The impact of Trade Openness on Economic Growth

A panel data analysis across advanced OECD countries

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Abstract

The role of trade flows in the modern economy has been brought to a focal point by the increased trade frictions, geopolitical tensions, countries exiting unions, pressures of global financial crises and the recent covid-19 pandemic. We, therefore, set out to examine the relationship between trade openness and economic growth among 31 advanced OECD countries between the period 2000 - 2018. Using a panel data analysis and utilizing a linear regression model with fixed effects, our findings show that trade openness has a positive and significant impact on economic growth. Our policy recommendation is that given a chosen level of economic integration, increasing investments can better leverage trade openness as a tool to enhance growth.

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Keywords: trade openness, economic growth, OECD, panel data, fixed effects

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1. Introduction

> We live in an age of unprecedented globalization. First mass media and then social media exposed us to the ideas, products and languages of our most far-flung counterparts around the world. Advances in finance, technology and logistics have facilitated more trade, and trade in a richer variety of goods and services, than at any time in human history. (Rampbell, 2016 para.16)

The impact of international trade on economic growth has been a key discussion in the field of development in recent centuries with prominent economic works of, inter alia, Adam Smith (1778), David Ricardo (1817), Robert Solow (1956), and Paul M. Romer (1990).

Better economic performance has “historically gone hand-in-hand” with trade openness, creating prosperity, improving working conditions, and promoting an overall “greater stability and security for everyone” (OECD, n.d. para.1). Opening to trade with other countries makes it possible for the domestic producers to increase their output given that the market expands, the exposure to competition encourages innovations and provides access to technologies and ideas that would not have been possible otherwise (Ibid., n.d.).

The importance of international trade is highlighted by the existence of many organizations and agreements that promote trade and aim to bring about beneficial outcomes among trading parties. Organizations such as the International Monetary Fund (IMF), a cooperation for a stable monetary system (IMF, 2021) and the Organisation for Economic Co-operation and Development (OECD) that seeks to achieve the highest sustainable growth and contribute to the expansion of world trade (OECD, 2020). There is also the establishment of the European Union (EU), an economic and political coalition with free trade among its members (European Commission, 2020), and the World Trade Organization (WTO), a multilateral trading system that deals with the rules of trade and trade negotiations (WTO, 2021).

Overall tariffs and trade barriers saw a decrease in the 1990s. Tariffs within OECD countries decreased the least, however, remained lower than non-OECD and developing countries (Dao, 2014). The world economy has had an overall sustained

positive growth for the past couple of centuries, accompanied by a significant increase in global trade and trade agreements (Beltekian & Ortiz-Ospina, 2018).

Countries that implemented market liberalization reforms such as the Washington Consensus, experienced mixed economic results. The consensus was to lower barriers to trade and investment due to the belief that protectionism created distortions in economies (Williamson, 1990, 2009). The results challenged the widely held support for trade liberalization (World Bank, 2005). The latest round of negotiations among WTO members aimed to reduce tariffs for agriculture, industrial, and service products (WTO, n.d.). However, this met resistance from developed countries, concerned about being undermined by foreign competition (Dao, 2014).

The role of trade flows in the modern economy has been brought to a focal point by the increased trade frictions like the tariff war between the United States and China, geopolitical tensions, countries exiting unions, pressures of global financial crises as seen in 2008 and the covid-19 pandemic. For example, by exposing the vulnerabilities countries face from relying on global trade for key products (e.g., microchips, medical supplies, vaccines), the recent pandemic has made autarky look like an increasingly attractive option. Moreover, trade barriers are on the rise, the European Commission (2020) registered 43 new trade hindrances in 2019, adding that “there seems to be a paradigm shift, with protectionism becoming ingrained in trade relations” (Ibid., 2020, p. 34). While this might contradict the classical economic belief that foreign trade brings benefits and prosperity, we see limits to trade and travel between countries being erected in the name of safety, domestic job protections, and self-sufficiency (The Economist, 2021).

1.1. Problem Statement and Research Question

Given the vast amount of research in the area of growth and trade (e.g., Frankel & Romer, 1999; Rodríguez & Rodrik, 2000; Dollar & Kraay, 2003; Rodriguez, 2007; Dao, 2014; Tahir & Ali, 2014; Huchet-Bourdon et al., 2018; Altaee & Al-Jafari, 2018; Wacziarg & Welch, 2008), and the discrepancy between trade protection policies and international trade advocates, our standpoint is that the effect of increased trade is far from settled both within academia and policy making. However, what is apparent is that engaging in international trade has made economies exceedingly more connected and interdependent than in the past (Rodriguez, 2007).

We seek to evaluate the effect of international trade on the growth of an economy by looking into the relationship between trade openness and economic growth. Examining whether global trade integration has a significant impact on the growth of a country's economy and the direction of that impact, the research question we ask:

Does trade openness have an impact on economic growth
across advanced OECD countries?

1.2. Research Design and Scope

We take on a quantitative approach by empirically exploring the trade-growth relationship across advanced OECD countries[1]. Advanced economies are defined as industrialized/ developed countries with a high level of GDP per capita and diverse exports, well integrated into the global financial system and international trade (IMF, 2013). The scope of the study is from 2000-2018 to account for the most recent development. We conduct a panel analysis and utilize multivariate linear regression with fixed effects. Our primary variables are economic growth, measured by the real GDP per capita growth and trade openness, measured as the share of imports and exports to the real GDP. We also control for human and physical capital, innovations, institutional quality, and trade restrictions. Variable choices are grounded in previous studies presented in the literature review and theoretical framework.

[1] See Appendix: Table 1

1.3. Contribution and Findings

Economies get exposed to new challenges that alter the previously established relationships. New research on the topic of international trade and economic growth can therefore be used as a guide to new or renewed trade policies. Our contribution to the field is an exploration of the data that is more recent and updated and by focusing on advanced OECD countries. To an extent, we envision that the knowledge we attain will guide policies and provide bearing if limitations on foreign trade are justified, or if the economic consequences exceed the benefits of self-dependency.

To anticipate, our main findings show that trade openness is an important and positive factor in determining the growth of an economy. However, trade openness, in isolation, is not sufficient in inducing a statistically significant impact.

1.4. Thesis Structure

The thesis continues as follows: section two reviews relevant literature in the field of trade and economic growth starting from the 1990s, while section three focuses on the conceptual and theoretical framework on why countries engage in trade and what are the determinants of economic growth. The methodology and applied model, along with the explanation behind chosen sample and estimation techniques, are reported in section four. Results and discussion are reported in sections five and six. The last section of the paper presents the conclusion, containing further research suggestions and policy recommendations.

2. Literature Review

The section includes what we consider to be the most influential work in the development of the field during the 1990s and early 2000s. We then continue by reviewing the current state of the field, with a particular focus on the choice of variables and their measurements. To an extent, we also include the source of data and regression methods.

2.1. Development of the Field

The 1990s saw a groundbreaking contribution to the endogenous growth model by Romer (1990) who put the nonrivalry of ideas at the center of growth. Furthermore, studies carried out in the 1990s showed a solid positive relationship between trade openness and economic growth, influencing both policymakers and researchers (Tahir & Ali, 2014).

The extensive work of Sachs & Warner (1995) found that open[2] economies saw significantly higher GDP growth compared to closed[3] economies for both developed and developing countries. Along with real GDP per capita, the authors controlled for political unrest, school enrolment rates, government spending, investment levels, and population density. The authors added that openness is not the only driver behind growth, and highlighted the need for stable policies and institutions.

Dollar & Kraay (2003) reflected on the importance of institutions, controlling for the effect of institutional quality (an index of rule of law and property rights), domestic market size (log of population) and trade openness (log of export and import volumes to GDP) on economic growth (log real GDP per capita). They concluded that when it comes to growth, both international trade and institutions play a vital role while acknowledging possible reverse causation, i.e, economic growth leading to more trade openness. They also added that the trade share measure might not be a good proxy for foreign markets integration.

[2] Do not meet any of the criteria for closed economies
[3] Closed classification if at least one of the following criteria is met: (1) non-tariff barriers covering ≥ 40 % of trade, (2) average tariff rates ≥ 40 %, (3) a black-market exchange rate that is depreciated by ≥ 20 % relative to the official average exchange rate, (4) a socialist economic system and (5) a state monopoly on major exports.

Frankel & Romer (1999) found that the positive effect of trade on growth was particularly notable for the countries larger in population and land area. The pair leaned on the gravity model of international trade, and by using geographical characteristics[4] they constructed a component of openness that is independent of economic growth to rule out the reverse effect. Along with log GDP per capita as a dependent variable, population and land area were added as controls.

Rodríguez & Rodrik (2000), while not fully disproving the positive relationship between trade openness and growth, scrutinized the justification of independent variables and methodology of previous studies. They replicated Frankel & Romer's (1999) regression while also considering the non-trade effects of geography[5], arguing that geography affects income not only through trade but also other channels, like natural endowments (e.g., access to minerals, soil quality). The results of this replication showed that non-trade effects of geography are in fact the ones driving trade. The pair also remade Sachs & Warner's (1995) openness indicator, arguing that the requirements by which a country is classed as open contain high degrees of multicollinearity. Furthermore, they highlighted the weakness of arbitrarily setting 40 % average tariffs as the closed economy qualification, given that the global average tariff rates within the period were much lower.

Wacziarg & Welch (2008) gave support to Sachs & Warner's (1995) findings that open economies achieve higher GDP per capita growth than closed economies. They also controlled for tariffs and non-tariff barriers and also reduced criteria to judge economies as closed to average tariff levels of 20 %. The focus of their study was rather on the timing of trade liberalization; the pair analyzed the mean GDP per capita growth rates, investment, and openness levels before and after liberalization. The authors concluded that countries that experience growth soon after liberalization tend to deepen liberalization efforts while those that do not tend to revert to more inward policies.

[4] Countries': (1) sizes, (2) distance from one another, (3) share a border or not and (4) are landlocked or not
[5] (1) distance from the equator, (2) the % of land area that is in the tropics and (3) a set of regional dummies

2.2. Recent Studies

The set of controls[6] and arguments for their importance used in Dao's (2014) study captures many of the explanatory variables used in the previous studies. The researcher found a positive and significant impact of trade openness on growth where trade shares (exports plus imports over GDP) and real GDP per capita growth were used as proxies. The author concludes that more closed economies stand to grow slower, therefore never reaching their potential economic growth.

Altaee & Al-Jafari (2018) concluded that export-led expansion is an important determinant of economic growth (log real GDP per capita). With the fixed effects method, the pair's results showed that it is the export volumes rather than trade shares that had the strongest positive impact. Gross fixed capital formation and energy use were also positive drivers, while import volumes had a negative effect on economic growth.

However, it is not only the openness to trade that matters, countries tend to experience economic growth if they are also specializing in the production and export of higher quality goods (Huchet-Bourdon et al., 2018). This study used log GDP per capita as a dependent variable while the regressor was trade openness made out of three indicators: exports-to-GDP ratio, export quality index, and export variety index. The controls for initial conditions and factor endowments were included in the regression measured by one-year lagged log GDP per capita, human capital (gross secondary school enrollment and log life expectancy at birth), and physical capital (investment-to-GDP ratio). Huchet-Bourdon et al. (2018) computed the quality and quantity measures based on various previous studies.

Methodology and the choice of indicators are far from universally agreed. The question of what the proxy of trade openness measures was asked by Fuji (2019) who noted that most of the variation in trade-to-GDP share is due to variability in GDP and not trade. Gräbner et al. (2021) made a similar critique and therefore attempted to create consensus by dividing between de facto and de-jure measures of

[6] (1) initial conditions: log of real initial GDP per capita, (2) human capital: secondary school enrollment, log of life expectancy at birth, population growth, (3) physical capital: gross capital formation over GDP, (4) fiscal policy: government consumption over GDP, (5) institutional quality: a legal system and property rights index obtained from Fraser Institute's Economic Freedom data

openness. The de facto measure reflects the degree of integration and is an outcome-oriented indicator usually measured by trade-to-GDP share, and de-jure shows how open a country wants to be, i.e. its regulatory environment measured via indicators such as tariff rates and licensing rules.

2.3. Summary of Literature Review

We conclude that a robust, statistically, and economically significant relationship, between trade openness and economic growth, has yet to be established. While previously mentioned studies have shown positive links, there exists serious doubts about the choice and the make-up of the measurements. The challenge we face in answering our research question, therefore, lies in finding the suitable variables and by dealing with endogeneity and the omitted variable bias.

3. Theoretical Framework

We explore the incentives that push countries to engage in international trade and then include growth theories by presenting the models that account for the drivers behind economic growth.

3.1. Trade Theories

Adam Smith's theory on absolute advantages provides an explanation that nations stand to benefit from specializing in the production of goods and services they are in some way superior in producing (e.g., at the lowest cost, fastest, effectively), and trading the excess output with other nations (Feenstra & Taylor, 2017).

David Ricardo’s theory on comparative advantages builds on this, showing that a country can benefit from trade even if it is an inferior producer. The model only considers labor as a factor of production, and given that labor is finite, each trading country faces a limit on how much they can produce. Essentially the opportunity cost of producing one product is the amount of labor that could have been used to produce another product. By dividing labor to produce some combination of products, each nation will benefit if they produce the products with the lower opportunity cost, and trade the surplus with each other (Feenstra & Taylor, 2017).

The Heckscher-Ohlin theory claims that trade occurs due to different relative abundance of factors of production across nations (Krugman et al., 2018). Nations will produce whichever products they have a factor endowment advantage in (Salvatore, 2013). For example, if a country has an abundance of capital it stands to gain from exporting capital-intensive products while importing products that are labor-intensive.

The Gravity theory explains that trade patterns are affected by physical proximity. Countries closer to one another enjoy lower costs of transportation and tend to trade more with each other and engage in free-trade agreements (Feenstra & Taylor, 2017). Geography is also a contributing factor. Countries either have or lack access to certain natural resources (e.g., oil, minerals), making it either profitable to export or necessary to import (Ibid., 2017).

3.2. Growth Theories

Our model is set within the exogenous and the endogenous growth theories. The exogenous growth theory states that economic growth is driven by external factors occurring outside of the model, e.g., saving rates, population growth, and technological progress (Nafziger, 2006). The endogenous growth theory highlights the importance of technological change and human capital aiming to explain it within the model (Ibid., 2006).

The Solow growth model, set within the exogenous growth theory, is built on a Cobb-Douglas production function (eq. 1). The function shows that the total amount of output is achieved using a combination of factors of production available in the economy: labor force and capital stock (equipment, machines, etc.). Both labor and capital are made productive using a given level of technology. The production function implies constant returns to scale because equal proportional changes in inputs give a change in output by the same proportion (Hall & Papell, 2005).

$$Y = f(K, L) = AK^{\alpha}L^{(1-\alpha)} \quad (1)$$

where Y is output and is a function of K- capital stock and constant L- labor force, A is the level of technology, α - share of output from capital and $(1 - \alpha)$ is the share of output from labor.

A simple Solow model assumes a closed economy, without technological progress or labor growth. The model endogenizes capital formation by showing that economical agents can accumulate tools and machines over time. The capital formation equation (eq. 2) demonstrates that the growth of capital depends on the amount of investment each year (the purchase of new capital), which occurs when output that is not consumed is saved (Jones, 2021). However, capital stock is affected by diminishing returns since it also wears and tears (depreciates) at a constant rate. Part of the investment will therefore go toward replacement and reparation, rather than increasing capital stock.

At starting levels of GDP, investment will exceed depreciation. As GDP grows, depreciation will eventually equal investment and the change in capital stock will

reach a point where the cost of fixing all physical capital absorbs the resources allocated towards investment (Nafziger, 2006; Acemoglu, 2009). The Solow model implies that in the long run, without foreign trade and technological progress, an economy will eventually reach a steady state and any departure from the steady-state is merely temporary.

$$\Delta K = sY - \delta K \tag{2}$$

where ΔK is the change in capital stock or capital formation, s is the saving rate, Y-output, δ is the depreciation rate and K is the existing stock of physical capital stock. Steady state occurs when $sY = \delta K \rightarrow \Delta K = 0$.

Mankiw et al. (1992) augmented the Solow model (eq. 3) to show that output is also made possible using human capital, in addition to physical capital and labor. The model assumes that population growth is constant, so all change in the productivity of labor is caused by the accumulation of human capital. This accumulation is achieved by taking a portion of savings that does not go toward physical capital and investing it toward education and health. The researchers added that higher savings or lower population growth allow for higher income which in turn further increases human capital. What the augmented Solow model implies is that technological progress is made possible by using a more skilled, educated, and healthier labor force. The production is more efficient and the workers have the know-how to attain new innovations and ideas (Ray, 1998).

$$Y = K^{\alpha} H^{\beta} A L^{(1-\alpha-\beta)} \tag{3}$$

where Y is the output, K- capital stock, H stands for human capital, A - the level of technology, L is the labor, and $\alpha, \beta, (1 - \alpha - \beta)$ are the shares of output from capital, human capital and labor respectively.

Advancements in technology are all the activities that bring about new methods, techniques, and processes that will increase the amount of output with the existing labor force and capital stock (Hall & Papell, 2005). Romer's (1990) contribution to the endogenous growth theory is the distinction between objects (e.g., capital and labor) and ideas (instructions on how to use the objects). Labor and capital together with the

existing stock of technology can be divided into producing both output and innovations, “emphasizing the role of entrepreneurs and researchers” (Jones, 2019, p. 879). Ideas are non-rivalrous and partially non-excludable, and as such are available to everyone and do not deplete with more users. Objects are limited in amount and access and are subject to diminishing returns. The Production function for technological progress (eq. 4) shows that increase in technology is achieved through the share of labor and capital employed in producing the technology (research and development) and the level of the existing stock of technology (Hall & Papell, 2005).

$$\Delta A = T(L_A, K_A, A) \tag{4}$$

where ΔA is technological progress and is a function of technology made by the share of labor L_A and the share of capital K_A devoted to research for new technology, and A is the existing stock of technology.

Ideas allow increasing returns to scale because they are cumulative (built upon existing ideas). They only need to be invented once and can then be used an unlimited number of times by any number of people, anywhere. The promise of an increase in returns encourages active devotion of time and resources in discovering new ideas (Jones, 2019). Sustained economic growth is therefore made possible by treating ideas or inventions as goods, and assigning both capital and labor in producing new ideas (Hall & Papell, 2005). Romer (1990) concludes that a larger stock of human capital and access to international trade (access to more ideas) will allow an economy to grow faster.

3.3. Summary of Theoretical Framework

In conclusion, a nation stands to benefit in producing products where it has comparative advantage and natural endowment while trading surplus for goods and services they are inferior at producing. Sustained economic growth depends on total factor productivity determined by technological advancements achieved through innovation (research and development) and investments in human capital (skills, knowledge, education) (Acemoglu, 2009; Nafziger, 2006).

4. Methodology

In this section, we start by presenting our research method and the data, followed by a presentation of the empirical model. We also include information on how we operationalize our method, we specify the model, and argue for the choice of variables.

4.1. Research Method

We apply a quantitative research method, a deductive approach where we seek to measure social phenomena and their relationships (Bryman et al., 2019), making it well suited for our aim. Panel data analysis is employed since we include both cross-sections and time series dating from 2000-2018. This allows us to control for the unobserved heterogeneity and endogeneity (Studenmund, 2017).

A homogeneous sample increases the generalizability of research (Tahir & Ali, 2014). Our sample is thus narrowed to 31 advanced OECD[7] countries. The sample ensures that countries are not newly[8] joined OECD members. Furthermore, it is within developed countries that we see growing concerns about trade effects and the resurgence of protectionism (The Economist, 2021).

To test the relationship between trade openness and economic growth, we utilize a multivariate linear regression with fixed effects. The use of fixed effects decreases bias caused by factors that do not change over time and accounts for country-specific attributes (Studenmund, 2017). For example, even if our sample is homogeneous, advanced economies still differ in many aspects, such as geography, language, culture, history, political and economic policies. Geography in particular is found to be important in various trade decisions and possibilities, e.g., the proximity to trading partners, land size, access to coastlines, or the distance from the equator (Frankel & Romer, 1999; Rodríguez & Rodrik, 2000). This is what we expect to get captured by the fixed effects method.

[7] Industrialized/ developed countries with a high level of GDP per capita and diverse exports, well integrated into the global financial system and international trade (IMF, 2013). See Appendix: Table1 for the list of countries.
[8] Joined the OECD after 2019

4.2. Data

Annual data is compiled from The World Development Indicators - WDI (World Bank, 2021) and the Heritage Foundation - HF (The Heritage Foundation, 2021b). The advantage of these databases is their wide use in scientific papers, credibility, and ease of access, enhancing our study's replicability and reliability. We are aware that the reliability could be weakened given that governments may manipulate their reports, for instance, by reporting inaccurate GDP figures (Tahir & Ali, 2014).

Our panel data for economic growth and trade openness is balanced. However, the data for our independent variables are affected by missing values. A way to handle this is to conduct interpolation or omit the missing data (Studenmund, 2017). To decide, we examine the descriptive statistics for the unbalanced dataset and a dataset where missing values are omitted. Both summaries return similar results[9]. To avoid skewing the data toward the mean by interpolating, we allow the statistical program to omit missing values during the regression process.

4.3. Empirical Model

We consider the general specification of a linear regression model with fixed effects:

$$y_{it} = \alpha_{it} + \beta_1 x_{1,it} + \beta_n X_{n,it} + \varepsilon_{it} \quad (5)$$

where y_{it} is the dependent variable, α_i is a unique time-invariant and country-specific intercept, β is the coefficient that shows how much the dependent variable changes for every unit of change in the independent variable, $x_{1,it}$ is the primary independent variable, $X_{n,it}$ represent n independent variables added to control for other determinants of growth as suggested by the theoretical framework and additions noted in previous studies, ε_{it} is an error term - factors causing variation in economic growth that cannot be explained by the included regressors, and i is a variable value at the time period t.

[9] See Appendix: Table 2. and Table 3.

4.4. Variables

Economic Growth

Economic growth is often defined as the increase in the value of a country's output from one period to another (Nafziger, 2006) or the growth in living standards over time (Jones, 2021). The measurement for the variable used in previous studies is GDP per capita growth (Dao, 2014; Wacziarg & Welch, 2008) or the natural logarithm of the real GDP per capita (e.g., Frankel & Romer, 1999; Dollar & Kraay, 2003; Huchet-Bourdon et al., 2018). To avoid the risk of causing non-existent correlation by using the same denominator between our variables (Baltagi, 2008), our choice of indicator is therefore real GDP per capita growth.

Trade Openness

Conceptually, trade openness is explained as a degree of an economy's orientation toward foreign trade (Fujii, 2019) and in a political sense, it describes liberal trade policies such as low tariffs or no barriers to trade (Winters, 2004). Given the simplicity and data accessibility, our indicator is the trade share computed as the sum of exports and imports over real GDP (Beltekian & Ortiz-Ospina, 2018). Imports and exports are made up of the trade in goods and services (World Bank, 2021). Intuitively, the larger the trade share, the more open the country is to international trade. We acknowledge critiques about the trade share indicator (OECD, 2011; Fujii, 2019; Gräbner et al., 2021).

Furthermore, we recognise that the make-up of a nation’s trade can affect other potential growth determinants. For example, importing educational services or high tech intermediary products may have spillover effects, such as boosting human capital/ technology levels and ultimately productivity. However, we must make a trade-off between data availability and validity (Fujii, 2019). We expect trade openness to have a positive effect on economic growth given that the trade theory sees openness as beneficial and that previous research has found a positive relationship.

Initial conditions

The relationship between economic growth and trade openness might be two-directional (Dollar & Kraay, 2003). Countries that experience an increase in income can afford to import more of the goods and services where they do not have a comparative advantage, causing a higher increase in trade openness. To control for this possible reverse causation we include initial conditions in our model. The measure we use is a one-year lagged GDP per capita as seen in the study of Hutchet-Bourdon et al. (2018).

Human Capital

To account for the importance of productive labor in creating greater output, as made clear by Mankiw et al.(1992) we include education, health, and labor as indicators of human capital.

Investing in education increases human capital, which enhances the productivity of workers (Mankiw et al., 1992). Previous studies used primary and secondary school enrollment rates (e.g., Wacziarg & Welch, 2008; Altaee & Al-Jafari, 2018; Huchet-Bourdon et al., 2018). We reason that secondary school enrollment rates are a better measure for advanced economies because these economies are knowledge-based, where education is an important factor of growth and where the demand for skilled labor is high (OECD, 1996). We expect to see a positive effect of schooling given the higher productiveness of a skilled and educated labor force.

The health indicator is life expectancy as used in previous research (Dao, 2014; Huchet-Bourdon et al., 2018). We argue that healthier inhabitants live longer and provide a more productive workforce**.** However, we also see a possible negative impact of longevity, since people living longer is not the same as people working longer.

Given the augmented Solow model (Mankiw et al., 1992), we predict that an increase in population will harm economic growth. Since more people sharing the income (GDP per capita) means less income is available for investments in physical and human capital.

Investment

Accounting for the effects of capital within the Solow model, we also add investment as a determinant of growth. As a proxy, we use the gross fixed capital formation to real GDP or investment-to-GDP share (Dao, 2014; Huchet-Bourdon et al., 2018). As implied by the Solow model, investment in physical capital is expected to enhance the productivity of labor and create a positive impact on the growth of an economy.

Technological progress

Romer's growth model explains that output is a function of technology; any activities that are directed toward technological progress are important for economic growth. We include technological progress as the share of research and development (R&D) expenditure over GDP. Holding all else equal, we expect economies to experience positive growth from devoting resources toward finding new innovations that increase the productivity of labor and capital.

Trade restriction

Considering that trade restriction can be seen as a government's stance toward foreign trade, we intuitively expect higher trade restrictions to harm trade openness and in turn lower economic growth. The indicator for trade restriction is the average tariffs on imports weighted by the share of imports (Sachs & Warner, 1995).

Institutional Quality

We lastly add institutional quality, accounting for the importance of institutions (Dollar & Kraay, 2003), The measures used in previous studies are beyond the scope of our research, e.g., economic freedom rank[10] used in Dao's (2014) work does not have a sufficient number of values given our time frame. We, therefore, rely on the Index of Economic Freedom[11] that contains complete data for our purpose and which we assess as a sufficient proxy. We predict that high institutional quality is attributed with a positive economic growth.

[10] Rank 1-10 assessing for the size of government, legal system and property rights, sound money (money growth, inflation, freedom to own foreign currency bank accounts), freedom to trade internationally and regulations (The Fraser Institute, 2020)
[11] Scale 0-100 assessing for rule of law (property rights, government integrity), government size (tax burden, government spending and fiscal health), regulatory efficiency (business freedom, labor freedom, monetary freedom) and open markets (tariffs and non-tariff barriers) (The Heritage Foundation, 2021a)

4.5. Empirical Operationalization

We begin the process by first examining whether the classical assumptions of linear regression are met (Studenmund, 2017). While we control for some unmet assumptions, we also tolerate deviation from perfectly achieving all assumptions.

Normality is examined through histograms[12], where we find that some variables are not normally distributed. To control for this, initial conditions and health indicators are log-transformed, i.e., conformed to a normal distribution by using the natural logarithm. This allows us to deal with the impact of outliers that skew the data (Studenmund, 2017). The log transformation also makes it possible to interpret coefficients as percentage changes. Given that trade openness and innovation are already expressed as percentages, they are not log-transformed. We then proceed with performing a linearity control by plotting yearly averages of each independent variable against the dependent variable. The plots[13] show that the distribution of data can be described with a straight line. There exists a linear relationship between most independent variables and economic growth.

To ensure homoscedasticity, we graphically examine our model for heteroscedasticity by plotting fitted values against residuals. The plot[14] reveals that residuals have some correlation with the value size, as seen by the slightly curved red line. The normal Q-Q plot[15] representing the standardized residuals against expected residuals show some variation from the pilot at both ends of the plot. To ensure that the assumption of homoscedasticity is met, we enhance our regression model with robust standard errors.

The independence of variables is controlled with a correlation matrix[16]. The results show an overall low correlation. Life expectancy is an exception, with a moderate correlation with population growth and innovation. There is no consensus on what is to be considered a high correlation and we assess that the independence qualification is met.

[12] See Appendix: Figure 1.
[13] See Appendix: Figure 2.
[14] See Appendix: Figure 3.
[15] See Appendix: Figure 4.
[16] See Appendix: Table 4.

4.6. Model Specification

The function that forms the basis of our research is a semi-log regression (6) that describes how the dependent variable, on the left, is affected by the independent variables on the right:

$$EG_{it} = \alpha_{it} + \beta_1 TO_{it} + \beta_2 \ln(IniCond)_{i,(t-1)} + \beta_3 edu2_{it} + \beta_4 \ln(lifexp)_{it} + \beta_5 pop\_growth_{it} + \beta_6 invest_{it} + \beta_7 innov_{it} + \beta_8 tr_{it} + \beta_9 IQual_{it} \quad (6)$$

where the variables are specified in the table 4.6 as follows[17]:

Variable(s)	Abbreviation	Indicator(s)	Measure(s)	Sign
Dependent				
Economic growth	EG_{it}	GDP per capita growth	*GDP per capita growth (annual %)*	n/a
Independent				
Trade openness	TO_{it}	Trade share	*Trade (% of GDP)*	+
Initial conditions	$\ln(IniCond)_{i(t-1)}$	GDP per capita	*GDP per capita (constant 2010 US$)*	-
Human capital	$edu2_{it}$	Education	*School enrollment, secondary (% net)*	+
	$\ln(lifexp)_{it}$	Health	*Life expectancy at birth, total (years)*	+/-
	pop_growth_{it}	Population growth	*Population growth (annual %)*	-
Physical capital	$invest_{it}$	Investment	*Gross fixed capital formation (% of GDP)*	+
Technological progress	$innov_{it}$	Innovation	*Research and development (% of GDP)*	+
Trade restriction	tr_{it}	Import tariffs	*Tariff rate, applied, weighted mean, all products (%)*	-
Institutional quality	$IQual_{it}$	Index of economic freedom	*Rule of law, government size, regulatory efficiency and market openness*	+

Table 4.6 Explanation of the model specification

[17] See Appendix: Table 5. for data sources and indicator definitions provided by the data sources

5. Results

The result section is where we narrate the findings and present the descriptive statistics of our data, followed by the regression results.

5.1. Descriptive Statistics

Table 5.1 below contains the summary statistics of our data. The summary includes the central tendency, measures of variability, and the outliers of our sample based on the observations during the period 2000-2018.

Variable	Mean	St.Dev	Min	Max	Obs
Economic Growth	1,84	3,25	-14,27	23,99	589
Trade Openness	96,90	58,82	19,80	408,36	589
Initial Conditions	40213,90	21118,56	6527,85	111968,35	589
Education	91,57	4,53	79,09	99,91	448
Life Expectancy	79,35	2,90	70,26	84,21	589
Population Growth	0,52	0,80	-2,26	2,89	589
Investment	22,27	3,73	11,07	36,82	589
Innovation	1,89	0,95	0,36	4,95	545
Trade Restriction	2,20	0,69	0,86	5,83	584
Institutional Quality	71,12	6,62	53,20	84,20	589

Table 5.1 Summary statistics for the advanced OECD

The economic growth among advanced OECD countries was relatively low, averaging at 1,84 %. There are two extreme values. Estonia had negative growth of 14 % in the year 2009 due to the aftermath of the 2008 financial crisis, and Ireland showed a tremendous growth at almost 24% in 2015 due to new standards in national accounting (OECD, 2016). The general notion is, however, that developed economies tend to experience lower and less volatile growth rates. The values are concentrated around the mean with few outliers suggesting that even though economies endure shocks with very high economic growth/ contractions, these are relatively rare occurrences. The largest growth contractions[18] are observed in the years following the 2008 financial crisis and the highest growth rates are seen among European countries[19].

[18] See Appendix: Figure 5.
[19] See Appendix: Figure 6.

With a mean of about 97 % the trade openness appears high, however with a standard deviation of around 59, there is a high degree of variability[20] between countries and years. The highest levels of trade openness are associated with geographically smaller economies such as Luxembourg, reaching 408% in the year 2015. Lower rates of trade openness are seen for larger countries such as Japan and the United States.[21] Trade restrictions, as in average trade tariff rates are also relatively low, and somewhat stable among OECD countries.

5.2. Empirical Results

The robustness of the impact of trade openness is assessed by running several specifications (Studenmund, 2017). Specifically, by conducting nine regressions. Each specification is created by iteratively adding independent variables to account for the changes in the coefficient of trade openness.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade Openness	0.0083	0.0283 *	0.0266	0.0634 **	0.0634 **	0.0611 **	0.0699 **	0.0710 **	0.0685 **
	(0.0101)	(0.0119)	(0.0149)	(0.0196)	(0.0195)	(0.0186)	(0.0214)	(0.0217)	(0.0220)
ln Initial Conditions		-6.3701 ***	-7.2405 ***	-2.3422	-2.3419	-3.4892 *	-3.8428 **	-3.4583 *	-3.0330 *
		(1.1379)	(1.3480)	(1.4516)	(1.4540)	(1.4714)	(1.4432)	(1.4512)	(1.4598)
Education			0.0417	0.0897	0.0898	0.0446	0.0363	0.0450	0.0548
			(0.0577)	(0.0508)	(0.0504)	(0.0518)	(0.0561)	(0.0557)	(0.0555)
ln Life Expectancy				-69.3038 ***	-69.3099 ***	-37.1287 **	-31.0128 *	-17.8445	-9.4386
				(12.9630)	(12.9708)	(12.2861)	(14.1455)	(15.4290)	(16.3948)
Population Growth					0.0068	-0.8222	-0.9125	-0.8945	-0.7332
					(0.4104)	(0.4266)	(0.4693)	(0.4685)	(0.4575)
Investment						0.3050 ***	0.2785 ***	0.2665 **	0.3051 **
						(0.0752)	(0.0839)	(0.0840)	(0.0925)
Innovation							-1.3234	-1.3098	-1.0821
							(0.7937)	(0.8016)	(0.7703)
Trade Restrication								1.0794 **	1.0937 **
								(0.3507)	(0.3466)
Institutional Quality									-0.2010 **
									(0.0727)
R2	0.1755	0.2206	0.2481	0.2969	0.2969	0.3432	0.3533	0.3682	0.3814
Adjusted R2	0.1296	0.1757	0.1901	0.2408	0.2390	0.2874	0.2928	0.3072	0.3198
No.obs	589	589	448	448	448	448	422	421	421

*** p < 0.001; ** p < 0.01; * p < 0.05
(Robust standard error)

Table 5.2 Regression results with fixed effects and robust standard errors

Table 5.2 represents the regression results where columns 1-9 show the number of regressors in the specification. Each addition of independent variables increases the impact of trade openness on economic growth. That is observed by following the values of our estimated coefficients as we move from left to right across the columns. The quality of our fit increases as more of the variation in economic growth is

[20] See Appendix: Figure 7.
[21] See Appendix: Figure 8.

accounted for by the model, given the increasing adjusted determination coefficient (adjusted R2). The added independent variables are therefore considered relevant.

Column one shows a simple linear regression between trade openness and economic growth where we find that the statistical relationship between the two variables is positive. The coefficient indicates that for every additional increase in trade openness, ceteris paribus, the growth of the economy increases by an average of approximately 0.01 percentage points. The model explains about 21% of the variation in the dependent variable, however, the results are statistically insignificant.

In the second specification, we introduce initial conditions, measured by the natural logarithm of the GDP per capita from a previous period. This is to control for the reverse causality between trade openness and economic growth. The results show that trade openness is positively affected by initial conditions, seeing that the coefficient rises in magnitude.

By the fourth column we receive a significant impact of trade openness on economic growth at the significance level of 1%. From this column and forward there are relatively small changes in the estimation of trade openness, i.e., the magnitude of the coefficient stays relatively stable. We thus consider our results as robust.

The ninth specification represents the main model of this thesis and shows that the impact of trade openness on economic growth is positive. Investment, trade restriction, and the quality of institutions all have significant impacts. Their coefficients indicate that, while keeping all else equal, for every additional change in these variables, the average growth of the economy changes by approximately 0.035, 1.094, and 0.201 percentage points respectively. The model explains about 32% of the variation in the dependent variable.

The results of our main regression suggest that trade openness has a positive impact on economic growth, assuming a 1% significance level. An additional increase in trade openness leads to about 0.07 percentage points increase in the average growth of an economy. The strength of the impact is consistent across the different model specifications.

6. Discussion

We look at the meaning and the importance of our results. We also highlight the implications encountered and provide recommendations on how to overcome them in future research.

Both previous studies and theoretical framework led us to expect trade openness to have a positive effect on economic growth. While the relationship is found to be positive and statistically significant, it required the addition of other determinants of growth. What this means is that trade openness on its own is not a strong nor a significant driver of economic growth. For economic growth to increase by 1 percentage point, trade openness must increase by over 14 %, which we assess as realistic, thus economically relevant.

Human capital as introduced in the augmented Solow model is considered an important contributor to positive growth. We did find such a relationship, however, the estimates ultimately never reached any significant levels. The use of life expectancy as a reflection of health standards, for example, returned a negative impact. We reason that within OECD countries, life expectancy does not vary greatly and a basic threshold of health standards is already achieved. Any extra life expectancy simply increases the population above working age. Following Solow's production function, the population above worker age would provide little to no contribution to labor and thus little contribution to output. The significance of coefficients for all three indicators of human capital dropped off to a level whereby results from our main regression were not worth considering. Reflecting upon this, perhaps a lagged and/or different indicators for human capital are better advised. For example, the number of hospital beds, labor participation rates, and tertiary school enrollment.

Endogenous growth theory predicts a positive impact of innovations on economic growth, given the increasing returns. However, we are surprised to see that the expenditure on R&D returned negative and insignificant results. We reason that in the early stages of research, the economy only induces costs, while the development of innovations take time and don't have guaranteed success. For future research, it might be more suited to lag the data and also control for other indicators of R&D.

Our findings confirm the positive role of investments as shown in Solow's model. The portion of GDP devoted to capital formation is reasonably high within our sample. For economic growth to increase by 1 percentage point, the capital investment must increase by over 3 %, which is realistic and thus economically significant. Considering that advanced OECD countries tend to be capital abundant with a comparative advantage in producing capital intensive products, this finding is rather intuitive.

With an average score of 71 out of 100, institutional quality is high amongst our sample. Considering that Sachs & Warner (1995), and Dollar & Kraay (2003) highlighted the importance of institutions for economic development, the results of our regression are surprising. Institutional quality, not only has a negative impact, but the results are also statistically significant. This has led us to question the choice of indicator and data source, noting that institutional quality measures vary amongst studies. Therefore, the discrepancy in our findings and previous research may be explained by differences in the make-up of the institutional quality rating. Future research is recommended to advise other measures of institutional quality.

In terms of economy and population size, smaller countries seem more open to trade. The explanation is rather intuitive; to establish economies of scale, producers in smaller countries must export production, while the sizable market in larger countries allows for economies of scale to be achieved without exporting.

Tariffs are found to have a positive effect on growth, however, descriptive statistics did show relatively low rates with little variation. The impact of tariffs on growth is economically significant, given that it only requires about 0,9% increase in tariff rate to induce a 1 percentage point increase in growth. However, tariffs do not reflect non-tariff barriers such as technical standards or the effects of retaliatory tariffs, casting doubt on whether tariffs are a good representation of trade restriction. Previous studies such as Wacziarg & Welch (2008), and Sachs & Warner (1995) considered tariffs only as part of their measure in making up their liberalized economy indicator. Given the resurgence of tariffs within trade policy, there is need for more research into its effects on growth.

7. Conclusion

In our final section, we briefly recollect the research question and summarize our results. We reflect on the possible limitations, make suggestions for future research and provide recommendations based on the evaluation of our results.

This research aimed to determine if the output of an economy is statistically and economically affected by its outward orientation. We started by asking whether trade openness has an impact on economic growth within advanced OECD countries, then continued by estimating the direction and magnitude of that impact. The ultimate goal was to provide policy guidance given that we see a resurgence of protectionism.

Quantitative analysis of growth rates between 2000-2018 allowed us to conclude that trade openness is an important and positive factor in determining the growth of an economy. Similarly, investing in physical capital increased productivity and therefore induced growth. However, tariff rates are also found to be a positive factor while institutional quality rather reverses the growth, which contradicts our expectations. The research returned a respectable adjusted R2 even though education, innovation, and population growth were statistically insignificant.

Reflecting on our limitations, future research might find it useful to lag some explanatory variables. This is to account for the time it takes for the variables to produce desired effects. We specifically suggest determining a suitable lag period. Within Romer's (1990) model of technological progress, we have captured the object's side, nonetheless much potential remains for testing the explanatory power of ideas on technical progress. Correlation between our variables is generally low, however, trade openness, physical capital, and technological progress indicators are all ratios with the same denominator. We acknowledge that this may cause false correlation between the variables, despite that, correlations are too low to be a cause for concern. In addition, we focused on overall trade share, where the type of goods and services is not addressed. Considering that trade has externalities, the nature of trade needs greater attention. Future research could thus explore the spillover effects of trade on potential growth determinants.

Our study complements existing research on the role of trade openness in determining growth, by examining the relationship in a more recent contemporary context. Moreover, we do so by comparing advanced OECD nations as a homogeneous group. Our findings address absolute, comparative, and gravity trade theories, confirming them in a general manner. Additionally, the exogenous growth theory concerning the role of savings and investments is also confirmed, whereas the importance of ideas and human capital are somewhat challenged.

Lastly, we conclude that openness to trade is an important and positive factor in determining economic growth. However, trade openness, in isolation, is not sufficient in inducing a statistically significant impact. This prevents us from providing a clear distinction on whether the resurgence of trade restrictions is justified. Moreover, a nation's integration into the global economy is affected by factors outside our model such as self-sufficiency aspirations, job protection, and safety. Therefore, for advanced OECD countries our policy recommendation is that given their chosen level of economic integration, increasing investments can better leverage trade openness as a tool to enhance growth.

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Appendix

Tables

Table 1. Advanced countries within OECD[22]

Country	Member	Country	Member
Australia	1971	Latvia	2016
Austria	1961	Lithuania	2018
Belgium	1961	Luxembourg	1961
Canada	1961	Netherlands	1961
Czech Republic	1995	New Zealand	1973
Denmark	1960	Norway	1961
Estonia	2010	Poland	1996
Finland	1969	Portugal	1961
France	1961	Slovak Republic	2000
Germany	1961	Slovenia	2010
Greece	1961	Spain	1961
Iceland	1961	Sweden	1961
Ireland	1961	Switzerland	1961
Israel	2010	United Kingdom	1961
Italy	1962	United States	1961
Japan	1964		

[22] Advanced OECD countries (IMF, 2013; OECD, 2020)

Table 2. Descriptive statistics with unbalanced panel data

Indicator	No. obs	Mean	St.dev	Min	Max
Economic growth	589	1.84	3.25	-14.27	23.99
Trade openness	589	96.90	58.82	19.80	408.36
Initial conditions	589	40213.90	21118.56	6527.85	111968.35
Education	448	91.57	4.53	79.09	99.91
Life expectancy	589	79.35	2.90	70.26	84.21
Population growth	589	0.52	0.80	-2.26	2.89
Investment	589	22.27	3.73	11.07	36.82
Innovation	545	1.89	0.95	0.36	4.95
Trade restriction	584	2.20	0.69	0.86	5.83
Institutional quality	589	71.12	6.62	53.20	84.20

Table 3. Descriptive statistics with omitted missing values

Indicator	Io. observation	Mean	St.dev	Min	Max
Economic growth	421	1.94	3.47	-14.27	23.99
Trade openness	421	99.30	59.09	22.15	408.36
Initial conditions	421	40246.22	21921.56	6640.49	111968.35
Education	421	91.56	4.54	79.09	99.91
Life expectancy	421	78.97	3.07	70.26	84.10
Population growth	421	0.50	0.84	-2.26	2.89
Investment	421	22.34	3.98	11.54	36.82
Innovation	421	1.75	0.87	0.36	3.91
Trade restriction	421	2.15	0.54	0.89	4.72
Institutional quality	421	70.27	6.33	53.20	83.70

Table 4. Correlation matrix

	Economic growth	Trade openness	Initial conditions	Education	Life expectancy	Population growth	Investment	Innovation	Trade restriction	Institutional quality
Economic growth	**1**									
Trade openness	0,11	**1**								
Initial conditions	0,01	0,02	**1**							
Education	-0,05	-0,10	0,31	**1**						
Life expectancy	-0,31	-0,14	0,04	0,28	**1**					
Population growth	-0,21	0,13	0,00	0,14	**0,45**	**1**				
Investment	0,31	-0,01	-0,01	-0,14	-0,29	0,03	**1**			
Innovation	-0,21	-0,23	-0,04	-0,02	**0,53**	0,13	-0,08	**1**		
Trade restriction	0,16	-0,18	-0,10	-0,05	-0,11	-0,02	0,22	0,01	**1**	
Institutional quality	0,01	0,12	0,22	0,20	0,17	0,15	0,17	0,24	-0,04	**1**

Table 5. Indicators, data sources and indicator definitions

Indicator	Database	Series	Indicator description
GDP per capita growth	World Development Indicators[23]	GDP per capita growth (annual %)	Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
Trade share	World Development Indicators	Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
Initial conditions	World Development Indicators	GDP per capita (constant 2010 US$)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars.
Education	World Development Indicators	School enrollment, secondary (% gross)	Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers.
Health	World Development Indicators	Life expectancy at birth, total (years)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
Population growth	World Development Indicators	Population growth (annual %)	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage . Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.

[23] (World Bank, 2021)

Physical capital	World Development Indicators	Gross fixed capital formation (% of GDP)	Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.
Innovation	World Development Indicators	Research and development expenditure (% of GDP)	Gross domestic expenditures on research and development (R&D), expressed as a percent of GDP. They include both capital and current expenditures in the four main sectors: Business enterprise, Government, Higher education and Private non-profit. R&D covers basic research, applied research, and experimental development.
Import tariffs	World Development Indicators	Tariff rate, applied, weighted mean, all products (%)	Weighted mean applied tariff is the average of effectively applied rates weighted by the product import shares corresponding to each partner country. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups and import weights. To the extent possible, specific rates have been converted to their ad valorem equivalent rates and have been included in the calculation of weighted mean tariffs. Import weights were calculated using the United Nations Statistics Division's Commodity Trade (Comtrade) database. Effectively applied tariff rates at the six- and eight-digit product level are averaged for products in each commodity group. When the effectively applied rate is unavailable, the most favored nation rate is used instead.
Index of economic freedom	The Heritage Foundation[24]	Index of Economic Freedom	The Index of Economic Freedom focuses on four key aspects of the economic and entrepreneurial environment over which governments typically exercise policy control: Rule of law, Government size, Regulatory efficiency and Market openness. In assessing conditions in these four categories, the Index measures 12 specific components of economic freedom, each of which is graded on a scale from 0 to 100. Scores on these 12 components of economic freedom, which are calculated from a number of sub-variables, are equally weighted and averaged to produce an overall economic freedom score for each economy.

[24] (The Heritage Foundation, 2021b, 2021a)

Figures

Figure 1. Normality control for each of the variables in the study

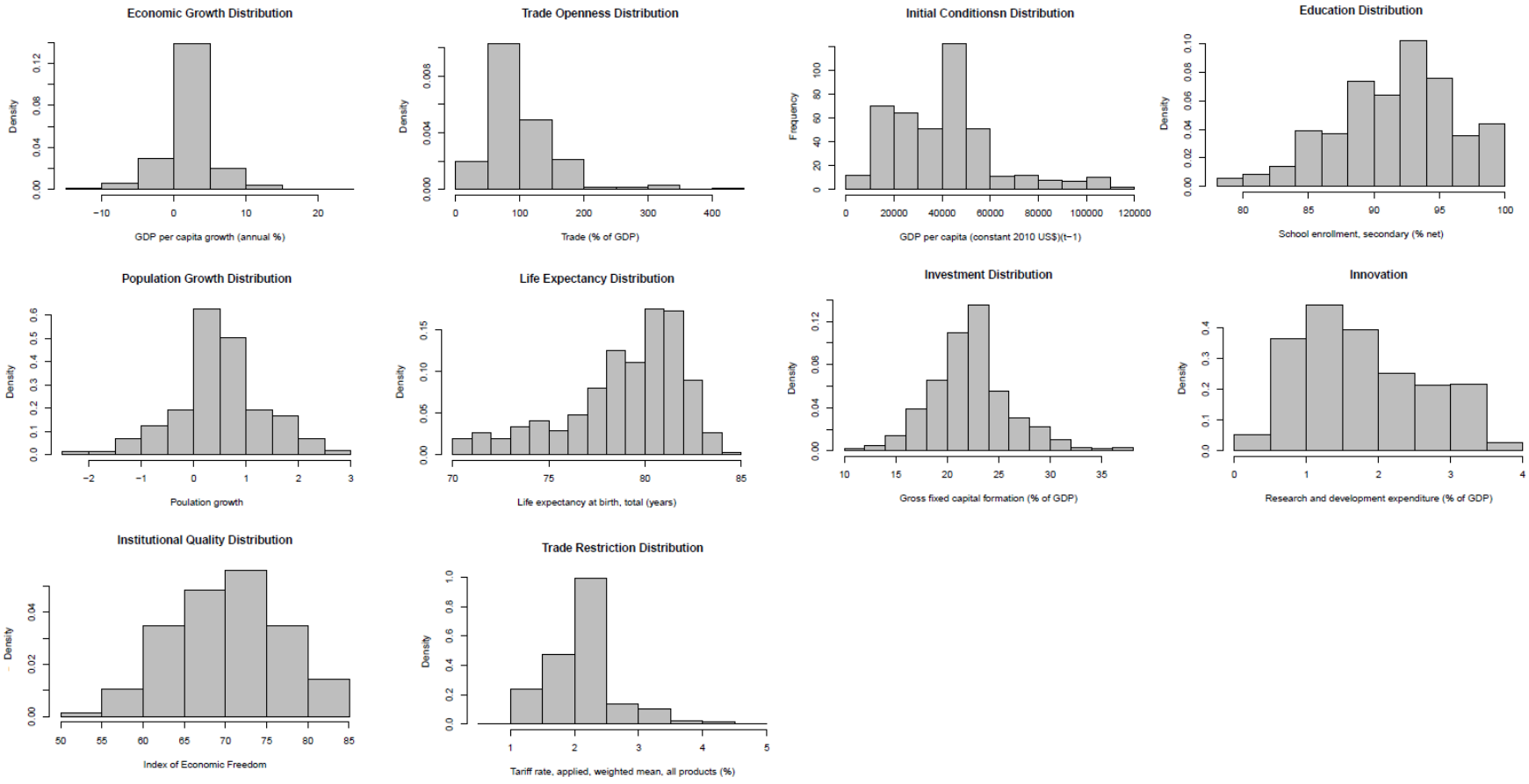

Figure 2. Linearity control with average values between economic growth and explanatory variables

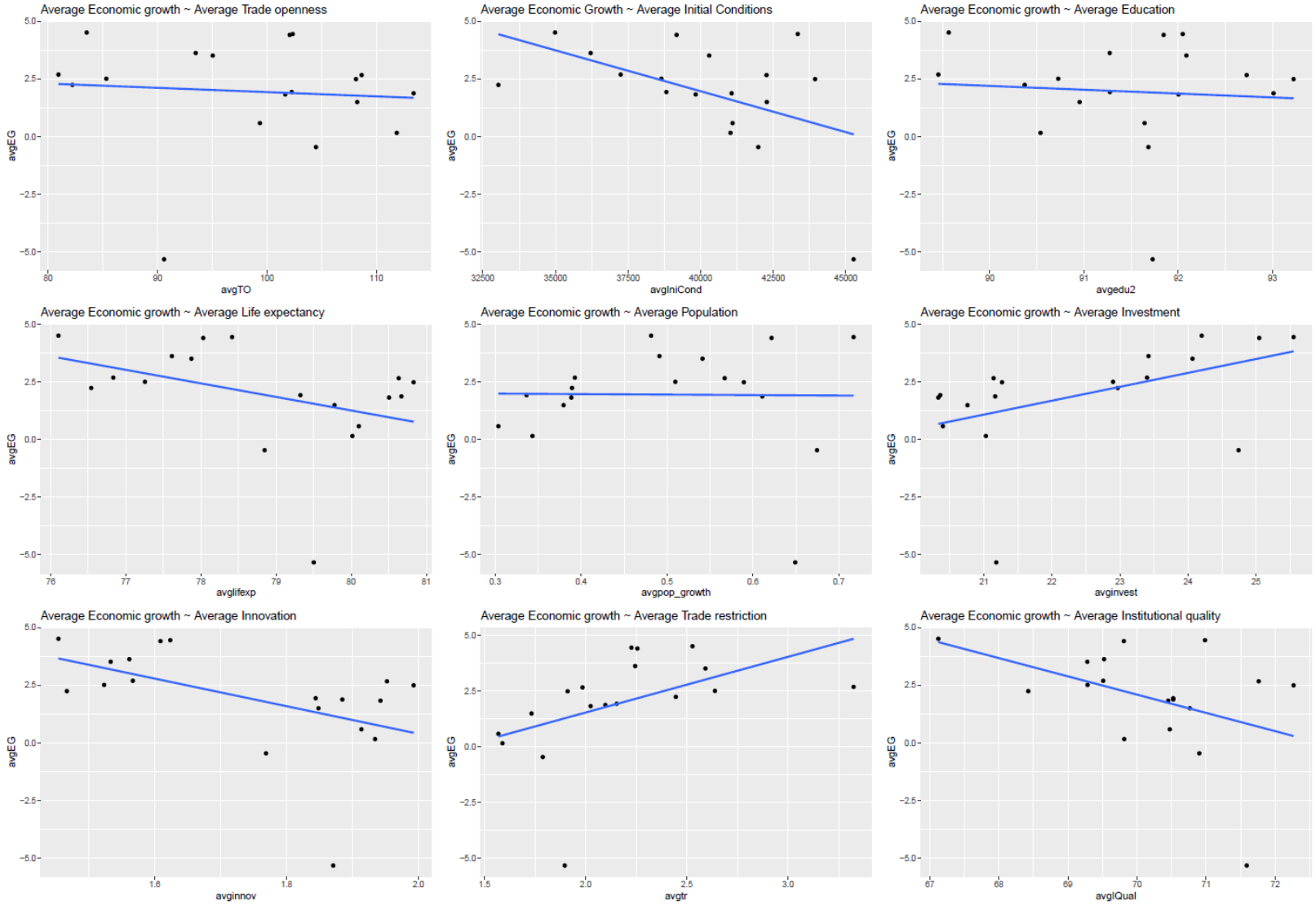

Figure 3. Heteroscedasticity control - Residuals vs Fitted

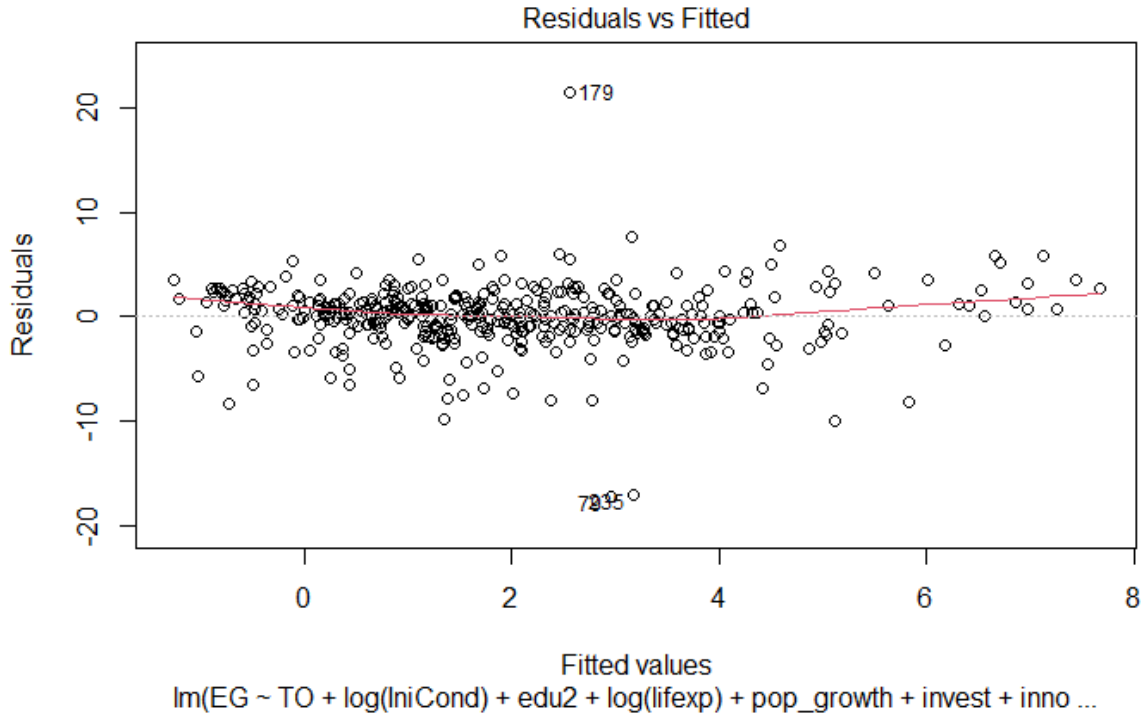

Figure 4. Heteroscedasticity control - Normal Q-Q

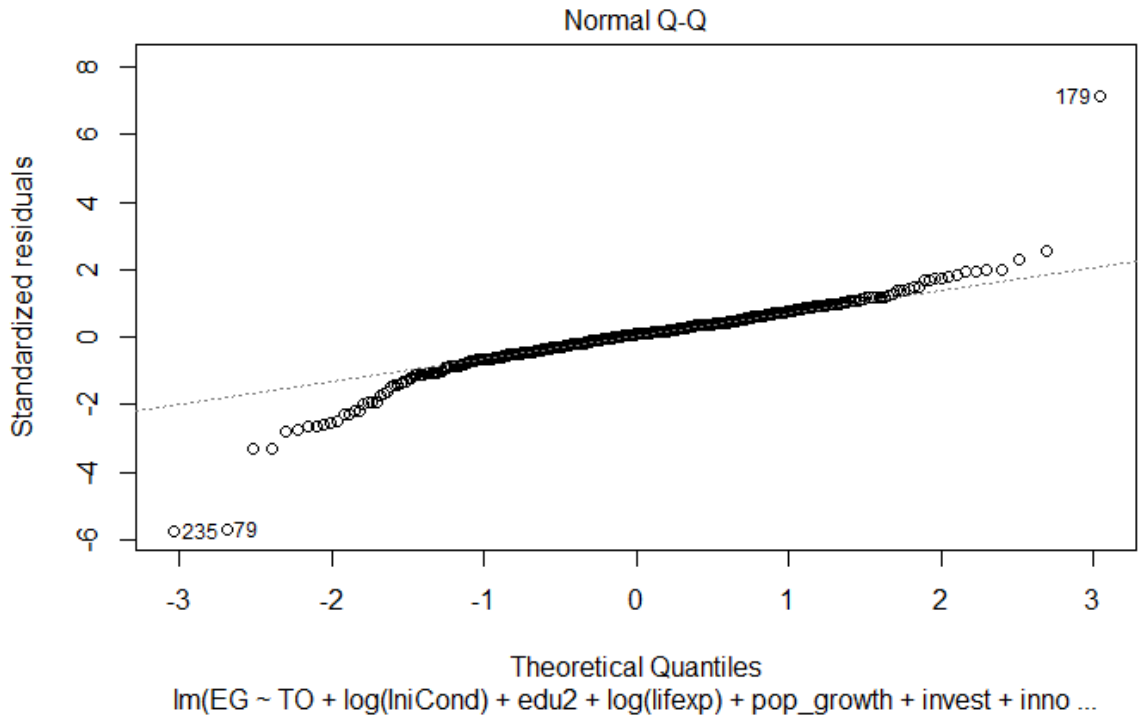

Figure 5. Economic Growth 2000-2018 (advanced OECD countries)

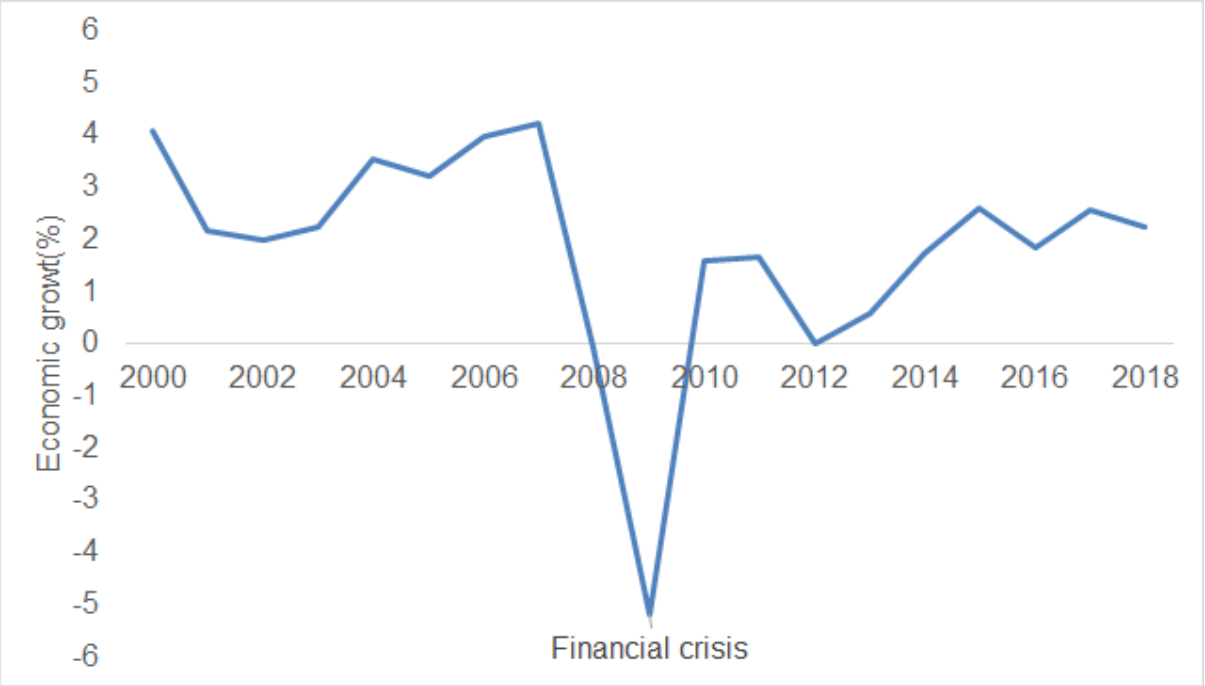

Figure 6. Average Economic Growth per Country 2000 - 2018

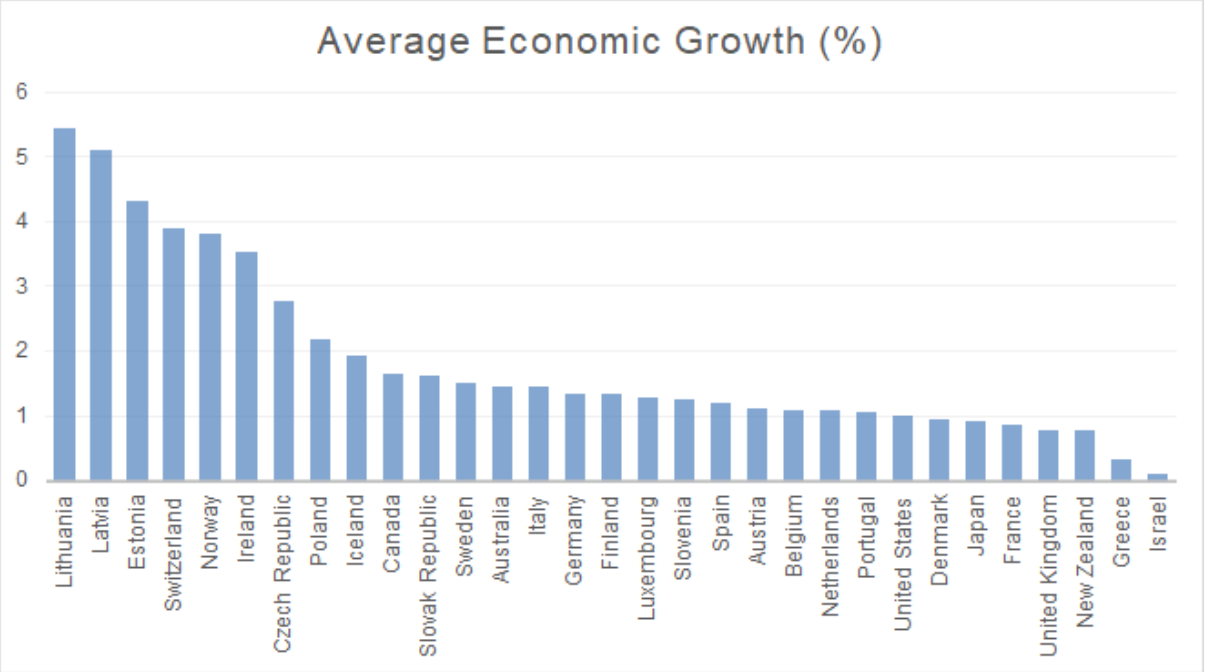

Figure 7. Trade Openness 2000-2018 (advanced OECD countries)

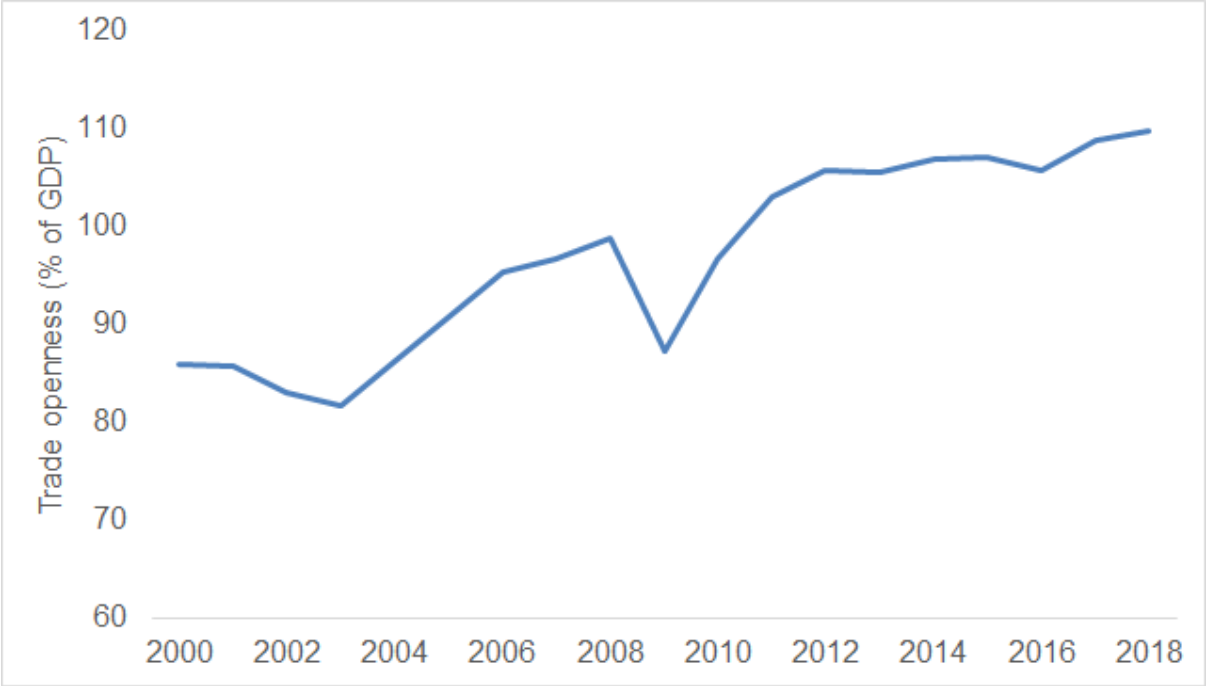

Figure 8. Average Trade Openness per Country 2000-2018