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ECONOMIC GROWTH AND HUMAN DEVELOPMENT IN OECD COUNTRIES: A TWENTY-YEAR STUDY OF DATA 2000–2019

Abstract

The aim of the current research is to determine the factors and processes which influence economic growth and human development in relatively free societies and thereby provide a framework for policy formulation. Countries within the OECD grouping are committed to democratically elected government and market economies and fall into this category. The OECD group comprises 37 countries, including Colombia, and in 2019 accounted for 63% of real global GDP. This research focuses on the data of the thirty-seven countries over the twenty-year period of 2000-2019. Economic data is drawn from the World Bank and the IMF websites; whilst data on development indicators and income inequality is drawn from the UNDP (United Nations Development Programme) and WID (World Inequality database) websites. Analysis of the data in these countries provides insights into the factors and processes which influence economic growth and human development in economies with a democratic political regime. The estimated equation shows that economic growth in OECD countries was significantly higher when incoming investment as a proportion of the size of the

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economy and openness of the economy were higher, inflation, exchange rate changes and oil prices were lower. Smaller economies in the OECD also had higher economic growth. As the aim of a government is to increase not only the income but also the standard of living of its citizens, it is necessary also to assess the relationship between economic growth and the quality of life and well-being of its citizens. Five-year average cross-sectional regressions also show that economic growth in OECD countries is higher in the countries with lower HDI. This report further finds that economic growth has a bi-directional causality with changes in the human development index, and changes in life expectancy and a unidirectional causality with changes in the expected years of schooling (implying higher delivery of education) and changes in the standard of living. Another finding is that income inequality increases with economic growth; both in terms of the share of income of the top 10% and share of the lower 50%. Clearly investment in public goods, and social policies for education, skills training, healthcare and redistribution of wealth need more attention.

Key Words:

economic growth; human development; income inequality.

JEL: F00, O11, O50, O57.

15 figures, 17 tables, 84 references.

Background and Problem Statement

The end objective of economic management by a government is to improve the standard of living and well-being of its citizens. Conventionally, this was measured by per capita gross national income. While economic growth is defined as the increase in the aggregated market value of additional goods and services produced, using estimates such as GDP, and is measured in terms of the rate of change of per capita national income, the term economic development is wider in meaning. Todaro (1994) identifies economic development as improv-

ing the availability of basic life sustaining goods, raising the standards of living and expanding the range of economic and social choices available to individuals. In recent years, the accent has changed to more equitable growth, with emphasis on issues of economic development such as the quality of life and well-being of citizens.

In general terms, quality of life encompasses a good standard of living with employment opportunities that can afford housing, food needs, travel and transportation with access to education, healthcare and expectancy of a long life. The Human Development Index (HDI) is a composite index devised by the UNDP (1990) to measure the quality of life and well-being and it is comprised of three dimensions: Health, Education and Income. The Education component is measured by expected years of schooling and mean years of schooling; the Health component – as life expectancy at birth; and the Income component – as the gross national income (GNI) per capita (purchasing power parity in US$). Another concept which has come to the fore in recent years is Income inequality. This is an additional dimension of well-being as confirmed in research: higher income inequality has negative social consequences such as family instability, mental illness, higher crime rates and drug use.

In the most recent update of HDI for 2019 by the UNDP, 185 countries are included and classified into four groups.

Table 1

HDI classifications

HDI Level	HDI range	Number of countries
Very high	0.80 < HDI < 1.00	66
High	0.70 < HDI < 0.80	53
Medium	0.55 < HDI < 0.70	37
Low	0.40< HDI < 0.55	29

Source: UNDP

Over the last twenty years, Norway has had the highest average HDI (0.94), while for comparison purposes, the HDI of the US was 0.91, that of China – 0.68 and that of India – 0.57.

The Organisation for Economic Co-operation and Development (OECD) is an international organisation that works to build better policies for better lives. It was founded in 1961 to stimulate economic progress and world trade and is a fo-

rum of countries describing themselves as committed to democracy and the market economy, providing a platform to compare policy experiences. Its goal is to shape policies that foster prosperity, equality, opportunity and well-being for all (OECD website).

As of the end of 2020, the OECD was comprised of 37 countries. Its members and the date of joining are as follows.

Table 2

List of OECD countries

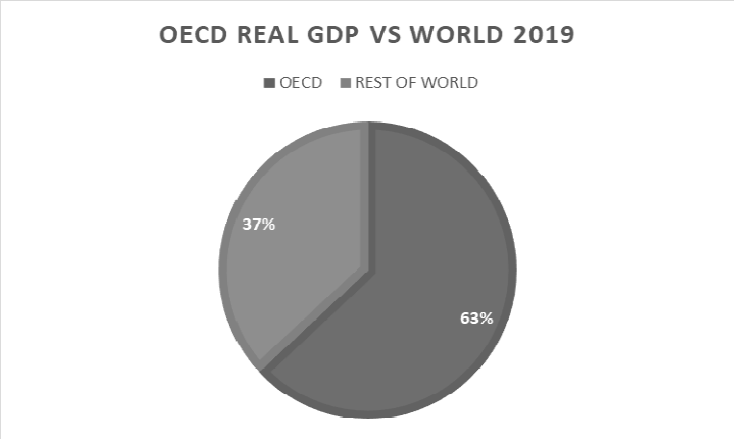
Country	Date	Country	Date	Country	Date
Australia	07-Jun-71	Hungary	07-May-96	New Zealand	29-May-73
Austria	29-Sep-61	Iceland	05-Jun-61	Norway	04-Jul-61
Belgium	13-Sep-61	Ireland	17-Aug-61	Poland	22-Nov-96
Canada	10-Apr-61	Israel	07-Sep-10	Portugal	04-Aug-61
Chile	07-May-10	Italy	29-Mar-62	Slovak Rep	14-Dec-00
Czech Rep	21-Dec-95	Japan	28-Apr-64	Slovenia	21-Jul-10
Denmark	30-May-61	Korea	12-Dec-96	Spain	03-Aug-61
Estonia	09-Dec-10	Latvia	01-Jul-16	Sweden	28-Sep-61
Finland	28-Jan-69	Lithuania	05-Jul-18	Switzerland	28-Sep-61
France	07-Aug-61	Luxembourg	07-Dec-61	Turkey	02-Aug-61
Germany	27-Sep-61	Mexico	18-May-94	United Kingdom	02-May-61
Greece	27-Sep-61	Netherlands	13-Nov-61	United States	14-Dec-60
				Colombia	28-Apr-20

Source: www.OECD.org

In 2019, OECD countries collectively accounted for 63% of real global GDP and their economic growth averaged 2.17% (world average 2.92%); OECD HDI averaged 0.90 (world average 0.737) and the income share of the top 10% of the population was 0.3664 in the OECD (world average 0.5163), while the income share of the lowest 50% was 0.204 in the OECD (world average 0.094). The GNI per capita in 2019 in OECD countries (based on PPP 2017$) was $44,967 versus the World average of $16,734.

Figure 1

OECD real GDP versus rest of world in 2019



Source: based on data of World Bank leading indicators

OECD countries being committed to democratically elected government and market economies, comprise a set of countries with transparent policies and data availability. Analysis of such data provides insights into the factors and processes which influence economic growth and their relationship with indices of quality of life, well-being and income effects. This research focuses on the data of thirty-seven countries over the twenty-year period of 2000-2019.

The aim of this research is to determine the factors and processes which have influenced economic growth in OECD countries over the last twenty years and also to ascertain the relationship of economic growth with indices of quality of life, well-being and income inequality.

In the first section, the aim and overview of the research are provided. Section Two is a review of relevant literature. This part presents a critical review of relevant articles on the subject of this research. Section Three explains the design of the research, methodological choices made and data sources. Section Four presents the results of the analysis conducted with interpretations. In Section Five, the findings are discussed and finally in Section 6 the conclusions of the research and recommendations for future research are presented.

Literature Review

This literature review provides an extensive overview of the factors which influence economic growth and also the quality of life and well-being. Economic Growth is the change in national income over a specific period (Bucknall, 2013). The most common way to measure economic growth is to measure the change in the gross domestic product. GDP takes into account all goods and services that are produced within a country. Real GDP adjusts for inflation effects (Amadeo, 2019). Alternative measures for economic growth include the change in the gross national product (GNP) and net national product (NNP). To compare different countries, possible national income per capita is a very useful method (Bucknall, 2013). However, when analysing data and statistics it is always important to be aware of the limitations. GDP and the above-mentioned measures do not take into account factors which affect the quality of life or the distribution of income among the population or damages (e.g. environmental damage) the production causes to the system. Furthermore, the «Black Economy» is not included in GDP. In some countries this is considered to be a huge share of national income (Bucknall, 2013). Nevertheless, national income is a clear measure with data available for most countries which makes it the most common measure for analysis of economic development.

What are the factors which drive economic growth? This question has been subject to many empirical studies. Barro (1996) conducted a cross-country study with the data of about 100 countries to identify seven factors that enhance economic growth. He identified them as higher schooling, higher life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law, lower inflation and improvements in the terms of trade.

In theory, trade openness has many beneficial effects: it facilitates factor movement from abroad, capital flows and investment and technological improvements leading to productivity improvements in the recipient economy and overall better allocation of resources (Grossman & Helpman, 1991; Romer, 1986, 1991; Rodrik, 1988; Chuang, 2000). However, for trade openness to be effective, it also needs to be accompanied by appropriate macroeconomic policies (Newfarmer & Sztajerowska, 2012). The level of economic development also influences the extent of effect of trade openness on economic growth (Kim & Lin,2009). The study by Herzer (2013) found that the impact of trade openness is positive for developed countries and negative for developing ones.

Empirical studies have looked at the causality between trade and economic growth. Zeren and Ari (2013) found positive bidirectional causality between openness and economic growth for G7 countries. Similar results were found by Dritsaki et al. (2004) for Greece. The result is somewhat different for developing economies: Bastola and Sapkota (2015) find a positive causality be-

tween exports and growth and a negative causality between imports and growth, suggesting that export promoting and import substitution policies are more appropriate overall. The effect of improvements in the terms of trade on global economic growth was also discussed by Zahonogo (2016), whose findings suggest that the relationship between trade openness and economic growth is not linear and improvements in terms of trade foster economic growth only below a certain trade threshold. Although Chatterji et al. (2014) could not find any evidence that trade barriers lower economic growth in India, their study found that increasing trading volume has a positive effect on growth.

The discussion about lower inflation as a driver for economic growth is quite controversial. Some researchers (Saymeh et al., 2013; Erbaykal & Okuyan, 2008; Chichi & Casmir, 2014; Fischer, 1993) agree with Barro (1996) that inflation has a negative influence on growth. A reason for this is the reduction of the value of investments and productivity growth at high inflation rates (Fischer, 1993). Therefore, some of these researchers suggest that policy makers should keep inflation at a low level. Others could not find a significant relationship between inflation and growth (Semuel & Nurina, 2015; Babalola et al., 2015; Shuaib et al., 2015). However, the studies that could not find evidence were all related to developing countries. This indicates a different effect of inflation on growth for developed and developing countries. This is also supported by the Balassa-Samuelson effect which suggests that developing economies have a higher rate of inflation through competition for resources to increase productivity, while in developed economies productivity is already higher with lower inflation rates.

McPherson and Rakovski (2000) studied the relationship between economic growth and exchange rate in Kenya based on data for the period from 1970 to 1996, and found no evidence of a strong direct relationship between changes in the exchange rate and GDP. However, Rodrik (2008) using a dataset of 188 countries and 11 five-year periods from 1950–54 through 2000–04 found that undervaluation of the currency helps economic growth. This result is supported by Khondker et al. (2012) studying data from Bangladesh over the period of 1980-2012. They concluded that the effect of currency undervaluation is at first contractionary but in the long run it has an expansionary effect and leads to higher economic growth, for which reason they propose a creeping exchange rate depreciation policy. Kojid et al. (2012) investigated the effects of the exchange rates on economic growth in Malaysia using time series data spanning from 1971 to 2009 and found that nominal and real exchange rate have a causal effect on economic growth and recommended for exchange rate management to promote economic growth.

Barguellil et al. (2018) conducted an empirical investigation on the impact of exchange rate volatility on economic growth based on a sample of 45 developing and emerging countries over the period of 1985-2015. They concluded that volatility is more harmful when countries adopt flexible exchange rate regimes and financial openness. Jakob (2016) studied the relationship between exchange

rate and economic growth in 74 countries using data from 36 developed and 38 developing countries for the year of 2012 and concluded that there is a positive and significant correlation between pegged exchange rate and growth in GDP. Huang and Malhtora (2004) studied the relationship between exchange rate regimes and economic growth in 12 developing Asian countries and 18 advanced European countries over the period of 1976-2001. They found that the choice of exchange rate regimes did not have significant impact on economic growth in European nations, although more flexible regimes were associated with higher growth. A different result was presented by De Grauwe and Schnabl (2004), who showed that higher output occurred under peg regimes in Central and Eastern Europe because it eliminated exchange rate risk. This result is supported by Morina et al. (2020) who examined the impact of exchange rate volatilty on economic growth for 14 CEE countries for the period of 2002–2018 and concluded that exchange rate stability is important for economic growth.

Kudaisi and Idharhi (2015) identify foreign direct investment as a driver for economic growth in Nigeria. This confirms the conclusion of Mukolu et al. (2013) who conducted a similar study for Nigeria. A significant positive relationship between FDI and economic growth was also found for Malaysia (Har Wai Mun, 2008) and Pakistan (Ali, 2014). However, the positive relationship in Pakistan was only confirmed in the short run. The analysis of a long run effect shows a negative impact of FDI on growth (Ali, 2014). Borensztein et al. (1998), too, assign FDI a positive contribution to growth under the condition that the host country has to hold a minimum threshold stock of human capital for this effect to be valid. The effect on growth through FDI is relatively higher than the effect of domestic investment. Furthermore, they found that foreign direct investment is crucial for transferring technologies among the countries (Borensztein et al., 1998). Interestingly, the sector that receives the FDI seems to play a role on how growth is affected. Alfaro (2003) analyzed cross-country data from 1982-1999 to find an ambiguous effect of FDI on growth. While there is a positive relationship between FDI and growth for investments in manufacturing, a reverse effect is observed for the primary sector. The causality between foreign direct investment and growth was studied by Dhakal et al. (2007). Using Granger causality tests, they found evidence of economic growth influencing FDI. Dritsaki et al. (2004) found a unidirectional causality between FDI and economic growth, with direction from foreign direct investments to GDP. The general finding is that FDI aids economic growth with causality from FDI to economic growth, though in some cases of developed economies a two-way causality is also evidenced.

Economic growth seems not to depend on the political regime in a country (Pinho et al., 2015 and Gerring et al., 2005 among others). Gerring et al. (2005) and Pinho et al. (2015) agreed that the degree of democracy is irrelevant for growth once fixed effects are considered. Gerring et al. (2005) added that there is a negative effect, if one at all, but identified political institutions as an important factor for growth. Przeworski et al. (1995) also could not find any evidence that

political regimes capture the development of economic growth. However, Przeworski (2004) argued that per capita income increases under democracy due to the more rapid growth of the population under dictatorships. Although there is no evidence for democracy having an influence on growth, Pillai (2011) finds a positive effect of the level of democracy on income inequality and Swagel et al. (1992) conclude that political stability, defined as «the propensity of a government collapse» supports economic growth. Returning to the cross-country research of Barro (1996), there was evidence in favour of a weak effect of political freedom on growth.

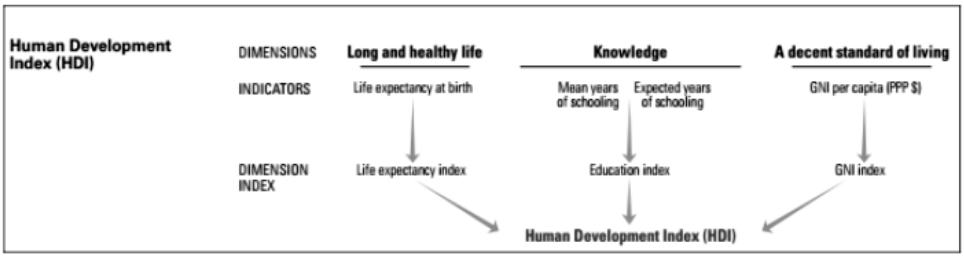
Changes in global oil prices have an influence on economic growth. As expected, the effect is different for oil importer countries and exporter countries (Ghalayini, 2011). Oil importer countries experience a negative relationship between oil prices and economic growth (Ghalayini, 2011). This can also be seen for the example of Tunis. As an oil importing country, the Tunisian economy suffers from rises in the oil price (Bouzid, 2012). Growth in OPEC countries like UAE, Kuwait, Saudi Arabia and Venezuela, on the other hand, is positively correlated with oil prices. This relationship however is stronger in the medium-term than in the short-term (Ftiti et al., 2016). For most other countries except the G7 group, a relationship between oil price and economic growth is not proved (Ghalayini, 2011). These findings are supported by Gadea et al. (2016). In their study on the effect of oil prices on the US economy they could not find a significant relationship between the two factors. Only some sub periods experience significant results. This suggests a non-linear relationship between oil prices and economic growth with a higher negative effect in times of large oil price increases (Gadea et al., 2016). Moreover, the effect of oil price shocks on economic growth in the United States has declined over time (Gadea et al., 2016).

Human Development Index (HDI)

The Human Development Index (HDI) was created in 1990 by the UNDP and has become an aggregate measure for capturing aspects of well-being not covered by economic growth alone (Malik, 2014). It is composed of three different dimensions: health, income, and education. The Education component is measured by expected years of schooling (entire age) and mean years of schooling (adults under 25); the Health component is measured by life expectancy at birth; the Income component – by gross national income (GNI) per capita (purchasing power parity in US$).

Figure 2

The HDI Index composition



Source: UNDP (2014).

Blanchflower and Oswald (2005) defined the HDI as one of the best efforts to move away from the dependence on GDP as the proxy for economic development. Taking advantage of the success of the HDI, the United Nations has been able to alert governments around the world that pursuit of economic development is not exclusively synonymous with economic growth. However, the HDI concept has some shortcomings such as human rights, freedom, gender equality, unemployment or access to clean water (Bucknall, 2013; UNDP, 2018). In addition, the HDI might be correlated with GDP due to the utilisation of the income dimension in the measurement process (Perovic & Golem, 2010). Despite its drawbacks, the HDI has been able to change policymakers' views and has influenced the focus of developing economies towards people-centred programmes (Haq, 1995; Scarpin & Slomski, 2007; Jahan, 2017).

Deb (2015) focused on whether the HDI ranking of countries is different from the GDP ranking to find a gap between the measures. The author found that the influence of GDP on the HDI index varies according to the level of income of each country. His research pointed out a positive impact for low-income countries, but a weak one for high-income countries. As such, the effect of GDP on HDI tends to deteriorate as the level of income increases. Ranis (2004) and Ranis and Stewart (2012) explored the HDI/GDP relationship to a great extent. The authors affirmed that there are different paths to obtain an improvement on the HDI index; the majority of them are either correlated to growth or to an increase in a government's social expenditure. Theoretically, the level of spending in education is likely to affect the index and might be relevant to defining success and failure in the evolution of HDI over time. Likewise, the size of health and social assistance expenditure ratios have a chance to impact on the standard of living of the population and therefore on human development (HD). Although political rights, social instability, and gender empowerment are weakly correlated to

the HDI index, Ranis and Stewart (2012) defined success in HD according to improvements in the HDI performance. As such, growing nations with a high HDI rank can reach success maintaining the national education indicator at a moderate level at least; medium and low HDI countries can advance even during slow growth periods, but only via better education and income distribution indicators (Ranis & Stewart, 2012). Another study on the relationship between human development and economic growth by Suri et al. (2011) again found that there is a two-way relationship between growth and development. Human development is affected by growth through increasing government activity. Allocation of income plays an important role in the degree of impact in human development. Therefore, the same increase in growth can lead to very different levels of development (Ranis, 2004). Increasing human development in turn supports peoples' productivity and therefore enhances economic growth (Ranis, 2004). Additionally, Suri et al. (2011) discovered an effect of human development on growth trajectories. They implied that human development must be improved first in order to achieve economic growth and development.

Korkmaz and Kulunk (2016) conducted a panel causality test of data on ten OECD countries for the period of 2007-2013 to reveal the relationship between economic development and economic growth. Their findings suggest a unidirectional relationship from economic growth to higher education schooling rate and life expectancy at birth. Mehrara and Musai (2013) analysed the interaction of economic growth and education (one of the factors in the HDI) in developing countries. Although they discovered a strong effect of growth on education, the reverse effect of education on growth was not significant. Evidence implied that an increasing number of students leads to a decline in education quality (Mehrara & Musai, 2013). Since economic development seems to play such an important role for economic growth, Dang and Pheng (2015) researched how it could be supported. However, they could not give a simple recommendation because development is a multidimensional and complex process. New policies to support economic development will be important in the long run (Dang & Pheng, 2015). The research of Shah (2016) showed that healthy lifestyles, better access to health services or improving education help to enhance life expectancy, which subsequently increases human development as a factor in the human development index (OECD, 2012).

Income Inequality

Apart from quality of life factors, Income inequality is an additional confirmed dimension of well-being. It considers some negative social consequences such as family instability, mental illness, higher crime rates and drug use. Wilkinson and Picket (2006) found higher rates of health and social problems (obesity, mental illness, homicides, teenage births, incarceration, child conflict, drug use),

and lower rates of social goods (life expectancy by country, educational performance, trust among strangers, women's status, social mobility, even numbers of patents issued) in countries and states with higher inequality. Using statistics from 23 developed countries and the 50 states of the US, they found social/health problems lower in countries like Japan and Finland than in countries (US and UK) with large differences in household income. These issues are also covered by Rowlingson (2011).

Evidence from a broad panel of countries (Barro, 2000) shows that higher inequality tends to retard growth in poor countries and encourage growth in richer places. The Kuznets curve – whereby inequality first increases and later decreases during the process of economic development – emerges as a clear empirical regularity. A study by Stiglitz (2015) emphasized the deleterious effect of economic growth in rich countries through increasing income inequality. This study recommended higher investment in public goods (infrastructure, technology and education) including support for education, increasing the minimum wage, cutting down excessive remuneration packages at the top level, ensuring proper macroeconomic policies to ensure stability and full employment, and financing the public investments through fair and full taxation of capital income.

Conventionally, the Gini index has been used to measure the extent of income inequality in a country. It measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution: a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

A comparative evaluation of the Gini coefficient of 21 OECD countries in 1985 versus 2012 by Cingano (2014) found that the Gini measure stood at 0.29 in the mid-eighties but had increased to 0.32 by 2012. Moreover, the Gini coefficient increased in 16 out of the 21 OECD countries for which long time series are available, rising by more than 5 points in Finland, Israel, New Zealand, Sweden and the United States, and falling slightly only in Greece and Turkey. While income inequality has been rising in the OECD countries, the study also found that income inequality reduces economic growth and evidence that this effect of inequality on growth is mainly driven by education (Cingano, 2014). Children in poorer households generally experience less investments in education, leading to lower social mobility and reduced skill development. The resulting and increasing gap between poor households and the lower middle class is responsible for the impact on economic growth (Cingano, 2014). Bruckner and Lederman (2015) came to a different conclusion about the effect of income inequality on growth. According to their study, the effect is nonlinear. An increase in income inequality has a negative impact on economic growth for rich and middle-income countries but there is an opposite effect in poor countries. They confirm the results of Galor and Zeira (1993), who also found a nonlinear relationship between economic growth and income inequality. All these studies used the Gini Coefficient to measure income inequality. All authors pointed out that data on the Gini coeffi-

cient is not a continuous series with many gaps for many countries for many years.

An alternative source of data on income inequality is the World Inequality database (WID) developed by Piketty and Zucman (2013, 2014). Here data from about 1900s is collated to illustrate the historical evolution of the world distribution of income and wealth. The data is collected using the methodologies of Kuznets (1953) and Atkinson (1970) – pioneers in the field of inequality research – and others. At present, data on the income share of the top 1%, 10%, middle 40%, and bottom 50% of the population is available for most countries from 1900.

The World Bank published their Growth Report prepared by the Commission on Growth and Development in 2008. The report focuses on 13 exclusive countries that have achieved high economic growth in the post-World War II period and discusses the factors that led to those growth rates. Their conclusion was that sustainable growth rates could be reached because of the opening of the world economy and the countries taking advantage of it. This was done by import of technology and know-how, on the one hand, and increasing export of goods, on the other hand. The report then continues to lay out the supporting policies that a country will need to enhance growth. This includes low barriers to enter and exit the market, the management of exchange rates to avoid real appreciations and the benefits of openness. It also draws attention to rising income inequality and commodity prices.

Although FDI has generally been associated with higher economic growth, it is important to look at the sector, too because effects can differ among different sectors (Alfaro, 2003). In developing economies, the causality from FDI to economic growth is higher, but in developed economies a two-way causality is also noticed.

Trade openness has many beneficial effects: it facilitates factor movement from abroad, capital flows and investment and technological improvements leading to productivity improvements in the recipient economy and overall better allocation of resources. Openness is an important aspect of external competitiveness, but sometimes it is discussed ambivalently in the literature.

A somewhat negative impact on economic growth can be found for inflation. While the effect of inflation on growth seems not to be as strong in emerging markets as several studies of emerging countries suggest, there is consensus about high interest rates and exchange rates having a negative impact on growth. The predominant opinion is that inflation should be kept at a relatively low level to support economic growth. A reason for this is that inflation distorts prices and reduces the value of investments and productivity growth.

Fixed exchange rate regimes are better for developing countries because they remove volatility and exchange rate risk and, secondly, undervaluation

spurs economic growth. However, for developed countries, where productivity is higher, openness and floating rate regimes may be better as they allow adjustment between tradeable and non-tradeable sectors to competitive circumstances.

The effect of oil price changes seems not to be very strong. As expected, an increase in oil prices has a positive effect on oil exporting countries and a negative effect in oil importing countries. Nonetheless, the impact has declined over time.

There does appear to be a two-way relationship between economic growth and economic development. Increasing growth enhances government activity and income allocation. Development, on the other hand, supports people's productivity, which leads to economic growth. According to the literature, human development is necessary for sustainable economic growth. A healthy lifestyle, access to good healthcare and education can be important factors to improve development. Income inequality is another important factor to take into account when analysing economic growth. In OECD countries there is clear evidence that income inequality reduces growth. Other studies find than an increase in income inequality has a negative impact on economic growth in high-income and middle-income countries, but growth in poor countries comes with higher income inequality.

As mentioned above, economic growth, development and income inequality are linked and measured by specific indices. Although they are good indicators and commonly used, it is important to know and consider the limitations and shortcomings of these measures. Provided this, the three indices combined can give a good overview and serve as a well-founded basis for analysis.

Methodology

Problem Statement

From the literature review, it is clear that much research has been done on economic growth and factors which affect economic growth. However, economic growth is an economy-wide measure and though it translates into a per capita metric, there could still be large proportions of the population with low income: a fact which is hidden by a simple metric that is calculated by dividing economy size (total gross domestic product) by the population. As the aim of a government is to increase not only the income but also the standard of living of its citizens, it

is also necessary to assess the relationship between economic growth and the quality of life and well-being of its citizens.

As relatively little research has been done in this area, it is **the aim of this research** first, to determine the factors which drive economic growth and then to assess its relationships with indicators of HDI and Income Inequality covered in the literature review.

The OECD group of countries is chosen for the research as they operate predominantly as market economies with a democratic framework and cover a range of countries with a good distribution of GNI per capita. The average GNI per capita in OECD countries in 2019 (PPP adjusted 2017 $) was $44,967 with 28 countries in the first quartile, 7 countries in the second quartile and 2 countries in the third quartile.

Econometric approach

This study research covers two aspects of economic growth; the macroeconomic factors which affect it and the relationship of Economic Growth with Human Development and Income Inequality.

From the literature review, six macroeconomic variables are identified as relevant factors which affect economic growth: trade openness (OPEN), inflation (INF), foreign direct investment as a proportion of size of the economy (FDIGDP), changes in exchange rates (LDXOECD), Economy size (LRGDP), Oil price (BOIL$) and GDP growth (GDPGWTH), so that the GDPGROWTH equation can be expressed as:

$$GDP\ Growth = f(OPEN, INF, FDIGDP, LDXOECD, BOIL\$, LRGDP)$$

To examine the impact of economic growth on human development and income inequality, the human development index (HDI) (composed of expected years of schooling (EYS), life expectancy at birth (LEB), and per capita Gross National Income (GNIPC)) and two indices of Income Inequality (INCINEQ): the share of income of the top 10% of the population (P90P100) and the share of income of the bottom 50% of the population (POP50) are analyzed for their relationship with growth.

$$GDP\ Growth = f(HDI, INCINEQ)$$

Since Granger (1969) introduced the concept of granger causality, it has become a well-known concept in econometrics. Causality describes the relationship between cause and effect of two variables (Pearl, 2012). Granger causality relationships between economic growth and macroeconomic factors; economic growth and human development and income inequality indicators are studied.

Data Sources and Estimation Method

The data in this research is made up of macroeconomic information accessed from the World bank and OECD websites. Human Development and Income Inequality data are accessed from the UNDP and WID websites. It is comprised of the data of 37 OECD countries for twenty years (2000-2019).

A panel data approach will be followed to analyse the data as it is most suitable for a sample that includes both cross-sectional and time-series data (Hoffman, 2011). The Generalised Method of Moments (GMM) is an estimation method used to overcome endogeneity problems. Dynamic panel estimation has one or more lagged dependent variables. When N is larger than T, the Generalised Method of Moments (GMM) using the Arellano Bond (1991) method gives consistent estimators. The moment conditions use the properties of instruments to be uncorrelated with future errors. Data is transformed and an instrument weighting matrix is used in the estimations. The Sargan test (1988, 1991) for overidentifying restrictions is applied to test the validity of instrumental variables, and the Arellano Bond second order serial correlation test is applied on the residuals.

Analysis and Findings

Relationships between GDPGWTH and macroeconomic indicators

For the sake of convienience, the variables have been presented as abbreviations in most tables and figure. Explanation of variables for estimations is given in Table 1.

First, the descriptive statistics for the macroeconomic data of the 37 OECD countries are presented.

The data is now visually inspected against world averages.

Over the entire twenty-year period (2000-19), real GDP growth averaged 2.56% in OECD countries, compared to the world average of 2.91%. The average growth rates in the same period in some other regions are also presented for comparison purposes: China (9.01%); India (6.47%); European Union (1.56%). A severe drop in GDP growth in all groups can be observed between 2007 and 2009. In the following period between 2009 and 2010 GDP growth rates bounced back to prior levels.

Table 3

Explanation of variables for the estimations

Abbreviation	Explanation
GDPGWTH	the economic growth rate, changes in real GDP
INF	year to year change in the consumer price series
FDIGDP	net inflows of Foreign Direct Investment as a percentage of GDP
LDXOECD	log difference (change) in LCU/$
LCU	Local currency exchange rate/$
OPEN	Export +Import as a ratio of GDP
BOIL$:	Brent crude oil price in $, an exogenous variable
LRGDP	log of real GDP

Table 4

Descriptive statistics of macroeconomic variables

	GDPGWTH	FDIGDP	INF	LDXOECD	LRGDP	OPEN	BOIL$
Mean	2.557645	4.938214	2.727695	0.003929	26.66882	93.72811	64.65407
Median	2.543450	2.819335	2.169846	-0.000321	26.66294	77.33419	62.94610
Maximum	25.16253	86.58909	54.91537	0.673074	30.53794	408.3620	111.9656
Minimum	-14.83861	-58.32288	-4.478103	-0.227578	23.07801	19.79813	24.42157
Std.Dev.	3.104389	10.37610	3.944378	0.091072	1.576862	57.15187	28.49339
Skewness	-0.398655	2.814785	8.305679	1.012830	-0.059779	2.303347	0.257743
Kurtosis	10.93409	23.26508	100.9449	7.368984	2.783439	10.82704	1.919914
Jarque-Bera	1960.550	13639.61	304298.7	715.0657	1.886785	2543.261	44.16290
Probability	0.000000	0.000000	0.000000	0.000000	0.389305	0.000000	0.000000
Observa-tions	740	740	740	740	740	740	740

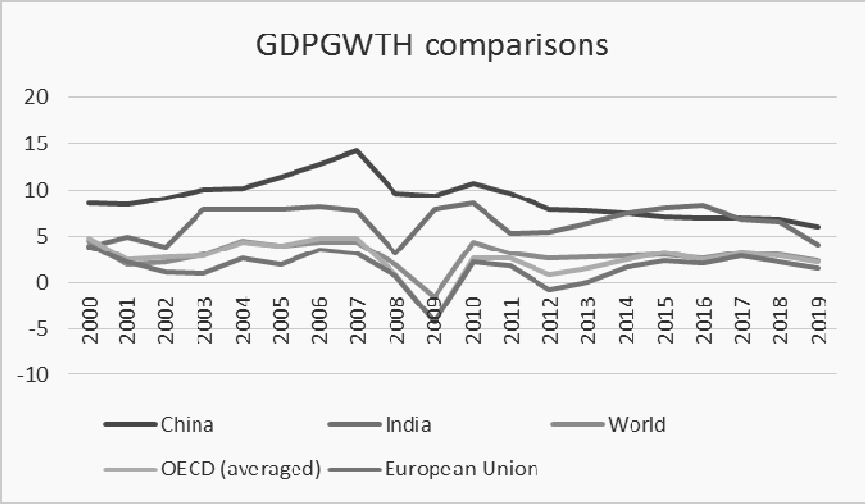
Data Source: World Bank

Over the entire twenty-year period, average inflation in OECD countries (2.73%) was lower than that in the whole world (3.38%). While inflation in OECD countries was above worldwide inflation prior to 2003, the relationship changed when worldwide inflation rose above OECD inflation from 2004 onwards only to align to OECD countries' inflation in 2017. Since then, both inflation rates have been almost similar.

Values of average exchange rates in OECD countries against US$ have been fluctuating and over the entire twenty-year period there has been an average positive change (depreciation) of 0.393%.

Figure 3

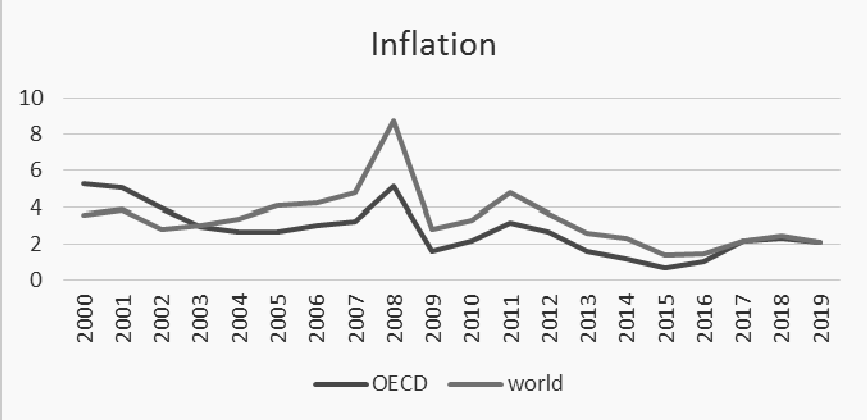
Real average GDP growth rates of OECD and the world



Data Source: World Bank leading indicators

Figure 4

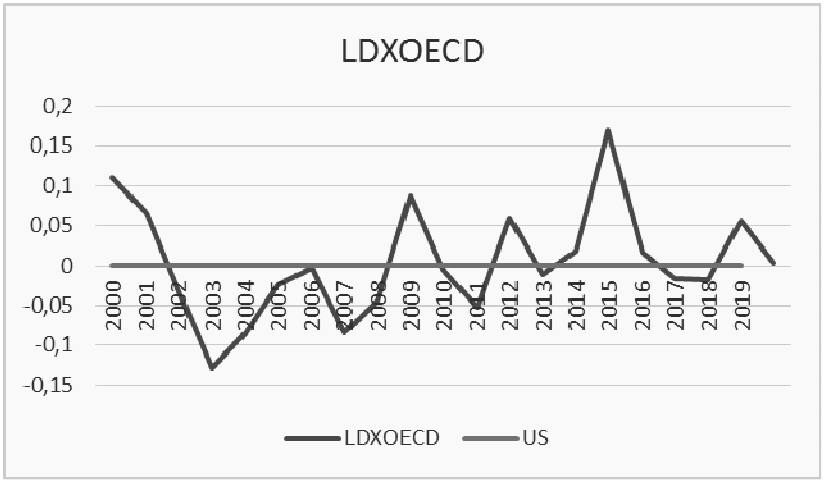
Average inflation rates of OECD and the world.



Data Source: World Bank leading indicators

Figure 5

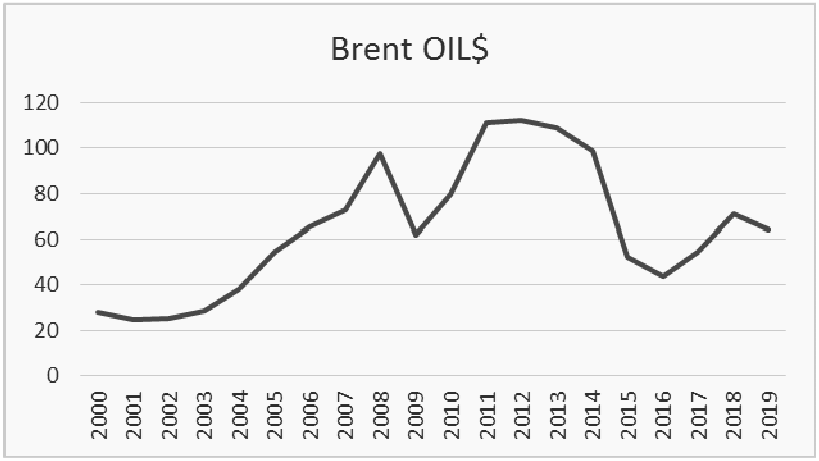
Average changes of OECD countries versus the US dollar



Data Source: World Bank leading indicators

Figure 6

Average annual Brent crude prices in US $ over the entire period

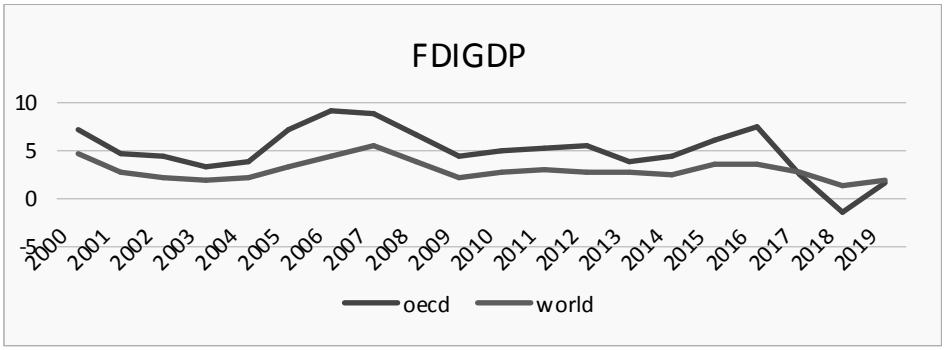


Data Source: World Bank leading indicators

Over the entire 20-year period, average annual Brent crude prices in US dollars increased substantially with a minimum of $24.96 in 2002, a maximum of $111.96 in 2012, and an average price of $64.65 over the entire period.

Figure 7

Average annual FDI/GDP ratios in OECD countries versus the whole world



Data Source: World Bank leading indicators

Over the entire twenty-year period, average FDI/GDP ratio (4.94%) was higher in OECD countries than in the whole world (2.96%). The world FDI/GDP ratio was above the FDI/GDP ratio of OECD countries after 2017.

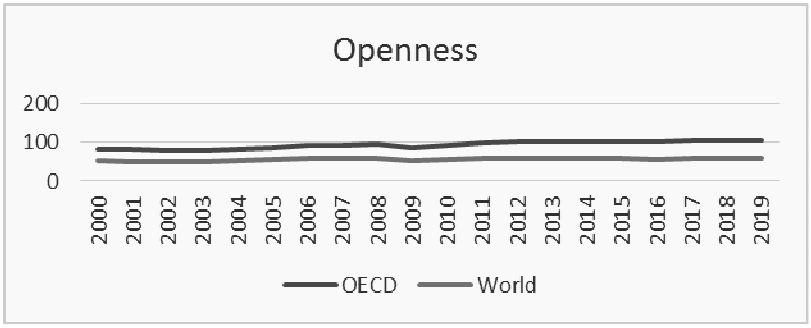
Over the entire twenty-year period, average Openness in OECD countries was higher (93.73%) than that in the whole world (56.52%).

On average, over the twenty-year period, OECD countries averaged 68.58% of that of the whole world.

The regression of macroeconomic variables versus GDPGWTH is as below (Table 5).

Figure 8

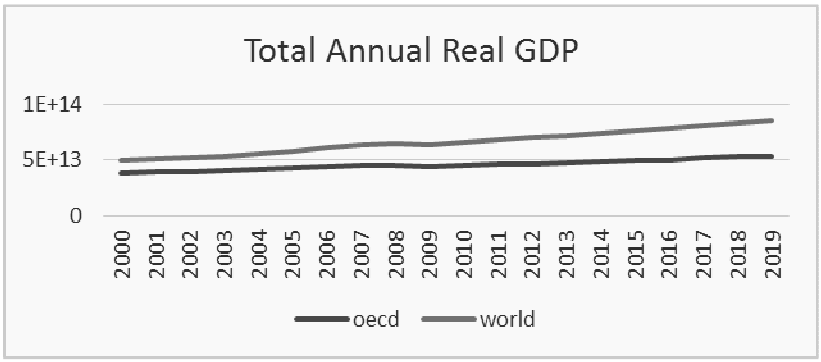
Average annual Openness in OECD countries versus the whole world



Data Source: World Bank leading indicators

Figure 9

Total annual real GDP (ln) of OECD countries versus the whole world



Data Source: World Bank leading indicators

The estimated equation shows that the coefficients of FDIGDP, OPEN are positive and significant at the 1% level, the coefficients of INF, LDXOECD, BOIL$ are negative at the 1% level, while the coefficient of LRGDP is negative and significant at the 10% level. It means economic growth in OECD countries was significantly higher when incoming investment as a proportion of the size of the economy and openness of the economy were higher; inflation, exchange rate depreciation and oil prices were lower, while the smaller economies also had higher economic growth.

Table 5

Regression of macroeconomic variables against GDPGWTH

Dependent Variable: GDPGWTH
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2002 2019
Periods included: 18
Cross-sections included: 37
Total panel (balanced) observations: 666
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(GDPGWTH,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPGWTH(-1)	0.230213	0.014133	16.28916	0.0000
INF	-0.039836	0.012609	-3.159281	0.0032
FDIGDP	0.106904	0.015611	6.847768	0.0000
OPEN	0.113485	0.015145	7.493359	0.0000
BOIL$	-0.031123	0.003783	-8.226247	0.0000
LDXOECD	-14.19476	0.547960	-25.90475	0.0000
LRGDP	-2.497673	1.387828	-1.799699	0.0803

Effects Specification			
Cross-section fixed (first differences)			
Root MSE	3.537893	Mean dependent var	-0.012916
S.D. dependent var	3.321417	S.E. of regression	3.556634
Sum squared resid	8336.116	J-statistic	35.19208
Instrument rank	37	Prob(J-statistic)	0.235718

Arellano-Bond Serial Correlation Test
Equation: EQ01
Date: 08/03/21 Time: 19:08
Sample: 2000 2019
Included observations: 666

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-1.268425	-812.972413	640.930588	0.2046

To assess these effects properly, it is necessary to look at directions of causality. A distance of two lags is taken, in which period, it can be expected one macroeconomic variable will show its effect on another.

Table 6

Causal relationships between macroeconomic variables and GDPGWTH

Pairwise Granger Causality Tests
Sample: 2000 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FDIGDP does not Granger Cause GDPGWTH	666	0.98717	0.3732
GDPGWTH does not Granger Cause FDIGDP		0.19119	0.8260
INF does not Granger Cause GDPGWTH	666	53.4940	3.E-22
GDPGWTH does not Granger Cause INF		27.9104	2.E-12
LDXOECD does not Granger Cause GDPGWTH	666	4.80847	0.0084
GDPGWTH does not Granger Cause LDXOECD		2.05264	0.1292
LRGDP does not Granger Cause GDPGWTH	666	7.85033	0.0004
GDPGWTH does not Granger Cause LRGDP		6.90522	0.0011
OPEN does not Granger Cause GDPGWTH	666	7.83046	0.0004
GDPGWTH does not Granger Cause OPEN		32.2310	4.E-14
BOIL$ does not Granger Cause GDPGWTH	666	54.1134	2.E-22
GDPGWTH does not Granger Cause BOIL$		26.9860	5.E-12

Variables	Direction of causality
GDPGWTH and FDIGDP	No causality
GDPGWTH and LDXOECD	Unidirectional causality from LDXOECD to GDPGWTH*** GGGDPGDPGWTH** GDPGDPGWTH*
GDPGWTH and Inflation	Bidirectional causality from Inflation to GDPGWTH***
GDPGWTH and LRGDP	Bidirectional Causality from LRGDP to GDPGWTH***
GDPGWTH and OPEN	Bidirectional Causality from OPEN to GDPGWTH***
GDPGWTH and BOIL$	Bidirectional Causality from BOIL$ to GDPGWTH***

*,**,*** stands for significance at the 10%,5% and 1% levels respectively

The above test captures the causality processes in economic growth: openness, inflation, oil prices and economy size have a bidirectional causal effect, exchange rate changes. They have a unidirectional causal effect, while the rate of foreign direction investment inflows has no causal effect.

Relationships between GDPGWTH and indicators of Human Development and Income Inequality

Explanation of variables for the descriptive statistics that focus on the comparison and examination of the relation between economic growth, human development, and income inequality is presented in Table 7.

Table 7

Explanation of variables for the descriptive statistics

GDPGWTH	the economic growth rate, changes in annual real GDP
HDI	annual Human Development Indicator
EYS	component of HDI and is the expected years of schooling
LEB	component of HDI and is the life expectancy at birth
GNIPC$	component of HDI and is at 2017$ PPP rates
POP90100	annual share of income of the top 10% of the population
POP50	annual share of income in the lower half of the population

Table 8

Descriptive statistics of HDI and II indicators

Descriptive statistics

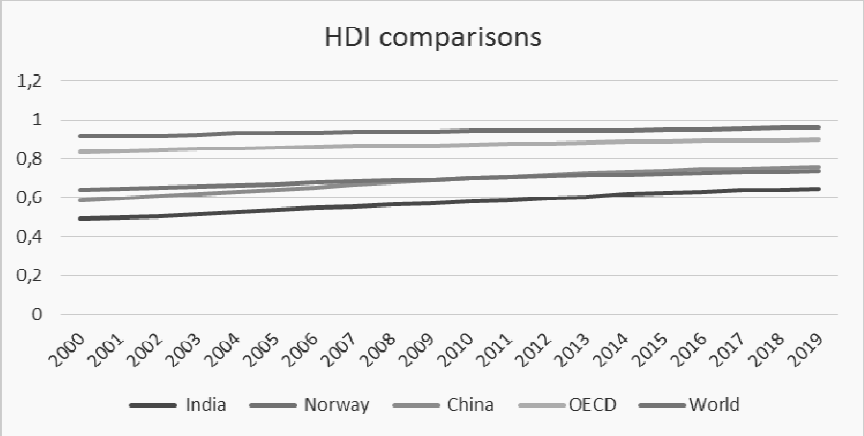
	EYS	GDPGWTH	HDI	LEB	P0P50	P90P100	GNIPC$
Mean	16.22809	2.557645	0.865039	78.96684	0.203888	0.366424	39148.89
Median	16.10000	2.543450	0.879500	79.70000	0.209450	0.338200	39086.50
Maximum	23.30000	25.16253	0.957000	84.63000	0.306500	0.637500	107701.0
Minimum	11.10000	-14.83861	0.655000	69.70000	0.070900	0.245800	8931.000
Std.Dev.	1.779709	3.104389	0.057871	3.095289	0.045667	0.081554	15503.87
Skewness	0.247449	-0.398655	-1.150503	-0.808837	-0.908331	1.437880	0.647133
Kurtosis	3.876526	10.93409	4.200249	2.958772	3.809298	4.507415	4.166781
Jarque-Bera	31.24102	1960.550	207.6696	80.73916	121.6232	324.1757	93.62545
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	740	740	740	740	738	738	740

Data source: UNDP, WID, World Bank leading indicators

The variables are inspected against world averages.

Figure 10

Annual HDI of OECD countries versus World average



Data Source: UNDP

Over the twenty-year period, HDI has been consistently higher in OECD countries (0.87) than the World average (0.69). Over the same period, Norway is ranked first and has an average HDI of 0.94, whilst the figures for China are 0.68 and India 0.57. From 2000 to 2019 HDI has increased in all datasets.

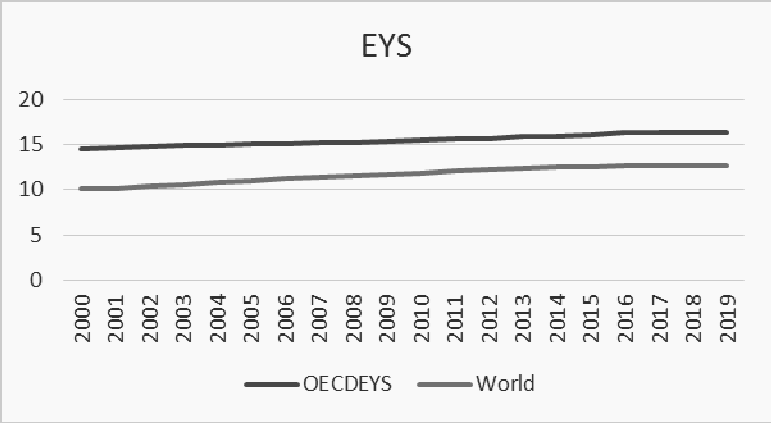
EYS has been consistently higher in OECD countries than the World average, and averaged 16.23 years over the twenty-year period (world average 11.67). In 2019, OECD average EYS was 17.01 years and the World average was 12.70 years. Like HDI, EYS has been increasing over the total period.

LEB has been consistently higher in OECD countries than the World average, and averaged 78.97 years over the twenty-year period (world average 70.29). From 2009 to 2019 LEB has slightly increased in both datasets and in 2019, OECD average LEB was 80.40 years and the World average was 72.8 years.

GNIPC$ is a component of HDI and is a measure of the standard of living of citizens (purchasing power). It has increased over the twenty-year period in both OECD countries and the world (OECD average for whole period is $39,148; World average is $13,717); the value in OECD countries is about thrice that of the world average.

Figure 11

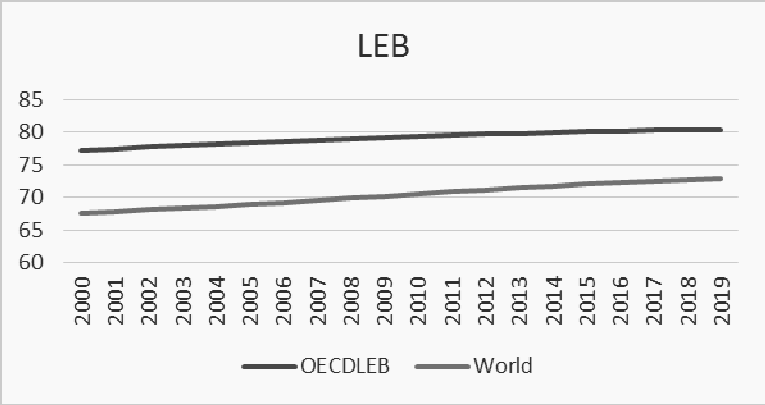
Annual EYS of OECD countries vs World average



Data Source: UNDP

Figure 12

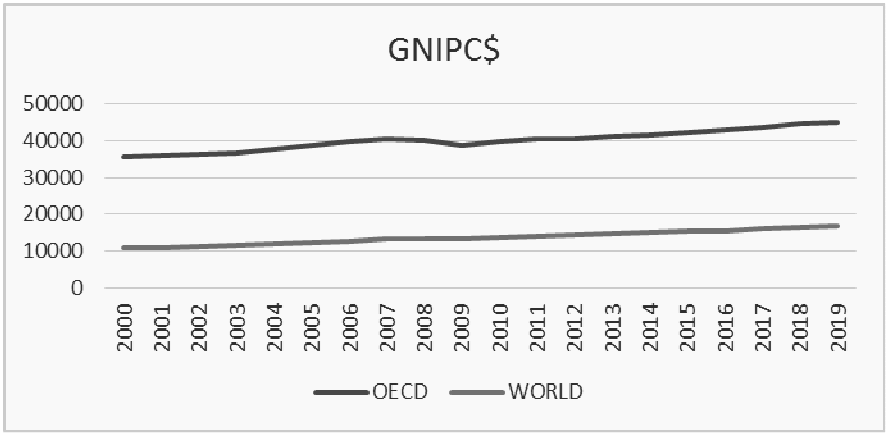
Annual LEB of OECD countries vs World average



Data Source: UNDP

Figure 13

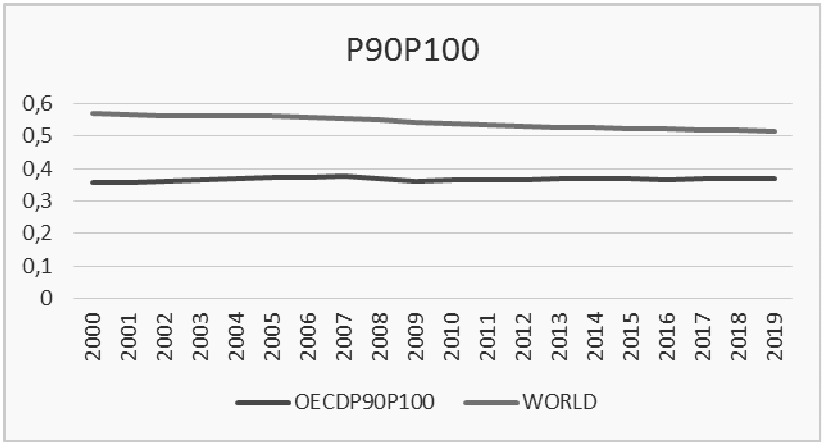
Annual GNIPC$ of OECD countries vs World average



Data Source: UNDP

Figure 14

Annual P90P100 of OECD countries vs World average

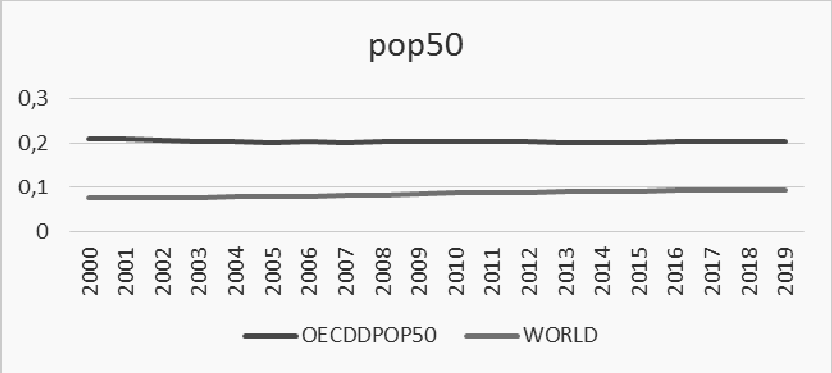


Data Source: WID

Top 10% of the population had a lower share of the total income in OECD countries over the twenty year period (36.64%) than the World average (54.15%). In 2019, top 10% of the population had 36.78% of the total income in OECD countries and 51.63% on the World average. On this measure, a lower percentage of the total income is held by the top 10% in OECD when compared to the world average.

Figure 15

Annual DPOP50 of OECD countries vs World average



Data Source: WID

Bottom 50% of the population had a higher share of the total income in OECD countries over the twenty-year period (20.39%) than the World average (8.47%). In 2019, bottom 50% had 20.40% of the total income in OECD countries and 9.40% on the world average. On this measure, a higher percentage of the total income is held by the bottom 50% in OECD countries when compared to the world average.

Considering the share of incomes held by the top 10% of the population and share of income held by the lower 50%, income inequality is lower in the OECD countries in relation to the world average.

Because HDI is a measure composed of three different components, cross-sectional regressions every five years and also over the entire period of twenty years are conducted to determine its relationship with GDPGWTH. The results are summarised below in Table 9.

Table 9

Results of five year and whole period regressions of GDPGWTH versus HDI

Years	Variable	Coeff	Std error	t-stat	Prob.	sig
2000-4	GDPGWTH	-0.0131	0.0059	-2.2293	0.032	**
2005-9	GDPGWTH	-0.0146	0.0060	-2.4141	0.021	**
2010-14	GDPGWTH	-0.0086	0.0039	-2.1850	0.036	**
2015-19	GDPGWTH	-0.0002	0.0050	-0.0432	0.966	-
2000-19	GDPGWTH	-0.0168	0.0068	-2.4830	0.018	**

*,**,*** stands for significance at the 10%,5% and 1% levels respectively

The coefficient of GDPGWTH is negative and significant in the first, second, third periods and over the entire period: economic growth is higher in OECD countries with lower HDI in almost all periods and also over the entire twenty years.

The determinants of economic growth have been identified earlier. Next, the causal relationships between economic growth and changes in the HDI and Income Inequality indicators are explored. Explanation of variables is presented in Table 10.

Table 10

Explanation of variables for the estimations

GDPGWTH	the economic growth rate, changes in annual real GDP
DHDI	year to year change in the Human Development Indicator
DPOP90100	year to year change in the share of income of the top 10% of the population
DPOP50	year to year change in the share of income in the lower half of the population
DGNIPC$	year to year change in GNI per capita at 2017 $s

The above test captures the causality processes in economic growth with indicators of human development and income inequality: there is a bidirectional causality with changes in the human development indicator and Life expectancy at birth and a unidirectional causality between GDP growth and change in expected years of schooling, change in the share of income of the top ten percent of the population, change in the share of income in the lower half of the population and change in the standard of living.

Table 11

Causality relationships between changes in changes in Human Development Indicators and GDPGWTH

Pairwise Granger Causality Tests
Sample: 2000 2019
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
GDPGWTH does not Granger Cause DGNIPC$	555	9.55355	2.E-07
DGNIPC$ does not Granger Cause GDPGWTH		1.80613	0.1262
GDPGWTH does not Granger Cause DEYS	591	4.40674	0.0016
DEYS does not Granger Cause GDPGWTH		1.66359	0.1569
GDPGWTH does not Granger Cause DHDI	591	4.47533	0.0014
DHDI does not Granger Cause GDPGWTH		5.80469	0.0001
GDPGWTH does not Granger Cause DLEB	591	3.23287	0.0122
DLEB does not Granger Cause GDPGWTH		4.16288	0.0025
GDPGWTH does not Granger Cause DP0P50	553	3.49348	0.0079
DP0P50 does not Granger Cause GDPGWTH		0.92286	0.4502
GDPGWTH does not Granger Cause DP90P100	553	3.95205	0.0036
DP90P100 does not Granger Cause GDPGWTH		0.85358	0.4917

Summary of causality tests

Variables	Direction of causality
GDPGWTH and DHDI	Bidirectional causality ***
GDPGWTH and DLEB	Bidirectional causality ***
GDPGWTH and DEYS	Causality from GDPGWTH to DEYS***
GDPGWTH and DPOP50	Causality from GDPGWTH to DPOP50***
GDPGWTH and DP90P100	Causality from GDPGWTH to DP90P100***
GDPGWTH with DGNIPC$	Causality from GDPGWTH to DGNIPC$***

*,**,*** stands for significance at the 10%,5% and 1% levels respectively

Table 12

Regression of GDPGWTH versus DHDI

Dependent Variable: DHDI
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2002 2019
Periods included: 18
Cross-sections included: 37
Total panel (unbalanced) observations: 665
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DHDI,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DHDI(-1)	-0.015681	0.000594	-26.40623	0.0000
GDPGWTH	0.000526	4.97E-06	105.7024	0.0000
	Effects Specification			
Cross-section fixed (first differences)				
Root MSE	0.005166	Mean dependent var		0.000183
S.D. dependent var	0.005341	S.E. of regression		0.005174
Sum squared resid	0.017748	J-statistic		36.83878
Instrument rank	37	Prob(J-statistic)		0.383810

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 31/05/21 Time: 15:07
Sample: 2000 2019
Included observations: 665

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-0.588940	-0.000499	0.000847	0.5559

Earlier, a significant bidirectional causality has been observed between economic growth and changes in HDI. The above equation shows that the relationship is positive; as the economic growth rate increases, changes in HDI are positive.

Table 13

Regression of GDPGWTH versus DLEB

Dependent Variable: DLEB
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 31/05/21 Time: 15:18
Sample (adjusted): 2005 2019
Periods included: 15
Cross-sections included: 37
Total panel (unbalanced) observations: 554
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DLEB,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLEB(-1)	0.282394	0.057553	4.906706	0.0000
DLEB(-2)	0.485027	0.041359	11.72719	0.0000
DLEB(-3)	0.252606	0.027848	9.070938	0.0000
DLEB(-4)	-0.000349	0.000683	-0.510962	0.6125
GDPGWTH	-0.004133	0.000560	-7.373764	0.0000

Effects Specification

Cross-section fixed (first differences)

Root MSE	0.092943	Mean dependent var	-0.007365
S.D. dependent var	0.085341	S.E. of regression	0.093365
Sum squared resid	4.785649	J-statistic	32.18659
Instrument rank	37	Prob(J-statistic)	0.457516

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 31/05/21 Time: 15:18
Sample: 2000 2019
Included observations: 554

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-1.309932	-0.280825	0.214382	0.1902

Earlier, a significant bidirectional causality has been observed between economic growth and changes in DLEB. The above equation shows that the relationship is inverse; as the economic growth rate increases, changes in LEB are lower.

Table 14

Regression of GDPGWTH versus DEYS

Dependent Variable: DEYS
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2002 2019
Periods included: 18
Cross-sections included: 37
Total panel (unbalanced) observations: 665
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DEYS,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEYS(-1)	-0.029451	0.000930	-31.65202	0.0000
GDPGWTH	0.003557	0.000692	5.137250	0.0000

Effects Specification
Cross-section fixed (first differences)

Root MSE	0.444117	Mean dependent var	-0.008964
S.D. dependent var	0.451606	S.E. of regression	0.444786
Sum squared resid	131.1645	J-statistic	34.19815
Instrument rank	37	Prob(J-statistic)	0.506638

Arellano-Bond Serial Correlation Test
Equation: EQ02DEYS
Date: 31/05/21 Time: 15:16
Sample: 2000 2019
Included observations: 665

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-0.784794	-5.566694	7.093192	0.4326

Earlier, a significant unidirectional causality has been observed between economic growth and changes in EYS. The above equation shows that the relationship is positive; as the economic growth rate increases, changes in EYS are higher.

Table 15

Regression of GDPGWTH versus DGNIPC$

Dependent Variable: DGNIPC2017
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 18/08/21 Time: 00:18
Sample (adjusted): 2003 2019
Periods included: 17
Cross-sections included: 37
Total panel (balanced) observations: 629
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DGNIPC2017,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DGNIPC2017(-1)	-0.153398	0.000543	-282.5174	0.0000
GDPGWTH	380.2729	1.842264	206.4161	0.0000

Effects Specification

Cross-section fixed (first differences)

Root MSE	2272.942	Mean dependent var	14.68680
S.D. dependent var	2670.670	S.E. of regression	2276.565
Sum squared resid	3.25E+09	J-statistic	35.69239
Instrument rank	37	Prob(J-statistic)	0.435702

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 18/08/21 Time: 00:18
Sample: 2000 2019
Included observations: 629

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-1.136923	-1146413691	1008347502	0.2556

Earlier, a significant unidirectional causality has been observed between economic growth and changes in the standard of living (GNIPC$). The above equation shows that the relationship is positive; as the economic growth rate increases, changes in GNIPC$ are positive.

Table 16

Regression of GDPGWTH versus DPOP50

Dependent Variable DPOP50
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2003 2019
Periods included: 17
Cross-sections included: 37
Total panel (unbalanced) observations: 627
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DP0P50,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DP0P50(-1)	-0.281363	0.001081	-260.3199	0.0000
GDPGWTH	-0.000428	2.37E-05	-18.06226	0.0000

Effects Specification

Cross-section fixed (first differences)

Root MSE	0.010009	Mean dependent var	2.49E-05
S.D. dependent var	0.011987	S.E. of regression	0.010025
Sum squared resid	0.062816	J-statistic	36.43685
Instrument rank	37	Prob(J-statistic)	0.401695

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 31/05/21 Time: 15:27
Sample: 2000 2019
Included observations: 627

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	0.516747	0.005978	0.011568	0.6053

Earlier, a significant unidirectional causality has been observed between economic growth and changes in P0P50. The above equation shows that the relationship is negative; as the economic growth rate increases, changes in POP50 are negative.

Table 17

Regression of GDPGWTH versus P90P100

Dependent Variable: DP90P100
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2003 2019
Periods included: 17
Cross-sections included: 37
Total panel (unbalanced) observations: 627
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(DP90P100,-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DP90P100(-1)	-0.201461	0.002700	-74.60749	0.0000
GDPGWTH	0.001282	2.77E-05	46.34335	0.0000

Effects Specification

Cross-section fixed (first differences)

Root MSE	0.015900	Mean dependent var	-8.84E-05
S.D. dependent var	0.017991	S.E. of regression	0.015926
Sum squared resid	0.158518	J-statistic	34.66217
Instrument rank	37	Prob(J-statistic)	0.484308

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 31/05/21 Time: 15:24
Sample: 2000 2019
Included observations: 627

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(2)	-0.377787	-0.003505	0.009277	0.7056

Earlier, a significant unidirectional causality has been observed between economic growth and changes in P90P100. The above equation shows that the relationship is positive; as the economic growth rate increases, changes in P90P100 are positive.

Discussion

GDP growth and macroeconomic factors

Economic growth rates

The OECD countries represent a group of countries with a predominantly market economy operating within a democratic framework. Such frameworks are considered desirable for policy formulation. Analysis of the underlying factors which determine economic growth gives insights into the drivers of economic growth in these countries. Over the entire twenty-year period (2000-19), real GDP growth averaged 2.56% in OECD countries, compared to world average growth (2.91%). The average growth rates in the same period in some other regions are also presented for comparison purposes: China (9.01%); India (6.47%); European Union (1.56%).

Inflation

Over the entire twenty-year period, average inflation in OECD countries (2.73%) was lower than that in the whole world (3.38%). While inflation in OECD countries was above worldwide inflation prior to 2003, the relationship changed when worldwide inflation rose above OECD inflation from 2003 onwards, only to align to OECD countries' inflation in 2017. Since then, both inflation rates have been almost similar. For the OECD data set, causality tests showed that there is a bidirectional causality between inflation and economic growth rates, with higher growth taking place when inflation was lower.

Review of research on the effects of inflation on economic growth showed that it generally has a negative impact on economic growth. Overall, the predominant opinion is that inflation should be kept at a relatively low level to support economic growth. This effect is supported by the current study of OECD countries. A reason for this is that inflation distorts prices and reduces the value of investments and productivity growth.

FDI/GDP

Over the entire twenty-year period, average FDI/GDP ratio was higher in OECD countries than that in the whole world (2.96%). The only time the world's

FDI/GDP ratio was above the FDI/GDP ratio of OECD countries was between 2017 and 2019. For the OECD data set, causality tests showed that there is no causality relationship between FDI/GDP and economic growth rates, with higher growth taking place when FDI/GDP is higher. These findings support similar results found for developing countries like Nigeria and Malaysia. However, while Dritsaki et al. observed a unidirectional causality between FDI and economic growth, with direction from foreign direct investments to GDP, such causality is not confirmed by this study.

LDXOECD

Values of average exchange rates in OECD countries against US dollar have been fluctuating and over the entire twenty-year period there has been an average positive change (depreciation) of 0.393%. For the OECD data set, causality tests showed that there is a unidirectional causality between LDXOECD and economic growth rates, with higher growth taking place when LDXOECD is lower. Researchers have found that for developing countries fixed exchange rate regimes are better because they remove volatility and exchange rate risk and, secondly, undervaluation spurs economic growth. The predominant opinion is that for developed countries, where productivity is higher, openness and floating rate regimes may be better as they allow adjustment between tradeable and non-tradeable sectors to competitive circumstances. This relationship is confirmed in the current study.

Openness

Over the entire twenty-year period, average Openness in OECD countries was higher (93.73%) than that in the whole world (56.52%). For the OECD data set, causality tests showed that there is a bidirectional causality between Openness and economic growth rates, with higher growth taking place when Openness is higher. These results are in line with the literature that attributes many beneficial effects of trade openness on the economy. It is also consistent with the findings of Herzer (2013) and Kim and Lin (2009), which showed that the effect of trade openness on economic growth is higher for developed countries. Since the OECD countries are classified as developed countries, these findings are supported by this study. Furthermore, the bidirectional causality of economic growth and trade openness that is found in this analysis confirms the results of Zeren and Ari (2013) or Dritsaki et al. that trade openness and economic growth positively affect each other.

Size of the economy

On average, over the twenty-year period, OECD countries averaged 68.58% of that of the whole world. For the OECD data set, causality tests showed that there is a bidirectional causality between the size of the economy and economic growth rates, with higher growth taking place in the smaller OECD economies.

Oil prices

Over the entire 20-year period, average annual Brent crude prices in US dollars increased substantially with a minimum of $24.96 in 2002 and a maximum of $111.96 in 2012, and an average price of $64.65 over the entire period. For the OECD data set, causality tests showed that there is a bidirectional causality between oil prices and economic growth rates, with higher growth taking place when oil prices were lower. This relationship between GDP growth and oil prices is supported by the literature. OECD countries can typically be classified as oil importer countries. Therefore, they benefit from lower oil prices (Ghalayani, 2011; Bouzid, 2012).

In summary, economic growth in OECD countries is driven by their higher levels of FDIGDP, OPENNESS and lower INF and lower changes in exchange rates. In OECD countries, economic growth rates are also higher when oil prices are lower. These results are important for policy formulation in countries operating in a market economy with a democratic framework.

GDPGWTH and HDI/INCINEQ

Over the twenty-year period, HDI has been consistently higher in OECD countries (0.87) than the world average (0.69). Over the same period, Norway has been ranked first and has an average HDI of 0.94, whilst the figures for China are 0.68 and India 0.57. From 2000 to 2019 HDI has slightly increased in all datasets.

Cross-sectional regressions show that the coefficient of GDPGWTH is negative and significant in the first, second, third periods and over the entire period. Economic growth is higher in OECD countries with lower HDI in almost all periods and also over the entire twenty years. Causality tests show that there is a bidirectional causality between economic growth and changes in HDI.

EYS has been consistently higher in OECD countries than the world average, and averaged 16.23 years over the twenty-year period (world average 11.67). Causality and regression tests show that there is a positive and unidirectional causality from economic growth rates to changes in EYS. LEB has been consistently higher in OECD countries than the world average, and averaged 78.97 years over the twenty-year period (world average 70.29). Causality and regression tests show that there is a negative and bidirectional causality from economic growth rates to changes in LEB. GNIPC$ has increased over the twenty-year period in both OECD countries and the world, though the value in OECD countries is about thrice that of the world average. Causality and regression tests show that there is a positive and unidirectional causality from economic growth rates to changes in GNIPC$.

Therefore, HDI improves with higher economic growth in OECD countries, though countries within the group with lower HDI have shown higher growth rates over the entire period. The relationship between economic growth and the human development indicator is bidirectional. As the economic growth rate increases, changes in EYS and GNIPC$ are higher, but changes on LEB are lower.

These results are in agreement with the research of Ranis (2004) and Ranis and Stewart (2012) who explored the HDI/GDP relationship and affirmed that there are different paths to obtaining an improvement on the HDI index and theoretically, the level of spending in education, healthcare and social assistance can affect the evolution of HDI over time. The finding on education in the current study is in agreement with the study by Korkmaz and Kulunk (2016), which suggested a unidirectional relationship from economic growth to higher education schooling rate and life expectancy at birth. Our research, however, finds that changes in life expectancy at birth are lower at higher rates of economic growth. The research of Shah (2016) shows that healthy lifestyles, better access to health services or improving education help to enhance life expectancy, which subsequently increases human development as a factor in the human development index (OECD, 2012).

The top 10% of the population had a lower share of the total income in OECD countries over the twenty-year period (36.64%) than the world average (54.15%). In 2019, top 10% of the population had 36.78% of the total income in OECD countries and 51.63% on the world average. On this measure, a lower percentage of the total income is held by the top 10% in OECD when compared to the world average. Causality and regression tests show that there is a positive and unidirectional causality from economic growth rates to changes in P90P100.

The bottom 50% of the population had a higher share of the total income in OECD countries over the twenty-year period (20.39%) than the world average (8.47%). On this measure, a higher percentage of the total income is held by the bottom 50% in OECD countries when compared to the world average. Causality and regression tests show that there is a negative and unidirectional causality from economic growth rates to changes in P0P50.

Considering the share of income held by the top 10% of the population and the share of income held by the lower 50%, income inequality is lower in the OECD countries in relation to the world average. However, the effect of higher economic growth rates is to increase the share of income held by the top 10% of the population and lower the share of income held by the bottom 50% of the population; thereby to increase income inequality. These results are consistent with the findings of Barro (2000) and Stiglitz (2015), that is higher economic growth leads to higher income inequality in rich countries.

Conclusions

In summary, economic growth in OECD countries is driven by higher levels of inward investment, openness and lower inflation, as well as lower changes in exchange rates. In OECD countries economic growth rates are also higher when oil prices are lower.

HDI in OECD countries improves with higher economic growth, though countries within the group with lower HDI have shown higher growth rates over the entire period. As the economic growth rate increases, changes in EYS and GNIPC$ are higher, but changes on LEB are lower.

Considering the share of income held by the top 10% of the population and the share of income held by the lower 50%, income inequality is lower in the OECD countries in relation to the world average. However, the effect of higher economic growth rates in OECD countries is to increase the share of income held by the top 10% of the population and lower the share of income held by the bottom 50% of the population; and thereby to increase income inequality.

These results are important for policy formulation toward more equitable growth in countries operating in a market economy with a democratic framework. Economic policies need to be focused on keeping inflation low, attracting foreign investment and ensuring openness, while managing the exchange rate within a certain range. Higher economic growth has an overall better effect on the overall human development index, but social policies need to be consistent with achieving more equitable growth through lowering income inequality.

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