



The sources of long-term economic growth in Indonesia, 1880–2008

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ARTICLE INFO

Article history:

Received 1 November 2008

Available online 10 November 2009

Keywords:

Economic growth
Growth accounting
Factor accumulation
Productivity
Indonesia

ABSTRACT

This paper presents new time series estimates of GDP, capital stock and education-adjusted employment, and uses a growth accounting approach to analyze GDP growth during 1880–2008. The growth of capital stock, employment and educational attainment explained almost all of GDP growth. During key growth periods 1900–29 and 1975–97, Total Factor Productivity (TFP) growth was on balance negative. TFP growth was substantial during some sub-periods, particularly 1933–41, 1951–61, 1967–74 and 2000–08. Each followed a major economic downturn that slowed capital stock growth and required a more efficient use of productive resources, supported by changes in economic policy that enhanced productivity and efficiency.

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1. Introduction

The broad dimensions of growth and structural change in Indonesia have been established in other publications (Van der Eng, 1992, 2002a). This paper builds on those results in order to outline possibilities for further research and discussion about Indonesia's growth experience. In particular, this paper initiates discussion about the contribution of Total Factor Productivity (TFP) growth to Indonesia's long-term economic growth. It presents new time series estimates of GDP, and tentatively explores and employs the data available to gauge long-term changes in capital stock, education-adjusted employment, and factor income shares. Some of these data are tentative, but offer an opportunity to explore the feasibility of growth accounting analysis. After accounting for the contribution of conventional factor inputs to GDP growth, the paper identifies the contribution of TFP.

Identification of the contribution of TFP allows an elaboration of Indonesia's long-term growth experience in the context of literature on the sources of long-term economic growth. In comparison, the data availability for Indonesia allows only a growth accounting approach that yields relatively crude TFP estimates. Without the refinement that was possible for other countries (see e.g. Abramovitz and David, 2001; Prados and Rosés, 2007), these cannot necessarily be taken as indications of the contribution made by technological change to long-term economic growth. Summarizing the historical growth accounting literature in particular for the UK, US and other Western countries, Crafts (2004) found consensus that TFP growth since the late 18th century has actually been quite modest. These findings underline the 'Solow Productivity Paradox', as they contrast sharply with notable evidence of technological change and its impact in these countries, e.g. in the form of steam power in the early 19th century and information technology in the late 20th. The answer to the paradox may lie in the embodiment of new technology in measures of capital stock.

The TFP estimates presented in this study will allow reflection on the results of multi-country growth studies that employed similar crude estimates. In the Asian context, a large part of the literature on the economics of macroeconomic growth is dominated by discussion about the degree to which TFP growth explains the 'Asian economic miracle' of high eco-

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¹ The author like to thank Howard Dick and Daan Marks, as well as participants in the conference Economic Change around the Indian Ocean in Venice (Italy) in July 2008, for their comments on previous versions of this paper.

nommic growth since the 1960s. Young (1994) argued, on the basis of a 4-country study, that this ‘miracle’ was more the result of the mobilization of factors of production (labor and capital) than productivity growth – i.e. ‘perspiration’ rather than ‘inspiration’, as Krugman (1994) summarized the findings, initiating a series of studies that often used readily available multi-country data sets in order to estimate TFP growth, extending beyond Asia to cover different parts of the world.² The multi-country studies that estimated TFP growth all found different, sometimes contradictory results. One of the reasons was that they had to make rather crude estimates of capital input on the basis of available national accounts data.

As a major Asian country, Indonesia has, of course, featured in the multi-country studies referred to above. Most found positive TFP growth, albeit to varying degrees (see Section 4). However, there are no reasons to regard the results of these studies as conclusive, as they failed to consider explicitly the quality and availability of Indonesian statistical data. Close scrutiny of the data from these multi-country studies also reveals inexplicable discrepancies with the original data produced at Statistics Indonesia (*Badan Pusat Statistik*, BPS), Indonesia’s statistical agency, and its predecessors. Moreover, studies using multi-country data sets took national accounts data for granted. They did take account of revisions in these data over time, and their capital stock estimates often depended on rough assumptions, such as depreciation or lifetime of different categories of productive assets. Consequently, estimates of gross fixed capital formation and capital stock, for example, deviate significantly from estimates that take close account of the idiosyncrasies in Indonesia’s statistical data and the composition of investment and capital stock (Van der Eng, 2009).

Indonesia’s long-term economic growth has been the subject of several studies (e.g. Booth, 1998; Dick et al., 2002) and its growth experience in recent decades has undergone even closer scrutiny (e.g. Hill, 1999). However, these studies did not employ growth accounting as a tool of analysis and focused on the ultimate reasons for Indonesia’s development in terms of changes in institutions and economic policies conducive to economic growth. Consequently, the proximate causes remain unclear, even though they underlie the country’s economic growth experience and offer pointers to the periodization of the long-term growth experience as well as the relative relevance of ultimate explanations.

This paper seeks to resolve these inconsistent findings in the literature. It follows an approach used by Sigit (2004), but enhances it by using new long-term estimates of GDP in 2000 prices, new long-term estimates of capital stock in Indonesia in 2000 constant prices, estimates of the share of labor income, new estimates of education-adjusted employment, and an extension of the timeframe of analysis. The next section outlines the methodology and data used in the paper, while Section 3 discusses the data. Section 4 estimates the ‘proximate’ sources of economic growth in Indonesia. Section 5 concludes.

2. Methodology of estimating TFP

This paper uses a simple, direct accounting method to estimate the contribution of TFP growth to economic growth. The production function in Eq. (1) indicates that output during a given year is a function of the productive employment of the total stocks of capital and labor.

$$Q_t = A_t f(K_t, L_t) \quad (1)$$

Here, Q_t = real output, K_t = capital stock and L_t = employment in year t , and A_t is the efficiency term. Differentiating with respect to time yields Eq. (2).

$$\frac{dQ}{dt} = \frac{dA}{dt} f(K_t, L_t) + A_t \frac{\partial f}{\partial K} \frac{dK}{dt} + A_t \frac{\partial f}{\partial L} \frac{dL}{dt} \quad (2)$$

Dividing both sides by Q_t yields Eq. (3).

$$\frac{dQ}{dt} / Q_t = \frac{dA}{dt} / A_t + \frac{\partial f}{\partial K} \frac{dK}{dt} / f(K_t, L_t) + \frac{\partial f}{\partial L} \frac{dL}{dt} / f(K_t, L_t) \quad (3)$$

Replacing the marginal productivities by factor prices then gives Eq. (4).

$$g_t^Q = g_t^{\text{TFP}} + (rK_t/Q_t)g_t^K + (wL_t/Q_t)g_t^L = g_t^{\text{TFP}} + s_k g_t^K + s_l g_t^L \quad (4)$$

Here, g_t^Q , g_t^{TFP} , g_t^K and g_t^L are the annual growth rates of output, TFP, capital and employment, respectively, r = per unit service price of capital (interest) and w = per unit service price of labor (wage rate), and s_k and s_l are the shares of income from capital and labor in national income respectively. Assuming constant returns to scale, or perfect elasticity of substitution between capital and labor, yields Eq. (5):

$$s_k + s_l = 1 \text{ or } s_k = 1 - s_l \quad (5)$$

Any effort to incorporate a measure of quality changes in the stock of capital goods, akin to e.g. Maddison (1987: 663–664), is arbitrary, particularly given the paucity of detailed long-term investment data for Indonesia. However, it is possible to incorporate a measure of quality changes in the stock of employment by adjusting it for educational attainment in a way shown by Eq. (6).

² See e.g. Baier et al. (2006: 45), who concluded that TFP growth contributed only 14% to the growth of output per worker throughout the 20th century, but –37% in Indonesia. Other studies, such as Chen (1997), Felipe (1999) and Weerasinghe and Fane (2005), offer critical discussions of the results of these multi-country studies for Asian countries.

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