Economic Newsletter
No. 23-03 | April 2023

Potential Output and Trade:

Key Findings and Policy Implications

Charles John P. Marquez, Marcus Jude P. San Pedro, and Jean Christine A. Armas[1]

[1] Mr. Marquez is Bank Economist III, Ms. Armas is Bank Officer V, and Mr. San Pedro is former Senior Research Specialist at the Department of Economic Research. The authors are grateful to Director Dennis M. Bautista, Ms. Jasmin E. Dacio, and Ms. Cherrie R. Mapa for their helpful comments and suggestions on improving the draft.

Introduction

Since the early 2000s, episodes of high potential output growth in the Philippines have coincided with periods of widening trade deficit. This development could be indicative of issues relating to productivity growth amid excess of investment over national savings to keep up with rising demand. Such is the usual case for a growing, emerging economy whose propensity to import is still relatively high where capital goods such as specialized machineries and transport and steel equipment are often not available locally and can be sourced mainly from advanced economies. However, this could have implications on the sustainability of the growth process.

This study examines the relationship between potential output growth and trade. Granger causality tests confirm that a widening trade deficit leads to a higher potential output growth. Furthermore, results from an autoregressive distributed lag (ARDL) model show that imports of capital goods as well as raw materials contribute significantly to potential output growth. Meanwhile, the impact of goods exports on potential output growth is not seen to be not statistically significant.

Correlation and Granger causality tests

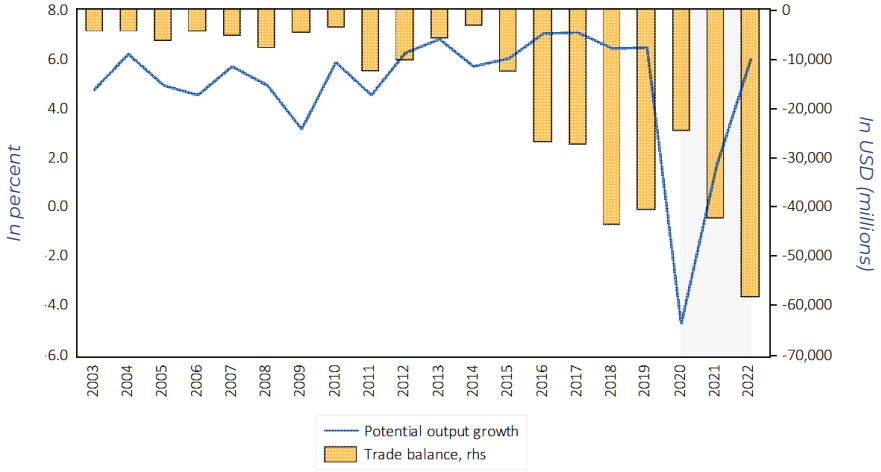
Figure 1 shows the net exports vis-a-vis the year-on-year growth rates of potential output for the period 2003 to 2022[2]. Starting in 2011, the Philippines recorded a widening trade deficit, which was sustained prior to the 2020 COVID-19 pandemic. During this period, potential output growth averaged 6.3 percent, significantly higher compared to the 4.8 percent mean growth observed from 2003 to 2010. This is validated by estimates of negative correlation between potential output growth and trade balance for the period 2003 to 2022 (Table 1).

To further investigate, the Granger causality tests have been employed to detect the direction of causality between potential output growth and trade[3]. These tests indicate that potential output growth Granger-causes exports, but not the other way around. In contrast, imports are seen to Granger-cause potential output growth and vice-versa (Table 2).

[2] Potential output growth was estimated using the following methodologies: (a) univariate filters, (b) production function approach, (c) structural vector autoregression, (d) macroeconomic unobserved components model, and (e) the Policy Analysis Model for the Philippines (PAMPh).

[3] A variable *x* is said to Granger-cause a variable *y* if, given the past values of *y*, past values of *x* are useful for predicting y (Stock and Watson, 2020).

Figure 1. Potential output growth and trade balance



Source: Philippine Statistics Authority (PSA), authors' estimates

Table 1. Correlation between potential output growth and trade balance

	Trade balance	Exports	Imports
Lag 0	-0.5510	0.2377	0.4513
Lag 1	-0.5927	0.3043	0.5212
Lag 2	-0.5474	0.2520	0.4320
Lag 3	-0.4670	0.1510	0.3402
Lag 4	-0.2842	0.0170	0.1911

Source: Authors' estimates

Table 2. Granger causality tests for the relationship between potential output growth and trade

Null hypothesis	F-stat
$EXP_{tot} \neq\triangleright YPOT_{gr}$	0.74
$YPOT_{gr} \neq\triangleright EXP_{tot}$	2.87*
$IMP_{tot} \neq\triangleright YPOT_{gr}$	2.88*
$YPOT_{gr} \neq\triangleright IMP_{tot}$	3.38**
$IMP_{tot} \neq\triangleright EXP_{tot}$	1.38
$EXP_{tot} \neq\triangleright IMP_{tot}$	2.37

Source: Authors' estimates
*Notes: *p-value<0.10, **p-value<0.05, ***p-value<0.01; H_0: X does not Granger-cause Y*

Autogressive Distributed Lag (ARDL) Model

This study follows the methodology of Kim et al. (2007) to further examine the relationship between potential output growth and trade balance. In particular, Kim et al. (2007) estimated the relationship between exports, imports, and total factor productivity growth in Korea using quarterly data from 1980 to 2003. Their results indicate that imports have a significant positive effect on productivity growth, but exports do not. Furthermore, their analysis identified two channels by which imports affect productivity: (a) productivity-enhancing impact of imports due to competitive pressures arising from consumer goods imports, forcing local producers to adopt more efficient production techniques, engage in innovation, and purse cost-cutting restructuring; and (b) increased productivity due to technological transfers embodied in capital goods imports from developed countries by means of knowledge spillovers.[4]

Data

Following Kim et al. (2007), we estimated an ARDL with potential output growth ($YPOT_{gr}$) as the dependent variable and data on imports (IMP_{tot}) and exports (EXP_{tot}) as independent variables. The YPOTgr data are internally generated estimates of the BSP's Department of Economic Research, while the foreign trade statistics were sourced from the Philippine Statistics Authority (PSA). Data on government final consumption expenditure (GOV) and the intellectual property product component of investment (IPP), based on data from PSA's National Account of the Philippines, were included to proxy for institutional and technological factors, respectively.

As a preliminary step, the stationarity of the time series data needed in the regression is examined using various statistical tests: (a) augmented Dickey-Fuller (ADF), (b) Phillips-Peron (PP), and (c) Kwiatkowski–Phillips–Schmidt–Shin (KPSS). Results show that potential output growth is stationary while the rest of the series are stationary in their first difference (Table 3).

Table 3. Unit root tests

	ADF		PP		KPSS	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
$YPOT_{gr}$	-4.02***	-5.65***	-3.30***	-6.93***	0.14	0.04
EXP_{tot}	-1.41	-8.15***	-1.43	-8.16***	1.23***	0.04
IMP_{tot}	-1.20	-11.09***	-1.20	-10.65***	1.23***	0.03
IMP_{cg}	-1.34	-11.14***	-1.22	-11.19***	0.96***	0.07
IMP_{rm}	-1.18	-11.45***	-1.08	-11.34***	1.16***	0.04
IMP_{co}	-1.00	-11.67***	-1.13	-12.20***	1.14***	0.04
GOV	0.43	-13.84***	0.31	-14.46***	1.14***	0.08
IPP[4]	0.63	-12.70***	0.43	-13.07***	1.07***	0.25

Source: Authors' estimates
*Notes: *pvalue<0.10, **pvalue<0.05, ***pvalue<0.01; sample period from 2002Q1 to 2022Q4; log transformed and seasonally adjusted using ARIMA Census X-13, except for potential output growth*

[4] This is supported by Griliches' (1992) theory on embodied technological spillovers, which refers to knowledge and technological flows that arise directly from flows of goods and services between firms.

Estimation equation

The regression model is specified in equation (1), with the optimal number of lags J, K, L, M, and N determined using the Akaike Information Criterion (AIC). To control for the impact of the COVID-19 pandemic, the period 2020Q1 to 2022Q4 is represented with a dummy and included in the estimation.

$$YPOT_{gr} = \alpha + \sum_{j=1}^{J} \beta_{1,j} YPOT_{gr_{t-j}} + \sum_{k=0}^{K} \beta_{2,k} IMP_{t-k} + \sum_{l=0}^{L} \beta_{3,l} EXP_{t-l} + \sum_{m=0}^{M} \beta_{4,m} GOV_{t-m} + \sum_{n=0}^{N} \beta_{5,n} IPP_{t-n} + \varepsilon_t \quad (1)$$

The specific mechanism underlying the import-productivity nexus is tested by decomposing imports in the equation according to processing stages: raw materials and intermediate goods (IMP_{rm}), capital goods (IMP_{cg}), and consumer goods (IMP_{co}).

Results

The regression results are summarized in Table 4. Prior to the estimation, pairwise correlation coefficients of the import variables were computed. The different import components are found to be highly correlated with each other. Thus, to avoid the issue of multicollinearity, the import variables are not simultaneously included in the estimation.

Table 4. Estimates of the long-run relationship between potential output growth and trade

	Model 1	Model 2	Model 3	Model 4
log(EXP_{tot})	-0.05	-0.18 ***	0.01	0.02
	(0.04)	(0.06)	(0.06)	(0.03)
log(IMP_{tot})	0.13 ***			
	(0.04)			
log(IMP_{rm})		0.25 ***		
		(0.05)		
log(IMP_{cg})			0.15 ***	
			(0.04)	
log(IMP_{co})				0.00
				(0.02)
log(GOV)	-0.01	0.12 **	0.08	0.00
	(0.03)	(0.04)	(0.05)	(0.05)
log(IPP)	-0.04 ***	-0.11 ***	-0.11 ***	0.00
	(0.02)	(0.02)	(0.03)	(0.01)
COVID	-0.01 ***	-0.03 ***	-0.03 ***	-0.02
	0.00	(0.00)	(0.01)	(0.02)
Intercept	-0.17	-0.92 ***	-1.37 ***	-0.10
	(0.28)	0.31	(0.47)	(0.40)
Bounds test	8.36 ***	12.44 ***	10.22 ***	9.83 ***
Speed of adjustment	-0.49 ***	-0.50 ***	-0.44 ***	-0.60 ***

Source: Authors' estimates
*Notes: *p-value<0.10, **p-value<0.05, ***p-value<0.01; standard errors in parenthesis; optimal number of lags chosen based on AIC; using heteroskedasticity- and autocorrelation-robust standard errors*

Based on the results from Table 4, three out of the four models indicate that imports positively affect potential output growth, with only the imports of consumer goods not seen to be statistically significant. Consistent with Griliches' (1992) theory, model 3 shows that imports of capital goods result in higher potential output growth due to technological transfers from developed economies, leading to productivity gains in the domestic economy.

Similarly, model 2 shows a positive and significant relationship between imports of raw materials and potential output growth. This may be seen to be in support of the observation that a sustained high potential output growth would require more imports of raw materials and capital goods needed for domestic production, given the capacity constraints faced by the economy.

Lastly, the insignificant relationship between imports of consumer goods and potential output growth implies that the productivity gains from increased competition among import-substituting firms may not be necessarily true for the Philippines.

The impact of exports on potential output growth is seen to be mixed, with models 1 and 2 indicating negative relationships, while the rest of the models show a positive but insignificant result. An explanation provided by Clerides et al. (1998) argues that only efficient firms engage in exporting and do not necessarily bring down production costs, while Bernard and Jensen (1999 and 2004) argue that exporting firms do not necessarily experience productivity and wage increases greater than those of non-exporting firms. It is noted, however, that these results only consider the exports of goods and do not include the BPO industry as it is classified under exports of services.

A larger government size is expected to have a negative impact on potential output growth, as higher government spending may crowd out more productive private capital expenditures and create inefficiencies in the form of excessive regulation and larger bureaucracies. However, results shown in Table 4 are mixed, with only model 1 showing a negative relationship. Meanwhile, the impact of intellectual property products on potential output growth is negative and significant based on models 2, 3, and 4, which may indicate limited research and development innovation and technical progress in the country.

Conclusion and policy implications

The results of our analysis indicate that imports have a positive and significant impact on potential output growth, but exports do not. Furthermore, the evidence reveals that the productivity-enhancing impact of imports is partly due to technological transfers embodied in capital goods imports from developed countries.

Evidence of reverse causality from potential output growth to imports is also present, which suggests that high GDP growth rates are not sustainable given the capacity constraints of the economy, thus prompting the need for more imports to support domestic production.

This observation is supported by Aldaba (2013), who identified common problems among the country's electronics, automotive parts, and garments industries – namely, limited backward linkages, lack of locally manufactured raw materials, and minimal domestic value added. The study noted that research on the country's electronics industry shows that backward linkages remain weak because local suppliers are few and immature. This is mainly attributed to unavailability of raw materials, difficulty in finding local suppliers, high cost of local raw materials, and failure to meet required quality standards. The garments sector also faces similar problems of limited linkages and weak competitiveness. The lack of locally sourced quality raw materials and dependency on imported raw materials such as fabrics and accessories from China, Taiwan, Hong Kong, and India resulted in longer lead times in production. As of 2022, garments exports accounted for less than 2 percent of total exports, in contrast to its 23 percent share in 1992. This raises some concerns on the country's current account sustainability, with the slow growth in goods exports being eaten away by imports of raw materials needed for production.

For the manufacturing industry, there is a need to strengthen the domestic parts and suppliers' sector, particularly small and medium enterprises, and deepen their linkages with domestic large enterprises and multinational companies. Equally important is for manufacturing industries, particularly electronics, to move up the value chain and diversify its export base given the limited role of the country's electronics exports in the production process, which are mainly concentrated in semiconductor assembly, packaging, and testing.

Apart from diversifying the country's export base, there is a need for the government to push for the expansion and diversification of foreign investment partners. Strong investment promotion should be carried out, particularly in technologically advanced countries, to facilitate knowledge transfer to local firms.

References

Aldaba, R. M. (2013). *Twenty Years after Philippine Trade Liberalization and Industrialization: What Has Happened and Where Do We Go from Here.* Philippine Institute for Development Studies. doi:https://ideas.repec.org/p/phd/dpaper/dp_2013-21.html

Bernard, A. B. & Jensen, J. B. (1999). Exceptional exporter performance: cause, effect, or both? *Journal of International Economics, 47*(1), 1–25. doi:https://doi.org/10.1016/S0022-1996(98)00027-0

Bernard, A. B. & Jensen, J. B. (2004). Exporting and Productivity in the USA. *Oxford Review of Economic Policy, 20*(3), 343–357. doi:https://www.jstor.org/stable/23607089

Clerides, S. K., Lach, S., & Tybout, J. R. (1998). Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco. *The Quarterly Journal of Economics, 113*(3), 903–947. doi:https://www.jstor.org/stable/2586877

Griliches, Z. (1992). The Search for R&D Spillovers. *The Scandinavian Journal of Economics, 94,* S29-S47. doi:https://doi.org/10.2307/3440244

Kim, S., Lim, H., & Park, D. (2007). *Could Imports be Beneficial for Economic Growth? Some Evidence from Republic of Korea.* Asian Development Bank. doi:http://hdl.handle.net/11540/1864

Stock, J. H. & Watson, M. W. (2020). *Introduction to Econometrics* (4th ed.). Pearson.