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Is Indonesia's growth rate balance-of-payments-constrained? A time-varying estimation approach*

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This paper analyses the performance of Indonesia's economy since the early 1980s using Thirlwall's balance-of-payments-constrained (BoPC) growth model, estimated in state-space form to take account of the varying nature of the income elasticities of demand for exports and imports. Results indicate that after peaking in the mid 1980s at above 10 percent, Indonesia's BoPC growth rate has declined significantly, to about 3 percent in recent years. This is the result of changes in the three components of this growth rate: the income elasticities of demand for exports and imports, and the growth rate of world income, all three significantly lower. Especially worrisome for Indonesia's future is the decline in the income elasticity of demand for exports, a variable that summarizes the non-price competitiveness of its exports. This is the consequence of the lack of progress in upgrading the export basket and increasing its sophistication, with natural resources and low value-added manufacturing still dominating the country's exports. Focusing on the two income elasticities, the analysis shows that their determinants are variables that proxy the economy's structural changes (for example, the manufacturing employment share) and within-sector productivity growth (for example, complexity of the economy, gross fixed capital formation as a share of GDP).

Keywords: *balance-of-payments-constrained growth rate, Indonesia, Kalman filter, Thirlwall's law*

JEL codes: *E24, E32, O14, O47, O53*

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1 INTRODUCTION

This paper discusses Indonesia's growth performance since the 1980s using Thirlwall's (1979) balance-of-payments-constrained (BoPC) growth model. Indonesia was one of the eight economies featured by the World Bank (1993) in its analysis of East Asia's high-performing economies (for having achieved high growth rates during 1965–1990). The country was severely affected by the Asian Financial Crisis (AFC) of 1997–1998 and GDP growth since then has declined significantly. Although current growth remains high for world standards (slightly above 5 percent per annum in recent years), Indonesia is still today a lower middle-income economy.

Our interest in this economy lies in the fact that, after China, India, and the United States, Indonesia is the world's fourth most populous country in the world (about 260 million people) and it is well endowed with natural resources. It is somewhat puzzling that this large nation, which did very well for a couple of decades and was even dubbed a miracle economy, has not yet achieved upper middle-income status. The BoPC growth model helps us to understand this lack of progress: it is the result of the composition of Indonesia's exports and imports, summarized in the income elasticities of demand for exports and imports. Their low values today are the result of the country's 'shallow export-led industrialization' (Dhanani and Hasnain 2001, p. 133). Nevertheless, Indonesia has received much less attention in the development literature than China or India, its larger regional neighbors. This paper intends to fill this gap.

The rest of the paper is structured as follows. Section 2 provides a historical overview of Indonesia's economy. Section 3 presents the BoPC growth model formally, including the state-space form used to obtain time-varying estimates of the key parameters. Section 4 discusses the estimation results. Section 5 analyses the determinants of Indonesia's BoPC growth rate. Section 6 concludes.

2 AN OVERVIEW OF INDONESIA'S ECONOMY

Indonesia obtained independence in 1945. It was still very poor by the early 1960s, and when former President Suharto assumed power in 1966, its economy was in a shambles after two decades of economic stagnation (with GDP growth at 1.8 percent during 1957–1966, and GDP per capita growth at –0.6 percent during the same period), successive wars, revolution, brief economic recovery, political turbulence, and economic decline (Boediono 2016). Prominent scholars thought that Indonesia's prospects to achieve economic growth were meagre, and some considered it a 'basket case' (Myrdal 1968) or a 'chronic dropout' (Hill 1995). Until the mid 1960s, the modern industrial sector that existed in Indonesia was dominated by a few large enterprises, subsequently taken over by the state as part of the 1957–1958 series of nationalizations.

With the arrival of President Suharto, Indonesia started growing much faster, reaching 10.9 percent in 1968 (Boediono 2016). The country began to experience rapid industrialization following major political changes and economic reforms in 1966–1967. Indonesian industrial development policy can be divided into three phases until the AFC (Dhanani and Hasnain 2001):

(i) 1965–1975: this was an open-door period. The government had to tackle a high debt-ridden and chaotic economy. The objective was to maximize growth by relying on international corporate capital.

(ii) 1975–1981: buoyed by high oil prices, Indonesia embarked on an industrialization strategy. The event that truly spring-boarded the Indonesian economy was the Organization of the Petroleum Exporting Countries' (OPEC) price hike of 1974, when oil prices quadrupled. The objective was to develop a national heavy-industry capacity based on major resource projects in steel, natural gas, oil-refining, and aluminium. This industrialization proceeded initially in an environment of import substitution. Indeed, the bonanza of this period meant that the country turned toward a slightly more statist, nationalistic, and inward-looking strategy than in previous years. Efforts were made to increase non-oil exports and in 1978 the rupiah was devalued 34 percent to increase the competitiveness of non-oil exports. Hill (1995, p. 778) argues that during this period 'there was a discordance between macro and microeconomic policies, reflecting divided authority in the realm of economic and particular industrial policy at that time.'

Indonesia grew by over 7 percent per year during the 1970s, implying that the economy doubled in size. The percentage of people living below the poverty line fell dramatically, from about 57 percent in 1970 to less than 40 percent in 1980. Rice output doubled between 1974 and 1987 and Indonesia became self-sufficient. However, despite the rapid growth in manufacturing from the late 1960s onwards and a shift towards a more diversified industrial structure from the 1970s onwards – away from the earlier dominance of simple consumer goods and resource processing – a dynamic manufacturing sector was slow to develop in Indonesia.

(iii) 1980s to the AFC: it wasn't until the 1980s that Indonesia became a significant industrial exporter. In 1982, oil prices collapsed and the government decided to restructure the Indonesian economy in a less protectionist environment. At the start of the 1980s, exports of manufactured goods represented less than 5 percent of total merchandise exports, which stands in stark contrast to the early specialization in manufacturing of other Asian countries. The delay in moving toward exporting resource- and labor-intensive goods was likely due to the presence of significant natural resources, most notably oil, but also rubber and others. At the peak of the boom, oil accounted for around three-quarters of export earnings and more than 60 percent of government revenues.

In 1982, economic expansion came to a halt when oil prices dropped, and the balance of payments deteriorated significantly. The government responded to this situation with a new stabilization program. An export-led industrialization strategy was adopted but without renouncing to protect several industries serving the domestic market. The rupiah was again devalued 28 percent in 1983 (and 30 percent in 1986, followed by a managed 5 percent annual devaluation against the dollar in the following years) and a major export promotion package was passed (for example, low interest rates for export credits). Other significant reforms were introduced, such as deregulation of the banking and financial sector.

It was not until 1985–1986 that 'both macro and microeconomic policy began to pull in the same direction … [and] manufactured exports and the private (domestic) sector became the major engines of economic growth' (Hill 1995, p. 779). 'The major thrust of the reforms was not "pro-export" and they did not generally involve government promotion in the sense of subsidy. Rather, the reforms were designed to achieve more straightforward and predictable policy environment, in which firms

were less encumbered by complex, costly and often unenforceable business regulations' (ibid., p. 779). While there is agreement that the macroeconomic reforms of the mid 1980s worked, there is less agreement on the impact of industrial policy. For example, Hill (1995) argues that the impact of this policy was not significant, while Rock (1999) argues that the view that industrial policy was incoherent, subject to rent-seeking and irrelevant is an oversimplified conclusion. In his view, industrial policy played a crucial role in the development of Indonesian manufacturing since the 1960s, and must be credited for the increase in diversification of the economy.

Dhanani and Hasnain (2001, p. 136) argue that the efforts produced disappointing results because by 1984 manufacturing exports had reached only 11 percent of total exports. However, the reality is that the economy became more broadly based, that is, more diversified toward manufactures of all types (and of higher value added), in particular textiles, plywood, iron and steel, footwear, sporting goods, toys, glass, electronics, and furniture. Manufactured exports represented a meagre 2 percent of total exports in 1980. This share increased to 35 percent in 1990 and to 53 percent in 1993. During this period, manufactures of clothing, woven fabrics, footwear, and electronics increased significantly. Plywood was a major item in Indonesia's exports. This product's phenomenal growth resulted from the prohibition of log exports (unprocessed timber) introduced in the early 1980s. The ban was introduced to exploit Indonesia's market power in the industry and to increase domestic value added. Clothing and textiles were also very large, in part propelled by the Multi-Fiber Arrangement, an international trade agreement in effect from 1974 until 2004. The assigned quotas under the arrangement allowed Indonesia to compete with the newly industrializing economies (NIEs). The increase in these exports reflected Indonesia's comparative advantage in labor-intensive and resource-based activities. Indonesia showed amazing rates of manufacturing growth, of about 30 percent per year in real terms between 1980 and 1993.

The fact that Indonesia was following an export-led growth (ELG) model led some authors to argue that, from the mid 1980s, Indonesia finally began to follow the standard path of labor-intensive outward orientation of other East Asian countries, with labor-intensive exports becoming a significant engine of growth (Hill 1995). Despite this, Indonesia had an extensive negative list of sectors closed to foreign investment, which was only gradually reduced, and there was a requirement to form partnerships with local firms.

The 1985 Plaza Accord realignment sent many Japanese companies, especially in the consumer electronics and automotive industries, to Southeast Asia. Indonesia benefitted enormously from restructuring in Japan, which led to a massive shift of its labor-intensive industries. The NIEs also restructured their economies and sent their production of footwear and garments to Indonesia.

By the end of the 1980s the economy was growing fast again (6–7 percent) and this lasted until 1996. In 1993, the World Bank included Indonesia as part of the group of 'high-performing Asian economies.' Its achievements became so well documented that it became part of the *The East Asian Miracle* report (World Bank 1993) and many economists became convinced that it was following the Japanese–Korean development model. As in the case of the NIEs, the World Bank attributed its success to 'getting prices right,' macroeconomic stability, export orientation, and the use of functional interventions or horizontal policies in the form of public goods such as infrastructure, education, and public health. Industrial policies were deemed incoherent and unsuccessful.

In the years before the AFC, some analysts started to question the country's status as a miracle economy, arguing that not everything was rosy in the Indonesian economy: the volume of bad loans mushroomed, cronyism between government, banks, and

businesses had led to growing inefficiency, and corruption had become rampant. Moreover, notwithstanding the country's progress, Indonesia could not create a thriving manufacturing sector like those of the NIEs, or even like those of Malaysia and Thailand.

Over the period 1990–1996, Indonesia's non-oil and gas sector grew at an average rate of 12 percent per year and contributed one-third to overall GDP growth. This contributed decisively to the transformation of Indonesia's economy. Today, manufacturing employs over 14 million Indonesians (about 15 percent of total employment) and contributes about 20 percent to GDP.

During this period, and more precisely in 1994, a new foreign investment regulation lifted the local partner requirement, allowing foreign firms to hold 100 percent equity in Indonesia. The negative list was also reduced considerably. Foreign direct investment (FDI) surged during 1994–1997, but manufacturing export growth began to slow down during this period, in particular manufacturing exports of plywood, textiles, garments, and footwear (the four major exports) (Dhanani and Hasnain 2001).

The next episode in Indonesia's development was the Asian Financial Crisis of 1997–1998, which devastated the country. Investment collapsed (as a result of the reversal in FDI inflows) and export growth (especially manufactures) declined significantly. Not without reason, Hill (1995, p. 787) concluded that: 'the World Bank may not have done the country a service by including it in the "miracle club".' Indonesia experienced a deep economic contraction. As noted, FDI inflows collapsed and most manufacturing sectors were severely affected (transport and equipment were the exception), particularly export-driven sub-sectors such as textiles, clothing and footwear, and wood products. These sectors' activities fell into a 'growth recession' and their contribution to GDP growth declined considerably (World Bank 2012). Lower domestic demand and a deteriorating business environment in the years following the AFC were major drivers of this decline. At the same time, rising commodity prices induced a shift in Indonesia's exports, away from manufactures and toward resource-based manufacturing and commodities. The result was that the transformation of the economy took a different direction after the AFC, with natural resource-based sectors (for example, food, beverages and tobacco, fertilizer, chemicals, and rubber) increasing, and the labor-intensive sectors (for example, textiles, leather and footwear, and wood and wood products) decreasing in importance. The shares in total value-added of sectors such as transport equipment and machinery and apparatus increased. Likewise, the shares of exports of natural resource-based commodities increased.

The result is that today Indonesia is still highly dependent on imported raw materials and components, low value-added generated in resource-based and labor-intensive industries, a virtually non-existent capital goods sector, a limited range of export products and markets, remarkable specialization in labor-intensive and demand-inelastic manufactures, low productivity in small and medium-sized enterprises, high market concentration, weak human resources, weak technology support systems, and weak domestic capabilities of domestic manufacturing firms (Asian Development Bank 2019).

Average GDP growth in Indonesia slowed down after the AFC. Average annual GDP growth was 5.3 percent in the 2000–2017 period, down from 7.2 percent over 1990–1997 and 5.8 percent in the 1980s. This worsening growth performance has also weakened the pace of Indonesia's progress towards better living standards, as annual per capita GDP growth decreased to about 4 percent in 2000–2017, down from 5.50 percent during 1990–1997. Against this backdrop, the question of whether Indonesia can improve its long-run growth performance and go back to growing on average 6 percent or more becomes critical – and, indeed, is at the centre of the country's

next National Medium-Term Development Plan (RPJMN) covering 2020–2024 (ibid.). For instance, since annual population growth is projected at about 1 percent over 2018–2024, average GDP growth at 6 percent would imply a per capita GDP level about 10 percentage points higher in 2024 with respect to what it would be with annual GDP growth at 5 percent over the same period.

3 BALANCE-OF-PAYMENTS-CONSTRAINED GROWTH RATE ESTIMATION: A STATE-SPACE MODEL WITH TIME-VARYING PARAMETERS

Before achieving its potential growth rate, an economy's actual growth performance can be curtailed by macro constraints. For emerging economies like Indonesia, the external constraint associated with the current account balance is particularly significant, given these countries' dependence on the availability of foreign exchange to finance their imports. Current account deficits can be sustainable and, indeed, necessary in the short-run – especially when they allow faster capital accumulation. However, countries cannot finance ever-growing current account deficits in the long run, as there is a limit beyond which the deficit becomes unsustainable (or is perceived as such by the financial markets) and a balance-of-payments (BoP) crisis ensues. Therefore, countries that find themselves in BoP problems may be forced to constrain growth while the economy still has surplus capacity and surplus labor – that is, while the actual growth rate is still below the potential growth rate.

To formally consider the implications of this situation for Indonesia's long-run growth performance, we start from the contention that, in the long run, economies cannot grow faster than the rate consistent with current account balance. This rate is the so-called balance-of-payments-constrained (BoPC) growth rate. The concept of the BoPC growth rate was put forward by Thirlwall (1979) and has given rise to a large theoretical and empirical literature (for example, Guarini and Porcile 2016; Lanzafame 2014; Mayer 2017).

Thirlwall (1979) proposed a model of BoPC growth based on the notion that persistent current account deficits are not endlessly sustainable, so that growth must be consistent with a balanced current account in the long run. As such, the BoPC growth rate approach encapsulates the Keynesian view that growth is demand-driven, as a country's performance in external markets may ultimately constrain the growth of the economy to a rate below that which domestic supply-side conditions would warrant.

The model assumes the following specifications for the export and import demand functions:

$$X_t = \alpha\left(\frac{P_{dt}}{P_{ft}}\right)^{\eta} Z_t^{\varepsilon} \tag{1}$$

$$M_t = \beta\left(\frac{P_{dt}}{P_{ft}}\right)^{\theta} Y_t^{\kappa}, \tag{2}$$

where t indicates time, α and β are constants, X, M, Y, and Z are, respectively, the flows of exports, imports, domestic income, and world income (in real terms); P_d and P_f are domestic and foreign prices (measured in a common currency); $\eta < 0$ and $\theta > 0$ are the price elasticities; and $\varepsilon > 0$ and $\kappa > 0$ are the income elasticities of exports and imports. In a growing economy, the long-run constraint imposed by BoP equilibrium requires

that exports and imports grow at the same rate, that is, $x_t = m_t$. Log-linearizing equations (1) and (2) and differentiating with respect to time, the equilibrium condition $x_t = m_t$ can be written as:

$$\eta(p_{dt} - p_{ft}) + \varepsilon z_t = \theta(p_{dt} - p_{ft}) + \kappa y_t, \tag{3}$$

where lower-case letters denote the growth rates of the relevant variables. If purchasing power parity (PPP) holds, so that relative prices measured in a common currency do not change over the long-run (that is, $p_{dt} = p_{ft}$), equation (3) can be rearranged to give:

$$y_B = \frac{\varepsilon}{\kappa} z_t. \tag{4}$$

Given that $\varepsilon z_t = x_t$, equation (4) can also be expressed as:

$$y_B = \frac{x_t}{\kappa}, \tag{5}$$

so that y_B is given by the ratio of the growth rate of exports to the income elasticity of imports.[1] Equations (4)–(5) are known as 'Thirlwall's law.' The BoPC growth rate represents an upper limit to long-run growth, which becomes binding and, therefore, constrains actual growth when a country's y_B is lower than its potential growth rate.

What do expressions (4) and (5) mean? In the long run, actual growth faster than the BoPC growth rate results in a persistently worsening current account balance, which puts constant pressure on the exchange rate and the financial system. Evidence shows that flexible exchange rates can support a short-run adjustment, but in the long run, the adjustment process occurs through slower growth to rebalance the current account. Given this, the long-term constraint associated with the BoPC growth rate is not affected by the price elasticities. Rather, it depends on the income elasticities for exports and imports. The latter capture the (non-price) competitiveness of a country's goods relative to the alternatives available in international markets; as such, the value of these elasticities depends on the type, quality, variety, etc., of the country's goods, as well as on the features (for example, reliability, speed of delivery) of its distribution network. These elasticities determine a country's BoPC growth rate and, consequently, its relative growth performance in the long run. Specifically, for any given value of the income elasticity of imports, the BoPC growth rate will be higher the faster exports grow as a result of the growth of the world economy – that is, the higher the income elasticity of exports.

Using these insights, an estimate of the BoPC growth rate can be constructed as the product of (trend) world economy growth times the ratio of the exports to imports income elasticities (equation (4)). The latter two can be obtained from the estimation of standard export and import functions. A simpler and equivalent formulation produces the BoPC growth rate as the ratio of a country's trend growth rate of exports with respect to the income elasticity of imports (equation (5)).

1. An alternative assumption that can be imposed on the equilibrium condition (3), which results in specification equations (4)–(5), is that the Marshall–Lerner condition for a successful depreciation or devaluation (that is, $|\eta| + \theta > 1$) is only just met. In this case, even large rates of change of relative prices will have no effect on the BoPC growth rate.

3.1 The model in state-space form

Since the BoPC growth rate represents a long-run limit to growth, empirical studies in the literature usually consider it to be constant over time. However, unless x_t or z_t are constant, a simple look at equations (4) and (5) shows that, even ignoring short-term variations, the value of y_B will change over time because of changes in the trend growth rate of exports. More importantly, the long-run value of y_B will also be time-varying if the income elasticities of exports and/or imports are not fixed parameters but, rather, are subject to changes over time. Since ε and κ capture non-price competitiveness and, more generally, an economy's structural characteristics (for example, sectoral composition of output, resource endowments, etc.), their values are bound to be time-varying, and this is particularly so for emerging economies like Indonesia, which have undergone and/or are still undergoing substantial structural change. Given this, we adopt an empirical approach that allows the estimation of time-varying export and import income elasticities, so that we obtain a time-varying BoPC growth rate for Indonesia.

The estimation methodology relies on Kalman filtering techniques, and is based on a model that can accommodate and account for changes in the economy's structural features and trade elasticities. To avoid problems with the possible non-stationarity of the variables involved in the log-level specifications of the export and import demand functions, the estimates reported in this paper are based on the growth-rate versions of equations (1) and (2). The latter are specified in state-space models with time-varying parameters and estimated relying on the Kalman filter recursive algorithm. Hence, for instance, in the case of the export demand function our model consists of the following system of equations, with the export growth relation in (6) being the measurement equation, and (7)–(8) the two state equations:

$$x_t^T = \theta_t rp_t + \varepsilon_t z_t^T + u_t \tag{6}$$

$$\theta_t = \theta_{t-1} + \upsilon_t \tag{7}$$

$$\varepsilon_t = \varepsilon_{t-1} + \nu_t, \tag{8}$$

where lowercase letters denote growth rates, $rp_t = (p_{dt} - p_{ft})$ and the terms υ_t and ν_t are independent normally distributed errors, with zero mean and constant variance. The parameters θ_t and ε_t are, respectively, the time-varying price and income elasticities of exports.[2] Since the BoPC growth rate is held to be a long-term constraint on

2. Some authors have used recursive estimation (that is, the use of an increasing window to re-estimate the model) or rolling regressions (that is, the use of a fixed window to re-estimate the model) of the export and import equations. Though these methods are related to the Kalman filter, they are different. All of them are recursive estimators designed to minimize the squared errors between a 'true' value and an estimate. The Kalman filter is a general algorithm to estimate the latent states of a system through a vector of observable signals. These states evolve in time according to a 'state equation' and are related to the signals through a 'measurement equation.' The state and measurement equation define a 'state-space model.' Estimation is based on maximum likelihood. The recursive least squares algorithm is a particular case of the Kalman filter, when applied to a specific state-space model. In this model, the state equation shows how the regression parameters change in time, and the observation equation describes how the dependent variable is related to the parameters by the regression model. Estimation is based on least squares or weighted least squares. See McCombie and Tharnpanich (2013) for an example of estimation of Thirlwal's law (export and import elasticities) using rolling regressions.

growth, the estimated $\hat{\varepsilon}_t$ and the relationship between the growth rates of exports and output need purging from short-run fluctuations. Thus, to estimate equation (6), we rely on x_t^T and z_t^T, which denote the trend growth rates of exports and world output, respectively, obtained via the commonly used Hodrick–Prescott filter. The same approach is applied to the growth-rate version of the import demand function in (2) to produce a time-varying estimate of the income elasticity of imports $(\hat{\kappa}_t)$.

Having obtained the two time-varying estimates $\hat{\varepsilon}_t$ and $\hat{\kappa}_t$, the estimate of Indonesia's time-varying BoPC growth rate (y_{Bt}) is then constructed as specified in equation (4′):

$$y_{Bt} = \frac{\hat{\varepsilon}_t}{\hat{\kappa}_t} z_t^T, \tag{4′}$$

where all variables are as previously defined.

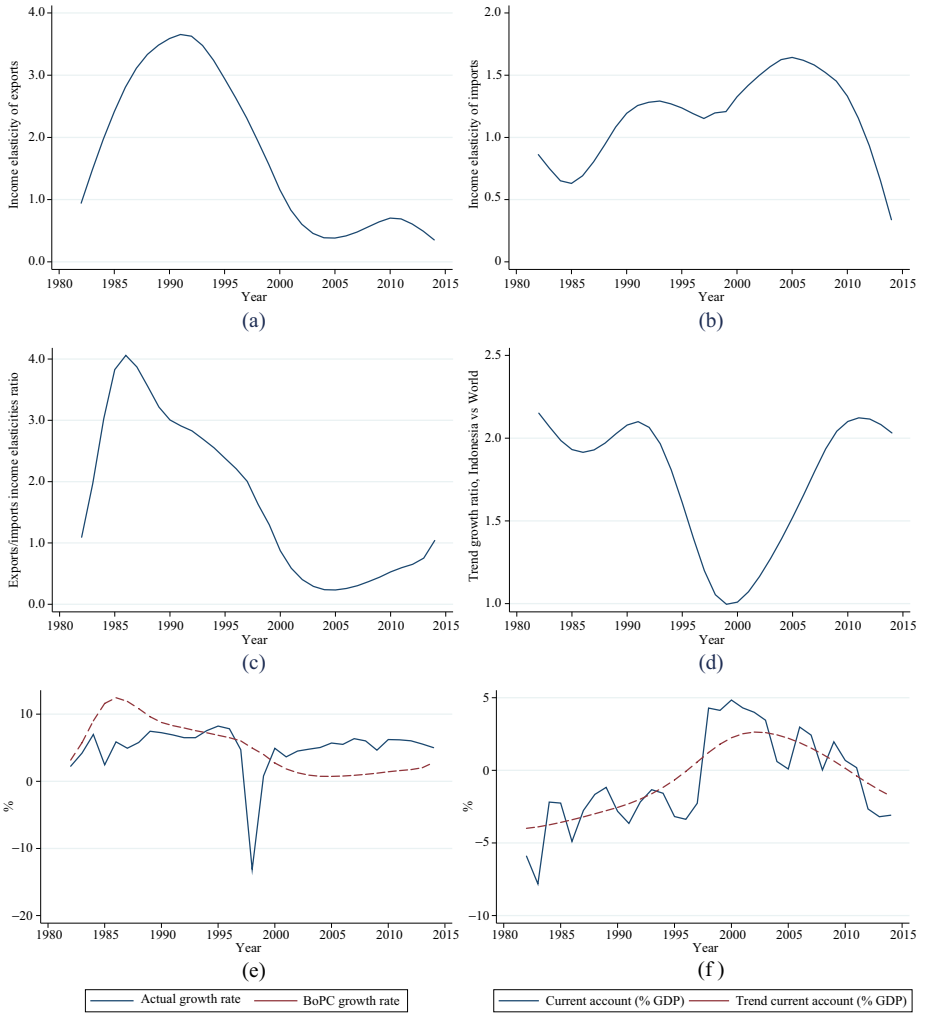
4 ESTIMATION RESULTS AND DISCUSSION

We estimate Indonesia's BoPC growth rate for the period 1982–2014, using annual data from two data sources: the World Bank's 'World Development Indicators' (WDI), and the database 'Merchandise: trade value, volume, unit value, terms of trade indices and purchasing power index of exports' from the United Nations Conference on Trade and Development (UNCTAD). To discuss the results of our analysis, we refer to the six panels in Figure 1, which report: (a) the income elasticity of exports; (b) the income elasticity of imports; (c) the ratio of exports to imports income elasticity; (d) Indonesia's trend growth rate as a ratio the world's trend growth rate; (e) Indonesia's BoPC growth rate and actual growth rate; and (f) the actual and trend current account balance as a share of GDP.

The two income elasticities display a fairly similar and increasing trend in the 1980s but, after peaking at about 3.65 in 1991, the income elasticity of exports decreased rapidly after the mid 1990s, stabilizing only in the early 2000s at around an average of about 0.5. The value of the income elasticity of imports, on the other hand, peaked only in 2005 (at about 1.65) and declined rather quickly afterwards. As a result, both elasticities are estimated at about 0.34–0.35 in 2014. Tables 1 and 2 show Indonesia's top 10 exports and imports (average 2012–2014), together with the complexity ranking (out of 5111 products), and the shares in total exports and imports.[3] The tables show that these products, especially exports, are mostly natural resources, low complex products with low export and import elasticities.

The outcome of these different dynamics is reflected in panel (c) in Figure 1, where we report the ratio of the two income elasticities. The $\frac{\hat{\varepsilon}_t}{\hat{\kappa}_t}$ ratio increased from about 1 to 4 in the mid 1980s, and though it displayed a negative trend thereafter, it remained above 2 until the late 1990s. This is consistent with the view that the productive diversification and manufacturing development experienced by Indonesia in the 1980s and during the pre-AFC years led to gains in international competitiveness. This, however, seems to have been lost throughout the following two decades as, while other Asian countries (primarily, but not only, China) excelled, Indonesia gradually became laggard in the

3. Complexity is an index that combines information of a country's diversification (number of products exported with comparative advantage) and how unique the products it exports are (how many countries export a given product). To derive complexity, we use a database that contains information on 5111 products for 150 countries.



Source: Authors.

Figure 1 Indonesia's exports and imports income elasticities, and BoPC growth rate

competitiveness race: the ratio of the two elasticities fell to about 0.26 in the mid 2000s, before returning to a value of about 1 again in 2014. Interestingly, panel (d) in Figure 1 shows that Indonesia's average growth rate was about twice as high as the growth rate of the world economy both in the pre-AFC period and from the mid 2000s onwards, once the recovery was completed. However, while in the 1980s and 1990s the economy enjoyed high international competitiveness (reflected in an income elasticity of exports much higher than the income elasticity of imports), this has not been the case in the post-AFC years, when the $\frac{\hat{\varepsilon}_t}{\hat{\kappa}_t}$ ratio fell below (or was at most equal to) 1. The upshot of all this is shown in panel (e) in Figure 1. In the pre-AFC 1981–1996 years, Indonesia's BoPC growth rate was very high (on average, about 8.5 percent) and almost always higher than

Table 1 Indonesia's top 10 exports by value, 2012–2014

HS code	Product description	Complexity ranking	Share in 2014 exports (%)
271111	Petroleum gases and other gaseous hydrocarbons; liquefied, natural gas	5098	5.84
270119	Coal (other than anthracite and bituminous), whether or not pulverized but not agglomerated	4598	5.11
270900	Oils; petroleum oils and oils obtained from bituminous minerals, crude	5111	4.85
270112	Coal; bituminous, whether or not pulverized, but not agglomerated	3827	4.90
151190	Vegetable oils; palm oil and its fractions, other than crude, whether or not refined, but not chemically modified	4841	6.05
400122	Rubber; technically specified natural rubber (TSNR), in primary forms or in plates, sheets or strip (excluding latex and smoked sheets)	5079	2.41
151110	Vegetable oils; palm oil and its fractions, crude, not chemically modified	4961	2.63
271121	Petroleum gases and other gaseous hydrocarbons; in gaseous state, natural gas	4956	2.42
271000[a]	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c., containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils	5102	2.01
270210	Lignite; whether or not pulverized, but not agglomerated, excluding jet	3210	1.26

Note: a. Only 4-digit product descriptions are available from https://www.foreign-trade.com/reference/hscode.htm.

the actual growth rate, so that the country was able to sustain high actual growth without incurring in BoP problems. Meanwhile, the BoPC growth rate decreased significantly and is estimated to be always lower than the actual growth rate in the post-AFC period. Panel (f) in Figure 1 shows how these BoPC and actual growth patterns translate into the dynamics of Indonesia's current account balance as a share of GDP. The positive trend of the 1980s and 1990s when, on average, the BoPC growth rate was higher than the actual growth rate turned negative after the AFC when the BoPC growth rate became lower than the actual growth rate. Since 2012 this negative trend has led to current account deficits of about 2–3 percent of GDP which, while far from worrying in the short run, do indicate that Indonesia's growth performance may run up against the BoP constraint in the medium to long term.

To sum up, the dynamics of Indonesia's BoPC growth rate shown in panel (e) in Figure 1, and the additional information included in Figure 1, seem to fit very well the narrative illustrating the country's macroeconomic development reported in Section 2. In particular, the fast growth during the 1980s and early 1990s can be suitably explained when considering that the export-led industrialization strategy adopted by Indonesia in those years boosted its BoPC growth rate. Similarly, the post-AFC growth slowdown becomes less puzzling when compared to the concomitant decline in the BoPC growth rate, underpinned by a shift away from manufacturing exports.

Table 2 Indonesia's top 10 imports by value, 2012–2014

HS code	Product description	Complexity ranking	Share in 2014 imports (%)
271000[a]	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c., containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils	5102	14.59
270900	Oils; petroleum oils and oils obtained from bituminous minerals, crude	5111	6.83
852520[a]	Transmission apparatus for radio-broadcasting or television, whether or not incorporating reception apparatus or sound recording or reproducing apparatus; television cameras, digital cameras and video camera recorders	1767	1.54
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15 000 kg	3748	0.94
100190[a]	Wheat and meslin	3978	1.15
230400	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	3919	1.04
271113	Petroleum gases and other gaseous hydrocarbons; liquefied, butanes	5104	0.85
854230[a]	Electronic integrated circuits	1314	0.77
170111[a]	Cane or beet sugar and chemically pure sucrose, in solid form	5018	0.66
520100	Cotton, not carded or combed	5095	0.78

Note: a. Only 4-digit product descriptions are available from https://www.foreign-trade.com/reference/hscode.htm.

In other words, this descriptive evidence indicates that Indonesia's growth performance can be properly understood through the lens of the BoPC growth model. In the next section, we provide empirical evidence to support this view.

4.1 Tests of Thirlwall's law

How relevant is Thirlwall's law to explaining Indonesia's long-run growth? Or, in other words, has Indonesia's actual growth rate been balance-of-payments-constrained? A number of tests of the law have been proposed and widely applied in the literature. These include those by Alonso (1999), McCombie (1989), McGregor and Swales (1985), and Thirlwall (1979).

In this paper we develop a new time-series approach to investigate empirically the relevance of Thirlwall's law. The intuition underlying our testing procedure is as follows. Theory indicates that the actual growth rate will not deviate from the BoPC growth rate in the long run or, equivalently, that $y_t - y_{Bt} = ydiff_t = 0$. Similarly, since $y_{Bt} = \frac{\hat{\varepsilon}_t}{\kappa_t} z_t^T$, the hypothesis that $y_t = y_{Bt}$ implies that $\frac{y_t}{z_t^T} = \frac{\hat{\varepsilon}_t}{\kappa_t}$, or $ydiff_t^{REL} = \frac{y_t}{z_t^T} - \frac{\hat{\varepsilon}_t}{\kappa_t} = 0$, in the long run. That is, a country's growth rate relative to the world's trend growth rate will reflect the ratio of the export to the import income

elasticities in the long run. These implications of the theory are consistent with the following hypotheses:

Hypothesis 1 *$ydiff_t$* and *$ydiff_t^{REL}$ are stationary, mean-reverting processes. This is a necessary, but not sufficient, condition that we test relying on standard unit root tests.*

Hypothesis 2 *$ydiff_t$* and *$ydiff_t^{REL}$ are zero-mean processes. This hypothesis is tested by modeling $ydiff_t$* and *$ydiff_t^{REL}$ as autoregressive (AR) processes, that is, $ydiff_t = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i} + \upsilon_t$* and *$ydiff_t^{REL} = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i}^{REL} + \upsilon_t$. For the theory to be supported by the data, the null hypothesis $H_0 : \theta = 0$ should not be rejected at the usual significance levels.*

Table 3 reports the results of the tests of Hypotheses 1 and 2. Hypothesis 1 is supported by the data, as all unit root test results indicate that *$ydiff_t$* and *$ydiff_t^{REL}$* are stationary processes. Specifically, the ADF (Dickey and Fuller 1979) and DF-GLS

Table 3 Tests of Hypotheses 1 and 2

Tests of Hypothesis 1 for $ydiff_t$: unit root tests on $ydiff_t$				
ADF	DF-GLS	KPSS	CMR-AO	CMR-IO
−3.706*	−3.321*	0.061	−2.394	−8.194**
Tests of Hypothesis 1 for $ydiff_t^{REL}$: unit root tests on $ydiff_t^{REL}$				
ADF	DF-GLS	KPSS	CMR-AO	CMR-IO
−3.744*	−3.499*	0.064	−2.374	−8.215**
Tests of Hypothesis 2 for $ydiff_t$: test based on $ydiff_t = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i} + \upsilon_t$				
$ydiff_{t-1}$		0.864**	1.065**	1.042**
$ydiff_{t-2}$		–	−0.203^	−0.220*
$ydiff_{t-3}$		–	–	0.051
Constant		−0.333	−0.200	−0.265
R-squared		0.771	0.800	0.800
Half-life		4.760	4.690	5.102
Tests of Hypothesis 2 for $ydiff_t^{REL}$: test based on $ydiff_t^{REL} = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i}^{REL} + \upsilon_t$				
$ydiff_{t-1}^{REL}$		0.871**	1.063**	1.036**
$ydiff_{t-2}^{REL}$		–	−0.194	−0.211^
$ydiff_{t-3}^{REL}$		–	–	0.053
Constant		−0.116	−0.074	−0.096
R-squared		0.781	0.806	0.806
Half-life		5.001	4.905	5.339

Notes: **, * and ^ indicate, respectively, significance at the 1 percent, 5 percent and 10 percent level; lag-selection for the unit root tests performed with a general-to-simple procedure, setting the maximum number of lags to 3; half-life calculated as $Ln(0.5)/Ln(\sum_{i=1}^{l}\lambda_i)$ and expressed in years; the years 1997–1999 are excluded from the sample used for the tests of Hypothesis 2.

(Elliott et al. 1996) tests reject the null of a unit root at the 5 percent significance level, while the KPSS test (Kwiatkowski et al. 1992) does not reject the null of stationarity at any conventional statistical level. Moreover, contrary to the additive outlier version (CMR-AO), the innovational outlier one-break variety of the Clemente et al. (1998) test (CMR-IO) strongly rejects the null of a unit root as well, while also signaling the presence of a significant structural break associated with the onset of the AFC in 1997.[4] In the case of Hypothesis 2, the evidence supports the long-run equivalence between actual and BoPC growth rates in Indonesia: independently of the lag order considered, and both for $ydiff_t$ and $ydiff_t^{REL}$, the three AR specifications in Table 3 return estimates of the constant that are not significantly different from zero.

To sum up, the evidence gathered supports the view that both $ydiff_t$ and $ydiff_t^{REL}$ are zero-mean stationary processes. This implies that actual growth in Indonesia tends to be equal to the BoPC growth rate on average, as short-term divergences between the two rates do not last in the long run. However, the calculated half-lives (between 4.8 and 5.3 years, depending on the AR specification considered) do indicate that deviations from the long-run equilibrium are very persistent.

5 THE DETERMINANTS OF INDONESIA'S BALANCE-OF-PAYMENTS-CONSTRAINED GROWTH RATE

The analysis of Indonesia's BoPC growth rate naturally raises the policy-relevant question of which factors may drive its dynamics. To investigate this issue, we carry out an empirical assessment of the determinants of Indonesia's BoPC growth rate, focusing on the two key elements in the framework – the export and import income elasticities. Note that, given the short time-series dimension of the data used, the analysis can at best be considered as a first exploratory inquiry into the proximate drivers of BoPC growth in Indonesia.

The two elasticities are modeled as a function of changes in sectoral employment shares (to control for structural change effects), as well as of a number of additional variables typically selected in the literature as possible determinants of a country's competitiveness on international markets. Specifically, we consider various measures of innovative activity, physical capital accumulation, trade openness, economic complexity, etc. Since the aggregate demand (AD) components are typically characterized by different import intensities, in the case of the import income elasticity we also take account of AD composition effects. The selection of a robust set of determinants and appropriate specifications (for example, in terms of lag orders) is carried out via a general-to-specific methodology. The outcome of this selection process is reported in Table 4. All data used are retrieved from the WDI dataset, except for the index of current account openness (which is the KAOPEN index by Chinn and Ito 2006) and the economic complexity index ECI+ constructed by Albeaik et al. (2017). Significance tests are based on heteroskedasticity-robust White–Huber standard errors, while the VIF test indicates that the estimates are not affected by multicollinearity. Moreover, the Durbin–Watson test (Durbin and Watson 1950; 1951) and Durbin's (1970) alternative test suggest the possible presence of serial correlation in the residuals only for the import income elasticity equation. However, the

4. We also performed the two-break version of the Clemente et al. (1998) test: the results, available from the authors upon request, did not change. Taking account of this outcome, the years 1997–1999 are excluded from the empirical analysis in the remaining part of the paper.

resulting loss of efficiency does not weigh heavily on the significance of the coefficient estimates, while the latter remain consistent and unbiased in this static model even in the presence of serial correlation.[5]

While there is no evidence of a significant impact from FDI, we find that the income elasticity of exports is significantly and positively correlated with manufacturing-biased structural change, gross physical capital formation, current account openness, as well as improvements in economic complexity (proxied by the index ECI+) and the share of manufacturing exports. This outcome is in line with the view that trade expansion can foster Indonesia's BoPC growth rate when complemented by product diversification and upgrading.

Turning to the final set of estimates in Table 4, we can see that a positive change in ECI+ *decreases* the income elasticity of imports – all else constant, a one standard deviation in the change of ECI+ is correlated with a decline of about 1.3 points in the income elasticity of imports. Consequently, the picture that emerges from these results is consistent with the view that, for any given growth rate of the world economy, a rise in Indonesia's economic complexity is associated with an increase in exports, a reduction in imports, and, thus, a boost to the BoPC growth rate. Furthermore, in line with the evidence indicating that investment and exports are the two most import-intensive components of aggregate demand, exports as a share of GDP and capital accumulation are positively and significantly correlated with the income elasticity of imports. Finally, higher government consumption reduces the import elasticity, a result which is consistent with a significant 'home-bias' effect in public spending.

Table 4 Determinants of Indonesia's income elasticities of exports and imports, 1982–2014

	Exports income elasticity	Imports income elasticity
Lag of change in manufacturing employment share	0.176*	–
Lag of gross physical capital formation as a share of GDP	0.078**	–
Lag of change in gross physical capital formation as a share of GDP	–	0.040*
Change in FDI as a share of GDP	0.126	–
Change in manufacturing exports as a share of total merchandise exports	0.104**	–
Standardized change in ECI+ index	–	−1.257***
Lag of standardized change in ECI+ index	4.088*	–
Current account openness index	5.159**	–
Government consumption as a share of GDP	–	−0.085*
Lag of exports as a share of GDP	–	0.021^
Constant	−4.449**	1.434**
R^2	0.96	0.79
Observations	19	27

Notes: **, * and ^ indicate, respectively, significance at the 1 percent, 5 percent and 10 percent level; White–Huber standard errors; the years 1997–1999 are excluded from the sample.
Source: Authors.

5. The results for the VIF, Durbin–Watson and Durbin alternative tests are available from the authors upon request.

Taken at face value, these results have important policy implications. The BoPC growth model indicates that Indonesia's key constraint on long-run growth is on the demand side and depends on the country's production and trade structures, based on non-complex products characterized by a low income elasticity of demand. Since there is little scope for further expansion of manufacturing based on domestic natural resources and a narrow range of labor-intensive and resource-based products, broader and technologically more resilient industrial development requires a comprehensive industrial strategy to strengthen the competitiveness of firms and spans the patterns of investment, innovation, industrial organization, and structure. This calls for a policy design aimed at transforming the manufacturing sector, in the context of open, deregulated, and increasingly liberalized markets. The challenge is how to channel domestic investment resources, attract more FDI, and direct more technology and other support infrastructure to transform the country's industrial sector. The government can play an important role in this endeavor (Mishra 2015), complementary to the market, and directed at improving the business environment, physical and human capital endowments, and also at implementing concrete and practical private–public measures to directly improve the competitiveness of manufacturing firms in Indonesia.

6 CONCLUSIONS

Indonesia's economy performed well between the mid 1960s and the mid 1990s. It achieved macroeconomic stability, high growth rates, and began industrializing (that is, the share of manufacturing increased both in GDP and in total employment, and the economy diversified out of natural resources). This process ended abruptly with the AFC of 1997–1998, and, since then, Indonesia's growth rate, at 5.0–5.5 percent, though high by world standards, has been significantly lower than that prior to the AFC (and much lower than that of China). This paper has argued that Indonesia's actual performance can be well explained by the fact that its BoPC growth rate increased significantly, reaching 9.5 percent in 1995–1996, and then declined to about 3 percent today. The fact that its BoPC growth rate is below the actual growth rate manifests itself in a current account deficit. What lies behind this performance is a significant decline in the ratio of the income elasticity of demand for exports to the income elasticity of demand for imports, a sign of significant loss in non-price competitiveness. Moving forward, as its actual growth rate appears to be balance-of-payments-constrained, Indonesia needs to upgrade its export structure to attain higher growth rates.

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