



Skilled–unskilled wage inequality, product variety, public input and increasing returns: A static general equilibrium analysis [☆]



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ABSTRACT

The paper develops a four sector small open economy model with two traded final good sectors, a public intermediate good producing sector and a nontraded good sector producing varieties of intermediate goods. There are three primary factors: capital, skilled labour and unskilled labour. Industrial sector producing a traded good uses capital, intermediate goods and skilled labour as inputs. Intermediate goods producing sector also uses capital and skilled labour. Public input producing sector and the agricultural sector producing the other traded good use capital and unskilled labour as inputs. It is shown that, if production technologies are the same for the agricultural sector and the public input producing sector and if the scale elasticity of output is very low, then an increase in capital stock (unskilled labour endowment) raises (lowers) the skilled–unskilled wage ratio. However, an increase in skilled labour endowment does not produce any unambiguous effect. On the other hand, an increase in the tax rate on industrial output and/or an increase in the price of the agricultural product, armed with the same set of assumptions, lowers the skilled–unskilled wage ratio.

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1. Introduction

Increasing wage inequality is one of the important issues of research in Development Economics in recent years. The conventional belief is that globalization is welfare improving both from the aggregative perspective and from the distributive perspective. However, with regard to its distributive effects, various empirical works point out that skilled–unskilled wage inequality has grown up in many developed¹ and less-developed² countries. Different studies offer different explanations for this phenomenon; and, among them, trade liberalization and technological progress appear to be two important

controversial reasons³ of this. Also international outsourcing,⁴ increase in the price of skill intensive good,⁵ entry of unskilled labour surplus low income countries in the international market⁶ etc. are claimed to be alternative causes of this increasing wage inequality by many other empirical studies.

There exists a lot of theoretical works explaining this problem of growing wage inequality. Theoretical models though differ in various features have a common property of introducing two different types of labour- skilled and unskilled. The ratio of wage rate of the skilled worker to that of the unskilled worker is taken as a measure of wage inequality in these models. Many of these theoretical models are dynamic and intertemporal in nature.⁷ Some of them adopt the

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¹ According to Bound and Johnson (1992), Leamer (2000), Marjit and Acharyya (2003) etc. growing income inequality is experienced in US between 1960s and 1970s; and Lawrence (1994), Katz et al. (1992) etc. points out the same problem in European countries between 1978 and 1988.

² According to Wood (1997), Dev (2000), Borjas and Ramey (1993), Banga (2005), Beyer et al. (1999) etc. wage inequality has increased in many Latin American and South Asian countries in the mid 1980s.

³ According to Wood (1998), Beyer et al. (1999), Green et al. (2001), Behrman et al. (2000), Isgut (2001) etc. trade liberalization is to blame for this growing wage inequality. However, Wood (1997, 1998), Dev (2000) and Gorg and Strobl (2002) are of the view that technological progress worsens wage inequality through an increase in the relative demand for skilled labour. Esquivel and Lopez (2003) shows that technological change aggravates but trade liberalization lowers wage inequality in Mexico.

⁴ See Feenstra and Hanson (1997) in this context.

⁵ See Harrison and Hanson (1999), Hanson and Harisson (1999) and Beyer et al. (1999) in this context.

⁶ See Wood (1997) in this context.

⁷ See, for example, Acemoglu (1998, 1999, 2002a, b), Kiley (1999), Wang et al. (2009), Fang et al. (2008) etc.

framework of static competitive general equilibrium models⁸ of small open economies; and others adopt product variety framework with monopolistic competition.⁹

The present work is an addition to the existing theoretical literature based on product variety framework. Among the existing static product variety models, Glazer and Ranjan (2003) introduces preference heterogeneity assuming that skilled workers prefer to consume skill intensive goods. However, their model does not have any public intermediate good. Anwar (2006a, 2009) and Anwar and Rice (2009) analyse the problem of wage inequality using endogenous product variety framework with specialization-based external economics; but they also do not consider the role of public input in their model. Anwar (2005, 2006b) introduce a public input producing sector in their models in the presence of specialization-based external economics. However, they have only one type of labour in their models; and hence can not explain the skilled–unskilled wage inequality. The model developed in the present paper is an extension of the works of Anwar (2006a, 2009) and Anwar and Rice (2009) introducing a public input producing sector like that in Anwar (2005, 2006) and consisting of two types of labour–skilled and unskilled. We develop a four sector small open economy model with two traded good sectors, a public intermediate good producing sector and a private nontraded good sector producing varieties of intermediate goods. There are three primary factors in this model– skilled labour, unskilled labour and capital. The public intermediate good plays the role of reducing the fixed cost of production of nontraded private intermediate goods. Production functions of all these sectors, except for varieties of private intermediate goods sector, satisfy all standard neo-classical properties including constant returns to scale (CRS). However, in the private intermediate goods producing sector, production function of each of these varieties satisfies increasing returns to scale (IRS).

We now turn to explain our motivation to introduce a public input in a general equilibrium model. In reality, public infrastructure plays a significant role to the development of market economics. The study of Ram (1986), based on data of many developed and developing countries, points out a positive relationship between the government size and the growth of national income. In the context of Korean economy, Kim (1998) shows that infrastructure investment leads to economic growth as well as inflation. Rioja (1999) argues that public infrastructure investment can lead to sizeable increase in GDP. Ang (2008), Hill (2007) and Appleyard et al. (2007) show that infrastructural development promotes foreign investment. On the other hand, Delorme et al. (1999) finds a negative relationship between public infrastructure and technical efficiency.

Our main purpose is to examine whether new comparative static results can be obtained in this model as compared to those available in the existing literature. We derive the following interesting results. If production technologies are the same¹⁰ for the agricultural sector and the public input producing sector and if the scale elasticity of output in the industrial sector is very low, then an increase in capital stock (unskilled labour endowment) raises (lowers) the skilled–unskilled wage ratio. This result is qualitatively similar to the result obtained by Anwar (2006a) but not quantitatively. The magnitude of the comparative static effect differs in the present model from that in Anwar (2006a) because here public intermediate good lowers fixed cost of producing varieties of private intermediate goods. This is also qualitatively similar to the result obtained by Glazer and Ranjan (2003) with respect to a change in unskilled labour endowment. However, an increase in skilled labour endowment with the

same set of assumptions makes this relative wage move in any direction in this model while in Anwar (2006a), we find a unambiguous negative effect on it. On the other hand, an increase in the tax rate on industrial output and/or an increase in the price of the agricultural product, armed with the same set of assumptions, lowers the skilled–unskilled wage ratio in this model. The result, though qualitatively similar to that in Anwar (2009) with respect to an increase in the price of the agricultural good, differs quantitatively because the magnitude of the comparative static effect is higher in the present model than that in Anwar (2009). Neither Anwar (2009, 2006a) nor Anwar and Rice (2009) analyse this comparative static effect with respect to change in the income tax rate.

This paper is organized as follows. Section 2 describes the model and Section 3 analyzes its various comparative static properties. Effects of changes in factor endowments on skilled–unskilled wage inequality are described in subsection 3.1. In subsection 3.2, we analyze effects of exogenous changes in prices of traded goods and of the tax-rate on skilled–unskilled wage inequality. Concluding remarks are made in Section 4.

2. The model

We consider a small open economy with two traded good sectors (Y and Z) and two nontraded good sectors (X and G). There are three primary factors– skilled labour, unskilled labour and capital. Sector Y produces an industrial good using skilled labour, capital and large number of varieties of intermediate goods produced by sector X with skilled labour and capital as inputs. Sector G produces a public input and sector Z produces an agricultural good; and each of these two is produced by unskilled labour and capital. The role of public input is to reduce the fixed cost of producing X. Production functions of all these sectors, except for sector X, satisfies all standard neo-classical properties including constant returns to scale (CRS). However, in sector X, production function of each of these varieties satisfies increasing returns to scale (IRS). All factor endowments are exogenously given. Capital is mobile among all these four sectors. However, skilled labour is mobile between sector Y and sector X; and unskilled labour is mobile between sector Z and sector G. Factor prices in each of these four sectors are perfectly flexible; and this flexibility ensures full employment of all these primary factors. All markets are competitive except for markets of varieties produced by sector X in which monopolistic competition exists. The representative firm maximizes profit in each of the three private goods sectors. The production of the public input is financed by a tax revenue obtained from the industrial sector; and the budget of the government is always balanced.¹¹

Production functions of sectors Y, Z and G are described as follows.

$$Y = (L_{SY}^{1-\beta} K_Y^\beta)^{1-\alpha} \left(\sum_{i=1}^n x_i^\delta \right)^{\frac{\alpha}{\delta}} \tag{1}$$

$$Z = L_{UZ}^{1-\gamma} K_Z^\gamma \tag{2}$$

and

$$G = L_{UG}^{1-\varphi} K_G^\varphi \tag{3}$$

Here, x_i is the quantity of the i th variety of intermediate good produced in sector X; and n is the number of these varieties. L_{SY} stands for the amount of skilled labour employed in sector Y; and L_{UZ} and L_{UG} represent amounts of unskilled labour employed in sectors Z and G respectively. K_Y , K_Z and K_G are amounts of capital used in sectors Y, Z and G respectively. α , β , γ , δ and φ are relevant elasticity parameters defined in the range (0, 1). Y, Z and G stand for levels of output of sectors Y, Z and G respectively.

⁸ See, for example, Beladi et al. (2008), Chaudhuri and Yabuuchi (2007, 2008), Chaudhuri (2004, 2008), Marjit and Kar (2005), Yabuuchi and Chaudhuri (2007), Marjit and Acharya (2003), Marjit (2003), Xu (2003), Marjit et al. (2004), Marjit and Acharya (2006), Kar and Beladi (2004), Zhu and Trefler (2005), Gupta and Dutta (2010a, b) etc.

⁹ See, for example, Glazer and Ranjan (2003), Anwar (2005, 2006a, b, 2009), Anwar and Rice (2009) etc.

¹⁰ It is a sufficient condition, not a necessary one.

¹¹ In reality, industrial sector is the most important source of collecting tax revenue even if it is not the only source.

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