

Trade liberalization: The right engine of growth?

A quantitative analysis

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ABSTRACT

Do lower barriers to international trade induce a positive effect on economic growth? This has been a highly debated issue within the field of economics for more than a century. Several studies find a positive relationship between openness to international trade and growth. Other studies do not find this relationship to be robust, while some studies find a negative correlation. Classical and neoclassical trade theory is the theoretical framework being the basis for the thesis. The infant industry argument, the structuralist and institutionalist approach, and dependency theory are included as criticism of this school of thought. In addition to openness, other key variables focused on when explaining growth, are indicators related to sector specialization, geography, institutions and political regimes. The research question will be investigated by using multivariate regression analysis and the OLS method. The analysis is based on quantitative data for an aggregate sample of 184 countries over the time period 1950-2004. The results indicate that the classical and neoclassical theories are suitable for the group of OECD countries concerning a positive effect on openness and growth, as well as the presence of convergence in income levels. For the remaining countries, openness does not seem to have a significant effect on growth, and the results indicate rather a divergence in income levels. The answer to the research question based on my results is therefore that lower barriers to trade induce a positive effect on growth only for wealthy countries. An implication of the results is that there still exists unexplained heterogeneity in the data. A positive relationship between openness and growth is therefore contingent of other factors to be present. A remaining challenge is therefore to explore what these contingencies are.

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ABBREVIATIONS

BLUE = Best Linear Unbiased Estimator

CICUP = Center for International Comparisons at the University of Pennsylvania

DA = Domestic Absorption

EU = European Union

EFTA = European Free Trade Association

GATT = the General Agreement on Trade and Tariffs

GDP = Gross Domestic Product

GNP = Gross National Product

ICRG = International Country Risk Guide

IMF = International Monetary Fund

ISI = Import Substitution Industrialization

NTBs = Non-Tariff Barriers

OLS = Ordinary Least Square

PPP = Purchasing Power Parity

PRS = Political Risk Services

PWT = Penn World Table

R&D = Research and Development

SSR = Sum of all Squared Residuals

TFP = Total Factor Productivity

UNCTAD = United Nations Conference on Trade and Development

WB = World Bank

WDI = World Development Indicators

WGI = World Governance Indicators

WTO = World Trade Organization

1 INTRODUCTION

“Nowadays world trade is a very complicated phenomenon because it is not just an economic but also a social and political matter [...] Implementing a right trade policy will enhance the economic welfare and growth of the economy. A wrong policy, however, could spell disaster” (Wong and Heiduk 2005:1).

Old controversies die slowly. For more than a century the connection between trade policy and economic performance has been debated. The core of classical and neoclassical trade theory is that international trade works as an engine of economic growth as it promotes efficient allocation of resources through specialization and comparative advantage. According to this view, a prerequisite for markets to operate efficiently is a free trade policy which assures that international trade is mutually beneficial. Economic convergence among countries is expected to occur, hence the prospect of a “catching up” by developing countries in income levels. The classical and neoclassical school of thought has been heavily criticized by theorists particularly concerned with development issues. These heterodox theorists especially refer to the continuous increasing income-gap between developed and developing, contrary to the predictions of the free trade doctrine.¹ Therefore, protectionist trade policies played a dominant role in the 1960s- and 70s when industrial policies were formed for a large number of developing countries (Hasan 2004:1). The core of this debate has been whether an outward-oriented, export-led growth strategy is superior to import substitution industrialization (ISI) based on protectionism.² This controversy continues today, even though the world is experiencing an unprecedented period of trade liberalization.

Since the end of the Cold War and the collapse of communism in 1989, globalization has characterized international economic affairs. Increasing economic integration between national economies has led to a substantial increase in world trade. However, today’s market liberalization also seeks social justice in addition to economic growth, hence a more fair distribution of the income generated. This has required better harmonization between international and national rules, and the need for well functioning supranational institutions

¹ The critics of classical and neoclassical trade theories will by a generic term be referred to as the heterodox theorists.

² The basic idea behind import substitution was to increase domestic demand by protecting own industries from foreign competition.

(Austvik et al. 2002:163-165). An ideological fundament in the International Monetary Fund (IMF) and the World Bank (WB) is based on the so called Washington consensus, where one of the pillars is trade liberalization as the universal “medicine” for economic growth in both poor and rich countries.³ This idea is also supported by the World Trade Organization (WTO), established in 1995 to rule the multilateral trading system: “... liberal trade policies — policies that allow the unrestricted flow of goods and services sharpen competition, motivate innovation and breed success” (WTO 2008).

How confident can we be that the alleged benefits from trade liberalization contended by the institutions governing our global economy? My motivation for the thesis is therefore to test the extent of validity of this position. The research question of this thesis is: *Do lower barriers to international trade induce higher rates of economic growth?* The research question will be investigated empirically within a quantitative approach, including 184 countries over the time period 1950-2004. In order to test the relative explanatory power of trade liberalization, other factors believed to influence growth are included such as geographical characteristics, institutional quality and political regimes.

1.1 Where we are

Since the role of international trade has been one of the most debated topics in the growth literature, numerous studies have assessed the relationship between openness and growth empirically by adopting statistical techniques. A majority of the studies have found a positive relationship between openness and growth, hence supporting the case for trade liberalization (Edwards 1997; Greenaway et al. 2002; Levine and Renelt 1992; Melchior 2007; Sachs and Warner 1995): Greenaway et al. argue: “If openness is indeed positively related to growth, then it follows that liberalization is a requirement for growth” (Greenaway et al. 2002:231). However, some studies do not find the result to be robust, implying that there still exists uncertainty about the issue. Rodrik et al. (2002) found the relationship between openness and growth to be negative, although not significant at a conventional level. Since the literature is inconclusive regarding this issue, further research seems to be required. An alleged effect of

³ The term “Washington Consensus” refers to a perception of broad agreement among public officials in especially the Western and US economies and international institutions that a neoliberal approach to economic development is favourable. It emphasises free markets, trade liberalization and a greatly reduced role for the state in the economy (Gilpin 2001:315).

liberal trade policies is that income levels worldwide should converge in order to close the income gap between rich and poor countries, which is one of the main hypotheses focused on in my thesis. Many studies have found convergence to occur among the countries under study (Edwards 1997; Greenaway et al. 2002; Levine and Renelt 1992; Sachs and Warner 1995). A controversy in the literature however, is whether convergence only occurs when certain factors are present, or if convergence occurs independently of other country characteristics. Consequently, researchers are therefore concerned with whether convergence is *conditional* or *absolute*.

A fundamental perception in the classical and neoclassical school of thought is the concept of comparative advantage. This doctrine holds that a country has a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than in other countries (Krugman and Obstfeld 2003:12). Due to resource endowments, some countries are more specialized in primary products, while others are more specialized in manufactures. A popular view among the heterodox thinkers is that agricultural sector specialization is a “bad” economic activity, while manufacturing is a “good” economic activity.⁴ In a recent empirical study, Melchior (2007) found that in order to obtain a positive trade-income link, a country should have little employment in agriculture and a high share of manufacturing in exports. In order to test the validity of these arguments, the hypothesis of agricultural specialization is included in my empirical analysis.

This thesis is mainly concerned with factors related to international trade in the study of economic growth. However, the determination of growth is a complex issue, and we cannot ignore the role of other factors that are believed to have an explanatory power. Rodrik et al. (2002) argue that there are two additional strands of thought that stand out in the growth literature: The role of institutions, and the role of geography. According to Rodrik, institutional quality has a superior explanatory power over both trade and geography on growth. Frankel and Romer (1999) argue that country size affects trade intensity, because large countries have more within-country trade, which correlates positively with economic growth. In addition, Levine and

⁴ A major exception is countries endowed with oil resources. It is basically products such as food and other raw material this is the case for.

Renelt (1992) emphasize that investment share of GDP and population growth is important and influential factors on a country's income level.

1.2 Purpose of the thesis

The discussion above implies that trade policy and economic performance is a controversial and highly debated theme. Due to the inconclusiveness of the large empirical literature on the topic, questions related to trade liberalization are still subject for further discussion and empirical investigation. Although most of the studies conclude that openness induces growth on an average basis, there is considerable unexplained heterogeneity in the data. Rodriguez and Rodrik (1999) argue that one major reason for the inconclusiveness of the literature is the methodological problems of the empirical strategies employed. Particularly the use of different indicators of openness is problematic in terms of comparing the different results. Further, measurement problems, endogenous variables and omitted variables are common challenges to all empirical studies. Other methodological deviations such as different research designs, sample selection of countries and the time-period under study also contribute to the inconclusiveness of the literature.

The purpose of my thesis is twofold: On one hand, I aim to test the link between trade liberalization and growth on existing influential theories within the field of international trade. Four hypotheses are derived from this literature: The free trade hypothesis, the convergence hypothesis, the Prebisch-Singer hypothesis, and the institutional quality hypothesis.⁵ On the other hand, I aim to test the results obtained by previous empirical studies conducted within the last 15 years, regarding direction, significance and strength of the link between openness and growth. Many of the variables included in these studies are derived from theoretical concepts in the theoretical literature. In addition, variables which are not theoretically motivated are tested, because economic growth is a complex issue, so more factors than those directly related to international trade are assessed.

The logic of analysis of this thesis is first and foremost *theory-testing*. I also test the impact of political regimes by including a dummy variable for democracy in my empirical analysis. The

⁵ Prebisch and Singer are scholars within the structuralist approach which will be presented in chapter two. The Prebisch-Singer hypothesis mainly proposes that agricultural specialization is detrimental for economic growth.

effect of political regimes is not frequently assessed in previous studies reviewed, thus constituting my contribution to bring some new perspectives into the field of research.

1.3 How to investigate the research question?

The research question is investigated in two steps, as outlined above. Chapter two presents the theoretical framework which forms the basis of the thesis. Two main traditions appear to stand out regarding trade policy: On one side, the classical and neoclassical school of thought which constitutes the advocates of free trade policies as a “universal medicine” of growth. On the other side, heterodox theorists advocate protectionist trade policies for developing countries as the preferred growth strategy.

In chapter three I review a selection of seven empirical studies conducted within the last 15 years, and identify the key explanatory variables which will be included in my own empirical analysis. Some of the variables reflect the theoretical concepts in order to test the hypotheses proposed in the theoretical chapter. Other variables are new in the sense that they are not motivated by international trade theory, but instead reflect other areas related to growth. The studies are chosen on the basis that all of them are conducted within a quantitative approach, and are discussed in terms of their findings and methodological characteristics. The independent variables will be presented by groups, following the divisions made by Rodrik et al. (2002).

In chapter four I present the methodological framework which I found to be suitable for my study of the research question. The research question is concerned with macro level effects of trade liberalization on economic growth. I therefore search for general trends both across time and space, and I have selected regression analysis as the tool of analysis in a panel framework. Before I proceed with the empirical analysis, operational definitions are given for the variables included. The variables are selected on different grounds: Some are chosen in light of the theoretical concepts identified in the theory chapter, some constitutes the key variables included in the empirical studies reviewed, and furthermore I include a group of “new” variables related to political regimes.

When transforming theoretical concepts into quantifiable variables, it is important that the criteria of data validity and reliability are met to reduce the potential of measurement errors. As a result, I have thoroughly explained what each variable in fact measure. The impact each independent variable has on growth are expressed in terms of my proposed hypotheses.

In chapter five, the empirical analyses of this thesis are undertaken by using panel data as the research design. The sample selection consists of 184 countries over the time period 1950-2004. The analyses are conducted in two steps: In the first part I test the findings of previous research by constituting a model that consists of the key variables frequently included in growth regressions. In the second part, I go on to build a new model by adopting a comprehensive statistical strategy. The findings are interpreted in light of the hypotheses proposed and compared with the results from previous studies. In order to check the robustness of my findings, tests for ordinary least square (OLS) assumptions are included. The final chapter summarizes and evaluates the findings obtained in previous studies, the testing of these studies, and my own empirical findings. Finally, I propose suggestions for future research.

2 THEORETICAL FRAMEWORK

This chapter presents the theoretical framework forming the basis for proposing the major hypotheses that are tested empirically later in this thesis. Two main directions are focused on: The classical and neoclassical trade theories, which share the common conviction that free trade is the “universal medicine” for economic growth. The other direction is theories which criticize the classical and neoclassical for the “one size fits all” comprehension. In a generic term, I call them the heterodox theories of international trade. They are especially concerned with issues related to developing countries, and state that special treatment is needed, such as allowing for protectionist trade policies. Only in this way, it will be possible to eventually “catch up” with developed countries and become competitive under a system of free trade according to this view. I start out with the first direction addressed, namely the classical and neoclassical theory of international trade.

2.1 Classical and neoclassical trade theory

Within the classical and neoclassical school of thought I focus on three theories which have been influential in the development of the theoretical framework for international trade. I start out with the Ricardian model and the doctrine of comparative advantage. Second, I present the Heckscher-Ohlin model and the factor price equalization theorem which builds upon the Ricardian model, but adds additional factors of production. A common feature of these trade models is that they employ a *static* framework in the sense that free trade will increase the *level* of income. The third theory is “the new trade theory” which adopts a *dynamic* framework that also relates to the *growth* effects.

2.1.1 The Ricardian Model

In order to fight the English Corn Laws, the classical economist David Ricardo demonstrated that trade is mutually beneficial through the theory of comparative advantage.⁶ This static trade theory is described in “The Principles of Political Economy and Taxation” from 1817. Ricardo’s first goal was to demonstrate that trade between countries is mutually beneficial, and second, to illustrate the importance of a free trade policy.

⁶ The English Corn Laws were tariffs imposed to restrict imports on food (Krugman and Obstfeld 2003:59).

In the Ricardian model, labor is assumed to be the only factor of production. Labor productivity is thus the measure of a country's technological level, expressed in the amount of labor needed in the production of a good. As Ricardo states, labor is "...the ultimate price which is paid for everything" (Ricardo and Fogarty 1965:253). Labor was believed to be immobile, but a major advantage with international trade was the distributional effect that arose from specialization and division of labor. Ricardo argued that under a system of free trade, each country would devote its capital and labor in the most efficient and beneficial way.

The object of the principle of comparative advantage was to establish a theory to determine the sources and patterns of trade. This builds upon the comprehension of *relative prices* which means that each country should produce the commodities most suitable given their conditions, such as natural or artificial advantages, and exchange them for commodities produced by other countries. This relates to the fact that resources are scarce, hence the existence of trade-offs between production of goods. Opportunity costs describe such trade-offs: "The opportunity cost of making a unit of one good is the quantity of the other good that must be given up to create the extra production resources" (Begg et al. 2003:254). Opportunity costs thus determine the *relative cost* of producing one commodity compared to another, and a country will produce the commodity where the relative costs are lowest. When countries engage in international trade, the amount and variety of commodities increase for the consumers. When consumption increases, revenues are gained, the savings rate rise, hence leading to capital accumulation (Ricardo and Fogarty 1965:80-82).

The most important contribution of Ricardo to the development of international trade theory is, as we have seen above, the comprehension of *relative prices* to determine the patterns of trade. However, this theory is exposed to delimitations of how the economy functions today, as it builds a model upon a one-factor economy. In the subsequent section, the neoclassical trade theory Heckscher-Ohlin model (H-O model) will be presented and includes an additional factor to the trade model.

2.1.2 The Heckscher-Ohlin model

The Ricardian model survived for a long time as the leading international trade theory. In the 1920s, the neoclassical economists Eli Heckscher and Bertil Ohlin developed a model where

comparative advantage not only arose due to international differences in labor productivity, but also due to differences in countries' *resource endowments*. The Heckscher-Ohlin model builds upon the same fundamental assumption as the Ricardian model, in the sense that foreign trade arises due to differences in comparative costs among countries.

The H-O model deviates from the Ricardian model with respect to Ricardo's assumption of labor as the only factor of production, and the perception of labor as an immobile factor. Considering the time of writing by Ricardo, migration of people, hence mobility of labor, was not a common issue. When Heckscher and Ohlin developed their theory hundred years later, a large amount of the European population emigrated to America namely because of working opportunities. The assumption that labor is an immobile factor is thus simply not realistic (Ohlin 1935:326-328; Heckscher et al. 1991b:58).

In the H-O model land is included as a second factor of production to reflect resource endowments. Comparative advantage is determined by differences in the relative prices of the factors of production as well as the different *proportions* in which the factors are used. Differences in relative prices are determined by the relative scarcity of resources so the relative price of a good produced with a scarce resource is more expensive than a good that is produced with an abundant resource (Heckscher et al. 1991b:48). Each country has subsequently an advantage in the production of those goods which are intensive in the factors of production which are particularly cheap in that region. It is thus advantageous to export those goods, and import the goods that are relatively expensive to produce. In sum, abundant factors of production are exported and scarce factors imported (Heckscher et al. 1991a:88-91).

A prerequisite for the optimal workings of the H-O model is a free trade environment. Heckscher argued that free trade was the best commercial policy simply because "...it creates the possibility of maximum satisfaction of human wants" (Heckscher et al. 1991b:68). Furthermore, free trade was believed to promote efficiency in the allocation of resources thereby shifting the economy's production possibility frontier outwards. This implies overall increased possibilities in the production and consumption of goods.

The Factor price equalization theorem

Heckscher and Ohlin developed the theory of comparative advantage with the inclusion of land as an additional factor to labor in the production function. Furthermore, they contributed to the theoretical framework for international trade by developing the Factor price equalization theorem. The core of this theorem is that relative prices of commodities will converge.

However, two assumptions are made for convergence to be present: The first is that the same techniques of production are used. Second, it assumes that it is a one-to-one relation between the relative prices of goods and factors, so when the relative prices of commodities converge, the same happen to the factors of production such as labor, land and capital. However, this tendency is most obvious when only two factors exist (Ohlin 1935:96-97). This theorem implies that countries with cheap labor have a comparative advantage over countries with relative expensive labor in commodities that make intensive use of labor, such as primary products. The price of labor, which is wages, is thus predicted to converge when countries engage in international trade under free trade conditions. In the empirical analyses of this thesis, I test a hypothesis regarding convergence in income levels among the countries included in my sample, which is inspired by the Factor price equalization theorem developed by Heckscher and Ohlin.

To sum up the essential contributions by Heckscher and Ohlin, they developed the theoretical framework of international trade theory further by adding a new factor in the production function. In line with the Ricardian model, comparative advantage arises from underlying differences between countries although patterns of trade are determined in terms of the *relative abundance* of the factors of production and the *relative intensity* in the use of these factors. The Factor price equalization theorem predicts that under free trade relative prices of products converge, along with the price of each factor used in the production process e.g wages.

I have now presented two static trade theories. In the next section I present a dynamic trade theory which is not merely related to the level effects of income, but also to the long-term growth rates.

2.1.3 The new trade theory

In the late 1970s, a group of theorists within the neoclassical school of thought challenged the static equilibrium models employed in international trade theory. These theorists constitute the

“new trade theory” here presented by the work of Paul Krugman. A hallmark of this direction is the emphasize put on *dynamic* effects of economies, implying that an economy can obtain long-term growth effects due to increasing returns.⁷ This is an independent cause of international specialization and trade, and must therefore be added as a new factor for why trade arises between countries (Krugman 1987).

Increasing returns in dynamic economies

The most important distinction from the Ricardian model and the H-O model is the idea of countries’ predetermined comparative advantage as the only source and patterns of trade. Krugman argues that underlying differences between countries is only *one* reason for why trade takes place. Countries also trade because of the advantages created by specialization caused by increasing returns in one sector not related to comparative advantage. Intra-industry trade is a common feature in world trade. For instance, France exports wines to South Africa and at the same time import wine from the same country, which would not fit into a model based on comparative advantage. However, the patterns of intra-industry trade are in themselves unpredictable. This happens because of product differentiation in order to offer consumers a wider range of wines. Due to advantages of large-scale production it leads to a random division of labor among countries. Thus, new trade theory concentrates more on resource allocation rather than the production of goods as an explanation for the gains from trade (Krugman 1990:80-88).

Nowadays technology is a driving force for international specialization. In contrast, Ricardo’s perception of technology was solely the productivity of labor, and Heckscher and Ohlin assumed that technology was the same between the trading countries. In many industries, knowledge generated through research and development (R&D) and experience can determine countries’ competitive advantage.⁸ Technological innovations may also generate spill-over effects to the rest of the economy. An industry in a country can thus become more competitive

⁷ Increasing returns is also known as economies of scale, which means that the average cost in the production of each unit falls as the scale of production rises (Baldwin and Wyplosz 2004:251).

⁸ The term competitive advantage deviates from comparative advantage in that the industry not only depends on its productivity relative to the foreign industry, but also on the domestic wage rate relative to the foreign wage rate (Krugman and Obstfeld 2003:24).

in its production even though the country originally was relatively poor endowed with that specific factor of production (Krugman 1992:7-8).

The new trade theory is not as rigid as its former predecessors regarding trade policy. Krugman argues that protectionism can be advantageous due to imperfect markets. Protectionist policies which aim to promote sectors can create spill-over effects to other parts of the economy, and also internationally, which is positive. However, Krugman points to adverse effects associated with protectionism: The promotion of certain sectors necessarily draws resources away from other sectors, and it is possibly that wrong sectors are prioritized. Protectionist policies would also affect the distribution of income. The politics of policy formation can then be dominated by issues concerning distribution rather than efficiency. First of all, this can lead to a “beggar-thy-neighbour” component, which can lead to retaliation and a mutually harmful trade war. Second, the gains from intervention could be captured by special interests at the domestic level, and turn into an inefficient redistribution program. Economic behaviour has often led to imperfect markets due to political corruption and patronage. In this respect, clear rules of the game for the trading countries must be established, hence the need for high institutional quality (Krugman 1987:142-143). Nevertheless, protectionism is only viewed as a *second-best* policy, as free trade is viewed as the ultimate and universal goal (Krugman 1987:132).

In sum, new trade theory has updated the theoretical framework for international trade by regarding economies as dynamic rather than static. Patterns of trade are not explained by the theory of comparative advantage, but by increasing returns made possible by imperfect market structures. Since income is generated also from the relatively scarce factors, it turns out that increasing returns increases rather than reduces the gains from international trade and is therefore good for long-term growth (Krugman 1987:134). Even though Krugman considers free trade as the desired trade policy, he also accounts for advantages with protectionism.

2.1.4 Summing up classical and neoclassical theory

I have now presented classical and neoclassical theories of international trade. The Ricardian model and the Heckscher-Ohlin model are static theories where the sources and patterns of trade are determined by the doctrine of comparative advantage. New trade theory emphasizes that economies are dynamic, so gains from trade arise from increasing returns instead of comparative

advantage. A common stance among these theories is that free trade policies are believed to maximize the utility created by international trade. Based upon this part of the theoretical chapter, two hypotheses are derived, which will be tested empirically later in the thesis:

The free trade hypothesis: *Free trade is the best policy for obtaining the highest possible income levels and economic growth.*

The convergence hypothesis: *Free trade policies lead to convergence in income levels among trading countries due to factor price equalization.*

In the next part of the chapter, I present theories which criticize the foundations of the classical and neoclassical school of thought.

2.2 Heterodox theories of international trade

The classical and neoclassical framework for international trade theory has been challenged by heterodox theories especially concerned with developing countries. They have a common belief of the classical and neoclassical school of thought that specialization and division of labor based on comparative advantage has not been mutually beneficial. Free trade has rather resulted in a wider income gap between developed and developing countries, with several developing countries actually experiencing negative growth rates.

The first critique presented in this thesis, will be from the early economist Friedrich List who advocated protection of infant industries. The second criticism comes from Prebisch and Singer, representing the structuralist approach. They emphasized that developing countries, mainly specializing in the production of primary products, have not benefited from a trading system based on comparative advantage due to deterioration in the terms of trade.⁹ This view is supported by the institutionalists, which is the third criticism presented. In addition to stress the patterns of international trade to be a major cause of the unequal levels of economic growth, they put emphasize on internal factors such as institutional quality for the lack of growth for developing countries. The last critique addressed is dependency theory. Dependency theorists

⁹ Terms of trade refers to the price a country receives for their exports relative to the price they have to pay for imports (Todaro and Smith 2003:96).

emphasize the dominant role of industrial countries during colonialism, and that developing countries have remained in a dependent relationship within today's world trading system. In the following section each theory will be thoroughly presented and discussed in the light of the concept of comparative advantage and the free trade approach.

2.2.1 The infant industry argument

The German economist Friedrich List is one of the first main critics of the classical theory of international trade. In his book "Das nationale System der politischen Oekonomie" from 1841, he criticizes the Ricardian model and especially the doctrine of free trade. At that time, Germany was an agrarian economy while England was an industrial nation. List's stated that free trade would only be desirable when Germany had reached the same industrial level as their trading partners. He further claimed that England used free trade as a means to adopt a policy which would enable them to dominate the trade and industry of weaker countries (List and Henderson 1983:24-25).

List is known as the "founding father" of the infant industry argument. The core of this argument is that infant industries should be protected until they become competitive on the world market. He saw free trade as specific to time and place, thus desirable only between symmetrical economies. This implies that developing countries should be allowed to impose protectionist policies until they become strong enough to compete with developed countries on equal terms. List can in this respect best be described as a free trader in one setting, but a protectionist in another, dependent on the state of economic level the respective countries are in (Maneschi 1998:99).

First of all, List criticized Ricardo for his understanding of labor as the only source of wealth for an economy. Ricardo did not distinguish between different occupations, but saw one hour of work as the same no matter what kind of work performed, in which List strongly disagreed:

"The physical labour of a worker on a steamship may be ten times higher than of the engineer, but the work performed by the engineer is a thousand times more important than that of a boy" (List and Henderson 1983:184).

His point was that intellectual production and brainwork could not be measured by the number of individuals concerned as assumed by the Ricardian model. List is thus one of the first to

acknowledge the role of technology for the output rather than the number of labour involved. This is closely tied with List's notion of the importance of which industries to protect or not. List saw specialization in the agricultural sector as a "bad" economic activity. He believed that the economic success of England could be explained by the development of an industrial sector, and therefore should Germany rather adopt a protectionist trade policy that supported the manufacturing sector contrary to the law of comparative advantage. In order to achieve a competitive industrial sector, List promoted an activist state policy where the central policy instrument would be a protective tariff. He advocated protection mainly for new infant industries during the first years of their development. These policies should lead a country into increasing returns industries. Productive powers in the society would be fostered, the national economy would grow, and the welfare of the people increase (List and Henderson 1983).

The idea of protecting infant industries disappeared for a while when neoclassical economics such as the H-O model dominated trade theory in the first part of the 20th century. However, from the 1960s inward-oriented, protectionist trade policies became popular among scholars especially concerned with development issues. In the next section, the structuralist approach will be presented, represented by Prebisch and Singer.

2.2.2 The structuralist approach

During the 1960s and 70s, Raul Prebisch was one of the central economists forming the school of thought known as the Latin American structuralists. Together with Hans Singer he criticized the Ricardian theory of comparative advantage and the alleged benefits of free trade, as this system had not closed the income gap between rich and poor countries. For a long time Prebisch supported the neoclassical perception of this international economic order, but when his home country Argentina experienced a persistent downturn he started to look for other factors, such as power relations, underlying the structure of countries. These structural differences made classical and neoclassical theory not applicable for increasing economic growth for developing countries (Prebisch 1959; Singer 1989).

In the structural perspective, developing countries were denoted the periphery while the developed countries were described as industrial centers. The periphery was characterized as producers of mainly primary commodities for exports, while the center countries were

specialized in manufacturing goods made possible due to a high level of industrialization. According to the concept of comparative advantage this would be an optimal division of production worldwide since countries in the periphery are well endowed with natural resources. How come that the centre realized all the benefits from trade while the periphery gained nothing? The main hypothesis of Prebisch and Singer was that inequality between developed and developing countries was due to deterioration in the terms of trade of primary products, in which developing countries were mainly specialized (Cypher and Dietz 2004:159). One reason for the decline in terms of trade for primary products was due to the disparity in the income elasticity of demand between primary and manufacturing products in international trade.¹⁰ Development of an industrial sector was hence seen as the key to economic growth where the recommendation was import substitution policies (ISI).

Import substitution industrialization

The logic behind the ISI-strategy was to promote domestic industrial sectors from outside competition by imposing protective tariffs, defined as "...an increase in the proportion of goods that is supplied from domestic sources and not necessarily as a reduction in the ratio of imports to total income" (Prebisch 1959:253). The aim with this strategy was thus not to reduce imports, but to correct for the disparities in demand elasticity. Another argument for shifting to manufacturing industry was that in normal business cycles primary product prices tended to rise much faster during an expansion in the economy, and to fall to a much greater degree during a contraction. Policies about promotion of the manufacturing sector would thus lead to an overall greater economic stability (Cypher and Dietz 2004:163).

ISI-strategies were only advocated for developing countries. This is thus concurrent with the infant industry argument put forward by Friedrich List. Prebisch and Singer also coincide with List by being a protectionist in one setting, but a free trader in another. They attacked protectionism at the centres, because protection should only be done when disparities in demand

¹⁰ The elasticity of demand of a good indicates how many percent demand change as a consequence of a one percent change in the price (Austvik et al. 2002:168). The low elasticity of demand for a primary commodity, such as food, could be explained by the fact that food is consumed in a relatively constant amount, so a drop in the price will not necessarily lead to higher consumption. A drop in the price would hence not lead to compensation in the balance-of-payments terms as a result of increased volume (Singer 1989:325-326).

elasticity exist, which is not the case for the industrial countries benefiting proportionally more from international trade (Prebisch 1984:179).

To sum up, the Prebisch-Singer hypothesis emphasizes the structure of the international economic order as divided into industrial centres and periphery countries. Under a system of free trade, the centres are extracting all the gains from international trade, while the periphery actually experience economic losses due to the deterioration in the terms of trade for primary products. To correct for disparity in income elasticity of demand for primary versus manufacturing products, a protectionist policy approach of import substitution industrialization was thus recommended.

2.2.3 The institutionalist perspective

Contemporary with the structuralist approach, the institutionalist perspective is present in the heterodox literature of economic development. I review the work by the Swedish economist Gunnar Myrdal who believed that classical and neoclassical trade theory solely based on the theory of comparative advantage was not sufficient when addressing the sources for the lack of economic growth in developing countries. A central feature of the institutional perspective is the importance of institutional reforms included in the development process to achieve higher rates of economic growth (Cypher and Dietz 2004:177).

The principle of circular and cumulative causation

Myrdal explained the sources for increasing inequalities between developing and developed countries with the principle of circular and cumulative causation. This implies that one negative factor is at the same time both causes and effects of other negative factors. Circular and cumulative causation results in “backwash effects” for inferior countries in the periphery. This implies that when forces work in the same direction, poor countries get poorer. Superior countries in the industrial centres experience positive “spread effects” by cumulative causation, which implies that richer countries get richer. This is the reason for why the income gap between developed and developing countries increases (Myrdal 1957:11-29).

The phenomena of underdevelopment and development could thus be explained by dynamics in economies. He therefore criticized the static equilibrium assumption in the Ricardian model and

the Heckscher-Ohlin theory for not being realistic. A static equilibrium would imply self-stabilisation, so a change in the economy should automatically lead to secondary changes leading the economy back to equilibrium. Another criticism of neoclassical international trade theory was the factor price equalization theorem predicted by the Heckscher-Ohlin model. In recent decades the opposite had rather occurred, considering that the income inequalities between developed and underdeveloped countries have increased instead of equalized as the theory predicts (Myrdal 1957:147-152).

The cumulative process, either going upwards or downwards, would lead to a change in the terms of trade of a country or a region. These trends were usually stronger the lower the levels of income. Therefore developing countries were vulnerable within the existing trading system, since they were primarily primary product exporters. With regards to policy advices, Myrdal agreed with both List and Prebisch-Singer that protectionist policy tools were needed in order to develop the domestic industry. In line with the infant industry argument, he believed that this should be a preferred policy only as long as the industry was not competitive (Myrdal 1957:92-94). However, Myrdal was more concerned with strengthening *internal* factors in order to enhance economic growth.

Attitudes and institutions

Myrdal's point of departure when he explains the inequality between developed countries and underdeveloped countries is the legacy of colonialism.¹¹ The economic structure which determines the pattern of production in developing countries reflects past institutional arrangements rather than the law of comparative advantage (Cypher and Dietz 2004:176). The main effect of international trade on underdeveloped countries in colonial times was promoting their production of primary products for exports in line with the theory of comparative advantage. Myrdal argues that market forces did not work under free competition, and many elements of monopoly worked in the favour of businesses belonging to the colonial powers (Myrdal 1970:284).

¹¹ Myrdal rather used the term "underdeveloped" instead of "developing", to illustrate that some economies did experience negative growth rates (Myrdal 1957, 1970, 1984).

To achieve economic growth, hence raising the standard of living for the poor countries, Myrdal claimed that radical institutional reforms were needed. Examples of institutional reforms could be land reform, fighting corruption, and displacement of the elite from high positions in policy making. This would require a strong state that could carry out national plans bringing about social and economic equality, with reference to the welfare states which were coming into existence in the Scandinavian countries (Myrdal 1984:152). In this respect, he believed that internal factors would be more important for enhancing economic growth. He was therefore critical to underdeveloped countries demanding a “new international economic order” when international trade policy was discussed at a multilateral level, with a belief that developing countries had turned these demands into a sort of alibi for not reforming their institutional setting:

“The great poverty among the masses in underdeveloped countries must account, at least in part, for their fatalism, their apathy, and their unresponsiveness to efforts to change attitudes and institutions, to spread modern technology, to improve hygiene, and so on” (Myrdal 1970:147).

To sum up, the institutionalist approach emphasizes that institutional reforms are needed in underdeveloped countries as development strategy. The goal is to create economic and social equality which is seen as a necessary condition for enhancing economic growth. Myrdal criticizes neoclassical international trade theory mainly with respect to the static equilibrium assumption and the factor price equalization theorem.

2.2.4 Dependency theory

The last heterodox theory of economic development addressed in this thesis is dependency theory, where Andre Gunder Frank and Samir Amin are representatives. This view was popular in the late 1960s as explanations for the lack of development in Latin America and later Africa. Dependency theory built on the ideas of the structuralists, specifically the distinction between center and periphery. Dependency of the periphery to countries located in the centre has its roots in colonialism when the advanced countries in the centre forced peripheral countries into a world capitalist system and still thereafter have remained in a dependent relationship. In contrast to the institutional perspective which emphasized internal factors as the root cause for lack of development, dependency writers contend that *external* factors are more decisive. Negative

influence from external actors such as transnational corporations, multilateral institutions, and the extensive influence of foreign governments in internal affairs, are believed to contribute to the poor state of economic level these countries find themselves in. (Cypher and Dietz 2004:177).

Historically, when England was allowed to conquer overseas markets with industrial exports through lower prices, it was the beginning of what Frank described as “monopoly capitalism”.¹² England was destroying manufactures and industry in Latin America, Africa and Asia, and consequently damaged the basis for industrial development. In line with the theory of comparative advantage those countries were specialized in primary commodities. In contrast to the alleged benefits predicted, this specialization for the peripheral countries was a drawback for economic growth and instead resulted in a capital drain from the periphery to the centre. Free trade was thus replaced by a system of monopoly capitalism, because a few foreign firms extracted most of the economic surplus (Frank 1979:102).

Frank criticized the classical theory of international trade for being isolated from reality of the historical process of world capital accumulation. He especially criticized Ricardo for the law of comparative advantage, because no empirical evidences have shown that there is something “natural” about the international division of labor associated with this law. Amin criticized the theory of comparative advantage for the perception of trade arising due to differences in relative prices. He rather saw international trade to be driven by profits, so capitalism was the core reason for why markets expanded: “International trade are thus growing, not because each country is specializing to a greater extent, but because capitalism is getting stronger and is spreading” (Amin and Pearce 1974:95). In line with former heterodox theories, the H-O model and the Factor price equalization theorem was also criticized for not addressing the problem of relations between different capital formations of the centre and the periphery. The model only applied to “pure” capitalist countries, which were the countries in the centre. Amin stated that it was the rise of monopolies that led to this divergence between wages at the centre and the periphery. This illustrated the unequal exchange, even though the developing countries exported

¹² Dependency writers were influenced by the work of Marx. A popular distinction is between Marxist dependency analysis and non-Marxist dependency analysis. However, the non-Marxist writers did also employ Marx’s categories and concepts such as “capitalism” (Cypher and Dietz 2004:178).

some products of modern high-productivity enterprises, hence confirming the centre's domination of the periphery (Amin and Pearce 1974:123).

In line with the structuralist approach, dependency writers emphasized specialization in primary commodities as detrimental for peripheral countries in terms of declining terms of trade. But in contrast to the structuralists who view production of primary products in itself for being the cause of worsening terms of trade, dependency theory see the monopoly capitalism created by this trade relationship as being the cause of underdevelopment. Frank argues: "The nineteenth-century international division of labour contributed to the development of underdevelopment in most of the world both when the terms of trade went in one direction and when they went in the other" (Frank 1979:103).

Dependency writers disagreed with the structuralists regarding the import substitution industrialization as the preferred trade policy. The critique contained mainly that analysis of development processes had left the principal factors of imperialism and class struggle out of consideration. Frank stated that the distribution of property and income became actually more unequal after implementing the policies of protection and import substitution. He further argued that the gains of this industrial growth only benefited the bourgeoisie class, which were allied with the multinational firms (Frank 1979:128-130).

To sum up, dependency theory emphasizes the legacy of colonialism as the point of departure for inequality between developed and developing countries. The implementation of the capitalist system during colonialism created a system of dependency which is still present. Dependency theory share common characteristics with the former heterodox theories regarding criticism of classical and neoclassical trade theory. However, they do not support the ISI strategies because they believe it is only the bourgeoisie class who benefits from this industrial growth, and that it has rather created unequal income distribution.

2.2.5 Summing up heterodox theory of international trade

I have now reviewed four theories which share the common characteristic to be critical to classical and neoclassical trade theory. They all argue that trade has not appeared to give the

alleged benefits predicted from either the doctrine of comparative advantage nor the factor price theorem, due to the fact of major inequality between developed and developing countries. Specialization in the agricultural sector is believed to be detrimental to the developing countries as primary products are vulnerable to bad terms of trade. The theories contend that free trade policies are not the right engine of growth, but that protectionist policies must be implemented for infant industries and inferior countries in order to become competitive on the world market.

Based upon the heterodox theories reported in this chapter, two additional hypotheses are derived from this part of the theoretical chapter which will be tested empirically later in this thesis.

The Prebisch-Singer hypotheses: *Specialization in the agricultural sector is negative for growth due to the terms of trade.*

The institutional hypotheses: *A prerequisite for economic growth is high levels of institutional quality.*

2.3 Concluding the theoretical chapter

I have now presented the theoretical framework which forms the basis for my thesis. The main distinction is between the classical and neoclassical theories which share the common characteristic that free trade is viewed as the “universal medicine” of economic growth. Within this strand of thought, the Ricardian model and the Heckscher-Ohlin model are static trade theories, while the new trade theory emphasizes that economies are dynamic and exposed to increasing returns. The other direction presented are heterodox theories which commonly criticize the classical and neoclassical comprehension of international trade, especially regarding the concept of comparative advantage and the Factor price equalization theorem. The main critique contains that developing countries have not benefited from a trading system based upon free trade, and thus advocate protectionist trade policies in order to increase abilities to compete on equal terms. All in all, I focused on the infant industry argument first put forward by Friedrich List, the structuralist approach, the institutionalist approach, and dependency theory as representatives for the heterodox view.

Four issues in the theoretical debate stand out. I have formulated hypotheses in light of these issues, where two of them are derived from the classical and neoclassical tradition, and two are taken from the heterodox theories:

The free trade hypothesis (H1): *Free trade is the best policy for obtaining the highest possible income levels and economic growth.*

The convergence hypothesis (H2): *Free trade policies lead to convergence in income levels among the trading countries due to factor price equalization.*

The Prebisch-Singer hypotheses (H3): *Specialization in the agricultural sector is negative for growth due to the terms of trade.*

The institution hypotheses (H4): *A prerequisite for economic growth is high levels of institutional quality.*

The table below summarizes each theory, and the stand they take with regards to the hypothesis proposed.

Table 1: Summing up the theory

Hypothesis	CLASSICAL/NEOCL. THEORY			HETERODOX THEORY			
	Ricardian model	H-O model	New trade theory	Infant industry arg.	Structuralist approach	Institutionalist approach	Dependency theory
H1	+	+	+	+/-	-	+/-	+/-
H2	+	+	+	+/-	-	-	-
H3	-	-	+/-	+	+	+	+
H4			+			+	+

Within the group of classical and neoclassical theory of international trade there is a consensus of the free trade hypothesis to be the best policy for economic growth. The heterodox theories advocate protectionist trade policies for inferior countries and industries, but also view free trade as desirable when competition appears on equal terms. The classical and neoclassical theories predict that convergence occur due to equalization in relative prices. The infant industry argument predicts that convergence only occur among developed and symmetrical economies, while the other heterodox theories emphasize only divergence of income levels. The Prebisch-Singer hypothesis states that agricultural exports have worked to the detriment for developing countries due to bad terms of trade. The static trade theories, being the Ricardian model and H-O model, rely on the workings of the law of comparative advantage and do not support this reasoning. New trade theory emphasizes that sectors with increasing returns are good for growth, but do not agree that agricultural specialization is bad for an economy as put forward by Friedrich List. He characterized agricultural productivity as a “bad” economic activity, and strongly recommended countries to turn to industrial sectors. The remaining heterodox theories also view agricultural exports as detrimental due to bad terms of trade compared to manufacturing exports. The last hypothesis derived from the theoretical chapter is concerned with the role of institutions. New trade theory emphasized that strong institutions were needed in order to establish clear rules of the game. The institutional approach stressed that building low levels of institutional quality was a larger concern than the role of international trade in order to enhance growth for developing countries. This was supported by the dependency theorists, who looked to past institutional arrangements in the legacy of colonialism in their explanation for why countries were poor.

A large number of scholars have attempted to test these hypotheses empirically by the use of statistical techniques. In the next chapter, I will review seven empirical studies conducted within the last 15 years in the literature on trade and growth.

3 PREVIOUS RESEARCH

From Ricardo's basic trade theory of comparative advantage to the debate of import substitution versus export led growth, great efforts have been made to find an adequate answer to the relationship between openness to international trade and growth. Many studies suggest that performance of more outward-oriented economies is superior to countries pursuing more inward-looking trade practices (Santos-Paulino 2005). However, there is little persuasive evidence for this. Some research do not find this relationship to be robust, yet other studies even find this relationship to be negative (Rodríguez and Rodrik 1999; Rodrik et al. 2002).

In this chapter I present a selection of influential empirical studies on the subject. These studies are chosen on the basis that they are widely referred to in the subsequent literature dealing with trade and growth, and are all carried out within a quantitative approach. The selection includes the following: Levine and Renelt (1992), Sachs and Warner (1995), Edwards (1997), Frankel and Romer (1999), Greenaway et al. (2001), Rodrik et al. (2002) and Melchior (2007). When I review these studies, I get a good overview of what we know today about the direction and strength of the relationship between openness and growth, as well as the influence of other determinants. The variables which form the basis of my own analysis later in this thesis, are included on the foundation that they are identified as key variables in the studies being subject of this chapter.

The findings are presented by groups according to the different themes addressed in the theoretical chapter. In line with Rodrik et al., the main groups are *international trade*, *geography* and *institutions*, as they stand out as three strands of thought in the literature (Rodrik et al. 2002:1). In addition, Levine and Renelt claim that variables related to investments and population growth are core variables frequently included in the regression analysis in the growth literature (Levine and Renelt 1991). I have therefore chosen to present the findings of these variables as well, and have gathered them into a group called *core variables* since they are not selected on theoretical grounds.

3.1 International trade variables

The main concern of this thesis is to show how international trade influences economic growth. In order to test the impact, researchers have included a wide range of variables related to trade in their studies. Based upon the concepts derived from the theoretical framework, I present the findings of the related variables from the empirical studies reviewed in this chapter. These include *openness* to international trade, real GDP to control for *converge*, and *sector specialization*.

3.1.1 Openness

Whether openness to international trade is positively correlated with growth or not, is the main concern of this thesis. Economic integration implies more open economies, and it is known that overall growth has increased over the last decades. A preliminary hypothesis is therefore that openness has a positive impact on growth. Before I go on to test this empirically, the findings in the literature are reviewed in order to identify the results of previous research.

Levine and Renelt (1992) study the impact of openness on growth on a sample of 119 countries in the time-period 1960-1989. Their findings are ambiguous. When using data from the World Bank and IMF openness correlates positively with growth with a coefficient of 0.023, while data from Penn World Table (PWT) shows a negative correlation with growth with a coefficient of -0.03.¹³ However, none of the outcomes appear to be significant at the 0.05 level. They use the openness measure exports/GDP, but they do obtain the same results when using the imports/GDP ratio. This implies that an export-led strategy is not necessarily superior to an import-based strategy. Based on these findings, they argue that the relationship between trade and growth may be the consequence of enhanced resource accumulation and not necessarily improved allocation of resources (Levine and Renelt 1992:945). However, when controlling for the share of investments in GDP, they could not find a robust independent relationship between none of the openness indicators, and they conclude that there is a two-link chain between trade and growth through investments.

¹³ Levine and Renelt undertake regressions on five different datasets with two different time periods. I will basically report results when using PWT as the data source since this is the primary data source in my own analysis which will be undertaken in chapter five. When the result from the dataset using WB/IMF as the data source deviates from PWT, these results will be reported as well.

Sala-i-Martin (1997) criticizes Levine and Renelt's robustness test for being too strong for any variable to pass. They use an extreme-bound analysis, and as Sala-i-Martin argues, if enough regression are run they are bound to find one regression for which the estimated coefficient changes signs (Sala-I-Martin 1997:179). Consequently, he finds that it is not surprising that very few of the variables are robust, and states that the non-robust results are not guaranteed.

Sachs and Warner (1995) study the relationship between openness and growth by classifying countries into developed and developing countries on one hand, and closed and open economies on the other hand. The sample consists of 135 countries during the time period 1970-1989. A remarkable characteristic by this study is the construction of a composite index of openness, hence making openness a dichotomous variable. This is done in an attempt to solve the measurement error problem. A country is classified as closed if it meets any of the following criteria:

- 1) Nontariff barriers (NTBs) cover 40 percent or more of trade.
- 2) Average tariff rates of 40 percent or more.
- 3) A black market exchange rate that is depreciated by 20 percent or more relative to the official exchange rate, on average, during the 1970s or 1980s.
- 4) A socialist economic system.¹⁴
- 5) A state monopoly on major exports.

The rationale behind combining these indicators into a dichotomous variable is to represent different ways in which policymakers can close their economy to international trade (Rodríguez and Rodrik 1999:15). They find a strong and significant relationship both within the group of developed countries and the group of developing countries, and furthermore that open economies grow, on average, 2.45 percentage points more than closed economies (Sachs and Warner 1995). However, Rodrigues and Rodrik (1999) question which of the individual components of the index that are responsible for the strength of the Sachs-Warner dummy. They find that it mainly derives from the combination of indicator 3) the black market premium and

¹⁴ See (Kornai 1992) for further details on the definition.

5) the state monopoly of exports variables. The two indicators which are the most direct measures of trade policy, namely 1) tariffs and 2) non-tariff barriers, have little influence on the dummy's statistical power. They further challenge to what extent the black-market premium and state monopoly indicators are measures of trade policy. They conclude that the Sachs-Warner index derives not from the direct indicators of trade policy (tariffs and NTBs), but from indicators they believe are correlated with plausible alternative explanatory variables such as macroeconomic instability, poor institutions and geographical location (Rodríguez and Rodrik 1999:15-23).

Edwards (1997) investigates the relationship between openness and total factor productivity (TFP) growth by testing the robustness of different indexes of trade policy. In his sample of 93 countries, both developed and developing countries are included for the time period 1980-90. He criticizes earlier empirical literature for being affected by severe data problems, and in particular, that researchers have been unable to generate satisfactory indexes of trade policy orientation. Three of his indicators are directly linked to quotas and tariff levels, and the remaining six indicators measure the extent of trade policy-induced distortions. He is not only concerned with whether there is a positive relationship between openness and growth, but also whether freer trade results in faster growth. One of the indicators included, is the Sachs and Warner index. This indicator correlates positively with growth, but only slightly with a significant coefficient of 0.009. A second openness measure is average tariff levels, which appears to have a negative and significant correlation with growth with a coefficient of -0.106. In sum, his findings show that all the openness indicators are significantly and positively correlated with higher growth, and therefore concludes that "...these results are quite remarkable, suggesting with tremendous consistency that there is a significantly positive relationship between openness and productivity growth" (Edwards 1997:391).

Rodríguez and Rodrik (1999) replicate the study by Edwards, and find a statistically significant correlation between trade-restricting policies and productivity growth in only three of the indicators applied. For the significant indexes they point to data problems, especially with respect to implausible numbers for several developing countries. Another shortcoming, they argue, is that for some of the indexes the sample sizes are rather small. They conclude that the

evidence to support Edward's conclusion of a robust relationship between openness and TFP growth is thus rather fragile (Rodríguez and Rodrik 1999:24-29).

Greenaway et al. (2002) study the impact of trade liberalization on growth on 73 developing countries in the time period 1975-1993. As a result of the literature on the topic being inconclusive, the aim of their paper is to contribute to the literature in three ways: First, they assess the relationship between liberalization and growth by using panel data as the methodological framework which captures both the time and space dimension. Second, they examine the relationship in a dynamic context rather than a static one. Third, in line with Edwards' approach, they investigate the relationship by using three different indicators of liberalization, among them the Sachs and Warner index. They find that all the proxies of openness give similar results, which ultimately shows a positive relationship between liberalization and growth. Of the three indicators, the Sachs and Warner index turns out to have the strongest effect. On average, they find, openness raises growth by 2.7 percent. However, these results appear with a lag and are relatively modest. The impact of liberalization is unlikely to be instantaneous, because the graph shows a J-curve effect. This implies a dynamic relationship where the correlations may be negative in the short run but become positive in the long run. As they point out, this is not very surprising since liberalization varies in depth and intensity, and the shift to free trade never takes place immediately (Greenaway et al. 2002:241-242).

In a recent paper, Melchior (2007) assesses the relationship between openness and growth. The sample consists of 165 countries making up the sample over the time period 1975-2002. The empirical test is undertaken in two-steps: First, the relationship between openness and growth is assessed on an individual country basis. Second, a cross-country analysis is carried out. The growth regression results show that, *on average*, trade liberalization, measured as the share of imports to GDP, is advantageous. Furthermore, for 1/10 of the countries under study, the relationship is negative. On the other hand, for 28 percent of the countries, representing 2/3 of the world population, the relationship is clearly positive. For the rest of the countries in the study the results are not very clear. Melchior argue that the primary objective of the paper is not to find new results on the *average* effect of openness, but account for the *heterogeneity* of the

outcomes. Hence, for policy purposes it is important to identify which countries have a “problem with trade”, and to be aware of the problem:

“Is it rare and accidental, or a widespread fault of the trade system? If the latter is true, it might even be appropriate to halt trade liberalization. But if the gains from trade liberalization far outweigh the problems, we should argue against the skeptics.” (Melchior 2007:10).

He also includes tariff levels in his study. This indicator correlates positively with growth, a finding that contradicts the notion of trade liberalization having a positive impact on growth. The coefficient is 0.23, but the estimate is only significant at the 0.9 level.

The following important question he addresses is: “Who are the countries experiencing a negative relationship between openness and growth?” Among the 30 countries that are found to belong to the group of negative cases, 16 of them are classified as least developed or low-income country. This indicates that being closed is not a pure poor country phenomenon. However, on average, a larger share of the countries belongs to the group of developing countries. Yet, this only applies for a minor part of the developing countries, which indicates that most of them do not have a problem with trade, or even benefit from it (Melchior 2007:24).

Rodrik et al. (2002) aim to estimate the effect of openness on growth while controlling for institutional quality and geography. They undertake a cross-sectional research design and use three different samples of countries. One consists of 64 countries, another of 80 countries, and a third of 140 countries. When running simple correlations between openness, measured as the trade share, and growth, they find a positive relationship similar to most of the research on the field. But when institutions are controlled for, trade appears to be almost insignificant, and often enters the income equation with a negative sign, giving a coefficient of -0.15. The same result appears when they substitute the openness indicator with the Sachs and Warner index. However, this is not found to be significant at a conventional level, so they are careful with drawing too strong conclusions. Rodrik et al. also test the effect of the determinants on each other, and they find that trade have a positive impact on institutional quality, which implies that trade can have

an indirect effect on growth via its effect on institutional quality (Rodrik et al. 2002). These results appeared to be true for all the samples of countries under study.

3.1.2 Economic convergence

Most of the studies on trade and growth show that there is a positive relationship between the two. Nonetheless, a question that is just as interesting is: Do we see convergence in income levels among countries? On theoretical grounds, Heckscher and Ohlin presented the factor price equalization theorem, which implies convergence in income levels among the countries involved in trade. When the idea is applied to developing countries, this theorem suggests that they will eventually catch up with developed countries and consequently grow with a faster pace. One plausible explanation may be that developing countries should be able to close the income gap over time due to the “advantages of backwardness” (Sachs and Warner 1995) . This implies that poorer countries can import capital and technology from the wealthier countries. However, Myrdal (1957) strongly criticized neoclassical theory on this point by emphasizing the increasing inequalities between developing and developed countries that has instead occurred. In the following section I present the findings of the convergence hypothesis conducted in the more recent empirical studies included in this chapter.

Several studies have found that countries taking part of economic integration tend to converge in the income levels. Ben-David (1993) found convergence among the members of the European Community (EC) and European Free Trade Association (EFTA). Dowrick and Ngyen (1989) found convergence among the OECD countries, and Barro and Sala-I-Martin (1992) found convergence among US states and Japanese prefectures. However, none of these studies included developing countries. Hence, Greenaway et al. (2001) ran a regression on the convergence hypothesis on 73 developing countries, and confirmed that this also applies for this group, both with significant coefficient estimates of respectively -0.003 (Sachs and Warner index) and -0.005 for the other two indexes.

Levine and Renelt (1992) test the convergence hypothesis among both developed and developing countries. They find a negative and significant relationship between the convergence variable and growth, with a coefficient of -0.57. They also find that poor countries tend to grow

faster than richer countries, and conclude that the convergence hypothesis is verified. But the convergence is *conditional*, because the relationship is negative and robust only as long as the human capital variable is included. This implies that certain other factors must be present for convergence to occur. These findings about conditional convergence are supported by Edwards (1997), who found all the openness indicators to be negatively correlated with the convergence controller variable with significant effects (coefficients spanning from -0.008 to -3.23).

Sachs and Warner (1995) argue that the trade regime is decisive for whether economies converge or not. Open economies tend to converge, while closed economies do not. This relationship is found to be significant in absolute terms, implying that other conditional factors are not regarded as indispensable. More specifically, their study shows that open economies grew, on average, by 2.45 percentage points more than the closed economies, with a highly significant effect. Hence, the lack of convergence for the poorer countries is explained by a closed trade regime. They therefore conclude that the differences in the growth level among countries are better explained by policies regarding economic integration than by taking advantage of the “advantages of backwardness”, such as the adoption of technology from richer countries (Sachs and Warner 1995).

3.1.3 Primary sector specialization

A fundamental principal in the classical/neoclassical trade theories was the concept of comparative advantage. This notion predicted that the pattern of international trade was determined by factor endowments, and that sector specialization would apply where the opportunity cost of production where the lowest. This view was challenged by heterodox theories arguing that specialization in the agricultural sector only worked to the detriment of developing countries. Prebisch (1959) argued that raw material exporters who maintained free trade would be unable to industrialize, and would therefore be vulnerable to long-term adverse movements in the terms of trade. A primary exporter that is evolving toward being a manufacturing exporter will thus experience a faster transition to manufacturing exports under a free trade policy (Sachs and Warner 1995:53).

Melchior (2007) includes a variable for sector specialization in his growth regression. He finds that a high share of agriculture in exports is negatively correlated with growth with a significant

coefficient of 0.36. This finding implies that comparative advantage is not mutually beneficial if a country has its comparative advantage in the agricultural sector. Sachs and Warner (1995) aim to test the Prebisch-Singer hypothesis of import substitution. Their findings show that the degree of openness positively affects the speed of adjustment from the primary sector to a manufacturing sector, thus violating the argument of import protection is a good strategy for export promotion. More specifically, the results show that open economies have a partial adjustment coefficient of 0.366, while the closed economies' coefficient is only 0.049.

At this point, it seems that variables related to international trade have a strong influence on economic growth. However, in the growth literature there are several competing theories suggesting that other determinants are more decisive in enhancing growth. In the next section, the role of geography will be assessed as Rodrik et al. (2002) claim to stand out as another major strand of thought in the literature.

3.2 The role of geography

Frankel and Romer (1999) directly ask the question in their study: "Does trade cause growth?" They investigate the issue of whether trade liberalization result *in*, or *from*, economic growth by examining the effects of the component of openness that is independent of economic growth (Winters 2004:8). They find it problematic to identify the direction of causation between trade and income. Even though earlier regression analyses usually have found a positive relationship between trade and growth, they claim that this relationship not necessarily reflects an effect of trade on income. "It is not the literal shipping of goods between countries that raise income, but trade is rather a proxy for the many ways in which interactions between countries raise income" (Frankel and Romer 1999:393).

3.2.1 Country size

Frankel and Romer propose alternative instruments for trade by constructing geographic variables which they claim are powerful determinants of trade's impact on income. The difficulty is, however, that the trade share may be endogenous. Geographic characteristics are

exogenous, hence attempting to overcome the problem of endogeneity.¹⁵ They first construct a trade equation for bilateral trade including the following geographical variables: Country size, distance from each other, whether they share a boarder, and whether they are landlocked. Their findings show that these geographic characteristics are important determinants of countries' overall trade, in respect of the volume of trade. Furthermore, they run a cross-country regression on the relationship between income per person and international trade and country size. Their argument is that larger countries have larger amount of within-country trade. They test whether within-country trade raises income by asking whether larger countries have larger income (Frankel and Romer 1999).

The findings of their study support that it does: Greater within-country trade raises income. When controlled for country size, Frankel and Romer's results ascertain that there is a positive relationship between trade and income. More specifically, a one percent increase in the ratio of trade to GDP increases income per person by at least 0.5 percent. But the geographic component of trade appears to account for only a moderate part of the variation in trade with a coefficient of 0.16, thus providing only a limited amount of information about the relation between trade and income. The null hypothesis are also only marginal rejected at standard significance levels, so they are careful with drawing too substantial conclusions (Frankel and Romer 1999:394-395).

Rodrik et al. (2002) are inspired by the work of Frankel and Romer in their study of the role of institutions, geography and trade on growth. When they include country size as a control variable, they find that it has no additional explanatory power for the income equation. The coefficient of country size is -0.6, but it is not significant. The size and significance of the coefficient on institutions are unaffected. However, the openness variable becomes positive, but appears to be highly insignificant. In the "horse race" between institutions, trade and geography, geography seems to only have an insignificant effect on growth once institutions are controlled for, hence rejecting Frankel and Romer's emphasize on the role of geography on growth. Rodrik et al. rather suggest that geography's role on income go through the channel of agricultural productivity. Nevertheless, the findings of Melchior (2007) shows that export diversity in the

¹⁵ Frankel and Romer are of the opinion that many other factors may affect income. But in their argument about the appropriateness of using geographic characteristics to construct an instrument for trade, they do not expect other variables to be correlated, and thus can be included in the error term (Frankel and Romer 1999:386).

agricultural sector are not a good way for enhancing growth. In this sense, it is not surprising that geography do not contribute substantially to increase growth rates. Melchior includes population density in his study, and finds that it correlates positively with growth. The coefficients are estimated to 0.19 for the year 1975 and 0.14 for 2002, both with significant effects. Sachs and Warner (1995) also find a positive relationship between population density and economic growth, although with a weak effect with a coefficient of 0.008. However, the effect appears not to be significant.

In the subsequent section, the third strand of thought emphasized in the growth literature will be addressed, namely the role of institutional quality.

3.3 Institutional variables

Among the heterodox theories presented in the theoretical chapter, the institutional perspective represents one of the criticisms of the classical and neoclassical tradition. This school of thought suggests that institutional arrangements are more important than comparative advantage in determining the economic structure and the pattern of production in an economy. This is also emphasized by more recent research as well. North (1991) describes the importance of institutions on economic performance in this way:

“International specialization and division of labor requires institutions and organizations to safeguard property rights across international boundaries so that capital markets can take place with credible commitment on the part of the players” (North 1991:101-102).

3.3.1 Institutional quality

Rodrik et al. (2002) seek to test which of the determinants related to international trade, institutional quality and geographical components that are most decisive in explaining economic growth. By institutional quality they especially refer to the role of property rights and the rule of law. According to this view, what matters are the rules of the game in a society and their ability to contribute to desirable economic behavior (Rodrik et al. 2002:1). In their measure of institutional quality, they use a composite indicator of a number of elements that capture the protection of property rights as well as the strength of the rule of law

When they ran the regression with the three groups of variables included, quality of institutions appeared to have a superior explanatory power over both geography and trade. Once institutions are controlled for, the trade variable has no direct effect on incomes as previously shown, while geography has at best weak direct effects. Institutions have a beta coefficient of 0.72, hence trumping trade with a factor of as much as 4.4. To test the robustness of these results, they estimate their model using three different samples, consisting of respectively 64, 80 and 140 countries. In all cases, institutional quality emerges as the clear “winner”. They also include regional dummies to see if they affect the results, but the outcome only changes slightly without affecting the conclusions. The reason for the strong impact of institutions may be that institutions play a particularly important role in preventing expropriability of property which serves as a powerful incentive to invest and accumulate physical capital (Rodrik et al. 2002:10).

Edwards also includes a variable for measuring institutional quality in his growth regression. He uses an indicator of property rights protection which captures the extent to which the legislation and the judiciary guarantee and protect property rights, but it is not found to have a significant effect (Edwards 1997). Melchior (2007) also finds a positive relationship between institutions and growth, with a one percent increase in growth corresponding to a 0.25 percent increase in institutional quality.¹⁶

3.4 Other core variables

Rodrik et al. (2002) suggested that geography, trade and institutions were the major groups of determinants in the growth literature. In addition, Levine and Renelt (1991) found investments and population growth to be commonly included in growth regressions. Although they are not theoretically driven as explanatory factors of growth, the findings from the empirical research reviewed in this chapter are presented.

¹⁶ The institutional quality measure consists of six components taken from World Government Indicators (WGI). The coefficient is the average of the components, as well as the average of the years 1996 and 2002, which is the only years included in Melchior’s study (own calculation).

3.4.1 Investments

Levine and Renelt argue that investment share is the most robust indicator of growth. Many of the studies that include the investment share of GDP have found a positive and significant relationship with economic growth (Greenaway et al. 2002; Levine and Renelt 1992; Melchior 2007; Sachs and Warner 1995). Levine and Renelt found the coefficient to be 10.15, and they also argue that investment is the channel in which openness is positively correlated with growth. When they compare the strength of openness with investments, they conclude that investment is the most important explanatory factor for determining growth. Sachs and Warner found that closed economies affect the rate of investment, indicating that a closed trade regime has an indirect adverse growth effect. The coefficient of investments on growth was found to be 6.30 on the aggregate sample. Furthermore, open economies has significantly higher investment to GDP ratios, which raises the investment ratio by an average of 5.4 percent points, and developed countries have higher investment rates than developing countries. Greenaway et al. argued that the coefficient on investment might be affected by liberalization. However, the coefficient is not significant (Greenaway et al. 2002:242). Melchior obtains a stronger effect with a significant coefficient of 0.26 for the year 1975. This drops to 0.08 in 2002, thus loses its significance.

3.4.2 Population Growth

Levine and Renelt (1992) and Greenaway et al. (2002) include population growth in their regressions, and they both found it to be negatively correlated with growth. Levine and Renelt did not find the variable to be significant, but Greenaway et al. obtain a significant coefficient of -0.41.

The empirical studies reviewed in this chapter are summarized in the table below. The independent variables are ordered after the groups presented in this chapter. For each of the studies and each of the independent variables, I indicate the direction in which it correlates with growth, as well as whether the variable was found to be significant at the 0.05 level, indicated by a *.

3.5 Summing up the literature review

Table 2: Literature review – theoretical variables, direction and significance

Dependent variable: Economic growth

Independent variables	Levine and Renelt (1992)	Sachs and Warner (1995)	Edwards (1997)	Frankel and Romer (1999)	Greenaway (2002)	Rodrik (2002)	Melchior (2007)
International trade variables							
Openness	+/-	+*	+*	+*	+*	-/+*	+*
Tariffs			-*				+/-
Convergence	-*	-*/+*	-*		-*		
Primary sector specialization		-*					-*
Institutional variable							
Institution index			+			+*	+*
Geography variables							
Country size		+		+*		No effect	
Other core variables							
Investment share of GDP	+*	+*			+		+*/+
Population growth	-				-*		

* = significant at 0.05 level

3.5.1 Concluding remarks

Based upon the findings presented in this chapter, we get a good picture of what we know today about trade and growth, as well as other determinants of growth. Most of the studies show a positive correlation between openness to international trade and growth. Although Rodrik et al. find institutional quality to trump the effect of openness on growth, and also makes openness to appear with a negative sign. However, they do not support the null hypothesis that trade protection is *good* for economic growth, as the coefficient is not found to be statistically

significant (Rodríguez and Rodrik 1999:39). What is remarkable about the findings is the strong impact that institutions appear to have on growth. It proves that having high institutional quality to protect property rights and the rule of law is in fact more important than open trade policies. Furthermore, this implies that internal factors are may be more important than external factors such as a global and open trade regime. The criticism of the classical and neoclassical approach put forward by the institutionalist perspective appears to be quite eligible in this respect.

Regarding the economic convergence hypothesis, the literature is quite conclusive, except for Sachs and Warner that find convergence only to be present in their sample of open economies. An implication is that convergence might be conditional rather than absolute, which indicates that certain factors must be present for convergence to occur. In line with the arguments of Prebisch and Singer, there are reasons to believe that a higher share of manufactures in exports is better for economic growth. Yet, promoting this sector with import substitution strategies is not a good strategy according to the findings of Sachs and Warner. They find that primary producers adjust faster to manufacturing producers in open trade regimes than in closed.

According to the studies reviewed in this chapter, the role of geography appears to be ambiguous. Even though Frankel and Romer argue that country size have an influence on growth, Rodrik et al. cannot find any evidence for this. It is therefore left to be an open question.

It is important to bear in mind the methodological critique assessed by Rodriguez and Rodrik (1999). First of all, different studies use different measures of the variables. This is especially true for the openness indicator, where we find a large amount of different indicators. Some indicators relate to volumes of trade, while others are more associated with trade policy issues. Second, the empirical studies use different research designs, so some of them are undertaken in a pure cross-sectional manner, while others rely on panel data. We also find a variation in the sample of countries included in the study, as well as different time spans.

Due to the inconclusive state of the literature, more research on the field is required. I will therefore attempt to test the hypotheses derived from the theoretical chapter and include the hypotheses which emerged from this literature review. They are tested empirically by applying

regression analysis. When I include the determinants addressed above in my own methodological framework, I am able to evaluate and assess the findings obtained in the literature along with my own empirical experience.

4 METHODOLOGY, DATA AND OPERATIONALIZATION

4.1 Research strategy: Quantitative method

In the following chapter, the strategy employed for testing my research question empirically is outlined. Earlier studies on the link between openness to international trade and growth have been undertaken in both a qualitative and quantitative manner. However, over the last ten to 15 years there has been a strong tendency in research papers to use regression analysis as the research strategy. This will be the methodological framework I adopt myself in order to form a good basis for comparisons.

4.1.1 The quantitative approach

Within the field of comparative social sciences, testing hypotheses have traditionally been divided into two research strategies: The qualitative, or case-oriented approach, and the quantitative, or variable-oriented approach. The main distinction between the two is to what degree one can make generalizations upon the empirical findings. The case-oriented approach lies within the Weberian tradition where the goal is to create historically contextualized knowledge of the origins and consequences of historical diversity. This strategy has a low potential of making broad generalizations about macro social phenomena. However, it is suitable when the researcher aims to undertake an in-depth study of a few cases, and where complexity is given precedence over generality (Ragin and Zaret 1983).

When I approach my research question, I search for general trends on the link between openness and trade on growth across many countries and many years. Following the footsteps of Durkheim's comparative strategy, a variable-oriented strategy is adopted with the aim of determining broad empirical generalizations about systemic relations.¹⁷ A relatively large number of cases are included, thus raising the potential for making broad generalizations. This advantage, however, occurs at the expense of complexity since it is impossible to address both

¹⁷ Durkheim's comparative strategy begins with the idea of social species that can be classified objectively. He adopted biology's metatheoretical assumptions because he thought that hierarchical emergence, holistic explanations and classification could be applied to social sciences as well. When studying social phenomena, the method should be as approximate to the experimental method as possible, hence favoring statistical control as the methodological approach (Ragin and Zaret 1983:734-738).

within the scope of this paper.¹⁸ Where Weber argued that causes are complex since they are strongly dependent on the historical context, Durkheim suggested that causes in social sciences could be permanent: “If we reject this type of cause, there are no concomitant conditions on which social phenomena can depend” (Ragin and Zaret 1983:735).

As the primary objective of this thesis is to test existing theories on the linkage between openness to trade and growth, applying the strategy of Durkheim is suitable. The variable-oriented approach is theory-centered, where the logic of analysis is to *test* theories. The hypotheses are tested by including a set of variables and a relatively large number of cases. Through econometric techniques, direction of the variables can be determined as well as the strength of these relationships by undertaking significance tests. This gives an opportunity to make empirical generalizations about determinants of growth. The more cases included in the sample, the larger the potential for making generalizations, hence my interest in including as many countries as possible.

4.1.2 Research design: Panel data

My dataset consists of 184 countries over the time period 1950-2004. When searching for structural effects, a cross-sectional analysis enables the identification of trends when comparing the countries under study. The inclusion of the time dimension in a regression analysis gives a more precise understanding of causal effects. Since effects happen to occur after the cause, and not reversely, it is easier to separate what is the cause, and what is the effect. By analyzing trends over time for many cases, the risk of spurious correlations is also reduced (Skog 2004:78). Time-series analysis is more complex, and accordingly aims to overcome the shortcomings of quantitative methods with respect to causal complexity (Ragin 1987). When combining *both* the time and space dimension, a panel analysis is undertaken.

One major advantage of panel design is a consequently increase in the sample size. The number of entities for the cross-section dimension (in my analysis countries) is multiplied with the number of entities of the time-dimension (years) (Midtbø 2007:117). The advantage of increasing the sample size is especially relevant for my research question on openness to trade

¹⁸ One alternative could be to use a combined strategy. Based upon the quantitative findings, one can conduct an in-depth study of some of the cases afterwards. This strategy is called a triangulation (Ringdal 2001:115).

and growth, because analyzing data and testing theories in comparative political economy is hampered by the “few cases, many variables” problem. Only about half of the countries in the world (the total population) publish reasonably complete and reliable data needed for my analysis, so a solution to the small-N problem has been the analysis of time-series cross-section data. An additional advantage when using panel data is the reduction of omitted variable bias by controlling for unit effects, and the control for exogenous shocks by controlling for the time effects (Plumper et al. 2005:328-329).

In spite of the great opportunities given by panel data, there are also disadvantages connected with this research design. When many countries and variables are included, the problem of missing data is expected to occur. However, it is possible to leave some points in the data matrix open thus not affecting the results considerably. The alternative would be to exclude variables with missing data although this would be an obstacle for the tests of the theories included in the thesis. Panel data face both the statistical problems related to heteroscedasticity for cross-sectional data and autocorrelation for time-series data which will be described in detail later in this chapter. In line with the statistical tools commonly undertaken in the empirical studies reviewed in chapter three, regression analysis is chosen as the tool of analysis in the empirical study of my research question. In the next section, a further description of this method is presented.

4.1.3 Multivariate regression analysis

In a multivariate regression analysis, more than one independent variable is assumed to have an influence on the dependent variable. The formerly discussed literature clearly shows that there is no consensus on what factors determine economic growth. A multivariate regression model allows the inclusion of more than one independent variable, and is therefore suitable as the tool of analysis.

Midtbø (2007) points to four advantages with this model: First, a multivariate analysis gives a more complete and broader picture of the determinants of the dependent variable. Second, the description of the causal relationship is more precise, and consequently gives more reliable results. Multivariate regression analysis can identify the effect of one independent variable on the dependent variable, while holding the other variables constant, hence isolating one

explanation from others. Third, a multivariate analysis also addresses the *relative* explanatory power of the independent variables. In this way, one explanation, or one theory, can appear to be more influential than others. Fourth, multivariate analyses can compare the effects of one group of variables to another (Midtbø 2007:97). An additional advantage emphasized by Ragin, is that deviating cases are a minor problem when multivariate regression techniques are applied. Investigators must not account for all cases since statistical methods assume that causal relationships are at best probabilistic, and outliers are expected (Ragin 1987:57).

The General Equation

The general multivariate regression model can be written in the following way:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_kX_k + e,$$

where Y represents the dependent variable. Y is determined by the number of independent variables included in the model ($X_1, X_2, X_3 \dots X_k$), plus an error term e. The letter *a* is the intercept or constant, and the coefficient *b* is referred to as the slope. The intercept is the average value of Y when the explanatory variables equal zero. The slope is the average change in Y associated with a unit change in X while holding the other variables constant. The slope will thus determine the direction of the relationship between the variables under study (Lewis-Beck 1980).

Relationships in social sciences are almost always inexact, and the error term represents the differences between the observed data and the expected value. The errors represent unknown parameters (variables) in the equation, which will always be present (Weisberg 2005:19). The error term also counts for errors of measurement in the data collection, which is always present in cross-country studies as different countries have different procedures of collecting data. Since the countries under study are only a sample of the total population, we are only operating with estimates of the parameters. The error term is denoted as residuals (\hat{e}) in order to represent the deviation between the actual value and the predicted value in the regression. A small residual gives a better prediction of the actual value (Midtbø 2007:76-78).

4.1.4 Robustness check: Ordinary Least Square

In order to find the best linear unbiased estimator (BLUE), the ordinary least square method (OLS) is a popular and common method to estimate the regression coefficients.¹⁹ This method prescribes that the sum of all squared residuals (SSR) should be minimized: $SSR = \sum (Y - \hat{Y})^2$

The Regression Assumptions

In standard OLS regressions, certain assumptions have to be satisfied. The assumptions are the following:

1. No specification error:
 - a) The relationship between X_1 and Y_1 is linear.
 - b) No relevant independent variables have been excluded, and no irrelevant independent variables have been included.
2. No measurement error: The variables X_1 and Y_1 are accurately measured.
3. The error term satisfies the following criteria:
 - a) The expected value of the error term is zero.
 - b) The variance of the error term is constant for all values of X (homoscedasticity).
 - c) No autocorrelation: The error terms are uncorrelated.
 - d) The independent variable is uncorrelated with the error term.
 - e) The error term is normally distributed.
4. No multicollinearity.

4.1.5 Challenges with OLS and panel data

When using panel data, there are four potential violations of OLS standard assumptions. First, errors tend to be heteroscedastic, which means that they tend to have different variances across units, for instance units with higher values may have a higher error variance. Second, errors tend to be autocorrelated, which indicates that they are not independent from one time period to another. Third, errors tend to be correlated across units due to common exogenous shocks, and fourth, errors may be non-spherical in both the serial and the cross-sectional dimension, that is, autocorrelated and heteroscedastic at the same time (Plumper et al. 2005). Below, I take a closer look at the phenomena of heteroscedasticity and autocorrelation.

¹⁹ BLUE represents the regression line that is closest to the regression line that would be present in the absence of an error term.

Heteroscedasticity

Heteroscedasticity means that the residual variance is much larger for some values of the independent variable than others (Pennings et al. 2006:158). This violates the assumption of homoscedasticity, and gives a wrong estimate of the standard error of the parameter estimates. A first step towards dealing with the problem is to undertake a logarithmic transformation of the variables which have a large spread of values. Heteroscedasticity can be corrected by applying the White heteroscedasticity consistent estimator.

Autocorrelation

Due to the time-dimension included in panel analysis, there is a potential threat that assumption 3c) “no autocorrelation” is violated. This assumption is almost always violated, with the consequence that it leads to incorrect estimates of the standard errors. Autocorrelation implies that a failure to explain the state of the dependent variable at one point in time is transferred to subsequent time periods, or put another way, serial correlation between residuals (Pennings et al. 2006:166). In order to deal with autocorrelation fixed effects are included, which controls for panel heterogeneity. The danger for omitted-variable bias is reduced by controlling for all unmeasured variables, as well as controlling for all time-invariant variables that matter for the dependent variable. This bias does not characterize the fixed effects estimator because the different intercepts for an individual variable are explicitly recognized by putting in dummies for them (Kennedy 2003:305-307).

4.1.6 Selection of units

When a quantitative approach is selected as the methodological framework in the study of the research question, the motivation is to enable empirical generalizations at a highest possible level. I have therefore aimed at maximizing the number of observations. The selection of units has thus been driven by data availability, more specifically by data availability on the dependent variable economic growth. As a result, my final dataset ended up with 184 countries over the time period 1950-2004. (See appendix B for a complete list of the countries included). A particular advantage by including the time dimension in studies on trade and growth, is to neglect the mere *level* effects of a one-shot trade liberalization on GDP as predicted by static trade theory, but instead focus on the long-term steady-state growth rates (Stensnes 2006:52).

4.2 Determinants of economic growth: Variables and hypotheses

In chapter two I identified the relevant theoretical variables addressed in previous empirical studies on trade and growth. Proceeding with the empirical analysis including these variables, I first present the operational definitions linked to the theoretical concepts. This is a necessary first step in order to meet the criteria of validity.²⁰ The data included in the analysis are also chosen on the basis of how reliable the data sources are, as well as the availability of the preferred measure. Before I account for the determinants of growth, the dependent variable itself will be operationalized:

4.2.1 The dependent variable

Economic growth – [GROWTH]

A key question in the field of economic development is which measures are the most adequate when determining a country's state of development. Other factors than merely a country's income level are important, although income levels at least suggest what constraints and possibilities policy makers are facing. Most of the studies reviewed in chapter three are not only concerned with economic growth *per se* in their choice of the measure of the dependent variable, but also focus on how growth affects standards of living. Rodríguez and Rodrik (1999) underline that growth and welfare is not the same thing:

“Trade policies can have positive effects on welfare without affecting the rate of economic growth. Conversely, even if policies that restrict international trade were to reduce economic growth, it does not follow that they would necessarily reduce the level of welfare” (Rodríguez and Rodrik 1999:4).

It is crucial to be aware of the distinction between *level* and *growth* effects. Trade liberalization can lead to a one-off increase in income while the long-run growth rate is unaffected (Melchior 2007:10). When the time-dimension is included, it is possible to focus on the long term steady-state economic growth, and not merely the level effect predicted by static trade theory.

In order to use a proper measure for economic growth, I apply a variable which reflects standards of living. Measures such as gross domestic product (GDP) and gross national product

²⁰ Validity of the data refers to whether or not one actually measures what is intended to be measured. Internal validity indicates if the chosen indicators manage to represent the theoretical concepts. External validity indicates if the results are valid for the countries not included in the sample (Midtbø 2007:25-26).

(GNP) relate only to the total value of income or output, hence not including a distributional component.²¹ For comparative purposes, it is necessary to adjust these measures so economic growth can be compared internationally. First, by adjusting total income for population size, comparisons across countries can be made to their *relative* level of development. The rate of growth of GDP per capita can thus be approximated as the difference between the rate of growth of total GDP and the population growth. Second, by adjusting GDP from nominal to real terms, it is possible to compare income levels for the same country in different years. Consequently, one can measure to what extent real physical output has changed, independently of any price changes that may have taken place between the years under study. This is essential when using panel data, since the time dimension is included. Third, in order to correct for different price levels among countries, adjustments to purchasing powers are commonly used (Melchior 2007; Rodrik et al. 2002). This is known as the purchasing power parity (PPP), normally estimated in US dollars (Cypher and Dietz 2004:28-46). When the arguments of adjusting real GDP per capita are taken into consideration, PPP will be the best measure in terms of internal validity as it gives the best international comparisons both across countries and over time.

The variable is taken from Penn World Table 6.2 (PWT).²² Real GDP per capita, PPP, is measured by using the chained index. The chain index is calculated by first applying the component growth rates between each pair of consecutive years, $t - 1$ where t ($t=1951$ to 2000), to the current price component shares in year $t - 1$ to obtain the domestic absorption (DA) growth rate for each year. This DA growth rate for each year t is then applied backwards and forwards from 1996, and summed to the constant price net foreign balance to obtain the chain GDP series.²³ Whereas the dependent variable now is identified, I proceed with the definitions of the independent variables believed to influence economic growth.

²¹ GNP is the total value of all income accruing to residents of a country, irrespective of whether the income is derived from sources within or outside the country. GDP is the total value of all income created within the borders of a country, regardless of whether the income is accrued by domestic or foreign sources (Cypher and Dietz 2004:31). GDP will be my preferred measure as it is commonly used in the literature reviewed.

²² The Penn World Table provides purchasing power parity and national income accounts converted to international prices for 188 countries for some or all of the years 1950-2004 (Heston, Summers and Aten 2006).

²³ Alternatively, the Laspeyres index could be used as the measure of real GDP, PPP. However, it is beyond the scope of the paper to go into a technical discussion of how PPP is computed.

4.2.2 Independent variables and hypotheses

The main concern of this thesis is to assess the relationship between openness to international trade and economic growth. However, a wide range of additional variables related to other areas in the growth literature have also been emphasized by scholars within this field. Following Rodrik et al. (2002), I have chosen to organize the independent variables into categories which represent the strands of thoughts that stand out in the growth literature: Variables related to economic integration and international trade, geography and institutional quality. In addition, a group of variables related to political regimes are included.

4.2.3 International trade variables

The theoretical framework applied mainly focuses on the role of international trade for increasing growth rates. In this section, the theoretical concepts are defined at a lower level of abstraction, in order to give precise operational definitions of the variables included in the analysis. The first indicator defined is the very important (and controversial) indicator of openness.

When measuring trade liberalization, a wide range of indicators have been used in the literature. The main distinction is between indicators being outcome-based and incidence-based. An outcome-based measure relates to trade flows, hence measuring *volumes* of trade, such as the level of imports, exports or net exports. An incidence-based measure, relates to trade *policy* by observing the policy instruments applied, such as tariffs and non-trade barriers (NTBs) (Pritchett 1996:308-309). Subsequently, I include two measures of openness in the analysis, to cover both of these alternatives. The remaining question is still, however, which measures should be used? Regarding this important decision, I look to the arguments presented in the studies reviewed in chapter three.

Trade share - [OPENNESS]

Levine and Renelt (1992) use exports to GDP as their openness indicator. However, they argue that imports or total trade (exports+imports) to GDP is an equally good measure, as they found the results to give almost the same coefficient estimates and standard error. Melchior (2007) strongly disagrees with this perception, and claims that exports as a share of GDP partly reflect a country's competitiveness on the income level: "This is not due to openness *per se*, but better

technology and skills, or lower costs” (Melchior 2007:11). He therefore uses imports as a share of GDP as the preferred measure, as he views this to be more directly affected by a country’s own trade liberalization. Even though this is a measure of openness, he argues that the import ratio is influenced by trade policy. The third option is exports plus import to GDP used by Frankel and Romer (1999), Rodrik et al. (2002), and included as one of the nine indicators addressed by Edwards (1997). Frankel and Romer use this measure only by arguing that this is “standard practice”, and Rodrik use this measure following Frankel and Romer. As this variable measures the trade intensity of an economy, I have chosen this as my induce-based measure. The variable is available from Penn World Table (PWT) which is my preferred data source, and is measured as exports plus imports divided by per capita real gross domestic product (Heston 2006). In line with the hypothesis regarding trade liberalization proposed in the theoretical chapter, and the findings of most of the studies, the hypothesized effect of trade share on growth is expected to be positive:

H1a): Increased volumes of trade increase the rate of growth.

Tariff level - [TARIFF]

The next task is to choose the outcome-based measure of openness. Sachs and Warner (1995) created a composite index of five indicators to classify whether a trade regime was considered open or closed. The rationale behind this indicator was to show in which ways policymakers could close an economy, hence being an outcome-based measure. However, recall the critique put forth by Rodrik and Rodriguez (1999), who claim that this variable has some serious shortcomings. First of all, the two variables which are the most direct measures of trade policy, namely tariffs and NTBs, appeared to have little influence on the dummy’s statistical power. The index was made into a dichotomous variable in order to overcome the measurement problem. One of the criteria for closed economies was average tariff rates of 40 percent or more. This implies that an economy with a 39 percent tariff rate is viewed as just as liberal as an economy with no applied tariffs (Greenaway et al. 2002:236). Following the suggestions of Pritchett (1996), tariffs and NTBs are good measures of trade policy as they relate directly to policy instruments. NTBs, however, cover a wide range of actions, such as licenses, import quotas and export restraint, which will impose a problem of quantification. Tariffs, in contrast,

are a more direct measure where the availability of data is better. One shortcoming, however, is that tariff data is only available from 1981. As a consequence, the time span is substantially shortened when employing the variable in my analysis. As Melchior argues about studies on trade and growth: "...there is to our knowledge still no study that use accurate time-series data on tariffs in such work" (Melchior 2007:9).

Tariffs are measured as average applied tariff rates (unweighted in %). Alternatively one could use simple or weighted averages, but this method runs the risk of giving influence to goods categories that are relatively unimportant for a country (Stensnes 2006:57). The data source is obtained from the World Bank, which has primarily collected the data from UNCTAD and WTO. The variable is available for the time period 1981-2005. Regarding the hypothesized effect, the literature is inconclusive on the direction of the effect of tariffs on growth. On the one hand, tariffs are a tax on import, which is an important revenue source for many countries. On the other hand, the creation of custom unions and free trade areas aim to reduce trade related costs, thus contribute to increase income levels and growth rates of the participating countries. My hypothesis is that tariff levels have an impact of growth, without stating in what direction.

H1b): *The average tariff level of a country has an impact on economic growth.*

Convergence – [RGDP]

Recall from the theory chapter that Heckscher and Ohlin argued that international trade was mutually beneficial due to the factor price equalization theorem. A free trade policy is not only believed to induce a positive effect on economic growth, convergence in income levels are also predicted by the free trade doctrine. Hence, the prediction of a "catching up" by developing countries is due to higher growth for this group of countries than for developed countries. All of the studies reviewed in chapter three that tested the convergence hypothesis found convergence to be present (Edwards 1997; Greenaway et al. 2002; Levine and Renelt 1992; Sachs and Warner 1995). In order to test the convergence hypothesis empirically, real GDP is included as the convergence controller because it relates to income levels. If this measure correlates negatively with the dependent variable it is a sign of convergence, which is the expected effect. The variable is taken from PWT 6.2.

H2: Real GDP corresponds negatively with growth, implying convergence in income levels worldwide.

Primary sector specialization – [AGRIX]

The doctrine of comparative advantage emphasized that countries should specialize in the sector where the relative price of production was lowest. However, the Prebisch-Singer hypothesis suggested that agricultural specialization had rather been detrimental for developing countries, due to declining terms of trade (Prebisch 1959; Singer 1989). I therefore include a variable that measures agricultural economic activity, where my first choice is the share of agricultural raw materials exports as a share of merchandise exports. The data are collected from the World Bank's World Development Indicators (WDI), and are available from 1960 until present. Alternative measures are also considered. Within the group of agricultural products constituting AGRIX, oil is also included. As this product is one of the most valuable primary resources traded on the world market, this can possibly have a large independent influence on growth. Consequently, the effect of the theoretical concept I test loses significance. Alternatively, a measure of the exports of food as a percentage of merchandise exports can be used [FOODX]. A third option is to use agriculture as a share of GDP as the indicator of primary sector specialization. This does not only relate to the value of exports, but also to the value of production. Value added in agriculture is the net output of agriculture (International Standard Industrial Classification divisions 1–5 including forestry and fishing) after totalling outputs and subtracting intermediate inputs. Both alternative measures of primary sector specialization are from WDI.

H3: Specialization in the agricultural sector has a negative effect on economic growth.

4.2.4 Institutional variables

Although international trade and economic growth is the main focus of this thesis, the role of institutions has been emphasized by scholars in the growth literature. Myrdal claimed that institutional reforms were more important than trade policies in order to enhance economic growth, with a special reference to developing countries. When this was tested empirically, Rodrik et al. (2002) found that institutional quality had a much larger impact than international

trade in their empirical study. In my empirical analysis, institutional variables are included in order to test for the impact of countries' institutional quality, as proposed by the institutional perspective in the theoretical chapter.

The most common method of measuring institutional quality quantitatively is to use government indicators. Two potential data sources were considered when choosing the institutional quality indicators: The International Country Risk Guide (ICRG) is a rating system for forecasting financial, economic and political risk among countries, offered by the Political Risk Services (PRS) group. The political risk rating includes twelve variables that measure institutional quality, with a data coverage of 140 countries on a monthly basis from 1984. However, these data are only available for paying subscribers and is therefore rejected to the benefit of the measure described below:

Institutional quality – [INSTAVG]

The second alternative is indicators taken from the World Bank's Worldwide Governance Indicators (WGI). These indicators were included in the studies by Rodrik et al. (2002) and Melchior (2007). The indicators measure six dimensions of governance: Voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. When included in my empirical analysis, the average effects of each component will be used. A closer description of the individual components follows:

Voice and Accountability: This indicator measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. *Political Stability and Absence of Violence:* This indicator measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism. *Government Effectiveness:* Government effectiveness measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. *Regulatory Quality:* This indicator measures the ability of the government to formulate

and implement sound policies and regulations that permit and promote private sector development. *Rule of Law*: This is one of the key indicators of institutional quality (Rodrik et al. 2002). Rule of law measures the extent to which agents have confidence in and abide by the rules of society, particularly the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. *Control of Corruption*: The indicator measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

A major disadvantage of these indicators, however, is that the coverage is only the years 1996, 1998, 2000, and annually from 2002-2006. Nevertheless, the data cover as many as 212 countries, thus giving a quite large number of observations. The indicators are based on several hundred individual variables measuring perceptions of governance. This is drawn from 33 separate data sources constructed by 30 different organizations. The individual data sources underlying the aggregate indicators are drawn from a diverse variety of survey institutes, think tanks, non-governmental organizations, and international organizations. The units in which governance is measured follow a normal distribution with a mean of zero and a standard deviation of one in each period. The scores lie between -2.5 and 2.5, with higher scores corresponding to better outcomes (Kaufmann et al. 2007). The hypothesized effect is that higher scores correspond to higher rates of growth:

H4: A higher average level of institutional quality has a positive impact on economic growth.

I have now identified the components of institutional quality which are included in my empirical analysis. The next group of variables to be defined are those related to geography.

4.2.5 Geography variables

Frankel and Romer (1999) emphasized the role of geography in their study on trade and growth. They argued that larger countries had more within-country trade which leads to higher growth rates. Country size was thus their measure of geography. A wide range of alternative geographical indicators have been included in the growth literature. The distance from equator, the percent of a country's tropical land area, access to sea, and area covered by frost were also

tested in the growth regression by Rodrik et al. (2002). However, none of these indicators were found to be statistically significant. In my choice of geographical indicator, I apply the variable put forth by Frankel and Romer, country size, which was also the geographical indicator, found to be statistically significant by Rodrik et al.

Country size – [POP]

The size of population and the size of land area are seen as two measures reflecting country size. Frankel and Romer (1999) included both population and area (both in logs), and focused on the sum of the coefficients. In the empirical analysis, only population is included because land area is close to being a time-invariant variable. Frankel and Romer also found land area not to have an impact growth as opposed to population. The variable is taken from the PWT 6.0. Frankel and Romer claimed that larger countries induce larger within-country trade, which is considered to be positive for economic growth. However, more people also means more mouths to feed, so I expect a negative effect between total population and growth:

H5: Higher levels of population have a negative effect on economic growth.

Population density– [POPDEN]

An alternative measure to country size is population density. This indicator additionally accounts for land area, as it refers to the number of people per square km. The variable is taken from World Bank's WDI and is available from 1960. The hypothesized effect is in line with the findings in the literature, namely that population density corresponds positively with growth:

H6: Higher levels of population density have a positive effect on economic growth.

4.2.6 Control variables

In the empirical analysis I include a set of control variables. They are not theoretically motivated, but are found to have an impact on growth by several studies. It is therefore necessary to include a set of control variables in order to test the impact of these variables compared to the theoretical variables outlined above.

Investments – [INVEST]

Recall the study carried out by Levine and Renelt (1992). They included investments in their growth regression, and suggested that investments were the channel in which openness was positively related to growth. This is also supported by the other studies reviewed which include investments (Greenaway et al. 2002; Melchior 2007; Sachs and Warner 1995). The investment variable is taken from PWT, and is defined as real gross domestic investment (private and public) as a percentage of GDP. Investment is measured as the investments share of GDP.

H7: Higher rates of investment share of GDP correspond positively with economic growth.

Population growth – [POPG]

Along with investments, population growth is one of the core variables that has frequently appeared in quantitative studies on trade and growth (Levine and Renelt 1991). Based upon the earlier findings in the literature reviewed, high population growth is expected to be negatively correlated with economic growth (Greenaway et al. 2002; Levine and Renelt 1992). The variable is taken from PWT, and is defined as the annual percentage change in a country's population.

H8: Higher rates of population growth have a negative effect on economic growth.

4.2.7 Political regime variables

This group of variables is not theoretically motivated, but is included as an attempt to contribute with new perspectives not frequently emphasized in the literature on international trade and growth. The political regime variables are taken from an updated version of the ACLP dataset²⁴ (Gandhi 2004).

Regime – [REGIME]

The regime variable is coded as a dummy variable, where regimes are classified as either a democracy or dictatorship. Democracies get the value of 0, and dictatorships get the value of 1.

²⁴ The ACLP dataset was created for and used in the project Democracy and Development: Political Institutions and Material Well-Being in the World, 1950-1990 (Przeworski and Alvarez 2000).

A minimal definition of democracy is used, inspired by Dahl's (1971) concept of polyarchi: "Democracy as a regime in which governmental offices are filled as a consequence of contested elections. Only if the opposition is allowed to compete, win, and assume office is a regime democratic" (Przeworski 1996:178). The central finding in their study is that economic factors are important in sustaining democracies. I also expect the reverse causal relationship, and thus expect democracies to have a positive impact on economic growth. They also state that "poverty breeds poverty and dictatorship" (Przeworski 1996). My hypothesized effect is therefore that moving from zero to one, a negative coefficient appears, meaning that dictatorships correspond more negatively with growth than democracies.

H9: Dictatorships correspond more negatively with economic growth than democracies.

Institutions - [DEMINST]

The ACLP dataset also includes a broader classification of political regimes. This variable accounts for different institutional settings within democracies, by including dummies for democratic institutions. The following classification of democratic institutions is used: 0 = dictatorships, 1 = parliamentary democracies, 2 = mixed democracies, 3 = presidential democracies. In line with the reasoning behind the hypothesized effect of REGIME, I expect dictatorships to correlate negatively with growth, although for the different types of institutions, my expectations are ambiguous.

H10: Dictatorships are expected to have a negative impact on economic growth.

4.2.8 Summary of variables and hypothesis

Table 3: Hypothesized effect of X_i on Y

Variable (x_i)	Hyp. relation	Variable (x_i)	Hyp. relation
International trade		Geography	
OPENNESS	+	POP	-
TARIFF	+/-	POPDEN	+
RGDP	-		
AGRIX	-	Political regimes	
FOODX	-	REGIME	-
AGRIGDP	-	DEMINST	-
Institutional quality		Control variables	
INSTAVG	+	INVEST	+
		POPG	-

Among the 13 variables included in the empirical analysis, four of them are believed to have a positive effect on growth, eight are believed to have a negative effect on growth, while the effect of tariff levels are ambiguous.

4.2.9 How good are the data?

In every quantitative study the criteria of validity and reliability must be met. Concerning validity, I feel comfortable that the right measures have been chosen so that the variables reflect the theoretical concepts derived from chapter two. In most of the cases I have applied measures commonly used in the studies reviewed in chapter three. Nevertheless, I have been obliged to choose certain measures due to data availability even though the alternative measure might be considered as equally good, or even better. All the variables are taken from data sources that are popularly used in studies on trade and growth. PWT are provided by the Center for International Comparisons at the University of Pennsylvania (CICUP), and are generally considered a good data source. The same is true for the WDI and WGI, both provided by the statistics division at the World Bank.

At this point, I am confident that both the criteria of validity and reliability are met. However, a larger concern is the problem with endogenous variables commonly faced in quantitative studies within social sciences. A requirement for undertaking OLS regression analysis is that the independent variables are independent of, or exogenous to, the dependent variable (Stensnes 2006:52). How certain can one be that this assumption is met? When selecting the data there is a dilemma between data exogeneity and data relevance that one has to be aware of. Winters (2004) argued that the trade share can be influenced by other factors. Both the exports and the import share can be endogenous as they are likely to vary with income levels. The same applies for the other openness variable. Even though average tariffs is a more direct measure of trade policy, policy-makers can be exposed to increasing pressure for protection as growth decreases, at least in the short run (Winters 2004:8).

Institutional variables are also facing an endogeneity problem. Przeworski argued that institutions in the study of economic development are endogenous, and consequently difficult to include in growth regressions: “Institutions and development are mutually endogenous and the most we can hope for is to identify their reciprocal impacts” (Przeworski 2004:185). In time-series analysis, one is dealing with path-dependence. The motor of history, he argued, is endogeneity. Factors such as geography, wealth, and political institutions are mutually interdependent and evolve together, so transforming institutions into exogenous variables is nearly impossible (Przeworski 2007). However, problems of endogeneity and reverse causality plague any empirical researcher assessing the relationship between openness, institutions and growth. Only geographical components can be said to be as exogenous a determinant as one can ever hope to get (Rodrik et al. 2002:2).

4.3 Concluding methodology, operationalizations and data

When investigating the research question of this thesis, I have chosen to use panel regression analysis as the methodological framework. As the units of analysis are countries, inclusion of the time-dimension subsequently expands the number of observations, hence giving a larger potential for making broad generalizations. However, there are possible challenges facing regressions undertaken by using OLS and panel data, so solutions to deal with these problems have been discussed. When conducting a quantitative analysis, the variables included must be

carefully defined in order to reflect the theoretical concepts that comprise the basis for the thesis. In the section on operationalizations of the variables, a presentation of the measures of the respective variables included in my empirical analysis was given. In order to meet the criteria of reliability, the different data sources in which the variables have been taken have been evaluated. The data are primarily taken from Penn World Table and the World Bank, which are both considered as reliable data sources.

In the next chapter, empirical analyses on openness and growth and related variables are conducted. By undertaking a multivariate regression analysis, direction, significance and the relative explanatory power of each variable on economic growth can be determined.

5 EMPIRICAL ANALYSIS AND RESULTS

The theoretical discussion showed a clear distinction between the classical and neoclassical trade theorists which favoured a free trade approach, and the heterodox theories which favoured protectionism to a certain degree for inferior countries. The quantitative studies assessed in the chapter three on previous research are inconclusive on whether openness is positively related to growth or not, although most of the studies show that it is. The other variables commonly included in growth regressions also appear with different effects and significance across the different studies. However, it is difficult to draw conclusions based on these results, because each study uses different samples of countries, different time periods and different methodological approaches. I have therefore undertaken an empirical analysis with the aim of maximizing the number of observations by including as many countries as possible, and as many years for which data are available. The sample selection ended up with 184 countries over the time-period 1950-2004, thus giving the highest potential of making generalizations compared to the other studies reviewed in chapter three.

5.1 Research strategy

Table 2 showed the direction and significance of the variables most commonly included in the previous studies reviewed. The first task in my empirical analysis is therefore to test these results as well as the robustness of them. When the same variables are included by groups, I am able to test the effect of the different groups of indicators. First, I include the variables reflecting international trade on growth. Second, the geography indicator is added in order to see how the model changes, and third, I add the institutional quality variable. Recall from the literature review, the measurement of openness and trade liberalization has been a highly debated topic and is still a subject for controversies. Openness, measured as the trade share, has by some scholars been accused for being a bad measure of trade policies since it relates to volumes of trade (Rodrik 2002). In order to account for this critique, I undertake a new test with average tariff levels as the openness indicator, following the same procedure as above.

Based on the variables included in the model for previous research, in the second part of the chapter I go on to build an expanded model which is my contribution to the research on trade and growth. Following Levine and Renelt (1992) some variables are considered to be core

variables which should be included in all growth regressions: Population growth and investments. They are therefore always included along with openness when running the multivariate regression analysis. Openness measured as the trade share $((\text{exports}+\text{imports})/\text{GDP})$ is my preferred indicator due to availability of the data. Compared to tariffs, data are available for more countries over a larger number of years. This gives a higher number of observations, which gives rise to broader empirical generalizations. I start out with building a four-variable model called the “Core variable model”. A comprehensive statistical strategy is adopted, meaning that one independent variable is added at a time to the core variables. Variables which do not appear to be significant at the 0.05 level is rejected since it is uncertain if they have an impact on economic growth or not.²⁵ This approach is followed until I end up with a final model constituted by the significant indicators in the growth equation.

Following Rodriguez and Rodrik (1999), their suggestion for future research is that contingent relationships between openness and growth should be looked for. I therefore aim to establish new knowledge about openness and growth by including variables related to political regimes in the regression. Even though this is not theoretically motivated, it would be of interest to discover the impact political regimes have in growth regressions. Melchior (2007) emphasizes that broad cross-country regression analysis give average effects, so the heterogeneity in the data among the countries are not accounted for. I therefore split the sample in two by creating a dummy-variable for OECD-countries, and test my final model on each of these groups. In this way, I can compare the results obtained between those groups of countries and the aggregate sample.

The empirical analysis is conducted by the statistical software program Limdep 8.0. This program is suited for diagnosis of OLS assumptions related to panel data, such as autocorrelation and heteroscedasticity. Before I go on with the regression analysis I run preliminary analysis including descriptive statistics in order to check for outliers in the sample, and a test to reveal collinearity between the independent variables.

²⁵ A 0,05 level refers to significance at a 95% confidence interval.

5.2 Preliminary analysis

5.2.1 Descriptive statistics

Some of the variables had a large variation on the minimum and maximum values. In order to create a linear estimating equation, a logarithmic transformation of these variables has been conducted, which included the following variables: RGDP transformed to LNGDP, POPDEN to LNPOPD, OPENNESS to LNOPEN, and POP to LNPOP. The dependent variable, economic growth, is measured as the percent change in real GDP, adjusted for per capita, purchasing power. In order to get an understanding of the strength of the regression coefficients later, it is useful to take a look at the descriptive statistics for GROWTH:

Table 4: Descriptive Statistics

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
GROWTH	2.03646896	7.57775080	-63.3185709	151.064607	7146
OPENNESS	72.4046398	53.6792940	2.00396015	986.452194	7146
LNOPEN	4.01972098	.774031185	.695125297	6.89411486	7146
TARIFF	15.2362697	12.7678730	.000000000	106.500000	2032
RGDP	7151.57932	8052.45999	170.554979	84408.2304	7146
LNGDP	8.29108509	1.12529004	5.13905770	11.3434202	7146
AGRIGDP	20.6353102	16.3859532	.000000000	94.8462296	4877
AGRIX	7.72117303	11.9730225	.000000055	92.0655904	4358
FOODX	30.4436118	27.5519899	.238091275E-03	99.8779045	4384
POPDEN	228.217156	1058.42747	.826851197	16213.1915	6315
LNPOPD	3.85038953	1.56275400	.024632258	9.69358048	6315
POP	28955.3986	105279.339	13.4080000	1294845.58	7146
LNPOP	8.50312645	1.98506400	2.59585154	14.0739020	7146
INSTAVG	.421529493E-02	.933859994	-2.26987434	1.96348942	995
POPG	.193120050E-01	.186561331E-01	-.554590989	.486362126	7146
INVEST	14.7222599	9.28359266	.141676678	103.164406	7146
REGIME	.545570835	.497958781	.000000000	1.00000000	6254
DEMINST	.772945315	1.03540262	.000000000	3.00000000	6254
OECD	.206968934	.405161407	.000000000	1.00000000	7146

Table 4 shows that GROWTH goes from a minimum value of about -63.3 to a maximum value of 151.1, thus showing a great distance in the growth rates. The country which represents the minimum value is Iraq which experience considerable negative growth rates. The country with the maximum value is United Arab Emirates. The average growth rate is about 2. The standard deviation of 7.6 indicates a low degree of variation in the growth rates among the countries in

the sample. When I check for outliers, no countries seem to stick out substantially from other countries, either on the top or the bottom of the list. The OLS assumption of no outliers is therefore met.

5.2.2 Collinearity

Another assumption for standard OLS regression was “no multicollinearity”. The effect of each independent variable should be independent of the other independent variables. If this assumption is violated, the consequence will be a high standard error of the estimate which will reduce the chance for rejecting the null hypothesis (Midtbø 2007:107). In order to test for this assumption, a matrix of simple correlation coefficients between all pairs of the independent variables is conducted. This gives an indication of which independent variables which are highly correlated with each other (see Appendix A). As a rule of thumb, variables that have correlation coefficients larger than +/- 0.7 are not included in the same model. Some of the variables have observations back to 1950, while other variables are only available from the mid 1980s or 1990s. The variables have thus been split into two groups when the test for collinearity is undertaken. It is important to bear in mind that this procedure is carried out only as a preliminary step towards building my model. A more advanced test for multicollinearity is undertaken on the final model. The following variables appear to be highly correlated with each other and are presented in the table below:

Table 5: Collinear variables

INSTAVG – AGRIGDP	(r = 0.71)
INSTAVG – LNGDP	(r = 0.81)
DEMINST – REGIME	(r = 0.76)
LNGDP – AGRIGDP	(r = 0.90)

Since agriculture/GDP is only one of my alternative indicators of sector specialization, this is rejected in favour of the variable measuring institutional quality if they both appear to be significant. I am therefore able to include all the theoretical groups in the empirical analysis. At this point, I know which variables that can be included in the same model, but I do not know whether these variables appear to have a significant effect on growth or not. That is an important question that I am not able to give an adequate answer to until I have reached the final model

through a series of multivariate regression analysis. Before I proceed with that task, tests of the findings of the studies presented in chapter three are conducted.

5.3 Testing previous research

A main concern of this thesis is to test the theories presented in chapter two, and the results obtained by more recent research on trade and growth reviewed in chapter three. By including the same variables addressed in Table 2 in chapter three, I am able to check the robustness of earlier results when the direction and significance of the variables believed to influence growth are identified. Considering that my dataset includes 184 countries and a time period spanning from 1950-2004, this gives a larger number of observations than any of the previous studies reviewed.

Even though the different studies reviewed give the same results on a number of indicators of growth, the literature is inconclusive on the effect of openness to international trade on growth. The variables included in this model are chosen on the basis that they frequently appear in growth regressions focusing especially on the role of international trade. The variables are classified in three groups which are believed to be the main strands of thought within the growth literature (Rodrik et al. 2002). I therefore undertake F-tests to test the impact of each group of variables in addition to the separate effect each individual variable have on growth. Since a main controversy in the literature has been how to measure openness, two separate series of regressions are run. The first includes the incidence-based openness indicator, the trade share ((exports+imports)/GDP) in a model called “Literature model I”. The other one includes the outcome-based openness indicator, namely average tariff levels in a model called “Literature model II”.

5.3.1 Literature model I

I start out with LNOPEN as the openness measure, and run a multivariate regression with the indicators belonging to the group of international trade variables.²⁶

²⁶ A star (*) indicates that the variable is significant at the 0,05 level.

Table 6: Literature model I – international trade variables

Variable	prev. finding	b	t-stat	sign.
LNOPEN	+/-	-0.98	-2.73	0.0063*
LNGDP	+/-	0.73	1.88	0.0603
AGRIX	-	0.04	2.80	0.0052*
POPG	-	-37.05	-5.99	0.0000*
INVEST	+	0.10	4.70	0.0000*

N = 4183

R ²	Adjusted R ²
0.11	0.08

LNOPEN appears to be negatively correlated with growth, with a strong significant effect. This result is closest to the findings of Rodrik et al. (2002), who obtain a coefficient of -0.15.

However, the estimate is not significant at the 0.05 level with a t-stat of 1.27. The other studies reviewed found a positive relationship between openness and growth with coefficients varying from 0.0089 (Edwards 1997) to 2.20 (Sachs and Warner 1995). Regarding the convergence controller, LNGDP, the result in

Table 6 shows a positive correlation with growth, thus giving an indication that the convergence hypothesis is rejected. For convergence to occur, a negative relationship must be present. Even though the estimate is not significant at the 0.05 level, it is very close to (sig. = 0.06). This contradicts the findings in the literature of a “catching up” by developing countries. All the studies that test this hypothesis found a negative and significant effect between the convergence controller and growth (Edwards 1997; Greenaway et al. 2002; Levine and Renelt 1992; Sachs and Warner 1995). AGRIX appears to have a significant impact on growth. A higher share of agriculture to GDP shows a slightly positive correlation with economic growth, thus contradicts the findings in the literature. Melchior (2007) found agricultural exports to be negatively correlated with growth, with a significant coefficient of -0.36.

The control variables POPG and INVEST show expected correlation with economic growth with highly significant effects. Levine and Renelt (1992) did not find POPG to be significant, but Greenaway et al. (2002) did. Their coefficient showed a much weaker effect on growth with

a value of -0.41. Investments were found to be significant, and positively correlated with growth by most of the studies reviewed (Edwards 1997; Greenaway et al. 2002; Melchior 2007). Only Greenaway et al. (2002) did not find the indicator to be significant.

Next, I include LNPOPD as the geographic component to see how it influences growth, as well as the impact it has on the other independent variables. In the literature, both population, land area and population density were used as measures of country size. As I here operate after the principle of parsimony, only one of the variables is included. Population density captures both the dimension of population and area, and is therefore chosen as the country size measure. The results are shown in the table below:

Table 7: Literature model I – international trade with geography added

Variable	prev. finding	b	t-stat	sig.
LNOPEN	+/-	-0.60	-1.63	0.1038
LNGDP	+/-	1.28	3.21	0.0013*
AGRIX	-	0.03	2.23	0.0260*
POPG	-	-67.91	-9.52	0.0000*
INVEST	+	0.07	3.47	0.0005*
LNPOPD	+/none	-2.68	-6.02	0.0000*

N=4133

R²	Adjusted R²
0.30	0.22

The new variable, LNPOPD, appears to be negatively correlated with growth with a significant effect. The result deviates from the findings in the literature. Sachs and Warner, Frankel and Romer and Melchior all found a positive correlation with growth, but when included in the literature model it appears with a negative coefficient (-2.68), also with a significant effect. All of the other variables remain with the same sign of the coefficients, but LNOPEN loses significance while LNGDP becomes more significant. When this additional variable is included, the model as a whole appears to have a greater explanatory power on growth due to the rise in

adjusted R^2 from 0.08 to 0.22.²⁷ The final step of testing previous research with LNOPEN is to include the indicator for institutional quality.

When pair wise correlations between the independent variables were run, LNGDP and INSTAVG appeared to be multicollinear. These variables can hence not be included in the same model, so LNGDP is excluded in this regression. The results are presented in the table below:

Table 8: Literature model I – international trade with geography and institutions added

Variable	prev. finding	b	t-stat	sig.
LNOPEN	+/-	3.81	2.76	0.0058*
AGRIX	-	-0.15	-1.85	0.0646
POPG	-	-107.67	-6.31	0.0000*
INVEST	+	-0.10	-1.23	0.2172
LNPOPD	+/none	-17.13	-3.40	0.0001*
INSTAVG	+	0.04	0.03	0.9772

N = 599

R^2	Adjusted R^2
0.45	0.26

When the indicator of institutional quality is included it turns out that this variable is not significant with a t-stat of only 0.03, which indicates no effect on growth. The inclusion of the institutional variable makes investment to change direction of the coefficient from positive to negative, but more importantly that the variables becomes insignificant. On the other hand, both LNOPEN and AGRIX now appear with the expected sign, although AGRIX is not significant at the 0.05 level (but close to). A remarkable consequence of the inclusion of the institutional quality indicator is the reduced number of observations from more than 4000 units to only about 600. The indicator is only available from 1996, so the results are based on a very few number of years. Nevertheless, this model gives some additional explanatory power since adjusted R^2 rises from 0.22 to 0.26.

²⁷ The addition of an independent variable cannot cause the R^2 to fall. Correcting the R^2 for degrees of freedom solves this problem, which is the adjusted R^2 (Kennedy 2003:91). This measure will thus be used when assessing the change in the variation of the dependent variable.

The test on previous research with trade share as the openness indicator is now completed. In order to see if these results change by using tariff levels as the openness indicator, a second study is conducted by following the same procedure as above.

5.3.2 Literature model II

Before I proceed with the analysis, recall that tariff data is only available from 1981. The number of observations is therefore reduced substantially compared to Literature model I. This is also a plausible explanation for why it is not commonly included in the previous studies. Sachs and Warner used this only as a component in their constructed index, so Edwards (1997) and Melchior (2007) is therefore the only studies to include tariffs as an independent openness indicator. The results of the multivariate regression analysis with the trade variables are presented in the table below:

Table 9: Literature model II – international trade variables

Variable	prev. finding	b	t-stat	sig.
TARIFF	+/-	-0.03	2.25	0.0242*
LNGDP	+/-	2.13	2.22	0.0262*
AGRIX	-	-0.03	-0.72	0.4695
POPG	-	-147.15	-9.39	0.0000*
INVEST	+	0.13	3.14	0.0017*

N = 1488

R ²	Adjusted R ²
0.29	0.21

The findings in the literature show ambiguous effects between tariff levels and growth. Edwards' result gives a significant and negative correlation of -0.11, while Melchior obtains a positive effect with a coefficient of 0.23. However, this is not statistically significant at the 0.05 level, but it is at the 0.1 level, so there is a great chance that the estimate is correct. My expected effects were also ambiguous. On the one hand, tariffs are a tax on imports which is an important revenue source for many countries. On the other side, the creation of custom unions and free trade areas, such as the EU and NAFTA aim to reduce trade related costs, thus contributing to

increase income levels and growth rates of the member countries. This finding supports the latter reasoning that tariffs affects growth negatively. Converge do not occur in this model either, as the coefficient is positive and significant. AGRIX is not significant, which indicates that the share of agricultural exports have no effect on growth. The control variables POPG and INVEST both appear to be significant. Furthermore, the geographical component is included in the equation which is shown in the table below:

Table 10: Literature model II – international trade with geography added

Variable	prev. finding	b	t-stat	sig.
POPG	-	-160.17	-10.08	0.0000*
INVEST	+	0.01	2.33	0.0194*
TARIFF	+/-	0.01	0.55	0.5802
LNGDP	+/-	3.80	3.72	0.0002*
AGRIX	-	-0.05	-1.30	0.1921
LNPOPD	+/none	-6.51	-4.34	0.0000*

N = 1476

R ²	Adjusted R ²
0.30	0.22

LNPOPD enters the regression with a negative and significant effect on growth. This contradicts with the findings in the literature. Sachs and Warner (1995), Frankel and Romer (1999) and Melchior (2007) all found a positive relationship between country size and growth. Frankel and Romer’s argument was that larger countries had more within-country trade, which correlated positively with the income level. A remarkable effect of TARIFF is that it loses its significance once LNPOPD is included. AGRIX is not significant either, although it becomes more significant than the former model. The coefficient is negative, which is in line with the findings of Melchior, and it indicates that there is about 80 percent chance that a higher share of agricultural exports to GDP affects growth negatively.

The inclusion of the country size measure does not contribute much to the explanatory power of the model as a whole. Adjusted R² only increases with 0.1 from the former model, implying that the geographical component do not have a large impact on growth. Next, the measure of

institutional quality is included in the growth regression. The results are presented in the table below:

Table 11: Literature model II – international trade variables with geography and institutions added

Variable	prev. finding	b	t-stat	sig.
TARIFF	+/-	-0.16	-2.47	0.0134*
AGRIX	-	-0.15	-1.91	0.0568*
LNPOPD	+/none	-19.76	-3.97	0.0001*
INSTAVG	+	-2.19	-1.43	0.1540
POPG	-	-116.93	-5.03	0.0000*
INVEST	+	0.02	0.26	0.7917

N = 482

R²	Adjusted R²
0.59	0.40

The third group of variables included in the model is the measure of institutional quality. INSTAVG is not significant at the 0.5 level, but on the 0.15 level, which leaves much uncertainty of whether it influences growth or not. If it influences growth (which there is 85 percent chance that it does), institutional quality correlates negatively with growth. The inclusion of INSTAVG makes TARIFF significant again, with a negative correlation of growth. This time, the effect appears to be stronger ($b = -0.16$). The impact of population density also effects growth to a higher degree, as the estimated coefficient decreases from -6.51 to -19.76. POPG do not change much regarding direction and significance, although the coefficient shows a weaker negative effect on growth than the former model. INVEST loses its significance with an estimate of 0.79 which is quite remarkable since investments is the only variable Levine and Renelt (1992) have found to be significant in all the growth regression they investigated. The number of observations decrease substantially when adding INSTAVG with $N = 489$, so the basis to make empirical generalizations upon is reduced. When INSTAVG is added, adjusted R^2 increases substantially from 0.22 to 0.40, implying that institutional quality accounts for a large part of the variation in growth even though the sample size is reduced. The test of previous research by using TARIFF as the openness measure is now completed.

5.3.3 Summing up tests of previous research

From the results obtained in Literature model I and II, the control variables POPG and INVEST are the variables that correlates best with the findings in previous studies. For both the openness indicators the effects on growth were ambiguous, as they appeared with a negative sign in one model where the effect was significant, and with a positive sign in the model where the estimate was significant. A common factor however, was that the models including institutional quality in both Literature model I and II gave the expected sign of the openness coefficients. LNGDP appeared to be positive in both models, hence not giving support to the convergence hypothesis which the previous findings all found to be true. The inclusion of geography in terms of POPDEN in the literature models gave a negative and significant relationship with growth, which is the opposite of what the previous studies that included this variable found. Institutional quality never appeared to have a significant effect on growth. In the instance where it was close to be significant, the coefficient was negative which contradicts with earlier findings.

Have I come any further in answering my research question after these tests on previous research? On the basis of the results obtained, my answer to that question is “no” because the results deviate to a large degree between the literature model and among the studies themselves. One reason is that it is difficult to compare the results, because each variable in each study was included within a different set of other variables, undertaken within different methodological frameworks. The same point is made out by Levine and Renelt:

“...economic theory does not generate a complete specification of which variables are to be held constant when statistical tests are performed on the relation between the dependent variable and the independent variables of primary interest. Thus, many candidate regressions have equal theoretical status, but the estimated coefficients on the variables of interest in the regressions may depend importantly on the conditioning set of information.” (Levine and Renelt 1992:942)

They further set the criterion for an indicator to be robust if: “...it remains statistically significant and of the theoretically predicted sign when the conditioning set of variables in the regression changes” (943). Following this strict perception, the conclusion of my tests on previous research is that none of the variables are robust.

I have therefore built a new model in order to come up with some adequate answers to my research question, described in detailed in the next section.

5.4 Explaining cross-country and time variation in growth – building a model

One of the obstacles for making empirical generalizations based on Literature model I and II, was that many of the variables included in the same model were not significant. I now go on to build a new model with an expanded set of independent variables. I undertake a comprehensive statistical strategy by adding one independent variable at a time, and end up with a model consisting of only significant variables influencing growth. But first, the independent variables included in the model are accounted for. In this way, I can test the hypothesis derived from the theory chapter properly, along with the additional hypotheses proposed in chapter four.

According to Levine and Renelt (1992), investments and population growth is core variables frequently included in growth regressions in addition to openness. Recall from the literature review, the choice of openness indicator is a controversial issue. In this model, LNOPEN is chosen as the core openness variable, as it accounts for a larger number of observations than for TARIFF (LNOPEN is available from 1950, while TARIFF is only available from 1981). These two openness measures do not appear to be multicollinear either, so TARIFF can be included in the model along with LNOPEN. All the variables from the literature models are included in my analysis. In the literature models, AGRIX was used as the measure of sector specialization. In chapter four, two alternative measures were presented. They are also included in order to see if they appear to have a stronger impact on growth, or turn out to be more significant. Regarding country size, POPDEN was chosen as the measure in the literature models. Frankel and Romer included both total population and land area in their study, so alternative measures of country size are included. However, land area is a more or less time-invariant variable, and do not contribute much in this panel study. Frankel and Romer also claim that using area alone to measure size of a country has no major impact on the results (Frankel and Romer 1999:388). Total population (LNPOP) is therefore included as the alternative country size measure. As stated previously, the set of independent variables is expanded by the inclusion of indicators not frequently appeared in the literature on trade and growth. I have chosen to focus on the role of

political regimes with the aim of contributing with some new perspectives, and therefore include the dummy variable REGIME along with DEMINST, which is a broader version of regimes. As none of the core variables poses problems of multicollinearity, all the independent variables can be included in a regression consisting of LNOPEN, POPG, INVEST and X_i .²⁸ The results of the core variable model with one independent variable added at a time are shown in the table below:

Table 12: Core variable model – LNOPEN, POPG and INVEST with one ind. variable added at a time

Variable	b	t-stat	sig.
International trade			
TARIFF	-0.01	-0.67	0.5030
AGRIGDP	0.03	1.45	0.1469
AGRIX	0.03	2.44	0.0149*
FOODX	0.01	0.73	0.4641
LNGDP	2.23	7.06	0.0000*
Geography			
LNPOPD	-2.45	-5.53	0.0000*
LNPOP	-1.99	-5.39	0.0000*
Institutions			
INSTAVG	-0.59	-0.30	0.7609
Political regimes			
REGIME	0.61	1.57	0.1161
DEMINST	-0.24	-1.56	0.1190

In the core variable model, four variables are significant at the 0.05 level. This includes two variables related to international trade, AGRIX and LNGDP, and both the geography measures LNPOPD and LNPOP. Institutions appear to be highly insignificant with an estimate of 0.76. The findings of Rodrik et al. (2002) about the superiority institutions have over both trade and geography is hence not confirmed by my study. Since the estimate is so highly insignificant I am therefore compelled to exclude the variable for the rest of the analysis. The rejection of AGRIGDP and FOODX do not pose a problem, since they are only alternative measures of sector specialization. Even though any of the political regime variables not appear to be significant at the 0.05 level, they are close to significant at the 0.1 level, indicating a 90 percent chance for a correct rejection of the null hypothesis. I therefore include one of the indicators further. LNPOP is also dropped since it is a measure of country size along with LNPOPD.

²⁸ A regression analysis run with only the core variables shows that all the indicators are significant and with the expected sign.

Following the principle of parsimony, only one measure of country size is included further.²⁹ REGIME and DEMINST are multicollinear, so I am compelled to include only one. Since the inclusion of this variable is not theoretically motivated, including REGIME is sufficient for my purpose of interest. By undertaking a comprehensive strategy of adding one independent variable at a time to the significant core variables, I have now ended up with the set of independent variables constituting the final model. The results of the multivariate regression are shown in the table below:

Table 13: Final model – indicators of economic growth

Variable	Coefficient	Standard Error	t-stat	sig.	Mean of X
POPG	-59.8386909	7.51654308	-7.961	.0000*	.01831506
INVEST	.08263448	.04474548	1.847	.0648	16.2754079
LNOPEN	-.56279197	.85586464	-.658	.5108	4.03816469
AGRIX	.03115583	.01566799	1.989	.0468*	8.04718654
LNGDP	1.15803969	.91845908	1.261	.2074	8.61815110
LNPOPD	-2.57499810	.81581023	-3.156	.0016*	3.89303739
REGIME	.35796721	.40873797	.876	.3811	.45846552

Least Squares with Group Dummy Variables					
Ordinary least squares regression					
Model was estimated Feb 11, 2008 at 09:38:57PM					
LHS=GROWTH	Mean	=	2.073106		
	Standard deviation	=	5.883065		
WTS=none	Number of observs.	=	3692		
Model size	Parameters	=	174		
	Degrees of freedom	=	3518		
Residuals	Sum of squares	=	109338.3		
	Standard error of e	=	5.574914		
Fit	R-squared	=	.1441044		
	Adjusted R-squared	=	.1020152		
Model test	F[173, 3518] (prob)	=	3.42 (.0000)		
Diagnostic	Log likelihood	=	-11493.48		
	Restricted(b=0)	=	-11780.73		
	Chi-sq [173] (prob)	=	574.50 (.0000)		
Info criter.	LogAmemiya Prd. Crt.	=	3.482606		
	Akaike Info. Criter.	=	3.482536		
Estd.	Autocorrelation of e(i,t)	=	-.006213		
White/Hetero. corrected covariance matrix used.					
Panel:Groups	Empty	1,	Valid data	167	
	Smallest	2,	Largest	41	
	Average group size			22.11	

²⁹ LNPOP and LNPOPD were originally included in the final model. But the model did not pass the heteroscedasticity test when both were included, and LNPOP is also excluded on this ground.

Before I proceed with the interpretation of the results, two additional sets of regressions are run: One model including the variables constituting the final model on the group of OECD countries, and the second model with all the other countries excluding OECD countries. The results are shown in the table below:

Table 14: Final model in split samples

OECD				NON-OECD			
Variable	b	t-stat	sig.	Variable	b	t-stat	sig.
LNOPEN	1.86	2.93	0.0034*	LNOPEN	0.33	0.61	0.5442
LNGDP	-1.65	-2.35	0.0186*	LNGDP	2.20	3.87	0.0001*
AGRIX	0.02	0.49	0.6275	AGRIX	0.03	2.01	0.0441*
LNPOPD	-6.02	-3.14	0.0017*	LNPOPD	-3.10	-5.44	0.0000*
REGIME	1.72	3.25	0.0012*	REGIME	0.16	0.35	0.7267
POPG	-11.33	-0.32	0.7535	POPG	-63.19	-7.43	0.0000*
INVEST	0.33	11.49	0.0000*	INVEST	0.03	1.27	0.2017

5.4.1 Interpretation of findings

The final model consists of three variables related to international trade, one geographic component, one related to political regimes, and two control variables frequently included in growth regressions. Among the groups of variables presented in chapter three, institutional quality is the only group not represented in the final model since INSTAVG turned out to be highly insignificant. The variables remaining significant when included in the final model are POPG, the measure of sector specialization AGRIX, and the country size measure, LNPOPD. Next, I go through each of the variables and interpret the findings in light of the theoretical framework of this thesis and the results obtained by the seven studies reviewed in chapter three.

The first result to be interpreted is the effect of openness on growth, which is the fundament of my research question. When the strength of the results obtained in my analysis are interpreted, I have to consider that the relationship is logarithmic, which implies that the decreasing effect is different on the lower and the higher end of the openness variable. In the aggregate sample, openness decreases by -2.6 percentage point when the trade share goes from the lowest value in the sample of 2.0 (Somalia), to the mean value of 72.4 (Philippines is closest). The decrease is only -0.4 percentage points when openness goes from the mean to the maximum value of 986.5, ceteris paribus. The country that represents the maximum value is Ghana, a country classified by

the World Bank as a low-income country. The coefficient shows a negative effect on growth, which is the opposite of the hypothesized effect. However, the estimate is not significant at conventional levels with an estimate of 0.51, so whether this result is correct or not is insecure. My findings can therefore not support or dismiss earlier findings based on the aggregate sample. Remarkably, openness turns out to be positive and significant for the group of OECD countries. Along with the aggregate findings, openness does not appear to be significant in the sample of non-OECD countries. Among the studies reviewed in chapter three, Rodrik et al. (2002) and Levine and Renelt (1992) (when using PWT data) found the relationship between openness and growth to be negative, although none of them with significant effects. The other studies found a positive and significant effect between openness and growth (Edwards 1997; Frankel and Romer 1999; Melchior 2007; Sachs and Warner 1995). Based on my findings, a positive and significant effect can only be said to be valid among rich countries, while for larger samples of countries the results are not significant and implies that openness have no effect on growth.

The general trends shown from this empirical analysis is closest to the arguments put forth by Friedrich List a century ago. His main perception was that openness to international trade is only beneficial among nations with symmetric economies. He therefore advocated protection of infant industries for inferior countries in order to become competitive. The classical and neoclassical theory perception of laissez fair and the alleged mutual benefits among trading countries is therefore weakened in this empirical analysis. Following this perspective, it would imply that the most open economies are also the richest countries. But do we see a systematic trend among the countries having high and low values of openness in the aggregate sample? Table 15 (below), gives an overview of the countries with the lowest and the highest values of OPENNESS. Among the top 20 countries with the highest score on the openness variable, ten of the countries belong to the group of low-income or lower-middle income.³⁰ Seven of the remaining countries belong to the group of higher-income countries. For the bottom top 20 of the data set, nine of the countries are low-income or lower-middle, while eight countries are high-income countries, all of them members of the OECD. This implies that there is a mix of both rich and poor countries in both groups, and a striking representation of OECD countries at the bottom top 20 list, which makes the negative coefficient between openness and growth

³⁰ Using the World Bank classification (WB 2008).

obtained in the regression therefore not surprising. These results are contrary to the findings of Sachs and Warner (1995). They argued that a majority of developing countries had closed trading regime, and explained bad economic performance with the absence of openness.

Table 15: Top/bottom 20 countries – OPENNESS

Top 20 OPENNESS		Bottom 20 OPENNESS	
Ghana	Guyana*	Somalia*	Nigeria*
Lebanon	Zambia*	Japan**	Turkey**
Singapore**	Malaysia	Iraq*	Brazil
Gambia*	Cape Verde*	Russia	China*
Hong Kong**	Suriname*	Korea, Republic of**	Greece**
Turkmenistan*	Sri Lanka*	Spain**	Poland**
Malta**	Netherlands Antilles**	Congo, Dem, Rep.*	Italy**
Luxembourg**	Antigua**	United States**	Burundi*
Djibouti*	Bahrain**	Laos*	Uganda*
Tajikistan*	Panama	Argentina	Ethiopia*

* = Low-income or lower-income country

** = High-income country

The convergence controller, LNGDP, turn out to have a significant effect on growth, although with the opposite sign than expected. All the studies which accounts for the convergence hypothesis found convergence to appear with a significant effects (Edwards 1997; Greenaway et al. 2002; Levine and Renelt 1992; Sachs and Warner 1995). Greenaway however, found the effect to be very weak with a coefficient of -0.003. My result gives a clear indication of *divergence* in the aggregate sample with a coefficient of 1.07. This is also a logarithmic relationship, so the effects will be different at the low and high ends. The minimum value of RGDP is 170.6 (Liberia).³¹ The increase is 0.7 percentage points, ceteris paribus, when RGDP goes from minimum to the mean value of 7151.6 (Uruguay). Going from the mean to the highest value of RGDP, 84408.2 (Qatar), the increase is weaker with 0.4 percentage points, implying

³¹ In million US \$.

that the increase is stronger at the lower end. When the sample is split into OECD versus non-OECD countries, the results change. LNGDP appears to be negative and significant for the OECD countries, implying that convergence do occur within this group of countries. For the non-OECD countries, divergence is rather a fact and appears with a positive sign. In the literature, one issue concerned whether convergence occurred to be conditional or absolute. Since it only applies for the OECD countries, support is given for conditional convergence to be true. In light of the theory that addressed the convergence issue, this gives support to the heterodox thinkers. Myrdal, who represented the institutional perspective, especially focused on the divergence in income levels among developed and developing countries due to circular and cumulative causation resulting in backwash effects for inferior countries in the periphery, and spread effects for superior countries in the industrial centres. Friedrich List's notion of convergence only among symmetrical economies is strengthened when convergence appears to be present among the OECD countries. The equalization theorem predicted by Heckscher and Ohlin do not appear to be true for the aggregate sample, only for the OECD countries, once again implying that classical and neoclassical trade theories are best suitable for developed countries.

AGRIX shows a significant and positive, although weak, effect on growth. According to the aggregate results, a one percent increase in the share of agricultural exports to GDP raises growth by 0.03 percent. This is not in line with the hypothesized effect, since primary sector specialization was argued by Prebisch-Singer to be the root cause for the inferiority of developing countries. Both Melchior (2007) and Sachs and Warner (1995) found a higher share of agricultural exports, compared to manufacturing, to be negatively correlated with growth. Specialization in agricultural production and exports may not appear to be as bad as the heterodox theories predict after all. One possible explanation could be that the major oil-producing countries are not excluded from my sample, thus gives this positive effect between agricultural exports and growth. In the group of OECD countries, AGRIX turns out to be insignificant, implying that agricultural exports are not an influential factor concerning growth. The result for the non-OECD countries however, is the same as for the aggregate sample.

Concerning the geography indicator, population density was transformed into LNPOPD, and therefore has a logarithmic relationship with growth. The coefficient is significant and negative, which indicates a negative relationship with growth. This result contradicts with the findings in the literature (Melchior 2007; Sachs and Warner 1995). POPDEN has a minimum value of 0.83 people per sq. km (Mongolia). When going from the minimum value to the mean value of 228.2 (Vietnam having the closest value) the decrease is 403.8 percentage points.³² The decrease is 4.0 percentage points when going from the mean to the maximum value of 16213 people per sq. km (Macao), which indicates that the decrease is much higher at the lower end of the variable.

The control variables population growth and investment were suggested by Levine and Renelt (1992) to be core variables frequently included in growth regressions. These variables are the only indicators of growth that have appeared with the same sign and significance in all the studies reviewed, along with the literature models. POPG is negative in all the three samples in this analysis, although for the OECD countries the variable is not significant. The coefficient shows also a weaker, negative effect with growth. Compared to the results in the literature, the findings in this analysis show a very negative effect between POPG and growth, with a coefficient of -59.8, which indicates a 60 percent decrease in the growth rate following a one percent increase in population growth. Levine and Renelt found the coefficient to be -0.02 and Greenaway et al. (2002) obtained a coefficient of -0.41. INVEST appears with a positive and expected sign in the final model, although it is significant only at the 0.06 level. The result is in line with the findings in previous studies and Literature model I and II. Greenaway et al. had the only study that did not find a significant effect of the variable. Based upon the findings in this empirical analysis, along with the findings of previous research, I can conclude with a high degree of certainty that a higher share of investments to GDP induces a positive effect on economic growth.

³² Technical note: As can be read from the descriptive statistics for the transformed variable, LNPOPD (see Table 4), the value appears with a negative sign. However, this contradicts with the purpose of transforming the variable to obtain a linear relationship, because multiplying a negative coefficient with a negative number on the minimum value, will give a positive product. I will therefore assume that the value is zero, as the minimum value on the logged variable is close to. (Min. value = -0.19).

REGIME was included in the final model in order to contribute with new perspectives in the trade and growth literature, although it was not significant at the 0.05 level in the core variable model. Significance does not increase this time either in the aggregate sample, implying that political regimes do not have an impact on growth. For the sample of OECD countries however, REGIME enters with a significant effect on growth. Not all of the OECD has always been a member of the organization since its establishment in 1961. One of the prerequisites for becoming a member is “...countries must commit to democracy and market economy” (OECD 2008). But that does not mean that they have always been democracies. Many of the current OECD countries have been under dictatorships in the past, such as for instance the former communist states of Eastern Europe. The table below give an overview over current OECD members and the time period with a dictatorship as political regime:

Table 16: Time periods of dictatorship

OECD country	Time period under dictatorship
Greece	1967-1973
Hungary	1971-1989
Republic of Korea	1954-1959 and 1961-1987
Mexico	1959-1999
Poland	1971-1988
Portugal	1951-1975
Spain	1951-1976
Turkey	1951-1960, 1980-1982

The relationship between dictatorships and growth appears to be positive with a coefficient of 1.72, and indicates that the countries had higher growth rates during the period of dictatorship. High growth rates do not necessarily correspond with high income levels, since high growth can lead to adverse macroeconomic consequences in form of high inflation rates. One of the main goals of the OECD is to contribute to growth in world trade, but also support *sustainable* economic growth (OECD 2008).

I have now interpreted the results for each individual independent variable constituting the final model. However, I am still curious to find out if the results could change if things had turned out

different, such as using TARIFF as the openness indicator instead of LNOPEN. That is the next task in the section to come.

5.4.2 Counterfactual models

When the final model was built, a number of variables were excluded either because they turned out not significant at the chosen level, or rejected on the basis of multicollinearity. Some of these variables were believed to have a great influence on growth, such as institutional quality. Some of these variables are therefore included again in a final model they *could* fit into. The results are shown in the table below:

Table 17: Regression results – counterfactual models

Variable	R1a)	R1b)	R1c)	R2	R3	R4
LNOPEN				0.56 (0.39)	-0.57 (-1.45)	-0.51 (-1.32)
TARIFF	0.02 (1.17)	0.01 (0.16)	0.03 (1.08)			
AGRIX	-0.03 (-0.97)	0.03 (0.15)	-0.03 (-0.75)	-0.14* (-1.93)	0.03** (2.18)	0.03** (2.3)
LNNGDP	2.92** (2.60)	-2.14 (-1.25)	5.82*** (3.27)		1.15** (2.62)	1.23** (2.94)
LNPOPD	-4.59** (-2.84)	-6.09 (-1.27)	-5.05** (-2.72)	-15.49** (-2.96)	-2.56*** (-5.21)	
POPG	-147.06*** (-5.81)	-164.43** (-2.18)	-140.56*** (-4.83)	-88.80** (-3.22)	-59.82*** (-8.03)	-34.7*** (-5.37)
INVEST	0.21*** (4.59)	0.46*** (7.49)	0.17** (2.89)	0.13 (1.40)	0.08*** (3.92)	0.08*** (3.81)
INSTAVG				-2.15 (-1.20)		
REGIME		1.84* (1.84)		-0.14 (-0.12)		0.26 (0.70)
DEMINST					-0.15 (-1.01)	
LNPOPOP						-2.47*** (-5.20)

*= sig. at 0.1 level
 ** = sig. at 0.5 level
 *** = sig. at 0.01 level
 (t-statistics in brackets)

A highly debated issue in the literature concerned the choice of openness indicator. LNOPEN was preferred over TARIFF in my analysis, because it appeared to be significant with the core variables POPG and INVEST, and TARIFF was not. LNOPEN is also available for a larger number of years, thus giving a larger number of observations. I have nevertheless run regressions with TARIFF as the openness indicator, also on the split sample. TARIFF do not appear to be significant in either the aggregate sample (R1a), the OECD sample (R1b) or the sample of non-OECD countries (R1c) this time either. My hypothesis was ambiguous on the effect of TARIFF, since tariffs is also an important source of gaining revenues for nations. This is in line with the findings of Melchior (2007), although he found the variable to be significant only at the 0.1 level. The effect of agricultural exports is more in line with the theory and the previous findings, as this variable appears with a negative sign. However, the estimates are not significant and thus fragile. The other independent variables stay mostly the same compared to the final model, except LNPOPD which appears to be negative in all three samples in the TARIFF models.

R2 is the regression with INSTAVG included.³³ Surprisingly, institutional quality turned out to be highly insignificant when included in the growth regression and with a negative sign on the coefficient. When the variable is included once again with a set of the other independent variables constituting the final model (except LNGDP which is multicollinear with INSTAVG), significance do not increase. Institutional quality can therefore with a high degree of certainty be said to not influence growth in my study. The results did not change when the sample were split into OECD and non-OECD countries. The previous studies that included an indicator of institutional quality all found a positive relationship with growth (Edwards 1997; Melchior 2007; Rodrik et al. 2002). However, Edwards did not obtain a significant effect on the indicator, but it was quite close with a t-stat of -1.5.

DEMINST was rejected in favour of REGIME in the final model due to multicollinearity. In R3, DEMINST substitutes REGIME. The results do not change to any substantially degree, so using

³³ The results for R2, R3 and R4 are shown only for the aggregate sample. When running regressions on the split sample, the results did not contribute with any new perspectives compared to the aggregate findings or former findings.

DEMINST instead of REGIME would not add much to the overall results. LNPOPD was chosen over LNPOP as the country size measure. R4 shows the results when LNPOP is substituted for LNPOPD. The coefficient of LNPOP indicates a negative relationship with growth, and the estimate is significant. This is in line with the results from the literature (Greenaway et al. 2002; Levine and Renelt 1992) Total population (POP) decreases with 5.6 percentage points when going from the minimum value of 13 400 (Palau) to the mean value of 28 955 400 (Qatar). The decrease is 1.6 percentage points from the mean to the maximum value 1 294 845 580 (China), indicating that the largest difference is at the lower end of the variable. A plausible explanation for population to correlate negatively with growth is that a larger population means more mouths to feed. However, the negative effect population has on growth is not as strong for the OECD countries. A larger population also means more potential productive powers which the rich countries can take advantage of to a larger degree than poorer countries.

5.5 Testing OLS assumptions

In chapter four, the common assumptions of OLS regressions were accounted for. In this section robustness checks of my results are undertaken, including tests for multicollinearity, heteroscedasticity and autocorrelation.

5.5.1 Multicollinearity

A preliminary test of multicollinearity was undertaken in 5.2.2 based on the collinearity matrix between each of the independent variables. A weakness with this approach is that it only accounts for correlations between one independent variable and another independent variable at a time. In multivariate regressions, one must account for the relationship with all other independent variables. The tolerance test is a stronger test, defined as one minus the explained variance in one independent variable x due to the other independent variables in the regression equation (Pennings et al. 2006:163). A rule of thumb is the closer to 1, the better. The results are shown in the table below:

Table 18: Tolerance test – final model

Variable	R²	Tolerance (1-R_x²)
LNOPEN	0.50	0.50
POPG	0.40	0.60
INVEST	0.37	0.63
AGRIX	0.22	0.78
LNGDP	0.81	0.19
LNPOPD	0.94	0.06
REGIME	0.26	0.74

As can be read from the table above, LNGDP, LNPOP and LNPOPD are all far from the ideal tolerance value of 1, which indicates that there are problems with multicollinearity in my model. Kennedy (2003) suggests that multicollinearity can arise for several reasons: For example that the independent variables might share a common time trend, one independent variable can be the lagged value of another that follows the trend, or some independent variables may have varied together because the data was no collected from a wide enough data sources (Kennedy 2003:206). If multicollinearity poses a problem at all is not agreed upon in the literature. Pennings argues that research based on data from official statistical agencies, tolerances between 0.01 and 0.25 may still be acceptable since these data are not prone to measurement errors (Pennings et al. 2006:163). The data sources for the respective variables are collected from PWT and WDI, which are both recognized as reliable sources. Based on this assumption, I can conclude that multicollinearity is not a problem in the final model.

5.5.2 Heteroscedasticity

Heteroscedasticity refers to the correspondence of the spread of residuals with the independent variables. The variance of the error term should be constant for all values of X. If the spread of the residuals increase or decrease with the values of the independent variables, the assumption of homoscedasticity is violated. To test whether heteroscedasticity is a problem in the final model, a regression analysis on the final model has been run with and without applying the White heteroscedasticity consistent estimator. The standard errors for the variables are compared before and after, so presence of heteroscedasticity can be tracked. The comparison of the output before and after did not change the standard error estimates for each variable to any substantial degree. Although the t-values decreased slightly for each variable, it did not affect

the significance of any variable. I can therefore conclude that heteroscedasticity is not a problem of my final model.

5.5.3 Autocorrelation

Panel data often faces the problem of autocorrelation due to the inclusion of time series.

Autocorrelation means that the dependent variable displays a rigidity that is not accounted for by the independent variables (Pennings et al. 2006:152). This potential problem was accounted for as fixed effects are included in the model. The estimated value of autocorrelation is -0.006, which indicates that autocorrelation is not a problem. A stronger test was implemented by running the final model with and without fixed effects, and comparing the output. No significant changes of the estimates occurred, so I can safely conclude that autocorrelation is not a problem in my model.

5.5.4 How good is the model?

To include all relevant variables that can explain cross-country and time variation in economic growth is way beyond the scope of this paper. I have chosen to focus on three strands of thought argued by Rodrik et al. (2002) to stand out in the growth literature, which includes the role of trade, geography and institutions, along with a set of control variables. In addition, a group of variables measuring political regimes were included in order to contribute with some new perspectives in the trade and growth literature. I am therefore well aware that my model leaves much unexplained variation, as I have not included any variables related to for instance human capital, health, political stability or other macroeconomic measures which surely affects the rate of growth. However, the choice of variables has been theoretically motivated in line with the logic of analysis, which is first and foremost *theory testing*. Adjusted R^2 gives a value of 0.10, which indicates that my model can explain about 10 percent of cross-country economic growth. Even though the number can be regarded as low, I am quite satisfied as my thesis has only concentrated on four groups of indicators related to growth. However, in regression analysis the objective should not be primarily to reach the highest R^2 as possible, but to obtain dependable estimates of the true population regression coefficients. A low R^2 only implies that more factors accounts for the unexplained variation in the dependent variable, not necessarily that the model is not good (Skog 2004:279).

5.6 Concluding the empirical analysis

The first empirical analysis conducted in this chapter, was tests of the robustness of results obtained in previous research. Variables frequently included in growth regressions were constituted Literature model I and II. Multivariate regression analyses were run in order to establish some insights about the robustness of earlier findings. An ongoing issue in the literature on trade and growth is how to measure openness to international trade. Two models were therefore made, one including the trade share as the openness measure (Literature model I) and another model including average tariff levels as the openness measure (Literature model II). The variables were tested by groups as they represented different strands of thought in the growth literature. However, the results obtained were rather fragile. Many variables appeared to be insignificant, and those that were significant mostly showed the opposite effect on growth than most of the studies reviewed. For the relationship between openness and growth, LNOPEN was significant only in the model where institutional quality were included. TARIFF was significant and gave a positive effect on growth in the model of trade variables. The effect became negative in the model with institutions included, thus giving ambiguous results in line with the previous studies. I had therefore not reached an adequate answer to my research question, and started to build a new model with the aim of establish some new knowledge about determinants of economic growth.

Seven independent variables which were found to have an impact on growth constituted the final model. To test for possible differences between countries with high-and low incomes, the sample was split in two groups: OECD countries versus non-OECD countries. The main findings are that the effect of openness on growth is only significant for the OECD countries. For the aggregate sample and the sample excluding OECD members, openness does not appear to have a significant effect. Among the 20 countries being most closed to international trade (having the lowest values of trade share to GDP), the largest group of countries are made up by members of the OECD, which contradicts with arguments put forward in the literature that developing countries are poor due to a closed trading regime. Concerning convergence in income levels among countries, my results find this to be true only among the group of OECD

countries. The aggregate results rather indicate divergent income levels. Regarding REGIME, it turns out that the variable is only significant in the sample of OECD countries. The results indicate that the OECD countries which have experienced both democratic regimes and dictatorship, experienced higher growth rates during the period(s) of dictatorship.

All in all, the arguments put forward by Friedrich List a century ago about free trade being mutually beneficial only among symmetrical economies seems to be the most reasonable explanation among the perspectives presented in chapter two. Concerning the doctrine of comparative advantage, specialization in agricultural exports does not appear to have the detrimental effect predicted by for example the Prebisch-Singer hypothesis. The aggregate result indicates a positive (but weak) impact between agricultural exports and growth. This gives support to the classical and neoclassical theories relying on the concept of comparative advantage as determinant of the sources and patterns of trade.

6 CONCLUSION

This thesis has been motivated by a genuine interest in understanding the role of trade liberalization within a development perspective. As economic growth is a prerequisite for developing countries to “catch up” with developed countries, assessing the relationship between openness to international trade and economic growth has been the research question of the thesis. In an era of globalization, wider and deeper economic integration is spreading to every corner of the world. Consequently, a large part of the world population is affected by decisions taken by policy-makers in powerful multilateral institutions governing the global economy. Ideological beliefs of global organizations such as the World Bank, IMF and the WTO have supported the pillar in the Washington consensus supporting trade liberalization as the “universal medicine” for growth. My aim has therefore been to test the extent of validity of this position. A second goal has been to identify alternative factors influencing growth, in order to compare the explanatory power of these factors to the role of trade liberalization.

A large number of empirical studies have attempted to give an adequate answer to my research question. The literature appears to be inconclusive regarding the impact of openness to international trade on growth, as well as the power of alternative driving forces of growth. Further research therefore seems to be required. My contribution has been to test existing theories of international trade, along with the robustness of the finding of more recent empirical studies by using multivariate regression analysis on panel data, and the OLS method.

I started out in chapter one by presenting the topic and the research question of this thesis. A brief overview of “where we are today” and the purpose of the thesis were given before I outlined the overall research strategy. In chapter two I presented the theoretical framework forming the basis of the thesis. Two main directions stand out: The classical and neoclassical school of thought is characterized by advocating free trade policies, and the heterodox theories which criticize this perception by advocating protectionist trade policies to a certain degree. Chapter three gave an overview of seven empirical studies conducted within the last 15 years. The key explanatory variables were presented, as well as the correlation and significance of each indicator on growth. Following the argument of Rodrik et al. (2002), three strands of

thought stand out in the literature: The role international trade, geography and institutions. The main variables were therefore organized by groups after this division.

The methodological framework for studying the research question was presented in chapter four. Following in the footsteps of Durkheim, a variable-oriented approach was chosen by adopting regression analysis using panel data in order to capture both the cross-country and the time dimension. The empirical analysis in chapter five was conducted in two steps: In the first part, tests of previous research were carried out by including the key variables identified in chapter three. Two literature models were tested by using two different measures of openness. In the second part, I built my own model by applying a comprehensive statistical strategy, and ended up with a final model consisting of significant determinants of growth. In addition to the key variables included in the literature models, a fourth group of variables related to political regimes were included in order to contribute to some new perspectives not frequently assessed in the literature on trade and growth. In the next section, the results of my own empirical analysis is presented and evaluated in terms of the findings the previous empirical studies reviewed.

6.1 Summary of findings

The findings are compared in terms of the impact each independent variable have appeared to have on growth regarding direction and significance. My findings are compared with the findings obtained in the empirical studies reviewed in chapter three and the literature models in the first part of chapter five, as well as comparison between the groups of samples. This is summarized in the table below:

Table 19: Summing up the results

Variable	Prev. finding	Literature model I	Literature model II	My findings: Aggregate	My findings: OECD	My findings: non-OECD
LNOPEN	-/+*	-*/-/+*		-	+*	+
TARIFF	+/-*		-*/+*	+	+	+
LNGDP	-*	+*	+*	+*	-*	+*
AGRIX	+*	+*/-	-	+*	+	+*
LNPOPD	+/+*	-*	-*	-*	-*	-*
LNPOP	+*/none			-*	-*	-*
INSTAVG	+/+*	+	-	-	-	-
INVEST	+/+*	+*/-	+*/+	+	+*	+
POPG	-/-*	-*	-*	-*	-	-*
REGIME				+	+*	+
DEMINST				-	-*	-

The role of international trade

Recall that the thesis started out with a quote which stated that implementation of a correct trade policy enhances growth and welfare, while a wrong trade policy could “spell disaster”. The main finding of my analyses, however, is that trade liberalization does not appear to have a significant effect on growth for a majority of the countries included in the study. This finding is valid for both the induce-based openness measure, LNOPEN, and the outcome-based openness measure TARIFF, hence challenging earlier findings. The results from the previous studies were ambiguous regarding the effect of LNOPEN on growth, although it was only the positive findings that appeared to be significant. In Literature model I, significant effects were found both for positive and negative correlations, depending on the group of variables included in the growth regression. Based upon my findings, openness appears only with a significant effect for the group of OECD countries. For the remaining countries, the results show that LNOPEN is not a driving force for economic growth. A remarkable finding, was that among the 20 countries being least open to trade in the sense of having the lowest values of exports plus imports as a share of GDP, about half turned out to be OECD countries. This implies that the link between closed trading regimes and poverty is not in line with the arguments put forward by Sachs and Warner. It is important to underline that the null hypothesis for the expectation of openness and growth is not verified, namely that openness induces a *negative* impact on growth, as the

negative coefficient for the aggregate sample is not significant. But it suggests that a *robust* relationship between openness and growth still remains to be established.

The alternative openness measure, TARIFF, was found to correlate negatively with growth in the previous studies, implying that low levels of average tariffs is good for growth. When testing this in Literature model II, the results were ambiguous as both a positive and a negative coefficient were obtained with a significant effect, depending on the group of variables included. My findings did not show significant effects of tariffs on growth for any of the samples. The number of observations was substantially reduced when using this measure, as tariff data are only available for a relatively short period of time. The implication of these results is that a robust relationship between average tariff levels and growth has yet to be established also for this openness measure. Classical and neoclassical theory stated that free trade would lead to the most efficient resource allocation, hence being mutually beneficial for the countries engaged in trade. Considering the findings of both previous studies and my own findings, a “one size fits all” approach of trade liberalization does not seem to hold. The findings of this thesis are more in line with Friedrich List and his infant industry argument. He argued that free trade was specific to time and place, implying that it is only mutually beneficial among symmetrical economies, which is in line with my findings of the positive and significant relationship which appears only for the group of OECD countries.

A second effect of trade liberalization as predicted by neoclassical theory is the presence of convergence in income levels. Poorer countries are believed to grow with a faster pace than richer countries and eventually “catch up”. Regarding the findings of the convergence hypothesis, there seems to be a consensus of convergence to occur among the studies reviewed. However, some of the studies only found convergence to occur when other contingent factors were present, thus arguing that convergence is conditional and not absolute. Support for the convergence hypothesis is only consistent with my findings for the OECD countries, which corresponds with a former study by Dowrick and Nguyen (1989) who also found convergence among OECD countries. Remarkably, my findings for the aggregate sample and the non-OECD countries, along with the findings of Literature model I and II, show *divergence* in income levels rather than convergence. This disproves the allegation of a catching up by developing countries,

as predicted by the Heckscher-Ohlin theorem. The critique put forward by heterodox theory, especially the institutionalist Gunnar Myrdal, are therefore entitled in terms of my empirical findings.

The last variable related to international trade was the effect of specialization in the agricultural sector measure by the share of agricultural exports to GDP. As proposed by the Prebisch-Singer hypothesis, specialization in primary products worked to the detriment of developing countries due to bad terms of trade. This was a critique of the concept of comparative advantage being the point of departure of classical international trade theory for explaining sources and patterns of trade. The results obtained in previous findings and Literature model I give support to this hypothesis. My findings however, are not consistent with this. Both for the aggregate sample and the group of non-OECD countries a significant and positive relationship was found. For the OECD countries, agricultural exports did not turn out to be significant.

The role of other determinants of growth

Economic growth is a complex issue, which implies that assessing the role of international trade and growth can not be done without accounting for other plausible determinants of growth. Variables related to geography, institutions and political regimes have been included in the growth regressions, along with a set of control variables. Country size was presented as the geographical indicator, including both population density and total population. Frankel and Romer proposed the hypothesis that larger countries induced more within-country trade, which was positively related to growth. Previous studies found that both population density and total population was positively related to growth, although not every study found it to be significant. My findings and the results in the Literature models are not consistent with this, as both LNPOPD and LNPOP appear to be significant and negatively correlated with growth.

Regarding the role of institutions on growth, the results of this thesis have been unexpected. The previous findings suggested that this factor had a strong, significant and positive impact on growth, as it represented a main strand of thought in the growth literature. However, the variable never appeared to be significant in my study, not when included in the literature models, nor when included in my counterfactual final model. Myrdal especially addressed institutional

quality, or the lack of such, for being an explanatory factor for the poor state of developing countries. He stated that poverty was a consequence of past institutional arrangements rather than of the workings of the law of comparative advantage. Poor countries were also accused of being unresponsive with regards to make efforts for changing their institutions. Krugman also pointed to institutional quality in order to establish “clear rules of the game” as a prerequisite for growth. One plausible explanation for the insignificance of the variable when included in my growth regressions, is the relatively few number of observations connected with this variable as it is only available from 1996. I am therefore careful with making empirical generalizations based on my results, as I find these results to be robust at a low level of certainty. More robust results are left to future research to establish, when more general trends can be assessed as the number of years for data available increases. Yet, without relying on any statistical proves, I find it hard to believe that institutional quality should be detrimental to growth, as it lays the ground for well-functioning societies. I would rather rely on the argument put forward by Przeworski, that inclusion of institutional measures in growth regressions are particularly faced with endogeneity problems. The fragile results can possibly be explained by some kind of measurement error.

Investments and population growth were included in the regression as control variables, thus not being theoretically motivated. Investments were commonly found to induce a positive and significant effect on growth in the previous studies, although with one exception where the variable was not found to be significant. The positive and significant effect was consistent with the results in the literature models, but in my models investment share was only found to be significant for the group of OECD countries. Regarding population growth, previous findings found it to have a negative effect on growth, although one study did not find the effect to be significant. The findings in the literature models and my models are consistent with earlier findings, although for the OECD countries, they did not appear to be significant.

A secondary goal of this thesis, following the testing of existing theories and findings, was to contribute with some new perspectives not frequently addressed in the literature on trade and growth. Variables related to political regimes were included in the final model, in order to test the role of democracies versus dictatorships on growth. The variables only appeared to be

significant for the OECD countries, and implied that higher growth rates were obtained for current OECD countries in times of dictatorship. This finding was contrary to what I expected, but it is closely connected with one of the goal in the OECD that *sustainable* growth is preferred over high growth rates, as the latter can cause macroeconomic instability, such as high inflation rates.

After I have summed up and assessed the findings of my thesis, how confident can I be that my results are true? Robustness checks were undertaken by the OLS method, in order to minimize the sum of squared residuals to obtain the best linear unbiased estimator. My final model passed all the tests for the OLS assumptions, including a test for outliers, multicollinearity, heteroscedasticity and autocorrelation. However, every study using statistical techniques as the tool of analysis is exposed to certain limitations. Results are at best probabilistic, thus universal generalizations can never be made. The problem of missing data and omitted variables will always be present, which decreases the potential for making generalizations. As addressed above for the institutional indicator, studies undertaken in social sciences are often constrained by the endogeneity problem. Social phenomena are complex, and often interdependent. In my study, data relevance were given priority over data exogeneity, in order to give the best measures reflecting the theoretical concepts, since the logic of analysis of my thesis is *theory-testing*.

6.2 Suggestions for future research

The most adequate answer to my research question resulting from this thesis is that openness (related to volumes of trade) induces a positive effect on growth only for OECD countries. For the remaining countries, which represent the majority of the countries in the world, other determinants than openness to international trade seem to be more influential on growth. I am still left with the question of *why* openness did not appear to affect growth for the non-OECD countries, neither in a positive or a negative way. However, it seems like certain factors must be present in order for openness to have a positive effect on growth. Future research should therefore look for *contingent* relationships when addressing the role of openness and growth. The regression analysis conducted in this thesis was based on additive effects, while a suggestion for future research could be to utilize interaction models to a larger scale, in order to

establish knowledge about the contingent factors that must be present. In this way, research can reveal *under what conditions* a liberal trading system can be mutually beneficial, also for the losers of this game.

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APPENDIX A: CORRELATION MATRIX

	POPG	INVEST	OECD	TARIFF	AGRIGDP	AGRIX	FOODX	INSTAVG
POPG	1.00000							
INVEST	-.32568	1.00000						
OECD	-.36142	.60303	1.00000					
TARIFF	.32439	-.45158	-.53421	1.00000				
AGRIGDP	.44389	-.53147	-.51320	.49483	1.00000			
AGRIX	.23217	-.20788	-.18882	.12332	.43600	1.00000		
FOODX	.26292	-.36421	-.30597	.22967	.45112	.05488	1.00000	
INSTAVG	-.39381	.59477	.73729	-.58794	-.70607	-.18072	-.27944	1.00000
	POPG	INVEST	OECD	TARIFF	AGRIGDP	AGRIX	FOODX	INSTAVG
REGIME	.40566	-.28796	-.40242	.36138	.32503	.10473	.06265	-.49230
DEMINST	-.10438	.08370	.08810	-.23335	-.10698	-.00927	.12016	.15312
LNGDP	-.45816	.60309	.64738	-.56714	-.89520	-.36554	-.43496	.80538
LNPOPD	-.09641	.17957	.07671	.03744	-.09977	-.26390	-.02141	.10015
LNOPEN	-.11126	.17982	-.03408	-.26316	-.30215	-.15502	-.12337	.24489
LNPOP	.03911	.08662	.17855	.05676	.07215	-.02274	-.26562	-.16392
	REGIME	DEMINST	LNGDP	LNPOPD	LNOPEN	LNPOP		
REGIME	1.00000							
DEMINST	-.76361	1.00000						
LNGDP	-.35348	.05880	1.00000					
LNPOPD	-.05693	-.05463	.09445	1.00000				
LNOPEN	.00935	-.13742	.25733	.22733	1.00000			
LNPOP	.05719	.08109	-.10033	.03994	-.53365	1.00000		

APPENDIX B: SAMPLE OF COUNTRIES

Afghanistan	Dominica	Lesotho	Senegal
Albania	Dominican Republic	Liberia	Serbia and Montenegro
Algeria	Ecuador	Lithuania	Sierra Leone
Antigua	Egypt	Luxembourg	Singapore
Argentina	El Salvador	Macao	Slovak Republic
Armenia	Equatorial Guinea	Macedonia	Slovenia
Australia	Eritrea	Madagascar	Solomon Islands
Austria	Estonia	Malawi	Somalia
Azerbaijan	Ethiopia	Malaysia	South Africa
Bahamas	Fiji	Maldives	Spain
Bahrain	Finland	Mali	Sri Lanka
Bangladesh	France	Malta	St, Kitts & Nevis
Barbados	Gabon	Mauritania	St, Lucia
Belarus	Gambia	Mauritius	St, Vincent & Grenadines
Belgium	Georgia	Mexico	Sudan
Belize	Germany	Micronesia, Fed, Sts,	Suriname
Benin	Ghana	Moldova	Swaziland
Bermuda	Greece	Mongolia	Sweden
Bhutan	Grenada	Morocco	Switzerland
Bolivia	Guatemala	Mozambique	Syria
Bosnia and Herzegovina	Guinea	Namibia	Taiwan
Botswana	Guinea-Bissau	Nepal	Tajikistan
Brazil	Haiti	Netherlands	Tanzania
Brunei	Honduras	Netherlands Antilles	Thailand
Bulgaria	Hong Kong	New Zealand	Togo
Burkina Faso	Hungary	Nicaragua	Tonga
Burundi	Iceland	Niger	Trinidad & Tobago
Cambodia	India	Nigeria	Tunisia
Cameroon	Indonesia	Norway	Turkey
Canada	Iran	Oman	Turkmenistan
Cape Verde	Iraq	Pakistan	Uganda
Central African Republic	Ireland	Palau	Ukraine
Chad	Israel	Panama	United Arab Emirates
Chile	Italy	Papua New Guinea	United Kingdom
China	Jamaica	Paraguay	United States
Colombia	Japan	Peru	Uruguay
Comoros	Jordan	Philippines	Uzbekistan
Congo, Dem, Rep,	Kazakhstan	Poland	Vanuatu
Congo, Republic of	Kenya	Portugal	Venezuela
Costa Rica	Kiribati	Puerto Rico	Vietnam
Cote d`Ivoire	Korea, Dem, Rep,	Qatar	Yemen
Croatia	Korea, Republic of	Romania	Zambia
Cuba	Kuwait	Russia	Zimbabwe
Cyprus	Kyrgyzstan	Rwanda	
Czech Republic	Laos	Samoa	
Denmark	Latvia	Sao Tome and Principe	
Djibouti	Lebanon	Saudi Arabia	