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Environmental effects of remittance of rural–urban migrant

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ABSTRACT

In this paper, we investigate the environmental effect of migrant remittance. The rural–urban migration is an important component of migration. Although migrants work and live in the city, the altruistic remittance affects the production scale of urban sector and then exerts impact on the environment. This paper establishes a two-sector general equilibrium model and adopts a comparative static approach to investigate the short-term and long-term impacts of increase in remittance of migrants on the environment. We mainly reach the following conclusions: the increase of migrant remittance can improve the environment in the short term but worsen the environment in the long run.

1. Introduction

Migrant remittance refers to the part of their income that migrants send home. In 1999, remittance in India, Philippines and Mexico formed 2.6%, 8.9% and 1.7% of their GDPs respectively (Stalker, 2002). Hoyos (2008) and Zarate-Hoyos (2004) showed that nearly 1.3 million households in Mexico received migrant remittance in 2000, which formed almost 48.9% of the Mexican national monetary income. It is also shown that over 10% of rural households and over 4% of urban households received remittance. So far, most papers merely studied the effect of international migrant remittance on the labor-outsourcing countries. The typical studies that could be referred to are Bhagwati and Srinivasan (1977), Djajić (1985) and Samanta (2003). However, the remittance of rural–urban migrants in the developing countries, particularly in nations with a dual economy, is an extremely important component of national income. For example, Chinese rural–urban migrants, nearly 260 million in number, send or take part of the income obtained from the labor-host region to the labor-outsourcing region. It has been estimated by the writer that the rural–urban migrant remittance in China was more than 1000 billion RMB (around 160 billion U.S. Dollar) in 2012. This requires special attention as the remittance is a result of rural urban migration instead of overseas emigration, and it is the latter that has been the subject of significant research hitherto. The family members of migrant workers in labor-outsourcing regions could benefit a lot from migrant remittance, and their use of remittance on consumption, investment in production or saving is an influential component of economic development in the rural region or even in the whole country.

From the facts above, we know that migrant remittance has a great impact on the labor-outsourcing regions or countries, which attracts interest of both empirical and theoretical economists. Theoretical researches mainly considered the effects of migrant remittance on rural income distribution, agricultural production, development of rural economy and some macro-economic elements such as current exchange rate and so on. The typical studies that could be referred to are Stark et al. (1986), Taylor and Wyatt (1996), Quibria (1997), Rozelle et al. (1999), McCormick and Wahba (2000), Ball et al. (2013) and so forth. The current empirical studies focused mainly on the impact of migrant remittance on rural income smoothing, household poverty and inequality, household decisions, relative prices and economic growth combined with the productive use of remittance on rural economy. The representative empirical works are Amuedo-Dorantes and Pozo (2011), Chiwuzulum Odozi et al. (2010), Grigorian and Melkonyan (2011), Nath and Vargas-Silva (2012), Pradhan et al. (2008), and Zarate-Hoyos (2004).

On the other hand, enormous theoretical and empirical studies showed the environmental effects of economic development from the perspective of labor transfer. For instance, Dean and Gangopadhyay (1997) used a three-sector model to analyze how limiting the export of intermediate goods would affect environmental pollution, rural–urban migration and urban unemployment. Chaudhuri and Mukhopadhyay (2006) investigated the efficiency of imposing a pollution emission tax on the formal manufacturing sector in a three-sector general equilibrium model that included pollution effects that arose from the informal sector. Previous empirical research, such as Papola (1981) and Romatet (1983), suggested that the urban informal sector produced intermediate goods for the formal manufacturing sector and the informal sector was, in fact, the main source of environmental pollution.

However, the environmental impact exerted by an increase in remittance of rural–urban migrants in developing countries is largely ignored. Considering the example of China, the appearance of migrant

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remittance could be traced back to the middle of 1980s, the amount of which has been growing larger hitherto, and China is suffering from worsening environmental pollution. The city of Shanghai is not only a major receiver of transferred farm labors in China, but also one of the major manufacturing bases. Fig. 1 reflects the changes in the amount of migrant remittance and industrial waste gas emissions from 2000 to 2011 in Shanghai. The variation trend shows that changes in migrant remittance were nearly in line with industrial waste gas emissions.

This trend can be explained from a simple theoretical deduction: since migrant remittance is generated from the wage, rural–urban migrants motivated by altruism are striving to send more remittance home to improve the quality of lives for their families, and this will prompt them to increase revenue through hard work; on the other hand, the growth in remittance means the increase in their workload, which will lead to an enlargement in the scale of production in the urban sector, the result of which is an increase in pollution during the production process, so the amount of migrant remittance and of environmental pollution will grow at the same pace. Admittedly, there are many reasons which can cause pollution, such as an increase in exports of industrial products, urbanization and so on.

However, if we do not seriously investigate the issue of remittance, which is taken to be one of the main reasons behind environmental pollution, it will be difficult for us to arrive at appropriate solutions for the environmental problems we face today. In order to clarify the relationship between remittance and environmental pollution and improve the environment, this paper establishes a two-sector general equilibrium model and conducts a comparative static study to investigate the short-run and long-run impacts respectively of an increase in remittance of migrants on the environment. We find that an increase in the remittance of rural–urban migrants to labor outsourcing regions will lead to environmental improvement in the short run, but will deteriorate the environment in the long term.

The rest of this paper is organized as follows: in Section 2, we set up the theoretical model; in Section 3, we conduct the theoretical analysis of the established model; and we draw conclusions in Section 4.

2. Theoretical model

Consider a developing country with a closed economy, which consists of two sectors: the rural agricultural sector and the urban manufacturing sector. The urban manufacturing sector absorbs rural–urban migrants. There are three kinds of labor in this economy—the urban labor, the rural–urban migrants and the rural labor. Because rural–urban migration control policies prevail in developing countries (Lall and Selod, 2006; Zhao, 2005), we set the number of the rural workers who transfer to urban areas as given.

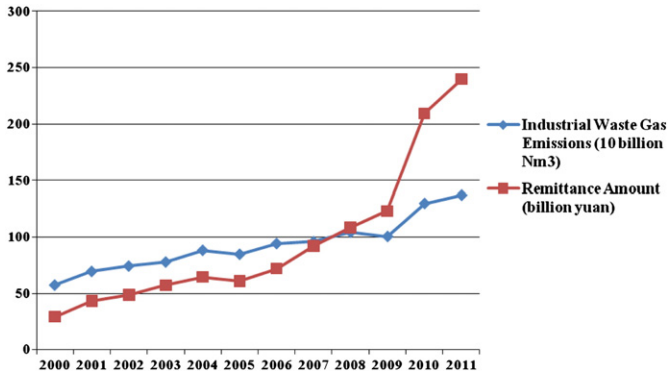

Fig. 1. The total amount of migrant remittance and of industrial waste gas emissions from 2000 to 2011 in Shanghai. Data sources: Authors calculated the results based on the data from Shanghai Municipal Bureau of Statistics (http://www.stats-sh.gov.cn/) and Shanghai Municipal Human Resources and Social Security Bureau (http://www.12333sh.gov.cn).

The urban sector utilizes urban labor, rural–urban migrants and capital as factors of production. The wage rate of the manufacturing sector is downward rigid. The agricultural sector utilizes capital, remittance of migrants and local labor as factors of production, and its wage is flexible. Furthermore we assume that the production procedure of agricultural sector depends on environmental factors. That is to say, the environmental improvement will create correspondingly higher levels of output. Production in the manufacturing sector will generate pollution, which damages the environment through factors such as air and water.

The production functions of the urban manufacturing sector and the rural agricultural sector are given separately by:

$$Y_1 = F^1(L_1 + \bar{L}_{TR}, K_1) \tag{1}$$

$$Y_2 = g(E)F^2(L_2, a\overline{w}\bar{L}_{TR} + K_2) \tag{2}$$

where Y_1 and Y_2 are the outputs of the urban manufacturing sector and the rural agricultural sector, respectively. L_1 and L_2 are the urban labor employed by the urban manufacturing sector and the local rural labor employed by the rural agricultural sector, respectively. $\bar{L}_{TR}$ is the number of rural–urban migrants employed by urban manufacturing sector. K_1 and K_2 are the capital utilized by the urban manufacturing sector and the rural agricultural sector, respectively. $\overline{w}$ is the wage rate of the urban sector, which satisfies $\overline{w} > w_a$. If we assume that $0 < a < 1$, a represents the rural–urban migrants remittance rate, that is, the rural–urban migrants will send a proportion a of their income back to the labor-outsourcing region. F^1 and F^2 are the strictly quasi concave and linearly homogeneous functions of the urban manufacturing sector and the rural agricultural sector, respectively. The quality of environment after pollution is denoted by E. Thus:

$$E = \bar{E} - \mu Y_1 \tag{3}$$

where $\bar{E}$ is the best quality of environment, which is regarded as given. μ expresses the units of local pollution generated by one unit of production in the urban manufacturing sector. Taking the effect of environment on agricultural productivity into consideration, the denotation of Eq. (3) here is in accordance with Copeland and Taylor (1999) and Li and Zhou (2013A). $g(E)$, with the properties $g > 0$, $g' > 0$ and $g'' > 0$, represents the effect of environment on agricultural productivity.

Firstly, in the short run, capital is illiquid and the interest rate is regarded as given. Profit maximization yields:

$$PF_L^1 = \overline{w} \tag{4}$$

$$gF_L^2 = w_a \tag{5}$$

where $F_L^i = \partial F^i / \partial L_i (i = 1, 2)$. Here we normalize the price of output in the rural agricultural sector into unit. P is the relative price of output in the urban manufacturing sector in terms of the output in the rural agricultural sector. w_a is the wage rate of rural local labor employed by the rural agricultural sector; $\overline{w}$ is the wage rate of the urban sector, which satisfies $\overline{w} > w_a$.

The full employment condition of factor markets is shown as follows:

$$L_1 + L_2 + \bar{L}_{TR} = \bar{L} \tag{6}$$

where $\bar{L}$ is the labor endowment in the economy. We assume that all individuals in the economy have twice-differentiable, strictly quasi-concave and homothetic utility functions. The utility-maximization problem of urban workers can be stated as follows:

To choose (c_1^1, c_2^1)
To maximize $u^1(c_1^1, c_2^1)$
Subject to $I^1 = Pc_1^1 + c_2^1$

where c_1^1 is the urban workers' utility maximizing consumption of urban manufacturing products; c_2^1 is their utility maximizing consumption of