Journal of Development Economics 96 (2011) 174–187

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Search, migration, and urban land use: The case of transportation policies☆,☆☆

Yves Zenou

Stockholm University, Sweden
IFN, Sweden

ARTICLE INFO

Article history:
Received 13 July 2009
Received in revised form 22 April 2010
Accepted 22 October 2010

JEL classification:
D83
J61
O18
R14

Keywords:
Rural–urban migration
Transportation policies
Entry-costs
Restricting migration

ABSTRACT

We develop a search-matching model with rural–urban migration and an explicit land market. Wages, job creation, urban housing prices are endogenous and we characterize the steady-state equilibrium. We then consider three different policies: a transportation policy that improves the public transport system in the city, an entry-cost policy that encourages investment in the city and a restricting-migration policy that imposes some costs on migrants. We show that all these policies can increase urban employment but the transportation policy has much more drastic effects. This is because a decrease in commuting costs has both a direct positive effect on land rents, which discourages migrants to move to the city, and a direct negative effect on urban wages, which reduces job creation and thus migration. When these two effects are combined with search frictions, the interactions between the land and the labor markets have amplifying positive effects on urban employment. Thus, improving the transport infrastructure in cities can increase urban employment despite the induced migration from rural areas.

1. Introduction

Cities of the developing world are often characterized by their large size, high unemployment, high poverty, a large fraction of rural migrants, and poor transport infrastructure. It is our contention that these different characteristics are strongly linked together and only policies taking into account all these aspects and thus the interaction between different markets can be successful. In particular, we believe that the lack of good transport system in developing cities can have a big influence on labor market outcomes. A good example is India where the overall population growth and increasing urbanization have led to the especially rapid growth of large cities,[1] so that the poor population must spend up to three or four hours a day for travel (Pucher et al., 2005).[2] Improving the transport system in such a country can have important effects on workers' labor market outcomes.

We thus need to develop a model where all these features are present. The Harris–Todaro framework (Todaro, 1969; Harris and Todaro, 1970) has become a cornerstone of models of rural–urban migration. The aim of the Harris–Todaro framework is to explain the persistent rural–urban migration in developing countries despite the high unemployment rates in cities. The original model has been extended in different directions (see the literature surveys by Basu, 1997, Part III; Ray, 1998, Chap. 10) to explain this puzzle. We believe that two aspects are particularly important in order to tackle the issues mentioned above and should be introduced if one wants to understand the policy implications of such a model. First, one should consider a search-matching labor market in the city in order to endogenize wages and unemployment. Indeed, there are large evidence showing that cities in developing countries are characterized by important search frictions due to coordination failures, mismatch costs and lack of information about jobs (see, e.g., Rama, 1998; Bosch et al., 2007; Bosch and Maloney, 2008). Second, an explicit land/housing market should be incorporated in the city to study the relationship between rural–urban migration and the land market. Indeed, a city differs from a rural area not only because of the specificity of its labor market (as in the standard Harris–Todaro model) but also because of its land/housing market.

There is a tradition of search models in the migration literature that only model one side of the market (the workers) so that firms' behavior and thus job creation are not considered (see e.g. Fields, 1975, 1989, Banerjee, 1984, Mohtadi, 1989). There is a more recent literature, which

☆ I thank the editor, Maitreesh Ghatak, and two anonymous referees for helpful comments.
☆☆ This paper was partly written while I was visiting the University of California, Berkeley. Their hospitality is gratefully acknowledged.
E-mail address: yves.zenou@ne.su.se.

[1] By 2001, India had three megacities: Mumbai (Bombay) with 16.4 million inhabitants, Kolkata (Calcutta) with 13.2 million inhabitants, and Delhi with 12.8 million inhabitants. And 35 metropolitan areas had populations exceeding one million, almost twice as many as in 1991 (Office of the Registrar General of India, 2001).

[2] See also Carruthers et al. (2005) who show that workers in developing countries spend a significant amount of their income on transportation.

0304-3878/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.jdeveco.2010.11.001

incorporates a search-matching labor market a la Pissarides–Mortensen (Mortensen and Pissarides, 1999; Pissarides, 2000) in a Harris–Todaro model (see Coulson et al., 2001; Ortega, 2000; Sato, 2004; Laing et al., 2005; Zenou, 2008; Albrecht et al., 2009; Satchi and Temple, 2009).[3] None of these models, however, have an explicit land market where workers choose their residential location in the city.

In this paper, we propose a rural–urban migration model where the city is characterized by both a search-matching labor market and an explicit land/housing market. To the best of our knowledge, this is the first paper that performs such an analysis. This allows us not only to characterize and to study the properties of the steady-state equilibrium but also to analyze the impact of three policies on labor market outcomes.[4]

To be more precise, we develop a model where there are search frictions in the city so that unemployment prevails there[5] whereas the rural area is competitive. In the city, the wage is determined by a bargaining between workers and firms and because of search frictions, unemployment emerges in equilibrium. In the rural area, workers are paid at their marginal productivity, so that there is full employment. Depending on their employment status, workers optimally decide whether to live in the city or in the rural area. We characterize the steady-state equilibrium of the economy with rural–urban migration and show that the equilibrium exists and is unique but not efficient because of search externalities. We then consider three different policies: a transportation policy that improves the public transport system in the city, an entry-cost policy that encourages investment in the city and a restricting-migration policy that imposes some costs on migrants. We show that all policies can increase urban employment but the transportation policy has much more drastic effects. This is because a decrease in commuting costs has both a direct negative effect on land rents, which encourages migrants to move to the city, and a direct negative effect on urban wages, which reduces job creation and thus migration. When these two effects are combined with search frictions, the interactions between the land and the labor markets have amplifying positive effects on urban employment. Thus, improving the transport infrastructure in cities can have important positive effects on urban employment despite the induced migration from rural areas.

2. Model and notations

There are two areas: an urban area (the city, denoted by the superscript C) and a rural area (denoted by the superscript R). As in the standard Harris–Todaro model, in rural areas, it is assumed that workers are paid at their marginal productivity so that there is no unemployment. Therefore, if N denotes the total population in the economy, the total population in rural areas is $L^R = N^R$, where L^R is the employment level. As a result, the total population in cities is equal to: $N^C = L^C + U^C$ (where L^C and U^C are respectively the employment and unemployment levels in cities), with $N = N^C + N^R$. In this context, the unemployment level in cities is given by:

$$U^C = N - L^C - L^R. \tag{1}$$

2.1. The city

It is assumed that there are search frictions[6] in the city and we use the standard search-matching framework (Mortensen and Pissarides, 1999; Pissarides, 2000) to model these frictions. There is a continuum of firms. A firm is a unit of production that can either be filled by a worker whose production is y units of output or be unfilled and thus unproductive. In order to find a worker, a firm posts a vacancy. A vacancy can be filled according to a random Poisson process. Similarly, workers searching for a job will find one according to a random Poisson process. In aggregate, these processes imply that there is a number of contacts per unit of time between the two sides of the market that are determined by the following matching function[7]:

$$\Omega\left(\bar{s}U^C, V^C\right)$$

where $\bar{s}$ is the average search efficiency of the unemployed workers and V^C denotes the total number of vacancies in the city. It is assumed that $s = \bar{s}$, so each worker provides the same search effort s, which is exogenous. As in the standard search-matching model (see e.g. Mortensen and Pissarides, 1999, and Pissarides, 2000), we assume that $\Omega(.)$ is increasing both in its arguments, concave and homogeneous of degree 1 (or equivalently has constant return to scale). Thus, the rate at which vacancies are filled is $\Omega(\bar{s}U^C, V^C)/V^C$. By constant returns to scale, it can be written as

$$\Omega\left(1/\theta^C, 1\right) \equiv q\left(\theta^C\right)$$

where

$$\theta^C = \frac{V^C}{sU^C} \tag{2}$$

is a measure of *labor market tightness* in efficiency units and $q(\theta^C)$ is a Poisson intensity. By using the properties of $\Omega(.)$, it is easily verified that $q'(\theta^C) \leq 0$: the higher the labor market tightness, the lower the rate at which firm fill their vacancy. Similarly, the rate at which an unemployed worker with search intensity s leaves unemployment is

$$\frac{s}{\bar{s}}\Omega\left(\bar{s}U^C, V^C\right) \equiv a\left(\theta^C\right)$$

where $a(\theta^C) \equiv s\theta^C q(\theta^C)$ is the job-acquisition rate. Again, by using the properties of $\Omega(.)$, it is easily verified that $a'(\theta^C) \geq 0$: the higher the labor market tightness, the higher the rate at which workers leave unemployment since there are relatively more jobs than unemployed workers. Also, the higher the search intensity s (unemployed search more actively for jobs), the higher is this rate $a(\theta^C)$. Finally, the rate at which jobs are destroyed is exogenous and denoted by δ.

If there are no frictions in this model, then unemployment and vacancies disappear, and jobs are found and filled instantaneously. Indeed,

$$\lim_{\theta^C \to 0} a\left(\theta^C\right) = \lim_{\theta^C \to +\infty} q\left(\theta^C\right) = 0 \tag{3}$$

and

$$\lim_{\theta^C \to +\infty} a\left(\theta^C\right) = \lim_{\theta^C \to 0} q\left(\theta^C\right) = +\infty. \tag{4}$$

[3] For an overview, see Zenou (2009).

[4] There are few theoretical papers analyzing transport policies in an explicit urban framework (exceptions include Zenou, 2000; Borck and Wrede, 2005, 2009; Brueckner, 2005; Brueckner and Selod, 2006; Wrede 2001) and even less papers studying the impact of such policies on labor market outcomes of workers (exception includes Zenou, 2000, who looks at an efficiency wage model with no rural–urban migration). Van Ommeren et al. (1999), Van Ommeren and Rietveld (2005), and De Borger (2009) study commuting issues in a search model but there is no land market.

[5] Cities in less developed countries are often characterized by an *informal sector*. In our analysis, the unemployed workers are basically the informal workers. In this perspective, the informal sector would be a disadvantaged sector in a segmented labor market where informal workers would try to obtain a formal job. This is certainly true in African countries but less true in Latin American ones (Maloney, 2004).

[6] As defined by Mortensen and Pissarides (1999), "market friction is the costly delay in the process of finding trading partners and determining the terms of trade." In other words, search frictions imply that it takes time and other resources for a worker to obtain a job and for a firm to fill a vacancy.

[7] This matching function is written under the assumption that the city is monocentric, i.e. all firms are located in one fixed location.