Foreign capital, pollution control, and wage inequality in developing countries

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ABSTRACT

This paper aims at studying how foreign capital and pollution control influence skilled-unskilled wage inequality in developing countries through three-sector general equilibrium models. In the basic model with urban unemployment, we find that an inflow of foreign capital will expand the skilled-unskilled wage inequality if the elasticity of substitution between labor and capital in the urban unskilled sector is large enough, and that stricter pollution control will expand the wage inequality if the elasticity of substitution between labor and pollution is small enough. In the extended model with full employment, we find that the intensity of capital plays a crucial role. In addition, when pollution externalities are taken into account, the main conclusions will not change significantly.

1. Introduction

Rising wage inequality in developing countries (e.g., some Asian and Latin American countries) is a hot issue that has provoked the great interest of a lot of labor and development economists. Many studies address this issue and identify different determinants of wage inequality from different perspectives. One of the most major and important strands of literature (e.g., Anwar, 2006, 2008; Beladi, Chaudhuri & Yabuuchi, 2008; Beladi, Marjit, & Broll, 2011; Beladi, Kar, & Marjit, 2013; Chaudhuri, 2008; Chaudhuri & Banerjee, 2010; Chaudhuri & Yabuuchi, 2007; Das, 2002, 2005; Gupta & Dutta, 2010; Kar & Beladi, 2004; Kar & Guha-Khasnobis, 2006; Marjit & Acharyya, 2003; Marjit & Kar, 2005; Oladi & Beladi, 2007; Oladi, Gilbert & Beladi, 2011; Pan & Zhou, 2013; Pi & Zhou, 2014, 2015; Wu, 2001; Yabuuchi and Chaudhuri, 2007; Zhang, 2012, 2013) theoretically stresses the role of international factor mobility in affecting skilled-unskilled wage inequality. The aforementioned studies hold that the international migration of skilled and unskilled workers and the inflow of foreign capital can unambiguously or conditionally lead to growing or shrinking skilled-unskilled wage gap through various mechanisms.

Some of above-mentioned studies (e.g., Beladi et al., 2008; Chaudhuri & Yabuuchi, 2007; Das, 2002; Oladi et al., 2011; Pi & Zhou, 2014; Wu, 2001; Zhang, 2013) pay special attention to the effect of foreign capital on skilled-unskilled wage inequality. For example, Chaudhuri and Yabuuchi (2007) show that an inflow of foreign capital will narrow down wage inequality under some factor intensity condition. Beladi et al. (2008) find that an inflow of foreign capital may increase or decrease wage inequality, which depends on the difference in the intersectoral capital intensities. Zhang (2013) analyzes the impact of an inflow of foreign capital on wage inequality in the presence of internationally traded product varieties, and shows that such an inflow will narrow down the wage gap in the long run. Pi and Zhou (2014) explore how an inflow of foreign capital affects wage inequality when the endogenous public infrastructure provision is taken into account, and find that the effect is determined by the capital distributive shares or the factor substitution elasticities in the urban sectors. However, the existing literature fails to consider the impact of an inflow of foreign

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capital when there exists pollution control. The interaction between foreign capital and pollution control in different sectors is largely neglected by the current studies.

Pollution control and its effects are also explored by many scholars from different perspectives. Lehmann (2012) provides a literature review for the policies of pollution control. Yohe (1979) examines the impacts of pollution control on the sizes of the polluting and non-polluting sectors and national income in a two-sector general-equilibrium model with full employment. Yu and Ingene (1982) analyze the effects of pollution control on unemployment and national income in a two-sector general-equilibrium model with generalized unemployment and rigid wages. Beladi and Samanta (1988) build a two-sector general-equilibrium model with factor price distortions and full employment, and explore the impacts of pollution control on the sizes of the two sectors and national income. Wang (1990) investigates the effects of pollution control on the wage rate, the rental rate, and national income in a two-sector general-equilibrium model with unemployment and the sector-specific rigid wage. Beladi and Frasca (1999) construct a three-sector general-equilibrium model, and analyze how pollution control affects some key variables of interest (e.g., output, real income, and unemployment). However, the existing literature on pollution control neglects to consider the issue of skilled-unskilled wage inequality, and thus fails to investigate the effect of pollution control on the skilled-unskilled wage inequality.

This paper tries to integrate foreign capital and pollution control into a unified framework of skilled-unskilled wage inequality. The economic intuition of this paper can be briefly described as follows. An inflow of foreign capital (resp. stricter control of pollution) will increase (resp. decrease) the supply of capital (resp. pollution permits), resulting in a fall of the interest rate (resp. a rise of the shadow price of pollution). On the one hand, the change of a factor's price will influence the inputs of this factor and other relevant factors in the urban unskilled sector, which is a sector that generates pollution. Specifically, the urban unskilled sector will change its inputs on the basis of the elasticities of substitution. For example, if the elasticity of substitution between unskilled labor and capital (resp. unskilled labor and pollution) is large, then the substitution of unskilled labor with capital (resp. pollution with unskilled labor) will become easy, and the demand for labor in the urban unskilled sector will decrease (resp. increase). This will reduce (resp. raise) the wage rate of unskilled labor. On the other hand, the change of the factor price will also affect the inputs in the urban skilled sector, which is a sector that does not generate pollution. If the interest rate becomes lower, then more capital will be employed in the urban skilled sector, resulting in an increase of the productivity of skilled labor. Thus, the wage rate of skilled labor will rise. If the shadow price of pollution rises, the demand for capital in the economy (i.e., the force that determines the movement direction of the interest rate) will be mainly influenced by the substitution of capital and pollution in the urban unskilled sector, and finally the wage rate of skilled labor will be changed. Combining the above two aspects, we can find out how foreign capital and pollution control exert their impacts on the skilled-unskilled wage inequality in developing countries.

In order to fill the current research gap, this paper builds three-sector general equilibrium models, and tries to analyze how foreign capital and pollution control influence wage inequality in developing countries. In the basic model with urban unemployment, we find that an inflow of foreign capital will expand the skilled-unskilled wage inequality if the elasticity of substitution between labor and capital in the urban unskilled sector is large enough, and that stricter pollution control will also expand the wage inequality if the elasticity of substitution between labor and pollution is small enough. In the extended model with full employment, we find that the intensity of capital plays a crucial role. In order to make our analysis more complete, we also explore how the skilled-unskilled wage inequality is affected by pollution externalities.

The remaining parts of this paper are organized as follows. The basic model with urban unemployment is given in Section 2. In Section 3, we extend the basic model by considering the case where there exists full employment instead of urban unemployment. In Section 4, we offer some discussions on pollution externalities. Concluding remarks are provided in Section 5.

2. The basic model

Consider a small open economy, which consists of three sectors, an urban skilled sector, an urban unskilled sector, and a rural sector. Following Beladi and Frasca (1999), Yohe (1979), and Yu and Ingene (1982), pollution is regarded as an input factor in the relevant sector. Other economic endowments in the economy are skilled labor, unskilled labor, capital, and land. The urban skilled sector employs skilled labor L_{SX} and capital K_X to produce an exportable manufacturing product X. The urban unskilled sector employs unskilled labor L_{UY}, capital K_Y, and pollution E to produce an import-competing product Y. The rural sector employs unskilled labor L_{UZ} and land T to produce an agricultural product Z. Furthermore, skilled labor, pollution, and land are specific to the urban skilled sector, the urban unskilled sector and the rural sector, respectively. Capital can move freely between the urban skilled sector and the urban unskilled sector. However, the migration of unskilled labor between the urban unskilled sector and the rural sector is imperfect, as there exists the Harris-Todaro unemployment rate λ among unskilled workers in the urban area (see Harris and Todaro (1970)). In the economy, total economic endowments of skilled labor, unskilled labor, land, and domestic capital are exogenously given. The amounts of foreign capital and pollution are controlled by the government through capital and environmental regulations. X, Y, and Z also represent the total outputs of the corresponding sectors. The production functions can be expressed as $X = F^1(L_{SX}, K_X)$, $Y = F^2(L_{UY}, K_Y, E)$, and $Z = F^3(L_{UZ}, T)$, where the three functions satisfy the neoclassical properties (i.e., strict quasi-concavity and linear homogeneity).

There are two points about the urban unskilled sector that should be noted. Firstly, this sector produces pollution, and thus uses pollution permits that are issued and controlled by the government as an input. The method that we set the urban unskilled sector as a polluting sector is similar to that in Pan and Zhou (2013). The reason behind such a setting is that the urban unskilled sector is usually an emission intensive sector in developing countries. For example, in the urban unskilled sector, steel, printing, chemical and other industries generate lots of pollution. Secondly, we use pollution control in the sense of Beladi and Frasca (1999), Yohe (1979), and Yu and Ingene (1982), and others. Although pollution is seen as an input in the urban unskilled sector, its amount is equal to a