

Felipe, Jesus; Estrada, Gemma

Working Paper

Why has the Philippines' growth performance improved? From disappointment to promising success

ADB Economics Working Paper Series, No. 542

Provided in Cooperation with:

Asian Development Bank (ADB), Manila

Suggested Citation: Felipe, Jesus; Estrada, Gemma (2018) : Why has the Philippines' growth performance improved? From disappointment to promising success, ADB Economics Working Paper Series, No. 542, Asian Development Bank (ADB), Manila,
<https://doi.org/10.22617/WPS189308-2>

This Version is available at:

<https://hdl.handle.net/10419/203382>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/3.0/igo/>

WHY HAS THE PHILIPPINES' GROWTH PERFORMANCE IMPROVED? FROM DISAPPOINTMENT TO PROMISING SUCCESS

Jesus Felipe and Gemma Estrada

NO. 542

April 2018

ADB ECONOMICS
WORKING PAPER SERIES

ADB Economics Working Paper Series

Why Has the Philippines' Growth Performance Improved? From Disappointment to Promising Success

Jesus Felipe and Gemma Estrada
No. 542 | April 2018

Jesus Felipe (jfelipe@adb.org) is an Advisor and Gemma Estrada (gestrada@adb.org) is a Senior Economics Officer in the Economic Research and Regional Cooperation Department of the Asian Development Bank

We are grateful to the participants at an Asian Development Bank seminar for their comments and suggestions.



Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO)

© 2018 Asian Development Bank
6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org

Some rights reserved. Published in 2018.

ISSN 2313-6537 (print), 2313-6545 (electronic)
Publication Stock No. WPS189308-2
DOI: <http://dx.doi.org/10.22617/WPS189308-2>

The views expressed in this publication are those of the authors and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.

ADB does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use. The mention of specific companies or products of manufacturers does not imply that they are endorsed or recommended by ADB in preference to others of a similar nature that are not mentioned.

By making any designation of or reference to a particular territory or geographic area, or by using the term “country” in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

This work is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO) <https://creativecommons.org/licenses/by/3.0/igo/>. By using the content of this publication, you agree to be bound by the terms of this license. For attribution, translations, adaptations, and permissions, please read the provisions and terms of use at <https://www.adb.org/terms-use#openaccess>.

This CC license does not apply to non-ADB copyright materials in this publication. If the material is attributed to another source, please contact the copyright owner or publisher of that source for permission to reproduce it. ADB cannot be held liable for any claims that arise as a result of your use of the material.

Please contact pubsmarketing@adb.org if you have questions or comments with respect to content, or if you wish to obtain copyright permission for your intended use that does not fall within these terms, or for permission to use the ADB logo.

Notes:

In this publication, “\$” refers to United States dollars.

ADB recognizes “Vietnam” as Viet Nam.

Corrigenda to ADB publications may be found at <http://www.adb.org/publications/corrigenda>.

CONTENTS

TABLES AND FIGURES	iv
ABSTRACT	v
HIGHLIGHTS	vii
I. INTRODUCTION	1
II. OKUN'S LAW IN THE PHILIPPINES	3
A. Data	4
B. Estimates of Okun's Coefficient: Impact of Growth on Unemployment	4
C. Estimates of Okun's Coefficient: Impact of Growth on Underemployment	8
III. THE PHILIPPINES' POTENTIAL GROWTH	15
IV. DECOMPOSITION OF LABOR PRODUCTIVITY GROWTH	22
V. PRODUCTIVITY GROWTH AND JOBS	27
VI. CONCLUSIONS AND POLICY IMPLICATIONS	32
APPENDIX	34
REFERENCES	35

TABLES AND FIGURES

TABLES

1	Okun's Coefficient Estimations, Static Models, Equations (1)–(4), 1957–2017	6
2	Okun's Coefficient Estimations, Autoregressive Distributed Lag Models, Equations (5)–(6), 1957–2017	7
3	Okun's Coefficient Estimations, Static and Autoregressive Distributed Lag Models, 1957–2017	9
4	Okun's Coefficient Estimations, Static and Autoregressive Distributed Lag Models, 1987–2017	14
5	Potential Growth Estimates, Static Models, 1957–2017	17
6	Potential Growth Estimates, Autoregressive Distributed Lag Models, 1957–2017	18
7	Effect of Productivity Growth on Employment and Underemployment Growth, Country Aggregate Level, 1990–2017	29
8	Effect of Productivity Growth on Own-Sector and Other Sectors' Employment Growth, by Sector, 1990–2017	30
9	Effect of Productivity Growth on Own-Sector and Other Sectors' Employment Growth, Pooled Sectoral Data, 1990–2017	31

FIGURES

1	Gross Domestic Product Growth	1
2	Unemployment in the Philippines	4
3	Underemployment in the Philippines	8
4	Underemployment by Class of Workers, 2016	10
5	Underemployment by Subsector, 2016	12
6	Total and Visible Underemployment, 1987–2017	13
7	Actual versus Potential Growth	20
8	Potential Growth Rate and Its Components	21
9	Recursive Gaps (Actual - Potential Growth Rates)	22
10	Sectoral Employment Shares and Productivity	23
11	Sectoral Contributions to Productivity	24
12	Actual Labor Productivity Growth Decompositions	25
13	Actual Labor Productivity Growth Decompositions by Sector	26
14	Potential Labor Productivity Growth Decompositions	27

ABSTRACT

This paper analyzes why the Philippines' growth performance has improved significantly in recent years. As in the medium to long term actual growth adjusts to potential, we posit that the reason behind this improvement is that the country's potential growth is increasing. We derive an estimate of the potential growth rate, defined as the growth consistent with a constant unemployment rate, through the notion of Harrod's natural growth rate and Okun's Law. Kalman filter estimation allows us to obtain a time series of potential growth rate for 1957-2017. Results corroborate that potential growth is increasing. It reached 6.3% in 2017, the highest value during the last 60 years. We find that in recent years, labor productivity growth (technical progress) accounts for most of the country's potential growth rate, as the trend labor force growth displays a downward trend. A decomposition of labor productivity growth shows that the within effect accounts for 70% of it, and that most of it is due to manufacturing productivity growth. As actual growth in 2017 reached 6.7% and to maintain the growth momentum, Philippine authorities ought to focus on increasing potential growth to enable more room for growth in a stable macroeconomic environment. Finally, two key results emerge from our analysis of output and productivity growth, and employment. First, estimates of Okun's Law indicate that the response of Philippine unemployment and visible underemployment to output growth is very small. However, the response of total underemployment is positive and significant. Second, productivity growth does not destroy employment.

Key words: Harrod's natural growth rate, Kalman filter, Okun's Law, Philippines, potential growth, underemployment, unemployment

JEL codes: E24, E32, O47, O53

HIGHLIGHTS

- **In 2017, the Philippines' potential growth reached 6.3%, the highest during the past 60 years.** Potential growth in our framework is the growth rate that keeps the unemployment rate constant. As medium to long-term actual growth adjusts to potential, we argue that the recent rapid actual growth rate reflects the adjustment to an increasing potential growth rate. The steady increase in potential growth signals that the economic prospects are improving.
- **Much of the increase in potential growth is due to rising labor productivity growth.** Potential growth rate can be decomposed into the growth rates of the labor force and of labor productivity. In the past, a large share of potential growth was the result of an expanding labor force. However, as the labor force growth began to slow down in recent years, labor productivity growth took over as the major component of potential growth rate. Indeed, labor productivity growth accounted for three quarters of potential growth during 2010–2017 (and over 85% in 2017).
- **To continue enjoying the current growth momentum, it is important to further raise potential growth.** Since actual growth in 2017 reached 6.7% (slightly above potential growth), authorities ought to focus on increasing the economy's potential growth rate to allow further actual growth in a stable macroeconomic environment.
- **To raise potential growth, authorities ought to focus on increasing labor productivity growth.** Supporting a more vibrant manufacturing sector will help boost productivity growth. The employment share of manufacturing has declined, yet the sector has experienced rising productivity and is the main contributor to the nation's overall productivity level: in 2017, manufacturing accounted for about one-fourth of the overall productivity level. In addition, around one-third of the overall labor productivity growth between 1989 and 2017 was due to manufacturing.
- **Most Filipino workers are employed in low-productivity services and agriculture.** While labor productivity in the finance, real estate, and business activities subsector is relatively high, the subsector employs a small share of workers, and its productivity has been declining. It is important to increase productivity in other service subsectors to lift overall productivity.
- **Efforts need to be made to increase productivity in agriculture.** The sector employs a quarter of all workers, although at very low productivity. Labor productivity growth in agriculture increases at very low rates. Although the sector's share in total employment has declined significantly, its output grows slowly and the absolute level of employment was increasing until 2012.
- **While actual growth has improved, the evidence shows that this has had little impact on reducing unemployment.** Estimates show that higher actual growth does not necessarily lead to a lower unemployment rate. However, the evidence indicates that faster growth is associated with a higher total underemployment rate. Understanding such dynamics requires a careful review of the country's labor market.

- **Almost one-fifth of those employed declare themselves underemployed.** The Philippine labor market is characterized not by high unemployment but by considerable underemployment. It is worrying that underemployment remains high, averaging almost 20% of total employment in 2010–2017, against a much lower average unemployment rate of 7%. About 60% of total underemployment is visible underemployment, i.e., the share in total employment of those who work less than the standard full-time work of 40 hours a week and desire longer work hours.
- **Productivity growth does not destroy employment.** There is no evidence to support the claim that productivity growth destroys jobs in the Philippines. Although the relation between a sector's own productivity growth and its own employment growth is negative, on the aggregate and when considering the indirect effects of employment growth in all other sectors, the impact of productivity growth on total employment generally becomes nil.

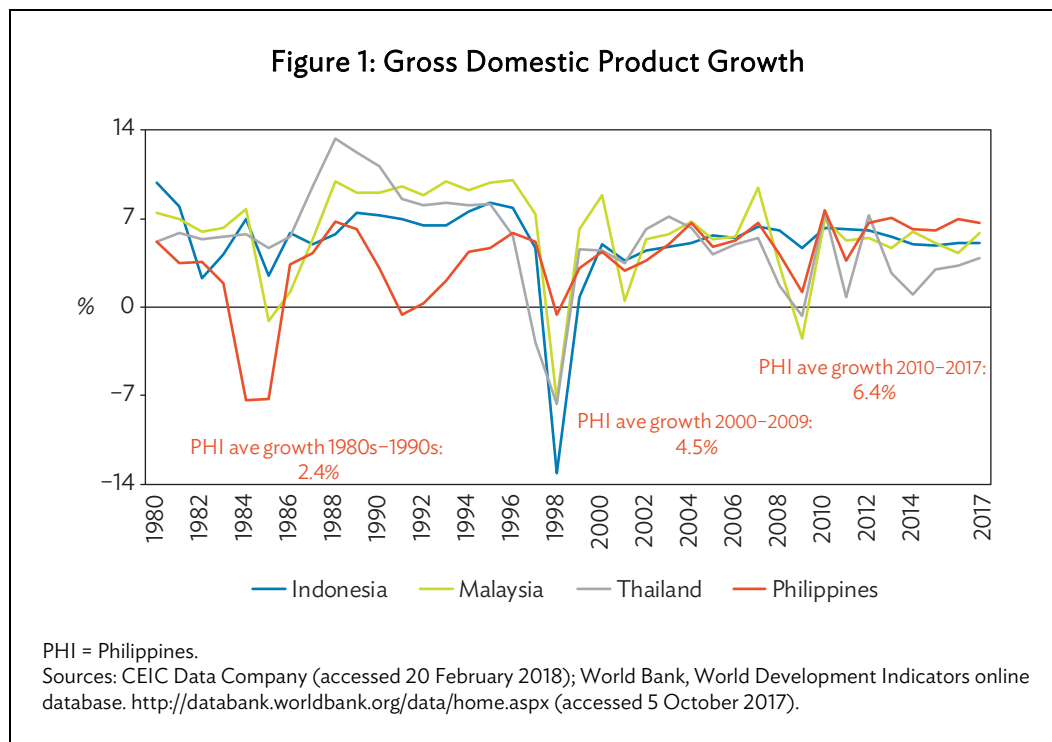
“...The Philippines is an example of a failed shift in policies and institutions, where at an already quite high level of income, the Marcos regime failed to keep potential income ahead of actual, and so growth slowed, then stalled. The democratic governments since have not been able to create a credible alternative set of policies and institutions that would kick off a growth boom to a higher level of income.”

(Lant Pritchett 2003, p.125)

I. INTRODUCTION

The recent economic growth performance of the Philippines has been quite impressive, for historical standards and relative to that of other Asian developing countries. Not only has the Philippines achieved continuous growth for nearly 20 years now, but also the pace of growth has picked up.

In 2010–2017, the country posted an average gross domestic product (GDP) growth of 6.4%, up from 4.5% annual growth rate during 2000–2009, and much higher than the 2.4% average growth posted during 1980–1999 (Figure 1). Moreover, in recent years, the Philippines has also registered faster growth than Indonesia, Malaysia, and Thailand. This represents a significant achievement for the Philippines, whose growth rate lagged those of its neighbors for most periods over the past several decades.



On the supply side, the economy has benefited from an expanding service sector, whose contribution to growth has averaged around 60% during 2010–2017. In addition, the manufacturing sector has also been an important source of growth. On the demand side, recent government efforts to step up public infrastructure have helped raise the contribution of investment to growth. In 2017, total

investment accounted for nearly 40% of GDP growth, thanks to fixed investment reaching 25% of GDP, the highest share in over 30 years.

In this paper, we inquire why the Philippines' growth performance has improved. We take an aggregate perspective of the economy and answer this question by estimating and examining the country's potential growth, that is, the maximum sustainable growth rate that technical conditions allow. We conjecture that actual growth is adjusting to an increasing potential growth rate. Combining Harrod's notion of the natural growth rate with Okun's Law, and using the Kalman filter estimation procedure, this study provides time-varying estimates of potential growth over the past 60 years and examines the underlying factors driving it. We corroborate that potential output growth is increasing and find that in 2017 actual growth was close to half a percentage point above potential growth. These results have important implications for policy making.

The rest of the paper is structured as follows. In section II, we review Okun's Law, discuss the data, and present estimates of Okun's coefficient for the Philippines. This allows us to discuss the extent to which growth translates into lower unemployment. It is often argued that in developing countries the link between growth and employment is weak, what has been termed "jobless growth." Hanusch (2013) found that growth was generally not jobless in East Asian economies, except in the Philippines, where the relationship between employment and economic growth was statistically insignificant. Paqueo et al. (2014) found that in the Philippines employment tends to increase less proportionately than output.¹ Our findings corroborate the view that growth has had limited impact on unemployment in the Philippines and confirm that it is important to understand why growth does not have a significant impact on reducing unemployment rate. On the other hand, we find a positive impact of growth on overall underemployment.

In section III, we provide estimates of potential output growth, also derived from Okun's Law. As we shall see, these estimates are consistent with Harrod's natural growth rate. Since we find that much of the increase in potential growth in recent years is due to rising labor productivity growth, in section IV we provide a decomposition of labor productivity growth into within and reallocation effects. In section V, we examine the impact of productivity growth on employment growth at the aggregate and sectoral levels. We find that own-sector productivity growth has a negative impact on own-sector employment growth. However, when we consider both own-sector productivity and spillovers from productivity growth in other sectors, we find no strong evidence that productivity growth destroys jobs.

Section VI provides conclusions and policy implications. Without being overly optimistic, our analysis leads to the conclusion that the Philippines has entered what we call a *growth momentum* that cannot be missed by implementing inappropriate policies, the result of not understanding how narrow the window of opportunity is. We find that both actual and potential growth are high. Further, actual growth is slightly higher than potential growth. The task of policy makers is to steer the economy in such a way that potential growth increases further, perhaps by 1–2 percentage points. This may allow actual growth to continue increasing in a stable macroeconomic environment. Paraphrasing Prichett (2003), we argue that the Philippines is evolving from being the region's "Democratic Dud," plagued by all sorts of economic and political problems and uncertainty, to a "Promising Success." This doesn't mean that the country's development is no longer hampered by the quality of its infrastructure and its human capital, or by an inadequate regulatory environment.

¹ Paqueo et al. (2014) showed that the elasticity of employment with respect to output was 0.60 for 1956–2010.

The fact is that the economy has performed well despite these problems. Addressing them means that the economy can do even better.

II. OKUN'S LAW IN THE PHILIPPINES

Does output growth lead to lower unemployment rates in the Philippines? We use Okun's Law to examine this question. While the literature provides different versions of Okun's Law, this paper uses a standard specification.²

In his seminal paper, Okun (1962) was concerned with "how much output can the economy produce under conditions of full employment?" Okun's Law is a short-run relationship between the change in the unemployment rate and output growth. In Okun's specification, the change in unemployment rate (ΔU) was a linear function of the growth of output (\hat{Y}):

$$\Delta U = \alpha - \beta \hat{Y} \quad (1)$$

where β is Okun's coefficient, the impact of growth on unemployment. Since Okun's original paper and application to the United States, many studies have confirmed the robustness of the relationship. Many of the studies on Okun's Law have been limited to advanced countries (Ball, Daniel, and Loungani 2017; Moosa 1997; Perman and Tavera 2005) and their objective was to compare estimates of Okun's coefficient across them. An, Ghazi, and Gonzalez Prieto (2017) provide estimates for a large number of developing countries. While results for the advanced economies tend to yield significant estimates, results for the developing countries are much more heterogeneous. The focus in our study on a single country, the Philippines, will allow us to go beyond the estimation of Okun's coefficient.

In Okun's original paper, equation (1) appeared not as a structural model but as a reduced form equation. He assumed that shifts in aggregate demand cause movements in output, which in turn drive fluctuations in the labor market: firms hire and fire workers to accommodate output changes, and these actions affect unemployment. This Keynesian view of Okun's relationship posits that in order to achieve a certain unemployment target, growth should be above its trend by a certain magnitude. Demand expansions do not lead directly to inflation because they have a positive cyclical effect on productivity. Therefore, the parameter appears to incorporate several fundamental structural parameters from the firms' optimal demand for labor. Ball, Daniel, and Loungani (2017) show that Okun's Law can be derived from two other relationships: the effect of changes in output on changes in employment, and the effect of changes in employment on changes in unemployment.³

A different interpretation of Okun's Law is based on the concept of the nonaccelerating inflation rate of unemployment, which considers an economy as having a supply capacity limit. If the economy grows significantly above its potential, unemployment will eventually fall below the natural rate, and inflationary pressures will develop.

² See, for example, Ball et al. (2017) who estimated Okun's Law through the relationship between the employment gap and output growth, as well as between the labor force gap and output growth.

³ Authors like Prachowny (1993) and Daly et al. (2012) derive the relationship from a production function in which employment determines output. In this case, the relationship is reversed, i.e., the growth of output appears on the left-hand side of the equation.

Empirically, we use two approaches to estimate Okun’s Law. One is the “change” version, which is a direct application of equation (1). The other version of Okun’s Law is a “gap” equation, which considers the cyclical components of both output and unemployment:

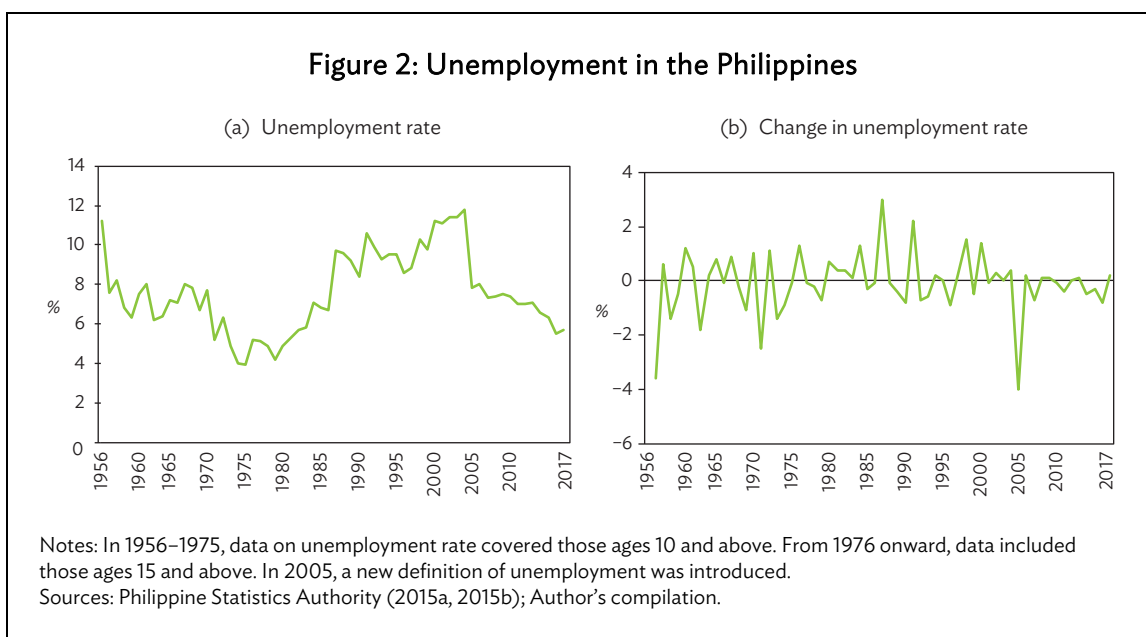
$$U^c = \alpha + \beta Y^c \quad (2)$$

where $U^c = U - U^*$ is the cyclical unemployment rate and $Y^c = Y - Y^*$ is cyclical output. Y is log output, while U^* and Y^* are the trend components of unemployment rate and output, respectively.

A. Data

Our study uses data on GDP growth and the unemployment rate for 1956–2017. The Philippine data on the unemployment rate, collected from labor force surveys, has had two major revisions. One was the change in coverage, from persons 10 years old and above for 1956–1975, to persons 15 years old and above afterwards. A second revision affected the definition of unemployed, starting in 2005. In the new definition, unemployment includes persons 15 years old and above who are: (i) without work; (ii) currently available for work, i.e., were available and willing to take up work during the reference period, and/or would be available and willing to take up work; and (iii) seeking work. The additional definition is item (ii).

Figure 2 shows that the 2005 new definition resulted in a large drop in the unemployment rate, from 11.8% in 2004 to 7.8% in 2005. While the unemployment rate declined in 1975, the decrease was not as large as that in 2005.



B. Estimates of Okun’s Coefficient: Impact of Growth on Unemployment

To obtain estimates of Okun’s coefficient, the empirical specifications for equations (1) and (2) consider the revisions in the unemployment rate data by including time dummy variables and the interaction of output growth with these variables:

$$\Delta U = \alpha + \beta \hat{Y} + \theta_1 D_1 + \theta_2 D_2 + \varphi_1 (\hat{Y} \times D_1) + \varphi_2 (\hat{Y} \times D_2) + \varepsilon \quad (3)$$

$$U^c = \alpha + \beta Y^c + \theta_1 D_1 + \theta_2 D_2 + \varphi_1 (Y^c \times D_1) + \varphi_2 (Y^c \times D_2) + \varepsilon \quad (4)$$

where D_i is a time dummy variable while ε is a stochastic error term. The time dummy variable covers three subperiods to account for the changes in the unemployment rate: (i) D_1 : 1957–1975, and (ii) D_2 : 2005–2017. The default reference period in the regression is 1976–2004.

Equations (3) and (4) are static versions of the Okun's Law. As the impact of output on the unemployment rate may occur with some time lags, we explore a dynamic relationship by estimating Autoregressive Distributed Lag (ARDL) model:

$$\Delta U = \alpha + \sum_{s=0}^p \beta_{0,s} \hat{Y}_{t-s} + \sum_{s=1}^q \rho_{1,s} \Delta U_{t-s} + \theta_1 D_1 + \theta_2 D_2 + \varphi_1 (\hat{Y} \times D_1) + \varphi_2 (\hat{Y} \times D_2) + \varepsilon \quad (5)$$

$$U^c = \alpha + \sum_{s=0}^p \beta_{0,s} Y_{t-s}^c + \sum_{s=1}^q \rho_{1,s} U_{t-s}^c + \theta_1 D_1 + \theta_2 D_2 + \varphi_1 (Y^c \times D_1) + \varphi_2 (Y^c \times D_2) + \varepsilon \quad (6)$$

where the short-run Okun's coefficient is measured by $\beta_{0,0}$. The total (or long-run) effect is given by

$$\beta_{0,s} = \frac{\beta_{0,0} + \dots + \beta_{0,p}}{1 - (\rho_{1,s} + \dots + \rho_{1,q})} \quad (7)$$

In choosing the appropriate lag lengths in equations, we examine the Akaike Information Criterion of varying lag lengths.

Table 1 shows the static estimates for the “change” and “gap” versions of Okun's Law, equations (1) and (2), respectively. The change version is reported in columns (a)–(c), while the gap version is reported in columns (d)–(f). Columns (a) and (d) are the baseline models with no time dummy variables. Time dummy variables are added in columns (b) and (e), while interaction between growth and time and between cyclical output and time are further added in columns (c) and (f), respectively.

Results indicate that Okun's coefficients are negative in the baseline specifications (equation [1] (column [a]) and equation [2] (column [d])) and in all other specifications and time periods, except for 2005–2017 with equation (3) (column [c]). However, most of the estimates are statistically insignificant, except in the change version with no time dummy variables (column [a], equation [1]), -0.086 .

In equation (3) (column [b]), the coefficient of the time dummy variable for 1957–1975 (D_1) is negative and statistically significant. Note that 1957–1975 (D_1) is the period when the minimum age in the labor force survey was 10 years old, while in the period after 1975 the minimum age was raised to 15 years old. Thus, the result in equation (3) (column [b]) on (D_1) shows that the unemployment rate was lower when the minimum age was still 10 than in base period (1976–2004). Equation (3) (column [c]), adds the interaction between actual growth and the time dummy variables ($\hat{Y} \times D_1$ and $\hat{Y} \times D_2$). The time dummy variables are no longer statistically significant, and neither are the interaction terms.

In equation (4) (column [e]), the coefficient of the time dummy variable for 2005–2017 (D_2) is negative and statistically significant. The period 2005–2017 (D_2) marks a change in the definition of unemployment rate. Hence, the result in equation (4) (column [e]) on (D_2) shows that the unemployment rate was lower in the period after the definition was revised than in the base period (1976–2004). The results in equation (4) (column [f]), which includes both the time dummy variables and the interaction between cyclical output and time dummy variables, are similar to those in equation (3) (column [c]), with insignificant time dummy variables and interaction terms.

The ARDL results in Table 2 show also negative Okun's coefficients (except short run for 2005–2017, column [c]), consistent with the results of the static estimations, but still not statistically significant across most specifications. One exception is the long-run estimate for 1957–2017 with equation (5), in column (a), -0.12 , which suggests that a 1 percentage point increase in growth leads to a 0.12 percentage point drop in the unemployment rate. Results indicate that although the long-run Okun's coefficient is significant for the whole period, this is not the case by subperiod in either the “change” or “gap” versions. The exception is column (f), where the long-run Okun's coefficient is significant during the period 1976–2004.

Table 1: Okun's Coefficient Estimations, Static Models, Equations (1)–(4), 1957–2017

(Dependent variable: Unemployment)							
	Change Version ΔU				Gap Version U^c		
	Equation (1)	Equation (3)			Equation (2)	Equation (4)	
	(a)	(b)	(c)		(d)	(e)	(f)
\hat{Y}	-0.086^* (-1.915)	-0.051 (-0.975)	-0.035 (-0.601)	Y^c	-0.056 (-1.585)	-0.058 (-1.659)	-0.054 (-1.434)
D_1		-0.570^* (-1.689)	0.473 (0.528)	D_1		-0.215 (-0.892)	-0.205 (-0.791)
D_2		-0.624 (-1.615)	-1.057 (-0.978)	D_2		-0.479^* (-1.776)	-0.460 (-1.669)
$\hat{Y} \times D_1$			-0.213 (-1.241)	$Y^c \times D_1$			0.010 (0.067)
$\hat{Y} \times D_2$			0.071 (0.377)	$Y^c \times D_2$			-0.105 (-0.617)
Constant	0.279 (1.204)	0.439 (1.647)	0.386 (1.383)	Constant	-0.000 (-0.001)	0.169 (1.122)	0.168 (1.097)
Observations	61	61	61	Observations	61	61	61
R-squared	0.048	0.109	0.137	R-squared	0.041	0.092	0.099
OC, 1957–2017	-0.086^* (-1.915)	-0.051 (-0.975)		OC, 1957–2017	-0.056 (-1.585)	-0.058 (-1.659)	
OC, 1957–1975			-0.248 (-1.531)	OC, 1957–1975			-0.044 (-0.302)
OC, 1976–2004			-0.035 (-0.601)	OC, 1976–2014			-0.054 (-1.434)
OC, 2005–2017			0.036 (0.202)	OC, 2005–2017			-0.159 (-0.959)

ΔU = change in unemployment rate, D_1 = dummy variable for 1957–1975, D_2 = dummy variable for 2005–2017, GDP = gross domestic product, OC = Okun's coefficient, U^c = cyclical unemployment rate, \hat{Y} = output (GDP) growth rate, Y^c = cyclical output (GDP), $\hat{Y} \times D_1$ = interaction between output growth and dummy variable for 1957–1975, $\hat{Y} \times D_2$ = interaction between output growth and dummy variable for 2005–2017, $Y^c \times D_1$ = interaction between cyclical output and dummy variable for 1957–1975, $Y^c \times D_2$ = interaction between cyclical output and dummy variable for 2005–2017.

Notes: * means significant at the 10% level. Values in parentheses are t-statistics and z-statistics for the Okun's coefficient.

Source: Authors' estimates.

Table 2: Okun's Coefficient Estimations, Autoregressive Distributed Lag Models, Equations (5)–(6), 1957–2017

(Dependent variable: Unemployment)							
	Change Version ΔU				Gap Version U^c		
	Equation (5)				Equation (6)		
	(a)	(b)	(c)		(d)	(e)	(f)
\hat{Y}	-0.076 (-1.663)	-0.043 (-0.954)	-0.042 (-0.825)	Y^c	-0.073 (-1.348)	-0.080 (-1.481)	-0.072 (-1.211)
				$Y^c(t-1)$	0.057 (0.787)	0.062 (0.857)	0.056 (0.740)
$\hat{Y}(t-2)$	-0.093* (-1.999)	-0.064 (-1.379)	-0.062 (-1.327)	$Y^c(t-2)$	-0.074 (-1.362)	-0.081 (-1.507)	-0.078 (-1.393)
$\Delta U(t-1)$	-0.307** (-2.363)	-0.419*** (-3.179)	-0.402*** (-2.933)	$U^c(t-1)$	0.238* (1.854)	0.217* (1.700)	0.215 (1.640)
$\Delta U(t-2)$	-0.099 (-0.807)	-0.181 (-1.485)	-0.195 (-1.526)				
D_1		-0.633* (-1.935)	-0.210 (-0.236)	D_1		-0.297 (-1.209)	-0.298 (-1.103)
D_2		-0.907** (-2.454)	-1.309 (-1.366)	D_2		-0.454* (-1.705)	-0.438 (-1.605)
$\hat{Y} \times D_1$			-0.084 (-0.498)	$Y^c \times D_1$			-0.008 (-0.052)
$\hat{Y} \times D_2$			0.071 (0.433)	$Y^c \times D_2$			-0.086 (-0.509)
Constant	0.659** (2.293)	0.766*** (2.737)	0.756** (2.569)	Constant	-0.015 (-0.141)	0.171 (1.153)	0.169 (1.121)
Observations	59	59	59	Observations	59	59	59
R-squared	0.175	0.269	0.276	R-squared	0.140	0.192	0.196
OC (short run), 1957–2017	-0.076 (-1.663)	-0.043 (-0.954)		OC (short run), 1957–2017	-0.073 (-1.348)	-0.080 (-1.481)	
OC (long run), 1957–2017	-0.120*** (-2.891)	-0.067* (-1.698)		OC (long run), 1957–2017	-0.118* (-1.942)	-0.127** (-2.139)	
OC (short run), 1957–1975			-0.126 (-0.787)	OC (short run), 1957–1975			-0.08 (-0.533)
OC (long run), 1957–1975			-0.118 (-1.146)	OC (long run), 1957–1975			-0.131 (-0.663)
OC (short run), 1976–2004			-0.042 (-0.825)	OC (short run), 1976–2004			-0.072 (-1.211)
OC (long run), 1976–2004			-0.065 (-1.527)	OC (long run), 1976–2004			-0.120* (-1.912)
OC (short run), 2005–2017			0.029 (0.188)	OC (short run), 2005–2017			-0.158 (-0.959)
OC (long run), 2005–2017			-0.021 (-0.202)	OC (long run), 2005–2017			-0.230 (-1.080)

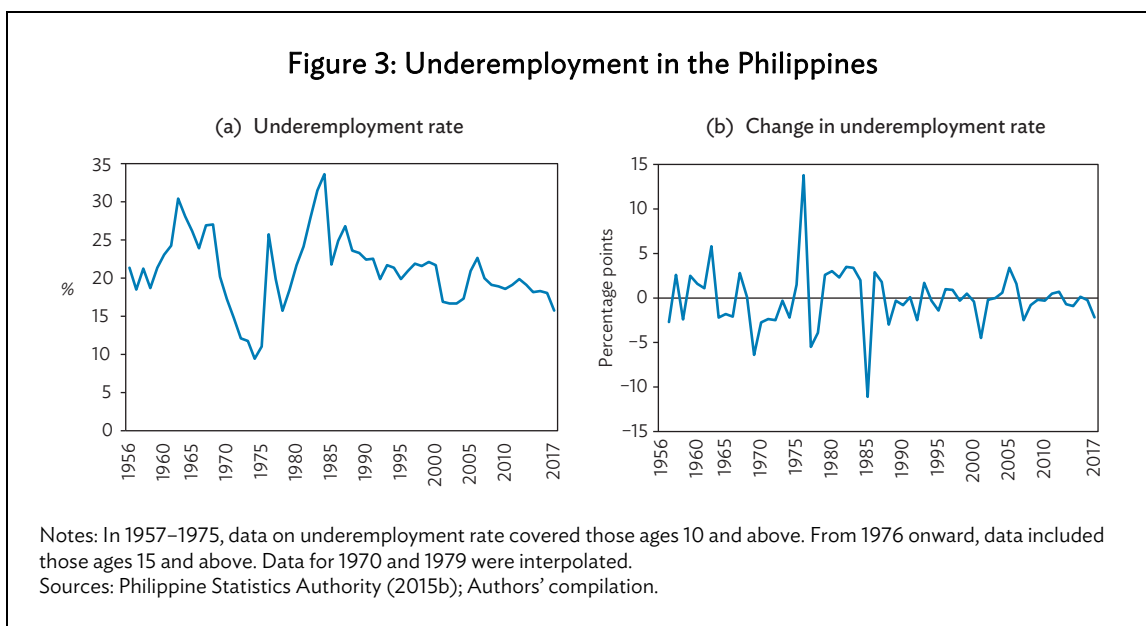
ΔU = change in unemployment rate, D_1 = dummy variable for 1957–1975, D_2 = dummy variable for 2005–2017, GDP = gross domestic product, OC = Okun's coefficient, U^c = cyclical unemployment rate, \hat{Y} = output (GDP) growth rate, Y^c = cyclical output (GDP), $\hat{Y} \times D_1$ = interaction between output growth and dummy variable for 1957–1975, $\hat{Y} \times D_2$ = interaction between output growth and dummy variable for 2005–2017, $Y^c \times D_1$ = interaction between cyclical output and dummy variable for 1957–1975, $Y^c \times D_2$ = interaction between cyclical output and dummy variable for 2005–2017. Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics and z-statistics for the Okun's coefficient.

Source: Authors' estimates.

Summing up, we find that the Okun's coefficient for the Philippines is negative. However, in most specifications, both static and ARDL estimates are statistically insignificant.

C. Estimates of Okun's Coefficient: Impact of Growth on Underemployment

The results above indicate that the link between the change in the unemployment rate and output growth in the Philippines is very tenuous at best. It is possible that this is indeed the case. Another possibility is that the unemployment rate might not be the proper indicator of the state of the labor market. This is because it is well known that the Philippines suffers from significant underemployment. Underemployment is a measure of the underutilization of the productive capacity of the labor force (ILO 2016). In the Philippines, a person is underemployed if he/she is employed but declares himself/herself during the labor force survey that he/she desires to have additional hours of work in his/her present job, or to have a new job with longer working hours (Philippine Statistics Authority 2015b). Although the unemployment rate has declined in recent years, there remains a relatively high underemployment rate, averaging around 20% since 2000 (Figure 3).



We estimate the same Okun's law equations as above, but with the underemployment rate on the left-hand side (These regressions do not include the time dummies that account for definitional changes). Results are reported in Table 3. Results for the "change" version are shown in columns (a) and (b) while the results for the "gap" version are shown in columns (c) and (d). Static results are in columns (a) and (c) while the ARDL results are in columns (b) and (d).

In contrast to the negative but statistically insignificant Okun's coefficients in the unemployment equations, the underemployment equations display statistically significant and positive coefficients of GDP growth in both the static and ARDL models. These results suggest that in boom periods people would like to work more hours.

A closer look at the data reveals why this may be the case. In the Philippines, the legal number of working hours is 8 a day, and the normal number of workdays per week is 5 or 6. In the labor force survey, it is possible for an individual who works 60 hours or more per week to be classified as underemployed, as long as he/she declares during the survey that he/she wants to work additional hours. The data show that 43% of the underemployed in 2017 worked for 40 hours or more during the

reference week. Given the lack of data on underemployment by class of workers and subsectors in 2017, we use 2016 data for the disaggregated level of analysis.

The data reveal broad heterogeneity among the underemployed. By class of workers, around half of them were wage and salary workers in private establishments, while 32% were self-employed (Figure 4a). Among those who worked less than 40 hours, 38% were wage and salary workers, about the same percentage as those self-employed (Figure 4b). In comparison, the proportion of wage and salary workers was much higher among those who worked 40 hours or more during the reference week, nearly 60% (Figure 4c).⁴

Table 3: Okun's Coefficient Estimations, Static and Autoregressive Distributed Lag Models, 1957–2017

(Dependent variable: Underemployment)

	Change Version ΔUd			Gap Version Ud^c	
	Static, Equation (3)	ARDL, Equation (5)		Static, Equation (4)	ARDL, Equation (6)
	(a)	(b)		(c)	(d)
\hat{Y}	0.284** (2.014)	0.257* (1.798)	Y^c	0.287** (2.426)	0.306*** (2.810)
ΔUd (t-2)		-0.178 (-1.391)	Y^c (t-3)		0.266** (2.390)
			Ud^c (t-1)		0.432*** (3.553)
			Ud^c (t-2)		-0.197 (-1.539)
Constant	-1.314* (-1.791)	-1.207 (-1.626)	Constant	0.001 (0.002)	0.099 (0.312)
Observations	61	59	Observations	61	58
R-squared	0.064	0.102	R-squared	0.091	0.357
OC (static)	0.284** (2.014)		OC (static)	0.287** (2.426)	
OC (short run)		0.257* (1.798)	OC (short run)		0.306*** (2.810)
OC (long run)		0.218* (1.705)	OC (long run)		0.748*** (3.122)

ΔUd = change in underemployment rate, ARDL= Autoregressive Distributed Lag Models, GDP = gross domestic product, OC = Okun's coefficient, Ud^c = cyclical underemployment rate, \hat{Y} = output (GDP) growth, Y^c = cyclical output (GDP).

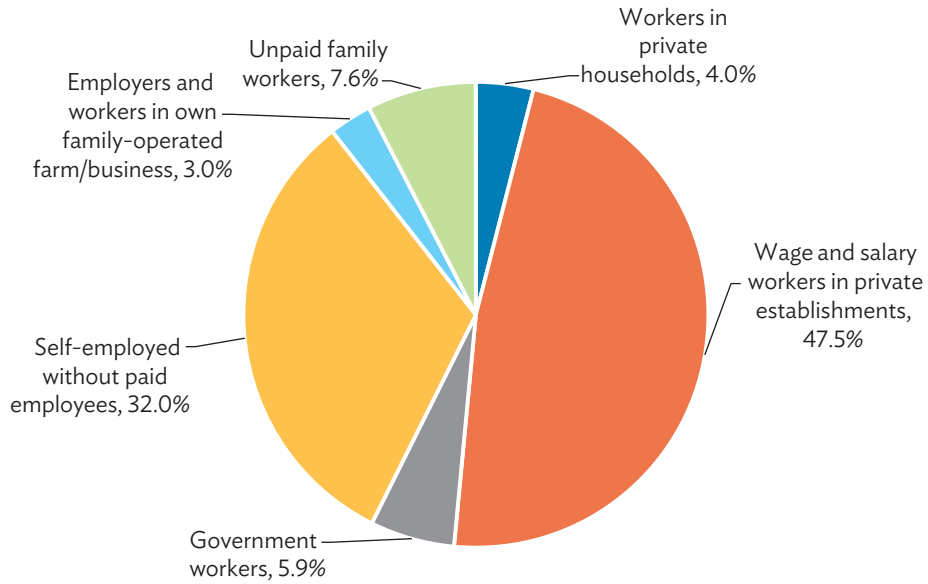
Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for the Okun's coefficient.

Source: Authors' estimates.

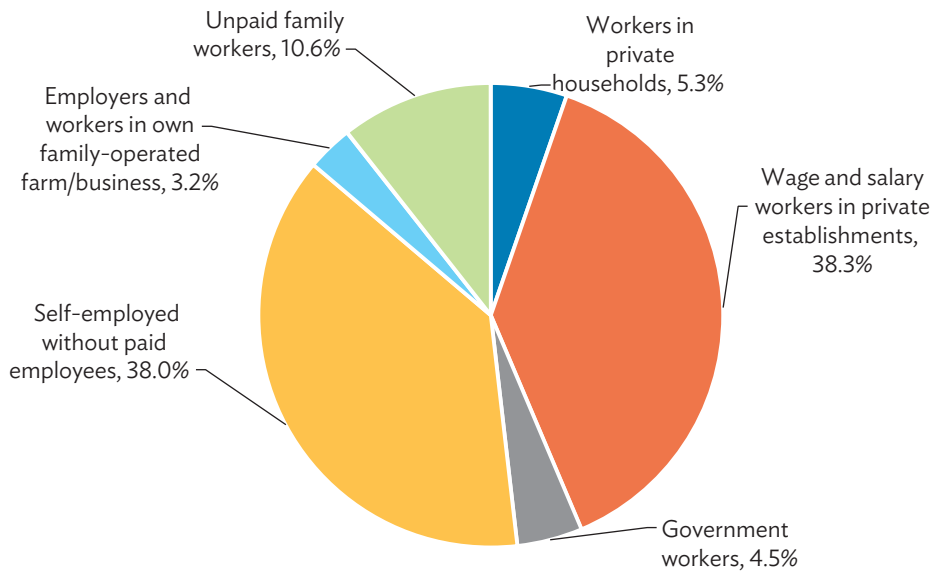
⁴ The latest data on the distribution of the underemployed by occupation or profession corresponds to 2014. We find that the underemployed work in diverse occupations, from professionals and government and corporate officials, to laborers and unskilled workers. The largest group of underemployed consists of laborers and unskilled workers, followed by farmers, fishers, and forestry workers. This pattern is more apparent among the underemployed who worked less than 40 hours than among those who worked 40 hours or more.

Figure 4: Underemployment by Class of Workers, 2016

(a) Share in total underemployment

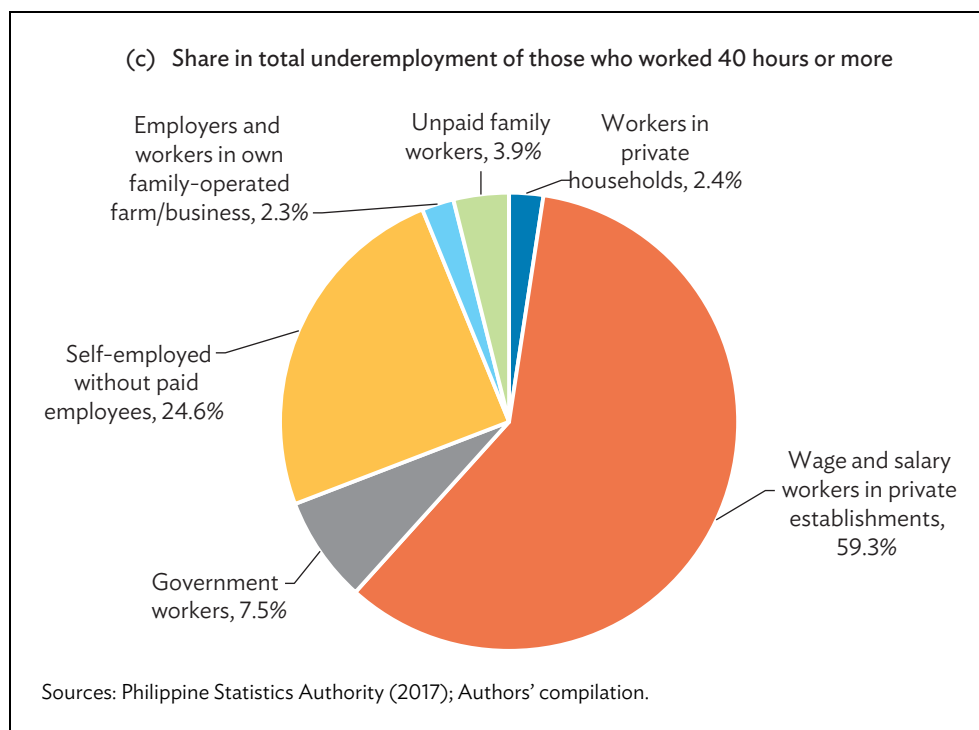


(b) Share in total underemployment of those who worked less than 40 hours



continued on next page

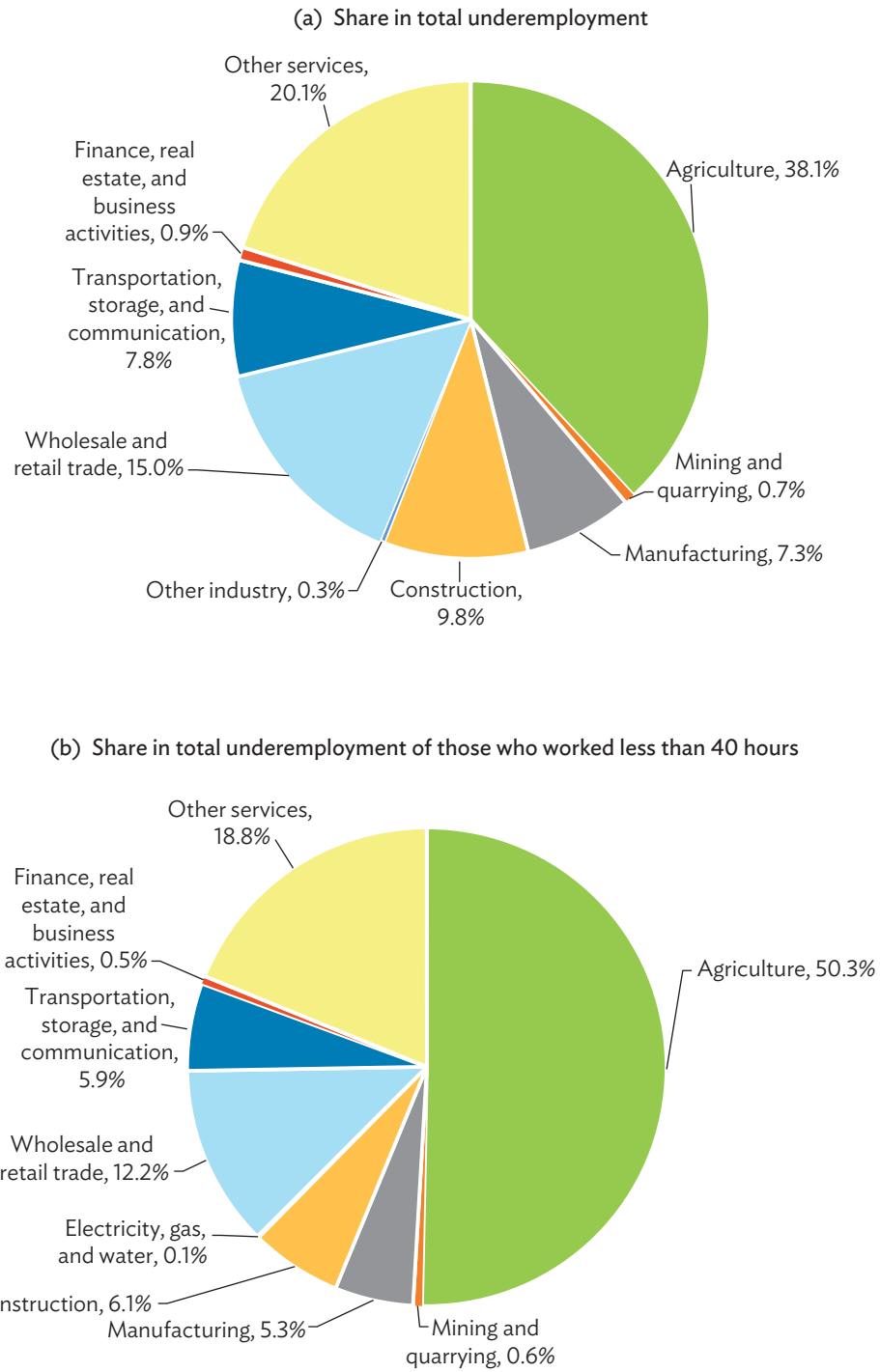
Figure 4 *continued*



By sector, 38% of those underemployed were in agriculture, about 44% were in various service subsectors, and 17% in manufacturing and construction (Figure 5a). Finally, the patterns of the underemployed who worked less than 40 hours and those who worked more than 40 hours, are different. The former is dominated by the agricultural sector while the bulk of the latter works in service subsectors (Figure 5b and Figure 5c).

The Philippine Statistics Authority (2015a) reports that there are people who work over 40 hours a week not out of “necessity” but due to “passion” for work or “ambition”, both being declared reasons in the survey for working longer hours. This means that some well-paid workers who already work 40 hours per week declare themselves as being underemployed. This may distort the underemployment data to the extent the latter is meant to reflect “necessity” and a labor force that is underutilized. For this reason, we run the same model and consider only those working less than 40 hours, what we term as *visible underemployment*. However, given data limitations, estimation with the visible underemployment rate is done with a much shorter series, 30 annual observations. Figure 6 shows data for visible underemployment during 1987–2017. The visible underemployment rate is significantly lower than the total underemployment rate. In 2010–2017, the average total underemployment was 18.6%, but visible the underemployment rate was 10.9%.

Figure 5: Underemployment by Subsector, 2016



continued on next page

Figure 5 continued

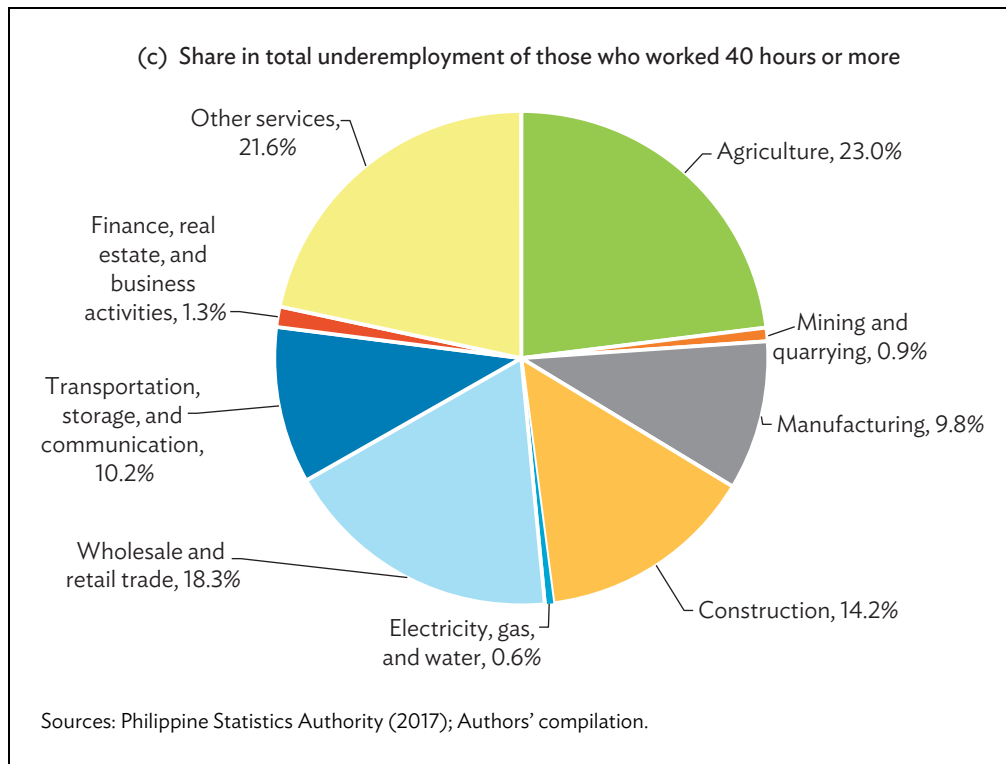
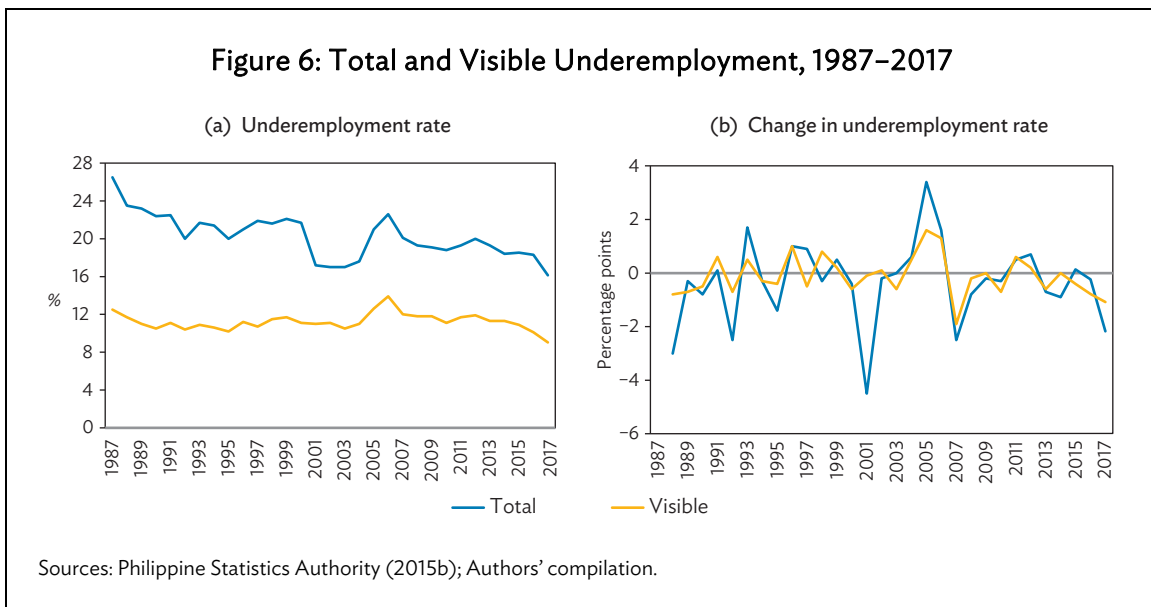


Figure 6: Total and Visible Underemployment, 1987–2017



Regression results in Table 4 show a negative link between output growth and visible underemployment. However, the relationship is statistically insignificant in most equations. Only the static model yields a negative and statistically significant relationship.

In summary, the evidence points to a positive and statistically significant impact of growth on total underemployment. However, when we focus only on visible underemployment, the impact of growth in general becomes negative but statistically insignificant, in line with the earlier results obtained with unemployment.

Table 4: Okun's Coefficient Estimations, Static and Autoregressive Distributed Lag Models, 1987–2017

(Dependent variable: Visible underemployment)

	Change Version ΔUdv			Gap Version Udv^c	
	Static, Equation (3)	ARDL, Equation (5)		Static, Equation (4)	ARDL, Equation (6)
	(a)	(b)		(c)	(d)
\hat{Y}	-0.113* (-1.940)	-0.100 (-1.444)	Y^c	-0.003 (-0.052)	-0.079 (-1.035)
$\hat{Y}(t-2)$		0.096 (1.404)	$Y^c(t-1)$		0.137** (1.982)
$\hat{Y}(t-3)$		-0.127* (-1.882)	$Udv^c(t-1)$		0.313 (1.635)
$\Delta Udv(t-4)$		-0.159 (-0.822)	$Udv^c(t-2)$		-0.451** (-2.419)
			$Udv^c(t-4)$		-0.408** (-2.288)
Constant	0.397 (1.347)	0.506 (1.147)	Constant	-0.029 (-0.262)	-0.008 (-0.084)
Observations	30	26	Observations	30	27
R-squared	0.119	0.266	R-squared	0.000	0.413
OC (static)	-0.113* (-1.940)		OC (static)	-0.003 (-0.052)	
OC (short run)		-0.100 (-1.444)	OC (short run)		-0.079 (-1.035)
OC (long run)		-0.113 (-1.281)	OC (long run)		0.038 (0.760)

ΔUdv = change in visible underemployment rate, ARDL = Autoregressive Distributed Lag, GDP = gross domestic product, OC = Okun's coefficient, Udv^c = cyclical visible underemployment rate, \hat{Y} = output (GDP) growth rate, Y^c = cyclical output (GDP).

Notes: * and ** mean significant at the 10% and 5% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for the Okun's coefficient.

Source: Authors' estimates.

III. THE PHILIPPINES' POTENTIAL GROWTH

Potential growth is the maximum sustainable growth rate that technical conditions allow. Harrod (1939) is probably the first formal reference in the literature to the idea of an economy's full-employment growth rate. He defined the natural rate of growth (\widehat{NGR}) as the rate that is allowed by the growth rate of population and technical progress. Formally, it is the sum of the trend labor force growth rate (\widehat{LF}) and of labor productivity growth rate (\hat{y}^P) (i.e., Harrod-neutral technical progress):⁵

$$\widehat{NGR} = \widehat{LF} + \hat{y}^P \quad (8)$$

The natural growth rate sets the ceiling to explosive growth and gives a measure of the rate to which the economy will gravitate in the long run. At any particular point in time, actual growth (\hat{Y}) can (and will) diverge from the natural growth rate (\widehat{NGR}), as the functioning of the economy is affected by various restrictions, rigidities, and constraints. Nonetheless, actual growth cannot persistently exceed the rate consistent with the full utilization of productive resources, as this would eventually result in growing inflationary pressures and unemployment would fall. With wages rising relative to the price of capital, the economy would adopt more capital-intensive techniques, unemployment would rise again to the rate consistent with full employment and growth would converge to the natural rate.

On the other hand, if actual growth were consistently below the natural growth rate, the resulting rising unemployment would trigger an opposite price adjustment process—decreasing wages would in due course lead to higher employment through the adoption of more labor-intensive production techniques, until equilibrium in the labor market is achieved, and actual and natural growth rates are brought into line.

As a result, in the medium to long term, the economy will tend to gravitate around that particular growth rate consistent with the full utilization of productive resources, stable inflation, and full-employment equilibrium in the labor market. This rate is the natural (potential) growth rate.

Given this, note that when actual growth is equal to potential growth, employment is growing at the same rate as the labor force. This means that the \widehat{NGR} , or potential growth (\hat{Y}^p), is the growth rate that keeps unemployment constant, i.e., $\Delta U = 0$. Therefore, this implies that one can obtain a measure of potential growth from equation (1), Okun's Law, as:

$$\hat{Y}^p = \left(\frac{\alpha}{\beta} \right) \quad (9)$$

⁵ Note the notation and concepts we use. Since we will estimate the natural (potential) growth rate and we will use trend labor force growth rate, labor productivity growth is derived residually as the difference between these two, to make sure left and right-hand sides of the definition are equal. This means that the derived labor productivity growth (\hat{y}^P) will not be equal to actual labor productivity growth.

The problem with this estimate is that labor hoarding by firms during normal period will lead to a downward-biased estimate of β , and hence an overestimate of the natural rate. At the same time, periods of no growth will discourage participation in the labor market, including dropping out from the labor market, thus biasing the estimate of α . Given the likely opposite impacts of the two scenarios on potential growth, it is difficult to gauge the net effects (Thirlwall 1969, Leon-Ledesma and Thirlwall 2002). Thirlwall (1969) proposed that a possible solution to partially overcome the biases is to estimate the reverse equation, that is:

$$\hat{Y} = \gamma - \delta \Delta U \quad (10)$$

Hence, a nonchanging unemployment rate, $\Delta U = 0$, implies

$$\hat{Y}^p = \gamma \quad (11)$$

We use equation (10) in our empirical work. In addition to providing static estimates of potential growth, this study also provides time-varying estimates for the Philippines using the Kalman filter. The estimation period is 1957–2017.

Estimates of equation (10), using both unemployment and underemployment, are shown in Tables 5 and 6. Note that columns (a)–(c) use the change in unemployment, column (d) uses the change in total underemployment, and column (e) uses both the change in unemployment and the change in total underemployment, with all regressions spanning a 61-year period. Column (f) uses change in visible underemployment and column (g) uses change in visible underemployment and change in total unemployment, with both estimations for only 30 years, i.e., 1988–2017. Note that columns (e) and (g) use unemployment and underemployment as separate regressors. Using total unemployment and total underemployment, estimates of potential growth are obtained for 1957–2017, and for three subperiods: (i) 1957–1975, (ii) 1976–2004, and (iii) 2005–2017, representing the periods when the Philippine statistical authorities changed the definition of unemployment. In the static models (Table 5), average potential growth over the period 1957–2017 was 4.3% (columns [a] and [d]). By subperiods, potential growth was close to 5% in 1957–1975, but fell to around 3.4% in 1976–2004, before rising again to around 5.5% in 2005–2017 (columns [b], [c], and [e]).

Using visible underemployment, potential growth is estimated for 1988–2017 and for only two subperiods, 1988–2004 and 2005–2017, due to data limitations. In the static models, average potential growth was 4.4% during 1988–2017 (column [f]) and, by subperiod, it was 3.7% in 1988–2004 and 5.3% in 2005–2017 (column [g]) (Table 5).

Table 6 presents potential growth estimates derived from the ARDL models. The estimates of potential growth in the ARDL models are consistent with those found in the static models.

Table 5: Potential Growth Estimates, Static Models, 1957–2017

(Dependent variable: GDP growth)							
Equation (10)							
	(a)	ΔU (b)	(c)	$\Delta U d$ (d)	ΔU and $\Delta U d$ (e)	$\Delta U d v$ (f)	ΔU and $\Delta U d v$ (g)
ΔU	-0.564*	-0.324	-0.533		-0.962*		-0.876
	(-1.729)	(-0.975)	(-0.920)		(-1.702)		(-1.501)
$\Delta U d$				0.226**	0.317***		
				(2.014)	(2.862)		
$\Delta U d v$						-1.048*	-0.985*
						(-1.940)	(-1.853)
D_1		1.507*	1.435		1.497*		
		(1.769)	(1.647)		(1.827)		
D_2		2.066**	2.205**		2.312**		1.592*
		(2.145)	(2.168)		(2.415)		(2.033)
$\Delta U \times D_1$			0.169		0.476		
			(0.221)		(0.652)		
$\Delta U \times D_2$			0.626		1.319		0.608
			(0.670)		(1.447)		(0.739)
Constant	4.269***	3.381***	3.438***	4.339***	3.490***	4.408***	3.733***
	(11.564)	(6.428)	(6.268)	(11.889)	(6.762)	(10.926)	(7.605)
Observations	61	61	61	61	61	30	30
R-squared	0.048	0.134	0.141	0.064	0.254	0.119	0.347
\hat{Y}^p , 1957–2017 (%)	4.269***			4.339***			
	(11.564)			(11.889)			
\hat{Y}^p , 1988–2017 (%)						4.408***	
						(10.926)	
\hat{Y}^p , 1957–1975 (%)		4.888***	4.873***		4.987***		
		(7.489)	(7.197)		(7.818)		
\hat{Y}^p , 1976–2004 (%)		3.381***	3.438***		3.490***		
		(6.428)	(6.268)		(6.762)		
\hat{Y}^p , 1988–2004 (%)							3.733***
							(7.605)
\hat{Y}^p , 2005–2017 (%)		5.447***	5.642***		5.802***		5.324***
		(6.900)	(6.589)		(7.187)		(8.509)

ΔU = change in unemployment rate, $\Delta U d$ = change in underemployment rate, $\Delta U d v$ = change in visible underemployment rate, $\Delta U \times D_1$ = interaction between output growth and dummy variable for 1957–1975, $\Delta U \times D_2$ = interaction between output growth and dummy variable for 2005–2017, D_1 = 1957–1975, D_2 = 2005–2017, \hat{Y}^p = potential growth.

Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for potential growth.

Source: Authors' estimates.

Table 6: Potential Growth Estimates, Autoregressive Distributed Lag Models, 1957–2017

(Dependent variable: GDP growth)							
Equation (10)							
	ΔU	ΔU	ΔU	$\Delta U d$	ΔU and $\Delta U d$	$\Delta U d v$	ΔU and $\Delta U d v$
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
\hat{Y} (t-1)	0.442*** (3.780)	0.398*** (3.178)	0.417*** (3.284)	0.472*** (4.016)	0.495*** (3.608)	0.381** (2.261)	0.414* (2.007)
\hat{Y} (t-2)					-0.208 (-1.532)		
ΔU	-0.451 (-1.380)	-0.349 (-1.015)	-0.792 (-1.438)		-1.486** (-2.615)		-1.498** (-2.395)
ΔU (t-2)	-0.379 (-1.272)	-0.293 (-0.942)	-0.340 (-1.068)		-0.522 (-1.589)		
D_1		0.753 (0.861)	0.589 (0.661)		0.464 (0.553)		
D_2		0.933 (0.949)	1.025 (1.003)		1.226 (1.294)		0.769 (0.818)
$\Delta U \times D_1$			0.512 (0.625)		1.292 (1.613)		
$\Delta U \times D_2$			1.057 (1.193)		2.079** (2.362)		1.438 (1.706)
$\Delta U d$				0.199* (1.968)	0.300*** (2.876)		
$\Delta U d$ (t-1)				-0.121 (-1.178)			
$\Delta U d$ (t-2)				-0.184* (-1.834)	-0.166 (-1.645)		
$\Delta U d$ (t-3)				-0.132 (-1.307)			
$\Delta U d$ (t-4)				0.199* (1.968)			
$\Delta U d v$						-1.041** (-2.063)	-0.822 (-1.585)
$\Delta U d v$ (t-3)							-0.887 (-1.712)
Constant	2.381*** (3.955)	2.160*** (3.351)	2.227*** (3.416)	2.331*** (3.949)	2.872*** (4.127)	2.716*** (3.240)	2.376*** (2.989)
Observations	59	59	59	57	58	30	27
R-squared	0.264	0.280	0.300	0.418	0.472	0.259	0.512

continued on next page

Table 6 *continued*

	Equation (10)						
	ΔU		$\Delta U d$	ΔU and $\Delta U d$	$\Delta U d v$	ΔU and $\Delta U d v$	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
\hat{Y}^p , 1957–2017 (%)	4.268*** (6.979)			4.415*** (7.306)			
\hat{Y}^p , 1988–2017 (%)						4.384 (7.205)	
\hat{Y}^p , 1957–1975 (%)		4.835*** (4.445)	4.831*** (4.219)		4.678*** (5.323)		
\hat{Y}^p , 1976–2004 (%)		3.585*** (4.277)	3.821*** (4.204)		4.027*** (5.861)		
\hat{Y}^p , 1988–2004 (%)							4.058*** (4.198)
\hat{Y}^p , 2005–2017 (%)		5.135*** (4.065)	5.581*** (4.014)		5.747*** (5.534)		5.372*** (5.360)

ΔU = change in unemployment rate, $\Delta U d$ = change in underemployment rate, $\Delta U d v$ = change in visible underemployment rate, $\Delta U \times D_1$ = interaction between output growth and dummy variable for 1957–1975, $\Delta U \times D_2$ = interaction between output growth and dummy variable for 2005–2017, $D_1 = 1957$ –1975, $D_2 = 2005$ –2017, \hat{Y}^p = potential growth.

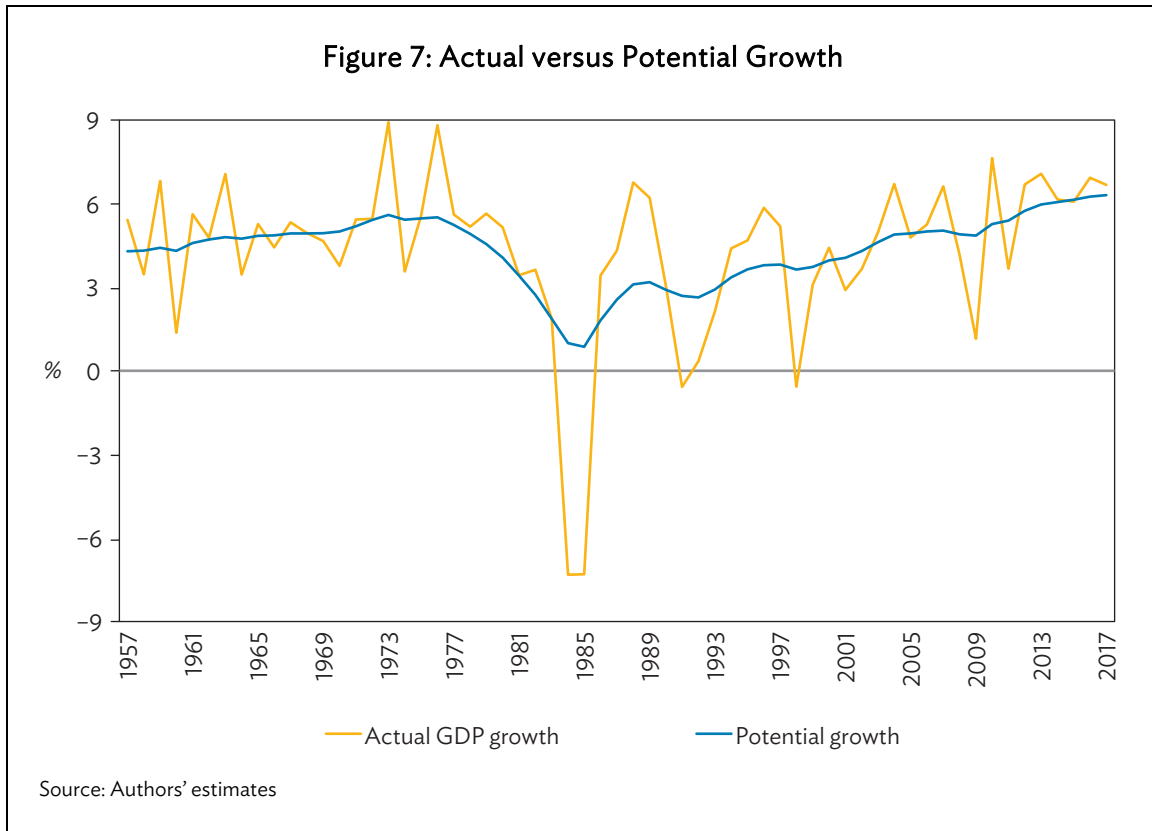
Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for potential growth.

Source: Authors' estimates

Next, we provide time-varying estimates of potential growth rate through the Kalman filter, applied to equation (10). Potential growth estimates are obtained from the Kalman smoothing procedure, which uses all the information in the sample to produce smoothed state estimates (See the Appendix). Figure 7 shows the actual versus the time-varying potential growth. The estimates are consistent with those derived from the standard regression models: the period ranging from the mid-1950s to the 1970s is marked by modest potential growth rates; the 1980s and 1990s by declining potential growth rates; and the 2000s to 2010s by steadily rising potential growth rates. Actual growth is higher than potential growth in 40 out of the 61 years, with an average gap of 1.1 percentage points. In the 21 years when actual growth is lower than potential growth, the average gap is 2.1 percentage points (the largest gap was in 1984 at 8.3 percentage points). In years when actual growth is higher than potential growth, the latter is significantly higher than in periods when actual growth is lower than potential growth. It is worth noting that from 2012 onward, the economy has been operating within or above potential growth. In 2017, the country had a record-high potential growth of 6.3%, close to half a percentage point below actual growth.

As actual growth is now slightly above potential growth, further increases in actual growth may eventually lead to inflationary pressures (as we show below, the economy still has room). Note that inflation has been trending up since the last quarter of 2015. In February 2018, inflation reached 3.8%, near the upper bound of Bangko Sentral ng Pilipinas' inflation target and the highest since October 2014.

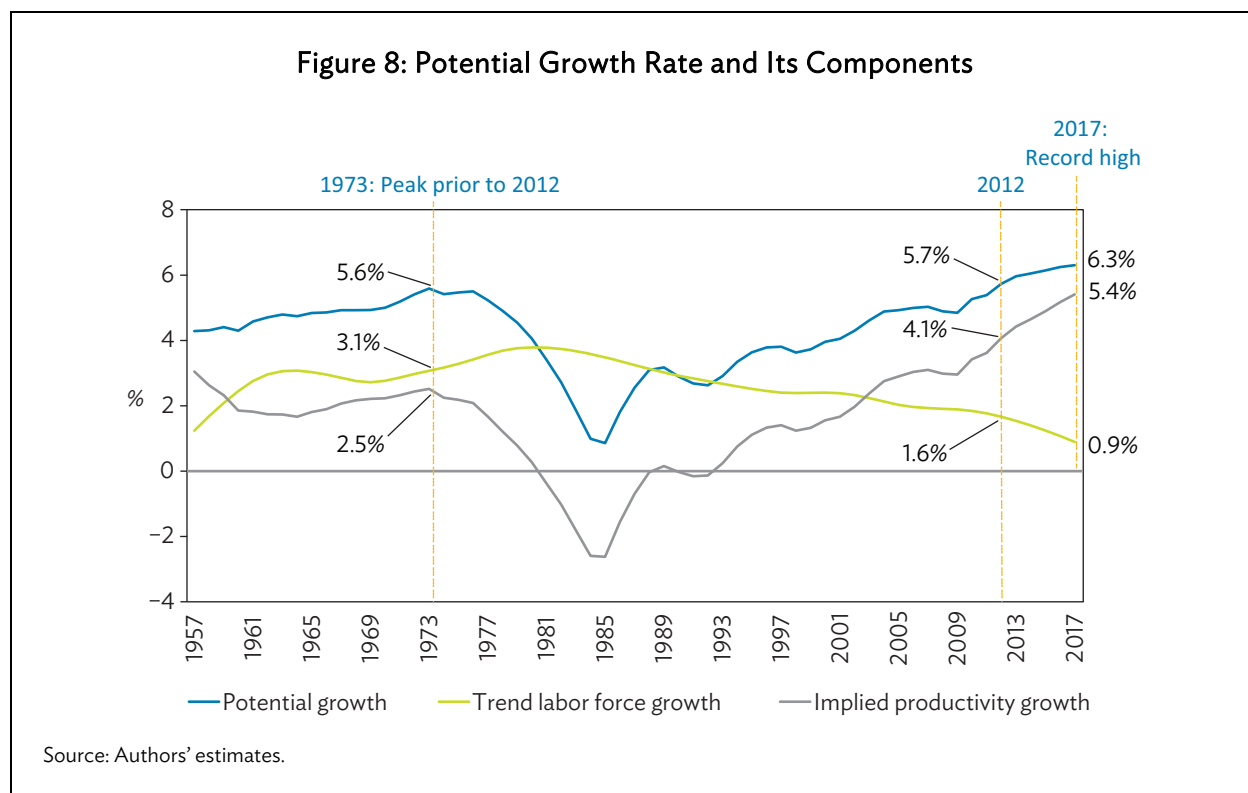
Examining the components of the time-varying potential growth rate allows us to identify what is driving the recent increase in potential growth. Recall that the potential or natural growth rate is the sum of labor productivity growth and labor force growth (Harrod 1939). The labor force growth we use is a smooth trend derived from the Hodrick–Prescott time-series filter. Consequently, we derived the implied potential labor productivity growth (\hat{y}^p) as the difference between the time-varying natural growth rate and trend labor force growth.



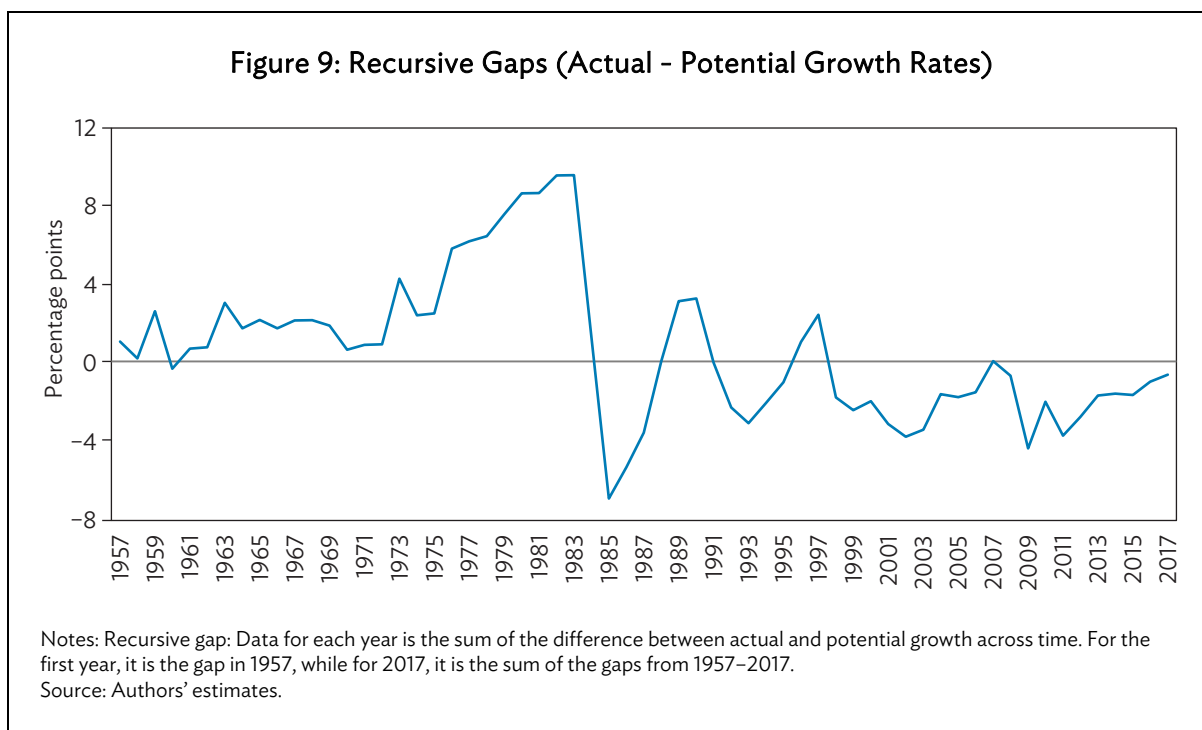
Estimates of the components of equation (8) are shown in Figure 8. The labor force growth trend began declining in 1981, while the implied productivity growth started gradually rising a few years afterwards. The implied potential labor productivity growth has exceeded the labor force trend growth since 2003. This indicates that much of the increase in potential growth in recent years is due to labor productivity growth, as trend labor force growth is on the decline. Indeed, labor productivity growth accounted for three quarters of potential growth during 2010–2017 (and over 85% in 2017).

Finally, we have hypothesized that Philippine actual growth is adjusting to an increasing potential growth. We test for Granger causality, where the null hypothesis is that past values of potential growth do not Granger cause current actual growth. The data clearly reject this hypothesis.⁶ We also tested whether future potential growth does not Granger cause current actual growth. This null hypothesis is likewise rejected. We conclude that potential output growth Granger causes actual output growth.

⁶ The data also reject the null hypothesis in the other direction, that is, actual growth Granger causes potential growth. This means that causality between actual and potential growth runs in both directions.



Likewise, since actual growth cannot diverge permanently from potential growth in the long run, this means that the sum of the deviations (in both directions) will tend to vanish (i.e., approach zero, $\sum_{t=0}^{\infty} (\hat{Y}_t - \hat{Y}_t^P) \rightarrow 0$ as times goes on. This is shown to be the case in Figure 9. We show recursive sums of the difference between both growth rates, starting with the gap in 1957 and ending up with the sum of the gaps from 1957–2017. Figure 9 shows that the total gap was very small in 1957. Then it increased in the positive direction until 1984, when the accumulated gap was about 9 percentage points. It turned negative in 1985, as a result of the shock caused by the economic crisis, which led to an accumulated gap that approached –8 percentage points. Since then, the total deviation has tended to vanish. Overall, the evidence shows that as more gaps are added (long run), successive sums become smaller and approach zero. In 2017, the sum of the gaps was still slightly negative and approaching zero. Our interpretation is that the economy has room to grow before it experiences inflationary pressures. Nevertheless, as it is expected that the Philippine economy will continue growing in the coming years, authorities should focus on increasing potential growth to provide room for further growth in a stable macroeconomic environment.

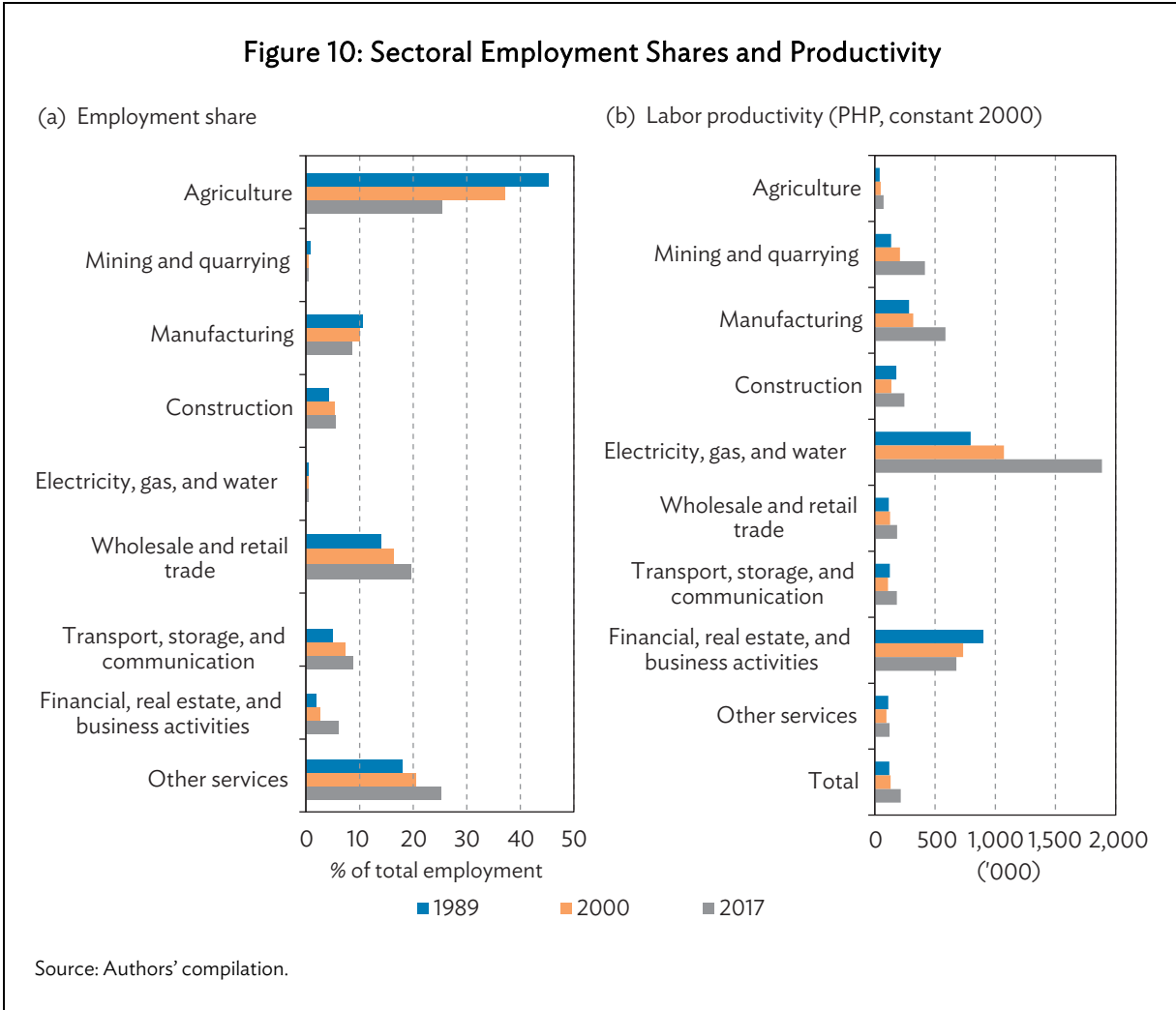


IV. DECOMPOSITION OF LABOR PRODUCTIVITY GROWTH

Since labor productivity growth has been the driver of potential growth in recent years, we take a closer look at it in this section, both its level and growth rate.

Figure 10 shows sectors' employment shares and the corresponding labor productivity levels. In the Philippines, agriculture is still the single largest employer (with a share of 25%), although the share is declining. Over the past 10 years, the share of agriculture in total employment dropped by about 10 percentage points, of which half were shed just in the past 3 years. The steady decline in the agricultural employment share bodes well in terms of raising productivity since it is the least productive sector. However, agricultural productivity has barely increased in the Philippines and remains very low despite the very significant decline in the employment share. The reason is that total agricultural output increased marginally, averaging a meager 2% annual growth rate during 1989–2017, while the absolute number of workers also increased slightly (the absolute number of workers in agriculture started declining in 2012). This stands in contrast with the standard experience, including that of Asia's advanced economies, which registered rising agricultural productivity along with declining employment shares during development.

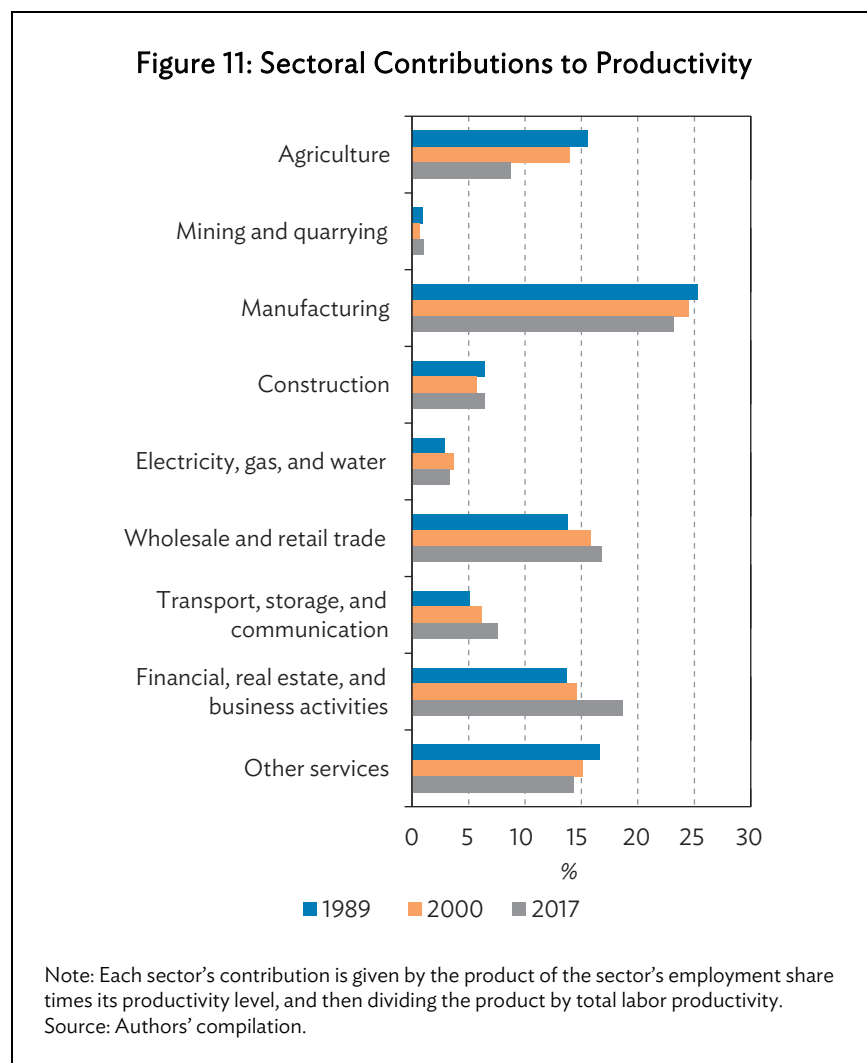
In 2017, total employment declined by 1.2% mainly due to a decline in agricultural employment by 7%. The drop in total employment occurred alongside a robust economic growth of 6.7%. If the data, which have just been recently released, are indeed accurate, then this means that the economy's total productivity increased by a staggering 7.9% in 2017, the highest since 1997.



A standard mechanism to achieve higher productivity is by transferring workers from low-productivity into higher-productivity sectors. In the Philippines, workers are shifting from agriculture toward services. Manufacturing labor productivity has increased while the sector's employment share has fallen. The manufacturing employment share peaked in 1973, at 11.1%, lower than the peaks achieved by the People's Republic of China, Indonesia, Malaysia, and Thailand (Felipe, Mehta, and Rhee 2018). The employment share of construction is increasing. The most productive sector is electricity, gas, and water, but its employment share is, together with that of mining and quarrying, the smallest. Within services, the financial, real estate, and business activities subsector, is the most productive, but it accounts for only about 6% of total employment and its productivity is declining.

Despite the decline in the employment share of the manufacturing sector, the total number of manufacturing workers is increasing (nearly 3.5 million in 2017). This suggests that the share of manufacturing employment has fallen because the number of workers in services has increased at a quicker pace. Employment is shifting more toward service subsectors with lower productivity than manufacturing, such as wholesale and retail trade and transport, storage, and communications.

Figure 11 shows the contributions of each subsector to the overall productivity level. Manufacturing contributes the most to aggregate productivity. So does still agriculture (although its contribution is declining) as a result of its significant employment share. Within services, subsectors that contribute the most to overall productivity level are (i) financial, real estate, and business activities; and (ii) wholesale and retail trade. Despite having a low employment share, the financial, real estate, and business activities subsector also contributes substantially to overall productivity because it has a high level of productivity. Wholesale and retail trade also contributes significantly to the overall productivity because it has a large employment share.



Actual labor productivity growth can be decomposed into the contribution of intrasectoral productivity growth (*within* effect) and that of the shift in employment across sectors (*reallocation* effect). This can be expressed algebraically as follows (with each term ordered in the sum):

$$\hat{y} = (y_t - y_0)/y_0 = \left(\sum_{j=1}^N (y_{j,t} - y_{j,0})s_{j,0} + \sum_{j=1}^N y_{j,t}(s_{j,t} - s_{j,0}) \right) / y_0 \quad (12)$$

where y denotes actual labor productivity level (and the symbol $\hat{}$ denotes a growth rate), 0 is the initial year, t is the final year, N is the number of subsectors, j corresponds to each subsector, and s is each sector's weight in employment.

The first summation is the within effect, the sum of the sectoral growth rates of labor productivity, weighted by the initial share of each sector's employment in overall employment. The second summation is the reallocation effect, the sum of the changes in employment's sectoral shares weighted by each sector's final productivity level. This reflects the effect of structural change on productivity growth. A sector whose share increases will have a positive contribution while a sector whose share declines will have a negative contribution to the reallocation effect.

Figure 12 shows the results of the decompositions of actual labor productivity for the economy by subperiod, as well as for the whole period of 1989–2017. Results indicate that during 1989–1999, the within effect was negative and lower than the reallocation effect. For the other subperiods, the within effect was positive and large, accounting for about 70% of overall productivity growth.

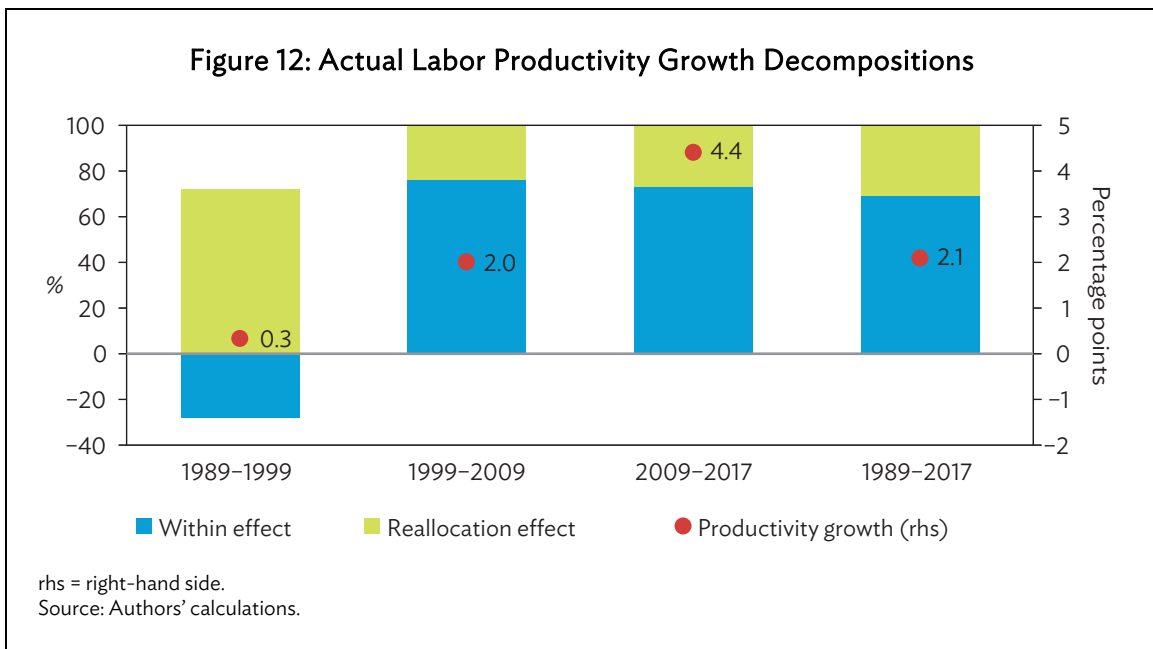
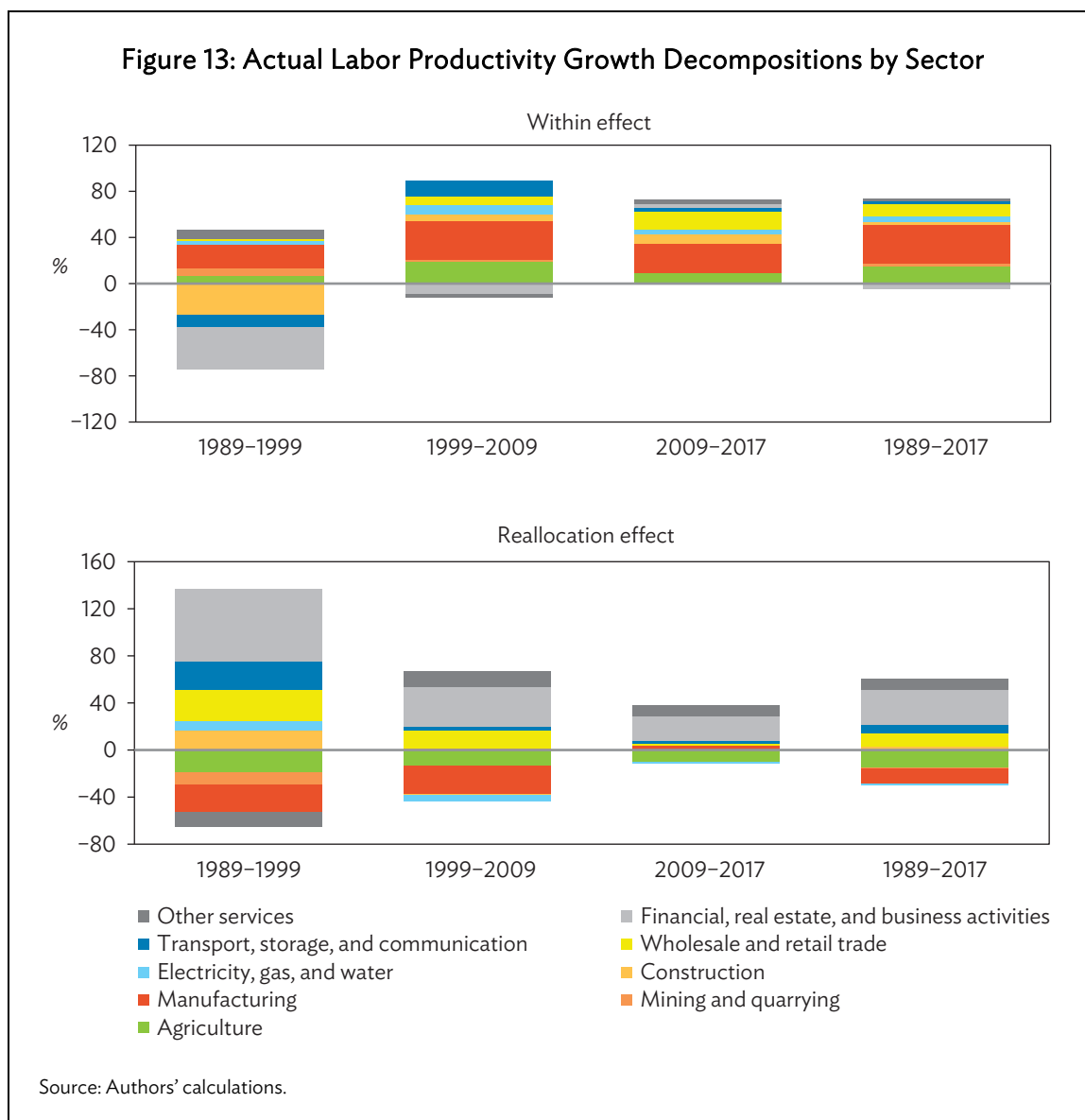


Figure 13 shows the contribution of each subsector to the within and reallocation effects. In 1989–1999, the contribution from productivity growth within each sector, i.e., the within effect, was negative due to declining productivity in construction; transport, storage, and communication; and financial, real estate, and business activities. During this subperiod, sectoral shifts in employment across sectors, i.e., the reallocation effect, contributed significantly due to employment growth in financial, real estate, and business activities; wholesale and retail trade; and transport, storage, and communication. In the other subperiods, the positive and large within effect was driven by rising manufacturing productivity. The reallocation effect was smaller than the within effect due to the fact that workers moved to service subsectors instead of manufacturing, and productivity is lower in the former. At the same time, the decline in the share of manufacturing employment damped the impact of the reallocation effect.

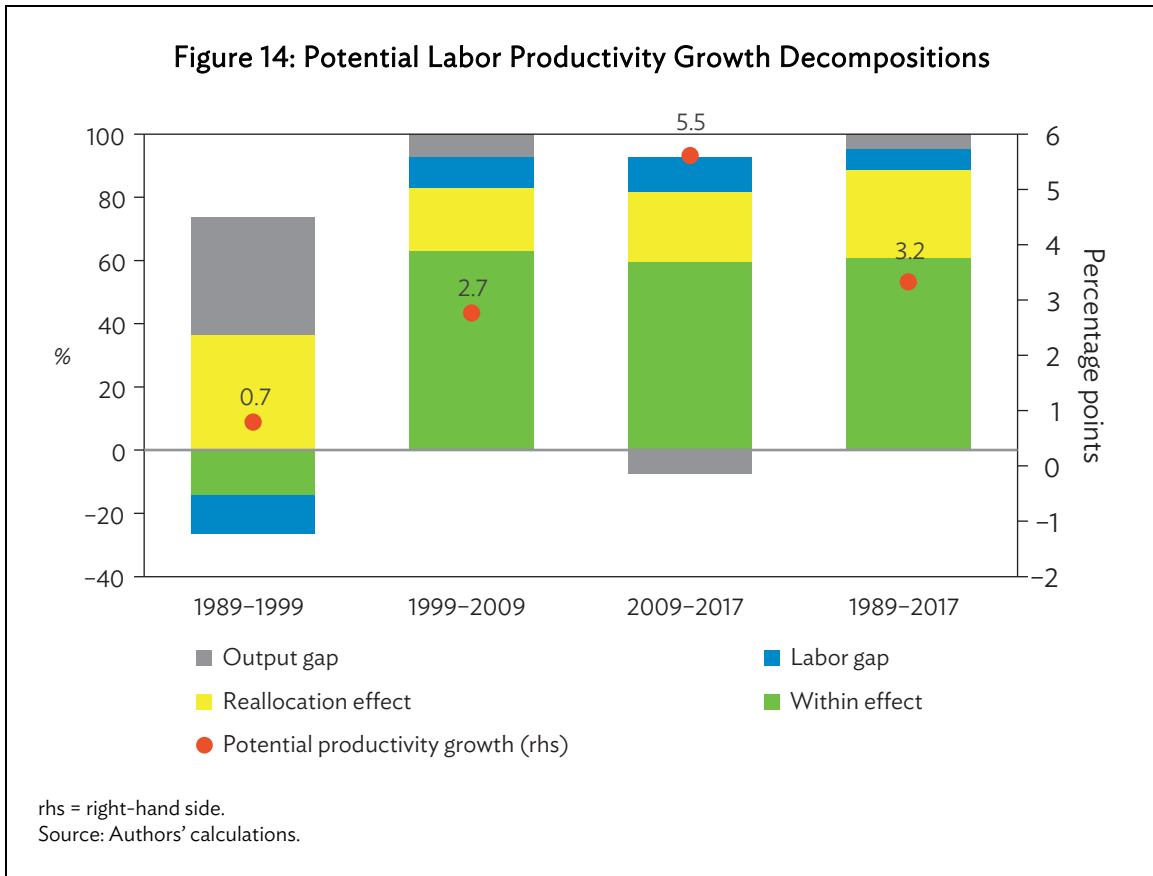


Next, we decompose potential labor productivity growth (\hat{y}^P) as follows:

$$\hat{y}^P = \widehat{NGR} - \widehat{LF} = \widehat{W} + \widehat{R} - (\hat{Y} - \widehat{NGR}) + (\hat{L} - \widehat{LF}) \quad (13)$$

Equation (13) shows that potential labor productivity growth can be also decomposed into the same within and reallocation effects as actual labor productivity growth, plus two additional terms, one that captures the output gap ($\hat{Y} - \widehat{NGR}$) and another one that captures the labor gap ($\hat{L} - \widehat{LF}$). The first additional term is actual GDP growth (\hat{Y}) minus the natural growth rate \widehat{NGR} or potential growth. The labor gap is the difference between actual employment growth (\hat{L}) and trend labor force growth (\widehat{LF}). Potential labor productivity growth increases when potential growth is higher than actual growth, as well as when employment growth is higher than trend labor force growth.

Results of the decomposition of potential labor productivity growth are shown in Figure 14. Over the period 1989–2017, most potential labor productivity growth derives from the within effect, with only minimal contributions from the output and labor gaps. During 2009–2017, the output gap contributed negatively to labor productivity growth since actual growth was higher than potential growth. However, on average, actual growth was lower than potential growth over the period 1989–2017, although by a small margin, which explains the low contribution of the output gap to potential labor productivity growth. Similarly, employment growth has only been slightly higher than trend labor force growth, and hence the small contribution of the labor gap.



V. PRODUCTIVITY GROWTH AND JOBS

The previous section showed that much of the increase in potential growth has been driven by labor productivity growth. This, therefore, implies that for potential growth to further rise, there is a need to boost productivity growth. However, there are concerns that adopting advanced technologies, say through robotics or automation, can crowd out employment and hence, the notion that productivity growth might come at the expense of lower employment. Some studies have shown that advanced labor-saving technologies can create short-term gains for skilled workers, but also that in the long run, such technologies can displace those workers (Sachs and Kotlikoff 2012; Berg, Buffie, and Zanna 2017).

A recent study by Autor and Salomons (2017) examines the impact of productivity growth on employment growth using country- and industry-level data for 19 advanced countries. They find that

industry-level employment falls as industry productivity increases. However, they also find that employment at the country level rises with productivity. This occurs because the negative own-industry employment effect of rising productivity is outweighed by positive spillovers on the rest of the economy.

Using Philippine data, we examine the impact of productivity growth on employment growth. This is done at the aggregate level and across nine subsectors over the period 1990–2016. The following empirical models are used to estimate the impact of labor productivity growth on employment growth:

$$\Delta \ln E = \alpha + b \Delta \ln y + \theta_1 D_1 + \theta_2 D_2 + \varepsilon \quad (14)$$

$$\Delta \ln E = \alpha + \sum_{k=0}^K b \Delta \ln y_{t-k} + \theta_1 D_1 + \theta_2 D_2 + \varepsilon \quad (15)$$

$$\Delta \ln E_j = \alpha + b \Delta \ln y_j + \sum_{k=0}^K b \Delta \ln y_{t-k}^{oth} + \theta_1 D_1 + \theta_2 D_2 + \sum_{j=1}^J \varphi_j S_j + \varepsilon \quad (16)$$

where $\Delta \ln E$ is the change in log employment or number of workers, $\Delta \ln y$ is the change in log total or own-sector labor productivity level, $\Delta \ln y^{oth}$ is the change in log other sectors' average labor productivity level, and S_j is sector dummies (nine sectors, with agriculture being the default reference sector). D_i represents decade dummies: D_1 for 1990–1999 and D_2 for 2000–2009, with the default reference decade being 2010–2017. The subscript k is for time lags of labor productivity growth while the subscript j refers to the subsector. Equation (14) is used to estimate the impact of aggregate labor productivity on growth in total employment, as well as underemployment, at the country level. Equation (15) extends the model by adding lags of productivity growth. Equation (16) is used to analyze impact of own-sector and other sectors' productivity growth on employment growth. We also extend the models by adding change in log population ($\Delta \ln p$) as control variable, with the assumption that employment growth may be partly driven by an increase in population.

Estimation results of equation (14) are shown in columns (a) and (d) in Table 7, while the results of equation (15) are shown in the other four columns. Results in columns (b) and (c) indicate that a 10% increase in productivity leads to an 8% decrease in employment. However, the impact of productivity growth on underemployment is statistically insignificant.

Table 8 shows the estimation results of equation (16) for each of the nine subsectors. Results are obtained by running individual-sector regressions. It is evident that a rise in own-sector's productivity is associated with a decline in employment growth. This is seen across all sectors, except in construction (statistically insignificant). Results also indicate that other sectors' productivity growth has no statistically significant impact on a sector's employment. The total effect, calculated as the sum of own-sector and other sectors' productivity growth, is negative and statistically significant in agriculture; wholesale and retail trade; financial, real estate, and business activities; and in other services. In the other sectors, the total effect is statistically insignificant.

Table 7: Effect of Productivity Growth on Employment and Underemployment Growth, Country Aggregate Level, 1990–2017

	$\Delta \ln E$ (Employment)			$\Delta \ln Ud$ (Underemployment)		
	Equation (14)	Equation (15)		Equation (14)	Equation (15)	
	(a)	(b)	(c)	(d)	(e)	(f)
$\Delta \ln y$	-0.542*** (-6.009)	-0.581*** (-5.647)	-0.581*** (-5.491)	0.054 (0.095)	-0.316 (-0.453)	-0.334 (-0.472)
$\Delta \ln y$ (t-1)		-0.054 (-0.575)	-0.059 (-0.552)		-0.645 (-1.010)	-0.871 (-1.207)
$\Delta \ln y$ (t-2)		0.002 (0.020)	-0.006 (-0.051)		0.250 (0.427)	-0.062 (-0.084)
$\Delta \ln y$ (t-3)		-0.179* (-1.899)	-0.182* (-1.801)		-0.036 (-0.056)	-0.173 (-0.256)
$\Delta \ln p$			-0.290 (-0.113)			-12.234 (-0.709)
D_1	-0.016** (-2.268)	-0.021** (-2.475)	-0.019 (-1.238)	0.025 (0.554)	0.021 (0.359)	0.083 (0.786)
D_2	-0.007 (-1.110)	-0.010 (-1.555)	-0.010 (-1.156)	0.014 (0.342)	0.001 (0.020)	0.025 (0.433)
Constant	0.041*** (6.909)	0.050*** (6.191)	0.056 (1.177)	-0.006 (-0.159)	0.024 (0.438)	0.245 (0.774)
Observations	28	25	25	28	25	25
R-squared	0.609	0.709	0.709	0.015	0.108	0.134
Total effect: $\sum_{k=0}^K b \Delta \ln y_{t-k}$	-0.542*** (-6.009)	-0.812*** (-4.257)	-0.828*** (-3.387)	0.054 (0.095)	-0.748 (-0.577)	-1.441 (-0.880)

$\Delta \ln E$ = change in log employment, $\Delta \ln p$ = change in log population, $\Delta \ln y$ = change in log productivity, $\Delta \ln Ud$ = change in log underemployment, D_1 = 1990–1999, D_2 = 2000–2009.

Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for the total effect (last row in the table).

Source: Authors' estimates.

Table 8: Effect of Productivity Growth on Own-Sector and Other Sectors' Employment Growth, by Sector, 1990–2017

Equation 16 ($\Delta \ln E$)									
	Agriculture	Mining and Quarrying	Manufacturing	Construction	Electricity, Gas, and Water	Wholesale and Retail Trade	Transport, Storage, and Communication	Financial Intermediation, Real Estate, Rent and Business Activities	Other Services
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
$\Delta \ln y$	-0.660*** (-3.680)	-0.542*** (-4.319)	-0.458*** (-2.929)	-0.041 (-0.285)	-0.823*** (-8.009)	-0.737*** (-7.461)	-0.535*** (-3.094)	-0.912*** (-10.654)	-0.975*** (-21.604)
$\Delta \ln y^{oth}$	-0.071 (-0.352)	-0.789 (-1.627)	0.137 (1.125)	-0.134 (-0.424)	0.087 (0.317)	-0.055 (-0.451)	0.033 (0.257)	-0.021 (-0.186)	-0.073 (-0.870)
$\Delta \ln y^{oth} (t-1)$	0.004 (0.023)	-0.925* (-1.837)	0.068 (0.550)	0.027 (0.083)	0.189 (0.636)	0.091 (0.757)	0.207 (1.622)	0.071 (0.598)	0.052 (0.637)
$\Delta \ln y^{oth} (t-2)$	-0.075 (-0.445)	0.556 (1.173)	0.146 (1.353)	0.078 (0.267)	0.202 (0.725)	0.173 (1.684)	0.206* (1.835)	0.147 (1.518)	0.095 (1.258)
$\Delta \ln y^{oth} (t-3)$	-0.081 (-0.528)	0.221 (0.536)	0.098 (1.015)	-0.175 (-0.669)	-0.124 (-0.494)	-0.002 (-0.020)	0.056 (0.563)	0.120 (1.324)	-0.079 (-1.097)
D_1	-0.000 (-0.003)	-0.147 (-1.473)	-0.046 (-1.694)	0.010 (0.139)	0.013 (0.295)	-0.023 (-0.956)	-0.021 (-0.782)	0.028 (0.926)	-0.004 (-0.204)
D_2	0.015 (0.794)	0.018 (0.360)	-0.041*** (-3.084)	-0.009 (-0.283)	-0.013 (-0.578)	-0.013 (-1.116)	-0.008 (-0.633)	-0.001 (-0.045)	-0.009 (-1.009)
$\Delta \ln p$	1.111 (0.236)	8.321 (0.677)	5.436 (1.666)	1.938 (0.229)	2.722 (0.372)	3.382 (1.130)	7.890** (2.492)	-7.207* (-1.935)	-4.752** (-2.239)
Constant	-0.009 (-0.121)	-0.072 (-0.356)	-0.054 (-1.029)	-0.002 (-0.012)	-0.009 (-0.071)	-0.008 (-0.155)	-0.098* (-1.927)	0.182*** (3.147)	0.135*** (4.019)
Observations	25	25	25	25	25	25	25	25	25
R-squared	0.620	0.654	0.572	0.164	0.873	0.870	0.670	0.894	0.978
Total effect other sectors:	-0.223	-0.937	0.449	-0.203	0.354	0.207	0.502	0.317	-0.006
$\sum_{k=0}^K b \Delta \ln y_{t-k}^{oth}$	(-0.505)	(-0.772)	(1.615)	(-0.267)	0.488	(0.789)	(1.620)	(1.234)	(-0.031)
Total effect own sector plus other sectors:	-0.883**	-1.479	-0.009	-0.244	-0.470	-0.530*	-0.033	-0.596**	-0.981***
$\Delta \ln y + \sum_{k=0}^K b \Delta \ln y_{t-k}^{oth}$	(-1.986)	(-1.221)	(-0.028)	(-0.322)	(-0.673)	(-1.885)	(-0.115)	(-2.125)	(-5.130)

$\Delta \ln E$ = change in log employment, $\Delta \ln p$ = change in log population, $\Delta \ln y$ = change in log labor productivity, $\Delta \ln y^{oth}$ = change in other sectors' average log labor productivity, D_1 = 1990–1999, D_2 = 2000–2009.

Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for the total effect (last row and third to the last row in the table).

Source: Authors' estimates.

Table 9: Effect of Productivity Growth on Own-Sector and Other Sectors' Employment Growth, Pooled Sectoral Data, 1990–2017

	Equation 16 ($\Delta \ln E$)		
	(a)	(b)	(c)
$\Delta \ln y$	-0.596*** (-14.082)	-0.574*** (-13.663)	-0.575*** (-13.630)
$\Delta \ln y^{oth}$	-0.001 (-0.017)	-0.027 (-0.330)	-0.037 (-0.424)
$\Delta \ln y^{oth}$ (t-1)	0.023 (0.263)	-0.002 (-0.028)	-0.009 (-0.099)
$\Delta \ln y^{oth}$ (t-2)	0.192** (2.362)	0.163** (2.030)	0.164** (2.043)
$\Delta \ln y^{oth}$ (t-3)	-0.016 (-0.212)	-0.037 (-0.510)	-0.034 (-0.455)
D_1	-0.004 (-0.429)	-0.007 (-0.697)	-0.012 (-0.657)
D_2	-0.000 (-0.027)	-0.001 (-0.084)	-0.003 (-0.298)
S_1 (Mining and quarrying)		0.025** (2.073)	0.025** (2.067)
S_2 (Manufacturing)		0.030** (2.427)	0.030** (2.422)
S_3 (Construction)		0.026** (2.111)	0.026** (2.102)
S_4 (Electricity, gas, and water)		0.049*** (3.982)	0.049*** (3.977)
S_5 (Wholesale and retail trade)		0.019 (1.554)	0.019 (1.550)
S_6 (Transport, storage, and communication)		0.023* (1.840)	0.023* (1.836)
S_7 (Finance, real estate, and business activities)		0.041*** (3.356)	0.041*** (3.349)
S_8 (Other services)		0.033*** (2.714)	0.033*** (2.708)
$\Delta \ln p$			0.802 (0.348)
Constant	0.038*** (4.849)	0.013 (1.163)	0.001 (0.014)
Observations	225	225	225
R-squared	0.487	0.533	0.533
Total effect other sectors:	0.198	0.096	0.085
$\sum_{k=0}^K b \Delta \ln y_{t-k}^{oth}$	(0.986)	(0.476)	(0.417)
Total effect own sector plus other sectors:	-0.398*	-0.478**	-0.490**
$b \Delta \ln y + \sum_{k=0}^K b \Delta \ln y_{t-k}^{oth}$	(-1.936)	(-2.337)	(-2.358)

$\Delta \ln E$ = change in log employment, $\Delta \ln p$ = change in log population, $\Delta \ln y$ = change in log labor productivity, $\Delta \ln y^{oth}$ = change in other sectors' average log labor productivity, D_1 = 1990–1999, D_2 = 2000–2009, S_j = sector dummy variable. Notes: *, **, and *** mean significant at the 10%, 5%, and 1% levels, respectively. Values in parentheses are t-statistics for the coefficients of independent variables and z-statistics for the total effect (last row and third to the last row in the table). Source: Authors' estimates.

The results in Table 9 are also based on equation (16), but this time pooling all sectoral data instead of running separate regressions for each sector. Results show that there are weak spillover effects on a sector's employment coming only from other sectors' productivity growth (Total Effect Other Sectors). However, given the high statistical significance of own sector productivity, the total effect on a sector's employment (i.e., own sector productivity growth plus other sectors' productivity growth) is statistically significant and negative (Total Effect Own Sector plus Other Sectors).

Overall, the evidence indicates that the impact of a sector's productivity growth on the sector's employment growth is negative. Further, there are no statistically significant spillover effects of other sectors' productivity growth on employment. The negative effect of own sector plus other sectors' productivity growth is seen in only four out of the nine sectors: (i) agriculture, (ii) wholesale and retail trade; (iii) financial, real estate, and business activities; and (iv) other services. In summary, there is no evidence to support the claim that productivity growth destroys jobs in the Philippines.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

After decades of lackluster performance, Philippine GDP growth has picked up and the country has been enjoying a growth momentum in recent years. We conjecture that this is due to the fact that actual growth is adjusting to an increasing potential growth rate. This paper has provided estimates of potential growth rate (defined as the rate of growth that is consistent with an unchanging unemployment rate) for 1957–2017. Our estimates show that potential growth in 2010–2017 averaged 5.9%, over 1 percentage point higher than the average potential growth in 2000–2009. In 2017, the country achieved a record-high potential growth of 6.3%, vis-à-vis an actual growth rate of 6.7%.

Our analysis leads us to the conclusion that the Philippines has entered a growth momentum that cannot waste. Given that actual growth is already about half a percentage point above potential growth, that the economy is expected to continue registering high growth, and that the accumulated gap (actual growth minus potential growth) is approaching zero, authorities should take measures to increase the economy's potential growth. This will allow actual growth to continue increasing without subjecting the economy to inflationary pressures.

If the objective is to increase potential growth, then there is a need to consider both labor force growth and productivity growth, the two components of potential growth. We find that labor force growth, although still high, has started declining. Therefore, to raise potential growth, authorities should focus on how to further increase productivity growth. In 2017, labor productivity growth accounted for over 85% of potential growth. This requires selective and well-designed reforms, including addressing regional disparities, strengthening firms' organizational capabilities, boosting competitive pressures, and tackling individual disparities in access to human capital.

Likewise, measures to improve individual sectors' performance are needed to raise productivity. Agriculture is still a large employer, although the absolute number of workers began declining in 2012. The sector needs to modernize to raise productivity, still very low. Manufacturing remains a key source of productivity growth. Although the number of manufacturing workers is increasing, the sector's employment share is declining. There is a need to find specialized niches in manufacturing so that productivity continues to rise. If the Philippines manages to create a core industrial base and ensures sectoral upgrading, it could further develop business services, which the literature shows is an intermediate that caters to manufacturing for more specialized functions.

Further, most Filipino workers are employed in low-productivity services and agriculture. While productivity in the finance, real estate, and business activities subsector is higher than that in other services, the subsector employs a small share of workers, and its productivity has been declining. It is important to increase productivity in other service subsectors to lift overall productivity.

Finally, while this study holds an optimistic view of the economy's growth prospects given that potential growth is on the rise, it should be noted that the analysis provided is at the very aggregate level. Possibly, the country's potential growth is constrained by factors not considered in this paper, such as the quality of its infrastructure, human capital, and the regulatory environment. The Philippines would possibly do even better if it addressed some of these likely constraints.

APPENDIX: THE KALMAN FILTER

A state space model is used to produce estimates of an underlying unobserved signal, say x_t , given data for y_t . In a state space model, an essential part of parameter estimation is the Kalman filter. The Kalman filter is a set of algorithms that produces an optimal estimate, which minimizes the estimated error covariance under some conditions.

To implement the Kalman filter to estimate a time-varying potential growth rate, consider the signal (i.e., observation) equation:

$$y_t = x_t + \delta u_t + v_t \quad (17)$$

where y_t is the actual GDP series, x_t is the trend component, u_t is the unemployment rate variable, and v_t is the noise; $v_t \sim iid N(0, R)$. Let x_t be the state equation that is modeled as autoregressive process of order 1 (AR1):

$$x_t = x_{t-1} + w_t \quad (18)$$

where x_t is a state vector that cannot be directly observed and w_t is the noise component, independent and identically distributed, with covariance matrix Q ; $w_t \sim iid N(0, Q)$. We add another state equation to allow δ to be time varying and modeled as an AR1:

$$\delta_t = \delta_{t-1} + \epsilon_t \quad (19)$$

The time varying potential growth is obtained through the Kalman smoothing procedure. This differs from Kalman filtering in the construction of the state series, as the latter uses only the information available up to the estimation period. In the Kalman smoothing, each estimated value is a function of the present, future, and past, while the filtered estimator depends only on the present and past.

REFERENCES

- An, Zidong, Taeyb Ghazi, and Nathalie Gonzalez Prieto. 2017. "Growth and Jobs in Developing Economies: Trends and Cycles." IMF Working Paper No. WP/17/257.
- Autor, David, and Anna Salomons. 2017. "Does Productivity Growth Threaten Employment?" https://www.ecbforum.eu/uploads/originals/2017/speakers/papers/D_Autor_A_Salomons_Does_productivity_growth_threaten_employment_Final_Draft_20170619.pdf.
- Ball, Lawrence, Leigh Daniel, and Prakash Loungani. 2017. "Okun's Law: Fit at 50?" *Journal of Monetary, Credit, and Banking* 49 (7): 1413–41.
- Berg, Andrew, Edward F. Buffie, and Luis-Felipe Zanna. 2017. "Should We Fear the Robot Revolution? (The Correct Answer is Yes)." <https://pdfs.semanticscholar.org/96a2/1932a7427de71fd29da6bd95176841d17a96.pdf>.
- Daly, Mary C., Bart Hobijin, Ayşegül Şahin, and Robert G. Valletta. 2012. "A Search and Matching Approach to Labor Markets: Did the Natural Rate of Unemployment Rise." *Journal of Economic Perspectives* 26 (3): 3–16.
- Felipe, Jesus, Aashish Mehta, and Changyong Rhee. 2018. "Manufacturing Matters...But It's the Jobs that Count." *Cambridge Journal of Economics*. <https://doi.org/10.1093/cje/bex086>.
- Hanusch, Marek. 2013. "Jobless Growth? Okun's Law in East Asia." *Journal of International Commerce, Economics and Policy* 4 (3): 1350014-1–1350014-14.
- Harrod, Roy F. 1939. "An Essay in Dynamic Theory." *Economic Journal* 49 (2): 14–33.
- International Labour Organization (ILO). 2016. *Key Indicators of the Labor Market. Ninth Edition*. Geneva.
- Leon-Ledesma, Miguel A., and A. P. Thirlwall 2002. "The Endogeneity of the Natural Rate of Growth." *Cambridge Journal of Economics* 26 (4): 441–59.
- Moosa, Imad. 1997. "A Cross-Country Comparison of Okun's Coefficient." *Journal of Comparative Economics* 24 (3): 335–56.
- Okun, Arthur M. 1962. "Potential GNP & Its Measurement and Significance." *American Statistical Association, Proceedings of the Business and Economics Statistics Section*, 98–104.
- Paqueo, Vicente B., Aniceto C. Orbeta Jr., Leonardo A. Lanzona Jr., and Dean Gerard C. Dulay. 2014. "Labor Policy Analysis for Jobs Expansion and Development." Philippine Institute for Development Studies Discussion Paper Series No. 2014-34.
- Perman, Roger, and Christophe Tavera. 2005. "A Cross-Country Analysis of the Okun's Law Coefficient Convergence in Europe." *Applied Economics* 37 (21): 2501–13.
- Philippine Statistics Authority. 2015a. *Integrated Survey of Households Bulletin*. Manila.

- . 2015b. *Yearbook of Labor Statistics*. Manila.
- . 2017. *Philippine Statistical Yearbook*. Manila.
- Prachowny, Martin. 1993. “Okun’s Law: Theoretical Foundations and Revised Estimates.” *Review of Economics and Statistics* 75 (2): 331–36.
- Pritchett, Lant. 2003. “A Toy Collection, a Socialist Star, and a Democratic Dud? Growth Theory, Vietnam, and the Philippines.” In *In Search of Prosperity: Analytic Narratives on Economic Growth*, edited by Dani Rodrik. Princeton, NJ: Princeton University Press.
- Sachs, Jeffrey D., and Laurence J. Kotlikoff. 2012. “Smart Machines and Long-Term Misery.” NBER Working Paper No. 18629.
- Thirlwall, A. P. 1969. “Okun’s Law and the Natural Rate of Growth.” *Southern Economic Journal* 36 (1): 87–89.
- World Bank, World Development Indicators online database. <http://databank.worldbank.org/data/home.aspx> (accessed 5 October 2017).

Why Has the Philippines' Growth Performance Improved? From Disappointment to Promising Success

The Philippines' potential growth rate reached 6.3% in 2017, the highest in the last 60 years. Most of it is labor productivity growth, driven by manufacturing productivity growth. To continue registering high growth in a stable macroeconomic environment, the Philippines needs to continue increasing its potential growth rate. The paper discusses how this can be done.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to a large share of the world's poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

