



The impacts of education investment on skilled–unskilled wage inequality and economic development in developing countries



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ABSTRACT

Four-sector general equilibrium models are established to investigate the impacts of increased governmental investment in education capital on skilled–unskilled wage inequality and economic development. The basic model, which assumes perfect competition in the producer services sector, shows that increased education capital investment from the government will unambiguously reduce skilled–unskilled wage inequality and conditionally promote economic development. Then the robustness of the basic model is substantiated by the extended model that incorporates the monopolistically competitive feature of the producer services sector.

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1. Introduction

We are living in the era of economic integration. Economic and trade liberalization brings enormous benefits, with countries having more development opportunities and people enjoying more various choices of consumption, education and work. However, globalization is a double-edged sword, as evidenced by the growing skilled–unskilled wage inequality in many developing countries during the past several decades. Empirical studies – typically exemplified by Robbins (1996), Feenstra and Hanson (1996), Wood (1997), Khan (1998), Feenstra and Hanson (2003), Lam and Liu (2011) and Mehta and Hasan (2012) – show that the increasing skilled–unskilled wage gap has prevailed in Latin American countries and some Asian countries.

This widened skilled–unskilled wage inequality in developing countries has captured the attention of many theoretical economists.¹ Their efforts to explain it theoretically can be roughly divided into three categories. The first category of research tries to analyze the widening skilled–unskilled wage gap by considering the international factor mobility, trade liberalization and the change of production patterns. Literature representative of this approach includes Das (2002), Marjit et al. (2004), Kar and Beladi (2004), Marjit and Kar (2005), Anwar (2006),

Chaudhuri and Yabuuchi (2007), Beladi et al. (2008), Beladi et al. (2010), Gupta and Dutta (2010) Beladi et al. (2011), Pan and Zhou (2013) etc. Scholars in this category argue that investment liberalization, international factor mobility and global outsourcing would increase (or conditionally increase) the wage gap between skilled labor and unskilled labor. A research in the second category argues that the growing wage inequality in developing countries can be (partially) attributed to the sector-biased or factor-biased technological progress and international technological spillover effects. The representative literature in this strand can be referred to Xu (2001), Ethier (2005), Moore and Ranjan (2005), Fang et al. (2008), Wang et al. (2009), etc. Researchers in the third category explore the institutional reasons for the widened skilled–unskilled wage inequality. They contend that such institutional changes as the reduction of corrupt behaviors, deunionization and industrial adjustments are the main institutional sources of the widening wage gap. Literature in this strand can be represented by DiNardo et al. (1996), Kar and Guha-Khasnobis (2006), Chaudhuri and Yabuuchi (2007), Yabuuchi and Chaudhuri (2009) and Mandal and Marjit (2010).

However, the role of education in determining skilled–unskilled wage inequality has received little attention. Nowadays, education is becoming increasingly important to a country's well-being. A higher level of education potentially stimulates a country's economic growth and enables a country to participate in the knowledge-based world economy. Yet recent research shows that some developing countries have been suffering from a shortage of skilled labor, which is a serious obstacle preventing them from gaining benefits from trade division and global disintegrated production (Beladi et al., 2011; Yabuuchi and

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¹ Generally speaking, the existing literature treats unskilled labor as low-wage workers who often lack college education, while skilled labor generally has at least college-level education (See Oladi et al., 2011).

Chaudhuri, 2009). Therefore, raising the level of education and stimulating the formation of a skilled labor force should be placed among the top priorities in developing economies. Fortunately, the governments of some developing countries have started education and training projects in order to ease the shortage of skilled labor and boost economic development. For instance, the government of India has initiated a national mission of developing skills (Yabuuchi and Chaudhuri, 2009). The Chinese government has also made policies and conducted relevant pilot projects, such as the Sunshine Project, in an effort to increase the human capital of rural labor and facilitate rural–urban labor migration by training the unskilled labor that mainly comprise rural residents and rural–urban migrants.² Besides, as Premier Li vowed recently, the Chinese government would prioritize education for years and continuously raise the investment in education to increase the number of skilled labor so that China can rely more on the talent bonuses when making use of demographic dividends.³ These governmental policies in reality necessitate a theoretical examination on whether government-led skill formation projects would reduce skilled–unskilled wage inequality and promote economic development.

In order to fill the current research gap and address the issues mentioned above, this paper establishes four-sector general equilibrium models to investigate the impacts of increased governmental investment in education capital on the skilled–unskilled wage inequality and economic development. The basic model, which assumes perfect competition in the producer services sector, shows that increased education capital investment from the government will unambiguously reduce skilled–unskilled wage inequality. Economic development hinges on the role of the manufacturing sector, which should occupy a sufficiently large share of national income and expand in terms of its output. However, our result shows that increased education capital from the government does not necessarily raise the manufactured output, leaving an ambiguous impact on the economic development. Only on certain conditions can government's policy of increasing education capital stimulate the manufacturing production. Thus, increased governmental investment in the education sector would conditionally promote economic development. The robustness of the basic model is substantiated by the extended model that incorporates the monopolistic competition feature in the producer services sector.

It is notable that Kar and Beladi (2004), Kar and Guha-Khasnobis (2006), Yabuuchi and Chaudhuri (2009), Gupta and Dutta (2010) and Beladi et al. (2011) also take the skill formation process into account and discuss the issues related to the skilled–unskilled wage inequality. Kar and Beladi (2004) investigate the complementarity between trade and skilled emigration in the presence of skill formation when unskilled labor does not migrate. Kar and Guha-Khasnobis (2006) argue that an increase in capital inflow may result in a rise in skilled emigration when there is a skill formation sector. Yabuuchi and Chaudhuri (2009) consider the impacts of an increase in the government's financial assistance to the education sector and capital endowment on the skilled–unskilled wage gap. Gupta and Dutta (2010) analyze the effects of changes in factor endowments and tariff rates on skilled–unskilled wage inequality with the existence of an education sector. Beladi et al. (2011) find that international mobility of capital may lead to the concentration of education capital and then result in a polarization between highly-skilled and unskilled labor.

The present paper is closely related to these works in the sense that we all consider the skill formation process and its impacts on wage inequality, but this paper is distinct from them in the following three aspects. First, compared with the above-mentioned studies on the skill formation process, the present paper considers a different policy instrument and derives a different mechanism of the effects on skilled–

unskilled wage gap. It can be observed that the literature mentioned above just examines how international factor mobility and tax or subsidy policies influence the skilled–unskilled wage gap with the involvement of an education sector which is considered as a medium or an intermediate step. However, this paper considers a different policy instrument – the government directly increases the education capital via governmental investment – and the change of wage inequality originates from the expansion of the education sector. Second, this paper is distinguished from the existing literature for considering a different economic structure. The papers mentioned above only consider the horizontal relations among production sectors, but the present paper highlights the vertical relation between the urban sectors, a manufacturing sector and a producer services sector. Such a vertical relation of the urban sectors prevails in modern developing economies, but is neglected by Kar and Beladi (2004), Kar and Guha-Khasnobis (2006), Yabuuchi and Chaudhuri (2009), Gupta and Dutta (2010) and Beladi et al. (2011). Third, in addition to investigating skilled–unskilled wage inequality, the present paper also analyzes how the governmental investment in the education sector affects economic development (measured by national income). Developing the economy is always among the priorities when the governments in developing countries make policies.

In sum, the present paper contributes to the current body of theoretical research in two aspects. First, we try to address the issue of skilled–unskilled wage inequality from the perspective of the rising governmental investment in education, a perspective that has been largely neglected in existing works on the growing skilled–unskilled wage inequality in developing economies. Second, by investigating the impacts of government's effort to promote skill formation aimed at confronting skilled–unskilled wage inequality and facilitating economic development, this paper can be treated as an extension of the existing literature concerning skill formation by considering a different government policy and studying its relevant impacts on the wage inequality and economic development.

The rest of this paper is organized as follows. In Section 2, we set up a four-sector general equilibrium model with perfect competition to analyze the effects of increased education investment on skilled–unskilled wage inequality and national income. In Section 3, we test the robustness of the basic model in Section 2 with the assumption of monopolistic competition within the producer services sector. In Section 4, concluding remarks follow.

2. The basic model

Consider a small open economy composed of four sectors, the urban manufacturing sector, the urban producer services sector, the rural agricultural sector and the modern education sector. The manufacturing sector produces import-competing goods by employing unskilled labor and the intermediate goods supplied by the producer services sector. The producer services sector uses skilled labor and capital to produce non-traded intermediate goods. The agricultural sector utilizes unskilled labor and land to produce exportable goods. The education sector utilizes capital to train unskilled labor into skilled labor. The factor markets and the good markets are all perfectly competitive. The dualism of the labor market in developing countries is shown by the segmentation of the labor market, where unskilled workers can only work and move between the rural agricultural and the urban manufacturing sectors while skilled labor concentrates in the producer services sector. The cost functions satisfy neoclassical properties.

Before the establishment of the theoretical model, we would like to mention two points. First, the assumption that the manufacturing sector does not employ capital as the factor of production is only to emphasize the labor-intensive characteristic of the manufacturing sector in developing countries. Capital is used in the production of the producer services sector and thus, indirectly employed by the manufacturing sector. The description of the manufacturing and producer services

² Detailed information can be found at <http://www.mingong123.com/news/52/201110/49145e615fed8666.html>.

³ "Education and sci-tech can boost economy", *China Daily* September, 2013, http://usa.chinadaily.com.cn/china/2013-09/01/content_16934860.htm.

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