, and factor intensity, which refers to intensity of use in the production process. Heckscher and Ohlin propose more realistic predictions of the Ricardian model, and argue that countries tend to produce both goods—rather than specializing completely. However, countries should still export the good in which they have a comparative advantage, and import the other good, which is stated by the Heckscher-Ohlin Theorem: 'The country that is abundant in a factor exports the good whose production is intensive in that factor' (Krugman et al. 2015, p. 91). They also discuss some implications of trade and argue that trade causes income redistribution between labor and capital owners, rather than benefiting all (Krugman et al. 2015). The model provides a firm ground to explain the case of Chinese trade

with advanced economies, such as the case of high-income European countries. China is abundant in labor and has due to the reforms and opening of the country experienced inflow of labor to the cities. Thus, it focused on producing and exporting labor intensive goods—manufactured goods (Krugman et al. 2015).

According to the Heckscher-Ohlin model, one of the effects of international trade is price convergence (Krugman et al. 2015). When two countries trade with each other, the price of the good that the home country is exporting will rise in the home country, while it will decline in the foreign country, where that good is imported. Thus, relative prices in the two countries converge with trade (Krugman et al. 2015). However, changes in relative prices further impact relative earnings of capital and labor (Krugman et al. 2015). With the increase in price of labor-intensive good, the wage of labor in the country that is labor abundant will increase. Thus, the purchasing power of labor will increase in terms of the exported good, and the imported good. The effect in the country that imports a labor intensive good will be reversed—the wages of people who derive income from labor in that country will decrease, while the wages of people who derive their income from capital will increase, since the country's abundant factor is capital (Feenstra 2002). In the country that is labor abundant and, hence, scarce in capital, wages of people deriving their income from capital will decrease. Thus, international trade impacts distribution of income and: 'Owners of a country's abundant factors gain from trade, but owners of a country's scarce factors lose' (Krugman et al. 2015, p. 91). This is called the Stolper-Samuelson theorem and it is derived from Heckscher-Ohlin theoretical framework. Furthermore, changes in relative prices of goods not only change the income distribution, but they always change it so that owners of the factor of production used for producing that good gain, while the owners of the other factor of production are worse off (Krugman et al. 2015). Hence, the abundant factor in a country gains, while the scarce factor loses from trade (Feenstra 2002). This is a fundamental conclusion that will be applied to the case of China and the respective European countries. Previous research combined with this theoretical model provides ground to expect that the sharp increase of trade with China played a role in the income distribution among the European countries. Since the fifteen European countries are advanced economies, that are relatively abundant in capital, they would import labor intensive manufactured goods from China. For instance, Autor et al. (2013) find that the wages of manufacturing sector in the US have decreased after large increase in trade with China. Since vast research has been focusing on the US, it will be interesting to explore the effects of trade on the European countries, and thereby also contribute to the existing theory.

However, there are also limitations of this model. An interesting challenge to the Heckscher-Ohlin model is the Leontief paradox. It was named by the Nobel Prize winner Wassily Leontief, who found in a US case study from 1953 that US exported less capital-intensive goods than it imported (Krugman et al. 2015). Since it is assumed that US is a capital-abundant country, these findings represented a contradiction to the Heckscher-Ohlin theory, according to which US should export capital intensive goods and import labor intensive goods. Another study by Bowen, Leamer and Sveikauskas expanded the number of countries examined to 27, and also the factors of production to 12 (Krugman et al. 2015). They were testing the Heckscher-Ohlin theory that a country relatively abundantly endowed in one factor of production should export goods intensive in that factor of production. However, they found that 'for two-thirds of factors of production, trade ran in the predicted direction less than 70 percent of the time' (Krugman et.al 2015, p. 100). Thus, they concluded that the Heckscher-Ohlin predictions are not always fulfilled, since trade does not always run in the direction predicted by this model (Krugman et al. 2015). Hence, Leontief paradox potentially holds not only for the US, but also for other economies.

The China Trade Shock

One of the most prominent scholars concerned with trade effects, especially in the case of trade with China is David Autor. His and his co-authors seminal research on the China trade shock—the vast increase of trade that emerged with its growth, was the inspiration behind this thesis. Autor et al. (2016) argue that the rise of China reflects benefits and costs of trade. Some of these costs are distributional ones—thus, there is a concern for effects of trade on income distribution.

Since increase in trade with China occurred due to its sustained GDP growth, it is important to explain the background of China's developmental path. China's reform period from planned to market oriented economy started in 1978, after the death of Mao Zedong. However, the experimental nature of the reforms did not flourish until the beginning of 1990s, with Deng Xiaoping's famous 1992 Southern tour around the country—an initiative to advocate for the importance of the reforms, opening-up of the economy, and the export-led growth (Naughton 2007, p. 99). With extended reform period, came further opening of the country with 150 special economic zones in 2010, compared to 20 in 1991 (Autor et al. 2016). Special Economic Zones were one of the experimental industrial policies, with areas along the coast implementing

market mechanisms, as for instance, liberalization of labor markets, foreign direct investments and export (Alder et al. 2013). There was a great inflow of foreign direct investments and share of world manufacturing exports from China grew from 2.3% in 1991 to 18.8% in 2013 (Autor et al. 2016). This gave China the role of the largest exporter of manufactured goods. Autor et al. (2016) argue that this increase in trade with China can be observed and investigated as a natural experiment in international trade, since everything else seems to have been constant, while it was trade with China and Chinese manufacturing exports that stood out. Therefore, Autor et al. (2016) claim that causal effects of trade shocks can be investigated by examining the case of China trade shock. Moreover, the new flow of reforms from 1992 enabled China to export labor-intensive goods and gain an advantage in manufacturing. Thus, trade theory expects net exports in manufacturing to be much larger than those in raw materials, due to the concept of comparative advantage (Autor et al. 2016). China's abundance in supply of labor compared to other countries resulted from decollectivization of agriculture and closing of inefficient state-owned enterprises (Li et al. 2012). There was an inflow of 250 million workers from rural to urban areas, which has made China an attractive location for different labor-intensive production facilities (Li et al. 2012). Hence, factor abundance explains a lot about China's specialization (Autor et al. 2016). However, China's advantage is not uniform and probably varies among labor-intensive industries (Autor et al. 2016). This industry specific aspect will be omitted from the thesis due to page limitations. China's export boom rose after the country entered the WTO. Autor et al. (2016) discuss the paradox of why the accession to the WTO played such a big role in Chinese exports and growth of productivity of 8% per year between 1998 to 2007. They explain that China already enjoyed the status of most-favored nation by the US and the EU from the 1980s, which meant that they got the best trade conditions from trading countries. Thus, the success followed by the accession to the WTO was somewhat peculiar. Autor et al. (2016) argue that the answer lies in privatization of China's state-owned manufacturing firms. Since the country had to comply with the WTO conditions, it had to 'sanction state subsidies for domestic industries' (Autor et al. 2016, p. 214). Thus, capital and labor from smaller less productive companies was reallocated to private manufacturing plants in that period, which rose productivity and output (Hsieh and Song, 2015). Before China joined the WTO, many private firms could only export through state intermediaries. Since the WTO is much against barriers to trade, China had to eliminate these restrictions (Autor et al. 2016). This has provided incentives, as well as a smoother path for efficient private manufacturers to export.

Effects on Local Labor Markets in the US

Autor et al. (2013) explore the effects of trade with China on the local US labor markets. They conclude that labor in manufacturing industries in the US has suffered due to pressure from trade with China. As global trade increased, the employment of low-skilled labor, as well as their wages decreased (Autor et al. 2013). This can be explained by the Heckscher-Ohlin model, since applying it to the case of China and the US would mean that since China is labor abundant and it is exporting labor intensive manufactured goods, this would push down the wages of labor among manufacturing industries in the US, and have a negative impact on employment in these sectors. In contrast, the high-skilled labor in the target country, in the work of Autor et al. (2013), the US, would benefit from trade and their wages and employment would be pushed up. Thus, the effects of international trade on high-skilled and low-skilled labor contribute to increasing the income gap inside the target country. Hence, it is intuitively clear how the Heckscher-Ohlin model can explain the surge in income inequality. This is one of the main arguments against globalization, which is another reason to stress the importance of the issue, and the debate on the tentative adverse effects of trade (Autor et al. 2013). Contrary to the work of Autor et al. (2013), this thesis tackles the trade with China and its impact on the income inequality in a group of European countries, since this case has gained less attention.

Effects on Innovation and Technology in the EU

In contrast to Autor et al. (2013), who investigate the effects of trade on labor markets, Bloom et al. (2015) investigate effects of trade on innovation and technology in twelve European countries. The synthesis of these two papers is what the discussion in this thesis is going to build upon, together with the guidelines of the Heckscher-Ohlin model. Bloom et al. (2015) argue that increase in trade with China was followed by faster technological change in terms of innovation and new technologies, which contributed to productivity growth. Furthermore, ‘the absolute volume of innovation increases within the firms most affected by Chinese imports in their output markets’ (Bloom et al. 2015, p. 87). With China being relatively abundant in labor, it is therefore exporting labor-intensive goods, aligned with the Heckscher-Ohlin theory. As developed countries trade with China, the price of manufactured goods in high-income economies goes down, and the opportunity cost of them investing in high-tech sectors decreases. Hence, with China being an important player in international trade, establishments in high income economies are incentivized to develop technological production. Thus, Chinese

import competition induced increased technical change (Bloom et al. 2015). Moreover, as these firms invest in high-technology and innovate more, this will increase the wages of high-skilled labor in developed countries, but suppress the wages and increase unemployment of low-skilled labor (Bloom et al. 2015). Hence, the inequality gap in the developed countries gets larger.

As shown in Bloom et al. (2015), there has been a vast increase in imports from China, compared to imports from other low-wage economies. In the period from 1980 to 2007, imports to EU from low wage countries, that Bernard et al. (2006) define as 'countries with less than 5% GDP/capita relative to the US 1972-2001' remain the same, while there is a vast increase in Chinese imports (Bloom et al 2015, p. 91). Furthermore, Bloom et al. (2015) claim that the rise of China could be 'the most important exogenous trade shock from low-wage countries to hit the 'Northern' economies' (Bloom et al. 2015, p. 114). Thus, similarly to Autor et al. (2013), Bloom et al. (2015) observe the China shock as a natural experiment, since while everything else was held constant, import penetration from China increased vastly. They conclude that in contrast to trade with low income economies, trade with developed countries does not impact innovation.

2.1.2 Inequality Theories

The Kuznets Curve

One of the most prominent concepts in literature on inequality is the Kuznets curve. Simon Kuznets has in 1950s set up a hypothesis that as an economy develops, inequality first increases, and then decreases. This inverted U-shaped curve which shows the relationship between the Gini coefficient, a measurement of income inequality, and GDP per capita is called the Kuznets curve (Barro 2000).

The Gini coefficient, or Gini index is defined by OECD's Glossary of Statistical Terms (2002) as the index which measures the extent to which the income distribution among individuals within an economy deviates from a perfectly equal distribution, with value of 0 representing perfect equality and value of 100 perfect inequality. The Gini coefficient will be used as a dependent variable in this thesis, nonetheless, utilizing Gini as a measurement of inequality and a dependent variable has its limitations. The Gini coefficient is a relative measure of inequality, and vast literature has questioned that most research on inequality focuses on relative measures,

instead of absolute measures, even though there are no indications that one is more appropriate than the other (Niño-Zarazúa et al. 2017). The polemics between relative and absolute inequality exist because looking at relative terms, world inequality has decreased. However, according to absolute measures, it has increased (Niño-Zarazúa et al. 2017). Thus, the estimates on income inequality are dependent on the measurement used. Due to data availability, simplicity and following previous literature, this research opted for the Gini coefficient. Although it might not be a perfect measurement of income inequality, it is the most commonly used one, and shows high degree of validity for this thesis.

The Kuznets curve states that in a country at very low levels of income, inequality is low. However, as growth expands, people move from agricultural sector and their wages increase (Kuznets 1955). Due to higher differentiation in wages, income inequality rises. At the early stages of development, physical and human capital is scarce, so the owners of these demand higher returns, thus, the capital is unequally distributed and heavily concentrated among the few (Milanovic 1994). However, as human and physical capital accumulate and spread throughout the population, the rate of return on physical capital declines, hence, the wage differentials between skilled and unskilled labor diminish. Thus, income distribution becomes more equal (Milanovic 1994).

Barro (2000) discusses the Kuznets curve as he explores the relationship between inequality and growth. He finds evidence in a panel of countries, consistent with the Kuznets curve that inequality first increases, and then diminishes, the further the countries are in the economic development. However, the Kuznets curve cannot explain the variations in inequality across countries or over time (Barro 2000).

Inequality of Outcomes and Inequality of Opportunities

Furthermore, when it comes to literature and analysis on inequality, it is important to distinguish between inequality of outcomes and inequality of opportunities (Dabla-Norris et al. 2015). Inequality of outcomes is measured by income, wealth or expenditure (Dabla-Norris et al. 2015). Thus, income inequality belongs to categorization of inequality of outcomes. However, inequality of opportunities is beyond individuals' power, and it can be measured by ,for instance, gender, ethnicity, family background and location of birth (Dabla-Norris et al. 2015). However, inequality of outcomes, and thereby income inequality, is a combination of differences in opportunities and individual's talents and efforts—individual's skills, according

to Dabla-Norris et al. (2015). Furthermore, similar to Dabla-Norris et al. (2015), Aiyar and Ebeke (2019) state that inequality of outcomes and inequality of opportunities are interrelated. They find that 'the relationship between income inequality and economic growth is mediated by the level of equality of opportunity' (Aiyar and Ebeke, 2019, p. 1). Moreover, Aiyar and Ebeke (2019) argue that income inequality impacts growth negatively in the economies that have low equality of opportunities. In addition, Perez-Arce et al. (2016) find correlation in income inequality and inequality of opportunity across countries. Finally, due to the theoretical background on correlation between inequality of opportunities and income inequality, it could be beneficial to consider a variable that captures the opportunities in the respective EU countries. Dabla-Norris et al. (2015) argue that opportunities could be measured by access to education or availability of health system, which is related to government expenditure, which is of high relevance for exploring inequality, as argued by Alvaredo et al. (2018). In a similar manner, Barro (2000) stresses the importance of human capital for combating inequality, nevertheless, investment in education is usually not possible for poorer households, which further induces inequality. Reduction in inequality would raise the rate of economic growth, which is why education, and thereby equality of opportunities, plays a big role.

Inequality between Countries and within Countries

Lindert and Williamson (2003) investigate the relationship between globalization and inequality. They explain two different components of world inequality: 1) inequality between countries and 2) inequality within countries. Inequality between nations can be investigated by comparing GDP per capita, while for inequality within countries, determinants of factor prices and their link to distribution of income play a larger role (Lindert and Williamson 2003). This thesis is treating income inequality inside a selection of EU countries, which is why the main theoretical framework used is the Heckscher-Ohlin model, the factor proportions model. Furthermore, Lindert and Williamson (2003) argue that without trade and globalization, there would be a steep rise in income gaps between the countries. However, the nations that gain the most from trade are the poor nations, while already developed nations suffer, due to unequal distribution among labor (Lindert and Williamson 2003). Lindert and Williamson (2003) conclude this by following the Stolper-Samuelson theorem, one of the theorems derived from the Heckscher-Ohlin model, that free trade increases the income of the owners of a country's relatively abundant factors of production, and reduces the income of the owners of scarce factors of production. This is aligned with the research of Autor et al. (2013), who conclude

that high-skilled labor in the US has gained, while low-skilled labor has lost from trade with China. When it comes to inequality between the countries, it would be expected that there is a relationship between the level of development of the country and effects of trade in terms of income inequality. This claim corresponds to Barro's (2000) research who investigates if there is a relationship between growth and income inequality. Moreover, examining the between country income inequality is excluded from this paper due to page limitations.

Income Inequality and Redistributive Policies

In his famous book 'Capital in the 21st century', Piketty (2012)—one of the most prominent scholars in the field of inequality—analyses the development of income and wealth inequality in Europe and the US since the 18th century. Furthermore, he stresses the importance and implications of unequal income and wealth distribution and argues that this implies negative impact on economic growth and development. This is another argument for the emergence of this topic and exploring its relationship with trade. Similar to his work from 2012, the recent World Inequality Report from 2018 discusses, inter alia, Piketty's proposals on how to combat inequality. One of his main arguments is the power of progressive taxation. He further argues that the reason for different inequality paths of different countries is due to institutional and policy changes (Alvaredo et al. 2018). This is what Milanovic (1994) refers to as social choice factors, opposed to given factors, that determine inequality. Milanovic (1994) discusses that social choice factors result from former and current political decisions, similarly also argued by Barro (2000). On the other hand, given factors are factors independent of economic policy (Milanovic 1994). Given factors are for instance income per capita and heterogeneity of the country, while social choice factors are policies that can affect inequality—for instance, government transfers and employment in the state sector (Bulíř 1998; Milanovic 1994). Piketty focuses his discussion on these social choice factors, and argues that income tax progressivity is proved to be a good tool to limit accumulation of wealth on the very top of income distribution (Alvaredo et al. 2018). The reason for this is because with progressive taxation, the tax rate increases as the income rises, limiting the rate by which the top percentile can increase their wealth. Even though progressive taxation seems to be efficient only with post-tax income, it also affects pre-tax income. It discourages and provides less incentives for the top earners to bargain for even higher pay (Alvaredo et al. 2018). This then limits the rising inequality at the top and thereby also impacts the overall inequality. Furthermore, motivation for inducing these fiscal policies can be found in the fact that tax progressivity was reduced vastly in the developed

countries from 1970s to mid 2000s. The top marginal income tax rate in developed countries in this period decreased from 70% to 42% on average, according to World Inequality data. Some countries have reversed the downward trend after the most recent financial crisis (Alvaredo et al. 2018). Since our unit of analysis are European countries, and this thesis is concerned with inequality in the developed economies, it would be beneficial to control for the variable that captures tax or government spending in the analysis.

Aligned with Alvaredo et al. (2018), Dabla-Norris et al. (2015) tackle redistributive policies and discuss progressive taxes and social transfers as ways to combat inequality. However, they also acknowledge that progressive tax systems decline in developed economies. Hence, in their analysis they include the variable total government spending as a share of GDP, which captures taxation and it is used as a proxy for redistributive policies (Dabla-Norris et al. 2015). This will also be captured in the model for the analysis of this thesis, since multiple sources indicate fiscal policies as important for explaining income inequality. As explained in Alvaredo et al. (2018) and Dabla-Norris et al. (2015), Barro (2000) argues that taxation and government expenditure can help combat inequality in the economy. Moreover, he claims that 'majority voting tends to favor redistribution of resources from rich to poor (Barro 2000, p. 6). The redistribution systems can be public expenditure programs, such as education, and regulatory policies. Barro (2000) discusses these factors, implied by political decisions. However, transfer payments and taxes distort economic decisions, by, for instance, discouraging work effort (Barro, 2000). Thus, redistributive policies create more distortions and reduce investments, which implies a decline in economic growth. Hence, since high inequality stimulates more redistributive policies, inequality consequently reduces economic growth (Barro 2000). Moreover, in cases without transfers, inequality can still impact growth negatively. The rich can prevent redistributive policies through lobbying, which promotes corruption, which further hampers economic growth (Barro 2000). However, Barro (2000) argues that even in low-democracy countries, leaders would still favor inducing redistributive policies, since that could diminish probabilities for social unrest and political instability. Moreover, he also incorporates the variable openness to trade, driven by the Heckscher-Ohlin model, that there is a relationship between opening to international trade and income distribution (Barro 2000).

Income Inequality and Financial Development

Brei et al. (2018) from Bank for International Settlements investigate the relationship between financial structure and income inequality. They find that more financial development reduces income inequality, thus, this topic is relevant for explaining the relationship between trade and income inequality. Furthermore, Brei et al. (2018) account for the financial structure by including variables for bank credit to private sector as a share of GDP, and market capitalization variable—stock market capitalization for listed companies as a share of GDP. They conclude that inequality rises with market-based financing, and does not rise when finance grows through bank lending. In addition, they also find that there are non-linearities between financial development and income inequality. Furthermore, similar to Brei et al. (2018), Dabla-Norris et al. (2015) discuss that financial development—the relative share of stock market and banking in the economy—could decrease income inequality. Thus, financial inclusiveness is important for combating inequality (Dabla-Norris et al. 2015). In addition, as Brei et al. (2018) who incorporate bank credit ratio—bank credit to private sector as a share of GDP, Dabla-Norris et al (2015) also include ratio of private credit to GDP in their analysis. Hence, there is firm theoretical ground to consider these variables to explain variations in the Gini coefficient.

Similar to Brei et al. (2018), Johansson and Wang (2013) investigate the impact of financial policies on income inequality. In contrast to the approach of Brei et al. (2018), who focus on market and bank based finances, Johansson and Wang (2013) analyze the impact of repressive financial policies. They utilize IMF's Financial Reform Database, which captures different repressive financial policies, such as: interest rate controls, credit controls, state ownership in the banking sector, entry barriers into the banking sector, lack of supervision of the banking sector and lack of prudential regulation, restrictions in security markets and capital account controls (Johansson and Wang 2013). Furthermore, they find that financial repression and income inequality are positively correlated. Thus, financial repression increases income inequality (Johansson and Wang 2013). These policies are also social choice factors, following the categorization of given and social choice factors of inequality, as proposed by Milanovic (1994).

When measuring the financial variables, Brei et al. (2018), as well as Johansson and Wang (2013), incorporate inflation as one of the factors relevant for explaining inequality. It was found that price stability—low inflation rate—together with financial deepening discussed

above, improves income equality (Bulíř, 1998). Thalassinos et al. (2012) analyze the relationship between inflation and income inequality in thirteen EU countries, which is of interest for this thesis since it will investigate the relationship between Chinese imports and income inequality in fifteen European countries. The time span is somewhat similar since they look at the period between 2000 and 2009, compared to the period of this thesis, which is 1995 to 2016. Moreover, it was found that openness of the economy, which is of high relevance for this research, increases income inequality (Thalassinos et al. 2012). Their main conclusion is that the relationship between income inequality and inflation rate in the EU countries is positive. Thus, with high inflation, also comes high income inequality. Furthermore, they conclude that with price stability (i.e. low inflation), inequality across regions in a country also decreases, and not only aggregate inequality.

2.1.3 Theories on Trade and Income Inequality

Alternative Explanations of Income Inequality

Explanations of income inequality and possible factors that influence it have been an important topic of discussion. Exploring why inequality has increased has been a question that vast literature has tried to answer, and two streams of thought have emerged. First, it is claimed that inequality has been increasing due to globalization and large increase in exports of manufactured goods from newly industrializing economies (NIEs), one of which is China (Krugman et al. 2015). Trade between high and low income economies was earlier referred to as North-South trade because most of the developed economies were located in the northern parts of the world, with low income economies being in the southern parts (Krugman et al. 2015). The trade was mostly based on low income economies exporting raw materials and agricultural goods until 1970s (Krugman et al. 2015). From then on, NIEs started to export manufactured goods, that were intensive in unskilled labor, like clothing and shoes—low-tech goods—and high-income countries exported high-tech goods, that are capital or skill-intensive, such as aircraft and chemicals (Krugman et al. 2015). There was a move towards factor-price equalization, with export boom of low-tech goods pushing down the wages of low-skill labor in capital and skill-abundant high income economies, as predicted by the factor-proportions model (Krugman et al. 2015).

Skill-Biased Technical Change

Second, another explanation for rising inequality in high income economies does not lie in costs of trade, but rather in costs of new production technologies, that require high-skilled labor (Krugman et al. 2015). This concept is called skill-biased technological or technical change, and it is besides Krugman et al. (2015), and Autor (2002), also discussed by Card and DiNardo (2002). Autor (2002) discusses variety of evidence that suggest increase in skill bias in the last few decades. For instance, the return on education has increased since 1970s, and despite an increase in supply in skills, there has been an ongoing demand for it. Autor (2002) also presents some of the characteristics of technological change and how it developed and affected the manufacturing industries over time. One of his main arguments is the role that computerization gained throughout the years. First, many different tasks that involved labor, are now performed by computers. Second, factories have become highly automated, for instance, monitoring many assembly lines on displays—the task that also required more human labor before the computerization (Autor 2002). Third, quality control in production facilities has become a mandatory feature of manufacturing plants, which is a task that requires high-skilled labor (Autor 2002). Similar to Autor (2002), Acemoglu (2000) argues for the existence of skill-biased technical change, as indicated by wages and returns to schooling in the last decades. He even points this skill bias to be responsible for the increase in inequality. In addition, he claims that the increase in supply of skilled labor force has encouraged further development of high-skilled intensive technologies. Moreover, the interaction between international trade and technical change can contribute to explaining the decrease in low-skilled workers' wages (Acemoglu, 2000). However, Acemoglu (2000) claims that when arguing that it is international trade that has an impact on wages and inequality, it also has to impact the technological progress. He further proposes an alternative theory of acceleration, which argues that skill-biased technical change accelerates due to the change in relative prices because of trade opening (Acemoglu 2000). Similar to Acemoglu (2000), Card and DiNardo (2002) examine the effects of skill-biased technical change on wage inequality. However, they conclude that not everything in the wage structure changes can be explained by skill-biased technical change.

The analysis of Dabla-Norris et al. (2015) focuses on the technological progress and the rise of the skill premium as some of the main causes of income inequality. Similar to Autor (2002), Bloom et al. (2015) and Krugman et al. (2015), this argument refers to skill-biased technical change. Skill premium determines how much more in income a worker would get depending

on their skills, and new information technology has fueled the increase of skill premium, which then induced increasing inequality (Dabla-Norris et al. 2015). This is reflected in high-skilled and low-skilled labor producing high-tech and low-tech goods, as implied by the Heckscher-Ohlin model. In addition, Dabla-Norris et al. (2015) find that higher skill premium is associated with increasing inequality in developed economies. They also discuss trade globalization and argue that an increase in trade rises the skill-premium. This is again aligned with one of the conclusions of the Heckscher-Ohlin model that trade with countries abundant in low-skilled labor would push down the wages of the low-skilled labor in the target country. Applied to the case of China and the EU, since China is exporting labor intensive goods produced by low-skilled labor, low-skilled labor's wages in the EU would be suppressed, and the gap between wages of high-skilled and low-skilled labor will increase, as also argued in the Dabla-Noris et al. (2015) inequality report. This report tackles causes and consequences of income inequality and Dabla-Norris et al. (2015) motivate their research by arguing that the gap between the rich and poor in developed countries is the highest it has been in decades, which is a firm ground of motivation for exploring this topic.

Thus, it can be concluded from discussed theory on trade and income inequality that there is a lot of interconnectedness of trade and skill-biased technical change, when it comes to explaining inequality. More trade implies more skill-biased technical change, which then implies higher skill premium, which in turn increases inequality. Simultaneously, wages of low-skilled labor are suppressed. Thus, skill-biased technical change causes inequality, but technical change is, in itself, caused by, at least to some extent, trade.

3 Method

3.1 Empirical Model

Following Autor et al. (2013), we are going to treat the China trade shock as a natural experiment, or a quasi-experiment. This methodology occurs when an exogenous event, such as a change in government policy, changes the environment in which countries operate (Wooldridge 2015). In contrast to a true experiment, where the researcher controls the treatments, the treatments now emerge due to a naturally occurring cause. As Autor et al. (2013) explain the China trade shock, this thesis similarly observes the emergence of China as a key exporter and its vast development from 1995, and entry in the WTO in 2001, as a natural experiment. Moreover, the timespan of the research is 1995 to 2016, which captures similar time frame analyzed by Autor et al. (2013) and Bloom et al. (2015). Furthermore, China has also been the second largest exporter of the EU in 2018, according to data from Eurostat, but this research includes years until 2016, due to data limitations in observations for the last couple of years.

The objective of my econometric approach is to specify a model motivated by previous research on trade and income inequality, and test the theory by utilizing a similar methodology to that of Autor et al. (2013) and Bloom et al. (2015). Furthermore, the variables in the model are synthesized from the literature discussed in the theory section. As previously discussed, the dependent variable is the Gini coefficient, and import penetration from China is the main explanatory variable, as motivated by Autor et al. (2013) and Bloom et al. (2015). First, I considered the distributions of the different variables and log transformed variables where it seemed to lead to a distribution more similar to normal. Second, variables that, according to the previous literature, have non-linear relationship with the Gini coefficient were squared. Descriptive statistics on the variables selected is presented in Table 1.

Table 1 Summary Statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
gov	345	20.49	3.120	12.12	27.94
infl	345	1.884	1.359	-4.478	8.935
gini	318	29.28	3.704	20	38.10
schooling	323	112.6	17.67	82.87	163.9
lgdpc	345	10.62	0.360	9.803	11.63
lcredit	320	4.515	0.381	3.263	5.356
lmarketcap	321	4.052	0.623	2.092	5.510
importschina	344	4.462	2.608	0.351	9.993

The main model, including country and time specific unobserved effects is the following:

Equation 1 Econometric Model

$$gini_{it} = \beta_1 importschina_{it} + \beta_2 lgdpc_{it} + \beta_3 lgdpc_{it}^2 + \beta_4 infl_{it} + \beta_5 lcredit_{it} + \beta_6 lmarketcap_{it} + \beta_7 lmarketcap_{it}^2 + \beta_8 gov_{it} + \beta_9 schooling_{it} + \lambda_t + \alpha_i + \epsilon_{it}$$

The selection of the variable is synthesis of previous research on the topic. The dependent variable used as a proxy for measuring income inequality is the Gini coefficient, as in Dabla-Norris et al. (2015), who discern the drivers of inequality. Furthermore, Johansson and Wang (2013) also utilize Gini as the dependent variable in their model, when investigating the relationship between financial repression and income inequality. Similarly, Brei et al. (2018) proxy inequality by the Gini coefficient when examining financial structure and inequality. Thus, we choose this variable to measure interpersonal income inequality, driven by theoretical background, as well as the fact that the Gini index is the most commonly used measure of inequality.

The main explanatory variable is importschina, which measures import penetration from China, defined as imports from China as a percentage of total imports. This was motivated by the research of Bloom et al. (2015), who also examine the China trade shock, and its impact on innovation and technology. Similarly, when discerning the China trade shock, Autor et al. (2013) also utilize imports from China, but in their case, divided by total labor in local labor markets, since they are interested in effects on the labor markets. Hence, there is firm theoretical

ground to select this variable, motivated by prominent research in the effects of the China trade shock.

Selection of control variables in the model was motivated by models from previous literature that have Gini as dependent variable. In order to control for the level of development of the country, we include GDP per capita, as well as its squared term, motivated by the Kuznets curve. Furthermore, majority of literature on income inequality, such as Brei et al. (2018), and Thalassinos (2012) also control for GDP per capita. Even though GDP per capita is not a perfect indicator of country's level of development and this paper is only concerned with top tier economies, it is still used as a covariate in the analysis. There could have been concerns of correlation between GDP per capita and our main explanatory variable importschina, since one could argue that countries with higher GDP per capita import more from China. However, the correlation between these two variables is negligible, which will be discussed in the results section. Brei et al. (2018) control for inflation and we opt for utilizing it in the model, defined as change in consumer price index. In addition, Thalassinos et al. (2012) find that inflation has a positive impact on income inequality, thus, it is relevant to control for inflation in our analysis. Furthermore, to capture the financial aspect, we include credit and market capitalization. First, lcredit is used to measure financial development of the country, and it is defined as the log of credit to private sector as a percentage of GDP, motivated by Dabla-Norris et al. (2015), who utilize this variable to measure domestic financial market development. In addition, Brei et al. (2018) utilize the same variable in their analysis. Second, they also incorporate variable market—measured as log of stock market capitalization as a fraction of GDP and it is used as an indicator of financial development of the country. Since the importance of government expenditure to explain inequality is stressed by Alvaredo et al. (2018) in World Inequality Report, we want to capture its effect. Therefore, the model controls for general government final consumption expenditure as a percentage of GDP, the same variable utilized by Ben Naceur and Zhang (2016). In addition, Dabla-Norris et al. (2015) argue that government expenditure can also be used as a proxy to explain the aspect of inequality of opportunities, since countries with high government expenditure usually have more equal opportunities. To control for human capital, we incorporate the variable schooling. It is defined as the enrollment rate of secondary education, and it is the same variable Johansson and Wang (2013) utilize as an indicator of the human capital stock in the country. Moreover, education is significant when it is above the minimal level—which is why secondary schooling plays a bigger role than primary schooling in explaining income inequality (Barro 1997). According to Dabla-Norris et

al. (2015), human capital can be an indicator of the development of the country, as well as equality of opportunities, which is why it is relevant to control for it when explaining inequality.

Several different econometric methods will be utilized in the analysis. These are: OLS (Ordinary Least Squares), RE (Random Effects), OLS and RE with IV (Instrumental Variable) and Long Difference (five years difference) with and without IV. OLS estimates will be used as a base. Then, a random effects model will be estimated, in order to control for unobserved time constant heterogeneity of the countries. Furthermore, IV regressions of OLS and RE will be used to mitigate endogeneity bias. Finally, long difference model was motivated by Autor et al. (2013), who, instead of the first difference, look at a longer period of difference to discern the effects of trade with China. These different methods will be compared in order to check the robustness of the results.

4 Data

4.1 Data Description

Data utilized for this research is obtained from different data sources. One of the biggest limitations of secondary data is that it was collected for a different purpose (Saunders et al. 2009). However, since this research is mainly utilizing macroeconomic variables, this is of little concern. Furthermore, since we are exploring the change in income inequality in fifteen European countries throughout a period of time, which is 1995 to 2016, the research conducted is longitudinal, since it studies change and development (Saunders et al. 2009). The time frame from 1995 to 2016 will capture the effect of China's development and emergence as a key global exporter. With observations throughout this period, the years after China's emergence in 1992, and throughout its development in the 1990s, all to the 2001 WTO accession can be captured. Moreover, the effects of the WTO accession can be observed from 2001 to 2016. Looking at this time interval was motivated by previous research and it was also the most appropriate due to data availability for those specific years. However, the time frame still differs from the existing literature on this topic, since for instance, Bloom et al. (2015), look at the thirteen European countries in the period from 1996 to 2007, and Autor et al. (2013) focus on the local US labor markets between 1990 and 2007. The time horizon of this thesis is expanded until 2016, and it has a different case study of fifteen European economies, to better test the effects of the Heckscher-Ohlin model. The countries used in this panel dataset are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

4.2 Sources

Several different data sources are utilized. First, observations on the dependent variable, the Gini coefficient are extracted from Eurostat. Motivation for utilizing this data source for the explanatory variable is that this was the most complete data source for the countries of interest.

There were many limitations concerning this variable due to missing observations in some years, but when comparing it with Gini variable from other data sources, the one from Eurostat was the most complete. For instance, as mentioned, Barro (2000), uses the Gini coefficient as a dependent variable and an indicator of income inequality. However, his data source for Gini is the World Bank, but his observations focus on the whole world and more observations than the ones in this thesis, so data on the Gini coefficient from the World Bank for this study was scarce. Another database, World Inequality Database, probably most famously utilized by Thomas Piketty, was also considered. However, this database is pooled data with different sources, and in cases of missing observations it was averaged on + or -3 years which could question the representativeness of the estimates, and the methodology of computing these averages. Moreover, it is important to mention the limitations of the Gini variable from Eurostat. The data contained missing observations for some of the countries for certain years. Even though it was not expected to find so many limitations on the Gini coefficient, since it is used broadly, this proved to be an issue when compiling the data. Second, data on explanatory variables comes from several different sources. The variables choice has been inspired by previous research, which was discussed in the previous section. The data used to compute the main explanatory variable—importschina is extracted from UN Comtrade Database. Another explanatory variable, GDP per capita, is retrieved from the World Bank. Variable on schooling, which describes the enrollment rate of secondary education, and variable on inflation are the exact same variables used by Johansson and Wang (2013), both originating from the World Bank. Third, the two variables describing financial development of the countries—credit (i.e. bank credit to private sector) and market (i.e. stock market capitalization for listed companies), consistent with Brei et al. (2018), originate from Global Financial Development Database. Finally, a control variable for government expenditure is extracted from the World Bank.

5 Empirical Results

5.1 Regression Diagnostics

One possible source of concern, common in multiple regression analysis, is high correlation among the covariates. In particular, it would be problematic if there was high correlation between the key explanatory variable, importschina, and GDP per capita. However, the correlation between these two variables is only approximately 0.10. Overall, there are no serious issues with high correlation between the variables. For instance, there is high correlation between gov and schooling, but it is less than 0.49, which is a usual threshold. Thus, multicollinearity does not seem to be a large concern. The correlation matrix can be seen in Table 2.

Table 2 Correlation Matrix

	importschina	lgdpc	infl	lcredit	lmarketcap	gov	schooling
importschina	1						
lgdpc	0.102	1					
infl	-0.234	-0.135	1				
lcredit	0.396	0.042	-0.227	1			
lmarketcap	0.074	0.452	-0.042	0.117	1		
gov	0.269	0.107	-0.225	0.158	0.097	1	
schooling	0.024	0.119	-0.175	-0.036	0.216	0.476	1

Furthermore, regression diagnostics is conducted and the assumption that errors are normally distributed is checked. Formal test of normality is conducted using the sktest in Stata, where the null of normality is rejected. The deviation from normality seems to be caused by a cluster of large negative residuals belonging to Germany and Finland in various years. Despite further exploration of the data, we were unable to conclude why these specific observations are so peculiar. If these observations are dropped, then there is no longer evidence against the normality assumption. In cases of non-normality, it is only the inference—p-values and confidence intervals, that is affected by it. When estimating all models with and without these potentially problematic observations, the difference in the significance of the estimates is negligible and thus, the results seem to be robust to non-normality of errors.

Moreover, formal test of serial correlation in the errors is conducted and there is evidence of positive serial correlation over time. To combat this issue standard errors that are robust to serial correlation are used. Formal test of heteroskedasticity is also conducted, however the null of homoskedasticity is not rejected.

The Durbin-Wu-Hausman test is used to decide if it is preferable to use the Random Effects or the Fixed Effects model. The test showed that a Random Effects model is preferable. Thus, the results using the Random Effects model are presented. Moreover, since it is difficult to discern whether Random Effects or Long Difference model is best, the results from both models will be presented, for the sake of comparison and to check the robustness of the results.

5.2 Regression Results

Table 3 shows the model using different estimation approaches. The first column is OLS, the second one is the Random Effects, the third one is OLS with instruments, and the final one is the Random Effects using instruments. As mentioned in the method section, the empirical analysis will be presented and robustness check conducted by comparing the different models.

Table 3 Regression Output OLS and Random Effects

VARIABLES	(1) OLS	(2) Random Effects	(3) OLS	(4) Random Effects
importschina	0.490***	0.258**	0.450***	0.356**
	(0.0719)	(0.132)	(0.106)	(0.175)
lgdpc	-162.7***	-120.9***	-162.9***	-141.5***
	(26.51)	(21.51)	(32.21)	(37.30)
lgdpc2	7.304***	5.318***	7.315***	6.300***
	(1.241)	(1.009)	(1.505)	(1.745)
infl	0.225*	0.363*	0.138	0.276
	(0.121)	(0.214)	(0.102)	(0.187)
lcredit	1.357*	1.230*	0.947	0.903
	(0.674)	(0.734)	(0.825)	(1.027)
lmarketcap	7.034**	7.213**	6.486	7.143
	(3.161)	(3.195)	(5.118)	(5.201)
lmarketcap2	-0.845*	-0.787*	-0.761	-0.791
	(0.422)	(0.433)	(0.663)	(0.682)
gov	-0.499***	-0.551***	-0.443***	-0.488***
	(0.0975)	(0.100)	(0.0891)	(0.103)
schooling	-0.00322	-0.0111	-0.0113	-0.0166
	(0.0185)	(0.0150)	(0.0165)	(0.0143)
Constant	919.5***	701.6***	924.0***	811.0***
	(140.2)	(110.6)	(169.8)	(197.0)
Observations	260	260	150	150
R-squared	0.790		0.812	
Number of country		15		15
Country Effect		YES		YES
Year Effect		YES		YES
Instrumented			YES	YES

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

5.2.1 Interpreting the Results

Looking at the OLS model, we see that our main explanatory variable importschina has a positive sign and it is statistically significant at a 1% level. The coefficient shows that a 1 percentage point increase in import penetration from China results in 0.490 increase in Gini coefficient. We get a significant effect, but we can explore the magnitude of the effect further. For instance, by looking at Figure 1 in the Appendix, we can take Germany as an example. In 1995 Germany had import penetration from China of approximately 2 percentage points, which has reached 10 percentage points in 2016. Thus, the difference in import penetration from China of 8 percentage points would mean an increase in Gini coefficient of approximately 4. This is a prediction by the model, and looking at this dataset, the approximate increase in Gini is quite high. From the regression, we can conclude that the relationship between import penetration from China and income inequality in the fifteen European countries is positive and significant. Furthermore, the results on the relationship between GDP per capita, as a proxy for the development of the country and Gini are highly significant but they have an unexpected shape. Previous research, such as Barro (2000), who examines the relationship between trade and economic development, has found inverse U-curve relationship between GDP and Gini, which is consistent with the Kuznets curve. In contrast, this analysis suggests a different relationship between income inequality and the level of development. Nonetheless, it should be considered that the Kuznets curve is a concept from 1950s and does not necessarily hold for high-income economies in the time frame examined. In addition, our findings are consistent with those of Branko Milanovic (2016), one of the most prominent contemporary scholars in the field of inequality. He argues that the Kuznets curve has come in waves throughout history. In addition, his results show the development of income inequality in the UK, a high-income European country, to be consistent with our findings for the period that captures the time frame of this research. Furthermore, he argues that the high-income economies are experiencing a second wave of the Kuznets curve, and finds evidence on pro-inequality trends. Hence, due to the maturity of the Kuznets curve and the fact that previous research has found the Kuznets curve in case studies of developing economies, our results are somewhat expected. Moreover, the Kuznets curve's prediction of low inequality in highly developed societies cannot be squared with the sustained increase in income inequality among all developed nations from 1970s onwards (Milanovic 2016). Thus, our results are inconsistent with Kuznets (1955), but consistent with Milanovic (2016). Looking at other relationships in our regression output, inflation is significant at a 10% level, and 1 percentage point increase in inflation would give

0.225 increase in Gini. This is consistent with findings of Thalassinos et al. (2012) that inflation has a positive significant effect on income inequality. Moreover, our findings have theoretical ground as Bulíř (1998) finds that price stability is associated with improving income inequality. By examining the relationship between Gini coefficient and the financial variables, the results are consistent with Dabla-Norris et al. (2015), as well as research of Brei et al. (2018) that there are statistically significant non-linearities, when it comes to financial development and income inequality. When it comes to government expenditure, it is statistically significant at a 1% level and it has a negative sign. It means that a 1 percentage point increase in government expenditure results in 0.499 decrease in Gini coefficient. The results are also consistent with Dabla-Norris et al. (2015) and Alvaredo et al. (2018) that government expenditure contributes to lower inequality. Variable schooling is the only insignificant variable in this regression. Explanation for that could be that we look at highly developed countries in the modern age, where enrollment in secondary education is already very high, so it is higher education that could have a significant impact. However, we selected secondary education driven by previous literature, with Johansson and Wang (2013) controlling for the same variable to capture the amount of human capital stock in a country.

The analysis on Random Effects is included in order to eliminate the time constant country specific unobserved heterogeneity that may cause omitted variable bias, also motivated by previous research. Importschina—the main explanatory variable is statistically significant, at a 5% level. Moreover, the magnitude is lower than in the OLS regression, with 1 percentage point increase in import penetration from China resulting in a 0.258 increase in Gini. Thus, the effect is smaller than in OLS, however, still significant, which is important for the robustness check of our results. Moreover, we get the same shaped relationship between GDP per capita and Gini, and same significance level of 1%. The Random Effects model shows higher magnitude for inflation, of 0.363, but the sign is positive, and consistent with the previous research that Gini increases with inflation. Financial variables have the same relationship as in the OLS model and they are statistically significant for explaining income inequality, consistent with Brei et al. (2018) and Dabla-Norris et al. (2015). Variable on government expenditure has same sign and significance level, but it is only slightly higher in the absolute value, from -0.499 in OLS to -0.551 in RE model. Schooling is the only insignificant variable in this model as well. Hence, the results are very robust in the two models.

5.2.2 Controlling for Endogeneity

For IV regressions, we use lagged values of the endogenous variable as instruments, motivated by the research of Brei et al. (2018). The instruments are lagged values of importschina, with lags of 3 years and higher, in order to mitigate the risk of serial correlation. In particular, import penetration from China with a lag from 3 to 10 years are used. When runing the regression of importschina on the suggested instruments, they are jointly statistically significant, and thus, we consider this a good instrument as it satisfies the instrument relevance criterion. IV can be considered a better estimator since it is removing bias and solving endogeneity in the cases of good instruments.

By looking at OLS model with instrumental variable, we see that there was a slightly positive bias in magnitude of the estimates in OLS without instrument. OLS IV model shows 0.450 increase in Gini with 1 percentage point increase in import penetration from China. The shape of the relationship between Gini and GDP per capita is similar to the ones in OLS and RE models. Inflation is insignificant in this model; however, the coefficient size is smaller with IV. Removing the positive bias affects the t-statistics used to find the p-values and that could be the reason why inflation, as well as the financial variables are now insignificant. The variable on government expenditure has also lower absolute value in OLS IV with -0.443, compared to previous -0.499, but the sign is again negative, and it is highly statistically significant. Schooling is still insignificant; thus, the results are very consistent throughout the models. The results from OLS IV showed same signs as OLS, with slightly lower magnitude throughout the variables. Since using instrumental variables is a way to better infer causality using non-experimental data, we can have more confidence in these results. In addition, our findings are very consistent throughout the different models, which gives us confidence in the previous selection of our variables.

When including lagged values of importschina as instrumental variable in our Random Effects model, we see that there seems to have been a negative bias in variable importschina without the instrumental variable. In RE IV model we control for time-constant, country specific effects, as well as other unobserved heterogeneity. For instance, in RE IV, 1 percentage point increase in import penetration from China implies a 0.356 increase in Gini, which is 0.258 in the RE model. The sign and significance level is the same throughout most of the variables, however, the magnitude is now slightly different. The relationship between GDP and Gini is similar to the ones in the other models, and inflation now has a lower coefficient, but it is no longer

significant, as in OLS IV model. Since inflation and the financial variables are insignificant in both OLS IV and RE IV, as previously discussed, we have firm ground to believe that the reason for this is that when removing positive bias, we get a smaller coefficient and smaller t-statistics and therefore larger p-value. Government spending now has a lower coefficient in absolute value of -0.488, compared to previous -0.551. Schooling is still insignificant, as throughout the other models.

5.2.3 Long Difference Models

Finally, Long Difference models of five years will be presented with and without instruments. In this case, the independent variable is the difference in import penetration from China—as used by Bloom et al. (2015). The results in Long Difference models in Table 4 are concerned with the difference in Gini and difference in import penetration from China. Autor et al. (2013) conduct the analysis on ten years difference level, however, we opted for five years, since testing on first difference, the results were insignificant, which can be the effect of a too short lag. For ten years difference model, too many observations are lost.

When comparing to the results from other models, sign is expected, but the magnitude is not directly comparable. In the regression output, importschina variable is the only significant variable at 5% level. The other variables are not statistically signficant, however we now look at differences. Furthermore, our sample is now much smaller, so the standard errors could be larger, which could be the reason why the other variables are insignificant. However, since they are control variables, this is not of large concern. It is, nevertheless, important that our main explanatory variable is statistically significant, which is consistent with other models.

For Long Difference with instruments model, the instruments are lagged values of difference in import penetration from China. By looking at the results from the LD IV regression, there was a negative bias before, so the coefficient for the IV estimates are larger. For instance, importschina variable is still statistically significant at a 5% level, but it has a higher coefficient of 0.893, compared to previous 0.352. Moreover, market capitalization variable is now statistically significant. There was a very large bias in this variable without the IV, which was then 0.326 and now 10.23, as well as -0.013 and -1.297 for the squared term. Beta coefficients are now larger in absolute value and the standard error is approximately the same. This yields a larger t-statistics and smaller p-value, thus, market variable now becomes statisticallly significant.

Table 4 Regression Output Long Difference

VARIABLES	(1) Δgini	(2) Δgini
Δimportschina	0.352**	0.893**
	(0.147)	(0.396)
Δlgdpc	-18.47	-48.56
	(58.82)	(85.48)
Δlgdpc2	0.709	1.869
	(2.701)	(3.958)
Δinfl	0.0308	0.0451
	(0.0880)	(0.109)
Δlcredit	-0.176	-2.575
	(0.914)	(2.424)
Δlmarketcap	0.326	10.23***
	(3.540)	(3.841)
Δlmarketcap2	-0.0130	-1.297***
	(0.457)	(0.488)
Δgov	0.0458	0.130
	(0.248)	(0.315)
Δschooling	-0.00770	-0.0599
	(0.0233)	(0.0605)
Constant	-0.0405	-0.239
	(0.278)	(0.509)
Observations	168	75
R-squared	0.132	0.126
Country Effect		YES
Year Effect		YES
Instrumented		YES

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

6 Discussion

The robustness of our results is an indicator that there is support for validity of the implications of the Heckscher-Ohlin model. China is abundant in low-skilled labor and it is therefore exporting mostly labor intensive goods. In trade with developed economies, such as the fifteen European countries, which are relatively abundant in skilled labor, import penetration from China affects wages of high-skilled labor in developed economies positively, and wages of low-skilled labor negatively. Previous research argues that there is a very high skill premium which means that high-skilled labor would become richer, and people on the other side of the income distribution—low-skilled labor, become poorer. Thus, the gap between rich and poor enlarges, and the Gini coefficient measuring income inequality is therefore increasing. Hence, there are costs and benefits of international trade, and this hypothesis is supported by the findings of this thesis, that import penetration from China has a positive effect on income inequality in the fifteen European economies. China is a very special case, since its growth rate was vast, so this natural experiment environment, as argued by Autor et al. (2013), provided grounds to conduct a case study and discern general effects of international trade, utilizing this example.

However, trade could have a dual effect, on wages, as well as prices. Thus, one could argue that since a low-income country is trading with high-income economies, it affects wages of the low-skilled labor negatively, but it also has an effect on prices of the imported manufacturing goods. The prices of these goods would go down, since the cost of importing them from China is lower than if they were produced in high-income economies, due to cheaper labor and capital. It is reasonable to assume that low and high-skilled labor may have different goods in their standard consumer baskets. The basket that is more likely to be affected by the decrease in price of manufactured goods is that of the low-skilled labor. As the prices goes down, their purchasing power increases, and in such a way alleviates the effect of their declining wage. In this case, the analysis would have to be expanded to factors of production of specific countries. Even though this approach would be opposed to the Heckscher-Ohlin model and the Stolper-Samuelson theorem, which drives the discussion on real wages (i.e. controls for changes in prices), it would be interesting to challenge these models, especially since there already is

evidence of deviation to these theories, such as the Leontief paradox. However, this is beyond the scope of this thesis.

Another limitation that could be tackled with analyzing factors of production of specific countries, is that it is assumed that top tier economies are always abundant in high-skilled labor, and low-income economies are always abundant in low-skilled labor. This is inspired by the trade theory, and it is important to mention that when discussing factors of production of different economies, it is referred to relative abundance—comparing the abundance of one country to another. Thus, when referring to China as abundant in low-skilled labor, it is important to compare it to the highly developed fifteen European countries, which are relatively abundant in high-skilled labor, compared to China. It would, nevertheless, be interesting to explore the factors of production of specific economies deeper, especially with existence of contradictory cases, such as Leontief paradox, which found countries considered as capital-abundant to export labor intensive goods (Krugman et al. 2015)

7 Conclusion

The aim of this thesis was to discern the relationship between trade and income inequality utilizing a case study of the so-called China trade shock—the development of China and its emergence as the key exporter of manufactured goods around the globe. The objective was to utilize this natural experiment environment, similar to Autor et al. (2013). In contrast to their study that examines effects on local labor markets in the US, in this paper, we treat the income inequality in fifteen European countries. This case study considered fifteen European countries, all top tier economies, in order to test the Heckscher-Ohlin model and the Stolper-Samuelson theorem. Using panel data for these countries for the period between 1995 and 2016, we examine the effects of import penetration from China on income inequality, proxied by the most commonly used measure of inequality, the Gini coefficient. By synthesizing previous literature and pooling the different variables that help explain Gini, the model which was used in the analysis was selected. In the final model, Gini is a function of import penetration from China, GDP per capita, inflation, financial development of the country—private credit ratio and market capitalization—government expenditure and rate of secondary school enrollment. Several different methods have been applied in order to compare different estimates—Ordinary Least Squares, Random Effects, Long Difference, and these three methods including instrumental variable estimation. These instruments were import penetration from China with a lag from 3 to 10 years, and lagged values of difference in import penetration from China for the Long Difference model. Results from these six models allowed us to check for the robustness of the estimated effect. From the regression output, it is concluded that there is a positive relationship between import penetration from China and income distribution in the fifteen European countries in the period from 1995 to 2016. The results were very robust throughout the different models, in terms of the significance level, the sign and to some extent, the magnitude. The largest difference is in magnitude of the Long Difference model and the other models, which is expected, since it is difficult to interpret and compare difference models to standard OLS models. The fact that the results are robust to different methods of estimation, gives some confidence to our model and the results. The objective to examine the effects of trade with China on income distribution in the fifteen European countries utilized in this study is fulfilled. From the analysis, we find evidence and support for the hypothesis that there is a positive

relationship between income inequality and import penetration from China in the fifteen European countries. Thus, previously set research question is answered: *What is the effect of trade with China on interpersonal income inequality?* China's growth and trade had an impact on income inequality in the developed countries, which is consistent with the Heckscher-Ohlin model. Concerning data for this research and this particular case study, it can be concluded that trade with China induces higher interpersonal income inequality. However, the limitations of the thesis, such as data limitations are still acknowledged. Moreover, we find evidence that there is no Kuznets curve in this particular research. However, since we only analyse observations from top tier economies, the Kuznets curve does not necessarily hold. In addition, one should keep in mind that theory on the Kuznets curve originates from the 1950s, and is challenged by contemporary work. Our results are, nevertheless consistent with the research of Milanovic (2016), who claims that Kuznets curve comes in waves. Thus, we have some confidence in our findings since they are consistent with Milanovic's (2016) more contemporary work. Finally, although the estimated effect is fairly robust across the different models, it is notoriously difficult to discern causal effects from regression analysis, and thus, the normal caveat applies.

In the last several years, the world has faced the rise of populist policies among the developed nations, starting with the US, and Brexit in the UK, to political pressure in France, Italy and Netherlands. Thus, there has generally been a negative view on trade in global political economy. However, the general economic theory argues that benefits from trade are high and offset the costs of it. Heckscher-Ohlin model is concerned by reallocation effect of trade, and argues that some are benefiting, while others do not. This is affecting distribution of income and increases inequality in developed economies. The results have shown that trade with China contributed to higher income inequality among highly developed European countries. Since high income inequality in a country is considered bad for the economy, this research has polict implications since it can help to explain anti-globalization sentiments, among the developed countries in the world. Although there is a positive net effect of trade, as a whole, on economies, this research showed that different parts of society gain and lose from trade, with unequal distribution of income as a result.

8 References

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9 Appendix

Figure 1 Import Penetration from China over Time