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EXAMINING THE RELATIONSHIP BETWEEN EXPORTS, CAPITAL FLOWS AND DOMESTIC INCOME GROWTH: AN APPLICATION OF BALANCE OF PAYMENT CONSTRAINED GROWTH MODEL IN SINGAPORE

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ABSTRACT

This study contributes to the literature on balance-of-payments constrained growth by examining how capital flows alongside relative prices of tradable goods affects the external constraint. The research tests both the initial as well as an extended version of Thirlwall‟s law for Singapore spanning 1980 to 2020. Even though, the initial Thirlwall‟s law is found to hold for the country; the extended analogue robustly accounts for the current account balance the country is enjoying. The outcome reveals that the extended version of Thirlwall‟s balance of payment constrained growth that incorporates the role of capital flows is suitable for the determination of long run growth of the economy. In the light of the research outcome, focusing on export-led growth strategy and policies that tend to attract more overseas capital inflows would be beneficial for the growth of the economy.

General Terms: Balance of payment, Constrained growth, Singapore

Keywords: Exports, Capital Flows, Exchange Rate, Growth

1. INTRODUCTION

The rebirth of capital inflows into Singapore in recent years has raised the enquiry of whether the country‟s long run growth is vulnerable to yet another financial crunch. Whereas a sudden large-scale reversal of capital flows is doubtful to result in a balance of payments crisis, the attendant sharp corrections in asset prices will have an unfavourable impact on the economy particularly through indirect channels.

Singapore is seen around the Asian region as one of the most vibrant economies. It is largely characterised by a stable currency, low cost of investment and low general price level. In addition, capital movements and domestic investment are believed to have massively contributed to the growth of the economy.

There is a growing theoretical as well as empirical consensus that aggregate demand performs a critical function in explaining long run growth of an economy (Thirlwall, 2019; Padhi, 2020; Panshak, Irfan & Hüseyin, 2021.a, b). One of the most important aspects of this position is that the accretion of productive capacity in terms of capital movement is determined by demand so that potential output is, to some level, is demand driven. In line with this paradigm is the submission of balance-of-payments-constrained (BOPC) growth theory-a powerful Post-Keynesian demand-led approach that stresses on the implication of external restrictions on long run growth.

The BOPC growth theory as first forwarded by Thirlwall (1979) concentrated on the relative growth rate of income adjustments essential to make trade to be balanced assuming that relative prices or real effective exchange rate is constant. It basicall y contends that that the balance of payments condition of an economy is the major limitation on the rate at which it grows because it sets a constraint on demand to which supply can (frequently) adjust. Therefore, the existence of growth disparities among countries is connected with the comparative strength of their respective balance of payments positions.

In essence, BOPCG theory fundamentally maintains that a country‟s growth rate is restricted by the ratio of export growth and the income elasticity of demand for imports. This is otherwise referred to as „Thirlwall‟s Law‟ and indicates the equilibrium growth in which economies ought to grow at without experiencing BoP crises in the long run. This „law‟ has survived refutation for over 40 years and has been shown to be relevant for many countries (Panshak et al, 2021a, Santos-Paulino, & Thirlwall, 2004; See Thirlwall 2011 for history and overview).

One of the extensions of Thirlwall (1979) model is that developed by Thirlwall and Hussain (1982), who adapted the original model to permit for the inclusion of capital flows. The present study uses the modified versions of the model for the analysis.

While, several studies regarding the BOPCG theory have considered several determinants, only few have incorporated the role of capital flows in growth explanation of countries. Bairam and Dempster (1991); Lopez and Thirlwall (2006, 2007); Perraton (2003); Moreno-Brid (2003); Sumra (2016); Thirlwall and Hussain (1982) are among the little studies that particularly used the BOPCG version of the model incorporating the implication capital flows growth. Similarly, Carvalho and Lima (2009) obtained evidence for an extended (to include capital flows and terms of trade) version of Thirlwall‟s law using Brazilian data for the 1930–2004 period. In addition, Darku (2012, 2018) have found great support for the theory using the extended version of the model. However, the results on different economies have rather produced wide-ranging conclusions which make this study useful.

This gap in literature is more profound when Singapore is specifically considered. Even though, there some evidences regarding the country in terms of group studies; at the moment, there are no country specific BOPCG studies on Singapore. For instance, Gouvêa and Lima (2010) applied original as well as the multi-sectoral BOPCG models on some selected Latin America and Asian countries to show that the Law holds for Singapore. According to the study, even though, it was shown that relative prices measured by terms of trade matter for growth in the Singaporean economy; world income elasticity was found to be the most important constraint explaining growth in the economy. Similar outcome was obtained by Gouvêa and Lima (2013). Note that these group studies are not relatively old but also only concentrated on the original model in which income is the only determinant.

To the best of our knowledge, there is no country specific study on this subject for Singapore. Accordingly, this study is the first to be conducted for the country, most importantly, by recognising the possible impact of relative prices as well as capital flows in growth process with an updated time frame from 1980 to 2020. The main argument advanced by this study is that international trade and capital flows have played important function in the growth performance of the Singapore economy over time and their implications ought to be empirically investigated.

The structure of the paper is as follows: following the introduction is Section two, which covers theoretical background and brief literature review. This is followed by theoretical and empirical model specification in Section three. Section four covers the empirical estimation and discussion of research outcome. Section five offers the conclusion and policy recommendation.

2. BRIEF REVIEW OF RELATED EMPIRICAL LITERATURE

The deep-seated question as to „why there are widespread differences in long-run growth experiences of countries across the globe has remained a controversial subject over the years. The mainstream economic theory maintains that differences in growth rates of countries are explained by the disparities in the growth rates of supply factors as well as productivity levels. Kaldor is the original advocate of the cumulative growth theory which later became the Kaldor–Verdoorn Law. The main idea of Kaldor is that long run growth path is demand driven, in particular, export driven. This hypothetical perspective is demonstrated by exported-led cumulative causation frameworks (ELCC). Accordingly, any rise in the growth of exports growth rate leads to increases the domestic income growth and easing any constraints arising from the balance-of-payments. This cumulative transmission system was initially put

forward by Dixon and Thirlwall (1975a) and the pioneer work of Thirlwall (1979) introduced the standard BOPCG. The model as put forward by Thirlwall indicates that the major restriction on economic growth because is the growth of exports and income elasticity of imports.

The adjustment of the model differs from the export-led growth models by demonstrating that growth of capital inflow and terms of trade are also essential determinant of long run growth. Balance of payments of a particular nation determines its growth experience. The external component of the balance of payments really matters for long run growth because of three major explanations. First, when worsening of balance-of-payments conditions is due to unfavourable long-run drifts in exports performance and patterns of imports, real growth of output and employment in the specific sectors of the economy affected (McCombie & Thirlwall, 1994). Secondly, at the aggregate level, it can be stated as a maxim that it is impossible for any country to experience growth more rapidly than that rate compatible with balance-of-payments equilibrium conditions on the external account in the long run, except it can fund continually rising deficits. The Third reason stems from a short run policy stance of the monetary authorities; mounting current account imbalances could be financed by soaring interest rates, however this could lead to the accretion of monetary assets and depress domestic investment in real sectors of the economy on which the growth of output finally relies on.
In line with the preceding theoretical foundation and initial development of the model, Thirlwall and Hussain (1982) calculated the growth rate predicted by the simple Thirlwall law, and the balance-of-payments constrained growth rate with the inclusion of capital flows and found that the new version surpassed the growth rate predicted by the original model and was approximately nearer to the real or actual growth rate of the economies.

As a consequence of over prediction of Hussain and Thirlwall (1982) the model was extended by Elliott and Rhodd (1999) to take into account role of interest rate payments. The idea was hinged on the perceptive that demand financed by capital movement usually has debt accretion and servicing obligations. Consequently, the model was adjusted to take account of external debt financing burden. The authors were victorious in lessening the degree of exaggeration of the model for 9 out of 13 countries, and affirm overwhelmingly that growth is also restricted by debt service payments which work as a channel of leakage on the insufficient capital indispensable for growth.

Moreno-Brid (1999, 2003) also said that Hussain and Thirlwall (1982) has a major shortfall on the round that it did not set a frontier to the quantity of overseas capital into a country and so assumed that a country can everlastingly raise its level of indebtedness relative to GDP. Sumra (2015) used Sub Saharan data to examine the validity of BOPCG with capital flows to the extended version of the model which allows for sustainable debt accumulation and interest rate payments abroad best explained the growth experience of the region.

Nell (2003) and Lanzafame (2014) are among the studies that contributed to the development of Thirlwall‟s model. The generalisation of the balance of payments constrained growth model to incorporate large number of countries was initially done by Nell (2003). Making use of the South African data, the author reveals that South Africa was only balance of payments constrained with respect to the OECD and seems to grow faster rates given an enhancement in the structural demand characteristic of its exports to the OECD countries.

Lanzafame (2014) briefly summarised the two growth literatures: the Harrod (1939) natural rate of growth and the balance of payments constrained growth model to advance a confirmation that the natural rate of growth was identical to the balance of payments constrained rate of growth. Further substantiation was obtained using Granger causality that there was unidirectional long run causality from the balance of payments constrained growth to the natural rate of growth. This outcome therefore reinforces the observation that long run growth is demand determined and constrained by the balance of payments on the 22 OECD countries used from 1960 to 2010.

Hussain (1999) estimated both the initial and extended version of Thirlwall law by incorporating both the relative prices and capital flows to elucidate disparities in growth rate among African and Asian countries. The outcome of the empirical investigation is essentially identical to the analysis by Thirlwall and Hussain (1982) except that, in the latter (extended version), the terms-of-trade effect is assumed to be inconsequential and is removed from the model.

Beko (2003) estimated the strength of the balance-of-payments–constrained growth model for Slovenia using cointegration technique. The outcome suggests that a long-run relationship exists between real gross domestic product and real exports variables. It also concludes that pressure from the balance-of-payments constraints on output growth requires shifts in elasticities of export and import flows. Finally, owing to the modernization requirements of the economy, persistence of import patterns, and empirically recognized strong reliance of exports on adequate imports, adjustment of export demand appears to be more acceptable.

Araujo and Lima (2007) developed a BOPCG model for a multi-sectoral economy in which productivity and demand varies over time at particular rates in each one of the sectors of two countries. The outcome supports Thirlwall‟s law. Following multi-sectoral approach, Nishi (2016) forwarded a multi sectoral model that incorporated structural heterogeneity between sectors and countries, such as differences in labour productivity, price competition, shares of exports and imports, and the quality of commodities.

The use of his model produced results close to that presented by Thirlwall (1979), Blecker (1998),and Araujo and Lima (2007), even though it contains their properties and reproduces their implications.

On the other hand, the assumption of relative prices constancy has been questioned widely in the empirical literature (such as Alonso and Garcimartín, 1998–99; López and Cruz, 2000 McGregor and Swales, 1991 among others). To be specific, Alonso & Garcimartín (1998) comparatively examine supply side models and balance of payment constrained growth model and long run economic growth depends not only on country‟s resource endowment but also on its capacity to satisfy both domestic and foreign demands. It was revealed that income is the main adjustment variable, hence growth is balanced of payment constrained. However, the assumption that prices do not matter in determining the equilibrium income is neither a necessary nor a sufficient condition to assert that growth is constrained by the balance of payments.

In the same vein, Blecker (2009) noted that when longer period of analysis is taken into consideration it is likely to assert that relative prices will remain stable. Therefore, making overriding conclusions on the constancy of relative prices need not be. On the contrary, increasing the ratio of budget deficits through capital inflows is not sustainable alternative to balance of payment because they just mere palliatives or transitory approach of soothing the balance-of-payments constraint

Razmi (2015) investigated the significance of growth of foreign income using panel data for 167 countries and found that foreign income growth variable always has a positive sign and is statistically significant in most situations, but the degree of its coefficient reduces remarkably when the domestic capital accumulation rate is included in the model – such that the world growth rate turns out to be insignificant when the generalized method of moments (GMM) is employed to control for endogeneity. In the fir st instance, he shows graphically that the raw correlation between individual country growth rates and world growth rates is not generally positive; for most of the countries in the sample, there is simply no correlation and for almost a third of the sample the correlation is unusually negative. This anomaly could be that investment is endogenous and responds through the accelerator mechanism to the growth of domestic income, which in turn is stimulated by exports – in which case the course of causality between capital accumulation and income growth would negate what the author assumed.

Of late, several demand-induced studies have found great support for the model especially by incorporating research intensity, which generates higher productivity growth (dynamic returns to scale) when related with output growth (Romero & McCombie, 2018; Romero & Britto, 2017) and research gap (Panshak, et al. 2019a) significantly improves income elasticities and structural change; hence robust external growth. Soukiazis, Cerquira and Attunes, (2014) and Panshak et al (2019b) have developed a simultaneous model that captures both internal and external imbalances in growth process in line with thoughts of Thirlwall (1979). The model, which accounted for capital flows in the form of external debts correctly, explains the growth experiences of the Italy and Nigeria, respectively.

Perrotini-Hernández , Vázquez-Muñoz and Angoa-Pérez (2020) made use of ARDL bound test to argue that, apart from the growth rate of exports, capital accumulation and the growth rate of capital productivity may also determine the long-run growth rate of output which is consistent with BoP equilibrium for the Mexican economy from 1961 – 2014.

Panshak eta al. (2021) made use of autoregressive distributed lag model (ARDL) approach determine Nigeria‟s long-run growth path using a multi-sectoral version of the balance of payment constrained growth from 1981 to 2016 to show that the economy is highly connected to sectoral differences in elasticities of income of tradable goods produced. In particular, the studies reveal first, that machinery and equipment turned out with the highest income elasticity; animal, fats and vegetable products was the lowest. This suggests that transition from primary production to the production of products of hi-tech products is necessary for growth. Second, the study shows that high reliance on intermediate imports with high income elasticity could harm growth in the long run his suggests that transition from primary production to the production of products of hi-tech products is necessary for growth.

As earlier noted, only few studies have incorporated the capital flows as additional constraint on growth (Thirlwall & Hussain, 1982; Bairam & Dempster, 1991; Pacheco-Lopez & Thirlwall 2006, 2007; Perraton, 2003; Moreno-Brid, 2003; Thirlwall , 2004) are among the little studies that particularly use the BOPCG version of the model incorporating the implication capital flows growth. In addition, Carvalho and Lima (2009) found evidence for an extended (to include capital flows and terms of trade) version of Thirlwall‟s law. Darku (2012, 2018) have found great support for the theory using the extended version of the model on the economies of Ghana and South Korea respectively. The results on different economies have rather produced wide-ranging conclusions.

This gap in literature is more profound when Singapore is specifically considered. Even though, there some evidences regarding the country in terms of group studies; at the moment, there are no country specific BOPCG studies on Singapore. For, instance, Gouvêa and Lima (2010) applied original as well as the multi-sectoral BOPCG models on some selected Latin America and Asian countries to prove that the Law holds for Singapore. The authors found that the coefficients of income elasticities in technology-intensive sectors have superior income sensitivities than the primary resource based sectors. In terms equilibrium growth rate computed by the authors, Singapore‟s BOPC growth rate was found as 7.44% per annum from 1965 to1999. Gouvêa and Lima (2013) as well as Bairam and Dempster (1991) in cross country investigation, equally had earlier found close result for the country.

Note that these group studies only concentrated on the original model in which only income is the only determinant. This study is first to be conducted on Singapore by including capital flows as well as relative prices.

2.1. Overview and Performance of the Singaporean Economy, 1980 to 2020

Real GDP growth measures the overall performance of an economy over a specified time period, usually annually or quarterly. Based on this, is often regarded as most vital economic barometer to appraise the general health and performance of a country.

Real GDP is therefore, an important indicators given that it expresses the value of the country's total production and thus what is available to use for private consumption, public consumption, investment and net exports.It gives some information on whether an economy is becoming richer or poorer.

In the last decade prior to the great recession that affected virtually all Asian countries, as of 1997 to 2007, Singapore‟s real GDP growth stood at 6.0% on average. Following the global financial crisis of 2007/2008, Singapore‟s real GDP declined to 0.6%; nevertheless, it coped to recuperate in 2010 and grew remarkably at 15.2%. Even though the economy experiences some negative growth in 1997/98, 2001 and 2007/08, the overall growth have being in the positive region with 2010 posting the highest growth rate. The global financial crisis adversely affected the growth of the economy. From 2011, real GDP has relatively being experiencing some declines. The real GDP growth has averaged 6.06% annually for the period 1980 to 2020; which is above that of the rest of world (3.72%) measured by the growth of its five major trading partners.

The economy has substantially gained from a considerable inflow of Foreign Direct Investment (FDI) as a result of its eye-catching investment atmosphere. Singapore‟s sturdy economic accomplishment mirrors its export-oriented growth policy. The economy is extremely reliant on exported products, predominantly in electronic goods as well as chemical related products. The country depends on international trade. Therefore, it imports raw-intermediate products and transform them for re-export. Some of the most essential manufacturing firms are water fabrication as well as fuel/oil refining.

It is a fact that the structure of Singapore‟s exports has transformed over time. It has progressed from labour-intensive products to medium and high tech products. Similarly, the contribution of services sector in the economy has experienced growth in recent times. Accordingly, the services sector contributes about 75% to overall GDP. The main impact sectors in the services industry are the banks and financial services, retail and transport, amongst others. Most importantly, the manufacturing sector contributes nearly a quarter to overall GDP and the industry is driven by electronic related firms, chemicals as well as biotechnology firms.

Figure 1: Growth Performance

Source: The WDI, 2021

The expansion impetus is likely to stay on firm largely in 2019 but should remain robust because robust service sector and high wage demands which have to raise local demand. Nonetheless, trade restriction and declining import demand from China may possibly weigh on exports as well as domestic investment, whereas housing investment may linger fragile. It is clear that healthy

private utilization is likely to aid uphold the upswing over the forecast prospect. Anchored by increasing housing price levels, residential construction is set to stay put as a vital determinant of growth of domestic investment in 2019. The recent downturn in GDP growth is possibly the offshoot the Covid-19 pandemic on the economy.

2.2: Examining the Relationship World Real GDP and Export Performance

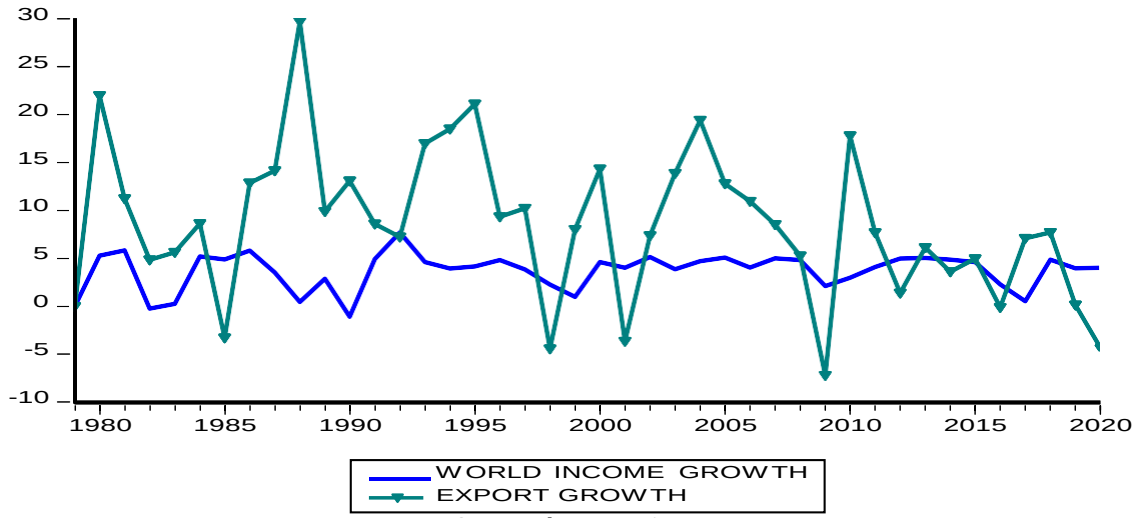
Indeed, the economy of Singapore is often described as open and extremely geared to trade with other nations. Its major trading partner is the Asian countries. Otherwise called the „Fine Country", the Republic of Singapore is a south eastern Asian country. It is advantageously situated close to China, Malaysia, Indonesia as well as Australia.

Based on the volume of exports, Singapore is the 20th major exporting nation on the globe. In 2016, about $208B worth of exports and about $279B worth of imports occurred in the country in the country. This scenario led to an unfavourable trade balance of $71.1B. By 2016 the GDP of Singapore stood at $296B with a per capita was income of $87.8k.

Singapore exported US$374.2 billion worth of goods around the globe in 2020. The dollar equivalent mirrors a 13.4% increase since 2016 but a -4.1% decline from 2019 to 2020. Making use of a continental lens, 71% of Singapore exports by value were exported to economies of Asia whereas 11.4% were delivered to North American importing firms. Similarly, Singapore exported an additional 10.6% worth of products to the European economies. Lesser percentages were exported to Oceania headed by Australia, Marshall Islands as well as New Zealand (3.9%); Latin America apart from Mexico however including the Caribbean (1.7%). 1.3% is the export value to Africa (Workman 2021).

At country level, the most important trading export partners of Singapore are the Peoples" Republic of China ($29.3B), Malaysia ($18.8Billion), US ($16.1 Billion), Indonesia ($15.1 Billion) and Hong Kong ($13.8 Billion). Similarly, the most important trading import partners of Singapore are the Peoples" Republic of China ($41.4B), Malaysia ($31.1B), the US ($29 Billion), Other Asia ($22.1 Billion) and Japan ($19.1 Billion) (Workman, 2021).

Figure 2: Nexus between World income and exports



Source: The WDI, 2021

A robust elasticity of exported products to real income is particularly responsible for a strong domestic economic performance. Figure 2 graphically shows the movement of export flows and world real GDP.

It is important to note that Singapore exports about 179 goods with revealed comparative advantage. This implies that the country"s share of worldwide exports is more than what is likely to originate from the size of its exporting economic sectors and from the size of a good"s international market (OEC, 2020).

Note that the service export sector is the main component that substantially increases the performance of the external sector and the overall growth regardless of growing global trade and sturdy demand in Singapore major export market destinations

Even though, with different degrees of deviation; it could be said that the fluctuation of world income largely affects exports from Singapore. A visible effect could be seen in the last two years in which the world was under grip of the novel Covid-19 pandemic.

2.3 : Exchange Rate Movements and Management

Since 1981, the Singaporean monetary policy focus has tended towards achieving stable exchange rate with and objective promoting and providing viable foundation for the sustainability of economic growth process. Basically, four most important traits characterised the exchange rate system. Firstly, the Singaporean dollar is supervised or managed in alignment to a range of foreign currencies of top major trading partners. The assortment of these currencies is allotted diverse levels of significance, or weights, based on the degree of trade reliance with such precise nation. The composition of the basket is revised periodically to take into account changes in Singapore's trade patterns.

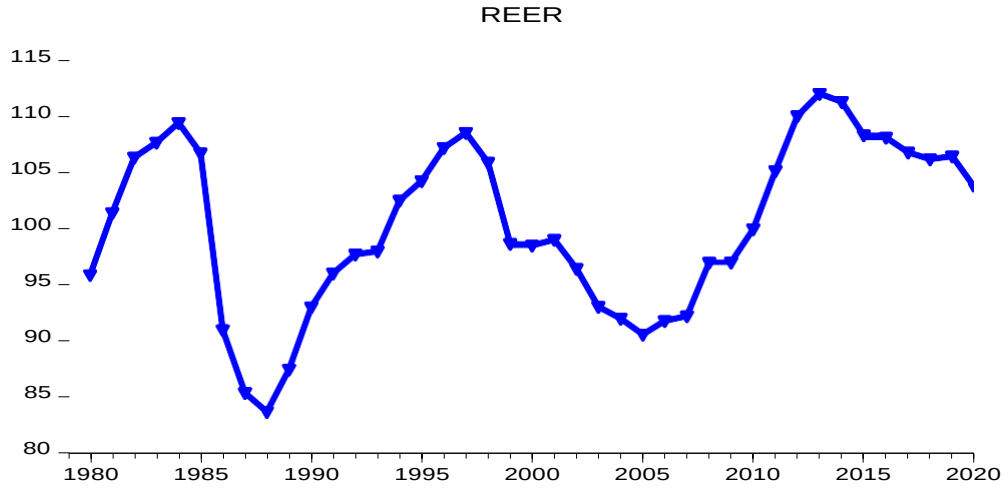
Secondly, the Singaporean monetary authority runs a managed float system for the dollar of Singapore. The exchange rate which is trade-weighted is permitted to oscillate inside an unrevealed strategy range, to a certain extent than being kept fixed to a value. The range gives elasticity for the system to have room for short-period movements in the foreign exchange marketplace and some cushion in the evaluation of the economy's equilibrium rate of exchange, which impossible to be known exactly. The monetary authority system interference actions commonly „incline against the wind'. Peradventure the exchange rate goes beyond the prescribed threshold monetary authority system will by and large come in, either purchasing or disbursing overseas exchange in order to manoeuvre or restore the exchange rate back within the acceptable range.

Thirdly, the exchange rate policy range is intermittently re-evaluated to certify that it stay put and compatible with the essential fundamentals of the macro economy. It is imperative to recurrently gauge the pathway of the exchange rate for the purposes of avoiding a misalignment in the local currency price. The routine review as well gives monetary authority system the plasti city to house short-term unpredictability in financial markets. The duration of the policy review cycle is characteristically 3 months.

Fourthly, the preference of the exchange rate as a transitional objective of monetary policy suggests that monetary authority system must forgo the regulation on internal rate of interest (as well as supply of money balances). In the situation of unrestricted capital flows, interest rates in Singapore are principally explained by international interest rates and investing agent‟s anticipations and expectation of the potential variations in the Singapore dollar. Accordingly, the local rate of interest has classically been beneath United States interest rates and reveals market expectations of an appreciation of the domestic currency.

As earlier indicated, the local currency has appreciated against the exchange rates of the country‟s top trading associates and competitors ever since 1981, signalling speedy growth of the economy, higher level of productivity as well as soaring rate of domestic savings. From Figure 3, four main phases in the variation of real effective exchange rate are observable. The upward movement or real effective exchange rate (REER) between 1981 to 1985 and 1989-1997 corresponds with a more impressive and faster growth of the economy as well as contraction/slimming down of labour market. Conversely, for the duration of the economic downturn in the middle of 1980s and the economic crisis that engulfed Asian countries, deteriorating economic situations justified an easing of the nominal effective exchange rate to smooth the progress of the resurgence of the economy. The roaring economic performance in the beginning of 1980 led to increasing labour costs as well as rising in the REER. The monetary authority system permitted the nominal effective exchange rate (NEER) to rise to restrain inflationary pressures. It is crystal clear that in 1985 that the favourable external economic positions unexpectedly misshapen, sinking the entire economic milieu into a quick downturn. In order to for the economy to recuperate its competitive position, REER was inevitably cut down. The public authorities were compelled to effect considerable the modification in the level of the REER through decreasing the cost of doing business and labour costs, predominantly via a reduction in company pension payments. The NEER was authorized to devalue moderately. Luckily global oil prices were deteriorating, therefore notwithstanding the lesser NEER; price level was very small (in the negative region).

Figure 3: Real effective exchange rate movement



Source: The WDI, 2021

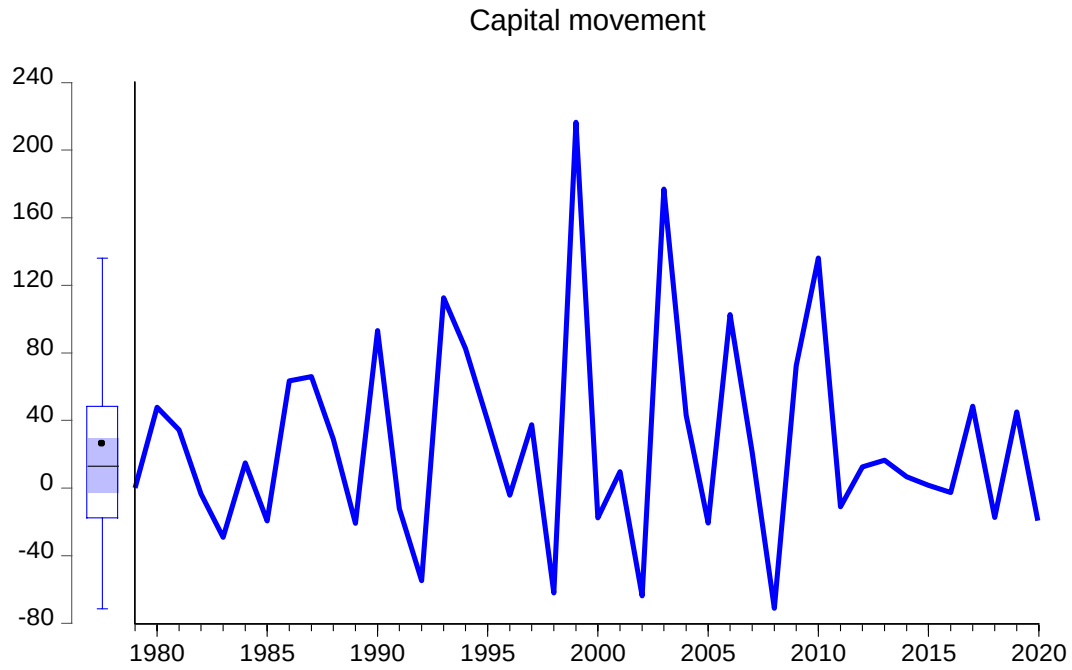
The subsequent outstanding segment of appreciation of the REER began in middle-1988 which lingers for about 10 years, signalling robust external demand and real growth of the economy that stood at 9.2% annually between 1988 and 1997. At the commencement of the Asian economic quandary and the succeeding quick reduction in the value of the currencies its competing countries around Asia affected the economy of Singapore. From 2010 onwards, the appreciation of the currency continued.

In general, it should be noted that movements of the domestic currency against the key currencies, particularly against the United State Dollar, have been relatively not as much of unpredictable as the movements between the principal currencies which tends to impact mildly on the economy.

2.4: Behaviour of Capital Flows

The link between capital movement and long run growth remains a theme of intense debate. Inconsistent with the principally positive view of trade integration, policy makers are often at variance generally concerning the impact of monetary integration on long run growth of an economy. Hypothetically, ease of access to overseas capital has the capacity to support investment enterprises and overall growth in the beneficiary country, and accessibility to a much greater scope of investment prospects could contribute to more resourceful investments and consequently growth.

Figure 4: Capital flows



Source: The WDI, 2021

From the graph, capital flows has been highly volatile. A major characteristic of the Singapore economy is its intense openness to trade and capital flows. The amount of total imports and exports has been roughly three times that of GDP over the past three decades. In relation to capital flows, nearly all forms of capital controls and foreign exchange restrictions have been dismantled close to 1980. As a consequence of its small open nature, the Singapore economy has often been battered by shocks from the peripheral environment such as the downturn in the global electronics industry in 1996-1997, the Asian crisis in 1997-1998, and the burst of the information technology bubble in 2001 as could be observed from the graph.

While the highest inflow of capital was recorded in 2000; 1997 and 2007/08, which corresponds to the period of Asian crisis and the global financial crisis recorded the lowest amounts for the country.

In spite of the volatility of the economic situation and free capital movement, Singapore has unremittingly recorded current account surpluses and exported capital overseas. With the exception few periods including, 1997, 2001, and 2007/08; the overall capital flow has remained positive since 1992. In the most recent year, capital movement tended to the decline possibly occasioned the advent of the novel Covid-19 Pandemic. Concurrently, as noted by Chow (2008) the surplus of national savings in excess of investment has authorized Singaporeans to purchase overseas assets abroad. This surplus has been sustained even into the last few periods.

3. DATA, THEORETICAL AND ECONOMETRIC MODEL

Significant efforts have made over the years to make certain the strength and authenticity of the Thirlwall"s balance of payment constrained growth model. One of such modifications is in the recognition of capital flows in growth process. As earlier noted, this shortfall and weakness was recognised by Thirlwall & Hussain (1982). They modified and extended the BOPCG model by adding capital flows into the specification. The authors contend that empirical applications of the model have rigorous principally on the evaluation of the fundamental dynamic Harrod foreign trade multiplier. The understanding was that by incorporating capital flow as added restriction, movement of capital or financial resources across countries, borders and regions could better give explanation to the growth of rate of domestic income. The new equilibrium identity was changed to mirror the insertion of the new restriction or constraint. Following the works of Thirlwall and Hussain (1982), Lopez and Thirlwall (2007) and Darku (2018), the present study uses the BOPC growth framework that begins from the balance of payments equilibrium conditions as:

$P_d X + K = P_f EM$ *Trade balance identity* (1)

Where X is the level of exports , P_d is the domestic price level of exported goods, M is the level of imported goods, P_f captures overseas price level of imported goods, E is the nominal exchange rate, and K is the level capital inflows.

$X = A\left(\frac{P_f}{P_d}\right)^{\beta_1} WY^{\beta_2}$ *Export demand function* (2)

$M = B\left(\frac{P_f E}{P_d}\right)^{\delta_1} Y^{\delta_2}$ *Import demand function* (3)

Where, β_1 represents price elasticity of demand for exports, δ_1 represents price elasticity of demand for import; β_2 represents the income elasticity of export demand; δ_2 represents the income elasticity of demand for imports; Y represents domestic income of Singapore and WY represents world real income.

Specifying the Equation 1 in growth terms produces

$/(p_d + x) + \theta k = p_f + e + m$ (4)

Here, small letters shows the growth rates of the variables expressed log form and $/$ and θ represent the proportions of the total import bill financed by export earnings and capital flows, respectively.

Continuing with transformation of equation (2 and 3) and substituting it into the (4) and algebraically solve for domestic income gives rise to:

$$y_{sp} = \frac{[-(1+/\beta_1+\delta_1)(p_d - p_f - e) + /\beta_2(wy) + \theta(k - p_d)]}{\delta_2} \quad (5)$$

Here, θ represents a fraction of export earnings in overall earnings for the settlement of foreign capital. It can be readily seen from equation (5) that any country"s growth rate can in principle be disaggregated into four component parts:

(i) GDP growth related to variations in real terms of trade: $(p_d - p_f - e)/\delta_2$

(ii) GDP growth related to variations in terms of trade joined with the price sensitivities of exports and imports: $[-(1 + /\beta_1 + \delta_1)(p_d - p_f - e)]/\delta_2$

(iii) GDP growth related to variations to exogenous adjustments in world real income $/\beta_2(wy)/\delta_2$

(iv) GDP growth related to variations in real capital flows: $\theta(k - p_d)/\delta_2$

Assuming that real exchange rate and capital flows are insignificant, Equations 6 collapses to the original model

$$y_{B1} = \frac{x}{\delta_2} \quad (6)$$

Or

$$y_{B2} = \frac{\beta_2(wy)}{\delta_2} \quad (7)$$

Equations 6 and 7 are the BOPC growth rates, which are correspondingly known as the weak and strong versions (Perraton, 2003). This means that there is a positive relationship between income and export growth; and a negative relationship with import elasticity. The essential implication of this simple law is that whenever a country grows more rapidly than the rate provided by BoP, namely, $y > y_{B1}$, then it must be pressurized, at the present or afterwards, to adjust its income by cutting it downwards as a result of the accumulation of external account deficits. As a result, deficits arising from the external account have the potential of inflicting a restriction on growth as a result of the pressure on demand anytime deficits on the external accounts are not sustainable (Soukiazis Cequirea and Attunes, 2014).

All variables are sourced from the world development indicators. GDP of five major trading partners (China, Hong-kong, United States, Indonesia and Malaysia) is used as proxy of world real income. Economic growth of Singapore is measured by GDP at constant local prices. Real effective exchange rate is a measure of relative prices. Capital flow is the net inflows of foreign direct investment. Exports and imports are also taken at constant local prices. We expressed all the variables in growth rates in li ne with theoretical underpinnings and to simplify estimation.

3.1: Econometric Model

The study makes use of ARDL methodology to determine the both short and long-run relationships among the variables. This econometric procedure was developed by Pesaran, Shin and Smith (2001) for testing cointegrating relationship. One rationale behind using the ARDL approach is that it outperforms other cointegration techniques when the variables are integrated of different order. Therefore, conducting stationarity tests may only be necessary to ascertain that none of the variables is integrated of any order higher than one. Similarly, the ARDL methodology has good small-sample properties, given that it depends on the estimation of a single equation. It gives unbiased parameter estimates of the long-run, despite of endogeneity problems. Given that the period is relatively long, we shall examine if there are structural in the data.

To carry out the cointegration investigation; it is accepted that ΔY_t is modelled as a conditional error correction model (ECM):

$$\Delta Y_t = \sum_{j=1} \alpha_j \Delta Y_{t-j} + \sum_{j=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta Z_{i,t-j} + \sigma Y_{t-1} + \sum_{i-1}^{k} d_i Z_{i,t-1} + dum \qquad (8)$$

Where Δ is the first difference of the variable and, σ is the error correction mechanism or speed of adjustment of the dependent current account balance toward the long-run equilibrium. b_i and d_i are the short and long run multipliers of the independent variables respectively. u_i is the error term. Z is a set of potential determinants of y (including, growth capital flows, world real income and real effective exchange rate)

The study moves further, to examine whether there is a long-run relationship between the variables using *F-stat* and *t-test*. The condition for establishing the subsistence of a long run relationship is that the Probability values of *F-stat* and *t-stat* ought to be greater than 1%. 5% or 10%. When the above holds, it is concluded that the null hypothesis of no long-run relationship at the respective levels at the corresponding levels of significance is rejected and conclude that there is a long run relationship.

Similarly, test for Breusch-Pagan and ARCH test for heteroskedasticity which ascertain whether the variances from the model is constant and converge in the long-run is carried out. In addition, serial correlation LM, which seeks to ensure that the errors are uncorrelated in the long run, is carried out. The study also ascertains the stability of the model using Ramsey RESET test. This test tells whether there is a misspecification error in the model. In a similar fashion, Cumulative Sum of Squares, Cumulative sum of squared residuals are carried out to confirm that the model is stable and could be used for meaningful policy making.

4. ESTIMATION AND DISCUSSION

4.1 Unit Root Test

The preliminary stage in the ARDL estimation requires the understanding of the statistical properties of the variables. The study obtained time series data from 1980 to 2020 for the investigation. Firstly, the period was essentially chosen to cover most notable economics events that have tremendous implications on macroeconomic fundamentals of the country. Therefore, carrying stationarity would necessary to understand account for such periods. These events may include the recession of the mid 1980 s, incessant appreciation of the Singapore dollar, Asian crisis of 1997 and beyond as well the global financial crisis. In this vein, unit root test is not only carried out to establish stationarity but to examine whether their substantial structural break in the data. In view of the fact that financial or economic data can have a stochastic drift or a deterministic movement, the study employs Zivot and Andrews unit root in the presence of structural break. The study conducts some recursive analysis to observe the stability of the model and account for any significant outlier in the model.

Table 1: Zivot and Andrew unit root test

	t-stat	P-value	Break date	t-stat	P-value	Break date
World real GDP, wy	-5.16	0.24	2004	-8.29	0.00	1984
Real GDP, y	-5.19	0.23	1988	-8.67	0.0 0	1998
REER, $(p_d - p_f - e)$	-3.79	0.00	1988	-8.53	0.00	1988
Capital flow, k	-6.84	0.01	2014	-10.85	0.00	2000
Export, x	-6.67	0.05	1987	-10.32	0.00	1988
Import, m	-7.50	0.38	1987	-11.32	0.00	1989

Source: Own computation

The result from Table 1 shows that the variables are of different order of integration at level but are stationarity at level at 1% levels of significance after first difference; hence, the necessity of making use of ARDL econometric method for the estimation.

4.2: Estimated Results and Discussion

In line with BOPCG model, the estimation started with the export equation and the result is presented in Table 2. It is obvious that the variables are by and large in conformity with the underlying theoretical postulation in size, signs and significance. Generally, the coefficients are statistically both short and long run periods.

Beginning with the long run coefficients, and in particular, growth of world real income, it is asserted that world real income positively affects export growth in Singapore. Therefore, 1% upward movement in real income of the major trading partners via its positive consequence on export demand causes an enhancement in the domestic income growth of Singapore by 2.79 % per annum.

While, real effective exchange rate negative was found that to exert negative and insignificant impact on trade in the export function; it exerts significant impact in the import equation (See Appendix 1).

Regarding capital flows, as earlier indicated in the modelling process, the sign of capital flows substantially depends on empirical determination. The outcome shows that capital flows to the Singapore is positive. This means that substantial inflow of financial resources have a tremendous implications on the growth performance of the economy in long run growth periods. 1% increase in foreign direct investment in Singapore leads to about 0.13% increase in export performance per annum.

Table 2: Export Equation Dependent variable: exports, x

Determinants	**Short run dynamics**			**Long run coefficients**		
Independent variables	Coeff.	t-stat	Prob	Coeff.	t-stat	Prob
Constant	-2.818532	0.698619	0.4908	-	-	-
World real income (wy), β_2	2.309278	2.152364	0.0405**	2.793017	2.577139	0.0157**
REER, $(p_d - p_f - e)$, β_1	-0.399914	-1.188521	0.2450	-0.483686	-1.156161	0.2577
Capital flows, K	0.114299	3.869293	0.0006***	0.138242	3.530193	0.0051*
Dummy_2004	4.707420	-2.183990	0.0378	-	-	-
Dummy_1984	5.265485	-1.20228	0.42978			
Error correction mechanism, σ	-	-	-	-0.826804	-6.729404	0.0000*
Bound test						
F –stat 10.11*	Significant level	LB	UB			
	10%	2.93	4.02			
	5%	3.54	4.80			
	1%	5.01	6.61			
t-stat -3.58***	Significant level	LB	UB			
	10%	2.93	4.02			
	5%	3.54	4.80			
	1%	5.01	6.61			

Source: Own computation.

Note: *, ** and *** denotes significance at 1%, 5% and 10% respectively. LB and UB are lower bound and upper bound respectively. Moving ahead, error correction shows that the variables are have long run relationship. The unrestricted error correction mechanism result shows that the variables are cointegrated. This is confirmed by the speed of error correction term, σ. This implies that any movement into disequilibrium is instantaneously corrected with the speed of 82% per annum.

Moving further, the decision as to whether there is a long-run relationship between the variables using the bounds test is based on the conditions that the Probability values of *F-stat* and *t-stat* fall above the upper critical (UB) bounds at 1%, 5% or 10%. When the above holds, it is concluded that the null hypothesis of no long-run relationship at the respective levels at the corresponding levels of significance is rejected. The bounds test result shows that the *F-stat* is significant at 1% level given that it falls outside the critical bounds (5.01 - 6.61). Therefore, the null hypothesis of no long-run relationship is rejected and it is concluded that there is a long run relationship between the variables. Likewise, this conclusion is confirmed at 10% when the value of *t-stat* is considered

Jarque-Bera test for normality suggests that the variables are normally distributed with mean zero and with a minimum variance, given that the probability values are greater than 0.05. Similarly, the test for Breusch-Pagan and ARCH test for heteroskedasticity reveals that the variances from the model is a minimum and converges in the long-run. In addition, serial correlation LM shows that the errors are uncorrelated in the long run. Therefore, the coefficients are valid and without econometric problems. Ramsey RESET is implemented to further make clear to the analysis. The outcome of the test is that there is no specification error in

the model as the coefficient on the power of fitted dependent variable is greater (0.67) than all the level of significance (1%, 5% and 10%). Therefore, it is concluded that the estimated Equation does not suffer specification error.

This is further supported by residual stability tests: CUSUM and CUSUMSQ in Figure 5 and Figure 6. The decision regarding these tests is that when the statistics fall within a 5% level of significance represented by two direct lines whose functional form is specified in Brown, Durbin and Evans (1975), it is concluded that the estimated elasticity coefficients of the variables are stable over time.

Figure 5: Cumulative sum of residuals (CUSUM)

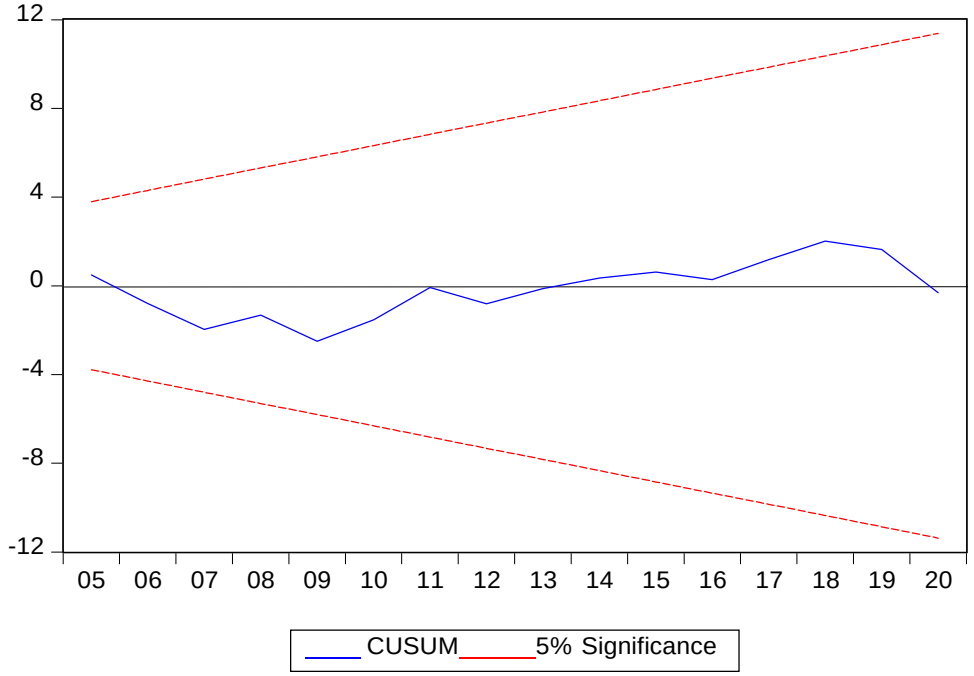
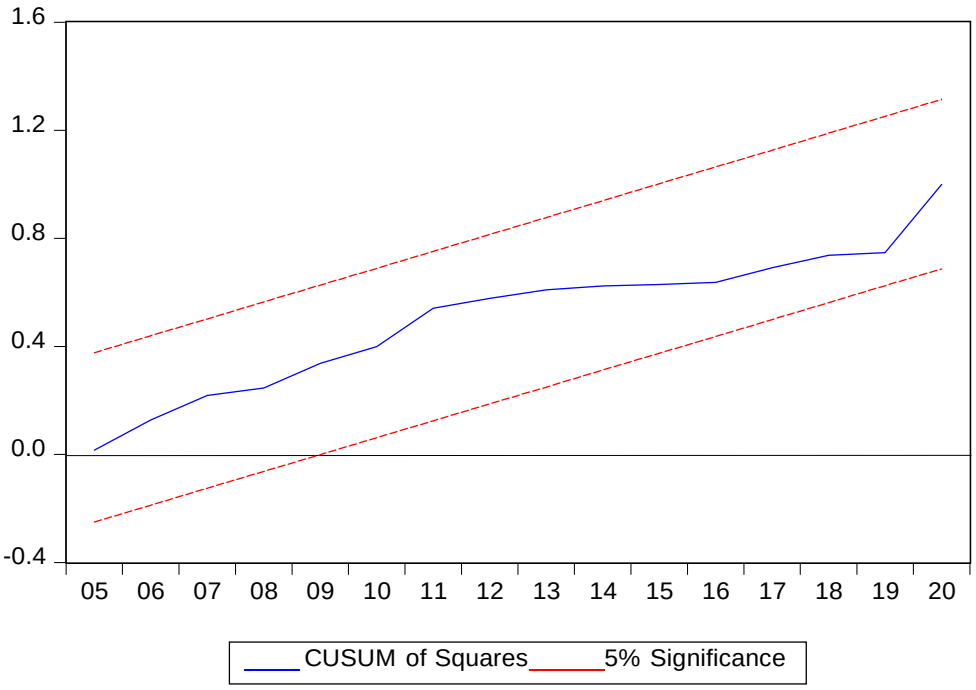


Figure 6: Cumulative sum of Squared residuals (CUSUMSQ)



After estimating the export equation, what is left is to estimate the required elasticities in the import function. Here, simple ordinary least squares is used for the estimation:

$$m = \delta_1(p_d - p_f - e) + \delta_2 y \qquad (7)$$

Growth of gross imports (m) depends on the growth of domestic income (y) and growth of relative prices($p_d - p_f - e$). Long-run gross income elasticities are obtained as ($\delta_2 = 1.73$) and ($\delta_1 = -0.50$). While Income elasticity is statistically significant at 1%; REER is significant at 5%. The output is given in the Appendix page. Looking at the magnitudes of the coefficients of the variables in the export and import equation, it is concluded that income is the major adjustment variable towards equilibrium given that they are both greater than unitary elasticity. This agrees with Thirlwall (1979) original submission.

4.3: Determination of Balance of Payment Constrained Growth Rate

The estimates of ARDL as well as the actual averages of some of the variables are used for the estimation of the growth rates in Table 3. When the required long run elastiticities in Table 2 and the respective averages and shares are substituted in Equation 5, balance of payment constrained growth rate with relative prices as well as capital flows turns out to be $y_{DM} = 6.59\%$. Given that the actual growth of the Singaporean economy 6.06% per annum, it is concluded that balance of payment constrained growth rate correctly predicts the growth experience of Singapore from 1980 to 2020. The result even though with marginal budget surplus in line with real statistics of the current account, largely reflects the balanced growth of the economy over time. This outcome is close with equilibrium growth rate (6.36%) obtained by Gouvêa and Lima (2013) for Singapore in a cross sectional analysis.

Table 3: Equilibrium Growth Calculation

Equation	
$y_B = \frac{[-(1+/\beta_1+\eth_1)(p_d-p_f-e)+/\beta_2(wy)+\theta(k-p_d)]}{\eth_2}$	6.59
$y_{B1} = \frac{x}{\eth_2}$	5.04
$y_{B2} \frac{\beta_2(wy)}{\eth_2}$	6.01
Averages	
Real growth of domestic income, y	6.06
Real growth of world income, wy	3.73
Average growth of real effective exchange rate, $p_d - p_f - e$	0.25
Export growth	8.73
Average growth capital flows, $k - p_d$	26.0
Average share of capital flow, θ	0.11
Average share of export flow, /	0.89

The study also computed equilibrium growth rates using the original models: Equation 6 and 7. While Equation 6 supplies 5.04% as growth rate; Equation 7 supplies 6.01%. These results indicate that actual growth rate of the economy is above that of the balance of payment constrained. In conclusion, it is asserted that the growth of the economy could be explained from the demand side with income, relative prices as well as capital flows as important determinants.

5. CONCLUSION

The economic growth path of Singapore is investigated from the demand side. The paper contributes to the empirical literature on BOPC growth by examining how capital flows, identified with relative prices affects the extent of external constraint. This was done by testing both the original and extended versions of Thirlwall‟s model for Singapore spanning 1980 and 2020 period. It employs autoregressive distributed lag econometric model for the analysis. The growth models indicate that balance of payment conditions are major restrictions on growth process. In this light, Singapore ought to focus on external oriented growth path of development. Effort toward increasing export competiveness and export share in the international market are important. Policies towards encouraging the flow of foreign capital to the economy are also germane to the long run of the economy.

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APPENDIX A: Import Equation

Dependent Variable: Import
Method: Least Squares
Date: 07/16/21 Time: 23:58
Sample: 1980 2020
Included observations: 41

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.719025	0.182778	9.404967	0.0000
REER	-0.508494	0.206581	-2.461472	0.0184
C	-1.873856	1.298708	-1.442862	0.1570

R-squared	0.695278	Mean dependent var	8.170474
Adjusted R-squared	0.679651	S.D. dependent var	8.505427
S.E. of regression	4.814018	Akaike info criterion	6.049690
Sum squared resid	903.8160	Schwarz criterion	6.173810
Log likelihood	-124.0435	Hannan-Quinn criter.	6.095185
F-statistic	44.49273	Durbin-Watson stat	2.327787
Prob(F-statistic)	0.000000		

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