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Dynamic Gains from Trade:
A Time-Series Data Analysis of Egypt

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Abstract:

In Egypt, this paper investigates, empirically, the long run relationship between trade openness and total factor productivity growth (*TFP*) to give evidence of the presence of dynamic gains from trade. The manufacturing sector time series data for Egypt are used between 1980 and 2020 to estimate both the Johansen Cointegration test and the Error Correction Model (ECM) applied to study the specified relationship. One of the paper's most significant findings—which provides evidence for the existence of dynamic gains from trade for Egypt—is the detection of positive long-run relationship between *TFP* and trade openness.

Keywords: Trade gains, Dynamic Gains, Static gains, Egyptian economy, Total Factors Productivity, Time-series data analysis, Stationarity test, Cointegration test, ECM.

1.Introduction

There are incessant arguments supporting trade. For a small open economy, trade is ideal in the absence of market defects (Greenaway, 1998). The exchange of commodities and services is considered to be trade in general. The main reason for this is the variations in prices between nations. These prices account for variations in production costs. Based on the comparative advantage law of Ricardo, some goods must be cheaper to produce domestically than abroad in order to be exported to other nations, whereas other goods must be cheaper to produce abroad in order to be imported from other nations.

Trade's purpose is to reduce the real resource used in global production. It "serves to maximise the real value of output by allocating global resource most efficiently," as a result (Kenen, 2000, 19). Because of this, countries that participate in international trade tend to produce more output (goods and services) per unit than those that do not. As a result, we may claim that trade raises the standard of living and maximises social welfare by making goods and services available to the world's population at a lower total cost than would otherwise be possible.

It is generally acknowledged that the gains from trade can be divided into two categories; static gains and dynamic gains. The idea of comparative advantage states that variations in countries' endowments of natural and acquired resources lead to static gains from trade. The slope of the production possibility curve and the opportunity cost differ due to various endowments. According to Thirlwall (2000), the static gains from trade are the costs that are kept when items are imported rather than produced domestically.

These gains from trade are not, however, assured to be dispersed equally under the doctrine of comparative advantage. The resource gains that can be acquired by exporting to obtain imports more affordably in terms of resources given up, compared to producing the commodities oneself, are used to measure the static gains from trade. Or, to put it another way, the excess cost of import substitution; by what is saved by not producing the imported good domestically, is used to assess the static gains from trade (Thirlwall, 2000, 134). That is a widely accepted standard theory.

In this regard, according to Thirlwall (2000) and Abou Doh (2003), the problem for many developing nations is that they are compelled, under the auspices of trade openness, to specialise in primary commodities that have both a low price and a low-income elasticity of demand. This means that when supply rises, prices may fall, while demand only slowly increases as income rises. Moreover, these primary goods are conditional on diminishing returns and a limit to employment set by the point where the labour marginal product reaches the minimal subsistence wage. As a result, trade may cause a loss for developing nations. Such problems do not arise in manufacturing.

In fact, economic growth stimulated by technical advancement might cause a country's national welfare to fall. "Immiserising growth" refers to this situation (Bhagwati, 1958). A situation like this develops when the advantageous welfare effects of economic growth at fixed product prices are outweighed by a worsening of terms of trade, which, in turn, leads to excess consumption that worsens global welfare. Therefore, if there are distortions, opening up to trade may result in immiserisation and decreased economic welfare. Static gains of trade contain lower costs due to economies of scale, improved efficiency as a result of utilising comparative advantage, a decrease in distortion from imperfect competition, and a greater choice of products accessible.

Brecher (1974) asserted that increased openness could result in static losses when real wages are rigidly depressed. The theory holds that reduced tariffs promote greater openness in the case of labour-intensive goods, such as those produced in developing nations, and that a decline in domestic wages for this type of labour would result in unemployment and possibly a GDP loss. On the other hand, the core of dynamic gains is that they shift away the entire production potential frontier by enhancing the availability of resources for production through growing resources productivity and expanding their availability (Thirlwall, 2000, 135). In addition to static gains from trade, dynamic gains from trade include benefits that accrue over time.

The static gains from trade has been widely addressed in the theory of international trade. However, trade theory doesn't offer much guidance regarding how international trade affects economic growth and technological advancement. Contrarily, the new trade theory demonstrates that the gains from trade can result from a number of fundamental sources, including disparities in comparative advantage and increasing returns across the economy.

The claim that trade is advantageous for dynamic efficiency, rather than just static economic welfare, is vague in theory, and the empirical evidence in support of it is always questioned. In this paper, we use a time-series technique to test this claim for Egypt, covering the period of its trade openness that is 1980-2020. Egypt represents an ideal case to investigate the existence of long run relationship between economic growth and openness via *TFP*, i.e. the presence of dynamic gains. One of the first countries in the Middle East and North Africa (MENA) area to declare the adoption of an export-promotion and open market policy as a means of fostering economic growth was Egypt.

Egypt has prioritised trade openness and export promotion in recent years because it sees them as the cornerstones of long-term economic growth that would create jobs and alleviate poverty. An export promotion strategy built on a number of trade policy measures aimed at liberalising trade has replaced the import substitution programmes used in the 1950s and 1960s. According to Lord (2000), three different types of measures are used to implement these reforms: lowering import tariffs, replacing quantitative import measures with tariffs and non-tariff barriers (NTBs) that have also been significantly lowered, and finally encouraging exports by easing administrative burdens.
let us show the following features of trade policy framework of Egypt along the years.

From 1952 until 1970, Egypt's trade strategy was characterised by a strong state involvement, adopting import substitution policies. Import licencing was the primary method used to regulate import quantities because the exchange rate was regularly overvalued. With the exception of the 1950s, exports of products have not significantly contributed to Egyptian development. In comparison to other developing nations, Egypt exported more than South Korea, Taiwan, and Thailand, as was reported in 1954. But by 1990, each of these nations was exporting ten to thirty times more than Egypt.

Wichterman (1994) claimed that throughout the 1990s, Egyptian exports gradually decreased. Egypt's contribution to global trade decreased significantly for the most of that time period as exports from developing countries increased substantially between 1960 and 1990. Egypt has made considerable strides since adopting the open-door policy in 1970, till now, to liberalise its markets in order to support favourable economic development rates by promoting increased trade. Egypt's free zones were established by Law 43 of 1974. Nasr City in Cairo, Alexandria, Ismalia, Suez, Port Said, Damiette, and Sixth of October City are the seven major free trade zones. The Red Sea and North Sina are the other zones. Duty-free system in Port Said was discontinued over five years starting in 2002. Free zones are available to investment in any activity and are governed by Investment Law 8. At least 80% of the output of these zones is intended for export.

Even though there had been attempts since the 1970s to lessen trade barriers, Egypt made significant progress in doing so in the early 1990s when the government expanded access to foreign exchange and changed the exchange rate to reflect market forces. Egypt has steadily shifted to a more open trading regime. In February 1994, it started implementing the harmonised coding system. The Egypt's agreements to liberalise trade are the African continental free trade area, AFCFTA, as a first step of economic integration; the general agreement on tariffs and trade (GATT); the general agreement on trade in services (GATS); European Union-Egypt free trade agreement (Association Agreement); Free trade agreement with EFTA states; Turkey-Egypt free trade agreement; Greater Arab free trade area agreement; Agadir free trade agreement among Egypt, morocco, Tunisia, and Jordan; Egyptian-European Mediterranean partnership agreement; The Common market for eastern and southern Africa (COMESA); Pan Arab free trade area (PAFTA); Egypt-MERCOSUR free trade agreement.

Egypt has made progress in lowering tariffs as part of its trade liberalisation programme and in accordance with its World Trade Organization (WTO) commitments. On July 1st, 2001, the Egyptian Customs began using the invoice-based system for the assessment of import tariffs. On this day, the Egyptian government started enforcing General Sales Tax Law 11 of 1991, Phases Two and Three, which expanded value added tax (VAT) to the wholesale and retail levels.

Depending on turnover, the government may collect sales tax from retailers on a monthly or quarterly basis. The only industries that are spared from immediate full adoption are those that deal with gold, woodworking, and spinning and weaving. Egypt has reduced the rates on its import tariffs. The maximum tariff rate for the majority of imports was lowered by 50% to 40% in 1998. With an average weighted tariff rate of 27.5%, Egypt's tariff rates are still quite high by global standards.

On imports that endanger connected industries and compete with domestic goods, the Egyptian government imposes hefty import tax rates. On the majority of imports, a service charge depending on the value of the imported goods is assessed in exchange for inspecting, listing, categorising, and re-examining these goods. Egypt doesn't directly subsidise exports. In accordance with its agreements with the World Bank, the Egyptian government raised the cost of purchasing cotton and energy while reducing indirect export subsidies such input subsidies, credit facilities, and customs rates. As a net food importer and a nation with significant potential for exporting fruits and vegetables, Egypt is keenly interested in the WTO agriculture negotiations.

WTO talks on market access for agricultural products took into account market access preferences afforded by current or potential bilateral trade agreements between Egypt and significant trading partners in areas where Egypt has a competitive advantage. Furthermore, Egypt is interested in bilateral trade agreements that give Egyptian goods better access to important markets. Egypt has bilateral agreements with Jordan, Lebanon, Libya, Morocco, Syria, China, and Russia. The Egyptian textile and clothing industry seek a thorough evaluation of the effects of the phase-out of quotas, China's WTO membership, and the conclusion of WTO discussions on market access and trade remedies. Egypt is persuaded that a sector's proper orientation in these areas and the removal of trade obstacles will contribute to the sector's structural reforms.

Additionally, customs clearance will proceed more quickly in Egypt and the nations that are importing, which is anticipated to have a positive effect on trade. The potential for exports and the domestic market in the Egyptian service sector is significant. The sector's enhanced awareness of the WTO service regulations is a critical component for the growth of export activities. Pharmaceutical manufacturing is another crucial sector. This sector is interested in any modifications brought on by the WTO TRIPS agreement's full adoption after 2005. The sector is under pressure to accept TRIPS-plus disciplines, which is another cause for concern.

On attempting to give evidence of the presence of dynamic gains for Egyptian economy from trade openness, this paper's remainder is structured as follows: The related literature is reviewed in section 2 on both theoretical and empirical levels. The methodology of the paper is revealed in Section 3. Using a time series data for Egypt from 19780 to 2020 (excluding the period 2011-2014), we show data and model results in section 4. The main conclusions are discussed in section 5.

2. Related Literature

2.1. Static Gains

The theory of comparative advantage, created by Ricardo in 1817, states that under the assumptions of perfect competition and resource fully utilisation, static gains would be earned by specialising in producing goods with the lowest opportunity costs and exchanging the production surplus above domestic demand. These static gains result from the resources reallocation from one sector to another as higher specialisation, built on comparative advantage, takes place.

As trade restrictions between members are detached, customs unions or free trade areas experience trade creation gains, but these gains are once-for-all. According to Thirlwall (2000), once the tariffs have been detached, with no further resource reallocation, the static gains are exhausted. The static gains from better allocation of resources are the classical foundation of gains from freer trade as, under perfect competition, a small, price-taking nation gains by tariffs removing.

Consumers become better off since their incomes stretch more, and resources are allocated more professionally as these resources are no longer allocated to a production that might be imported at a lower price. Cairnes (1874) asserted that free trade always makes more goods available when addressing the issue of "gain" from trade through the growth of real income. Trade openness therefore always functions to raise the country's real income unless it causes a significant enough degradation of the distribution of real income to cancel out the rise in the amount of available goods.

The superiority of trade vs. autarky using a numerical example:

We attempt to analyse the ideal scenario for the Egyptian economy in both closed and open instances using the Ricardian model. Our model includes two goods: manufactured and agricultural. Labour is the only factor of production, just like in the Ricardian model. This model uses analysis to show whether Egypt would benefit from complete specialisation in producing agricultural products and selling them to other countries, particularly the European Union, which is thought to be Egypt's main trading partner. Given that, the model aims to depict both an equilibrium with perfect specialisation and an equilibrium with no trade (autarky). The Utility function will be constructed and calculated in both scenarios—autarky and open economy—to show how the trade solution is superior (if exists).

a. In autarky case:

Let's start with the first situation of a closed Egyptian economy, where our problem can be specified as follows: Egypt wants to maximise Utility, which may be expressed as:

$$\max U(C_1 C_2) \qquad (1)$$

The above function is subject to:

$C_i = P_i$

U is utility, C_1 is the agricultural good consumption, C_2 is the manufactured good consumption, C_1 & C_2 represent C_i, and

P_i is the good production so, P_1 is the agricultural good production, and P_2 is the manufactured good production.

Additionally, the utility maximisation function mentioned above is subject to:

$\lambda_{s_1} P_1 + \lambda_{s_2} P_2 = S$ where S is labour supply. Consequently, the following might be used to summarise our problem: in a closed Egyptian economy, Egypt requires to

$\max U(C_1 C_2)$

s.t. $C_i = P_i$ and

s.t. $\lambda_{s_1} P_1 + \lambda_{s_2} P_2 = S$

When maximum welfare is obtained in a closed economy, the indifference curve (the demand or consumption side) and the production possibility frontier curve (the supply or production side) must have the same slopes; this is the equilibrium condition. The marginal cost (MC) of the first good—the agricultural good in our example—is represented by the slope of the production possibility frontier curve. Either the resources employed in production or the other goods forgone are used to calculate this marginal cost that known as the marginal transformation rate (MTR)-the agricultural good's relative price in autarky.

$$MTR = \frac{\lambda_{s_1}}{\lambda_{s_2}} \quad (2)$$

The marginal substitution rate (MSR), which is the slope of the indifference curve that shows consumers' willingness to pay for the agricultural good, is the second slope., where

$$MSR = \frac{mU_1}{mU_2} \quad (3)$$

As previously mentioned, the equilibrium condition is satisfied by

$MTR = MSR$, i.e. $\frac{\lambda_{s_1}}{\lambda_{s_2}} = MSR$

Using a numerical illustration for the above:

As noted, in the closed economy $C_i = P_i$ hence, given $U = P_1 P_2$ (4)

$$MSR = \frac{P_2}{P_1} \quad (5)$$

$\lambda_{s_1} = 3$, $\lambda_{s_2} = 2$, $S = 300$

$$MTR = \frac{\lambda_{s_1}}{\lambda_{s_2}} = \frac{3}{2} = 1.5$$

As previously stated, in an autarky (closed economy), production must equal consumption across all sectors of the economy. So,

$C_1 = P_1$ & $C_2 = P_2$ (6)

Egypt wants to

$\max U = P_1 P_2$

$s.t. PPF = 3P_1 + 2P_2 = 300$ (7)

The equilibrium condition: $MSR = MTR = \frac{P_2}{P_1} = \frac{3}{2} = 1.5$ thus,

$P_2 = 1.5P_1$ (8)

By replacing $P_2 = 1.5P_1$ into equation (7), we obtain

$3P_1 + 2(1.5P_1) = 300 \Rightarrow 6P_1 = 300 \Rightarrow P_1 = 50$

$P_2 = 1.5P_1 = 1.5 * 50 = 75$

$U = P_1P_2 = 50 * 75 = 3750$

This 3750 reflects the utility in autarky case, or when the Egyptian economy is closed. However, what would happen if this economy were opened?

b. <u>In trade case</u>

The goal in an open economy is the same, which is for Egypt to maximise utility (welfare) under the condition that total production value equals total consumption value, but in this case, the challenge is to select four unknown variables. $C_1, C_2, P_1 and P_2$ to $\max U(C_1C_2)$

$s.t. p_1P_1 + p_2P_2 = p_1C_1 + p_2C_2$ (i.e. Income=Expenditure) (9)

However, it is always advised to break the problem down into two steps: first, maximise net domestic product while meeting a restriction, and then, second, solve the original problem.

Egypt must therefore maximise its net domestic product that is: $p_1P_1 + p_2P_2$ (10)

$s.t. \lambda_{s_1}P_1 + \lambda_{s_2}P_2 = S_{(PPF)}$. This equation gives us the following:

$P_2 = \left(\frac{S}{\lambda_{s_2}} - \frac{\lambda_{s_1}}{\lambda_{s_2}}P_1\right)$, by replacing P_2 into equation (10), the net domestic product can be maximised as follows:

$$\max Dp = p_1P_1 + p_2\left(\frac{S}{\lambda_{s_2}} - \frac{\lambda_{s_1}}{\lambda_{s_2}}P_1\right) \quad (11)$$

Dp represents net domestic product.

The slope of the preceding function can be written as:

$$\frac{\partial Dp}{\partial P_1} = p_1 - p_2\left(\frac{\lambda_{s_1}}{\lambda_{s_2}}\right) \quad (12)$$

Equation 12 is rewritten as follows when obtaining the slope value:

$$\frac{p_1}{p_2}-\frac{\lambda_{s_1}}{\lambda_{s_2}}>,<,=0$$

, this means positive, negative or zero

If the value is positive, we can infer that the agricultural good's world price is higher than the same good autarky price. The second scenario, where the value is negative, is the opposite. For the positive value Egypt selects a maximum $P_1=\frac{S}{\lambda_{s_1}}$ and therefore $P_2=0$ (the agricultural good producing). For the negative value Egypt selects a minimum $S_1=0$ besides $P_2=\frac{S}{\lambda_{s_2}}$ (the manufactured good producing). Both of the aforementioned instances show that Egypt will focus on providing a single good (a Ricardian model model). In contrast, if the value is zero, Egypt is free to produce any output. Let's use the identical numbers as in the case of autarky to illustrate the superiority of trade.

Given $\max U=C_1C_2$,

$$MSR=\frac{C_2}{C_1},$$

$$\lambda_{s_1}=3,\lambda_{s_2}=2,S=300,p_1=2 and p_2=1$$

We carry out two steps to solve the problem as mentioned:

First, Egypt needs to maximise $2P_1+P_2, s.t. 3P_1+2P_2=300$ (13)

$$\frac{p_1}{p_2}=\frac{2}{1}>\frac{3}{2}=\frac{\lambda_{s_1}}{\lambda_{s_2}}$$

, Egypt would specialise in good the agricultural good and thus $S_2=0$

$$P_1=\frac{S}{\lambda_{s_1}}=\frac{300}{3}=100$$

National income = 2*100 + 1*0 = 200, this 200 is used to maximise the utility in the next step.

Second: $\max U=C_1C_2 s.t. 2C_1+C_2=200$ (14)

The equilibrium condition: $MSR=\frac{C_2}{C_1}=\frac{p_1}{p_2}=\frac{2}{1} Or C_2=2C_1$ (15)

By replacing the equilibrium condition into the budget written in equation 14 $p_1C_1 + p_2C_2 = 200$, we obtain $2C_1 + C_2 = 200 \Rightarrow 4C_1 = 200 \Rightarrow C_1 = 50$

Thus, $C_2 = 2*50 = 100$

then $U = C_1C_2 = 50*100 = 5000 > 3750$ and therefore U for open economy of Egypt is greater than that is closed verifying the trade solution superiority.

Any country (in our example, Egypt) can specialise in one product, as shown in the numerical example above using the Ricardian model, provided that the slope of the net domestic product does not equal zero. Additionally, this example demonstrates the superiority of trade versus autarky by demonstrating the presence of static gains from trade that result from the fact that various nations have varying levels of endowments of both natural and acquired resources. As a consequence, each nation will have a different opportunity cost associated with producing goods. Given specific assumptions, trade openness is not only pareto-superior to autarky from a normative (or welfare) perspective, it is also pareto-efficient, outperforming various levels of trade restrictions, as proved for a small economy by Samuelson (1939).

The world's prices departed from autarky pricing, according to Samuelson's model. This stated a transfer from autarky to either free trade or restricted trade. The more the prices of world and autarky deviate, the more the gains are. An additional contribution in Samuelson (1962) was to extend the argument to the large country case by use of the “Baldwin envelope”. According to Baldwin (1948), a country's consumption possibilities might influence its trade terms. The envelope is outside the frontier of autarky. The optimal point, on the frontier, can be reached for any given distribution of income by the optimal tariff application, meaning that the opportunity to trade makes a country gain in both small and large economies.

Other research addressed the real cost vs. opportunity cost approach when addressing the gain from trade issue. The opportunity cost theory (Haberler, 1950) places a strong emphasis on the evaluation of alternate products' options and the part that these options play in attributing values through the production structure to the original factors. Real cost theory of value's main tenet is that there is at least a strong presumption of rough proportionality between market prices and real costs (Viner, 1955).Viner built his argument on the three distinct approaches to deal with the gain from trade question.

These approaches include first, the doctrine of comparative costs, which used efficiency in the costs of attaining a given income as the criterion of gain; second, income growth as a criterion of gain; and third, terms of trade as an indicator of global division and the gain trend. The studies following Samuelson be contingent on the elimination of some key assumptions, and propose that the basic orthodox gains message from the theory of trade is nonetheless confirmed.

When Dixit and Norman (1980) studied cases with one consumer, many consumers, lump-sum transfers, and commodity tariffs, they came to the conclusion that free trade can be superior to autarky, or at the very least, not worse. However, Jones and Kenen (1984) discovered that, in the absence of lump sum transfers, the cost of moving from a free trade situation that results in a differential income distribution to one combined with redistribution, where all losers from the move to free trade are fully compensated, may be the effects of income taxes and subsidies. Using a multi-commodity analysis, Krueger and Sonnenschein (1967), supported Samuelson's conjecture that gains from trade increase with more price divergence between autarky and free trade. They also demonstrated that, in a model with more than two goods, an improvement in the terms of trade does not always translate into an increase in the gains from trade. Using a three-commodity counter-example, improvement in terms of trade might result in a drop in welfare.

With the work of Helpman and Razin (1978), who took uncertainty into account, the gains from trade analysis changed. They came to the conclusion that although while trade may cause uncertainty, and uncertainty may cause costs, there are still gains from trade because it opens up more opportunities than autarky. Deardorff (1973) expanded the gains from trade analysis to developing nations, demonstrating how the opening of trade might lower per-capita consumption under condition of constant saving propensity. This does not, however, nullify the normal gains from trade proposals.

It is challenging to obtain the optimal fixed savings propensity, and as the steady state is approached, higher consumption in the early phase may offset decreased consumption in the steady state. Kemp (1962) provided the foundation for discussion of the trade gains with increasing returns by making the critical premise that the increasing returns are Marshallian, i.e. internal to the industry and external to the firm. He showed that if trade leads to the expansion of industry 1 while industry 1 has increasing returns and industry 2 has constant returns, the small country gains from trade.

However, subsequent research indicates that where there is an externality (distortion), one country will lose from trade under the condition of increasing Marshallian returns in one industry and constant returns in the other (Melvin, 1969), and in the case between a small country and a large one, the small country is more likely to be the loser (Markusen and Melvin, 1981).The literature on product differentiation, monopolistic competition, and increasing returns was the most significant development in the 1980s and early 1990s in the study of the gains from trade. Markusen and Melvin (1982) tried to create a coherent framework for the gains of trade in a monopolistic competition, scale economies-based model.

They came to the conclusion that there are some cases where price-marginal cost mismatches may result in gains or losses. The other issue is the difficulties related to the presence of economies of scale.

2.2. Tariff losses

Regarding the limits of tariffs, some scholars have already determined the welfare gains under the effects of the tariffs decrease. Harris (1984) focused on the characteristics of market structure to explain static gains from trade. Static gains are higher when oligopoly or monopoly is present. The firm will be exposed to foreign competition under these market structures and free trade, which will afterwards enhance efficiency through the trade-induced rationalisation impact or a pro-competitive effect.

Conversely, inefficient enterprises will be forced to leave the market. Oligopolists are compelled to lower their prices and increase production volume in an effort to make up for the new low pricing when faced with high price elasticity of demand. Gains from liberalisation, according to Dornbusch (1992), come from scale economies and economies of scope that develop in larger markets. Furthermore, the lack of competition from the rest of the world and the restricted markets of protected economies encourage oligopoly and inefficiency. In the absence of free trade, protectionism can provide domestic companies market power.

According to the traditional trade theory, developing nations should continue to specialise in producing and exporting raw materials, fuels, minerals, and food to developed nations, who in turn will export manufactured goods to developing nations, given the current distribution of factor endowments and technology between developed and developing nations. Salvatore (2004) noted that while short-term welfare maximization may occur, developing countries will ultimately be denied the benefits of industry and welfare maximisation.

Developing nations will focus on the dynamic gains that arise from industrial production since they regard the static advantages from comparative advantage to be irrelevant to the development process. This translates to a better skilled labour force, higher and more stable export prices for the nation, more inventions and technological advancements, and ultimately, increased income for people. It is important to note that much of conventional contemporary trade theory and real trade theory, which is founded on the traditional principles of Smith and Ricardo, largely disregard the monetary or balance-of-payments consequences of trade.

Furthermore, orthodox theory ignored these consequences. However, one of the most significant arguments in favour of assuming a close relationship between trade (exports) and growth is the consequences of trade on the balance of payments. Thirlwall (2000) asserts that if a specific trade pattern results in balance-of-payments problems and the balance of payments is not self-correcting through relative pricing (i.e., rate of real exchange) movements, the output reductions and rise in unemployment required to compress imports can easily outweigh the gains of trade. Thinking about the potential function of strategic protection and the speed of trade liberalisation requires taking this into account (Thirlwall, 2000). International trade was viewed as the growth engine during the nineteenth century.

According to Nurkse (1970), the export sector was the chief sector that pushed the economies such as the United States, Canada, and South Africa into fast growth. Nevertheless, as Cairncross (1962) claimed that developing nations can relied much less on trade for their growth. The majority, with the exception of the nations that produce petroleum, have significantly fewer endowments of natural resources than areas that were only recently settled during the nineteenth century, including the United States and Canada. Likewise, today's overpopulation in most developing nations means that any rise in their production of food and raw materials are consumed domestically.

Developing nations, furthermore, face a skilled labor outflow rather than an inflow, besides, they have ignored the agriculture sector in favour of further fast industrialization, which is an difficulty to their trade and development prospects. Additionally, we observe that the international capital flow to developing nations is far lower than it was in the nineteenth-century areas of recent settlement. However, for exports of food and agricultural raw materials from developing countries, the income elasticity of demand in developed countries is less than 1.

Additionally, the demand for natural raw resources is decreasing as synthetic substitutes are developed. According to Salvatore (2004), technical developments have lowered the raw material content of numerous products then the services output, with raw material requirements, has grown up quicker than that of goods in developed countries which have levied tariffs on many moderate developing countries exports. Regarding the limits of tariffs, some scholars have already determined the welfare gains under the effects of the tariffs decrease.

Salvatore (1987) assessed the welfare gains from free trade using trade models and assumed that the country redistributes the revenue of tariff entirely to its citizens in the subsidised public consumption form and/or general income tax relief, to show the effects of a tariff on the general equilibrium. His research was centered on general equilibrium and partial equilibrium analyses of import tariffs imposed by small and large countries for either protection or revenue. Irrespective of the establishing tariffs justifications, Salvatore came to the conclusion that protection costs or dead weight loss will occur as a result of inefficiencies, therefore in the end all countries often lose due to the tariff. Free trade therefore maximises global welfare.

Salvatore (2004) emphasises in his book that a nation's production possibility frontier is equally its consumption frontier in the absence of trade. With trade, each country can, however, specialise in producing the good or service that best suits its comparative advantage and trade a portion of its output for the good or service that best suits its comparative disadvantage. By doing this, more of both goods are consumed by both countries than they would have been without trade. Salvatore claims that the trade gains can be divided into two categories: exchange gains and production specialisation gains.

The supply and demand curves were used by Kenen (2000) to depict the major consequences of a tariff. The tariff lowers the quantity that domestic consumers are demanding. It does, however, increase the quantity supplied by domestic producers. He demonstrated that this circumstance has the effect of reducing consumer surplus more than it has increased producer surplus, and the difference between the two would be used to calculate the tariff welfare cost.

2.3. Dynamic Gains

Beyond the basic advantage of being exposed to a developed, competitive global market, trade liberalisation also includes the possibility of dynamic advantages. With regard to dynamic gains we should make a distinction between the two dynamic consequences of trade—out of steady state and steady state. Out of a steady state, the neoclassical model of growth allows for the analysis of transitional dynamics growth.

In this regard, Corden (1985) expressed the central idea, according to which some of the static gains from trade discussed above that result in a permanent increase in income level are saved and invested, leading to higher capital accumulation and a temporary increase in the per capita income growth rate and as a consequence it reaches a new steady state. The nature of the relationship between trade and steady state growth is further explained by endogenous growth models, in which the drivers of steady state (long run) growth are explicitly modelled.

Among these drivers initial conditions, which are represented by a variety of measures of development level (such as per capita output, labour productivity, stocks of physical capital or stocks of human and knowledge capital), growth of physical capital, growth of labour force, fertility, growth of population, supply of labour, education: both investment in human capital (educational spending) or educational accomplishment, government consumption spending, Research and Development (R&D), trade barriers…..etc. Particular emphasis was placed on the linking between trade and steady state growth rates by Francois and Shiells (1993). For instance, in models of growth originating from R&D, growth will increase since the stock of knowledge and the variety of products produced as a result of the R&D are both continually expanding. In this situation, trade can spur growth if economic integration drives global knowledge diffusion.

Another illustration is endogenous growth models' case that result from returns to specialisation, where growth happens as the quality of specialised inputs rises. Trade has the potential to stimulate growth in two different ways: either by importing inputs at a low cost or by increasing the size of the domestic market if it is modest in comparison to the level of production of these inputs. Furthermore, the theory of endogenous growth makes it easier to understand how exports and growth are related (see Grossman and Helpman, 1991). The trade in intermediate goods boosts R&D productivity and, as a result, growth rate, according to Rebelo's (1991) AK model.

This is because trade openness causes the variety of intermediate goods to increase. However, if knowledge spillovers are imperfect, i.e., impoverished nations cannot utilise all the knowledge accessible in industrialised countries, trade openness results in a divergence in growth paths, claim Grossman and Helpman (1991, ch. 8). According to Thirlwall (2000), trade has a number of dynamic gains, one of which is the expansion of the market for a nation's producers, through exports.

Export expansion turns into an ongoing source of productivity growth if output is subject to increasing returns. Capital accumulation is also aided by increasing returns. There is relatively limited scope for large-scale investments in advanced capital equipment in a small, non-trading nation since the small market discourages specialisation. Contrarily, trade makes industrialization and a departure from conventional production methods possible. Export markets make it possible to produce a variety of commodities that would not otherwise be economically feasible.

The promotion of competition, the exchange of knowledge, ideas, and technological know-how; the potential for capital flows to be accompanied by foreign direct investment; and adjustments to attitudes and institutions are a few other significant dynamic gains of trade. According to the "new" growth theory, such gains are forms of externalities that keep physical capital's marginal product from declining. Consequently, trade promotes long-term national economic growth.

The following table provides a summary of some empirical time-series data analyses on the relationship between trade openness and economic growth, starting with the most recent:

Table 1

literature on the relationship between trade openness and economic growth

Author	Nation	Period of a study	Methodology	conclusions
-Ozturk and Radoual (2020)	(Morocco)	1960-2018	ARDL	-The existence of dynamic long run relationship between trade openness and economic development
-Keho (2017)	(Cote d'Ivoire)	1965-2014	cointegration	-the existence of the positive short and long runs relationships between trade openness and economic growth.
-Hye and Lau (2015)	(India)	1978-2009	Causality	-validity of trade openness led growth
- Herzer et al., (2006)	(Chile)	1960-2001	production function	- Manufactured exports improve productivity.- Primary exports seem to have productivity limiting influences.
-Tsen (2006)	(China)	1978-2002	Causality	- Granger causation between domestic demand, exports, and economic development in both directions.
-Awokuse (2005)	(Korea)	1963-2001	VECM	

-Keong et al., (2005)	(Malaysia)	1960-2001	the bounds testing approach	- Granger causation between real exports, and real GDP growth in both directions. -In both short and long runs a cointegrated relationship between exports and economic growth is detected.
-Ahmed (2004)	(Pakistan)	1972-2001	Granger non-causality established by Toda and Yamamota	- exports and labour force enhance economic growth, whereas imports and exchange rate affect negatively on growth
-Sharma Panagiotidis (2004)	(India)	1971-2001	The analysis is based on the Feder (1983) model	-- a presence of a long-run relationship among the variables: domestic output, growth of export and Foreign direct investment.
-Awokuse (2002)	(Canada)	Quarterly data for the period 1961-2000	VECM	- Supports ELG. - Failed to support the hypothesis ELG; the same holds for the exports and investment relationship
-Medina-Smith (2001)	(Costa Rica) (Taiwan)	1950-1997	Cobb-Douglas production function	-The presence ofa long-run steady state among the all variablesof the model.

-Biswal &Dhawan(1998)		1960-1990	Cointegration test	- The presence of a unidirectional causality from real exports to real GDP. -ELG is valid for short and long runs.
-Shan&Tain (1998)	(Shanghai) (China)	1990-1996	VAR model	
-Lui et al., (1997)		Quarterly data 1983-1995	Integration and Cointegration (models of Granger, Sims, Geweke, and Hsiao)	- Long-run equilibrium relationship between exports and GDP - Long-run relationship between manufactured exports and GDP. -- One directional causality running from GDP to export. - Two directional causal relationship exists between economic growth and exports.

Author's preparation based on the mentioned studies included in table 1.

Based on the summarised studies our contribution to the literature is applying on Egypt. Egypt has received a less of attention, despite it represents an ideal case in this regard, as mentioned. Moreover, we use total factor productivity (*TFP*), rather than economic growth, as a dependent variable when investigating the presence of dynamic gains from trade, i.e. a long run relationship between *TFP* and trade openness.

3.Methodology

To investigate the existence of long run relationship between openness and total factor productivity *TFP* (Evidence of dynamic gains from trade) of Egypt, we concentrate on the determinants of the *TFP* growth rather than *GDP* growth, as stated. According to Jonsson and Subramanian (2001), the advantage of using such approach is that there is a greater assumption that the growth in total factor productivity (*TFP*) is positively related to trade and improvements in total factor productivity (*TFP*) reflect the contribution to output that comes from using resources more effectively or implementing new technologies of production. Independent variables are the ratio of the total of real manufactures imports and exports of goods and services to the manufacturing value-added data of Egypt to measure openness (*Open*). Gross domestic expenditure on *R&D* (*R&D*) represents the second independent variable affecting *TFP*. The third independent variable affecting *TFP* is human capital (*HK*), i.e. knowledge, skills, strength, and vitality of human characteristics that improve income.

The economic production inputs of health and education are the focus of human capital theory (Appleton and Teal, 1998). According to the endogenous growth theory, either trade or human capital serve as the main drivers of growth (Romer 1990). Education is used to represent human capital in our model framework. More specifically, higher education attainment ratio is used to represent human capital (*HK*). According to Lee and Barro (1993), education increases the productivity of individuals who contribute to growth, which in turn promotes the nation's long-run growth rate. They contend that education raises an individual's human capital stock.

We begin our model investigation by testing both integrated ad cointegrated properties of time-series data. For the integrated factors we need to figure out how they are related over the long run. This is accomplished using Johansen's cointegration (1988) method. Since variables in a system may fluctuate in the short run, it is expected that they will eventually return to their steady state in the long run, the cointegration test represents the next step if the variables under consideration have unit roots to determine whether or not there is a long run relationship between the variables (Awokuse, 2002).

Ahmad et al. (2004) claim that if the cointegration vector is missing, we can investigate the long run relationship and still come up with valid results by first differentiating the VAR model. However, if there are cointegration variables, to represent the short run departures of series from their long-run equilibrium path, will further demand addition of an error term in the stationary model. Because cointegrating regression cannot capture short run behaviour in the presence of cointegration of the variables, we can instead utilise the error correction model. We should provide some specifics regarding Vector Autoregressive Model (VAR) or Error Correction Model (ECM) before we apply one of them.

Our model's variables are ***TFP, Open, R&D, and HK.*** The four variables' VAR is represented as follows:

$$TFP_t = \phi_1 + \gamma_1 t + \alpha_{11} TFP_{t-1} + .. + \alpha_{1p} TFP_{t-p} + \beta_{11} Open_{t-1} + .. + \beta_{1p} Open_{t-p} + \theta_{11} R\&D_{t-1} + .. + \theta_{1p} R\&D_{t-p} + \vartheta_{11} HK_{t-1} + .. + \vartheta_{1p} HK_{t-p} + \varepsilon_{1t};$$

$$Open_t = \phi_2 + \gamma_2 t + \alpha_{21} TFP_{t-1} + .. + \alpha_{2p} TFP_{t-p} + \beta_{21} Open_{t-1} + .. + \beta_{2p} Open_{t-p} + \theta_{21} R\&D_{t-1} + .. + \theta_{2p} R\&D_{t-p} + \vartheta_{21} HK_{t-1} + .. + \vartheta_{2p} HK_{t-p} + \varepsilon_{2t};$$

$$R\&D_t = \phi_3 + \gamma_3 t + \alpha_{31} TFP_{t-1} + .. + \alpha_{3p} TFP_{t-p} + \beta_{31} Open_{t-1} + .. + \beta_{3p} Open_{t-p} + \theta_{31} R\&D_{t-1} + .. + \theta_{3p} R\&D_{t-p} + \vartheta_{31} HK_{t-1} + .. + \vartheta_{3p} HK_{t-p} + \varepsilon_{3t};$$

$$HK_t = \phi_4 + \gamma_4 t + \alpha_{41} TFP_{t-1} + .. + \alpha_{4p} TFP_{t-p} + \beta_{41} Open_{t-1} + .. + \beta_{4p} Open_{t-p} + \theta_{41} R\&D_{t-1} + .. + \theta_{4p} R\&D_{t-p} + \vartheta_{41} HK_{t-1} + .. + \vartheta_{4p} HK_{t-p} + \varepsilon_{4t}$$

When the series are cointegrated and considering the non-stationarity of the variables, an Error Correction Model (ECM) must be applied (Laszlo, 2004). As a result, the ECM for each variable—***TFP, Open, R&D, and HK***—under consideration in our model will be set as follows:

$$\Delta \log TFP_t = \phi_{TFP} + \eta_{TFP} ECT_{t-1} + \sum_{i=1}^{m} \alpha_{TFPOpen,i} \Delta \log Open_{t-i} + \sum_{i=1}^{m} \alpha_{TFPTFP,i} \Delta \log TFP_{t-i} + \sum_{i=1}^{m} \alpha_{TFPR\&D,i} \Delta \log R\&D_{t-i} + \sum_{i=1}^{m} \alpha_{TFPHK,i} \Delta \log HK_{t-i} + \mu_{TFPt}$$

$$\Delta \log Open_t = \phi_{Open} + \eta_{Open} ECT_{t-1} + \sum_{i=1}^{m} \alpha_{OpenOpen,i} \Delta \log Open_{t-i} + \sum_{i=1}^{m} \alpha_{OpenTFP,i} \Delta \log TFP_{t-i} + \sum_{i=1}^{m} \alpha_{OpenR\&D,i} \Delta \log R\&D_{t-i} + \sum_{i=1}^{m} \alpha_{OpenHK,i} \Delta \log HK_{t-i} + \mu_{Opent}$$

$$\Delta \log R\&D_t = \phi_{R\&D} + \eta_{R\&D} ECT_{t-1} + \sum_{i=1}^{m} \alpha_{R\&DOpen,i} \Delta \log Open_{t-i} + \sum_{i=1}^{m} \alpha_{R\&DTFP,i} \Delta \log TFP_{t-i} + \sum_{i=1}^{m} \alpha_{R\&DR\&D,i} \Delta \log R\&D_{t-i} + \sum_{i=1}^{m} \alpha_{R\&DHK,i} \Delta \log HK_{t-i} + \mu_{R\&Dt}$$

$$\Delta \log HK_t = \phi_{HK} + \eta_{HK} ECT_{t-1} + \sum_{i=1}^{m} \alpha_{HKOpen,i} \Delta \log Open_{t-i} + \sum_{i=1}^{m} \alpha_{HKTFP,i} \Delta \log TFP_{t-i} + \sum_{i=1}^{m} \alpha_{HKR\&D,i} \Delta \log R\&D_{t-i} + \sum_{i=1}^{m} \alpha_{HKHK,i} \Delta \log HK_{t-i} + \mu_{HKt}$$

Considering how small the sample is, $ECT_{t-1,}$ stands for the error correction term, is one period lagged.

4. Data and Findings

To provide evidence for the presence of dynamic gains from trade, this paper tries to detect a log run relationship between trade openness (*open*) and total factor productivity growth (*TFP*). Four variables—total factor productivity (*TFP*), trade openness (*open*), research and development spending (*R&D*), and human capital (*HK*) —are the foundation of our model examination. The model's data are based on Egypt's manufacturing sector for the period between 1980 and 2020 (for untrusted data, years 2011, 2012,2013,2014 are excluded). Total factor productivity (*TFP*) growth is calculated as the difference between real value-added growth and real factor accumulation growth (Capital and labour growths) since it is defined as the difference between the growth of output and the growth of all factors or inputs. To calculate TFP, the manufacturing value-added data of Egypt (% GDP) are obtained from World Bank available at: http://www.data.worldbank.org, labour growth data are obtained from CIA factbook available at: http://www.cia.gov and capital growth data are obtained and available at http://www.elibrary.imf.org and http://www.globaleconomy.com. Since creating a trustworthy series of "trade policy" for the sample period is challenging, openness (*open*) was calculated as the ratio of the total of real manufactures imports and real manufactures exports of goods to the real GDP of the manufacturing sector. Data on Egypt's manufacturing output (% GDP) are obtained and available at: http://www.macrotrends.net and http://www.researchgate.net , real manufactures exports data are obtained and available at: http://www.tradingeconomics.com and http://www.ceicdata.com and real manufactures imports data are obtained and available at: http://www.knoema.com and wits that is available at: http://www.wits.worldbank.org . Gross Domestic Expenditure on R&D data in Egypt are obtained and available at: http://www.statista.com and http://www.data.worldbank.org. Finally, human capital variable (*HK*) is represented by higher education attainment ratio and its data are obtained from the statistical yearbook of the Central Agency for Public Mobilisation and Statistics of Egypt (CAPMAS) available at: http://www.capmas.gov.eg and WDI database available at: http://www.databank.worldbank.org .

Checking each variable's unit root is the first step in the analysis of this paper. Give Win, Pc Give is used to achieve appropriate tests' results. Ordinary Least Square (OLS) regressions method is used to estimate ECM. The results of the unit root test are shown in the following table.

Table 2
Results of the Augmented Dickey Fuller (ADF) Test for Unit Roots

Variable	Level		First Difference	
	Constant (No trend)	Constant (trend)	Constant (Notrend)	Constant (trend)
TFP	-2.574*	-3.724*	-6.932**	-7.763**
Open	-1.894	-2.783	-4.830**	-4.983**
R&D	-3.021*	-4.7832**	-8.378**	-11.738**
HK	-1.934	-3.028	-5.984**	-5.432*

Notes:

(1) *TFP, Open, R&D, and HK* are total factor productivity, the ratio of the total of real imports and real exports of goods and services to the real *GDP of manufacturing sector*, the domestic expenditure on *R&D* and higher education attainment ratio, respectively, all expressed in logarithmic form, i.e. growth rates.

(2) The symbols * and ** signify, respectively, statistical significance at the 5% and 1% levels.

(3) The critical values at the 5% and 1% significance levels for level and first difference:

constant and no trend: -2.95 and -3.64, respectively.
constant+ trend: -3.55 and -4.25, respectively.

Testing for stationarity, or figuring out degree each variable has been integrated, is a crucial initial step. All variables are stationarised to avoid instantaneous causation. The four variables in the proposed model are subjected to the Augmented Dickey Fuller (ADF) unit root test. The ADF test is based on confinement of the intercept (constant), a linear time trend and without the trend term as well. By applying the ADF test statistic for the levels and first differences, throughout the period 1980–2020 (excluding years 2011,2012,2013, &2014 as mentioned), we have obtained the time series properties results of data and reported them in table 1.

With the exception of both *TFP* and *R&D* variables, the other two variables, *Open* and *HK*, have a unit root, or are non-stationary in their levels, as shown by Table1 of the ADF test statistics. This indicates that their series are integrated of order one, I (1), but *TFP* and *R&D* are I (0) in their levels with and without a trend. After taking the first difference, we came to a different conclusion, that is, all series are stationary or the series are I (0); rejecting the null hypothesis of the unit root existence. Next, our analysis explores the establishment of a long-run relationship among these variables; meaning that the investigation of the variables cointegration properties.

Table 3

Johansen Cointegration test results

Vector	Rank	Eigenvalue 1%	Null hypothesis	Alternative hypothesis		Critical Value
TFP,			Trace tests		Trace value(prob)	
Open,	0	0.75224	r=0	r>0	61.89(0.001)*	53.79
Minv,	1	0.29357	r≤1	r>1	21.94(0.235)	35.39
HK	2	0.26574	r≤2	r>2	16.76(0.053)	19.31
	3	0.16483	r≤3	r>3	5.76(0.073)	6.93
			Maximal eigenvalue test			
			λmax test		λmax value(prob)	
			r=0	r=1	36.18(0.005)*	31.94
			r=1	r=2	13.67(0.535)	25.52
			r=2	r=3	8.64(0.298)	17.93
			r=3	r=4	5.76(0.073)	6.93

Notes:

1. **Based on table A1 (Johansen &Juselius, 1990), we obtained critical values**
2. **The * symbol denotes rejection of the null hypothesis that there is no cointegration at the 99% critical value.**

For non-stationary variables, I (1), cointegration analysis is used to look into the probability of a long-run relationship. We use the Johansen (1988) cointegration technique, in which two test statistics are used to test the number of cointegrating vectors (the cointegrating rank). The maximal eigenvalue test (λmax) which examines the null hypothesis, comes first. There are r cointegrating vectors, which is the null hypothesis; r +1 cointegrating vectors is the alternative hypothesis. The second test, known as a trace test, tests the existence of at most r cointegration vectors hypothesis. Table 3 presents the results of the cointegration tests' trace and maximal eigenvalue statistics.

According to the findings in Table 3, at most one cointegrating vector exists in the system of the four variables under study; implying the existence of three independent common stochastic trends in the system. In order to demonstrate the rejection of the null hypothesis of no cointegration, r = 0, at the 1% significance level, we compared the computed values of the test statistics, both the trace and the maximal eigenvalue, with the corresponding critical values obtained from Johansen and Juselius (1990). The computed value of the test statistic from the trace test is 61.89, which is higher than the critical value of 53.79.The maximal eigenvalue test establishes the precise number of cointegrating vectors in the system under the null hypothesis, where the computed value (36.18) is higher than the critical value (31.94).We then get to the conclusion that there is a single cointegrating vector, indicating that *TFP*, *Open*, *R&D*, and *HK* are cointegrated, i.e. the existence of a long run relationship among variables.

Table 4

Long Run Relationship of TFP and Trade Openness of Egypt (1980-2020)

Dependent Variable	Independent variable ΔTFP	ΔOPEN	ΔR&D	ΔHK	ECT	R^2
	F-statistics (Prob)				t-statistic(prob)	
ΔTFP	-	34.625 (0.000)**	7.271 (0.020)*	27.467 (0.001)**	-14.27 (0.000)**	0.844
ΔOPEN	25.736 (0.000)**	-	0.753 (0.345)	0.002 (0.745)	-11.92 (0.000)**	0.635
ΔR&D	13.448 (0.003)**	5.842 (0.041)*	-	3.128 (0.099)	-0.287 (0.982)	0.764
ΔHK	31.378 (0.000)**	10.265 (0.005)**	(6.521) (0.035)*	-	-8.83 (0.000)**	0.787
RESET test: (Ramsey regression Specification Error Test)	59.546 [0.0000]**	68.583 [0.0000]**	23.271 [0.0000]**	13.190 [0.0030]**		

Notes:

1. **Δ denotes the first operator**
2. **Statistical significance is indicated by * and ** at the 5% and 1% levels, respectively.**
3. **P-values are numbers in parenthesis.**
4. **Using t-statistics, the error correction term's (ECT) significance is assessed.**
5. **Misspecification test, indicated in the last raw of table 4, is tested for dependent variables.**

To give evidence of the dynamic gains from trade openness, the next step is to apply Error Correction Model (ECM) as the variables under examination are non-stationary and all of them are integrated of order one, I (1), as was indicated when using the Unit Roots test. ECM is utilised to distinguish between short run and long run relationships among our variables because a unique cointegrating vector (one cointegrating vector) exists. The key findings of the test performed in accordance with an ECM specification to investigate short-run and long-run effects are summarised in Table 4 above.

The short-run effect is captured by the F-statistics of the explanatory variables (in first differences), whereas the long-run relationship is implied by the significance of the Error-Correction Term (ECT), derived from the cointegration test, by using the t-statistics for the ECTs from each of the four equations included as well to capture this long run influence.

Based on the ECM specification, the results shown in Table 4 suggest that there is a short-run and long-run bi-directional relationship connecting trade openness (*Open*), *R&D*, and *HK* to *TFP* at the 1% significance level, with the exception of *R&D*, which has a 5% short-run. The detected long run relationship between trade openness and total factor productivity growth (*TFP*) supports evidence of the presence of dynamic gains from trade in the case of Egypt for the period (1980-2020).

The human capital equation revealed both short- and long-run relations between *R&D* and *Open* and human capital (*HK*) at the 5% and 1% significance levels, respectively. At the 5% level of significance, a further short run relationship between *Open* and *R&D* was found in *R&D* equation. Yet, there is no evidence that *Open* and *R&D* have a long run relationship for *R&D* equation. For *Open* equation, there evidence of this long run relationship.

Table 4 shows that the R^2s demonstrate that a significant percentage of the variation in the dependent variable can be explained by independent ones. Also, table 4 shows no evidence of model misspecification.

5.Conclusion

It is claimed that there are dynamic gains from trade along with static gains and the nations' growth depends on the steady and robust development of their trade openness. Statistically significant positive relationships between trade openness and growth have been proved by many empirical researches. The main objective of this paper is to assess this relationship in the long run to provide evidence for the dynamic gains presence from trade by applying on Egypt which adopted an outward-oriented trade strategy.

Instead of focusing on economic growth, total factor productivity growth (*TFP*) is used as the dependent variable to estimate this paper's tests and the proposed Error Correction Model (*ECM*). Our model includes three factors that have an impact on total factor productivity growth (*TFP*): trade openness (*open*), gross domestic R&D spending (*R&D*), and human capital (*HK*). In order to estimate the model, time series data for Egypt from 1980 to 2020 (excluding 2011,2012,2013,&2014) were used, and the ordinary least squares (OLS) method was used. This time span, 1980-2020, signifies the most significant years of Egypt's transformation to an open economy since it includes the year that Egypt's reform programme (1991), which included a trade openness regime.

Using total factor productivity growth, *TFP*, rather than economic growth, as suggested, and applying to Egypt are our additions to the literature studying the mentioned relationship. Both the integration and cointegration chattels of the data are perceived. The proposed model within the error correction model, ECM, framework is detected as well. The Johansen cointegration method, Johansen's maximum likelihood procedure, was used to examine the long-run relationship between the variables after utilising the unit roots test to test for stationarity, existence of unit roots, which revealed that some of the time series data (*open and HK*) used are integrated of order (1).

As soon as this long run relationship was identified, the directions of the relationships are detected within the error correction model (ECM) framework in both short run using the F- statistics of the lagged first difference of independent variables and long run using the error correction term (ECT) t- statistics. The model's variables are definitely cointegrated when their coefficients are statistically significant, which is supported by the error correction term's (ECT) expected negative but not always statistically significant coefficient.

In short, based on the ECM, the results show that there is a significant bidirectional relationship running from trade openness (*open*) which has a positive coefficient, to *TFP*, and vice versa, indicating the importance of the effect of trade openness to enhancement of technology and skills, which in turn increases efficiency and creates a comparative advantage, providing empirical evidence for dynamic gains from trade in the case of Egypt.

To sum up, it is found that trade openness has gains for Egypt. This might be as a result of the function that trade openness plays in fostering rivalry for Egypt in a globalised world via its positive effect on total factor productivity *TFP* growth.

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