**37th EBES Conference**

**Trade Liberalisation and Growth: Case Study on G7 countries**

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# **Glossary**

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| --- | --- |
| ADF | Augmented Dickey-Fuller |
| ARDL | Autoregressive Distributed Lag |
| BE | between-effects model |
| BOT | Balance of Trade |
| BRIC | Brazil,Russia,India and China |
| E7 | Brazil, India, Indonesia, Mexico, People’s Republic of China, Russia, and Turkey |
| EC | Energy Consumption |
| ECM | Error Correction Models |
| EDA | Export Development Agencies |
| EG | Economic Growth |
| ERDI | exchange rate distortion index |
| EU | European Union |
| EXP | Exports |
| FDI | Foreign Direct Investment |
| FE | fixed effect model |
| FERS | Foreign Exchange retention scheme |
| FGLS | Feasible generalised least squares |
| G20 | Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union. |
| G7 | group of seven developed economies including, Germany, France, Italy, U.S, UK , Canada, Japan |
| G8 | group of Eight developed economies including, Germany, France, Italy, U.S, UK , Canada, Japan and Russia |
| GARCH | Generalized Autoregressive Conditional Heteroskedasticity |
| GATT | General agreement of tariff and Trade |
| GDP | Gross Domestic Product |
| GFCF | Gross fixed capital formation, |
| GMM | generalized methods of moments |
| HCI | Human Capital Index |
| HCI | Human Capital |
| IMF | International Monetary Fund |
| IMP | imports |
| LDC | Least Developed Countries |
| OECD | Organisation for economic corporation and development |
| OEEC | Organisation of European economic corporation |
| OLS | Ordinary Least Square |
| PDOLS | Panel Dynamic ordinary Least Square |
| PLS Test | Partial least squares regression |
| POLS | Panel Least Square |
| R&D | Research and Development |
| REER | Real Effective Exchange rate |
| SACU | Southern African Customs Union |
| SSA | Sub-Sahara African Countries |
| TOT | Term of Trade |
| TRDGDP | Trade (exports plus imports) as a percentage of GDP |
| UK | United Kingdom |
| UNCTAD | United nation Conference on Trade and Development |
| US | United State of America |
| VECM | Vector Error Correction Model |
| WTO | World Trade Organisation |
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# **1. Introduction**

## **1.1 Understanding of Trade Liberalisation**

In the era of globalisation, the whole world has become a village; international Trade plays a decisive part in the collaboration and development of business in a globalised economy. It is a factor that boosts the economy of both the affected trading countries. (Putzel 2005), concluded globalisation as liberalisation reform of Trade and financial market both in micro and macro level micro in terms of household and macro as its overall economy. It is a two-way communication. Home countries' services and goods are going across the territories; indeed, the whole procedure involves many documentation and quality procedures that need to be addressed and fulfilled during transactions of products and services.

Trade liberalisation is a trade openness process that helps economies remove restrictions and trade quotas between their borders; this process allows economies to freely exchange their goods and services in-country and outside the country. In most developing countries, the trade liberalisation process started in the 1980s after implementing the IMF and world banks' structural adjustment program (SAP's). The two leading multilateral lending agencies of the world invest heavily in trade design and operation through trade adjustment programs. Greenaway, Leybourne and Sapsford (1997), the program's primary function is to expand the market and eliminate anti-export perception. This program provides a lower interest rate loan to the countries to adjust their economies for long-term economic growth. Moreover, industry privatisation, trade liberalisation (by removing tariffs and restrictions), and free-market are the main segments of this program.

According to Greenaway, Leybourne and Sapsford (1997), a tariff is another tax name that imposes on the import and export of goods. A country's tariff's restrictive effect can indicate the difference between potential and actual Trade in a general equilibrium framework. The former refers to trade flows that would take place under ceteris paribus assumptions if the country in question eliminated all of its duties. Tariffs affect production and consumption patterns and generally reduce imports and exports under full employment conditions as changes in relative prices associated with the imposition of tariffs.

(Zakaria 2014), explain that effect of trade liberalisation on trade balance of an economy, namely the elasticity approach, the absorption approach and the monetary approach. The elasticity approach is mainly concerned with exploring trade liberalisation on export and import price elasticity. However, this approach relegates other aspects of trade liberalisation that do not involve price changes. According to the absorption approach, the effect of trade liberalisation will depend on how real income is affected relative to total absorption. Finally, in the monetary policy, trade liberalisation depends on how the real demand for money changes relative to the real supply.

Trade liberalisation is the process of reallocation of market share. Falvey, Greenaway and Kreickemeier (2013), in previously held studies, the size of the firm not consider as an essential factor in exports, the new empirical result confirms that the level of the firm is a crucial factor that narrowly defined industries, a small firm with export is not consider as profitable, as compared to a big firm with non-export, Trade liberalisation encourages the less productive firms to exit from the market. It induces more productive non-exporting firms to become exporters.

**Figure 1: Scatter diagram represent the cause and effect relation of Trade Liberalisation and Growth**



*TOT denotes the term of trade use as a proxy of trade liberalisation. The index of multilateral trade liberalisation.*

*GDP indicates the gross Domestic Product per capita.*

usage data collected from 1976-2019, on the world bank website [www.wits.worldbank.org](http://www.wits.worldbank.org)

(Source): Author’s creation.

## **1.2 The Link Between Trade and Growth**

The link between trade and growth is not new and remains a topic of discussion at international forums for the last many years. As shown in Figure 1, the mathematical diagram of trade liberalisation and growth, the fall along line represents that both variables are correlated. If one increases, the other factor will also be affected. Falvey, Greenaway and Kreickemeier (2013) define that the theory of trade and level of growth change with respective time. Many countries now only rely on their unique product quality and make a profit by exporting products worldwide. Economies of scale are one of the elements that play an essential role in trade and growth. It is the cost advantage that many firms used in scale of operation.

Trade and growth depend upon effective policymaking. Kneller Morgan .and Kanchanahatakij (2008), it requires proper planning to open borders for another country. Once the trade relationship starts between two nations, then it won't be easy to break. To form a link or connection is a complicated procedure; sometimes, many countries combine and form a trade bloc to trade freely and unrestricted.

Trade relaxation considered a strong macroeconomic stabiliser indicator. Mkubwa, Mtengwa and Babiker (2014) substantially reduce the inflation rate and normalise the exchange rate. These benefits attract the exporters, and eventually, the steady growth rate of commodities average will rise in real terms. Additionally, a relaxation on trade and exchange rate, causing strict import restrictions to support a local or domestic market. Consequently, the country's trade balance will disturb.

International trade and growth are associated with other economic factors like capital accumulation, equality of factor prices among nations, knowledge transfers, technology transfers, and the state's human capital. Jadoon, Rashid and Azeem (2015), the human capital aspect shows positive results mostly in advanced economies because of less-skilled workers in underdeveloped economies. Therefore, investment in labour education required for better and fast economic growth.

It is easy to state that firms are getting higher profit in exporting their products when trade barriers are lower. Falvey, Greenaway and Kreickemeier (2013), the reason for the newly generated profit is an innovative technology and righteous use of resources. The involvement of technology with trade and growth becomes part of the endogenous growth model. which consider investment in technology and the human aspect of growth. The government of liberalising economies spend more resources on research and development projects to innovate new products. People living in liberalised economies benefit more from faster technologies.

## **1.3 Role of GATT & WTO:**

Falvey, Greenaway and Kreickemeier (2013), Since 1947, GATT (General agreement of tariff and Trade) was responsible for handling legal and duty issues of Trade in the world. But in 1995, GATT transformed into WTO (World Trade Organisation). It is the only international organisation that handles trade rules and disputes, and its primary aim is to promote a multilateral trade system, 164 countries registered with this organisation.

Reference to the WTO Annual Report (2008), trade liberalisation is a crucial method to boost economic growth. It increases the county's access to goods and services, and brings entrepreneurship to the private sector, attracts FDI, increases knowledge, technology, employment opportunities, and foreign earnings Figure 2. Another way it helps in reducing the imbalance of relative prices. WTO successfully integrated into many developed and developing economies like Asia and South America. However, some efforts are still far behind in Africa and the Middle East, mostly related to corruption and marginalisation issues.

GATT and WTO's main difference is that GATT was an agreement, and WTO is now an organisation. A contract always has a set of rules signed by partners/parties; in contrast, the organisation has a legal identification, secretariat, and members. The GATT and WTO's fundamental mission is to promote international trade with the secure open, fair and undistorted competition. Clause 1 of GATT rules mentioned that all members must share the product, and no country could give particular advantages to another nation. Falvey, Greenaway and Kreickemeier (2013), GATT always provide a 2negotiation platform called “trade rounds.” Negotiations are not limited to tariffs but also subsidiaries, protection, technical barriers, anti-dumping, government restrictions, etc.

According to (Dornbusch 1992), free Trade was in high favour by the vast majority of countries in the early ages. In 1960, the fare of protection policy became more focused on a trading business, due to supplementary resources industrialised counties' doing measure progress in trade liberalisation or development. Therefore, GATT gave exceptional margin for developed countries in maintaining trade protection. The peculiar point is that now underdeveloped economies have to focus more to make the best from the available resources.

## **1.4 Theories on International Trade and Protectionist Policies**

Erkisi and Ceyhan (2019), Falvey, Greenaway and Kreickemeier (2013) explain that Classical economist Adam Smith defines the theory of the absolute advantage theory in 1776 and describes the nation as having to produce quality products using a few resources. The country must have sufficient quality and quantity of natural resources, created specialised products at a significantly lower cost, and exported the surplus amount of manufactured items; thus, the transition is beneficial for both economies (Sarkar 2008). On the other hand, David Ricardo gave the comparative advantage theory in 1817, explained that Trade between two nations is possible if one economy can produce at a lower opportunity cost (to make a product at a lower price) compared to the other economy. The comparative advantage theory is very successful in developing countries as they used underdeveloped economies for producing their products. Comparative advantage theory is effectively applicable, where the buyer power is strong and the market competition is very high. Theories confounded by economists, as mentioned above, were in favour of trade liberalisation and its positive impact on economic development.

(Crina 2010), one of the elements of trade liberalisation is foreign direct investment. Mainly in underdeveloped economies, which are always looking for collaboration with developed economies. Therefore, firms use the theory of international production for the expansion of the business. This theory explains that the firm is only attracted to another foreign country if the other marketplace has some advantages. It is not only related to cheap labour or natural resources. But mostly involve governmental flexible laws and Trade. International production's theory is strongly linked with internalisation theory; successful firms form a new office or store in the potential market. Internalisation is a complex process. The host countries' internal intermediaries play an essential role in this process, called vertical integration. The internationalisation expansion is considered macro-level evolution, in which management, human resource, and marketing decisions taken at the nation-level.

New growth theory or endogenous growth theory possesses the idea of trade liberalisation and growth by boosting the country's technical segment, resulting in accelerating productivity. Considering technology as the primary highlighted source, and the secondary learning by doing means human capital (Romer 1986), confirmed by Utkulu and Özdemir (2004), explain that developed economies invest in research and development to produce innovative products. Increased trade openness grows the technology positively because openness escalates the import of products and services in the country, creating competition for the local market to make the more advanced product compete for the domestic market and the foreign market. The result is three factors trade technology, and human participation called human capital to inflate in one direction.

Smith and Ricardian models define trade openness as product specialization, through which if countries have a comparative labour-productivity advantage, they can succeed in terms of growth. The nation can then export such goods to other countries; also, a division unable to compete in the international market will use production factors in other sectors Zeren and Ari (2013). In contrast, the Heckscher-Ohlin model defines openness as the country exports those goods that used its abundant elements, increasing its production globally.

 *Figure 2: The novel model representation of literature of trade openness and growth, this model is empirically explained in the conclusion of current studies.*(Source): Author’s creation

## **1.5 G7 Countries**

G7, or group of seven, is an international intergovernmental Organisation formed in 1975; it developed during the global oil recession and inflation crisis. Initially, it had only six members US, France, West Germany, Japan, Italy, and the UK. Later, Canada also joined the community. In 1998 Russia also became a member of the G7 group, but later, in 2014, other members of the bloc voted it out due to a violation of Ukraine's sovereignty. The main goal of the organisation is to handle global political and economic issues. According to (Webster 2019), G7 countries represent 40% of the world's GDP and 10% share in world population, while 40%-45% of the economy depends on country imports exports.

Gurdal, Aydin and Inal (2020), Tax revenues are a crucial factor in the country's development. In all G7 economies, governmental positions are stable for many years. The tax expenditure in Germany Policymakers primarily determines how much they will spend on the project and then adjust to tax policy accordingly. Conversely, in France, the first policymakers collect taxes, then they design public expenditures according to the generated tax income. In Canada's case, policymaker simultaneously works on growth and spending policy; in Japan, economic growth depends upon the sustainability of existing tax policy. However, in the USA, the UK, and Italy, Tax revenue depends upon the income; if income per capita increases, it directly increased the tax revenue, overall; in all seven economies, the taxation policy is control and positively depends upon the economic growth. Moreover, due to a stable taxation policy, the trade relationship between G7 countries and outside of the world is steady.

According to (Cichero 2021), G7 countries bound to follow three trade policies to promote international trade. The foremost important rule is the *free trade* relationship between all seven countries. Free trade encourages trade and investment in the region and boosts growth; economic development drives the country's prosperity and eventually achieves sustainable development worldwide. The second important point is the commitment to fight *protectionism*; this rule-bound seven countries keep their markets open for all countries and fight all forms of protectionism or tariff barriers. The third principle of the G7 trade *acquis* is the multilateral trading system; this rule came into existence before WTO. The motive behind free trading is to liberalise the trade in maximum countries to exchange products.

For many organisations like OECD (Organisation for economic corporation and development) and OEEC (Organisation of European economic corporation), their original mandate includes trade liberalisation. (Nitsch 2007) discover the trade relationship between G8 countries through the gravity model by examining the trade relationship between 175 countries from the Period of 1948 to 1999 and finding that membership in G7/G8 is consistently associated with a strong positive effect on trade. Moreover, G7/G8 is an exceedingly non-legalistic institution and follows an informal Organisation setup; chairpeople continuously rotate concerning the change of countries' government. But respective to international Trade, it is always on the topic of negotiation in every summit conference. It has observed that the institution members are effectively involved in liberating Trade from yearly import and export indicators. On the other hand, it focuses on different world issues; but no clear picture has foreseen except trade relationship.

## **1.6 G7 Countries and Trade Relationship**

Enea, Palaşcă, and Ţigănaş (2015), explain the role of G7 countries in the international economy. A group of seven countries can describe the route of the globalisation process, and trade has found to be a significant business cycle transmission channel for developing these seven economies. Nevertheless, these countries cannot consider as homogeneous Figure 3. Technically, they are divide into three macro business cycle zones. The first zone is the Euro-zone cycle, which includes Germany, France, and Italy, the second is the English-speaking cycle zone means U.S.A., Canada, and the United Kingdom, and the third is the Asian cycle (Japan and China). Having part of a zone, bloc members have personal contacts and benefited trade settings regarding tax and border restrictions. The point challenging to ignore here is that all seven countries work in a synchronic pattern during world recession or expansion. The disturbance of recession in one country becomes an alarming situation for another G7 country.

According to the (Federal Statistical Office of Germany 2015), the G7 countries are devoted to promoting democracy, economic stability and sustainable development in the world. G7 states combinedly have a responsibility for the global economy. An analysis of the economic trend shows that most G7 states have managed to increase their economic output in real terms despite financial crises in the overall world. New era forecasting figures and trends define G7 power as a new competition with BRICS or G20 states, although all seven states part of the G20 bloc. But definitely, power will spread in more countries as compared to not only seven countries.

*Figure 3. Trade Liberalisation of selected countries from the period 1976-2019*

*usage data from the OECD website* <https://data.oecd.org/trade/terms-of-trade>

Term of Trade variable used as a proxy of trade liberalisation

(Source): Author’s creation

Since the formation of the G7 bloc in 1975, the trade statistic entirely changed over time, in Figure 3. A rise can be observed in Japan import and export business, but after 2004, the same statics of trade followed in all G7 countries.

For the last hundred years, countries and continents have been involved in the trading business and applied economics theories and concepts. Countries part of the G7 bloc mostly adopt these theories and produce quality and specialised products and services in many areas (Nitsch 2007). dominant status, especially in automobiles, pharmaceutical, cosmetics, chemicals, nuclear, dairy, or farm many more. Also, franchising, licensing, mergers of big brands are part of the foreign investment or trade openness. This Research will try to connect the dots concerning trade theories and their application in G7 countries.

The current studies seek to explore and examine the subsequent questions:

* In what ways trade liberalisation impact the economic growth of G7 countries?
* How trade liberalisation affects the economic growth of G7 countries?
* Trade liberalisation is beneficial for G7 counties? If they open more borders towards underdeveloped countries?
* What are the other factors of the economy that affected due to trade liberalisation?

# **2. Empirical Literature Review**

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| **Researcher** | **Data Span and Methodology** | **Indep Variable** | **Dependent Variable** | **Findings** | |
| A.U. Santos-Paulino **(2002)** | Data from *1972–1998***,** Dynamic Panel data based on FE, GMM, heterogeneous panels, applied to 22 developing economies (Chile, Costo Rica, Colombia, Zambia, Tunisia, Morocco, Malawi, Cameroon, Thailand, Philipines, Malaysia, India, Pakistan, Srilanka, Indonesia, Korea, Paraguay, Mexico, Ecuador, Dominican Republic, Uruguay and Venezuela) | Export growth | REER, World income growth, dummy Variable (year of liberalisation), export duties | Export duties have a negative effect on export growth. Trade liberalisation has a strong positive impact on export performance. Exports react positively to real exchange rate depreciation. Moreover, external demand (that is, world income growth) has a strong positive effect on export growth. | |
| Amelia U. Santos-Paulino **(2002)** | Data from *1972-1997****,*** GMM technique applied on Chile, Costo Rica, Colombia, Zambia, Tunisia, Morocco, Malawi, Cameroon, Thailand, Philipines, Malaysia, India, Pakistan, Srilanka, Indonesia, Korea, Paraguay, Mexico, Ecuador, Dominican Republic, Uruguay and Venezuela | Import Growth | Growth in relative prices; growth in domestic (real) income relative, import duties price, a dummy variable is a shifting year following significant liberalisation | Results found that import duties reduce import growth, but the effect varies depending on the country’s type of trade policy. Real GDP demonstrates a significant and positive impact on import growth in every country; moreover, a substantial influence of import tariff and trade liberalisation on import growth also found positive. In Latin America and Africa, representing high-income elasticities, trade liberalisation significantly impacts import growth and Africa's most decisive impact. | |
| Atif Khan Jadoon, Hafiz Abdur Rashid and Aamir Azeem **(2015)** | Data from *1981-2002* Fixed-effect model, Autocorrelation, Contemporaneous Correlation, Heteroskedasticity, applied on Lower-income countries (India, Indonesia, Pakistan and Srilanka, ka) and higher-income countries (Japan, Malaysia, Singapore and South Korea) | Human capital/ Growth Rate | Model 1: Human capital, Trade liberalisation, Dependency ratio, Per Capita income. Model 2: Growth Rates, Gross Capital Formation, Labour Force | The result defines that trade openness and impact on human capital have been found positive in both companies' groups, but significance only found in developed countries due to a well-trained workforce, more investment in labour development required in underdeveloped economies. GFCF also found positive growth in both groups of countries, the value or R2 67% and 87% independent and indep variables, respectively. In the Hausman test, rejection of Ho represents that the Fixed effect is appropriate. | |
| Bülent Ulaşan **(2014)** | Data from *1960- 2000* of turkey, Hansen test, GMM test, dynamic Panel growth model. | GDP per worker | Population growth, technological progress and depreciation, physical and human capital, degree of openness | The results show that the fraction of open years are Positive and highly significant GMM method for real openness shows positive, but not statistically significant. On the other hand, coefficient estimates of import duties are negative but not statistically significant, representing that lower trade barriers are not associated with higher growth. | |
| David Greenaway and David Sapsford **(1994)** | The average four-year period from *1965-1984*. OLS, Correlation analysis, Production function approach-to 13 countries (Brazil, Colombia, Greece, Israel, Korea, New Zealand, Pakistan, Peru, Philippines, Singapore, Spain, Sri Lanka, Turkey, Yugoslavia) | GDP growth | Capital stock growth (proxied by the investment share) Export share, employment, Dummy variable (trade liberalisation) | The regression results find that 10 out of 13 countries has insignificant export/growth relationship. Moreover, liberalisation has not significantly visible impact on the export share and GDP growth relationship. Capital stock(a proxy of investment) also not significantly positive with growth due to trade liberalisation. | |
| David Greenway, Wyn Morgan and Peter Wright **(2002)** | *1986–1991* 44 non-liberalisers countries with liberalisation period, **South Asia:** Bangladesh, India, Pakistan, Sri Lanka, **East Asia:** China, Philippines, Indonesia Korea, Thailand **SSA**: Cote d’Ivoire, Ghana, Kenya, Madagascar, Nigeria, Senegal, Tanzania, Zaire, **Latin America:** Colombia, Peru, Costa Rica, Brazil, Venezuela, Chile, Argentina, Mexico dynamic panel model, Sargan Test | Real GDP per head | level of secondary school enrolment, real GDP per head as of 1965, trade index, population, domestic investment, dummy variable (capturing liberalisation episode) | All the coefficient estimates found statistically significant with GDP, the increase in population associated with slower GDP, a higher schooling rate defines higher growth, increased investment, and more trade. Liberalisation shows a favourable and substantial impact on growth, international trade reform in reducing transportation, communication costs, technological change, etc. | |
| Eldin Mehic, Sabina Silajdzic, and Vesna Babic-Hodovic **(2013)** | Southeast European countries ((Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Romania) from the period *1998-2007*, OLS fixed effect panel data, random effects models, panel-corrected standard errors, Granger causality | Real GDP per capita | FDI, Domestic Investment, the share of exports and imports, Inflation Rate, the government balance, Log of GDP per capita(t-1) | The results define that FDI is an endogenous element in economic development in SEE countries. On the other hand, weak impact shows of domestic capital formation on growth. Between FDI and domestic investment found a negative relationship, because of an option of substitutability, gov balance found positive but insignificant, growth does not granger causes FDI in SEE countries. | |
| Farai Manwa, Albert Wijeweera b, Michael A. Kortt **(2019)** | *1980–2011*, Botswana, Lesotho, Namibia, South Africa, and Swaziland Southern African Customs Union (SACU) countries, Panel Model, Fixed effect regression. | GDP per Capita | Labour, capital, human capital, and Liberalisation measures (tariffs, real effective exchange rates, trade ratios, and adjusted trade ratios) | In the selected data set, Trade Liberalisation has had a positive and significant impact on economic growth. On the other hand, human capital and labour have a negative sign, and only labour is significant to economic growth. The negative sign in labour defines a lack of productivity. In contrast, a capital variable is positive and significant with country growth. The coefficient of lagged error correction term describes the positive longterm relationship between economic growth and variables. | |
| Hamad, Mayasa Mkubwa, Dr. Burhan Ahmad Mtengwa, Stabua Abdul Babiker **(2014)** | Data of Tanzania used in two contexts, Closed Economy period: *1970-1985*, Open Economy period *1986-2010*, Ordinary Least Square approach, Heteroscedasticity Test, Correlation Matrix | Real GDP | Trade Openness (ratio of the sum of exports and imports divided by GDP- Proxy of Trade liberalisation) | Trade openness represents positive and significant results with economic growth at both times. The adjusted R2 defines that model is a perfect fit according to the data. No problem of heteroscedasticity observed. However, a country facing a problem with the balance of payment since the 1980s as imports are more than exports. | |
| Julia Worz and Jesús Crespo Cuaresma **(2005)** | *1981–1997* 45 countries (OECD members and selected Asian and Latin American countries), Sample OLS, random effects, Fixed effect, Durbin–Wu–Hausman test | Real GDP per Capita | Investment ratio, Population, GDP per Capita, a fraction of the population aged 15+ which has completed secondary schooling as highest education in 1981 | Developing countries gain from openness on the export side primarily via improved resource allocation due to exposure to international competition; also, technology-intensive export is necessary for country long term growth | |
| Kemal Erkisi and Turgay Ceyhan **(2019)** | *1995-2016*, 13 transition countries in Europe Albania, Bulgaria, Croatia, Czech, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovak Rep. and Slovenia, PLS Test, CD-Test, Unit Root Test, Swamy S Homogeneity causality and co-integration analysis. Granger Panel Causality Test, ECM, Panel Cointegration and PDOLS Estimator | Gross Domestic Product | Imports of goods and services, Gross fixed capital formation, exports of goods and services, Foreign direct investment- net inflows (Bop, current US$), Secondary education, pupils | The study concludes a positive long-term relationship between the variables; short-term, bidirectional causality find out between FDI and GDP, EXP and GDP, GFCF and GDP and HC and GDP, only unidirectional causality observe between IMP to GDP. The long-term results show that a 1% raise in EXP boosts GDP by 0.39%. | |
| Michael B. Devereux **(1997)** | Japan, Germany, Italy, France, U.K., and the U.S., simple dynamic model  *First Period:1720-1985*  *Second Period: 1930-1973* | First Period: GDP Second Period: Dutiable Imports | First Period: Exports Second Period: Imports | The first Period:(1720-1985) There is a progressive tariff reduction after the post-war era and keeps decreasing. Second Period: (1930-1973) In the process of trade liberalisation equilibrium tariffs should be falling progressively, or obtain free Trade and become zero at one point |
| Paresh Kumar Narayan & Russell Smyth **(2005)** | *1962–2000*, Data of Fiji, Autoregressive Distributed Lag (ARDL), Unrestricted equilibrium correction model (UECM). | GDP | Labour force, Real Exports, secondary school enrolment rate, Total Investment, tax on international Trade, Dummy Variable (IMF structural adjustment policy) | In the case of Fiji economy of agreement with IMF regarding trade liberalisation, found that significant impact only in the long run, not in the short run. Human capital found a significant and most influential variable with GDP. In contrast, investment and export don't found significant and influential with GDP. The same IMF result has observed between the labour force and GDP negative and insignificant, in the short run but not in the long run. |
| Kojo Menyah, Saban Nazlioglu, and Yemane Wolde-Rufael **(2014)** | 21 African countries data from *1965–2008*, panel bootstrapped approach, Granger causality test, panel causality analysis, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic. Chad, Congo, Cote d'Ivoire, Gabon, Gambia, Kenya, Madagascar, Malawi, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Togo, Zambia | Real GDP per Capita | Trade openness (TO) is measured as [(export + import)/GDP × 100%] | Financial development results found that limited causality exists with trade openness and economic growth. Unidirectional causality can be observed in Benin, Sierra Leone and South Africa. The hypotheses of finance-led growth and trade led growth to seem to be rejected for the overwhelming number of the 21 SSA countries, | |
| Michael Bleaney and David Greenaway **(2001)** | Data of 14 SSA countries (Botswana, Burkina Coˆte d’Ivoire, Cameroon, The Gambia, Ghana, Kenya, Malawi, Mauritius, Faso, Niger, Senegal, Tanzania, Togo and Zimbabwe.) from *1980-1995*, Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model, Fixed effects panel regressions | Total investment and GDP growth | Real exchange rate (RER), terms of Trade (ratio of export prices to import prices) | The result suggests that a negative relationship is found between the volatility of trade and economic growth. The Over-evaluation of RER is bad for investment. TOT represents the confident and significant relationship with investment, growth and RER. In contrast, private investment is fallen through time. No trend has been found for public investment between GDP and INVestment endogeneity observed in OLS but shows insignificant results. | |
| Nabila Asghar and Zakir Hussain **(2014)** | From *1978-2012*, POLS, Panel co-integration Panel causality test 1. Homogenous non-causality hypothesis (FINS) 2. Homogenous causality hypothesis (HC) 3. Heterogeneous non-causality hypothesis, sample size: 15 countries (Bangladesh, chile, china, India, Indonesia, Jordan, South Korea, Malaysia, Pakistan, Mauritius, Srilanka, Syria, Philippine and Thailand | Real GDP | Financial Development, Trade openness, FDI, Human Capital Index, Gross Capital Formation, Real Interest Rate | The result shows that financial development favours trade openness and economic growth. Long term relationship with growth observed in financial development. Moreover, bi-directional causation exists between financial development and FDI. Respective to variable human capital and FDI both positively support GDP. | |
| Neil Foster **(2008)** | sample of 75 liberalising countries within the Period *1960–2003*, OLS, quantile regression Model, robustness tests, Albania, Argentina, Armenia, Australia, Azerbaijan, Bangladesh, Honduras, Hungary, Indonesia, Ireland, Israel, Barbados, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Cape Verde, Chile, Colombia, Costa Rica, Cote d’Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Gambia, Trinidad Georgia, Ghana, Guatemala, Guinea-Bissau, Guyana, Jamaica, Japan, Kenya, Republic of Korea, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Madagascar, Singapore, Slovak Republic, South Africa, Sri Lanka, Niger, Pakistan, Panama,l, New Zealand, Nicaragua, Mali, Mauritania, Mexico, Moldova, Morocco, Mozambique, Nepal, Paraguay, Peru, Philippines, Poland, Romania, Sierra, Tajikistan, Tanzania, and Tobago | GDP per Capita in-country | GDP per Capita in 1960, Average years of secondary schooling in the population over 15, ratios of gross domestic investment to GDP 1960, population, dummy Variable (Dummy variable capturing trade liberalisation episode, taking thevalue one for all years after and including the year of liberalisationand zero otherwise) | The results show that GDP per capita is significant but negative coffeciant, coefficients on investment and schooling are both positive and significant. The coefficient on population growth is insignificant but found to be positive. Finally, the coefficient on liberalisation suggests that trade liberalisation is associated with a 0.7 per cent increase in the GDP per capita. The countries benefit most in the long‐run; they are the most likely to suffer from short‐run adverse effects of liberalisation; moreover, liberalisation is more vital for countries with lower per capita GDP growth rates. | |
| Nelson C. Modeste **(2016)** | Data collected in three stages of Guyana, Before Trade Liberalization-*1982–1987* During Trade Liberalization-*1988–1991* after trade liberalisation *1992-2000* Dynamic ordinary least squares (DOLS), Johansen Co-Integration Test | Output per worker (GDP Per Capita) | Capital per worker (gross capital formation per worker), human capital, real exports, average import tariff rate, dummy variable (Guyana Economic Recovery Program) | According to results, the performance of Guyana in long-run and short-run perspective trade liberalisation has enhanced the economic growth, the dummy variables statistically significantly represent the change in quota and import licensing measures the analysis would suggest that the cuts in the average import tariff rate would have to be reasonably large for there is to be a substantial increase in income. Second, given the result that the removal of regulations limiting international trade contributed much to the growth of the economy in the post-liberalisation period, | |
| Qazi Muhammad Adnan Hye, Shahida Wizarat, Wee-Yeap Lau **(2013)** | Annual data from *1971-2009* for Pakistan and Bangladesh; *1960–2009* for India and Sri Lanka; *1965–2009* for Nepal and *1981–2009* for Bhutan ADF unit root test, (ARDL), Granger Causality test | Economic growth/ GDP Growth | Real exports and real imports | The export-led growth model is Appropriate for all countries except Pakistan, while the Import-Led Growth model is Applicable for all six Asian economies. The growth-led Export model is relevant for all countries except Bangladesh and Nepal, and the Growth Led-Import model is appropriate for all the countries. The international budget constraints are weakly stable for the six South Asian countries. | |
| Olugbenga a. Onafowora and Oluwole owoye **(1998)** | *1963-1993* 12 Sub-Saharan African (SSA) countries (Cote d’Ivoire, Kenya, Nigeria, Madagascar, Tanzania, Zambia, Burundi, Ethiopia, Cameroon, Ghana, Sudan and Senegal). VECM model, VAR, Error correction | Real GDP | Real exports (ratio of merchandise exports to real GDP), investment rate (INV), trade policy (dummy variable) | Results conclude that all variables are casualty related in the long term, trade policy and export has positive and long-lasting relationship in 10 out of 12 countries, outward-oriented trade policy and trade liberalisation policy boost economic growth, in all countries, Real GDP found positive and significant excluding Ethiopia and Tanzania, INV is positive and significant in Ethiopia, but positive and insignificant in Madagascar, Senegal, and Sudan, moreover negative and significant in rest of countries exports exercise a significantly positive influence on growth Suggests that export-led growth is feasible. a positive relationship between investment and real output growth | |
| Tarek Ghazouani, Jamel Boukhatem, and Chung Yan Sam **(2020)** | Seven countries in the Asia Pacific region (Indonesia, Japan, South Korea, Malaysia, Pakistan, Australia and Thailand)  *1980–2017* ARDL, VECM, Granger causality method | Real GDP per Capita | Real trade openness per Capita, renewable electricity consumption per Capita, real capital per Capita | Results confirm the evidence of short term Granger causes real trade openness to real GDP. Moreover, renewable electricity Granger causes trade openness and consumption for Indonesia, Malaysia, Pakistan, and South Korea. Acceptance of one or two tests hypotheses of Australia, Malaysia, and Pakistan, demonstrating that energy consumption, economic growth, and capital do not determine these countries' trade openness in the long run. | |
| Pam Zahonogo **(2017)** | Data From 42 SSA countries, *1980 -2012* Angola, Gabon, Niger, Benin Gambia, Nigeria, Botswana, Ghana, Rwanda, Burkina, Faso, Guinea, Senegal, Burundi, Guinea-Bissau Seychelles, Cameroon, Kenya, Sierra, Leone, Cape Verde Lesotho South Africa, Central African Republic Liberia, Sudan, Chad, Madagascar, Swaziland, Comoros, Malawi, Tanzania,Congo, Dem. Rep. Mali Togo, Congo Rep, Mauritania, Uganda, Cote d’Ivoire, Mauritius, Zambia, Ethiopia, Mozambique and Zimbabwe Panel unit root, panel co-integration, dynamic heterogeneous panels and threshold effects | GDP per capita | The ratio of external debt to export, investment, education, financial development, inflation, trade openness, governance index, population growth rate, external debt services to export, export, import | long-run growth and trade openness confirm by the Laffer Curve of trade (inverted U) represent positive and The significant effect of trade openness. Specific threshold level, co-integration found, between economic growth and trade openness, the results found that increment in trade openness on growth is more significant when Investment in human capital is higher. Also, an increase in the gross secondary enrolment rate is associated with growth; on the other hand, the adoption of technology determined by human capital, linked with the effect of technology growth in the economy, high-quality governance brings new firms and new businesses with in the country. | |
| Patricia Higino Schneider **(2005)** | Four separate Panel sub-periods, *1970–1974, 1975–1979, 1980–1984, and 1984–1989* of 47 developed and developing countries, OLS, FE regressions | Innovation rate in-country | Human capital stock, real import level of high-technology goods coming from developed countries, R&D expenditures in-country, FDI, Real GDP, Patent Protection, and country Infrastructure | The results explain that all dependent variable is positively impacting on a country’s innovation. However, high-technology imports, human capital, and R&D expenditures appear to have a more substantial effect on developed countries. | |
| Pedro Cavalcanti Ferreira And Jose' Luiz Rossi **(2003)** | Brazil's trade liberalisation in *1988–1990*, Cobb–Douglas production function, Hausmann test, OLS, Fixed Effect, Wald test, robust standard errors (White heteroskedasticity consistent covariance matrix), instrumental variables (nominal exchange rate and the weighted price index of the main Brazilian trade partners.) | Total productivity/output | Physical capital, labour, Total Factor of production, Human Capital (aggregated information of average schooling years of modern and tradition) | Evidence on the positive effect of international Trade on productivity growth due to the removal of trade barriers, tariff reduction in the Period brought a 6% estimated increase in total factor productivity growth rate and a similar impact on labour productivity | |
| Prabirjit Sarkar **(2008)** | Panel regression analysis,between-effects (BE) model, the fixed effect (FE) model and the random-effect (RE) model. The model applied to 51 less developed countries from *1981-2002* Closed Economy: Argentina, Bangladesh, Bolivia, Brazil, Burkina Faso, Cameron, Guatemala, Haiti, India, Madagascar, Mexico, Pakistan, Peru, Rwanda, Sierra Leon, Uruguay, Venezuela, OPEN ECONOMY: Botswana Chile, Congo, Costa Rica, Coted'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Gambia, Ghana, Honduras, Indonesia, Jamaica, Jordan, Kenya, Korea Malawi, Malaysia, Mauritius, Nigeria, Panama, Paraguay, Philippines, Senegal, Singapore, Sri Lanka, Thailand, Trinidad, Tobago, Tunisia, Zimbabwe | GDP per Capita (constant 1981) | Capita GDP in purchasing, Trade (exports plus imports) as a percentage of GDP, Growth in real GDP per Capita | The result identifies that Middle-Income group Economies experienced a positive long-term relationship; moreover, BE Model Explains that the higher the trade openness, the higher is the growth rate. Therefore, the result in a closed economy represents that trade liberalisation has a negative effect on growth. However, a positive relationship appeared between trade and growth in open economies, but coefficients of intercept and their slope dummies are not significant. | |
| Victor M. Cuevas Ahumada and Roger Ivanodik Juan López Churata **(2019)** | Data from *1994-2014* for Mexico, US and Canada, Solow growth model, AB dynamic panel GMM, FGLS (Feasible generalised least squares) | GDP Per Capita at current PPPs | International Trade (sum of non-oil exports and non-oil imports in terms of GDP), Total Factor of production at current PPPs, physical capital stock per person, Human Capital index | Evidence indicates that positive result of international Trade on Gross Domestic Product (GDP) per Capita, the total production factor, human capital and physical capital accumulation. | |
| Qunxi Kong, Dan Penga, Yehui Nia, Xinyue Jianga, Ziqi Wangb **(2021)** | Data From *1994 to 2018* of China, Co-integration Analysis, ARDL and threshold model | Economic Growth quality | FDI, REER and trade openness (imports + exports /GDP) | The result shows that trade openness positively impacts economic growth in the eastern part of China, but results are not positive in central and western regions; it's mainly because of the infrastructure and availability of physical and human capital in the eastern area. This concludes that Trade openness endorse the excellence of economic growth in the short and long term, moreover in a long-term stable co-integration relationship exists between economic growth and trade-openness, FDI and REER also positively associated with economic growth and trade openness | |
| Richard Kneller, C.W. Morgan and S. Kanchanahatakij **(2008)** | FE, Heterogeneity, POLS, data collected in 6 different periods of liberalisation from *1970–74, 1975–79, 1980–84, 1985–89, 1990–94 &1995–98* Guinea-Bissau, Gambia, Cape Verde, Kenya, New Zealand, Brazil, Uruguay, Nepal, Turkey, Uganda, Niger, Zambia, Tanzania, Madagascar, Honduras, Venezuela, Mauritania, Mali, South Africa, Jamaica, Philippines, Tunisia, Egypt, Albania, Cambodia, Paraguay, Israel, Guinea, Benin, Sri Lanka, Ecuador, Bangladesh, Dominican Rep., Mexico, Cameroon, Panama, Ethiopia, Argentina, Cøte d’Ivoire, Peru, Guatemala, Costa Rica, Bolivia, Ghana, Trinidad, Tobago, Mozambique, Guyana, and Nicaragua | GDP per capita (37 countries data) | The volume of trade, human capital, political rights, ethnic, linguistic, trade tax, natural barriers | Increased imports of goods with high R&D levels experience higher growth, human capital and import positively correlated with GDP per capita, the relationship between GDP and taxes are inversely proportional, and their relationship varies with each period, GDP per capita pre-liberalisation increased post-liberalisation growth by 2.93% | |
| Rod Falvey, Neil Foster and David Greenaway **(2012)** | Data of 75 countries with year of liberlisation, within the Period of *1960–2003*, threshold regression technique Albania (1992), Argentina (1991), Armenia (1995), Australia (1964 ), Azerbaijan (1995), Bangladesh (1996), Barbados (1966), Benin (1990), Bolivia (1995), Botswana (1979), Brazil (1991), Bulgaria (1991), Burkina Faso (1998), Burundi (1999), Cameroon(1993), Cape Verde (1991), Chile (1976), Colombia (1986), Costa Rica (1986), Cote d’Ivoire 1994), Dominican Republic (1992), Ecuador (1991), Egypt (1995), El Salvador 1991),Ethiopia (1996 ), El Salvador( 1991), Gambia (1985),Georgia(1 996), Ghana( 1985),Guatemala (1988),Guinea-Bissau (1987), Guyana (1988),Honduras (1991),Hungary (1990), Indonesia (1970), Ireland (1966), Israel (1985), Jamaica ( 1962), Jamaica (1989), Japan(1964), Kenya (1963), Kenya (1993), Korea republic (1968),Kyrgyz Republic (1994), Latvia (1993), Lithuania (1993), Macedonia (1994) , Madagascar (1996), Mali (1988 )Mauritania (1995), Mexico (1986), Moldova(1994), Morocco (1984), Mozambique (1995), Nepal (1991), New Zealand (1986), Nicaragua (1991), Niger (1994), Pakistan (2001), Panama (1996 )Paraguay (1989),Peru 1991), Philippines (1988),Poland (1992),Romania (1992), Sierra Leone (2001), Singapore (1965), Slovak Republic (1991), South Africa (1991), Sri Lanka (1977) Sri Lanka (1991), Tajikistan (1996 ), Tanzania (1995), Trinidad and Tobago (1992 )Tunisia (1989),Turkey (1989), Uganda (1988), Venezuela (1989), Venezuela (1996), Zambia (1993) | GDP per Capita in 1960, the result define in five crisis variables  (OUT) as a GDP, the inflationrate (INF), the nominal exchange rate (XR), the ratioof debt to exports (DEBT), and the current account deficit  (CAD) | Average years of secondary schooling, the term of trade, gross capital formation, dummy variable (Trade liberalisation period), Population growth, | The result represents a negative and significant relationship with population growth. Initial schooling, investment, and the TOT index represent positive and significant coefficients. Increment of trade liberalisation concerning economic growth observed in the long-run, internal crisis has a lower impact on the economy as compared to an external world crisis, only two variables (OUT and XR) have significant short-run thresholds, the relationship between INF, DEBT and OUT shows that crises and growth found adverse in both the low and high crisis regime. Threshold results of OUT, INF, and XR represent, the impact of liberalisation is more extensive in non-crisis countries, and CAD found a more significant benefit of liberalisation in non-crisis countries. | |
| Sèna Kimm Gnangnon **(2018)** | 150 countries divided into Low-Income Countries, Lower-Middle- Income Countries Upper-Middle- Income Countries High-Income Countries, from *1995~2015* (Two-Step System GMM Estimator) | Real per capita income growth rate | Multilateral trade policy lib., Initial real GDP per Capita income, Domestic trade policy index, Financial openness index, Gross enrolment secondary school rate, GovernmentconsumptionGFCF, Inflation rate, Size of the Pop, Institutional and governance quality, Dummy Variable | The strong impact of the multilateral trading system in every standard income country, all the independent variables confirm the positive and significant relationship with the dependent variable. | |
| Syed Tehseen Jawaid, Syed Ali Raza **(2013)** | *1980 to 2010* of India, unit root test, Autoregressive distributed lag (ARDL), Granger Causality test | Real gross domestic product | Real gross fixed capital formation (Proxy of Capital Stock), total labour force, terms of Trade | In India's case, both short and long term results represent a confident relationship between TOT and economic growth. GFCF and Labour force both are positive and significant with GDP. Moreover, a bidirectional causal relationship exists between terms of trade and economic development in India | |
| Yaya Keho **(2017)** | Data of Cote d'Ivoire from  *1965-2014,* ARDL, OLS, and dynamic OLS methods, Unit root and co-integration tests, Granger causality tests and variance decomposition analysis | Real economic output/GDP | labour force, Real capital stock per Capita and real trade per Capita | The short and long-run results represent the positive impact of capital and trade per capita on economic growth. The country mostly relies on exports of cocoa, coffee, and cashews representing 47% of total exports and import machinery and technology equipment; therefore, trade-led growth is a validated hypothesis for Cote d'Ivoire. | |
| Utku Utkulu and Durmus Özdemir **(2004)** | Data of Turkey from *1950–2000*, co-integration analysis and Error Correction Models (ECM), VAR test, Granger causality test | Real GDP per Capita | Exports, imports, exchange rate, Openness index [(exports + imports)/real GDP per capita], human capital, physical capital (real gross domestic investment (private and public) | The result shows the joint causality exists between the GDP per Capita and trade liberalisation. Physical and human capital positively affects growth, affecting trade policy and human capital on turkey's development in the long term. | |
| Rifat Baris Tekin  **(2012)** | Granger causality in Panel Data, for the Period between *1970-2010*, of 23 African LDC’s, Gambia, Mozambique, Niger, Rwanda, Angola, Sierra Leone, Madagascar, Benin, Burkina Faso, Burundi, Central African Republic, Liberia, Senegal, Malawi, Mali, Mauritania, Somalia, Sudan, Togo, Uganda, Tanzania, Zambia, Congo, Djibouti, Guinea, Chad, and Comoros | Real GDP per capita | Openness to trade ratio, real total net official development assistance (ODA) (official financial aid flows) | Results conclude that official financial inflows Granger-causes GDP per capita. On the other hand, all LDC's OPENNESS (trade ratio) are not causing GDP per capita, which accepts the null hypothesis that granger causality exists between variables, except four countries: Sierra Leone, Burkina Faso, Malawi, and Zambia. Between official development assistance and trade ratio, negative causal relation means aid has a negative impact on trade. Results also fail to find a significant causality relation between GDP and Openness, except for Sudan and Guinea. | |

# **3. Econometric Model and Data Source**

## **3.1 Liner Panel Model**

To determine the relationship between trade liberalisation and growth, referring to a literature review of current studies, a six variables model has developed using GDP, trade openness, real effective exchange rate, Human Capital, gross fixed capital formation and Foreign direct investment. GDP considers as the dependent variable in the model. The data set concern G7 countries ([United States](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=USA&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsS2TzcsNtJQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrMyhwY47WBkBmSMXLkcAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoATAaegQIERAD&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Italy](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Italy&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY2LsrK0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsrJ4liTmVO1gZAcV8Ec1IAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoAjAaegQIERAE&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Japan](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Japan&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY3jjVO0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsrF6JBYl5O1gZAbA49c9IAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoAzAaegQIERAF&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Canada](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Canada&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsVMMzAzStZQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrGzOiXmJKYk7WBkBkNwUE0oAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBDAaegQIERAG&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Germany](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Germany&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY1NTDO0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWs7O6pRbmJeZU7WBkB07CeTEoAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBTAaegQIERAH&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [France](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=France&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsdMsciyTtZQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrGxuRYl5yak7WBkB8lMhKkoAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBjAaegQIERAI&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [United Kingdom](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=United+Kingdom&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsc2Li5O1lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsfKF5mSWpKQremXnpKfm5O1gZAcfKz6ZRAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBzAaegQIERAJ&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957)), and Trade Openness, REER, GFCF, HC, and FDI affect work as independent variables.

The reason not to use the log values in Eq. 1 is that the data set has negative values, making an error in the values or data set.

**GDP*i,t* =β0+ β1TradeOpenness*i,t* + β2REER*I,t* + β3HCI,t + β4FDI*i,t* + β5GFCF*i,t*+µ*i,t………Eq(1)***

Here,

i = 1,2,…N, t = 1,2, ..T,.

i/N = number of individuals countries or cross-section

T refers to the number of time periods.

M represent the model

𝑢𝑖𝑡 refers to the error term.

NxT, generate an equation from this model

## **3.2 Data Set, Variables, Methodology**

In contrast to previous studies, this research used balanced data set of G7 countries ([United States](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=USA&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsS2TzcsNtJQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrMyhwY47WBkBmSMXLkcAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoATAaegQIERAD&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Italy](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Italy&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY2LsrK0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsrJ4liTmVO1gZAcV8Ec1IAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoAjAaegQIERAE&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Japan](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Japan&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY3jjVO0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsrF6JBYl5O1gZAbA49c9IAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoAzAaegQIERAF&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Canada](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Canada&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsVMMzAzStZQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrGzOiXmJKYk7WBkBkNwUE0oAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBDAaegQIERAG&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [Germany](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=Germany&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsY1NTDO0lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWs7O6pRbmJeZU7WBkB07CeTEoAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBTAaegQIERAH&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957), [France](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=France&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIEsdMsciyTtZQzyq30k_NzclKTSzLz8_Tzi9IT8zKrEkGcYqvc1Nyk1KJFrGxuRYl5yak7WBkB8lMhKkoAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBjAaegQIERAI&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957) and the [United Kingdom](https://www.google.com/search?sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957&q=United+Kingdom&stick=H4sIAAAAAAAAAOPgE-LSz9U3MCowrijLUuIAsc2Li5O1lDPKrfST83NyUpNLMvPz9POL0hPzMqsSQZxiq9zU3KTUokWsfKF5mSWpKQremXnpKfm5O1gZAcfKz6ZRAAAA&sa=X&ved=2ahUKEwi79ZvApsLoAhVOQEEAHWKqADUQmxMoBzAaegQIERAJ&sxsrf=ALeKk00YcX52oCOTCC1-iqZ4hl33cHcOKQ:1585574821957)) from 1976-2019. By referring to Falvey, Foster and Greenaway (2012), (Modeste 2016), Erkisi and Ceyhan (2019), Manwa, Wijeweera and Kortt (2019), (Kong et al. 2021), this research used the variables of; Gross Domestic Product (GDP) Per Capita, Trade Openness (a proxy of trade liberalisation (net imports plus net exports, divide by the percentage of GDP growth rate), Real effective exchange rate (REER), Human Capital (HC), Gross fixed capital formation (GFCF) and Foreign direct investment (FDI).

This research is a mix of casual and descriptive research design because, in one way, it is answering the what and how of trade liberalisation, and in another way, it is also explaining the impact of trade liberalisation on economic growth. To defend the research questions, the yearly longitudinal data collected from 1976 to 2019, from official websites of the world bank, The Federal Reserve Bank of St. Louis and the Organisation for Economic Co-operation and Development. The sample size is seven developed economies globally, called (a group of seven) G7 countries. Therefore, the total panel (balanced) observations become 308; for testing the theory and data set, Panel Data regression analysis applied by using Eviews 10 student version.

*Figure 4: represent the GDP per capita of G7 Countries (1976-2019)*

Data extracted from [www.wits.worldbank.org](http://www.wits.worldbank.org)

(Source): Author’s creation

### **3.2.1 Gross Domestic Product**

According to (Callen 2008), “*gross domestic product is a factor that measures the monetary value of final goods and services, in a given period*”. In other words, GDP considers as total output because it counts all the product and services generated inside of a country; these products can be used for selling purpose in a market or used as a nonmarketed product, like education or defence services products. Voluntary work or household work is not part of GDP; moreover, resale and reused products not included in the statistics. GDP is one of the crucial factors of economics. Generally, GDP is directly proportional to the stability and health of the country’s economy. It defines the country's growth and performance; on the other hand, GDP is unable to reveal the standard of living of the society.

GDP Per Capita can calculate a change in the output of goods and services per person, which defines citizens' well-being. (Callen 2008), it also fails to describe the per-person cost of environmental pollution or noise pollution. The quality of citizens' lives may depend upon the dispersal of GDP between the country's residents, representing the Human Development Index, which accounted for life expectancy, school education, and citizen literacy rate.

This research paper includes GDP per capita as a dependent variable by referring Greenaway, Morgan and Wright (2002), Wacziarg and Welch (2008), (Gnangnon 2018), (Sarkar 2008), Falvey, Foster and Greenaway (2012), Manwa, Wijeweera and Kortt (2019), (Zahonogo 2017), GDP acts differently in every country and every region, the scenario is always different depending upon countries production, consumption and investment. Undoubtedly, trade is one of the crucial factors of GDP, and trade liberalisation brings economic growth. However, other factors (like Human capital, physical capital, technology) also play a vital part in economic growth.

The GDP growth rate of G7 countries has changed over time in the last forty decades Figure 4. Sharp inflation shock observed in the year 2009, the reason was the financial crisis in 2008, later in 2017 growth rate of all G7 countries has increased, but the figures are again showing a downward trend in 2018. Economic indicators are very uncertain, and it is necessary to record the variances in the data. However, G7 economies consider as superlative economies of the world, but logical dis-balance of global events appeared in economic growth from time to time (Federal Statistical Office of Germany, 2015).

### **3.2.2 Trade Openness**

Trade openness defines as the ratio of trade to GDP. It is an important indicator that defines international trade in the country's economy. It measured as the sum of total imports and total export divided by the gross domestic product Mkubwa, Mtengwa and Babiker (2014). Trade openness is one of the factors that help economies establish Cross country relationship and connections. Utkulu and Özdemir (2004) Countries support each other in difficult times and situations by forming different trade alliances and blocs.

In the given literature of Menyah, Nazlioglu and Wolde-Rufael (2014), Aboubacar, Xu and Ousseini (2014), Kim, Lin and Suen (2016), Bleaney and Greenaway (2001), the term of trade takes as a proxy of trade liberalisation or trade openness. Therefore current study also used the term of trade as one of the independent variables. Trade openness is a degree to which a country or economy is involved in the global trading system. Trade liberalisation reacts differently in every region and bloc Figure 3, from the studies of Narayan and Smyth (2005), (Shaheen et al. 2013), (Tekin 2012), Aboubacar, Xu and Ousseini (2014), in many underdeveloped countries like Pakistan, Fiji, Nigar, LDC’s etc. trade liberalisation is not a favourable indicator that supports economic growth. Alternatively, Bleaney and Greenaway (2001), Hye, Wizarat and Lau (2013) is also not a profitable option for many trading blocs like in south Asia or Sub Sahara countries.

However, positively support the idea of trade liberalisation by (Zahonogo 2017), Jawaid and Raza (2013), (Keho 2017) in countries like SSA, Cote d'Ivoire, India. According to Manwa, Wijeweera and Kortt (2019), connects the idea of trade liberalisation as a key trade development strategy. The process starts slowly by removing tariffs and restrictions and gradually attracting more cross countries with free trade opportunities. It sometimes reacts as a discouragement for the local business.

(Kong et al. 2021) explain China's case. Trade openness enhances the economic growth quality in the coastal and eastern region, mainly due to the excellent infrastructure and abundant physical and human capital availability.

### **3.2.3 Human Capital**

According to (Goldin 2016), HC considers educational growth or skills of the labour force; it is a personality attribute of the labour that helps them perform better. Consequently, HC increases the economy's value and individual productivity. In economic growth per capita, term physical capital accumulation count as labour input in terms of their education and training. Countries and organisations require a special kind of skills and knowledge to become innovative and achieve goals. However, not all labour is the same in terms of skills and education; therefore, companies investing in employees to improve the capital's quality. The ratio of individual earning differs with education; the higher education level means higher-earning and higher spending. Therefore, it is an essential indicator for the organisation and companies to invest in Human capital as it increases productivity and, thus, profitability.

In Eq. 1, human capital act as an independent variable by referring to Ndikumana and Baliamoune-Lutz (2007), Asghar and Hussain (2014), Cuevas Ahumada and López Churata, (2019). Manwa, Wijeweera and Kortt (2019), Human capital has a positive impact on economic growth. Since the mid-nineteenth century, developed economies are working on both the quality and quantity of secondary education. The government fully funds all secondary and middle schools in developed economies. Eventually, the youth is growing due to a strong primary education system.

Utkulu and Özdemir (2004) support and contradict the idea of investment in human capital by explaining the concept of reallocation of resources. If the demand for skilled labour increases in production activities, a shortage will create in the research and development segment.

### **3.2.4 Gross Fixed Capital Formation**

GFCF define as domestic investment. According to (Gibescu 2010), between GFCF and GDP, a very high and positive correlation exists, the result tested in European countries like the Czech Republic, Romania, Poland, Bulgaria and hungry. GFCF is one of the vital indicators of macroeconomics. It helps to take a large-scale investment decision and how the economic activity and projects need to execute, like health care projects, constructions of roads and buildings etc.

Respective to this research, GFCF also used as one of the independent variables by referring to the literature of (Gnangnon 2018), Asghar and Hussain (2014), Falvey, Foster and Greenaway (2012), (Modeste 2016), (Shaheen et al. 2013), contributes in favour of economic growth and domestic investment. According to Jadoon, Rashid and Azeem (2015), GFCF provides more significant result in developing countries than in underdeveloped countries due to the quality of capital, which means more extensive availability of resources and funds wealthier countries. Erkisi and Ceyhan (2019) explain that GDP and GFCF are granger causes each other, which means both variables help forecast one another's values. Moreover, a short-run relationship exists between the variables.

Jawaid and Raza (2013) measure capital formation brings a 27.72% change in India's economic growth. Utkulu and Özdemir (2004) define turkey's market system, a combination of physical and human capital, robustly (continues to perform beside changes in a market system) related to economic growth.

### **3.2.5 Real Effective Exchange Rate**

According to (Darvas 2012), Manwa, Wijeweera and Kortt (2019), the real effective exchange rate expressed in an index. It describes a weighted average of the real exchange rate, dealing with domestic currency in terms of chief trade partners. REER used as an alternative tool to measure one country's absolute competitiveness in their trading partners. It deals in relative prices of non-tradable goods and captures the comparative of imports and exports.

By the literature Bleaney and Greenaway (2001), Aboubacar, Xu and Ousseini (2014), (Kong et al. 2021), this research paper also use REER as one of the independent variables with trade liberalisation and growth to apprehend the effect of a relative price change and trade openness. Utkulu and Özdemir (2004) highlighted a point of exchange rate distortion index (ERDI), the difference between the official exchange rate and the black market rate. It seeks to observe the effect of trade and other black-market interventions; greater the deviation means the economy becomes more unstable, declining exchange rate becomes more favourable for liberalisation.

According to (Santos-Paulino 2002), exchange rate reform is a crucial aspect of trade liberalisation, especially for countries where ERDI distortion is extensive. This policy, called the Foreign Exchange retention scheme (ERS), gave the exporter or exporting firms relaxation to import the input as per their requirement. This policy works against the restrictive import control regime, giving more rights to the exporter on a trading business. However, it is not a successful policy in many underdeveloped economies like Pakistan, India, Venezuela, Costa Rica, Srilanka, Zambia, etc., because it creates more distortion in the trade balance.

### **3.2.6 Foreign Direct Investment**

Mehic, Silajdzic and Babic-Hodovic (2013), defines foreign direct investment as a governmental policy for the economy's transaction by removing legal barriers and institutional setting (public agencies to attract foreign investors). Since 1995, countries have practised attracting foreign investors by investing in state infrastructure and taking classical measures (tax exemptions or tax relaxation).

FDI works with GFCF in economic development; it stimulates domestic investment and induces technological knowledge in the production segment. Asghar and Hussain (2014) define a positive and significant relationship between FDI and GDP, new technology, and innovative products boost economic growth. Foreign investors attract the high tech country and creative industry; willing to invest in government projects favourable for foreign investors. Manwa, Wijeweera and Kortt (2019), foreign investment is a segment that gave more power to the private sector than the government sector by allowing direct connections with other potential nations and economies, not only in terms of investment but also in exploring mining, and marketing.

According to (Santos-Paulino 2002), by giving tax incentives to the foreign firm and MNC’s (multinational companies), many underdeveloped governments support the idea of FDI to developing the competition within the industry, between the local exporter and foreign firm, so that more quality products will create and export.

(Shaheen et al. 2013), Aboubacar, Xu and Ousseini (2014) (Kong et al. 2021) also used foreign direct investment as a dependent variable in their studies and concluded that FDI assumed one factor that benefited trade liberalisation and has a positive relationship with economic growth.

### **3.2.7 Carbon tax dummy variable**

According to (Meltzer 2014), a carbon tax policy aims to reduce the world's carbon emission to save the environment and reduce climate change. International trade emphasises a carbon tax problem because nontaxing economies are likely involved in emission, and these countries' governments fear losing production. Nevertheless, they mostly agreed on imposing a tax on imports because it will remain become favourable for home production and exporters. However, this solution will not solve a problem, first many border taxes are illegal and not according to WTO policy, second imposed border taxes may be expensive and become impossible for the importers to afford; therefore, importing country ending up paying uncalculated more taxes, which makes their final product more expensive.

Metcalf and Stock (2020), consider free trade alliances as one of the drawbacks of increasing emission; around 31 European countries are part of the EU Emission Trading System (ETS) in which approximately 15 countries in practices of imposing a carbon tax on their exported products, due to the free trading system between EU countries, trading of items is impossible to control. Therefore, climate policy may be successfully implementing in one county but increasing emission in another EU part.

In the current studies, The Carbon tax was considered a dummy variable. By referring to the reviews of (Khan et al. 2020) (Tong et al. 2020), putting a tax on imports can be favourable for the environment. However, its impact on growth or GDP is minimal, and results show insignificancy; therefore, removing it after consideration.

# **4. Estimation Strategy**

## **4.1 Panel Data**

Current studies used the panel data technique to check the selected variables. According to (Hsiao 2014), due to the enhancement of statistical survey at a larger scale, many developed and developing countries' data are widely available online or through statistical survey reports. Panel data also called longitudinal data because it includes both the dimensions cross-sectional and time series. Panel data has the advantage of a degree of freedom. An immense amount of data can deal with; moreover, analysis of individual groups is possible, and the audience's panel effect is also possible. It also helps to analyse and answer more economic questions, as it allowed to measure the same audience group over a period, which is impossible in cross-sectional and time-series data. Overall, the gathered data become more informative and has more variability and efficiency.

Respective to this research, panel data capture the former view's effect and later view effect, through the variables Gross Domestic Product, Trade openness, Real Effective exchange rate, Foreign direct investment, Human capital, Gross fixed capital formation.

***Table 1. Correlation Analysis of selected data***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Correlation** | **GDP** | **FDI** | **TOT** | **REER** | **HCI** | **GFCF** |
| **GDP** | 1.000000 | 0.307318 | 0.097626 | 0.029033 | 0.674120 | -0.114319 |
| **FDI** | 0.307318 | 1.000000 | -0.216326 | -0.246261 | 0.349998 | 0.086026 |
| **TOT** | 0.097626 | -0.216326 | 1.000000 | 0.660843 | 0.004010 | 0.056444 |
| **REER** | 0.029033 | -0.246261 | 0.660843 | 1.000000 | -0.062028 | -0.056622 |
| **HCI** | 0.674120 | 0.349998 | 0.004010 | -0.062028 | 1.000000 | 0.016126 |
| **GFCF** | -0.114319 | 0.086026 | 0.056444 | -0.056622 | 0.016126 | 1.000000 |

*Correlation analysis describes the linear relationship between distinct variables. Relationship analysed between the +1 and -1 observation*(Source): Author’s creation

## **4.2 Unit Root Test**

The current study used the Levin, Lin and Chu (2002) and IM, Pesaran and Shin (2003) unit root test by referring Zandi and Haseeb (2019). The reason to apply the mentioned unit root test is mainly focused on integrating variables. If any of the variables are not stationary at level means I(0), then it implies to have a unit root at a level and become stationary on the first difference.

## **4.3 Cointegration Test**

The correlation matrix Table 1 indicates that all the independent variables have a positive relationship with growth rate except GFCF, GDP and GFCF have a negative correlation, but the figures represent not a strong negative relationship if GDP rises GFCF decreases vice versa. The correlation Analysis of FDI explains that GDP and HCI have a positive and robust connection. GFCF also has a positive relationship, but very minutest, TOT and REER show a negative association with FDI. TOT negatively relates to FDI and positive relationships with all other variables. Moreover, REER represents the most positive influence variable in terms of trade (TOT).

Concerning REER, the Correlation analysis of Model (1) defines in Table 1 that only GDP and TOT have a positive relationship with REER. The other factors represent a negative relationship, but the effect is very minimal. On the other hand, HCI represents a positive relationship with all the variables that accept REER. In contrast, GFCF has a negative relationship with REER and GDP; all other variables have a positive relationship.

The Residual Cross-Section Dependence Test in Table 3, explain that problem of hetroiskiatcity and cross section is removed during computation of correlations as all three test Breusch-Pagan LM, Pesaran scaled LM, Pesaran C, represent significant results at 1% .

***Table 2. Results of Panel least square, Fixed effect and random effect, GDP as a dependent variable***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Independent Variables* | POLS | | Fixed Effect | | | Random Effect | | |
| *t-Statistic* | *Prob.* | *t-Statistic* | *Prob.* | *t-Statistic* | | *Prob.* |
| FDI | 949.5329 | 0.0053\*\*\* | 129.0163 | 0.5492 | 536.1432 | | 0.0101\*\* |
| GFCF | -445.5150 | 0.0007\*\*\* | -79.38857 | 0.2877 | -220.6380 | | 0.0030\*\*\* |
| HCI | 23492.93 | 0.0000\*\*\* | 54800.51 | 0.0000\*\*\* | 43165.36 | | 0.0000\*\*\* |
| REER | 7.655592 | 0.8672 | 155.2422 | 0.0000\*\*\* | 105.8080 | | 0.0001\*\*\* |
| Trade Openness | 113.5844 | 0.0253\*\* | 14.49280 | 0.6745 | 39.60158 | | 0.2248 |
| *R*2 | 0.493807 | **-** | 0.848422 | **-** | 0.711830 | | **-** |
| *f-* Statistics | 58.92219 | 0.000000\*\*\* | 150.6175 | 0.000000\*\*\* | 149.1987 | | 0.000000\*\*\* |
| D.W stats | 0.140351 | **-** | 0.155096 | **-** | 0.130545 | | **-** |

Notes: \* Significance at the 10% level.\*\* Significance at the 5% level.\*\*\* Significance at the 1% level.  
(Source): Author’s creation

## **4.3 Panel Least Square (POLS)**

In a Pooled/ Panel Least square, we pooled all the observation in OLS regression. It is also called the common effect model. Considering that the coefficient and intercepts are the same for all seven countries. Using Eq.(1), the probability value of *f* statics is less than 5 % critical value. The model can conclude that the variables combine effect is significant or considerable. The coefficient of GFCF represents that GDP has a significant but negative relationship; also, REER represents positive but negative significant. Moreover, all other variables define a positive and significant relationship with economic growth.

The value of *R*2 explains that the independent variable-GDP only 50% depends on the other independent variables in the given model Table 2. DW statistics illustrate a severe correlation between the variables, as panel data analysis depends more on the model's individual significance and overall significance instead of R square. Therefore, the fixed effect and random effect model used for further clarification of results. One of POLS' measure problems is that it did not distinguish between the various countries, consequently combining the seven countries results in a pooled, refute, heterogeneity or individuality (Gujarati 2011).

|  |
| --- |
| ***Table 3. Residual Cross-Section Dependence Test*** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Test | Statistic | d.f. | Prob. |
|  |  |  |  |
|  |  |  |  |
| Breusch-Pagan LM | 476.4752 | 21 | 0.0000 |
| Pesaran scaled LM | 70.28136 |  | 0.0000 |
| Pesaran CD | 21.39907 |  | 0.0000 |
|  |  |  |  |
|  |  |  |  |
| Note: All variables are significant at 1% Level  *The significant results define that cross-section removed during computation of correlations*  (Source): Author’s creation | | | |

## **4.4 Fixed Effect Model**

**GDP*i,t* = β1TradeOpenness*i,t* + β2REER*I,t* + β3HCI,t + β4FDI*i,t* + β5GFCF*i,t*+**

**α*i∑N-1Dummy*+µ*i,t………Eq(2)***

One of Pols' shortcomings is that it neglected the panel structure and individual attribute generating in the model; therefore, this research used the fixed-effect model. In Eq. (2), αi represent the fixed effect or individual effect of controlling the time-invariant differences respective to an individual; moreover, A dummy variable is a time-invariant variable, αi defines the dummies in the model instead of using all of the time dummies, implicitly assume that it is already included.

Regression analysis common problem is that error term variance across all observation is different, called as heteroskedasticity when error term variance is same is called homoscedasticity (Gujarati 2011), In Eq. (2), rejecting the problem of heteroscedasticity by considering error term variances is same in all observation, µi,t is homoscedastic and not autocorrelated. αi +µi,t combine considering the unobserved heterogeneity and syncretic error, the covariance between unobserved heterogeneity of one or more in our explanatory variables that are not equal to zero. The result of table 5 also clarifies the point of non-heteroskedastic in the data.

Applying the fixed effect in panel least square, the estimators become better. The value of R2 and *f* stats are an increase in Table 2. The fixed-effect model allows for heterogeneity and individuality among all countries by having their respective intercept values and violates the assumption that least square estimates should be consistent and unbiased. It already omitted the time-invariant aspects within the model like gender, age, education etc.. It is impossible to estimate the effects of variables in a fixed-effect model because values do not change across time. Therefore the null hypothesis holds that there is a zero effect in a model.

The results in a fixed-effect model Table 2, the coefficient of GFCF represents that GDP has a non-significant and negative relationship; also, Trade Openness and FDI represents positive but negative significance in the model. The redundant fixed effect test rejects the null hypothesis as the cross-section fixed effect present in the data, and the Individual-specific impact correlated with the independent variables (Annexure A).

## **4.5 Random Effect Model**

**GDP*i,t* = β0+β1TradeOpenness*i,t* + β2REER*I,t* + β3HCI,t + β4FDI*i,t* + β5GFCF*i,t*+ α*i,*+µ*i,t………Eq(3)***

Considering all seven countries have an expected mean value for the intercept, this research applies a random effect or error component (ECM). This technique also defines with the name of the GLS-Generalized Least Square technique. In Eq. (3) error term, one part α*i* becomes random; therefore, we apply GLS to transform the model into a normal state.The random-effects model estimates the effects of time-invariant variables, but the estimates may be biased because we do not control omitted variables.

The random effect model accounts for individual heterogeneity in both the slopes and intercepts and controls each slope and intercepts' cross-section. The coefficient of GFCF represents that GDP has a significant but negative relationship, on the other hand, with Trade Openness positive but non-significant relationship, specified in Table 2*.* The null hypothesis of random effect holds that individual-specific effects are uncorrelated with the independent variables.

## **4.6 Correlated Random Effects - Hausman Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Table 4. Test cross-section Random Effects- Hausman Test*** | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| **Test Summary** | | **Chi-Sq. Statistic** | **Chi-Sq. d.f.** | **Prob.** |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | 239.987762 | 5 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| **Variable** | **Fixed** | **Random** | **Var (Diff.)** | **Prob.** |
|  |  |  |  |  |
|  |  |  |  |  |
| FDI | 129.016305 | 536.143186 | 3385.738903 | 0.0000 |
| GFCF | -79.388575 | -220.638006 | 122.065320 | 0.0000 |
| HCI | 54800.507886 | 43165.363789 | 605846.589552 | 0.0000 |
| REER | 155.242206 | 105.807978 | 39.465112 | 0.0000 |
| TOT | 14.492801 | 39.601585 | 128.232361 | 0.0266 |
|  |  |  |  |  |

Notes: All variables are significant at the 1% level.

*(Source): Author’s creation*

Hausman test observes that a correlation exists between the unique errors and the regressors in the model. This study applied the Hausman test in Table 4 to check which model is better or appropriate between a fixed effect or random effect for the selected data and variables. The null hypothesis explains that cross-section effects are random. The p-value of the Chi-square is <0.05. We reject the null hypothesis and accept (H1) fixed effect is appropriate and preferable over random effect.

# **5. Results**

To find out the relationship between trade liberalisation and growth is the focus of this paper, the data of a group of seven countries used to explain this study's research questions. A six variables model built to answer this research question. GDP represents the dependent variable in the current analyses. Trade openness used a proxy of trade liberalisation, REER, HCI, GFCF and FDI considered other independent variables of the Eq 1; import and exports in terms of % of GDP recorded as trade openness.

This study's findings compare with the previously held literature about undeveloped African economies. The results elaborate mixed results. Due to the high corruption ratio in LDC’s Trade liberalisation not providing a satisfactory economic growth impact, one reason is not utilising the right amount of money coming from foreign development aid programs. Bleaney and Greenaway (2001), (Tekin 2012), Menyah, Nazlioglu and Wolde-Rufael (2014), The idea of failure of trade liberalisation is due to the weakness of institution and technology, investment of capital in the accurate direction and labour education can bring economic growth in LDC’s countries. Onafowora And Owoye (1998), (Zahonogo 2017), Ndikumana and Baliamoune-Lutz (2007). Those African countries with a lower GDP per capita growth rate found a strong relationship with trade liberalisation (Foster 2008). In contrast to Table 2 results define, the GDP per capita of G7 countries also finds a positive relationship with trade liberalisation. Therefore, trade liberalisation reacts positively in developed or underdeveloped countries, only utilising the resources better in developed countries.

(Sarkar 2008) Asian and South American middle-income earning countries mostly experience a positive long-term relationship with trade liberalisation; the main factor is the trade balance. On the other hand, the developed economies of Asia and South America mostly gain more from exports Worz and Cuaresma (2005); due to improved resources and incentive technology, countries unique selling point is their advanced machinery and Hi-tech products Figure 2 and also confirmed by cointegration results in Table 1.

The scenario is a little different in the South Asia bloc, which includes underdeveloped but potential economies. Instead of export-led growth like Africa, the favourable model is import-led growth for south Asian countries Hye, Wizarat and Lau (2013), and their nearest market is china and japan. Compared to the G7 bloc study, the fixed-effect model represents a positive relationship between GDP and Trade openness; due to the honest connection between G7 countries and European Union, having an advantage of the same continent and trade of tariff-free products services is understandable. (Nitsch 2007).

In Europe, trade liberalisation and growth has a positive relationship in both the short and long term; the main factor is FDI and investment, which explains a strong significant Robust relationship Mehic, Silajdzic and Babic-Hodovic (2013), Erkisi and Ceyhan (2019). The problem of resources and labour education, technology mostly not faced by developed economies in the world; the growth scenario for middle level or underdeveloped countries massively different because of stable financial condition, group of seven economies make progressive tariff reduction after the post-war era time, the process of trade liberalisation started, and tariffs falling progressively and obtain free trade in the end. (Devereux 1997).

Trade openness is an engine for economic growth to compare the scenario between developed and underdeveloped countries. Jadoon, Rashid and Azeem (2015) compares two models of Asian countries: Lower-income countries included (India, Indonesia, Pakistan, and Sri Lanka) and higher-income countries included (Japan, Malaysia, Singapore, and South Korea). Using the fixed-effect model and Correlation, elaborated the comparative analysis of the economies into four primary channels: capital accumulation, equality of factor prices among countries, knowledge transfers and technology transfers and human capital.

Cuevas Ahumada and López Churata (2019), Worz and Cuaresma (2005), Greenaway, Morgan and Wright (2002), Trade blocs and territories are one of the reasons for trade liberalisation; this kind of relationships only prosperous when both the parties are getting the same level of advantage from each other; before the formation of the G7 bloc, all seven economies was trading liberalise and involve in trading with each other and other countries, therefore forming a trade bloc between developed and a middle or underdeveloped economy open ways for the countries to expend like NAFTA, SACU, South-Asia, Latin-America.

# **6. Conclusion and Policy Implications**

International Trade is one of the themes that constitute the G7 countries' goal, alongside the global economy and foreign policy issues (Cichero 2021). G7 countries are the developed nations that decide for the next generation of the world, liberalising Trade and investment for economic growth their foremost agenda since existence. The last G7 summit conference held on 24 August 2019, and in the discussion, the main topic discussed was the improvement of the trade and trade policy effectiveness. Therefore, this year G7 demands WTO (World trade organisation) to improve intellectual property protection and endeavour the fraudulent trade practices. The WTO Doha round was never concluded and suspended in June 2006 because the European Union and the USA refuse to cut the agriculture subsidiaries. However, the issue was mainly related to opening borders for developing countries respective to agriculture and industrial market and cut the subsidiaries of developed economies. Now again, the focus of G7 countries diverted towards the multilateral trade system and WTO trying to adjust the unfair trade practices.

A positive and significant relationship from studies of (Gnangnon 2018), Falvey, Foster and Greenaway (2012) explains that the panel technique is useful in a larger dataset. In the current study, the preferable fixed-effect model signifies the positive relationship with all included variables except GFCF. Which can be a difference of recorded accounting system in all seven countries; UN and IMF used the United Nations System of National Accounts (UNSNA), US bureau statistic used National Income and Product Accounts (NIPA) and the European System of Accounts (ESA) used by European countries.

Figure 2 explains that trade openness and growth both has a bi-directional relationship. If one increases, the other factor will boost it, trade openness and process start with the reduction of the tariff, which eventually increases export of the home country. Expansion of exports gave room for new technology and an educated workforce. The growth of the economic infrastructure of the country matters; it helps to attract FDI. Foreign investor attracts skilled labour and technology advancement, which eventually benefits the economy to increase domestic investment and capital.

Trade liberalisation is not an issue for developed economies or G7 countries because their respective trades liberalised for many decades. A group of seven economies can help other underdeveloped economies by providing them with new trade links or production units to grow. The current study literature review explains which economies have available room for expansion and are not profitable after liberalisation. Therefore, the issue of liberalisation for underdeveloped economies should take as an open opportunity to support other nations and economies at the world level. Moreover, Doha's discussion points should again be considered for the further development of underdeveloped economies.

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**Annexure A**

**EViews Results of Panel Least Square**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: GDP | | | |  |
| Method: Panel Least Squares | | | |  |
| Date: 02/14/21 Time: 15:41 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -61239.89 | 6551.995 | -9.346755 | 0.0000 |
| FDI | 949.5329 | 337.9823 | 2.809416 | 0.0053 |
| GFCF | -445.5150 | 130.1936 | -3.421942 | 0.0007 |
| HCI | 23492.93 | 1633.080 | 14.38566 | 0.0000 |
| REER | 7.655592 | 45.75845 | 0.167304 | 0.8672 |
| TOT | 113.5844 | 50.53029 | 2.247847 | 0.0253 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.493807 | Mean dependent var | | 27653.99 |
| Adjusted R-squared | 0.485427 | S.D. dependent var | | 13913.64 |
| S.E. of regression | 9980.779 | Akaike info criterion | | 21.27400 |
| Sum squared resid | 3.01E+10 | Schwarz criterion | | 21.34666 |
| Log likelihood | -3270.196 | Hannan-Quinn criter. | | 21.30305 |
| F-statistic | 58.92219 | Durbin-Watson stat | | 0.140351 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**EViews result of Fixed Effect Model**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: GDP | | | |  |
| Method: Panel Least Squares | | | |  |
| Date: 02/14/21 Time: 15:44 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -168332.5 | 6314.251 | -26.65914 | 0.0000 |
| FDI | 129.0163 | 215.1375 | 0.599692 | 0.5492 |
| GFCF | -79.38857 | 74.54089 | -1.065034 | 0.2877 |
| HCI | 54800.51 | 1564.668 | 35.02373 | 0.0000 |
| REER | 155.2422 | 28.10986 | 5.522695 | 0.0000 |
| TOT | 14.49280 | 34.47205 | 0.420422 | 0.6745 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.848422 | Mean dependent var | | 27653.99 |
| Adjusted R-squared | 0.842789 | S.D. dependent var | | 13913.64 |
| S.E. of regression | 5516.733 | Akaike info criterion | | 20.10714 |
| Sum squared resid | 9.01E+09 | Schwarz criterion | | 20.25247 |
| Log likelihood | -3084.500 | Hannan-Quinn criter. | | 20.16525 |
| F-statistic | 150.6175 | Durbin-Watson stat | | 0.155096 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Redundant Fixed Effects Tests** | | | |  |
| Equation: Untitled | | |  |  |
| Test cross-section and period fixed effects | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Effects Test | | Statistic | d.f. | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section F | | 68.118749 | (6,253) | 0.0000 |
| Cross-section Chi-square | | 296.124036 | 6 | 0.0000 |
| Period F | | 27.278063 | (43,253) | 0.0000 |
| Period Chi-square | | 532.596300 | 43 | 0.0000 |
| Cross-Section/Period F | | 92.019763 | (49,253) | 0.0000 |
| Cross-Section/Period Chi-square | | 903.988284 | 49 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed effects test equation: | | | | |
| Dependent Variable: GDP | | | |  |
| Method: Panel Least Squares | | | |  |
| Date: 02/16/21 Time: 12:55 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| FDI | 228.0314 | 165.8727 | 1.374738 | 0.1704 |
| GFCF | 117.6601 | 72.21796 | 1.629237 | 0.1045 |
| HCI | 7107.586 | 790.8011 | 8.987831 | 0.0000 |
| REER | 111.3329 | 19.82328 | 5.616271 | 0.0000 |
| TOT | 38.47167 | 21.51260 | 1.788333 | 0.0749 |
| C | -12007.38 | 2982.868 | -4.025450 | 0.0001 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Period fixed (dummy variables) | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.929661 | Mean dependent var | | 27653.99 |
| Adjusted R-squared | 0.916625 | S.D. dependent var | | 13913.64 |
| S.E. of regression | 4017.533 | Akaike info criterion | | 19.57963 |
| Sum squared resid | 4.18E+09 | Schwarz criterion | | 20.17306 |
| Log likelihood | -2966.264 | Hannan-Quinn criter. | | 19.81691 |
| F-statistic | 71.31558 | Durbin-Watson stat | | 0.113772 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Period fixed effects test equation: | | | | |
| Dependent Variable: GDP | | | |  |
| Method: Panel Least Squares | | | |  |
| Date: 02/16/21 Time: 12:55 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| FDI | 129.0163 | 215.1375 | 0.599692 | 0.5492 |
| GFCF | -79.38857 | 74.54089 | -1.065034 | 0.2877 |
| HCI | 54800.51 | 1564.668 | 35.02373 | 0.0000 |
| REER | 155.2422 | 28.10986 | 5.522695 | 0.0000 |
| TOT | 14.49280 | 34.47205 | 0.420422 | 0.6745 |
| C | -168332.5 | 6314.251 | -26.65914 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.848422 | Mean dependent var | | 27653.99 |
| Adjusted R-squared | 0.842789 | S.D. dependent var | | 13913.64 |
| S.E. of regression | 5516.733 | Akaike info criterion | | 20.10714 |
| Sum squared resid | 9.01E+09 | Schwarz criterion | | 20.25247 |
| Log likelihood | -3084.500 | Hannan-Quinn criter. | | 20.16525 |
| F-statistic | 150.6175 | Durbin-Watson stat | | 0.155096 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section and period fixed effects test equation: | | | | |
| Dependent Variable: GDP | | | |  |
| Method: Panel Least Squares | | | |  |
| Date: 02/16/21 Time: 12:55 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| FDI | 949.5329 | 337.9823 | 2.809416 | 0.0053 |
| GFCF | -445.5150 | 130.1936 | -3.421942 | 0.0007 |
| HCI | 23492.93 | 1633.080 | 14.38566 | 0.0000 |
| REER | 7.655592 | 45.75845 | 0.167304 | 0.8672 |
| TOT | 113.5844 | 50.53029 | 2.247847 | 0.0253 |
| C | -61239.89 | 6551.995 | -9.346755 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.493807 | Mean dependent var | | 27653.99 |
| Adjusted R-squared | 0.485427 | S.D. dependent var | | 13913.64 |
| S.E. of regression | 9980.779 | Akaike info criterion | | 21.27400 |
| Sum squared resid | 3.01E+10 | Schwarz criterion | | 21.34666 |
| Log likelihood | -3270.196 | Hannan-Quinn criter. | | 21.30305 |
| F-statistic | 58.92219 | Durbin-Watson stat | | 0.140351 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: GDP | | | |  |
| **Method: Panel EGLS (Cross-section random effects)** | | | | |
| Date: 02/14/21 Time: 15:46 | | | |  |
| Sample: 1976 2019 | | |  |  |
| Periods included: 44 | | |  |  |
| Cross-sections included: 7 | | | |  |
| Total panel (balanced) observations: 308 | | | | |
| Swamy and Arora estimator of component variances | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -128081.3 | 5509.627 | -23.24682 | 0.0000 |
| FDI | 536.1432 | 207.1193 | 2.588572 | 0.0101 |
| GFCF | -220.6380 | 73.71756 | -2.993018 | 0.0030 |
| HCI | 43165.36 | 1357.328 | 31.80172 | 0.0000 |
| REER | 105.8080 | 27.39889 | 3.861761 | 0.0001 |
| TOT | 39.60158 | 32.55902 | 1.216302 | 0.2248 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  | S.D. | Rho |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | | 1915.219 | 0.1076 |
| Idiosyncratic random | | | 5516.733 | 0.8924 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.711830 | Mean dependent var | | 11014.95 |
| Adjusted R-squared | 0.707059 | S.D. dependent var | | 13591.61 |
| S.E. of regression | 7356.321 | Sum squared resid | | 1.63E+10 |
| F-statistic | 149.1987 | Durbin-Watson stat | | 0.130545 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.226198 | Mean dependent var | | 27653.99 |
| Sum squared resid | 4.60E+10 | Durbin-Watson stat | | 0.046392 |
|  |  |  |  |  |
|  |  |  |  |  |

**Residuals Test**



|  |  |  |  |
| --- | --- | --- | --- |
| **Wald Test:** | |  |  |
| Equation: Untitled | | |  |
|  |  |  |  |
|  |  |  |  |
| Test Statistic | Value | df | Probability |
|  |  |  |  |
|  |  |  |  |
| F-statistic | 443.1833 | (6, 302) | 0.0000 |
| Chi-square | 2659.100 | 6 | 0.0000 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Null Hypothesis: C(1)=0,C(2)=0,C(3)=0, C(4)=0, | | | |
| C(5)=0,C(6)=0 | | |  |
| Null Hypothesis Summary: | | | |
|  |  |  |  |
|  |  |  |  |
| Normalized Restriction (= 0) | | Value | Std. Err. |
|  |  |  |  |
|  |  |  |  |
| C(1) | | -61239.89 | 6551.995 |
| C(2) | | 949.5329 | 337.9823 |
| C(3) | | 7.655592 | 45.75845 |
| C(4) | | 113.5844 | 50.53029 |
| C(5) | | -445.5150 | 130.1936 |
| C(6) | | 23492.93 | 1633.080 |
|  |  |  |  |
|  | | | |
| Restrictions are linear in coefficients. | | | |

# **Annexure B:**

UN List of Least Developed Countries (LCDs)

1. Afghanistan
2. Angola
3. Bangladesh
4. Benin
5. Bhutan
6. Burkina Faso
7. Burundi
8. Cambodia
9. The Central African Republic
10. Chad
11. Comoros
12. The Democratic Republic of the Congo
13. Djibouti
14. Eritrea
15. Ethiopia
16. Gambia
17. Guinea
18. Guinea-Bissau
19. Haiti
20. Kiribati
21. Lao People’s Democratic Republic
22. Lesotho
23. Liberia
24. Madagascar
25. Malawi
26. Mali
27. Mauritania
28. Mozambique
29. Myanmar
30. Nepal
31. Niger
32. Rwanda
33. Sao Tome and Principe
34. Senegal
35. Sierra Leone
36. Solomon Islands
37. Somalia
38. South Sudan
39. Sudan
40. Timor-Leste
41. Togo
42. Tuvalu
43. Uganda
44. United Republic of Tanzania
45. Yemen
46. Zambia

# **Annexure C:**

Collected Data of variables of G7 countries, from (1976-2019)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Countries** | **ID** | **Year** | **GDP** | **TOT** | **GFCF** | **FDI** | **HCI** | **REER** | **Dummy (Carbon Tax)** |
| Canada | 1 | 1976 | 8809.26 | 101.1 | 6.406081 | 1.186356 | 2.9820964336395200 | 135.5868711234830 | 0 |
| Canada | 1 | 1977 | 8919.06 | 97.07209 | 2.433876 | 1.593399 | 3.0076386928558300 | 126.2378494889950 | 0 |
| Canada | 1 | 1978 | 9123.69 | 93.29638 | 1.874024 | 1.710718 | 3.0333998203277500 | 116.4745601416050 | 0 |
| Canada | 1 | 1979 | 10043.7 | 97.03866 | 6.29703 | 2.183606 | 3.0593817234039300 | 111.2817588231390 | 0 |
| Canada | 1 | 1980 | 11170.6 | 97.60233 | 5.417597 | 2.122763 | 3.0855858325958200 | 108.4882609692180 | 0 |
| Canada | 1 | 1981 | 12337.5 | 94.24198 | 9.16878 | 0.21675 | 3.1054987907409600 | 111.0791761819900 | 0 |
| Canada | 1 | 1982 | 12481.9 | 92.14388 | -10.8491 | 0.028727 | 3.1255404949188200 | 115.9154767016300 | 0 |
| Canada | 1 | 1983 | 13425.1 | 93.31852 | -0.63109 | 1.356215 | 3.1457111835479700 | 120.6567370167530 | 0 |
| Canada | 1 | 1984 | 13877.9 | 91.87686 | 2.180295 | 1.596989 | 3.1660120487213100 | 116.6666274561950 | 0 |
| Canada | 1 | 1985 | 14114.8 | 91.06911 | 8.479146 | 0.344548 | 3.1864440441131500 | 112.0182012330920 | 0 |
| Canada | 1 | 1986 | 14461.1 | 88.25909 | 3.952042 | 0.717913 | 3.2070078849792400 | 107.2758646611050 | 0 |
| Canada | 1 | 1987 | 16309 | 91.10265 | 9.092043 | 1.99327 | 3.2277042865753100 | 109.8585123014440 | 0 |
| Canada | 1 | 1988 | 18937 | 93.28472 | 9.138464 | 1.418417 | 3.2485344409942600 | 116.4536364200940 | 0 |
| Canada | 1 | 1989 | 20715.6 | 95.18348 | 5.14306 | 1.269193 | 3.2694990634918200 | 122.6408370924260 | 0 |
| Canada | 1 | 1990 | 21448.4 | 93.28777 | -3.46817 | 1.414597 | 3.2905988693237300 | 122.2976923747610 | 0 |
| Canada | 1 | 1991 | 21768.3 | 91.58248 | -4.23201 | 0.575792 | 3.3113508224487300 | 125.9007711449680 | 0 |
| Canada | 1 | 1992 | 20879.8 | 90.34679 | -2.93887 | 1.184738 | 3.3322334289550700 | 116.3459762122650 | 0 |
| Canada | 1 | 1993 | 20121.2 | 88.8874 | -1.16141 | 0.723956 | 3.3532478809356600 | 108.3993679597850 | 0 |
| Canada | 1 | 1994 | 19935.4 | 88.38518 | 6.699309 | 1.650299 | 3.3743948936462400 | 99.3813279737340 | 0 |
| Canada | 1 | 1995 | 20613.8 | 90.68697 | -1.36462 | 2.261073 | 3.3956749439239500 | 97.1491981076961 | 0 |
| Canada | 1 | 1996 | 21227.3 | 92.32714 | 5.772566 | 1.402868 | 3.4170894622802700 | 97.2083283616883 | 0 |
| Canada | 1 | 1997 | 21829.2 | 91.54102 | 11.67967 | 2.32565 | 3.4386391639709400 | 96.5300994523945 | 0 |
| Canada | 1 | 1998 | 20952.1 | 87.90307 | 3.23429 | 3.953574 | 3.4603245258331200 | 91.1168168467941 | 0 |
| Canada | 1 | 1999 | 22238.7 | 89.15296 | 5.131115 | 4.06104 | 3.4821467399597100 | 90.5520281135495 | 0 |
| Canada | 1 | 2000 | 24190.2 | 92.95404 | 5.065824 | 9.201639 | 3.5041067600250200 | 91.3121956361645 | 0 |
| Canada | 1 | 2001 | 23738.2 | 91.93619 | 4.819524 | 3.855497 | 3.5189161300659100 | 88.6327867688591 | 0 |
| Canada | 1 | 2002 | 24169.3 | 89.7728 | 0.996616 | 3.230609 | 3.5337877273559500 | 87.7127099904428 | 0 |
| Canada | 1 | 2003 | 28200.7 | 94.71832 | 5.217446 | 0.785739 | 3.5487225055694500 | 97.1549747842290 | 0 |
| Canada | 1 | 2004 | 32034.3 | 98.93715 | 8.435216 | 0.141949 | 3.5637204647064200 | 102.2745623434260 | 0 |
| Canada | 1 | 2005 | 36266.2 | 102.4207 | 9.124077 | 2.18515 | 3.5787816047668400 | 108.4453043337400 | 0 |
| Canada | 1 | 2006 | 40385.9 | 103.5037 | 6.279763 | 4.888366 | 3.5939064025878900 | 114.5762195528970 | 0 |
| Canada | 1 | 2007 | 44543 | 106.6086 | 3.167648 | 8.222072 | 3.6090953350067100 | 118.8111253948900 | 0 |
| Canada | 1 | 2008 | 46594.5 | 111.2334 | 1.626537 | 4.526383 | 3.6243484020233100 | 116.2140924262470 | 0 |
| Canada | 1 | 2009 | 40773.1 | 101.0977 | -11.314 | 1.527991 | 3.6396656036376900 | 110.4205979118630 | 0 |
| Canada | 1 | 2010 | 47448 | 106.455 | 11.51167 | 1.841673 | 3.6550478935241600 | 121.0519260772630 | 0 |
| Canada | 1 | 2011 | 52087.4 | 110.0251 | 4.637211 | 2.143425 | 3.6623251438140800 | 123.7374373617960 | 0 |
| Canada | 1 | 2012 | 52678.4 | 108.3669 | 4.886111 | 2.699692 | 3.6696166992187500 | 122.7914763192350 | 0 |
| Canada | 1 | 2013 | 52652.6 | 109.0477 | 1.448915 | 3.628603 | 3.6769227981567300 | 118.4020942526380 | 0 |
| Canada | 1 | 2014 | 50893.4 | 107.5241 | 2.250224 | 3.558271 | 3.6842434406280500 | 111.2414824462180 | 0 |
| Canada | 1 | 2015 | 43585.5 | 100 | -5.2099 | 3.854834 | 3.6915786266326900 | 100.0000000000000 | 0 |
| Canada | 1 | 2016 | 42322.5 | 98.89469 | -4.6536 | 2.237986 | 3.6989285945892300 | 97.5374092799813 | 0 |
| Canada | 1 | 2017 | 45148.6 | 102.4902 | 3.346628 | 1.764361 | 3.7062931060791000 | 98.9778994655811 | 0 |
| Canada | 1 | 2018 | 46313.2 | 103.2476 | 1.81846 | 2.711868 | 3.7136721611022900 | 98.5768915572844 | 1 |
| Canada | 1 | 2019 | 46194.7 | 103.1294 | 0.255593 | 2.755389 | 3.7210659980773900 | 97.4969465468996 | 1 |
| Germany | 2 | 1976 | 6634.86 | 91.60446 | 3.501336 | 0.25423 | 3.0700683593750000 | 117.6614336192180 | 0 |
| Germany | 2 | 1977 | 7682.95 | 91.63072 | 4.490293 | 0.158199 | 3.0968301296234100 | 119.9909394790650 | 0 |
| Germany | 2 | 1978 | 9482.04 | 94.96732 | 4.834496 | 0.216546 | 3.1238253116607600 | 121.4221113685140 | 0 |
| Germany | 2 | 1979 | 11281 | 91.5446 | 6.204123 | 0.19658 | 3.1510558128356900 | 121.7854164962300 | 0 |
| Germany | 2 | 1980 | 12138.3 | 86.10823 | 2.255836 | -0.01963 | 3.1785235404968200 | 115.7258558084790 | 0 |
| Germany | 2 | 1981 | 10209.1 | 81.41037 | -4.66717 | -0.05195 | 3.2028431892395000 | 106.5127503680300 | 0 |
| Germany | 2 | 1982 | 9913.74 | 82.5556 | -4.56126 | 0.060298 | 3.2273490428924500 | 108.5309015086550 | 0 |
| Germany | 2 | 1983 | 9864.34 | 83.67989 | 2.999297 | 0.129477 | 3.2520422935485800 | 109.8521216693410 | 0 |
| Germany | 2 | 1984 | 9313.17 | 82.28847 | 0.149682 | 0.081458 | 3.2769243717193600 | 105.2144297806190 | 0 |
| Germany | 2 | 1985 | 9429.57 | 82.56623 | 0.679348 | 0.072503 | 3.3019967079162500 | 102.9211844803080 | 0 |
| Germany | 2 | 1986 | 13461.8 | 92.31987 | 3.184887 | 0.113932 | 3.3272612094879100 | 110.1414318122690 | 0 |
| Germany | 2 | 1987 | 16677.5 | 96.00159 | 2.079517 | 0.124804 | 3.3527188301086400 | 114.0810999039980 | 0 |
| Germany | 2 | 1988 | 17931.3 | 95.75693 | 5.048044 | -0.10766 | 3.3783714771270700 | 111.1578430617170 | 0 |
| Germany | 2 | 1989 | 17764.4 | 93.26045 | 7.23259 | 0.369803 | 3.4042201042175200 | 108.0596249483240 | 0 |
| Germany | 2 | 1990 | 22304 | 94.55015 | 7.995906 | 0.14431 | 3.4302666187286300 | 111.4187347735680 | 0 |
| Germany | 2 | 1991 | 23357.8 | 93.31639 | 5.318589 | 0.253701 | 3.4436352252960200 | 109.7306754698690 | 0 |
| Germany | 2 | 1992 | 26438.2 | 96.29776 | 4.468375 | -0.10029 | 3.4570555686950600 | 114.4784744662050 | 0 |
| Germany | 2 | 1993 | 25522.6 | 97.92801 | -4.52607 | 0.023165 | 3.4705281257629300 | 118.2708316536880 | 0 |
| Germany | 2 | 1994 | 27076.6 | 98.74105 | 3.574089 | 0.340907 | 3.4840533733367900 | 118.6173415083350 | 0 |
| Germany | 2 | 1995 | 31658.3 | 100.1516 | -0.19171 | 0.46568 | 3.4976315498352000 | 122.8732017375420 | 0 |
| Germany | 2 | 1996 | 30485.9 | 99.74838 | -0.44418 | 0.62436 | 3.5112621784210200 | 117.9033001493050 | 0 |
| Germany | 2 | 1997 | 26964 | 98.19937 | 0.518511 | 0.84261 | 3.5249462127685500 | 112.3531777096660 | 0 |
| Germany | 2 | 1998 | 27289.1 | 100.204 | 4.018715 | 1.318742 | 3.5386836528778000 | 113.4745953151180 | 0 |
| Germany | 2 | 1999 | 26725.9 | 100.876 | 4.301695 | 3.921042 | 3.5524744987487700 | 111.5658274681540 | 0 |
| Germany | 2 | 2000 | 23635.9 | 96.70093 | 2.078727 | 12.76319 | 3.5663189888000400 | 105.3873724865560 | 0 |
| Germany | 2 | 2001 | 23607.9 | 96.72696 | -2.61049 | 2.92929 | 3.5749263763427700 | 105.0416510214850 | 0 |
| Germany | 2 | 2002 | 25077.7 | 98.63884 | -6.08386 | 2.478373 | 3.5835545063018700 | 105.4106447035460 | 0 |
| Germany | 2 | 2003 | 30243.6 | 100.4826 | -1.62245 | 2.620118 | 3.5922033786773600 | 109.3237228539640 | 0 |
| Germany | 2 | 2004 | 34044.1 | 100.6286 | -0.44541 | -0.72649 | 3.6008732318878100 | 110.2272738228670 | 0 |
| Germany | 2 | 2005 | 34507.4 | 98.90823 | 0.894801 | 2.102577 | 3.6095640659332200 | 108.0219793340910 | 0 |
| Germany | 2 | 2006 | 36323.4 | 97.23888 | 7.53835 | 2.922407 | 3.6182756423950100 | 107.1673488665880 | 0 |
| Germany | 2 | 2007 | 41587.2 | 97.71967 | 3.610833 | 1.486226 | 3.6270084381103500 | 107.8728274623010 | 0 |
| Germany | 2 | 2008 | 45427.2 | 96.05896 | 1.581155 | 0.829879 | 3.6357622146606400 | 107.2131765818150 | 0 |
| Germany | 2 | 2009 | 41485.9 | 100.3583 | -9.45574 | 1.668788 | 3.6445372104644700 | 108.2634359541230 | 0 |
| Germany | 2 | 2010 | 41531.9 | 98.12326 | 5.274238 | 2.533231 | 3.6533331871032700 | 103.5674834789840 | 0 |
| Germany | 2 | 2011 | 46644.8 | 95.59252 | 7.387247 | 2.604828 | 3.6557762622833200 | 102.4529856748120 | 0 |
| Germany | 2 | 2012 | 43858.4 | 95.42974 | -0.22758 | 1.855307 | 3.6582205295562700 | 99.9489521755687 | 0 |
| Germany | 2 | 2013 | 46285.8 | 96.45905 | -1.29601 | 1.800276 | 3.6606667041778500 | 101.5449405587500 | 0 |
| Germany | 2 | 2014 | 47960 | 97.70479 | 3.245798 | 0.501769 | 3.6631145477294900 | 102.7237766836520 | 0 |
| Germany | 2 | 2015 | 41139.5 | 100 | 1.73975 | 1.859895 | 3.6655640602111800 | 100.0000000000000 | 1 |
| Germany | 2 | 2016 | 42098.9 | 101.7574 | 3.81 | 1.866124 | 3.6680150032043400 | 101.3185402481800 | 1 |
| Germany | 2 | 2017 | 44349.6 | 100.8816 | 2.504576 | 3.210382 | 3.6704676151275600 | 101.4986503701930 | 1 |
| Germany | 2 | 2018 | 47639 | 100.0598 | 3.524105 | 4.23728 | 3.6729221343994100 | 102.9747843488410 | 1 |
| Germany | 2 | 2019 | 46258.9 | 100.9327 | 2.514523 | 1.870213 | 3.6753778457641600 | 101.8418510316770 | 1 |
| France | 3 | 1976 | 6866.82 | 100.9017 | 2.22258 | 0.262523 | 2.4799304008483800 | 118.6932299480320 | 0 |
| France | 3 | 1977 | 7532.53 | 98.94105 | -0.66614 | 0.462163 | 2.5092966556549000 | 113.1333010403140 | 0 |
| France | 3 | 1978 | 9264.78 | 103.1109 | 2.799627 | 0.48775 | 2.5390110015869100 | 114.4468186602810 | 0 |
| France | 3 | 1979 | 11179.6 | 101.6374 | 2.983054 | 0.421581 | 2.5661015510559000 | 117.3619465019270 | 0 |
| France | 3 | 1980 | 12713.4 | 95.01532 | 3.067308 | 0.468106 | 2.5865206718444800 | 121.0997015339920 | 0 |
| France | 3 | 1981 | 11105 | 89.88033 | -0.96031 | 0.401206 | 2.6072204113006500 | 117.0416810678830 | 0 |
| France | 3 | 1982 | 10496.9 | 90.10851 | -0.89092 | 0.271048 | 2.6280858516693100 | 112.0569723330360 | 0 |
| France | 3 | 1983 | 9993.42 | 92.21238 | -3.02809 | 0.308228 | 2.6491181850433300 | 108.1585122389560 | 0 |
| France | 3 | 1984 | 9419.7 | 90.85816 | -0.83689 | 0.451868 | 2.6703190803527800 | 106.4686158534320 | 0 |
| France | 3 | 1985 | 9763.33 | 91.25379 | 2.307425 | 0.46923 | 2.6916892528533900 | 109.3117989378440 | 0 |
| France | 3 | 1986 | 13540.2 | 99.24731 | 4.184045 | 0.422034 | 2.7132308483123700 | 113.4174481513860 | 0 |
| France | 3 | 1987 | 16302.4 | 99.02467 | 5.156986 | 0.550189 | 2.7349448204040500 | 114.8359980840330 | 0 |
| France | 3 | 1988 | 17680 | 101.2795 | 8.687545 | 0.833286 | 2.7568323612213100 | 112.3740132675820 | 0 |
| France | 3 | 1989 | 17694.3 | 99.76994 | 7.365232 | 1.005053 | 2.7788951396942100 | 109.9109362468350 | 0 |
| France | 3 | 1990 | 21793.8 | 100.0704 | 4.608864 | 1.038725 | 2.8011343479156400 | 113.6846436906600 | 0 |
| France | 3 | 1991 | 21675.1 | 99.11079 | -0.53423 | 1.193809 | 2.8100614547729400 | 109.9496027640570 | 0 |
| France | 3 | 1992 | 23813.7 | 99.72869 | -1.48704 | 1.558333 | 2.8190169334411600 | 111.3641341328550 | 0 |
| France | 3 | 1993 | 22380.1 | 101.2022 | -5.43792 | 1.568929 | 2.8280010223388600 | 112.4874140250460 | 0 |
| France | 3 | 1994 | 23496.5 | 100.5688 | 1.555463 | 1.133237 | 2.8370134830474800 | 112.1667914929710 | 0 |
| France | 3 | 1995 | 26890.2 | 99.52242 | 1.329405 | 1.482504 | 2.8460547924041700 | 114.3673837110990 | 0 |
| France | 3 | 1996 | 26871.8 | 98.4798 | 0.751684 | 1.368389 | 2.8551251888275100 | 113.5789104447280 | 0 |
| France | 3 | 1997 | 24228.9 | 98.41562 | 0.78876 | 1.586356 | 2.8642241954803400 | 109.0599744630040 | 0 |
| France | 3 | 1998 | 24974.3 | 99.74577 | 6.409821 | 1.963825 | 2.8733522891998200 | 109.7486398843550 | 0 |
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| ITALY | 7 | 1981 | 7622.83 | 83.20213 | -1.56141 | 0.261064 | 2.3163921833038300 | 96.4213705279023 | 0 |
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| ITALY | 7 | 1983 | 7832.58 | 87.82903 | -1.43951 | 0.269705 | 2.3671753406524600 | 103.7324741326690 | 0 |
| ITALY | 7 | 1984 | 7739.72 | 88.06197 | 3.984149 | 0.29989 | 2.3929829597473100 | 104.9890082646620 | 0 |
| ITALY | 7 | 1985 | 7990.69 | 88.72702 | 1.033678 | 0.235908 | 2.4190719127655000 | 104.7874778308240 | 0 |
| ITALY | 7 | 1986 | 11315 | 100.3681 | 2.784425 | -0.02389 | 2.4454452991485500 | 111.5746562883100 | 0 |
| ITALY | 7 | 1987 | 14234.7 | 103.1422 | 4.819738 | 0.519803 | 2.4721059799194300 | 114.0412964742700 | 0 |
| ITALY | 7 | 1988 | 15744.7 | 101.8177 | 7.188404 | 0.761483 | 2.4990577697753900 | 113.1826547421480 | 0 |
| ITALY | 7 | 1989 | 16386.7 | 101.4721 | 4.384752 | 0.235981 | 2.5263030529022200 | 116.4193615524340 | 0 |
| ITALY | 7 | 1990 | 20825.8 | 106.1677 | 4.326683 | 0.545263 | 2.5538454055786100 | 120.9546104978110 | 0 |
| ITALY | 7 | 1991 | 21956.5 | 110.3891 | 1.2971 | 0.192851 | 2.5766487121582000 | 121.5029480408360 | 0 |
| ITALY | 7 | 1992 | 23243.5 | 109.2388 | -1.43767 | 0.236225 | 2.5976178646087600 | 119.3943854076910 | 0 |
| ITALY | 7 | 1993 | 18738.8 | 104.3383 | -11.2183 | 0.351085 | 2.6187579631805400 | 100.7110633451660 | 0 |
| ITALY | 7 | 1994 | 19337.6 | 102.9969 | 0.717773 | 0.200921 | 2.6400697231292700 | 97.6861028993097 | 0 |
| ITALY | 7 | 1995 | 20664.6 | 99.99888 | 7.035405 | 0.412364 | 2.6615552902221600 | 90.5197008370496 | 0 |
| ITALY | 7 | 1996 | 23081.6 | 102.5465 | 2.482414 | 0.27041 | 2.6832153797149600 | 100.1603958248960 | 0 |
| ITALY | 7 | 1997 | 21829.3 | 103.0034 | 1.970845 | 0.29691 | 2.7050521373748700 | 100.2707319084440 | 0 |
| ITALY | 7 | 1998 | 22318.1 | 105.9081 | 4.048778 | 0.207871 | 2.7270662784576400 | 101.7376821310260 | 0 |
| ITALY | 7 | 1999 | 21997.6 | 105.794 | 4.359941 | 0.554444 | 2.7492597103118800 | 101.9228529786940 | 0 |
| ITALY | 7 | 2000 | 20087.6 | 100.0384 | 6.809245 | 1.151656 | 2.7716336250305100 | 98.1986291248512 | 0 |
| ITALY | 7 | 2001 | 20483.2 | 101.5922 | 2.67252 | 1.274886 | 2.7933568954467700 | 99.0202083712597 | 0 |
| ITALY | 7 | 2002 | 22270.1 | 103.1339 | 3.855236 | 1.356669 | 2.8152503967285100 | 101.0387826220750 | 0 |
| ITALY | 7 | 2003 | 27465.7 | 104.0325 | -0.62474 | 1.243397 | 2.8373155593872000 | 105.8737080760630 | 0 |
| ITALY | 7 | 2004 | 31259.7 | 103.0318 | 1.616762 | 1.11471 | 2.8595535755157400 | 107.0665149270070 | 0 |
| ITALY | 7 | 2005 | 32043.1 | 100.3177 | 1.550421 | 1.97909 | 2.8819658756256100 | 105.3780261212170 | 0 |
| ITALY | 7 | 2006 | 33501.7 | 97.33951 | 2.540586 | 2.925967 | 2.9045538902282700 | 104.7876559930610 | 0 |
| ITALY | 7 | 2007 | 37822.7 | 98.46969 | 1.522122 | 2.984923 | 2.9273190498352000 | 104.6715382478990 | 0 |
| ITALY | 7 | 2008 | 40778.3 | 96.0665 | -3.15548 | -0.39609 | 2.9502625465393000 | 104.9783213033190 | 0 |
| ITALY | 7 | 2009 | 37079.8 | 101.6439 | -9.74712 | 0.75789 | 2.9733858108520500 | 106.7630396068670 | 0 |
| ITALY | 7 | 2010 | 36000.5 | 97.60525 | -0.20019 | 0.465343 | 2.9966902732849100 | 102.4282871077660 | 0 |
| ITALY | 7 | 2011 | 38599.1 | 95.05412 | -1.43274 | 1.503735 | 3.0142395496368400 | 102.0862012132430 | 0 |
| ITALY | 7 | 2012 | 35053.5 | 93.70233 | -9.73977 | 0.001672 | 3.0318915843963600 | 100.6093202804340 | 0 |
| ITALY | 7 | 2013 | 35550 | 95.28043 | -6.44561 | 0.912122 | 3.0496473312377900 | 101.6336985308360 | 0 |
| ITALY | 7 | 2014 | 35518.4 | 97.73155 | -2.21947 | 0.788869 | 3.0675067901611300 | 102.5227849506840 | 0 |
| ITALY | 7 | 2015 | 30230.2 | 100 | 1.759932 | 0.724628 | 3.0854706764221100 | 100.0000000000000 | 1 |
| ITALY | 7 | 2016 | 30939.7 | 103.2531 | 3.993264 | 1.367774 | 3.1035399436950600 | 100.8340885659260 | 1 |
| ITALY | 7 | 2017 | 32406.7 | 101.723 | 3.217294 | 0.567767 | 3.1217148303985500 | 100.4371528092210 | 1 |
| ITALY | 7 | 2018 | 34520.1 | 101.1556 | 3.074441 | 1.893973 | 3.1399965286254800 | 101.7056497007630 | 1 |
| ITALY | 7 | 2019 | 33189.6 | 101.8262 | 1.627892 | 1.458422 | 3.1583850383758500 | 99.7945245322589 | 1 |