Journal of Comparative Economics 48 (2020) 163–181

Contents lists available at ScienceDirect

Journal of Comparative Economics

journal homepage: www.elsevier.com/locate/jce

The PRC's long-run growth through the lens of the export-led growth model

Jesus Felipe[a,1,*], Matteo Lanzafame[a,b,1]

[a] Asian Development Bank, No. 6 ADB Avenue, Mandaluyong City 1550 Philippines
[b] Department of Economics, University of Messina, Piazza Pugliatti 1, 98122 Messina, Italy

ARTICLE INFO

JEL Codes:
E24
E32
O14
O47
O53

Keywords:
Balance-of-payments equilibrium growth rate
Bayesian Model Averaging
China
Export-led growth
Kalman filter

ABSTRACT

We explain China's remarkable growth performance over the last three decades through an export-led growth (ELG) model, where countries need to export to pay for their imports. We show that China's actual long-run growth rate is well approximated by its balance-of-payments equilibrium (BOPE) growth rate, defined as the long-run growth rate consistent with current account equilibrium. This growth rate is given by the ratio of the growth rate of exports to the income elasticity of imports. We estimate the latter using the Kalman filter, which allows us to obtain a time-varying estimate of China's BOPE growth rate. We find that the average value of China's BOPE growth rate during 1981–2016 was about 11 percent but fluctuated significantly over time and declined notably after 2007. It is estimated to be 5.9 percent in 2015. We then discuss the determinants of China's BOPE growth rate and of the income elasticity of imports, with the help of the Bayesian Model Averaging technique. The analysis highlights the role of the composition of aggregate demand as the main driving force, both for its direct effects on the income elasticity of imports, and for the indirect effects on export growth via capital accumulation, in particular fixed asset investment. Our analysis has important implications to understand China's transition to a "New Normal" of a lower growth rate and the effects of the external and internal rebalancing strategy pursued from the early 2000s.

1. Introduction

A wide body of literature has studied China's growth experience since the 1980s. Most of this literature has used standard growth accounting decompositions of overall growth into the contributions of the growth rates of labor, capital, and total factor productivity (TFP). These growth analyses typically gravitate around discussions of the contribution to GDP growth of residually-estimated TFP growth versus that of capital accumulation. Most studies tend to conclude that the latter contributed significantly to China's GDP growth (the investment-to-GDP ratio reached about 50 percent), although the size of the contribution varies across studies and periods considered.[2] Some studies indicate that the contribution of TFP growth is small, but very likely technical progress was

* Corresponding author.
E-mail addresses: jfelipe@adb.org (J. Felipe), mlanzafame@adb.org (M. Lanzafame).

[1] We are grateful to Yasu Sawada, to the participants at an ADB seminar, and to two anonymous referees, for their comments and suggestions. This paper represents the views of the authors and not necessarily those of the Asian Development Bank, its member countries, or those of its Executive Directors.

[2] Examples are: Tsui et al. (1995), Borensztein and Ostry (1996), Hu and Khan (1997), Young (2000), Heytens and Zebregs (2003), Islam et al. (2006), Brandt and Zhu (2010), Lin and Zhang (2015). See also the edited volume by Lin et al. (2018a). Chow (1993) used regression analysis to estimate TFP growth. See Chow (2006) and Holz (2006) exchange on the construction of capital stocks for China.

https://doi.org/10.1016/j.jce.2019.08.004
Received 1 August 2018; Received in revised form 26 April 2019; Accepted 16 August 2019
Available online 20 September 2019
0147-5967/

embodied in capital, or technical progress was biased with an elasticity of substitution less than one, in which case standard TFP growth calculations lead to incorrect (too small) estimates of the latter (Felipe and McCombie 2001, 2002). It is important to note that these analyses offer a supply-side explanation of growth (i.e., through the factors of production), and the implicit assumption is that growth is supply-constrained, and hence determined by the growth of supply.

While the role of capital accumulation in China's growth is undeniable, and certainly there has been significant technical progress (however measured), the country's remarkable growth performance over the last three decades has also been associated to a very robust growth of exports, so much so that many refer to it as a clear example of export-led growth (ELG).[3] The standard literature on ELG has focused exclusively on the role of exports (e.g., Yao 2018, 42–44), either by estimating price and income export elasticities in export functions (e.g., Ang et al., 2015) or by investigating the growth effect associated with exports (e.g., Tingvall and Ljungwall 2012), typically relying on Granger-causality methods (e.g., Marin 1992; Tang et al., 2015).

The main argument proposed in this paper is that, both in general and in the case of China, the ELG model is more complex than simply considering the role of exports. A first look at the data supports this view. Panel (a) of the Fig. 1 is a simple scatterplot of China's output growth rate and the growth rate of the volume of exports. It shows the expected positive correlation (significant at the 5 percent level) revealed by standard ELG studies. However, the relation between the two variables is very weak: a 1 percentage point growth in exports is associated with slightly less than 0.1 percentage point growth in output. Another indicator typically considered as a reflection of a successful ELG strategy is the improvement in the current account balance (as a share of GDP) – indeed, China's relevant current account surpluses in the 2000s have frequently been mentioned in support of the ELG hypothesis. Nevertheless, as shown in Panel (b), there is no evidence of a statistically significant correlation between China's current account (as a share of GDP) and the growth rate of its volume of exports. Similarly, changes in the current account (as a share of GDP) are not significantly associated with the dynamics of output growth. Though far from conclusive, this evidence suggests that, to analyze China's growth performance through the lens of the export-led growth model, we need to rely on a more comprehensive approach. In this paper, it is argued that such an approach must take into account the interaction between exports and imports as a key determinant of long-run growth performance.

There are powerful reasons why exports matter, and these provide the rationale for why countries gain by following an ELG strategy (McCombie and Thirlwall 1994). Particularly relevant is the fact that exports are the only component of demand that can pay for the import requirement (especially of capital goods) of growth. Surely an economy can experience consumption-led, investment-led, or government-expenditure-led growth; but each of these components of demand has an import content.[4] If an economy does not obtain sufficient export earnings to pay for its imports (more precisely, the import content of other components of expenditure), then demand will have to be constrained. For this reason, exports play a very significant role. The evidence shows that countries, especially developing countries, need to maintain current account equilibrium in the long-run. Otherwise they run into crises. Indeed, the experience of many developing countries shows that, in the long run, they cannot grow faster than the rate consistent with balance-of-payments (BOP) equilibrium on current account, unless they can finance ever-growing deficits. There is a limit to the deficit-to-GDP ratio beyond which financial markets become nervous and a country is unable to borrow any more. Thus, countries that find themselves in BOP problems must constrain growth while the economy still has surplus capacity and surplus labor – indeed, there are not many developing countries that could not grow faster if they had more foreign exchange. This implies that exports not only have a direct effect on demand, but also an indirect effect by allowing all other components of demand to rise faster than otherwise would be the case. This helps us anticipate the result that the long-run rate of growth of an economy becomes attuned to the rate of growth of the dominant component of autonomous demand, which in an open economy is exports.

This paper contributes to the debates and literatures on ELG and China's growth in several ways. First, we offer an alternative (to the supply-side growth accounting) explanation of China's growth, one that allows us to consider explicitly the growth-enhancing effects of exports. In doing so, we offer a demand-side explanation of China's growth in terms of the ELG hypothesis. By this we mean that China's growth may well have been demand-constrained, especially when it is below its productive potential – in which case there is excess capacity, supply constraints are not binding, and GDP growth is determined by the growth of demand. This possibility is acknowledged by Lin et al., 238–242). We believe this hypothesis merits serious investigation.

Second, unlike the growth accounting approach, that relies on somewhat *ad-hoc* assumptions about, for example, the future path of TFP growth (apart from the fact that its determinants are very unclear), this framework allows proper statistical testing.

Third, we make use of an approach that goes beyond regressions of output growth on export growth. There is a fairly robust literature that relies on the hypothesis put forward by Thirlwall (1979). The basis of this work is the contention that the relationship between output growth and exports needs to be analyzed in a BOP equilibrium framework, specifically considering not only the growth effect associated to exports but also the rise in imports brought about by fast exports and output growth. That is, export-led growth can be the pillar of a sustainable development process only if it relaxes the long-run constraint on growth imposed by the BOP.

[3] See, for example, China's improvement in the economic complexity index elaborated by the Center for International Development (http://atlas.cid.harvard.edu/).

[4] Exports are the only component of 'autonomous' demand in an economy, in the sense that their demand emanates outside the economy. On the other hand, the major part of consumption and investment demand depends on the growth of income itself. Second, imports may be more productive than domestic resources because certain crucial goods for development, e.g., capital goods, are not produced domestically. This is the supply-side argument for export-led growth (Feder 1983). Likewise, exports matter because the sophistication of a country's export basket is a good predictor of its future growth (Hausman et al. 2007). A good example of this is given by the experience of fast-growing firms in several Asian countries, which moved up in the development ladder and consequently produced more sophisticated products by slowly accumulating productive capabilities. Exporting was a means of 'testing' whether firms and sectors could compete in the global market place, by subjecting them to global competition.

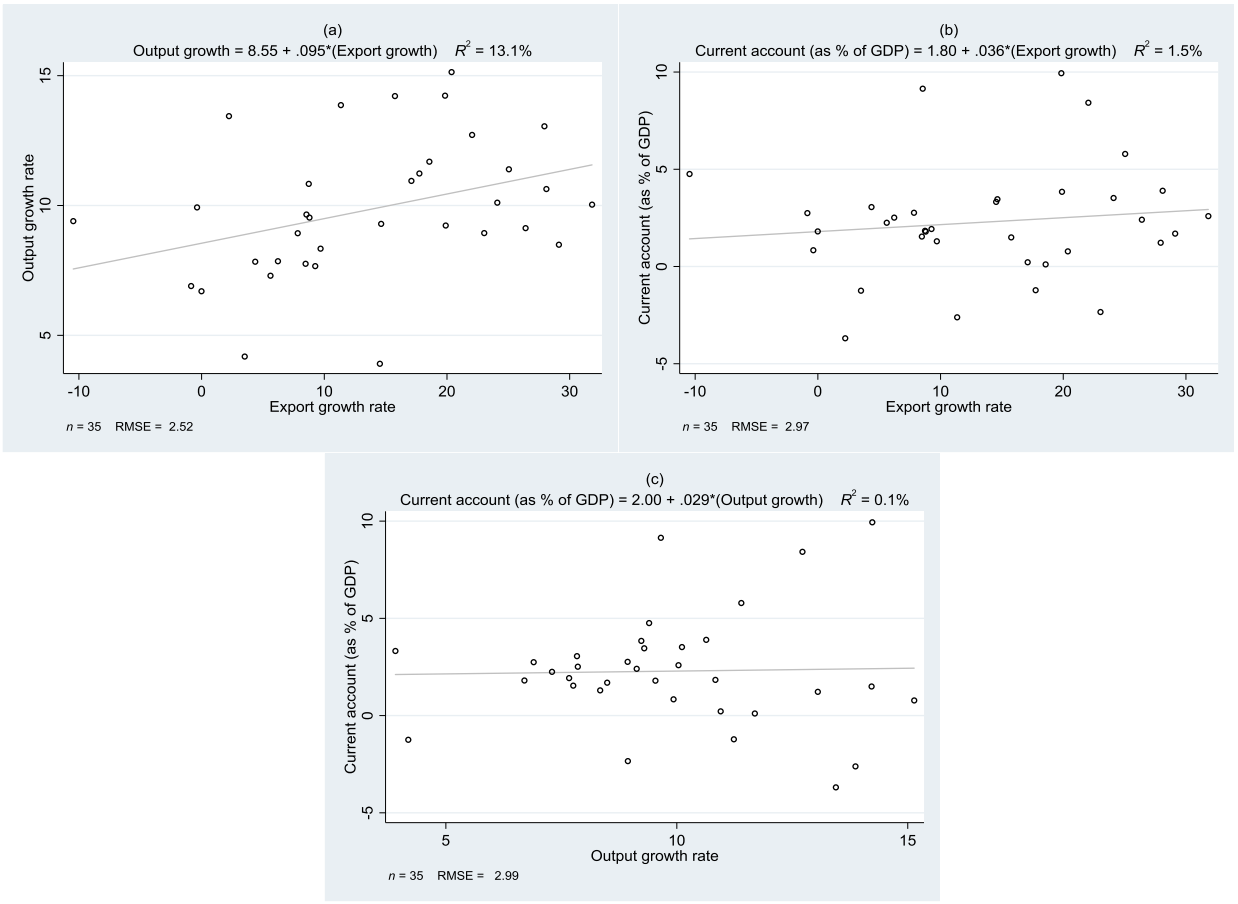

Fig. 1. The relations between output growth, export growth and the current account (as a share of GDP) in China, 1981–2016.
Source: Authors based on WDI and UNCTAD data.

Under this view, a country's long-term growth performance will tend to converge toward that particular growth rate consistent with current account equilibrium – the balance of payments equilibrium (BOPE) growth rate.

Fourth, the paper provides several empirical contributions to the literature on BOPE growth, as well as to our understanding of China's growth. The most important is that we estimate a time-varying BOPE growth rate (y_{Bt}) for China. To our knowledge, this is the first time that such an exercise has been carried out and this is somewhat surprising, since the hypothesis that the BOPE growth rate is fixed over time is a restrictive one. This is particularly so for an emerging economy like China, which has undergone significant structural change in the past four decades. A second empirical contribution of this paper is that we rely on a Bayesian Model Averaging (BMA) approach to examine the factors driving the evolution of the BOPE growth rate in China.

Building on this approach, this paper addresses the following questions: (i) to what extent can the BOPE growth rate explain China's growth performance over the last three decades?; and (ii) what are the determinants of China's BOPE growth rate? These issues, interesting in their own right from a theoretical viewpoint, are now very important for policymakers too as after the Great Financial Crisis the Chinese economy has entered a new phase of slower economic growth, which some see as structural and heralding the beginning of a 'New Normal' for growth in China.[5] We show that the trajectory of China's BOPE growth rate from the mid-2000s onwards is consistent with the gradual shift to a New Normal of slower growth.

The remainder of the paper is structured as follows. Section 2 derives the BOPE growth rate, discusses its interpretation, and provides a discussion of why China's growth rate may indeed have been determined by its BOPE growth rate. Section 3 implements this methodology using annual data for 1981–2016. We find that the average value of the BOPE growth rate was about 11 percent

[5] As noted above, when using growth accounting approaches to identify the supply-side determinants of growth, i.e., the relative contributions of labor, capital, and total factor productivity (TFP), estimates vary widely depending on the particular data set used. The optimists about China's future generally find that the contribution of TFP growth to GDP growth is sizeable. This implies that the PRC's high growth rates are likely to be sustained because they do not depend on a rapid rise in the capital–output ratio, which would imply a sharp decline in the rate of return to capital. The pessimists, on the other hand, tend to find that most of the PRC's growth can be attributed to capital deepening, which implies a substantial reduction of the return to capital, and hence is likely to limit potential growth going forward.

but, consistent with our hypothesis, it varied significantly during the estimation period. In Section 4, we test how relevant (as an upper limit constraint) the BOPE growth rate has been to explain China's actual growth rate. The evidence is consistent with the notion that the trajectory of China's trend growth performance is closely associated to the dynamics of its BOPE growth rate. Section 5 focuses on the investigation of robust determinants of the BOPE growth rate and of the income elasticity of imports via BMA analysis. Our findings indicate that China's BOPE growth rate is primarily influenced by specific components of aggregate demand. In particular, export growth has acted as China's engine of growth and, at the same time, as a check on output growth via its direct and indirect effects on import growth and the balance-of-payments constraint. Section 6 dwells on the relationship between the recent trajectory of China's BOPE growth rate and the New Normal, focusing on the effects of the external and internal rebalancing strategy pursued by China from the early 2000s. Finally, Section 7 concludes and discusses policy implications.

2. The balance-of-payments equilibrium growth rate model

The concept of the BOPE growth rate was put forward by Thirlwall (1979), and has given rise to a large theoretical and empirical literature (e.g., Guarini and Porcile 2016; Lanzafame 2014; Mayer 2017). Thirlwall's (1979) model is based on the idea that, in the long-run, countries cannot run current account deficits, hence their current account needs to be in balance. Therefore, the term BOPE growth encapsulates the idea that a country's performance in external markets may ultimately constrain the growth of the economy to a rate below that which internal conditions would warrant.

To implement empirically the notion of BOPE growth, assume the following specifications for the export and import demand functions:

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

$$M_t = \left(\frac{P_{dt}}{P_{ft}}\right)^{\theta} Y^{\pi} \tag{2}$$

where t indicates time, X, M, Y and Z are, respectively, the flows of exports, imports, domestic 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 price elasticities (measures of price competitiveness), while $\varepsilon > 0$ and $\pi > 0$ are the income elasticities of exports and imports (measures of non-price competitiveness), respectively. The latter two play a crucial role in this model, as we shall see below.

In a growing economy, the long-run constraint imposed by the BOP equilibrium requires that exports and imports grow at the same rate, i.e., $x_t = m_t$. Fig. 2 shows these two series. After peaking in the early-to-mid 2000s, both series have trended downward in China; in the case of exports, registering consecutive negative values in 2015 and 2016, and in the case of imports a negative growth rate in 2015.

Log-linearizing Eqs. (1) and (2) and differentiating with respect to time, the equilibrium condition $x_t = m_t$ can be written as:

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

where lowercase letters denote the growth rates of the relevant variables. If relative prices measured in a common currency do not

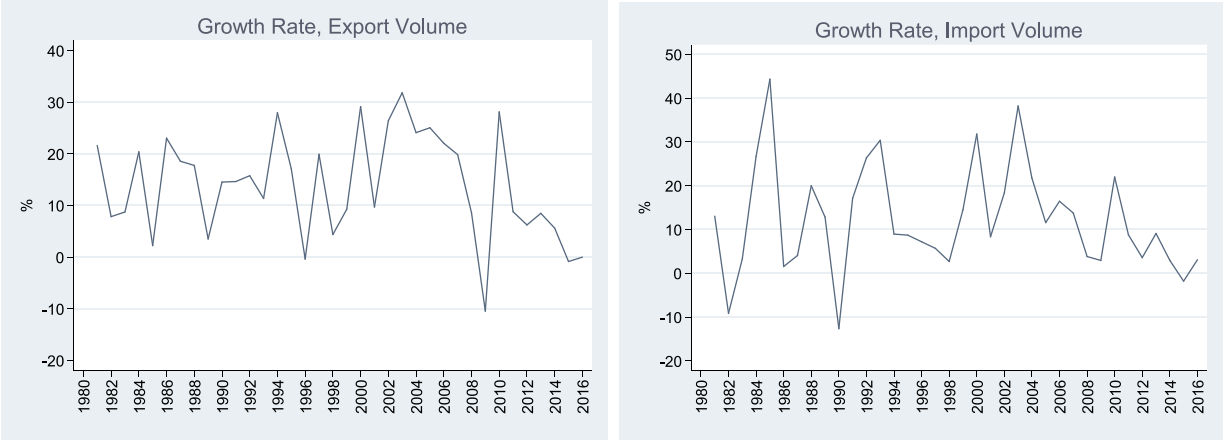

Fig. 2. Growth Rates of the Volumes of Exports and Imports.
Source: Authors based on UNCTAD data.

change over the long-run (i.e., $p_{dt} = p_{ft}$), Eq. (3) can be rearranged to give :[6]

$$y_B = \left(\frac{\varepsilon}{\pi}\right) z_t \tag{4}$$

The simple rule in Eq. (4), the product of the ratio if the income elasticities of exports and imports times the growth rate of world income, represents an upper limit to long-run growth, which becomes binding and, thus, constrains actual growth when a country's y_B is lower than its potential growth rate. As such, the approach is labeled demand-oriented because when y_B is below potential growth, an increase in the growth of exports will increase the growth of output. This is not to say that the supply side is unimportant, since the emphasis on increasing the growth rate of exports inevitably involves supply-side measures. What is argued is that the direction of causation in Eq. (4) runs from the right-hand side to the left-hand side, i.e., from the income elasticities to the growth rate of output, via the balance-of-payments constraint on demand. These income elasticities are largely determined by the non-price characteristics of exports and imports, such as quality, variety, reliability, speed of delivery or distribution network. All else constant, the better these characteristics, the higher the country's exports for a given growth rate of the world economy (i.e., the higher its ε) and the lower the import content for each of the components of aggregate demand (i.e., the lower its π).

Note that given that $\varepsilon z_t = x_t$, Eq. (4) can also be expressed as:

$$y_B = \frac{x_t}{\pi} \tag{5}$$

so that y_B is given by the ratio of the growth rate of exports to the income elasticity of imports. To avoid the potential problems involved in the estimation of the export function, relating in particular to the selection of an appropriate proxy for z_t, the empirical relevance of the BOPE growth model is usually investigated relying on the simple rule expressed in (5).[7] The accuracy of Eq. (5) in approximating actual growth depends crucially on the estimate of the income elasticity of demand for imports ($\hat{\pi}$), which can be retrieved from a standard aggregate import function, such as the log-linear specification of Eq. (2):

$$\log M_t = \gamma + \theta(\log P_{dt} - \log P_{ft}) + \pi \log Y_t + u_t \tag{6}$$

As the relationship in Eq. (5) is concerned with long-run growth and the variables involved often display non-stationary behavior, Eq. (6) is typically estimated via cointegration methods (e.g., Bairam 1993; Alonso 1999; Bagnai 2010).

Eq. (5) offers an alternative view to the growth accounting (supply-side) explanation of growth in general, and of China's fast growth in particular.[8] The thrust of the argument is that economies typically expand at a slower pace than that warranted by their potential growth rate, so that there is excess capacity, supply constraints are not binding and, thus, their growth rate is determined by the growth of demand. In this framework, therefore, growth rates across countries must differ *because* the growth of demand differs among them. As in the case of several East Asian countries in the past, China's growth performance was boosted by the development of its export capabilities (in particular manufactures) to and beyond the threshold associated to the cost of full-employment imports (i.e., the value of imports that would occur if resources were fully utilized). In other words, the growth of exports relaxed the BOP constraint imposed by the import requirements of rapid growth. In more recent times, this process has led China to run significant current account surpluses – a typical indication of a high BOPE growth rate. This was also the case of countries such as Japan, Germany, Switzerland and the oil-producing economies of the Middle East, in the past.

This discussion naturally raises a number of questions: what is the value of the growth rate consistent with current account equilibrium in China?; has it changed over time?; what are the determinants of China's BOPE growth rate?; can growth in a country like China, which has received significant inflows of foreign direct investment (FDI), be explained by the dynamics of its BOPE growth rate? And if that is the case, what are the implications? The following sections provide answers to these questions.

Here, we clarify the last point, namely the role of FDI and capital flows in general. Our approach starts from recognizing that, if the BOPE growth rate is found to be a good approximation of a country's long-run growth rate, the implication is that relative price changes and capital flows *do not matter* for long-run growth. Short-term deviations of the actual growth rate from the BOPE growth rate are, of course, possible – and will give rise to current account improvements or deteriorations, associated to corresponding capital flows. These deviations, however, cannot persist in the long-run, as deficits will sooner or later be corrected via a slowdown in growth, while current account surpluses will lead to faster growth, at least until the economy's growth becomes constrained by its

[6] This assumption need not be taken to be the same as the Law of one Price, i.e., that arbitrage ensures that the price of trade goods will be the same in the long-run, hence all firms and countries face infinitely elastic demand curves, and the only factor that prevents countries to export more is supply constraints. This would imply that there are no BOP constraints, as small relative price changes will be sufficient to bring the current account into equilibrium. The Law of one Price is one of the most empirically refuted propositions in economics. Here, this assumption means that, in the long-run, movements in relative prices are relatively small. The idea is simply that when exchange rate changes take place, domestic price movements tend to mirror those changes to keep real exchange rates relatively stable.

[7] We follow this practice, but also provide an estimate of the income elasticity of exports in Section 6.

[8] The relevance of non-price competitiveness in the Asian context appears to be supported by the statistical analysis of Ang et al. (2015). These authors show that the spectacular productivity and export growth rates experienced by the Asian economies in their analysis (China, India, Korea, Japan, Singapore, and Taiwan) during 1953–2010, were driven by innovation, in particular of diversification (new product variety), an outcome of R&D in the intermediate goods producing sector. The coefficient of the (trade-weighted) income variable (proxy for non-price competitiveness) is highly significant and high (elasticity), about 2. On the other hand, price competitiveness (measured by the price elasticities) was not a quantitatively important determinant of export. They also find that innovation competitiveness has been less influential for export growth for China and India. These two countries' export booms were more based on imitation and process innovation than on product innovation.

productive capacity. The latter case appears to fit well China's experience, at least from the early 2000s, when the country started enjoying a healthy current account surplus. Empirically, the implication of this argument is that the BOPE growth rate can be expected to approximate an economy's long-run (trend) growth rate, rather than its actual growth rate. Therefore, our empirical work in this paper focuses on the relationship between China's BOPE growth rate and its trend growth rate.

Capital flows both allow short-term deviations of growth from the BOPE growth rate, and also affect the latter – if they influence a country's export performance and/or its income elasticity of imports. This is particularly the case of FDI, whose most important contribution to China's development has probably not been physical capital (since the country enjoys high saving and investment rates), but access to advanced technologies and management (Zhang 2015). Of enormous importance has also been entry into global markets, as foreign investors integrate their operations in China into their global supply chains. Therefore, these flows have contributed to the country's development and may have helped relax the BOP constraint in the sense of increasing China's BOPE growth rate. Whether or not this was the case is an empirical question, which we address in Section 4 (when we test whether China's actual growth rate deviates from the BOPE growth rate) and in Section 5 (in the context of our investigation of the determinants of China's BOPE growth rate).

3. Estimation results of the PRC's time-varying BOPE growth rate

Empirical studies in the literature consider the BOPE growth rate as constant and, typically, compute its value as the ratio of average export growth (over a certain time span) to the point estimate of the income elasticity of imports (obtained from Eq. (6)). Some of the most recent point estimates of China's y_B are provided by Hussain (2004) for 1976–1989 and Jeon (2009) for 1979–2002. Hussain (2004) estimated China's y_B rate at 6.36 percent – lower than, but not statistically different from, the average actual growth rate of 8.20 percent. Jeon (2009) found that the Chinese economy grew, on average, as fast as its y_B over 1979–2002 – the average actual growth rate (9.25 percent) and the estimated y_B were found to be not statistically different. However, unless x_t or z_t are constant, a simple look at Eqs. (4) and (5) shows that, even not considering short-term variation, the value of y_B will change over time because of changes in trend growth rate of exports. More importantly, the long-run value of y_B will also be time-varying if the income elasticity of imports is not a fixed parameter but, in fact, itself subject to changes over time. Since π captures non-price competitiveness and, more generally, is determined by an economy's structural characteristics and the import content of the components of aggregate demand, its value is very likely to be time-varying. This is particularly so for economies whose economic, trading and structural features have undergone and/or are still undergoing substantial change, such as China's. Empirically, therefore, the use of a time-varying parameter approach seems appropriate in this case.[9]

This section provides time-varying estimates of the PRC's π_t and BOPE growth rate (y_B), relying on Kalman filtering techniques.[10] Models with time-varying parameters can accommodate and take into account changes in an economy's structural features, which may have an impact on the trade elasticities. Since the potential non-stationarity of the variables in the log-level version of the import function in (6) makes the use of the Kalman filter impractical in this case, we rely on the growth-rate version of the import function in (2). The latter is specified in a state-space model with time-varying parameters and estimated relying on the Kalman filter recursive algorithm, commonly used to estimate time-varying coefficients.[11] A state-space model consists of two sets of equations, called *measurement* and *state*. The Kalman filtering approach provides optimal estimates for state variables based on the information from these two sources. Hence, our model consists of the following system of equations, with the import growth relation in (7) being the measurement equation, and (8)–(9) the two state equations:

$$m_t^T = \theta_t rp_t + \pi_t y_t^T + u_t \tag{7}$$

$$\theta_t = \theta_{t-1} + \upsilon_t \tag{8}$$

$$\pi_t = \pi_{t-1} + \nu_t \tag{9}$$

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,

[9] Since the methodology is implemented to estimate a long-run growth rate, it does raise questions regarding the tension between the empirical and theoretical definitions that are implicit in the BOPE growth approach. Empirically, the estimation of a static equation such as the import-demand function in (6), produces coefficient estimates that reflect both the short- and long-run relations between the variables: the BOPE growth theory requires imposing the long-run condition of a balanced current account to get a long-run growth rate, i.e., the BOPE growth rate, consistent with that condition and the static-model estimates. However, if the underlying parameters of the import-demand function are different in the short- and long-run, then the model should be specified in dynamic form by introducing lags of the dependent variable as additional regressors (e.g., in an autoregressive distributed lag model). This yields estimates of both the short- and long-run price and income elasticities, and will use the estimated long-run income elasticity of imports to produce an estimate of the BOPE growth rate. The time-varying estimation framework we adopt in this paper extends this reasoning, allowing for the elasticities to be changing all the time. Note, however, that even though the time-varying approach produces a time-varying BOPE growth rate, what we obtain is still an estimate of a long-run growth rate: this is because our (time-varying) BOPE growth rate estimate is retrieved by imposing the long-run BOP equilibrium condition.

[10] The Kalman filter is a tool very frequently used in the literature to estimate long-run time-varying trends, because the evidence shows it performs well at this task. For instance, a number of contributions have found evidence of time variation in the trend growth rate of output or productivity (e.g., Roberts 2001; Gordon 2003), energy prices (e.g., Pindyck 1999), unemployment Richardson et al. 2000).

[11] A wide variety of time-series models can be written and estimated as special cases of a state–space specification. Extensive examples of applications of state–space models can be found in Harvey (1989).

with zero mean and constant variance. The parameters θ_t and π_t are, respectively, the time-varying price and income elasticities of imports. Since the BOPE growth rate is held to be a long-term constraint on growth, we need to purge the estimated π_t and, thus, the relationship between the growth rates of imports and output from short-run fluctuations.[12] Thus, to estimate Eq. (7), we rely on m_t^T and y_t^T which denote the trend growth rates of imports and output, respectively.[13] Note also that, to capture possible level breaks or trend patterns, we impose a unit root in the state equations – this is a standard procedure in the literature on state–space modeling (e.g., Harvey 1989).

To obtain time series for the state variables we apply the Kalman Smoothing procedure, which uses all the information in the sample to provide smoothed state estimates.[14] This procedure differs from the Kalman filter in the construction of the state series, as the latter technique uses only the information available up to the beginning of the estimation period. Smoothed series tend to produce more gradual changes than filtered ones and, as discussed by Sims (2001), they provide more precise estimates of the actual time variation in the data.

The analysis is carried out using annual data for 1981–2016, although for reasons explained below we disregard the 2016 estimate. We make extensive use of the recently constructed data set by Chang et al. (2016) which, to our knowledge, is the most complete and consistent source of macroeconomic data on China to date.

Our estimate of the time-varying BOP-constrained growth rate (y_{Bt}) is constructed as follows:

$$y_{Bt} = \frac{x_t^T}{\hat{\pi}_t} \tag{10}$$

where $\hat{\pi}_t$ is the estimate of the income elasticity of imports obtained from the state-space model in (7)–(9) and x_t^T is the trend growth rate of exports.

Fig. 3 shows numerator and denominator of y_{Bt} in Eq. (10), while Fig. 4 displays the estimates of the BOPE growth rate, together with the actual (y_t) and trend (y_t^T) output growth rates.

Fig. 3 indicates that, indeed, both components of the BOPE growth rate varied significantly during the estimation period. From about 0.9 in 1981, the income elasticity of imports (IEoI) increased to 1.7 in 1989, reflecting the gradual turn from an import-substitution strategy to a growth process powered by an increasing integration into world trade and underpinned by large imports of foreign capital (e.g., machinery, plant and equipment) for domestic industries. This upward trend turned downward abruptly in 1989–1990, when China's trade relations were affected by a substantial negative shock (including trade sanctions). As the effects of the trade shock gradually disappeared and trade liberalization measures took hold, the IEoI started increasing again in mid-1990s and reached 2.7 in the early 2000s – when trade liberalization culminated in China's accession to the World Trade Organization.[15]

This is in line with the evidence that, as China's income increased, its imports became progressively more complex. Together with machinery, these imports included intermediate goods (e.g., chemicals) and more sophisticated consumer products – a reflection of China's structural transformation and increasing integration in world trade. Then, and somewhat surprisingly, the elasticity started declining rapidly to below 1 in 2010 and to about 0.5 and even less, in recent years.[16] As argued and analyzed in detail later on in Section 6, this decline in the IEoI is consistent with the gradual shift to a new growth model, determined by both structural forces undermining export-led growth and by a new strategy pursued by China's policymakers to give a greater role to domestic (as opposed to external) demand.

The trend growth rate of exports, on the other hand, oscillated around 15 percent per annum until the early 2000s. Given that $\varepsilon z_t = x_t$, and that world income growth (z_t) was much lower, we can infer that the income elasticity of China's exports (ε), a proxy for the non-price characteristics of China's exports, increased very fast and reached very high values – we provide empirical support to this inference in Section 6. This had to be the consequence of the transformation (diversification and upgrading) of China's export structure (see Felipe et al., 2013). China's export growth increased to 25 percent in the mid-2000s, and then declined fast to well below 5 percent after the Great Financial Crisis (GFC).[17]

The average value of China's estimated y_{Bt}, the long-run growth rate that China could achieve without running into BOP problems for 1981–2015, is a very high 11.3 percent. The available estimates in the literature (e.g., Hussain 2004) indicate that very few countries have enjoyed similar values for the BOPE growth rate. However, Fig. 4 shows significant variation over time. Before the

[12] Note also that, even though equations (4) and (5) describe a long-run equilibrium condition consistent with relative prices not changing in the long-run, relative price changes need to be included in equation (7) to control for their short-term effects on imports – if that were not the case, the import demand function would be misspecified and the estimated π would turn out to be biased.

[13] The two trend growth rates are obtained via the frequency domain filter developed by Corbae et al. (2002) and Corbae and Ouliaris (2006). The Corbae-Ouliaris filter grants several advantages with respect to the available alternatives, such as the commonly used Hodrick-Prescott filter or the Baxter-King filter: It can handle both stochastic and deterministic trends, it avoids the end-point issue estimating end-points directly, it does not require the investigator to set any parameters except the business cycle range.

[14] Suppose that we observe the sequence of data up to time period t: The process of using all this information to form expectations at any time period up to t is known as *smoothing*.

[15] The point estimates of the income elasticity of imports in Hong et al. (2016, Tables 1, 2) vary from 1.5 to 2, depending on the specification and sample. Hussain (2004, Table 14.4) gives an income elasticity of imports of 1.76.

[16] We also estimated the income elasticity of imports from equation (6) using rolling regressions (with a window of 15 years) and obtained very similar values. The elasticity also declines rapidly after 2000 in these regressions.

[17] As noted earlier (Figure 2), the growth rates of both exports and imports peaked in the early 2000s. Since then, both series have been on a downward trend.

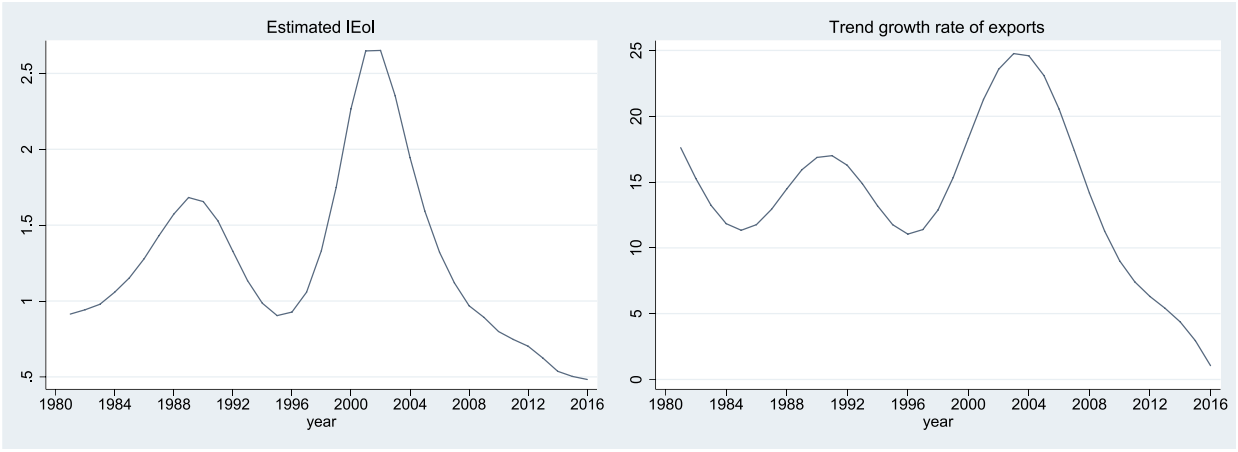

Fig. 3. Estimated income elasticity of imports (IEoI, left) and trend growth rate of exports (right), China, 1981–2016.
Source: Authors.

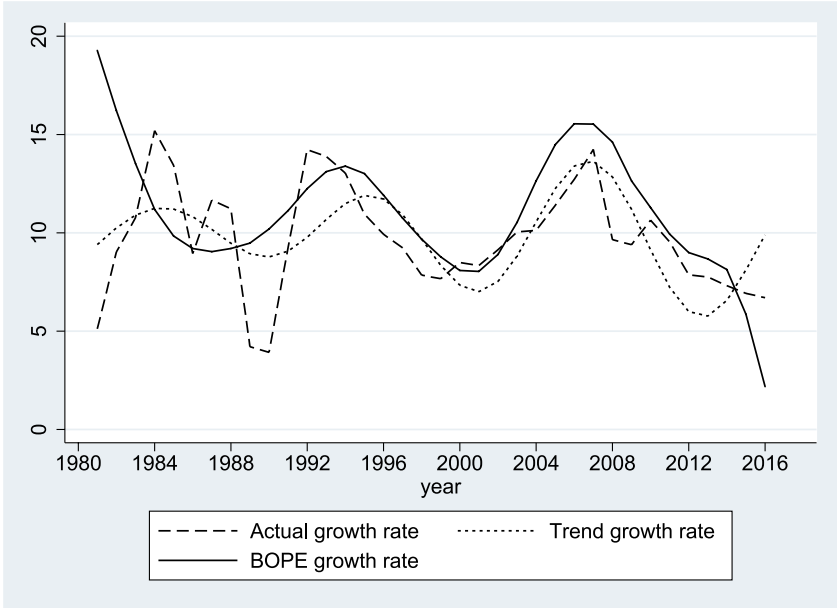

Fig. 4. Actual, Trend and BOPE growth rates of China, 1981–2016.
Source: Authors.

GFC of 2007 (and excluding the 1981–1982 years), China's y_{Bt} remained above 9 percent for the whole period considered except for 1999–2002 (when it was, nonetheless, above 8 percent), reaching a peak value of 15.5 percent in 2006–2007, the result of a very high growth rate of exports and an already declining import elasticity. The BOPE growth rate was above the actual growth rate and this gave rise to the accumulation of payment surpluses. The interpretation in terms of BOPE growth model is that China did not grow faster than it did because of an ultimate capacity ceiling. In this sense, the supply side (factors of production) constrained, rather than determined, China's growth. China, nevertheless, grew faster than most other countries in the world because demand was unconstrained and induced its own supply of factors of production. From 2007 onwards, the BOPE growth rate has declined to about 8 percent in 2014 and it is estimated to be 5.9 percent in 2015. For reasons discussed below, we consider this to be the most reliable current estimate of China's y_{Bt} – meaning that the country cannot grow persistently faster than 5.9 percent a year without eventually running into BOP problems.

Inspection of Fig. 4 also indicates that, with a few exceptions, y_{Bt} is always above the trend growth rate (y_t^T), particularly from the early 1990s onwards. Moreover, there is a pretty clear positive correlation between the two series, which appear to move together for most of the period under analysis. Similar comments apply to the relationship between y_{Bt} and the actual growth rate (y_t) although, as expected, the deviations between these two series are larger, and the correlation is lower, than between y_{Bt} and y_t^T, particularly in the 1980s. This evidence is in line with Thirlwall's hypothesis that the BOPE growth rate represents a long-term limit to actual growth, which implies a higher correlation with the trend growth rate than with the actual growth rate.

Before moving on to the formal tests of the significance of these correlations, some caveats about the estimates in Fig. 4 need to be mentioned. First, the lower correlation between the BOPE growth rate and the actual growth rate in the 1980s may be the result of the fact that China's transition towards a market economy was still in its early stages, so the relationship in Eq. (5) (BOPE approach) may not capture properly the country's growth dynamics during that period.[18] Second, like other filtering techniques, the Kalman Smoother does not perform so well for end-point estimates – as no future information is available, the y_{Bt} estimate of 2.2 percent in 2016 is based solely on data for the preceding years, which makes it less reliable. For this reason, we have disregarded this year's estimate and refer to 2015 (5.9 percent) as our latest most reliable estimate. Third, as mentioned, estimates for the years 1989–1991 are problematic. In addition to the trade shock, in those years the economic reforms were essentially put on hold. As a result, China's GDP growth rate fell from 11.2 percent in 1988 to 4.2 percent in 1989, and declined further to 3.9 percent in 1990. In 1991, economic sanctions started being lifted, economic reforms were resumed, and output growth increased to 9.3 percent. To avoid undue influence of this shock on the results, in what follows we exclude the years 1989–1991 from the econometric analysis.

4. How relevant is the BOPE growth rate for China?

For the BOPE growth rate to be an anchor for long-run growth, it must be the case that, on average, China's actual growth rate should not be significantly different from its BOPE growth rate; or, equivalently, that deviations of actual growth from y_{Bt} should be temporary. As argued earlier, one advantage of the BOPE growth model over growth accounting is that hypotheses like this one can be properly tested. In this section, we propose and carry out three such formal tests.

The intuition underlying our approach is as follows. Theory indicates that actual growth will not deviate from the BOPE growth rate in the long-run or, equivalently, that $y_t - y_{Bt} = ydiff_t = 0$. This is consistent with three testable hypotheses:

I $ydiff_t$ is a stationary, mean-reverting process. This is a necessary, but not sufficient, condition that we test by relying on standard unit root tests;

II $ydiff_t$ is a zero-mean process. We test this second hypothesis by modeling $ydiff_t$ as an autoregressive (AR) process, i.e., $ydiff_t = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i} + \upsilon_i$. 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.

III y_{Bt} does not differ significantly from the trend growth rate y_t^T, i.e., $y_{Bt} = y_t^T$. We test this hypothesis by relying on the following specification $y_{Bt} = \alpha + \beta y_t^T + u_t$, where the null hypothesis is H_0: $(\alpha, \beta) = (0, 1)$, with the coefficient of y_t^T statistically significant.

Test results are reported in Table 1:

(i) Hypothesis I: all unit root test results indicate that $ydiff_t$ is a stationary process. The DF-GLS (Elliott et al., 1996) and ZA (Zivot and Andrews 1992) tests strongly reject the null of a unit root, while the KPSS test (Kwiatkowski et al., 1992) does not reject the null of stationarity. Moreover, the ZA test, which allows for an endogenously-selected structural break, indicates that the latter is (as expected) present in 1989.[19]

(ii) Hypothesis II: we find evidence that supports the long-run equivalence between the actual and BOPE growth rates in China: independently of the lag order, the three AR specifications considered in Table 1 return estimates of the constant that are not significantly different from zero. The upshot of this analysis, therefore, is that $ydiff_t$ is a zero-mean stationary process: in other words, actual growth in China tends to be equal to the BOPE growth rate on average, as short-term divergences between the two rates do not last. Indeed, the calculated half-lives (between about seven months and one year, depending on the AR specification) indicate that deviations from the long-run equilibrium are not very persistent either.

(iii) Hypothesis III: The test results reject the hypothesis that y_{Bt} does not differ significantly from y_t^T. Indeed, although the estimated constant term is not significant and the null H_0: $\beta = 1$ is not rejected, the joint hypothesis H_0: $(\alpha, \beta) = (0, 1)$ is marginally rejected by the data with a p-value of 0.044. However, as it turns out, this outcome is entirely due to the less reliable beginning-of-period estimate for y_{Bt}: if the year 1981 is excluded from the sample, the F-statistic on the joint null is 2.35, with a p-value of 0.114. For completeness, we also run the test for the actual growth rate y_t. As expected, in this case we reject the null hypothesis, as the estimated $\hat{\beta}$ is not significantly different from zero. This is in line with the proposition that the BOPE growth rate should be thought of as a long-term growth rate from which economies can deviate in the short-run.

Additionally, the BOPE growth theory makes the clear prediction that actual growth rates above (below) the BOPE growth rate in the short-term (i.e., when $ydiff_t > 0$ ($ydiff_t > 0$)) should give rise to negative (positive) changes in the current account. Fig. 5 shows that this is, indeed, the case for China: there is a negative correlation, significant at the 5 percent level, between the current account (as a share of GDP) and $ydiff_t$. The coefficient estimate is consistent with the current account share falling by about 0.5 percentage

[18] The very high BOPE growth rate estimate for the early 1980s reflects a similarly high trend growth rate of export volume in 1981–1982 (16.4% on average), in particular relative to the trend growth rate of import volume (9.1% on average).

[19] As noted by a referee, since the key assumption in the BOPE growth approach is that $x_t = m_t$ in the long-run, an alternative way to test this hypothesis is to investigate the stationarity properties of the $(x_t - m_t)$ series. We carried out unit root tests on $(x_t - m_t)$ and found that the DF-GLS tests strongly reject the null of a unit root, while the KPSS cannot reject the null of stationarity. The results are reported in Appendix A, Table A.1.

Table 1
Tests of Hypotheses I, II and III.
Source: Authors.

Hypothesis I: Unit root tests on $ydiff_t$			
	DF-GLS	KPSS	ZA
	−3.109**	0.124	−5.086*
Hypothesis II: Test based on $ydiff_t = \theta + \sum_{i=1}^{l} \lambda_i ydiff_{t-i} + \upsilon_i$			
$ydiff_{t-1}$	0.501**	0.773**	0.713**
$ydiff_{t-2}$	–	−0.309^	−0.329
$ydiff_{t-3}$	–	–	−0.066
Constant	0.044	−0.226	−0.372
R-squared	0.428	0.382	0.389
Half-life	1.004	0.902	0.606
Hypothesis III: Test based on $y_{Bt} = \alpha + \beta y_t^T + u_t$			
y_t^T	0.921**	–	
y_t	–	0.457	
Constant	2.028	6.504^	
R-squared	0.332	0.115	
F-statistic on H_0: $\beta = 1$	0.53	2.61	
F-statistic on H_0: $(\alpha, \beta) = (0, 1)$	3.46	1.90	

Notes: **, * and ^ indicate, respectively, significant at the 1%, 5% and 10% 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.

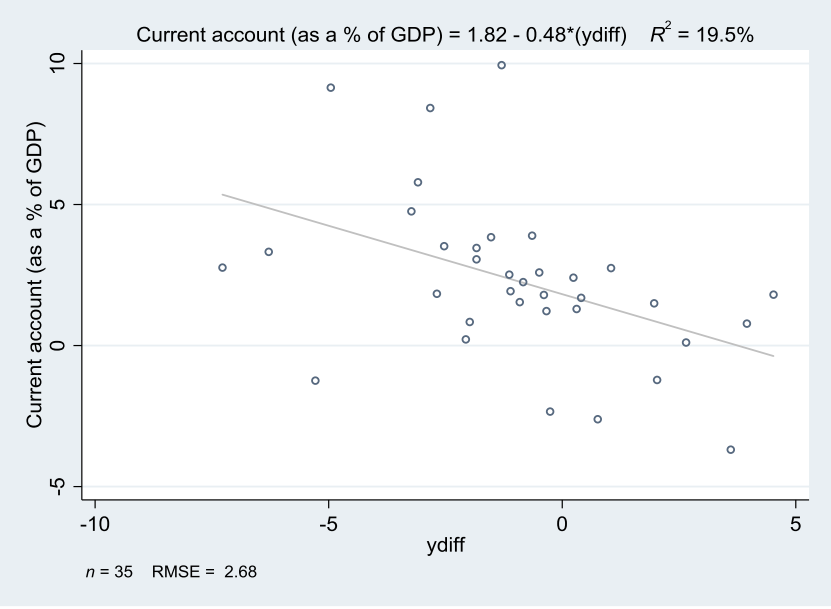

Fig. 5. Relation between the current account (as a share of GDP) and deviations of actual growth from the BOPE growth rate in China, 1981–2016. Source: Authors.

points for each percentage point of actual growth higher than the BOPE growth rate. Comparing this finding with the absence of a significant correlation between the current account (as a share of GDP) and actual growth (Fig. 1) reinforces the notion that the BOPE growth framework is the appropriate approach to analyze China's ELG process.

Summing up, we find qualified support for the hypothesis that China's long-run growth performance reflects very closely the dynamics of its BOPE growth rate. We stress the implication that FDI (capital flows in general) do not matter for long-run growth. We conclude that the demand-side explanation of the PRC's long-run growth performance fits the data well, both for its fast-growing years and for the recent growth slowdown phase, when declining actual growth has been mirrored by a similarly falling BOPE growth

rate. Seen in this light, the significant decrease in China's trend growth rate from the mid-2000s onwards is primarily explained by demand-side factors, reflected in the fall in the PRC's export growth rate and BOPE growth rate. These dynamics may be (at least partly) cyclical but, just like China's rise to become a major world exporter, structural factors may also be playing an important role. This latter case would cast doubts on the possibility of China's trend growth to return to the fast rates that characterized the years before the GFC. According to the BOPE growth approach, the answer to this question depends critically on the role played by the determinants of y_{Bt} and π_t. An investigation of these determinants becomes crucial from an economic policy viewpoint.

5. The determinants of China's BOPE growth rate and the income elasticity of imports: a Bayesian Model Averaging approach

Faced with the uncertainty of determining a priori the determinants of economic growth, several studies have recently implemented various model selection procedures that help ascertain which variables are "robustly" correlated with economic growth (e.g., Sala-i-Martin et al., 2004; Lanzafame 2016). In this paper, we rely on one such methodology – specifically, the Bayesian Model Averaging (BMA) approach developed by Magnus et al. (2010) for estimation of classical linear regression models with uncertainty about the choice of the explanatory variables, to investigate the determinants of China's BOPE growth rate and of the income elasticity of imports. We saw in the previous section that both varied significantly during the estimation period.

This estimator is based on a classical linear regression framework with two subsets of explanatory variables, "focus regressors and auxiliary regressors". The former are explanatory variables always included in the model because of theoretical reasons or other considerations about the phenomenon under investigation. The latter are additional explanatory variables whose inclusion in the model is less certain. The problem of model uncertainty and variable selection arises because different subsets of auxiliary regressors could be excluded from the model to improve (in the mean squared error sense) the unrestricted ordinary least squares estimates. When there are k_2 auxiliary regressors, the number of possible models to be considered is 2^{k_2}.

The BMA estimator provides a coherent method of inference on the regression parameters of interest, by taking explicit account of the uncertainty due to both the estimation and the model selection steps. This Bayesian estimator uses conventional noninformative priors on the focus parameters and the error variance, and a multivariate Gaussian prior on the auxiliary parameters. The unconditional BMA estimates are obtained as a weighted average of the estimates from each of the possible models in the model space, with weights proportional to the marginal likelihood of the dependent variable in each model. An auxiliary regressor is considered to be robust if the *t* ratio on its coefficient is greater than one in absolute value or, equivalently, the corresponding one-standard error band does not include zero. Alternatively, researchers can rely on their posterior inclusion probabilities (pip). Specifically, Masanjala and Papageorgiou (2008) suggest that a posterior inclusion probability of 0.5 corresponds approximately to a *t* ratio of one in absolute value.

5.1. Data and empirical analysis

Our selection of potential determinants of y_{Bt} and $\hat{\pi}_t$ is based on insights from the international trade literature. In particular, focusing on the trade slowdown that followed the Great Recession, several recent studies (e.g., Hong et al., 2016; Martinez-Martin 2016) highlight a number of possible channels that could affect the volume of international trade and the trade elasticities. Based on data availability, we consider the following:

- *The composition of Aggregate Demand (AD)*. The various AD components are characterized by different import intensities (e.g., investment and exports are typically more import-intensive than consumption), so that the same level or growth rate of output and aggregate demand can give rise to different import volumes and, therefore, a different IEoI.[20] As discussed earlier, this intuition is the basis for the relationship embedded in Eq. (5) (BOPE approach) and the reason why the BOPE growth model is an appropriate framework to study long-run growth. Our BMA analysis takes account of this by controlling not only for the various components of AD (i.e., exports, investment, consumption, government expenditure) but also for the determinants of the latter and in relation to their specific origin. The Chang et al. (2016) dataset is particularly suitable for this type of analysis, as it provides information on the features of income allocation by various agents in the economy (e.g., households, government, etc.), as well as the structural composition of the AD. These features can be expected to play a significant role in determining both y_{Bt} and $\hat{\pi}_t$;
- *Global value chains (GVCs)*. GVCs affect global trade dynamics. China's exports contain a significant share of imported goods. China is at the center of many GVCs. Following Martinez-Martin (2016), we use the share of intermediate goods in total imports as a proxy for China's degree of integration into GVCs;
- *Inflows of Foreign Direct Investment (FDI)*. The stocks of inward FDI can have a substitution effect on the domestic demand for imports, thus affecting the IEoI. We control for this by introducing in our BMA analysis the share of inward FDI in total value added;
- *Trade Barriers*. All else constant, protectionist measures (e.g., non-tariff barriers such as quality standards or health regulations)

[20] Building on this point, Bussière et al. (2013) have recently proposed to analyze trade dynamics and trade elasticities relying on their relationship with an import Intensity-Adjusted Demand (IAD), rather than GDP (or internal demand). They show that the IAD turns out to be very useful in explaining the so-called Great Trade Collapse of 2008–2009.

Table 2
Variables and data sources.

Variable	Description	Source
List of variables used for the estimation of y_{Bt}		
m_t^T	Trend growth rate of imports.	Merchandise: Trade value, volume, unit value, terms of trade indices and purchasing power index of exports, annual, 1980–2016: UNCTAD.
rp_t	Relative price of imports.	Merchandise: Trade value, volume, unit value, terms of trade indices and purchasing power index of exports, annual, 1980–2016: UNCTAD.
y_t^T	Trend growth rate of output.	Chang et al. (2016).
x_t^T	Trend growth rate of exports.	Merchandise: Trade value, volume, unit value, terms of trade indices and purchasing power index of exports, annual, 1980–2016: UNCTAD.
List of potential determinants of y_{Bt} and $\hat{\pi}_t$ included in the BMA analysis		
lys	Labor income share in total value added.	Chang et al. (2016)
sr	Saving rate as percentage of total value added: total.	Chang et al. (2016)
sr_hh	Saving rate as percentage of total value added: households.	Chang et al. (2016)
sr_nfe	Saving rate as percentage of total value added: non-financial enterprises.	Chang et al. (2016)
sr_fi	Saving rate as percentage of total value added: financial institutions.	Chang et al. (2016)
ln_avrw	Logarithm of aggregate average real wages.	Chang et al. (2016)
fai	Fixed asset investment as percentage of total value added.	Chang et al. (2016)
hhc	Household consumption by expenditure as percentage of total value added.	Chang et al. (2016)
gc	Government consumption by expenditure as percentage of total value added.	Chang et al. (2016)
gkf	Gross capital formation as percentage of total value added.	Chang et al. (2016)
gfkf	Gross fixed capital formation as percentage of total value added.	Chang et al. (2016)
gfkf_gov	Gross fixed capital formation as percentage of total value added: government.	Chang et al. (2016)
gfkf_ps	Gross fixed capital formation as percentage of total value added: private sector, excluding government, households, SOEs, and other non-SOEs.	Chang et al. (2016)
gfkf_hh	Gross fixed capital formation as percentage of total value added: households.	Chang et al. (2016)
fdi	Inward foreign direct investment as percentage of total value added.	World Development Indicators: World Bank.
gvc	Intermediate goods as percentage of total imports.	Bilateral Trade in Goods by Industry and End-use (BTDIxE), ISIC Rev.4: OECD.

can reduce trade volumes and, consequently, affect y_{Bt} and π_t. Following Martinez-Martin (2016), we control for this by relying on an index of Temporary Trade Barriers (TTBs) constructed by Bown (2012).

The BMA analysis of the determinants of y_{Bt} and $\hat{\pi}_t$ is carried out with a total of 17 potentially robust regressors, listed in Table 2. We initially considered a larger number of possible determinants, fully exploiting all the information included in the Chang et al. (2016) dataset. However, many variables in the dataset can be considered as close alternatives, so that several of these were dropped from the analysis because of collinearity – including Bown's TTBs index.

The BMA results are reported in Tables 3 and 4. Table 3 focuses on the robust determinants of y_{Bt} – thus, we include the trend growth rate of exports as a focus regressor, while the other 16 possible determinants of the BOPE growth rate are considered as

Table 3
BMA estimates of robust determinants of $y_{Bt.}$
Source: Authors.

	Coefficient	Std. Err.	t_stat	pip	1-Std. Err. Bands	
x_t^T	**0.238**	**0.194**	**1.23**	**1.00**	**0.045**	**0.432**
lys	**−0.511**	**0.358**	**−1.43**	**0.73**	**−0.869**	**−0.152**
sr	0.120	0.293	0.41	0.25	−0.173	0.414
sr_hh	−0.028	0.145	−0.19	0.11	−0.173	0.118
sr_nfe	**0.339**	**0.341**	**0.99**	**0.59**	**−0.003**	**0.680**
sr_fi	**2.192**	**1.979**	**1.11**	**0.66**	**0.213**	**4.171**
ln_avrw	**−12.858**	**2.684**	**−4.79**	**1.00**	**−15.542**	**−10.174**
fai	**0.429**	**0.278**	**1.54**	**0.82**	**0.151**	**0.707**
hhc	**−0.862**	**0.620**	**−1.39**	**0.86**	**−1.482**	**−0.241**
gc	**−0.891**	**0.756**	**−1.18**	**0.65**	**−1.647**	**−0.135**
gkf	**−0.890**	**0.775**	**−1.15**	**0.65**	**−1.666**	**−0.115**
gfkf	−0.022	0.217	−0.10	0.22	−0.238	0.195
gfkf_gov	−0.375	0.769	−0.49	0.36	−1.144	0.394
gfkf_ps	**−0.272**	**1.419**	**−0.19**	**0.57**	**−1.691**	**1.147**
gfkf_hh	0.031	0.286	0.11	0.29	−0.254	0.317
fdi	−0.002	0.126	−0.01	0.10	−0.128	0.124
gvc	−0.001	0.059	−0.01	0.15	−0.060	0.059
Model space: 65,536 models						

Table 4
BMA estimates of robust determinants of $\hat{\pi}_t$.
Source: Authors.

	Coefficient	Std. Err.	t_stat	pip	1-Std. Err. Bands	
x_t^T	**0.048**	**0.028**	**1.73**	**0.84**	**0.020**	**0.075**
lys	0.009	0.036	0.25	0.14	−0.027	0.045
sr	0.003	0.033	0.09	0.18	−0.030	0.036
sr_hh	0.011	0.037	0.29	0.15	−0.026	0.048
sr_nfe	0.008	0.023	0.35	0.18	−0.015	0.030
sr_fi	−0.003	0.069	−0.04	0.11	−0.072	0.066
ln_avrw	**2.227**	**0.801**	**2.78**	**0.96**	**1.426**	**3.028**
fai	−0.016	0.029	−0.54	0.33	−0.045	0.013
hhc	**0.228**	**0.067**	**3.41**	**0.96**	**0.161**	**0.295**
gc	0.026	0.076	0.35	0.18	−0.050	0.103
gkf	0.015	0.042	0.35	0.25	−0.0277	0.057
gfkf	0.016	0.033	0.47	0.28	−0.017	0.049
gfkf_gov	0040	0.106	0.38	0.23	−0.066	0.146
gfkf_ps	**−0.184**	**0.220**	**−0.84**	**0.54**	**−0.404**	**0.036**
gfkf_hh	**−0.126**	**0.093**	**−1.35**	**0.74**	**−0.219**	**−0.033**
fdi	−0.004	0.031	−0.13	0.09	−0.035	0.027
gvc	−0.000	0.012	−0.04	0.12	−0.012	0.011
Model space: 131,072 models						

auxiliary regressors. As can be seen, nine variables (shown in bold) were selected by the BMA approach as robust determinants of China's y_{Bt}, under either of the abovementioned criteria, i.e., a *t* ratio higher than one in absolute value, or a pip value greater than 0.5. The labor income share (*lys*), the average real wage (*ln_avwr*), household (*hhc)* and government consumption (*gc)* all enter with a negative sign, as expected. As household incomes and the share of consumption in total value added increase, *ceteris paribus*, domestic absorption increases too, thus lowering the growth rate of exports and the BOPE growth rate. The same reasoning can be used to interpret the positive sign on the coefficient of the saving rates of non-financial institutions (*sr_nfe*), as well as of financial institutions (*sr_fi*). Meanwhile, for the remaining robust regressors we find a positive sign in the case of fixed asset investment (*fai*), and a negative sign for gross fixed capital formation of the whole economy (*gkf*) and gross fixed capital formation of the private sector (*gfkf_ps*). The interpretation of these results is less clear-cut, at least *a priori*. As mentioned above, as an import-intensive component of AD, investment (and, thus, capital accumulation) increases the IEoI. At the same time, however, investment can be expected to have a positive impact on the economy's export capability and performance. The overall impact on y_{Bt}, therefore, is an empirical question. In the case of China, the positive effect on export growth appears to exceed that on the IEoI only in the case of fixed asset investment.

Table 4 reports the BMA results from our search for robust determinants of $\hat{\pi}_t$. Recall that the income elasticity of imports captures the non-price competitiveness attributes of China's imports. One would expect the import elasticity to have increased over time, reflecting among other things the increase in imports of machinery (which reached about 45 percent of total imports in the early 1990s and in the early 2000s) and of sophisticated consumer products, as China's income increased. This is indeed China's experience until the early 2000s. Since then, the IEoI has undergone a significant decline. We will return to this point in Section 6.

Since in the case of the IEoI there is no clear theoretical approach advising about the number of possible focus regressors, all 17 variables in the analysis were considered as auxiliary regressors. The BMA analysis selected five as robust determinants of the IEoI: the trend export growth rate (x_t^T); the average real wage (*ln_avwr*); household consumption (*hhc)*, which enter with the expected positive sign; gross fixed capital formation of the private sector (*gfkf_ps*); and the household sector (*gfkf_hh*), both with a negative sign.

It is also worth noting that foreign direct investment inflows (*fdi*) do not turn out to be one of the robust regressors in our BMA analysis. This may be due to the fact that these inflows affect the BOPE growth rate through the effects on capital accumulation and knowledge spillovers, picked up in our analysis via the physical capital accumulation proxies and the *gvc* index (intermediate goods as percentage of total imports). Indeed, once the latter variables are taken out of the set of robust regressors, *fdi* is selected as significant by the BMA estimator.[21]

Overall, the picture that emerges from the BMA analysis is one in which, since the early 1980s, the trajectory of the BOPE growth rate in China has been primarily influenced by the dynamics of particular components of aggregate income and aggregate demand. As neatly summarized in the simple specification of the BOPE growth rate, export growth has acted as an engine of growth and, at the same time, as a check on output growth via its direct and indirect effects on import growth and the BOPE. In the next section, we explore the links between these mechanisms underlying the BOPE growth and the hypothesis of a New Normal of slower growth in China.

[21] Supporting this view, Granger-causality tests (Granger 1969) confirm the significant causality running from *fdi* to: (i) gross fixed capital formation as percentage of total value added (*gfk*); (ii) gross fixed capital formation as percentage of total value added: households (*gfkf_hh*); and (iii) intermediate goods as percentage of total imports (*gvc*). To save space, these results are not included in the paper: They are available from the authors upon request.

6. The New Normal and China's BOPE growth rate

Lin et al. (2018) have argued that, having achieved a much larger share of world exports (13.7 percent in 2015) than comparator economies at a similar stage of development, China may have exhausted the gains from export-led growth.[22] The rationale is that since it will be increasingly difficult for China's export growth to outpace world trade growth, the country's economic performance will gradually become more dependent on the dynamics of domestic demand. Far from being in contrast with policy objectives, this switch to a new growth model is an integral part of China's new growth strategy. Specifically, faced with growing imbalances created by two decades of breakneck export-led and investment-based growth, in the early 2000s, China's policymakers started pursuing a rebalancing of the economy. The focus and objective of this strategy has been the implementation of a growth model characterized by less dependence on exports and investment and greater emphasis on private consumption, as a driver of economic growth. This commitment to rebalance the economy to ensure sustainable growth is explicitly embedded in China's 12th (2011–2015) and 13th (2016–2020) 5-year plans. The price to pay for the advantages associated with a more balanced economic environment is a gradual slowdown in growth.[23]

The outcome of our analysis, indicating a significant decline in China's BOPE growth rate from the early 2000s onwards, is in line with this 'New Normal' of slower growth fostered by the rebalancing, which has had an effect on the two key elements of the BOPE growth rate, i.e., export growth and the IEoI. On the first element, examining China's rebalancing along the external, internal, environmental and distributional dimensions, Zhang (2016) finds that significant progress has been made with respect to external rebalancing – that is, the transition from external to domestic demand as the key driver of overall aggregate demand (AD). This is a significant part of the new economic environment pursued by China's policymakers and implies a switch from export-led growth to a more broad-based growth model. China's export growth rate has, indeed, declined significantly from the mid-2000s onwards – averaging about 8 percent over 2011–2016, down from about 18.6 percent in 2000–2010. The question is whether this trend is simply a reflection of the world growth and trade slowdown in the aftermath of the Great Financial Crisis (GFC) and, thus, a cyclical occurrence; or whether it reflects (at least to a certain extent) external rebalancing forces and, thus, a structural shift to a new growth model. If it is cyclical, that is if global output and trade growth return to pre-GFC rates, China's export growth should return to similarly high pre-GFC rates too. This would be consistent with China's income elasticity of exports (IEoE) remaining relatively stable in the post-GFC period. On the contrary, if it is a structural shift and consistent with Lin et al. (2018) argument indicating a declining IEoE in the post-GFC years, China's export growth should not be expected to return to pre-GFC rates.

To investigate these two hypotheses, we rely on the Kalman filter methodology to produce a time-varying estimate of China's income elasticity of exports from the following state-space model:

$$x_t^T = \eta_t rp_t + \varepsilon_t z_t^T + u_t \tag{11}$$

$$\eta_t = \eta_{t-1} + \varsigma_t \tag{12}$$

$$\varepsilon_t = \varepsilon_{t-1} + \zeta_t \tag{13}$$

where x_t^T is the trend growth rate of export volume; $rp_t = (p_{dt} - p_{ft})$; z_t^T is the trend growth rate of world output (measured in international dollars); η_t and ε_t are, respectively, the price and income elasticity of exports.

As shown in Fig. 6, we find that the IEoE has declined significantly from the early 2000s onwards, in line with the structural shift hypothesis. This outcome is consistent with the evidence in favor of external rebalancing presented by Zhang (2016) and implies that the fall in China's export growth depends to a large extent on the gradual switch to a new growth model, less dependent on exports and, therefore, on the dynamics of the global economy. Crucially, the falling IEoE is also in line with our estimate of China's BOPE growth rate declining after the GFC. Specifically, the BOPE growth framework implies that, for a given income elasticity of imports, the growth rate consistent with BOP equilibrium (equal to $y_{Bt} = x_t^T/\hat{\pi}_t$) will decrease as the average export growth performance deteriorates.

As revealed by the empirical analysis in this paper, far from being fixed, the IEoI is a time-varying parameter whose path depends on the structural changes in the economy. Indeed, our estimates (Fig. 3) show a pronounced decrease in the IEoI from the mid-2000s onwards which, as the BMA results suggest, can also be associated to rebalancing mechanisms. Specifically, apart from a decline in export growth, rebalancing requires less focus on physical capital accumulation and more on consumption. All of these are factors highlighted by the BMA analysis as robust determinants of the IEoI as well as the BOPE growth rate (Tables 3 and 4). As a result, the composition of China's aggregate demand (AD) will be gradually changing toward one in which the shares of exports and investment are lower, in favor of an increase in the share of private consumption. Since these AD components are characterized by different import intensities, the rebalancing-driven changes in the composition of aggregate demand will have an impact on the value of the income elasticity of imports and, therefore, on the BOPE growth rate.

To formalize this argument, note that the IEoI can be specified as a weighted average of the elasticities associated to the individual AD components:

$$\pi_t = \pi_t^C \frac{C_t}{Y_t} + \pi_t^I \frac{I_t}{Y_t} + \pi_t^X \frac{X_t}{Y_t} + \pi_t^G \frac{G_t}{Y_t} \tag{14}$$

[22] UNCTAD data indicate that, after peaking in 2015, China's share of world exports has declined and was 12.8 percent in 2018.

[23] We need to add that China's lower growth rate is also the result of the fact that it is approaching the frontier.

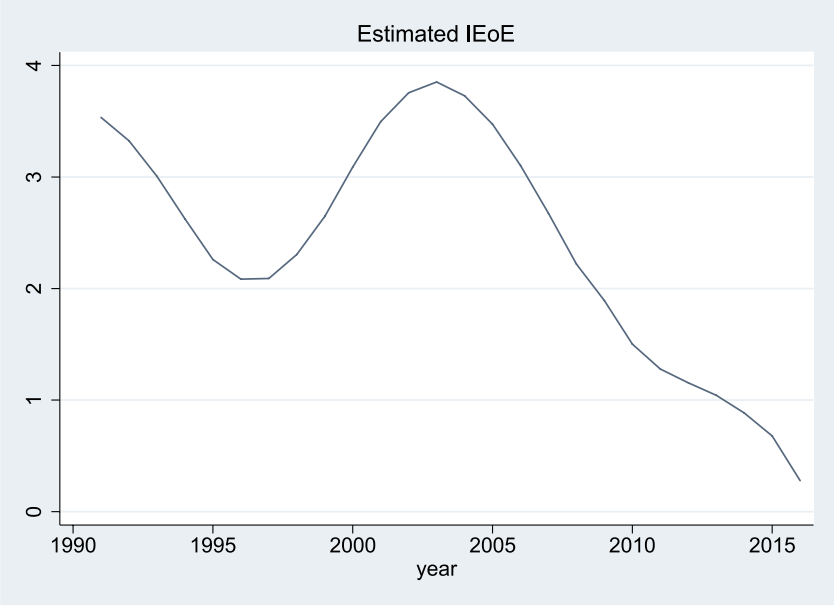

Fig. 6. Estimated income elasticity of exports (IEoE), 1991–2016.
Source: Authors.

where the weights are given by the respective shares of the individual AD components. The overall impact on the IEoI will be the combined effect of changes in the shares of the AD components and of changes in the import intensities of private consumption, investment, exports and government consumption.

To investigate how the decomposition in (14) helps shed light on the declining trend of China's IEoI from the mid-2000s onwards, we use data from the World Input-Output Database (WIOD) to construct measures of the contributions of the various components of AD on the IEoI. Specifically, we use WIOD data on the share of foreign value added (FVA) in private consumption, investment, exports and government consumption, to construct measures of the elasticity of imports for each one of these AD components over 2001–2014 – the longest time series for which data are available.[24] As the decomposition in (14) shows, the product of these elasticities times their respective shares in AD provides an approximation of the contribution of each one of the AD components to the overall income elasticity of imports. These are shown in Panel (b) of Fig. 7. Panel (a) includes the Kalman-filter-estimated IEoI from the state-space model in Eqs. (7)–(9), as well as the IEoI obtained from the decomposition in (14), as a weighted-average of the contributions of the individual AD components. Meanwhile, Panel (c) shows the shares of the four AD components and Panel (d) displays their respective import elasticities.

Although the weighted-average IEoI series is affected by short-term variations, the two series in Panel (a) display a similar decreasing pattern and have a correlation coefficient of 0.57 (significant at the 5 percent level). This suggests that the Kalman-filter-estimated IEoI is broadly consistent with the decomposition based on WIOD data – an outcome which, again, supports the view that the BOPE growth rate post-GFC declining trend reflects rebalancing-driven changes. Panel (b) gives us a more detailed insight into the nature of these changes. We can see that the individual contributions of all AD components were increasing in the early 2000s, thus leading to a rising aggregate IEoI. Panel (d) shows that this is associated with similar trends for the individual IEoIs for the four AD components. This pattern likely reflects China's entry into the World Trade Organization (WTO) in 2001, which led to greater trade liberalization and turned the country into the world's manufacturing factory and leading to a rise in import intensity of all AD components. From the mid-2000 onwards, however, the series in both Panels (b) and (d) display a declining trend, which becomes particularly pronounced for private and government consumption in the early stages of the GFC, before turning positive in 2008–2009 and then negative again. While the changes around 2007 are likely a reflection of the global trade slowdown leading to a substitution of domestic production for imports, the upward trends in 2008–2009 can be associated to the effects of the RMB 4 trillion stimulus package approved in November 2008, and disbursed during 2009–2010, to mitigate the negative effects of the GFC on growth. The program had a monetary component and a fiscal component. On the monetary side, authorities cut both the reserve ratio policy interest rates, and a gradual appreciation of the yuan alleviated inflationary pressures. On the fiscal side, the program focused on increasing infrastructure investment (particularly transport and energy) and social welfare spending (healthcare and environmental projects). The central bank financed only about a quarter of the stimulus. State-owned banks financed the rest. Credit grew quickly as a result. The stimulus package is considered to have played a key role in supporting the Chinese economy as it generated large multiplier effects on overall output, in part creating additional demand by encouraging private investment and consumption

[24] For each one of the AD components, the elasticity of imports is constructed as the ratio between the growth rate in foreign value added and the growth rate in the AD component.

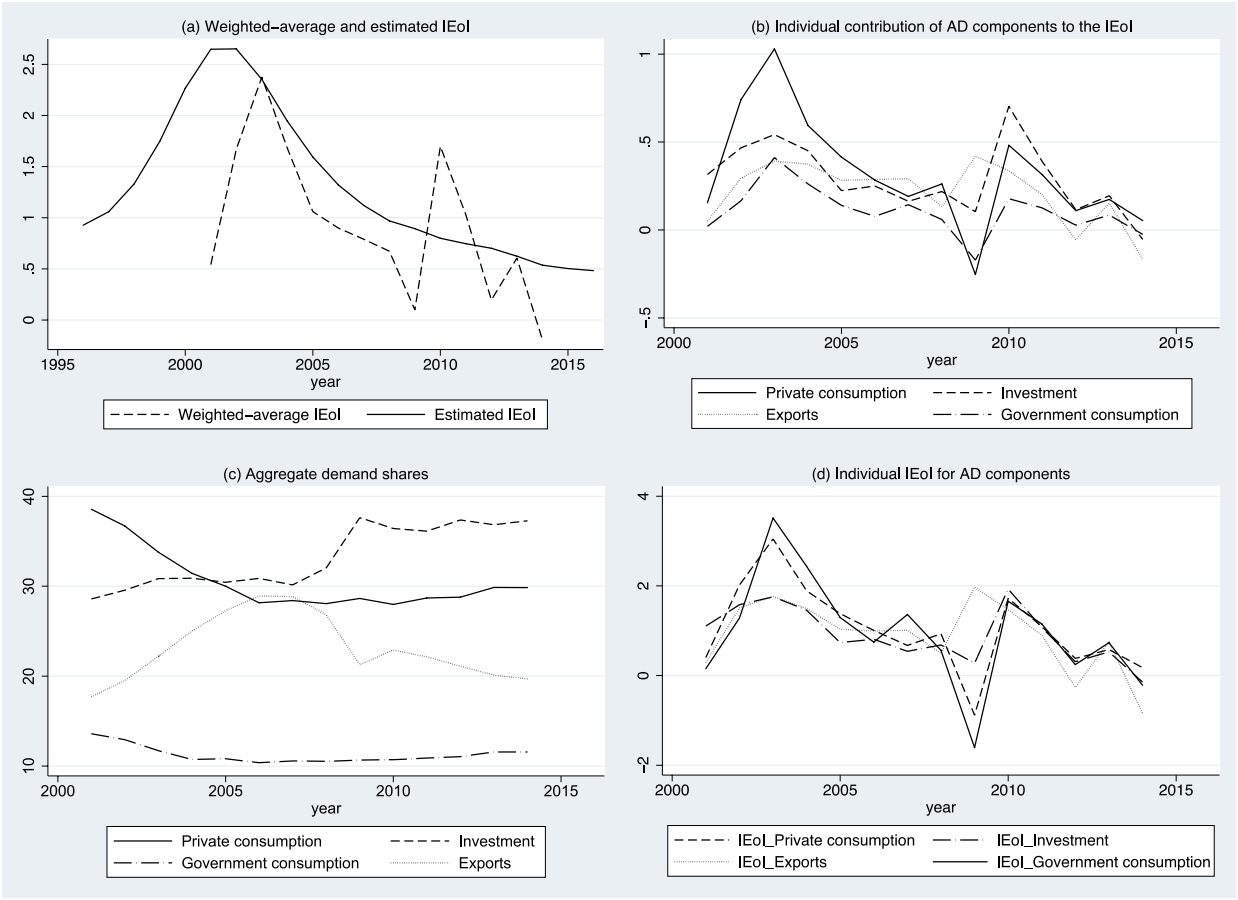

Fig. 7. Decomposition of the income elasticity of imports (IEoI), 2001–2014.
Source: Authors based on WIOD data.

(McKissack and Xu 2011; Fardoust et al., 2012). These investments likely raised the import intensity of aggregate demand – e.g., via the imports of final and intermediate inputs needed for infrastructure investment and the boost to private consumption associated to a more inclusive social welfare system.[25]

Setting aside this short-term variation, the data are consistent with a significant decline in the individual IEoIs of the AD components in the post-GFC period. In particular, the average IEoI for consumption declined from 1.62 in the pre-GFC 2001–2006 to 0.51 over 2009–2014. The respective figures for investment are 1.24 and 0.66, for exports 1.18 and 0.66, and for government consumption, 1.57 and 0.33. While a full-fledged assessment of the determinants of this trend is beyond the scope of this paper, these results are consistent with the evidence presented by Kang and Liao (2016) pointing to increasing onshoring – substitution of imported intermediate inputs with domestic production – since mid-2000s. The WIOD data we rely upon are also consistent with a significant role played by onshoring, indicating that the FVA shares for all the four AD components declined during 2001–2014 and, in particular, from their peak values in the mid-2000s. Specifically, the FVA share in consumption decreased from 15.8 percent in 2005 to 11.6 percent in 2014; the FVA share in investment declined from 27.5 to 17.3 percent; the FVA share in exports declined from 23 to 16 percent; and the FVA share in government consumption declined from 11 to 8 percent (see Fig. B.1 in Appendix B).

Finally, Panel (c) in Fig. 7 provides a visual representation of the effect of rebalancing and the gradual shift away from the export-led growth model on the AD shares. While the government consumption share remained fairly stable during 2001–2014, the pre-GFC years show a substantial increase in the export share (from 18.2 to 28.9 percent between 2000 and 2006) and a similarly large fall in the consumption share (from 39.3 to 28.2 percent), with the investment share remaining steady at 28–30 percent. These dynamics gave rise to large external imbalances, in the form of substantial current account surpluses. The effects of external rebalancing are revealed by the significant post-GFC decline in the export share (to about 19.7 percent in 2014). However, as pointed out by Zhang (2016), this trend was not associated to similar progress for internal rebalancing – indeed, the imbalance between the components of domestic AD worsened as the investment share surged to about 36–37 percent during 2009–2014, while the consumption share

[25] Estimates of the macroeconomic effects of China's fiscal stimulus in Cova et al. (2011) and He et al. (2009) are consistent with a significant impact on imports.

started increasing gradually only in 2011 and is estimated at about 29.8 percent in 2014.

To sum up, the significant post-GFC decline in the Kalman-filter-estimated IEoI, displayed in Fig. 3, appears to be in line with the rebalancing-driven dynamics shown in Fig. 7. Together with the decline in the income elasticity of exports, this evidence supports the view that the fall in China's BOPE growth rate from the mid-2000s onwards is indeed linked to rebalancing and consistent with the contention that the country has entered a New Normal of slower, less export-led growth.

7. Conclusions

This paper has analyzed China's growth experience since the early 1980s. We have hypothesized that it is consistent with an export-led growth explanation. China's remarkable growth performance since reforms began has been associated to a similarly significant growth rate of its exports. A comprehensive analysis of China's long-run growth can be understood as an export-led growth process according to which the country had to export in order to pay for its import needs. This means that the long-term constraint on long-run growth was the need to maintain current account BOP equilibrium. We have referred to the maximum growth rate the country could achieve without running into balance-of-payments problems, as the balance of payments equilibrium (BOPE) growth rate. We have shown that this a function of the growth rate of exports and the income elasticity of imports.

Based on this, we have implemented a time-varying parameter approach to estimate China's BOP equilibrium growth rate. We find that the average value of China's y_{Bt} estimate for 1981–2016 is about 11 percent, although it varied significantly over time and has declined notably after 2007. This rate approximates very well China's long-run growth rate trend. Today, China's BOPE growth rate is a much lower 5.9%. Standard tests support the hypothesis that trend growth in China is significantly associated to the BOPE growth rate.

Our search for the determinants of China's BOPE growth rate, based on the BMA approach, underlines the role of aggregate demand composition as the main driving force, both for its direct effects on the income elasticity of imports and for the indirect effects on exports growth via capital accumulation (and, in particular, fixed asset investment). These findings are reinforced by the analysis of the effects of the rebalancing strategy pursued by China from the early 2000s onwards, which shows how the post-GFC decline of China's BOPE growth rate is consistent with the significant progress the country has made with respect to the external dimension of rebalancing as well as with the impact of onshoring.

The results presented in this paper on the primary role played by demand factors as determinants of China's long-run growth should not be interpreted as dismissing entirely supply-side explanations: as mentioned, China's exceptional growth performance can only be explained considering the interaction of demand and supply factors. For instance, there is some evidence that the latter help explain China's trade and growth performance during the GFC. Recent findings by Eaton et al. (2016) indicate that, while globally the 2008–2009 decline in trade was mainly due to negative shocks to investment efficiency in durables (i.e., technology shocks), China was the only country to experience growth in durables investment efficiency during the GFC, so that the relatively modest fall in trade is explained by positive productivity shocks. While not in contrast with this short-run evidence, the findings in this paper imply that, in the long-run, the dynamics of aggregate demand and its composition have outweighed the role of supply-side shocks in China.

It is worth noting that our analysis is also related to another strand of the literature, that focusing more generally on the relationship between trade and income (e.g., Frankel and Romer 1999; Feyer 2009). These contributions rely on exogenous geographical variations to investigate the direction of causality between trade and income via an instrumental variable approach. Findings suggest that the typical result of a significant correlation between the two variables, obtained via least-squared estimation methods, does indeed reflect a causal link from trade to per-capita income. Our approach shares with this literature the general focus on trade as a driver of growth, by explicitly recognizing that export-led growth should be analyzed considering the role of both export *and* import growth in a BOPE growth model. The difference lies in the essential notion conveyed by the BOPE growth model – that is, that more (less) trade will not necessarily always lead to higher (lower) long-run growth, but only as long as more (less) trade leads to a higher BOPE growth rate.

Related to this point, the upshot of our analysis is that the future dynamics of China's BOPE growth rate, and thus its long-run growth performance, will depend on the features of its switch from export-led growth to a new growth model, reflected in the ongoing structural change and rebalancing strategy. In particular, if the expected transition towards a consumption-driven economy occurs at a steady pace, China is likely to gradually follow the standard path towards 'economic maturity', associated with a decline in fixed asset investment, a rise in the labor income share, and a higher share of private consumption in GDP. Based on our BMA estimates, all of this points to a further decline in the BOPE growth rate. However, the extent of this decline will depend on the effects of rebalancing on the IEoI which, as shown in Section 6, may be significant. In particular, if external and internal rebalancing go together (not only with slower export growth but also with a lower IEoI), China's BOPE growth rate may not be significantly affected. Indeed, such a scenario would signal that policy efforts directed at rebalancing have been successful in achieving the objective of switching to a new and sustainable long-run growth model, focused on consumption (rather than exports and investment) as a key driver of growth. Seen in this light, the future trajectory of China's BOPE growth rate will define the shape of the country's New Normal.

Appendix A. Unit root and stationarity tests

Table A.1

Table A.1
Unit root and stationarity tests on $(x_t - m_t)$.

	DF-GLS	KPSS
Test with no deterministic trend	−6.481**	0.111
Tests with deterministic trend	−6.549*	0.082
	ZA	
Break in intercept	−7.112**	
Break in trend	−7.201**	
Break in intercept and trend	−7.155**	

Notes: ** indicates significant at the 1% level; Lag-selection performed with a general-to-simple procedure, setting the maximum number of lags to 3.
Source: Authors.

Appendix B

Fig. B.1

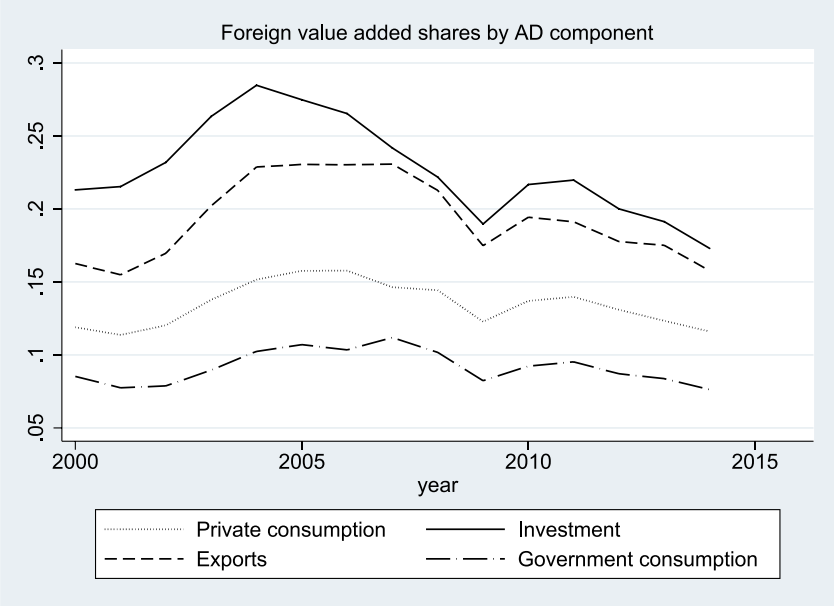

Fig. B.1. Foreign valued added shares in China's AD components.
Source: WIOD data.

References

Alonso, J.A., 1999. Growth and the external constraint: lessons from the Spanish case. Appl Econ 2, 245–253.
Ang, J., Madsen, J.B., Robertson, P., 2015. Export performance of the Asian miracle economies: the role of innovation and product variety. Can. J. Econ. 48 (1), 273–309.
Bagnai, A., 2010. Structural changes, cointegration and the empirics of Thirlwall's law. Appl Econ 42, 1315–1329.
Bairam, E., 1993. Static versus dynamic specifications and the Harrod foreign trade multiplier. Appl Econ 25, 739–742.
Borensztein, E., Ostry, J.D., 1996. Accounting for China's economic performance. Am. Econ. Rev. Pap. Proceed. 86, 224–228.
Bown, C.P., 2012. Temporary Trade Barriers Database. The World Bank.
Bussière, M., Callegari, G., Ghironi, F., Sestieri, G., Yamano, N., 2013. Estimating trade elasticities: demand composition and the trade collapse of 2008–2009. Am. Econ. J. Macroecon. 5, 118–151.
Chang, C., Chen, K., Waggoner, D.F., Zha, T., 2016. Trends and cycles in China's macroeconomy. NBER Macroeconomics Annual 30 University of Chicago Press.

Chow, G.C., 1993. Capital formation and economic growth in China. Q. J. Econ. 108, 809–842.
Chow, G.C., 2006. New capital estimates for China: comments. China Econ. Rev. 17, 186–192.
Corbae, D., Ouliaris, S., 2006. Extracting cycles from nonstationary data. In: Corbae, D., Durlauf, S.N., Hansen, B.E. (Eds.), Econometric Theory and Practice: Frontiers of Analysis and Applied Research, eds. Cambridge University Press, New York.
Corbae, D., Ouliaris, S., Phillips, P.C.B., 2002. Band spectral regression with trending-data. Econometrica 70, 1067–1109.
Cova, P., Pisani, M., Rebucci, A., 2011. Macroeconomic Effects of China's Fiscal Stimulus. In: Cheung, Y.W., Ma, G. (Eds.), eds. Asia and China in the Global Economy.
Eaton, J., Kortum, S., Neiman, B., Romalis, J., 2016. Trade and the global recession. Am. Econ. Rev. 106, 3401–3438.
Elliott, G., Rothenberg, T.J., Stock, J.H., 1996. Efficient tests for an autoregressive unit root. Econometrica 64, 813–836.
Fardoust, S., Lin, J./.Y., Luo, X., 2012. Demystifying China's fiscal stimulus. In: World Bank Policy Research Working Paper, pp. 6221.
Feder, G., 1983. On exports and economic growth. J. Dev. Econ. 12, 59–73.
Felipe, J.U.K., Usui, N., Abdon, A., 2013. Why has China succeeded? And why it will continue to do so. Cambridge J. Econ. 37, 791–818.
Felipe, J., McCombie, J.S.L., 2001. Biased technical change, growth accounting, and the conundrum of the East Asian miracle. J. Comp. Econ. 29, 542–565.
Felipe, J., McCombie, J.S.L., 2002. Productivity in China before and after 1978 revisited. Zagreb Int. Rev. Econ. Bus. 5, 17–43.
Feyrer, J., 2009. Trade and Income–Exploiting Time Series in Geography. National Bureau of Economic Research No. w14910.
Frankel, J.A., Romer, D.H., 1999. Does trade cause growth. Am. Econ. Rev. 89, 379–399.
Gordon, R.J., 2003. Exploding productivity growth: context, causes, and implications. Brookings Pap Econ Act 2, 207–298.
Granger, C.W.J., 1969. Investigating causal relations by econometric models and cross-spectral methods. Econometrica 37, 424–438.
Guarini, G., Porcile, G., 2016. Sustainability in a post-Keynesian growth model for an open economy. Ecolog. Econ. 126, 14–22.
Harvey, A., 1989. Forecasting, Structural Time Series Models and the Kalman Filter. Cambridge University Press, Cambridge.
Hausmann, R., Hwang, J., Rodrik, D., 2007. What you export matters. J. Econ. Growth 12, 1–25.
He, D., Zhang, Z., Zhang, W., 2009. How large will be the effect of China's fiscal-stimulus package on output and employment. Pac. Econ. Rev. 14, 730–744.
Heytens, P., Zebregs, H., 2003. How fast can China grow? In: Tseng, W., Rodlauer, M. (Eds.), China Competing in the Global Economy, eds. International Monetary Fund, Washington, DC.
Holz, C., 2006. Response to Gregory C Chow's “new estimates for China” comments. China Econ. Rev. 17, 193–197.
Hong, G.H., Lee, J., Liao, W., Seneviratne, D., 2016. China and Asia in global trade slowdown. In: IMF Working Paper WP/16/105.
Hu, Z.F., Khan, M.S., 1997. Why is China growing so fast? IMF Staff Papers 44, 103–131.
Hussain, M.N., 2004. The balance of payments constraints and growth rate differences among African and East Asian economies. In: McCombie, J.S.L., Thirlwall, A.P. (Eds.), Essays On Balance of Payment Constrained Growth, eds. Routledge, pp. 220–244.
Islam, N., Dai, E., Sakamoto, H., 2006. Sources of growth. In: Wu, Y. (Ed.), Economic Growth, Transition and Globalization in China, ed. Edward Elgar, Northampton, pp. 13–60.
Jeon, Y., 2009. Balance-of-payment constrained growth: the case of china, 1979-2002. Int. Rev. Appl. Econ. 23, 135–146.
Kang, J.S., Liao, W., 2016. Chinese imports: what's behind the slowdown? IMF Working Paper WP/16/106.
Kwiatkowski, D., Phillips, P.C.B, Schmidt, P., Shin, Y., 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: how sure are we that economic time series have a unit root? J. Econom. 54, 159–178.
Lanzafame, M., 2014. The balance of payments-constrained growth rate and the natural rate of growth: new empirical evidence. Cambridge J. Econ. 38, 817–838.
Lanzafame, M., 2016. Potential growth in asia and its determinants: an empirical investigation. Asian Dev. Rev. 33, 1–27.
Lin, J.Y., Zhang, F., 2015. Sustaining growth of the people's republic of china. Asian Dev. Rev. 32 (1), 31–48.
Slowdown in the People's Republic of China: Structural Factors and the Implications for Asia. In: Lin, J.Y., Morgan, P., Wan, G. (Eds.), Slowdown in the People's Republic of China: Structural Factors and the Implications for Asia, eds. Asian Development Bank Institute, Tokyo.
Lin, J.Y., Morgan, P., Wan, G., 2018Ab. Factors affecting the outlook of for medium-to long-term growth in the People's Republic of China. In: Lin, J.Y., Morgan, P., Wan, G. (Eds.), Slowdown in the People's Republic of China: Structural Factors and the Implications for Asia, pp. 220–249.
Magnus, J.R., Powell, O., Prüfer, P., 2010. A comparison of two model averaging techniques with an application to growth empirics. J Econom 154, 139–153.
Marin, D., 1992. Is the export-led growth hypothesis valid for industrialized countries? Rev. Econ. Stat. 74, 678–688.
Martinez-Martin, J., 2016. Breaking down world trade elasticities: a panel ECM approach. In: Banco de España Working Paper No. 1614..
Masanjala, W.H., Papageorgiou, C., 2008. Rough and lonely road to prosperity: a reexamination of the sources of growth in Africa using Bayesian Model Averaging. J. Appl. Economet. 23, 671–682.
Mayer, J., 2017. How could the south respond to secular stagnation in the North? World Econ. 40, 314–335.
McKissack, A., Xu, J.Y., 2011. Chinese macroeconomic management through the crisis and beyond. Asia Pac. Econ. Lit. 25, 43–55.
McCombie, J.S.L., Thirlwall, A.P., 1994. Economic Growth and the Balance of Payments Constraint. Macmillan, Basingstoke.
Pindyck, R.S., 1999. The long-run evolution of energy prices. Energy J. 20, 1–27.
Richardson, P., Boone, L., Giorno, C., Meacci, M., Rae, D., Turner, D., 2000. The concept, policy use and measurement of structural unemployment: estimating a time varying nairu across 21 oecd countries. In: OECD Economics Department Working Papers, No. 250. Paris. OECD Publishing.
Roberts, J.M., 2001. Estimates of the productivity trend using time-varying parameter techniques. Contrib. Macroecon. 1, 1–27.
Sala-i-Martin, X., Doppelhofer, G., Miller, R.I., 2004. Determinants of long-term growth: a Bayesian Averaging of Classical Estimates (BACE) approach. Am. Econ. Rev. 94, 813–835.
Sims, C., 2001. Comments on Sargent and Cogley's evolving post World War II US inflation dynamics. NBER Macroecon. Annu. 16, 373–379.
Tang, C.F., Lai, W.L., Ozturk, I., 2015. How stable is the export-led growth hypothesis? Evidence from Asia's four little dragons. Econ. Model. 44, 229–235.
Thirlwall, A.P., 1979. The balance of payments constraint as an explanation of international growth rate differences. Banca Nazionale del Laboro Quarterly Review 32 (128), 45–53.
Tingvall, P.G., Ljungwall, C., 2012. Is China different? A meta-analysis of export-led growth. Econ. Lett. 115, 177–179.
Tsui, K.-Y., Hsueh, T.-T., Rawski, T.G., 1995. Productivity. Efficiency and Reform in China's Economy. Chinese University of Hong Kong, Hong Kong.
Yao, Y., 2018. Will the People's Republic of China be able to avoid the Japan syndrome? In: Lin, J.Y., Morgan, P., Wan, G. (Eds.), Slowdown in the People's Republic of China: Structural Factors and the Implications for Asia, pp. 29–60.
Young, A., 2000. Gold into base metals: productivity growth in the People's Republic of China during the reform period. In: Working Paper No. 7856. Massachusetts. National Bureau of Economic Research (NBER).
Zhang, K.H., 2015. What drives export competitiveness? the role of FDI in Chinese manufacturing. Contemp. Econ. Policy 33 (3), 499–512.
Zhang, L., 2016. Rebalancing in China—Progress and Prospects. IMF Working Paper WP/16/183.
Zivot, E., Andrews, D., 1992. Further evidence on the great crash, the oil price shock, and the unit-root hypothesis. J. Bus. Econ. Stat. 10, 251–270.