



# A productivity growth accounting approach to the ranking of developing and developed nations <sup>☆</sup>

Raymond L. Raab <sup>a</sup>, Ehsan Habib Feroz <sup>b,\*</sup>

<sup>a</sup> *Labovitz School of Business, University of Minnesota Duluth, Duluth, MN 55812, United States*

<sup>b</sup> *Milgard School of Business, University of Washington,  
Tacoma, WA 98402, United States*

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## Abstract

Productivity growth accounting studies generally focus on productivity growth or decline in more developed countries such as the Organization of Economic Cooperation and Development (OECD) members. In this paper, we develop a generalized efficiency index for a much larger set of 57 national governments (NGs), both developing and developed, by employing four components of gross national product and five resource-availability indicators. Using a Data Envelopment Analysis (DEA) linear-programming approach, we maximize the components of Gross National Product (GNP), subject to minimizing specific resource-input measures. If used with appropriate precautions, the DEA-based comparative production-efficiency measures developed here can be used by individual NGs and international organizations like the World Bank and the International Monetary Fund to make equitable and sustainable lending-allocation decisions in the public and private sectors of the increasingly interdependent global economy.

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*Keywords:* Productivity growth accounting; Data Envelopment Analysis (DEA); Sustainable global development

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\* Corresponding author. Department of Accounting, Milgard School of Business, University of Washington, Tacoma, WA 98402, United States. Tel.: +1 253 692 4728.

*E-mail address:* [ehf2@u.washington.edu](mailto:ehf2@u.washington.edu) (E.H. Feroz).

## 1. Introduction

Productivity literature has generally focused on growth or slowdown in the developed OECD (Organizations of Economic Cooperation and Development) countries during the seventies and eighties (Costello, 1993; Fare, Grosskopf, Norris, & Shang, 1994; Wolff, 1996). Although there has been a growing interest in productivity growth (decline) in highly developed nations, we have not seen a similar focus applied to a broader range of developing countries across the new world economies. The productivity winners and losers in the new global-information economies need to be identified and analyzed, both at the aggregate and individual country level. This is relevant since productivity rankings provide important inputs for sustainable and equitable resource-allocation decisions by national governments (NGs hereafter), as well as by international organizations like the World Bank and International Monetary Fund. Presumably, financial markets around the globe impound the GNP-and-GDP related aggregates, which are crude measures of productivity, in the pricing of foreign (national) currencies and debts issued by national governments. Decision makers may also use subjective rank ordering of productivity, as reflected in the various testimonies of the Federal Reserve Board Chairman before Congress.<sup>1</sup> The importance of the rank ordering made by NGs, in terms of sustainable productivity, has been recognized, [though not technically possible in classics such as Adam Smith's *The Wealth of Nations*, (1776; reprinted 1953, pp. 3–4.)]

Nations tolerably well advanced as to skill, dexterity and judgment in the application of labour, have followed very different plans in the general conduct or direction of it; those plans have not all been equally favourable to the greatness of its produce. The policy of some nations has given extraordinary encouragement to the industry of the country;...

In this paper we develop a more generalized linear-programming approach to rank 57 NGs in terms of overall production efficiency. Unlike traditional aggregate productivity measurements such as those generated by Cobb–Douglas functions, we use linear programming to measure and rank relative technical efficiency. This approach can include a large number of countries, in various stages of development (sustainable or not), employing resources to produce the various components of GNP. Data Envelopment Analysis (DEA) ranks relative efficiency by evaluating the extent to which the NG of each country minimizes input components (to be efficiently allocated), and maximizes the output components that comprise the GNP. The NG in each country is assumed to choose particular weights or coefficients for inputs and outputs that allow the country to achieve its maximum efficiency ranking.<sup>2</sup> In the conventional productivity growth studies that employ regression weights a single transformation function for all NGs is implied, or else subjective fixed

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<sup>1</sup> Although there are frequent references to changes in productivity in Alan Greenspan's and Ben Bernanke's testimonies before Congress, it is unclear how productivity rankings are determined vis-à-vis other national governments (NGs). We believe that the approach elaborated in this paper could become an important tool in the hands of the Federal Reserve Board and other NG central banks throughout the globe.

<sup>2</sup> This is in the spirit of Adam Smith, cited above.

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