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THE SEARCH EQUILIBRIUM APPROACH TO MIGRATION AND LABOR MARKET

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This paper looks at the relation between migration and labor market parameters in search equilibrium model upon which a steady-state analysis can be based. We define and characterize the properties of steady-state equilibrium according to several conditions that we assume to be present in the process of migration from rural to urban sectors. The main implication of this study is the suggestion that, in the absence of urban-to-rural migration, the urban sector may have a higher unemployment rate with higher productivity differentials between urban and rural sectors. However, unemployment rates may drop for the urban sector as a result of increases in a firm's output level, which increases gross income along with a firm's entry cost.

JEL Classification: J3, J6, R0
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I. INTRODUCTION

The existing literature on migration, especially Todaro(1969) and Harris and Todaro(1970), tends to focus on the way in which migration occurs as a result of anticipated income differentials between rural and urban sectors. These studies generally focus on this one-sided migration from rural to urban sectors within certain time frames. As indicated by Todaro(1969) and Harris and Todaro(1970), an equilibration of incomes between rural and urban sector occurs as a result of unemployment or underemployment in the urban labor force. There is little doubt that significant levels of urban unemployment[1] do result from rural-urban migra-

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tion. This is, of course, especially true in developing countries, where rural-to-urban migration is clearly one factor involved in high urban unemployment rates. Nevertheless, even where vast income differentials between rural and urban sectors do exist, this does not always result in massive waves or high numbers of rural-to-urban-migration. In addition to cultural factors, this is also because there are, in reality, few economic incentives for rural dwellers to migrate to cities, especially high levels of unemployment. For this reason the thesis that one-sided migration from rural to urban areas is a direct result of expected income differentials, is in need of revision.

With respect to the theoretical issues surrounding migration and employment relations, Todaro(1969) and Harris and Todaro(1970) adopted the view that labor migrates to wherever its expected income is the highest[2]; hence, an equilibrium develops between migration and employment, where rural-to-urban migration is produced by the availability of high wages. Bencivenga and Smith(1997) developed a neoclassical growth model that charts the relationship between rural-to-urban migration patterns and underemployment, demonstrating how high levels of rural-to-urban migration combined with high levels of underemployment can lead to development traps and result in periodic equilibria interchanged with dramatic oscillations. Carrington et al. (1996) have presented a dynamic model of labor migration in which relocation costs decrease with the number of migrants already settled in the destination. As a result of endogenous relocation costs, migration can occur gradually over time.

Studies have also been published concerning a search for theoretical models that help us to better understand urban labor market settings[3]. Viswanath (1991), for example, has studied individual models of rural-to-urban migration that emphasize the effects of information flow and the way in which urban wages are dispensed. Bhattacharya (1990) has developed a theoretical framework for analyzing the migration decisions of workers who are able to accept the quality of a location only after having migrated there following the obtainment of employment. Bell (1991) has analyzed the relation between migration and the influence of social scarcities, including differences in consumer prices, preferences across locations, and the ramifications of rigid wage scales in one particular region.

With respect to empirical approaches to rural-to-urban migration, Gabriel and Schmitz (1995), using the National Longitudinal Survey of Youth data for 1985 through 1991, show that, in general, even recent migrants do enjoy higher average wages than non-immigrants from similar socio-economic backgrounds. Goss and Paul(1986) has examined the impact of age on the migration decisions

[1] Bencivenga and Smith(1997) indicates that economic development is typically accompanied by migration from rural to urban employment.

[2] Hatton and Williamson(1992) survey the trends in the real wage gap between city and farm from 1890-1941 in the world.

[3] see for example, Helsley and Strange, 1990; Abdel-Rahman and Wang, 1995

of employees and found that while age increases many of the costs of a geographic move, subsequently reducing the probability of migration, the possession of higher levels of general skills, as measured by years of experience, tends to increase mobility.

With respect to Korea, Yoo (1991) has examined the long-term patterns of migration within Korea between 1966 and 1985. The results suggest that economic factors are not the most critical determinants of rural-to-urban and urban-to-urban sector migration; instead, this study argues that non-economic factors such as community amenities and education opportunities are the central driving factors. Goo (1986) analyzed the determinants of migration in Korea based on age. He found that the higher the level of education the higher the rate of migration for all ages, and that income level, distance, and population crowd sensitivity were also important factors.

In this paper we try to explain the migration of rural labor to the urban market according to job search outcome by worker and we present a theoretical equilibrium model of migration, in which migration decisions are analyzed according to explicit matching functions and the transitional flow contact rate attributed to workers in the urban sector. This process is endogenously determined. Thus, we are concerned with a steady state search equilibrium in which both transitional contact rates and wages are determined endogenously in the urban sector. This model, therefore, not only allows us to explore the sufficient and necessary conditions for the urban sector to reach a point of equilibrium, but it also analyzes the comparative properties of steady-state search equilibrium. We utilize the 'matching and bargaining' framework developed in the seminal contributions of Diamond (1982a, 1982b, 1984), Mortenson(1982), and Pissarides (1984, 1985, 1987). This facilitates an explicit analysis of the interaction between workers and firms in the urban labor market, and the extent to which the consumer-producer relationship is an integrated one.

Again, the central objective of this paper is to examine steady state equilibrium in an economy in which no-arbitrage migration, free entry, and the explicit matching function are present in the urban labor market. We provide and characterize the properties of steady-state equilibrium with respect to unique wages, contact rates, and unemployment, paying special attention to several conditions factors that have a major impact on the migration process between sectors. The results of our study suggest that, in the absence of labor supply redundancy in the urban sector, unemployment rates become higher in accordance with higher productivity differentials between the two sectors. And, in steady-state equilibrium, there is no migration flow between two sectors with no-arbitrage migration for both sectors. In other words, we conclude that there are no economic incentives for rural dwellers to migrate to cities, if one assumes that the expected discounted value of a worker who continues a job search in the urban sector equals the discounted value of lifetime income in the rural sector.

This paper is organized as follows. Section 2 presents the economic environment and economic activity. Section 3 analyzes the asset value and wage determination by the explicit matching technology function whereas the steady-state analysis is presented in section 4. Section 5 characterizes comparative properties of steady state. Lastly, Section 6 is devoted to the articulation of preliminary conclusion.

II. THE BASIC ENVIRONMENT AND ECONOMIC ACTIVITY

2.1 The Basic Environment

We consider two sectors, rural and urban, in a closed economy. Time is continuous. Each worker discounts the future at the rate, δ. Workers are endowed with a unit of labor which they can supply to firms inelastically. Workers can search[4] for vacancies in the urban sector without any search or moving costs and their decision to do so depends, thus, on the expected discounted value of income between the sectors. There is free entry of firms into the formal urban labor market, in the sense that any number of firms can enter (or exit) the market upon incurring the costs of acquiring the capital necessary for production.

Thus, in urban labor market firms, with open vacancies, and workers, seeking jobs, are brought together at random points in time through a stochastic matching technology. Upon a successful match, the worker-firm pair negotiates a wage and production takes place.

2.2 Production Activity

Each firm has exactly one opening that can be filled by a single worker. The active mass of firms in the economy is V. There is free entry, in the sense that any number of firms can instantly enter the labor market and search for workers, after paying a fixed entry fee, v_0, which is taken to be constant through time. In practice, the fixed entry fee reflects unit capital costs and setup costs. So, an improvement in the organization of financial markets that lowers finance costs or tax incentives geared toward promoting investment lower the entry fee. For simplicity, we assume that vacancies are completely *durable* and that they are identical in every respect.

There is a continuum of agents whose mass is normalized to unity. We assume rural sectors to be fully employed. That is, the total workforce population in this economy is represented by:

$$N = N^R + N^C = E^R + E^C + U^C = 1 \tag{1}$$

4) We do not assume pre-arranged jobs in this search behavior.

where N^R is the total rural population workforce, in which every worker is employed (E^R) and N^C is the total urban workforce, where it consists of unemployed (U^C) and employed workers (E^C).

Rural Sector

The production function in the rural sector is given by:

$$Y^R = A/\delta \tag{2}$$

Where Y^R is rural sector gross output, A/δ is the discounted value of income.

The Urban Sector

The production function in the urban sector in steady state is represented by:

$$Y(t) = \bar{Y} = A/\delta + \bar{\Delta} \tag{3}$$

Where $\bar{\Delta}$ is the productivity differential between the sector. In order to consider the steady state equilibrium with no migration, we need to impose a condition which assumes that the discounted value of lifetime income, A/δ equals the expected discounted value of the unemployed in the urban sector, J_U. The no-arbitrage migration condition is given by:

Assumption 1: (No-Arbitrage Migration Condition)

$$J_U = A/\delta = J^R > 0, \text{ where } J_U = J_U^C \tag{4}$$

Where $J_U(J_U^C)$ implies the expected value of an unemployed workers in the urban sector; J^R the discounted value of lifetime income in the rural sector. Equation (4) implies that rural workers would be indifferent given the choice to relocate. The no-arbitrage migration condition (4) needs to be defined to have the economic environment whereby all rural individuals do not migrate to the urban sector, even though there exists expected income differentials between rural and urban sectors. Most migration literature does not consider this assumption so that like Todaro's(1969) migration takes place whenever the expected income in urban sector is higher than rural sector with one-way migration. In this sense, the assumption 1 can consider the process of migration from rural to urban sector and two-way migration between rural and urban sector.

Ⅲ. JOB SEARCH AND MATCHING

Upon locating a successful match, each firm-worker pair produces a fixed stock of output, $\overline{Y}$, which is the gross economic surplus that is to be shared between them. So, the total discounted value of accruing to the match between a worker and a vacancy (assuming there is no additional human capital accumulation after employment) equals $\overline{Y}$.

Let U denotes the mass of searching workers, and V denotes the mass of vacancies. We denote the flow probability that a worker locates a vacancy with μ and inversely, a vacancy that locates a worker with η. Since a vacancy can be filled by exactly one worker, it is clear that steady-state matching in the primary labor market implies:

$$\mu U = \eta V \tag{5}$$

Although μ and η are determined in equilibrium, both workers and firms treat them as parametric when making their hiring decisions. In order to complete the description of the model, it is necessary to specify the matching technology. For simple analysis, let us use the explicit matching technology, $m = m_0 X(U, V) = m_0 U^{\alpha} V^{1-\alpha-\rho}$, which describes the instantaneous flow meeting rate between unfilled vacancies, V, and searching workers, U, and captures some matching externality. Such explicit matching function, $m_0 U^{\alpha} V^{1-\alpha-\rho}$ satisfies the following properties:

Assumption 2. The matching technology, $m = m_0 U^{\alpha} V^{1-\alpha-\rho}$, where $m_0 > 0$ and U and V are strictly increasing and concave, diminishing - returns - to - scale function of U and V, satisfying the Inada ($\lim_{z \to o} m = \infty$ and $\lim_{z \to \infty} m = 0, Z \in U, V)$ and boundary conditions.

The matching technology parameter m_0 captures the matching efficiency; for example, an improvement in the communication and transportation infrastructure would increase the flow matching rate given the masses of workers (U) and vacancies (V). The properties of the matching function, $m_0 U^{\alpha} V^{1-\alpha-\rho}$, ensures a well-behaved, hyperbolic Beveridge curve in which the absence of either side of the matching parties would result in no matches. It is worth noting that both flow probabilities are to be endogenously determined in equilibrium. Nevertheless, both workers and firms treat them as parametric in the decision-making process.

Based on the steady state matching in the primary labor market, $\mu U = \eta V$, and the matching technology, $m_0 U^{\alpha} V^{1-\alpha-\rho}$, we know that $\mu U = \eta V = m_0 U^{\alpha} V^{1-\alpha-\rho}$ in the steady state. Therefore, we can obtain the transitional matching rate from firm to worker, η, which is represented by:

$$\eta = m_0 \mu^{-a} U^{-b} \tag{6}$$

where $m_0 = m_0^{1/1-\alpha-\rho}$, $a = (\alpha+\rho)/(1-\alpha-\rho)$, $b = \rho/(1-\alpha-\rho)$. Equation (6) is well defined in assumption 2. We know from this equation (6) that the transitional matching rate, η, in the steady state decreases when the transitional flow rate from workers to firms, μ, and the unemployed searching workers rise in the primary urban sector.

3.1 The Asset Value

We are now prepared to specify the value function of workers and firms. Let J_E denotes the present-discounted gross value of a worker employed by a firm; Π_F is the discounted value of income accruing from the match to vacancy; J_U denotes the expected discounted value to a worker who continues search in the labor market, and Π_V denotes the corresponding asset value of an unfilled vacancy.

Let w denotes the flow value of wage income and β is the birth or death rate. We thus have the following asset values:

$$\delta J_E = w + \beta[0 - J_E] \tag{7}$$

$$\delta J_U = \mu[J_E - J_U] + \beta[0 - J_U] \tag{8}$$

$$\delta \Pi_F = \{y - w\} + \beta[0 - \Pi_F] \tag{9}$$

$$\delta \Pi_V = \eta[\Pi_F - \Pi_V] + \beta[0 - \Pi_V] \tag{10}$$

Equation (7) implies that the expected discounted value of an employed worker equals the flow value of wage income plus the expected changes in wealth due to exiting the labor market[5]. Equation (8) implies that the expected value of an unemployed worker equals the capital gain with the probability μ of finding a job plus expected changes in wealth due to exiting the labor market. Equation (9) implies that the expected discounted value of a filled firm equals the net flow profit plus the expected change in profit due to exiting the labor market. Equation (10) implies that the expected discounted value of an unfilled firm equals the capital gain of finding a worker plus the expected changes in profits due to exiting the labor market.

3.2 Determination of Wage

We now turn to the determination of the wage bargain in this steady-state setting. We assume that both firms and workers are risk neutral[6]. This simplifies

[5] We assume that the employed worker/filled vacancy pair separate at rate, β, because they are separated from the death only.

the analysis. With risk neutrality, workers are interested in the expected present discounted value of wages; whereas firms focus on the expected present discounted value of profits. Formally, we need to make two assumptions about the wage bargain. First, we assume that the wage bargain is independent of the means by which worker and job have come together; that is, independent of whether the worker found the job or the job found the worker. Second, we assume that the bargain process is symmetric in the sense that the worker and job split evenly the surplus from their matching. With the assumption of risk neutrality and perfect capital markets, workers focus solely on these present discounted values and the surplus from finding a job, represented by $J_E - J_U$. Similarly, from the expected discounted values of income for filled jobs by $\Pi_F - \Pi_V$, we can express the assumed symmetry in the outcome of the negotiation process as:

Assumption 3(Symmetric Nash Bargain): The wage bargain follows a symmetric Nash rule:

$$J_E - J_U = \Pi_F - \Pi_V \geq 0 \tag{11}$$

In determining the unique wage offer function in the steady state equilibrium with no migration, we know that the expected value of unemployed worker in the labor market equals the discounted value of lifetime income, A/δ, in rural areas. This relation specifies the no-arbitrage migration condition, $J_U = A/\delta$. With the free entry equilibrium assumption, the expected value of vacancy is equal to constant capital costs, v_0, so that Π_V is exogenous in determining the unique wage offer function, that is, $\Pi_V = v_0$.

Therefore, applying the no-arbitrage migration, $J_U = A/\delta$, and free entry equilibrium assumption, $\Pi_V = v_0$, we have the following stock asset values in the steady state:

$$J_E = w/\delta + \beta = \overline{W} \tag{12}$$

$$J_U = \mu \overline{W}/\delta + \beta + \mu = A/\delta \tag{13}$$

$$\Pi_F = \{y - w\}/\delta + \beta = \overline{Y} - \overline{W} \tag{14}$$

$$\Pi_V = \eta/\delta + \beta + \eta[\overline{Y} - \overline{W}] = v_0 \tag{15}$$

From the four value equations (12), (13), (14), (15), and the rule describing the outcome of the negotiation process, (11), we can solve the unique wage offer

[6] For more detail, see Diamond (1984).

function, $\overline{W}$, given the other parameters.

$$\overline{W}(\overline{Y}, A, v_0) = 1/2[A/\delta + \overline{Y} - v_0] \tag{16}$$

where $\overline{Y} = A/\delta + \overline{\varDelta}$.

Proposition 1 (*The Wage Offer Function*): The unique wage offer function, $\overline{W}(\varDelta, A, v_0)$, determined in the Nash bargain between worker and vacancy, is given by:

$$\overline{W}(\overline{\varDelta}, A, v_0) = A/\delta + 1/2[\overline{\varDelta} - v_0] \tag{17}$$

and satisfies

$$\partial \overline{W}/\partial A > 0;\ \partial \overline{W}/\partial \overline{\varDelta} > 0;\ \partial \overline{W}/\partial v_0 < 0.$$

Intuitively, an increase in gross income (A) without discounting, enhances the bargaining power of workers and leads to the higher expected income, which raise their wages. Also, an increase in $\overline{\varDelta}$ increases the size of the 'pie' to be divided among both parties and thus the wage, $\overline{W}$, increases. Alternatively, an increase in the market value of unfilled vacancies, v_0, improves each firm's threat point and lowers the wage. We also assume from the proposition 1 that $\varDelta - v_0 > 0$, implying that urban-rural income differentials are greater than the entry costs in the labor market.

Ⅳ. STEADY-STATE ANALYSIS

Definition 1. (Steady State Analysis): A steady-state equilibrium is a wage function $\overline{W}^*(\overline{\varDelta}, A, v_0)$ and a sexruple $(\mu^*, \eta^*, E^{*R}, E^{*C}, U^*, V^*)$ satisfying the following conditions:

(i) (Symmetric Nash Bargain): $J_E - J_U = \Pi_F - \Pi_V \geq 0$,
(ii) (Unrestricted entry): $\Pi_V = v_0$,
(iii) (No-arbitrage): $J_U = A/\delta = J^R > 0$,
(iv) (The steady-state): $\eta^* = m_0 \mu^{-a} U^{b}$ (6)

$$\beta(E^{*C} + U^*) = \mu U \tag{18}$$

The intuition is as follows. First, condition (i) of the definition 1 ensures that wage $\overline{W}^*(\overline{\varDelta}, A, v_0)$ is consistent with the equal division rule. Part (ii) reflects the assumption of free entry into the labor market. Upon paying, v_0,firms can instantly enter the search market to recruit workers. We assume $\Pi_V > v_0$ for entry to be profitable. Part (iii) reflects that rural workers are indifferent to staying or migrating to the urban sector as long as their discounted value of income, A/δ, is the same as J_U in the urban area. This condition leads to no migration between the sectors in the steady-state equilibrium. Part (iv) of the definition provides necessary and sufficient conditions for constant populations of vacancies, V, and searching workers, U. Equation (6) states that the instantaneous matching rate of vacancies and searching workers is determined by the matching technology, while (18) indicates that the instantaneous outflow of workers from the unemployment pool, μU, must equal the inflow of the population, $\beta(E^{*C}+U^*)$, of the urban sector.

The model possesses a convenient recursive structure, which can be utilized to prove the existence of equilibrium and its properties. First, the equilibrium wage can be determined from constant parameters, no-arbitrage, and the given v_0. Second, the equilibrium values of the matching rate μ^* and η^* can be determined from the unrestricted entry condition, the no-arbitrage condition, and the steady-state conditions. Third, once μ^* and η^* are determined, U^* and V^*can be obtained. Finally, the equilibrium value of the E^{*R} and E^* can then be obtained directly from equation (6), (18), and (1).

4.1 The Free Entry Condition(The FE locus)

Utilizing proposition 1 together with the definition of Π_V enables the unrestricted entry condition, $\Pi_V = v_0$, to be written as:

$$\Pi^*_V = \Pi_V = \eta/\delta + \beta + \eta[\overline{Y} - \overline{W}^*(\overline{\Delta}, A, v_0)] = v_0 \tag{19}$$

Equation (19) implicitly defines a function $\eta = \eta^{FE}(\overline{\Delta}, A, v_0)$, which gives the value of η which is independent of μ. We assume that, after paying the fixed entry fee, any number of vacancies can establish themselves and commence searching for unemployed workers. This implies that firms attain zero (ex ante) profits in steady-state equilibrium.

Lemma 1:(*The Free Entry*) The function $\eta^* = \eta^{FE}(\overline{\Delta}, A, v_0)$ is independent of μ and is given by the following equation:

$$\eta^* = 2v_0(\delta+\beta)/(\overline{\Delta} - v_0) \tag{20}$$

and satisfies:

$$\partial\eta^{FE}/\partial\overline{\Delta} < 0; \partial\eta^{FE}/\partial v_0 > 0.$$

The lemma 1 states that an increase in the rate at which workers contact vacancies, μ, doesn't affect the wage or firm's profits. An increase in $\overline{\Delta}$ increases the expected return from a match, which stimulates the entry of vacancies and lowers η. An increase in the entry fee, v_0, makes entry less attractive which lowers the number of vacancies and consequently raises η.

4.2 The No-Arbitrage Condition(The NA locus)

The no-arbitrage migration condition is given by $J_U = A/\delta$, where $J_U = \mu\overline{W}/\delta+\beta+\mu$. Utilizing proposition 1, this equation can be written as:

$$\mu\overline{W}^*(\overline{\Delta}, A, v_0)/\delta+\beta+\mu = A/\delta \tag{21}$$

Equation (21) implicitly defines a function $\mu = \mu^{NA}(\overline{\Delta}, A, v_0)$, yielding the value of μ which is independent of η. The following lemma provides the properties of the no-arbitrage migration, μ^{NA}, as given by:

Lemma 2 (*The NA locus*). The function $\mu^* = \mu^{NA}(\overline{\Delta}, A, v_0)$ is an independent of η. The function is given by:

$$\mu^* = 2A(\delta+\beta)/\delta(\overline{\Delta}-v_0) \tag{22}$$

and satisfies:

$$\partial\mu^{NA}/\partial\overline{\Delta}<0;\ \partial\mu^{NA}/\partial A>0;\ \partial\mu^{NA}/\partial v_0>0.$$

An increase in the rate at which firms contact workers, η, doesn't affect either the wage or firm's profits. An increase in $\overline{\Delta}$ in turn increases the anticipated return from a match, which stimulates the entry of vacancy and lowers μ. An increase in the entry fee, v_0, makes entry less attractive which lowers the number of vacancies and consequently raises μ. An increase in A reduces the worker's value of search causing the matching rate to be increased.

4.3 Steady-State Matching(The SS locus)

The diminishing-returns-to-scale property of matching technology (assumption 2), $m = m_0U^aV^{1-a-\rho}$, in conjunction with (5) and the fact that $U/V = \rho/\mu$, yields $\eta^* = m_0\mu^{-a}U^{-b}$. The locus of points (μ, η) satisfying $\eta^* = m_0\mu^{-a}U^{-b}$ is referred to as the steady-state(SS) matching locus. Although both flow probabilities are endogenously determined in equilibrium, workers and firms treat the matching rate as parametric in formulating their optimal decisions. Thus, the properties of the **SS** locus follow directly from assumption 2 and are summarized in lemma 3:

Lemma 3 (*The SS locus*). Under assumption 2, the function $\eta = \eta^{SS}(\mu;\ m_0)$ satisfies the following properties:

(i) $\partial\eta^{SS}/\partial\mu < 0$,
(ii) $\partial\eta^{SS}/\partial m_0 > 0$,
(iii) $\lim_{\mu\to 0} \partial\eta^{SS}/\partial\mu = -\infty$,
(iv) $\lim_{\mu\to\infty} \partial\eta^{SS}/\partial\mu = 0$.

4.4 Steady State Unemployment

From the steady-state matching technology, we have the following equation:

$$\eta = 2v_0(\delta+\beta)/(\overline{\Delta}-v_0) = m_0\mu^{-a}U^{-b}$$
$$U^* = 2v_0(\delta+\beta)/(\overline{\Delta}-v_0)^{-1/b}\mu^{-a/b} \tag{23}$$

Equation (23) refers to the mass of unemployed workers in steady state. We know from the no-arbitrage condition that the contact rate, $\mu^* = 2A(\delta+\beta)/\delta(\Delta - v_0)$. Therefore, if we substitute this contact rate into the equation (23), then we have the following unemployment equation in the steady state.

$$U^* = 2v_0(\delta+\beta)/(\overline{\Delta}-v_0)^{-1/b}\mu^{*-a/b} \tag{24}$$

Evidently, it will be important to know some properties of equation (24) in equilibrium. They are summarized in the following lemma:

Proposition 2 (*The mass of unemployed workers in steady state*). The function $U^* = U^*(\overline{\Delta}, A, v_0)$ is an independent of η and μ, and is given by equation (24),

and satisfies:

$$\partial U/\partial\overline{\Delta} > 0;\ \partial U/\partial A < 0;\ \partial U/\partial v_0 < 0.$$

An increase in productivity differentials, i.e., urban advantages, increases the mass of unemployed workers in the urban labor sector. An increase in the entry fee, v_0, makes entry less attractive which lowers the number of vacancies and consequently decreasing the mass of unemployed workers. An increase in A increases the worker's value of search, which causes the mass of unemployed workers to be decreased.

4.5 Steady-State Labor Population

Once U^* and μ^* are determined in steady state, we can obtain E^{*C} and E^{*R} from the steady state equation of the population, $\beta(E^{*C}+U^*)=\mu^* U^*$ since the inflow of population equals to the outflow of the unemployed workers in the urban sector. From this steady state population equation,(18), we know that

$$E^{*C}=(\mu^*-\beta)/\beta * U^* \tag{25}$$

We already know the unemployment and the contact rate and thus can obtain the mass of urban employed population. Once we obtain the E^{*C}, then we can also obtain E^{*R} from the population equation (1). That is

$$E^{*R}=1-(E^{*C}+U^*) \tag{26}$$

V. COMPARATIVE PROPERTIES OF STEADY-STATE

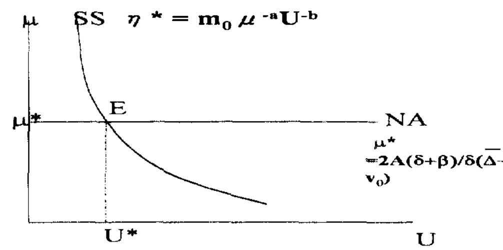
By exploiting the properties of the steady state contact rate and unemployment it is straightforward to prove the existence of a steady-state equilibrium and to characterize its properties:

Proposition 3 (Steady State Equilibrium). Under assumption 1-3, a unique steady-state equilibrium exists, which provides the following properties.

(i) Contact rate:
(a) $d\mu/d\overline{\Delta}<0$; $d\mu/dA<0$; $d\mu/dv_0>0$;
(b) $d\eta/d\overline{\Delta}<0$; $d\eta/dv_0<0$.
(ii) Steady state population of Unemployment and vacancy:
(a) $dU/d\overline{\Delta}>0$; $dU/dA<0$; $dU/dv_0<0$.

The economic intuition of this proposition is followed with more details based on the unique wage offer function, the contact rate, and the unemployment equation with the analysis of these equations proposition 1, lemma 1-4, and the assumption 1-3. With these proposition, we have a steady state equilibrium which is given by the combination of the no-arbitrage locus (NA) and the steady state matching locus(SS)

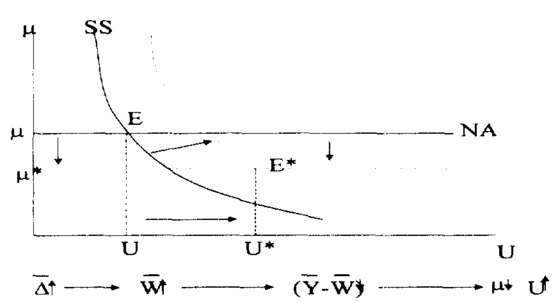
[Figure 1] Steady-State Equilibrium



Case 1: Change in productivity differentials:

When the productivity differentials, $\overline{\Delta}$, increase as shown in the Figure 2, then the NA curve shifts down and the SS curve shifts to the right direction, which means urban wage, $\overline{W}$, increases and thus firms profits, $\overline{Y}-\overline{W}$, are reduced. So, decreases in the firms economic net profit reduces the level of entry and contact rate, μ, which in turn leads to higher unemployment, U, in the urban labor market.

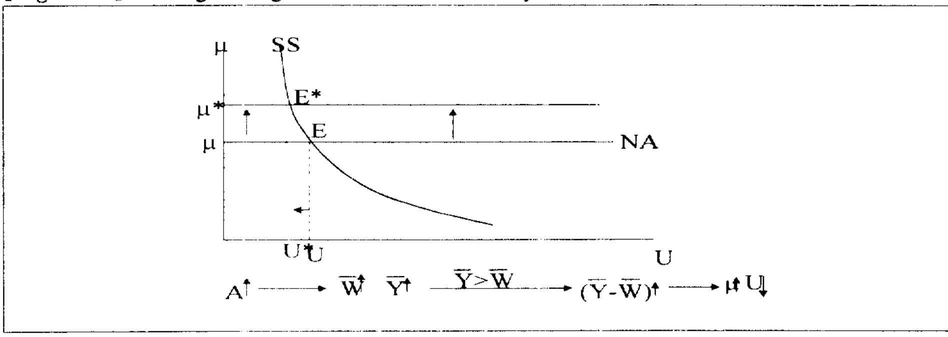
[Figure 2] Change in productivity differentials in steady-state



Case 2: Change in Gross income:

When the gross income, A, increases there are two separate effects: it increases the unique wage, $\overline{W}$, and firm's total output, $\overline{Y}$. As shown in the Figure 3 below, the NA curve shifts up, but the SS curve doesn't change. So, if the firms output level dominates the level of the expected income for workers, firms profit increases and thus the entry level and contact rate increase, which in turn leads to lower unemployment in the urban labor market.

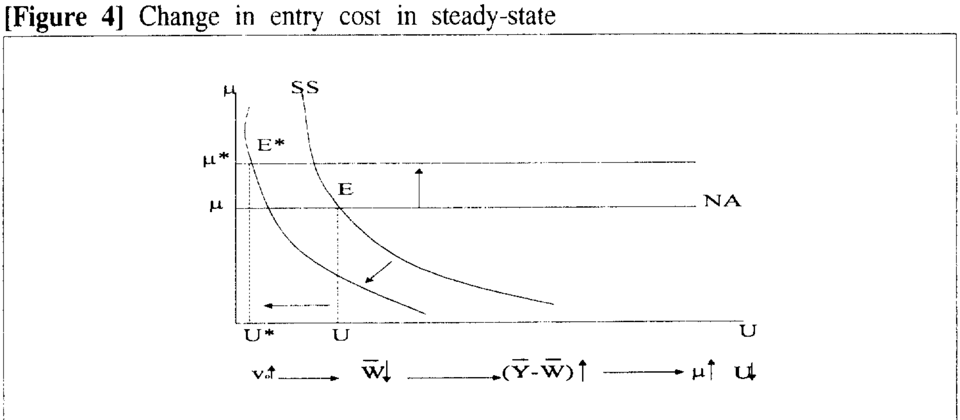
[Figure 3] Change in gross income in steady-state



Case 3: Change in entry costs:

When the firm's entry cost, v_0, increases, as shown in the Figure 4, the NA curve shifts up and the SS curve shifts to the left direction implying the unique wage offer, $\overline{W}$, decrease and firms total output, $\overline{Y}$, increase. So firms profit increases and thus the entry level and contact rate increase, which in turn leads to lower unemployment in the urban labor market.

[Figure 4] Change in entry cost in steady-state



Ⅵ. CONCLUSIONS

In this steady-state equilibrium, there is no migration flow between two sectors with the no-arbitrage migration assumption between either sector. Simply stated, there are no economic incentives for rural dwellers to migrate to cities based on the assumption that the expected discounted value of a worker who continues a job search in the urban sector equals the discounted value of lifetime income in the rural sector. This assumption leads to clarify the view of

Todaro(1969) that higher unemployment and underemployment in the urban sector is equated by expected income between the two.

The main implication of this paper indicates that in the absence of the urban rural migration, urban sector's unemployment is controled by productivity differentials between the two. That is, urban sector may have a higher unemployment rate as productivity differentials increase. Put it different way, when the productivity differentials, $\bar{\Delta}$, increase (or when the firms entry cost, v_0,falls) then urban wage, W, increases and thus firms profits, $\bar{Y}-\bar{W}$, are reduced. So, decreases in the firms economic profit reduces the level of entry and contact rate, μ, which in turn leads to higher unemployment, U, in the urban labor market. And, when the gross income, A, increases there are two separate effects: it increases the unique wage, W, and firms total output, Y. So if the firms output level dominates the level of the expected income for workers, firms profit increases and thus the entry level and contact rate increase, which in turn leads to lower unemployment in the urban labor market.

By extending this model into the transitional dynamics, we can analyze and determine the properties of the transitional dynamic pattern of wage, the matching rates, and the dynamic unemployment. Because the rapid urbanization of initial economic development with capital formation in the urban sector leads to a further increase in wage differences between the sectors.

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