IMMIGRANTS AND DISCRIMINATION IN THE CITIES

by

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REAL 02-T-16 December, 2002

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December 27, 2002

Abstract

The aim of this paper is to investigate the relationship between the spatial mismatch hypothesis and the migration decision. Under the assumption that immigrants are discriminated in both the housing and labor markets It is shown that the presence of segregation can lower the profitability of migration. Some preliminary empirical evidence corroboring the basic assumptions and results of the model is also presented. Finally this paper explains the positive relation between the segregation and the number of immigrants during the Great Black Migration by proving that the function of migration profitability is not globally monotonic and that it can be, under some restrictive conditions, an increasing function of the level of discrimination.

Keywords: Spatial Mismatch; Immigation; Urban Structure
JEL: J15, J24

*This paper was written while the author was a visitor at the Regional Economics Applications Laboratory at the University of Illinois at Urbana-Champaign. I would like to thank Chokri Dridi, Geoffrey Hewings, Julie Le Gallo, Maria Plotnikova and seminar partecipants at UIUC for helpful comments. However, any errors or shortcoming in the paper are my responsibility. *Correspondence to:* Marco Percoco, Istituto di Economia Politica, Università Bocconi, via Gobbi, 5, 20136 Milano, Italy. e-mail: marco.percoco@uni-bocconi.it.

1 Introduction

In recent years, a growing body of economic literature has focused on the spatial mismatch hypothesis first introduced by Kain (1968), who argued that the worst economic outcomes (in terms of labor market effects) for ethnic minorities are partially due to the spatial separation between their residences, often in the city centers, and the location of their jobs, often in the suburbs. Kain also argued that this situation is the result of the growing job decentralization in U.S. cities, combined with explicit or implicit constraints on the household choice of residence.

As pointed out in Winant (2002), in order to better understand the process of ghettoization we need to understand the historical reasons of this phenomenon and perhaps we need to trace the process back to the nation-building in Europe. In that period, the nations of imperial Europe only forged themselves into racially/ethnically homogeneous entities through prolonged processes combining both amalgamation and exclusion. In the contemporary age, the rise of ghettos is related to large immigration flows and in recent years a growing number of scholars has begun to find the economic causes and effects of this historical fact.

Since the study by Kain (1968) appeared on the *Quarterly Journal of Economics*, a number of papers have focused on the empirical issues concerning the test of the spatial mismatch hypothesis. After decades, this concept seems still to be a Muse for contemporary researchers.

But, despite the presence of a large number of empirical papers[1], it is only in recent years that the scholars have also focused on the theoretical issues. In particular, Brueckner and Martin (1997) provided the first model representation of the spatial mismatch (with a follow-up paper by Martin, 1997) by partially developing the theory of multicentric cities.

According to Zenou (2002), there are currently four main paradigms trying to explain the spatial mismatch in terms of:

1. distance and difficulty to reach jobs from blacks residences (Brueckner and Martin, 1997; Brueckner and Zenou, 2003);

2. incomplete information about job opportunities for blacks (Wasmer and Zenou, 2002);

[1]See Ihlanfeldt and Sjoquist (1998) and Kain (1992) for a complete review of the empirical literature.

3. weak intensity in job search for blacks due to long distance (Smith and Zenou, 2002);

4. blacks may have lower productivity and hence lower wages and worst housing (Zenou and Boccard, 2000; Zenou, 2002).

Cutler et al. (1999) provide empirical research on the historical pattern of racial segregation in a number of U.S. cities over the period 1890-1990. The most interesting result concerns the years 1940-1970, during which the ghettos expansion was combined with a large immigration flows. As the structure of the relation between these phenomena is not completely clear[2], several studies have been carried out in recent years to understand persistent migration of blacks or other minorities in the cities despite the housing segregation between the end of the XIX century and the first half of the XX century[3].

Despite the common belief, the presence of a (at least weak) positive relation between immigration and segregation seems to persist also in recent years. In 1997, the metropolitan areas with largest foreign-born population were Los Angeles (4.8 million) and New York (4.6 million). Together these metropolitan areas included 36% of the foreign-born population of 25.8 million.

Among the 10 largest metropolitan areas in 1997 (those with total populations of 4 million or more), Los Angeles had the highest proportion of foreign born at 31% (Table 1). For metropolitan areas with 1 million to 4 million population in 1997, Miami had the highest proportion foreign born at 39%.

[Insert Table 1 about here]

It is remarkable that this figure is strongly related to the share of black population in central cities and suburbs (under the assumptions that it is a first approximation of segregations), as pointed out in Table 2.

[Insert Table 2 about here]

[2]We would expect, in fact, that the presence of segregation should lower immigration flows.

[3]See Collins (1997), Collins and Margo (2000), Grossman (1989), Margo (1988) and (1990), Vigdor (2002).

To the best of our knowledge, the theme concerning the impact of the presence of spatial mismatch in the cities on the migration decision has not been theoretically investigated enough. At present time, several studies have been published to explain the Great Black Migration and a number of them have also focused on the relationship with the life cycle of ghettos[4].

The aim of this paper is to understand the relationship between the immigration decision and the racial segregation in the cities in the context of the spatial mismatch models.

The article is organized as follows. In Section 2 we present the basic set-up of the classical model of spatial discrimination, given that the city is open to immigration flows. We further analyze the migration decision in the presence of segregation in both the minimum wage and efficiency wage frameworks. The interesting case of asymmetric information is presented in Section 3. In Section 4 we present some preliminary empirical evidence and we try to explain the Great Black Migration in the context of the model. Finally, in Section 5 we summarize the principal results.

2 The Model

2.1 The Spatial Dimension of the Model

The theoretical background of this paper are the seminal studies by Brueckner and Martin (1997), Brueckner and Zenou (1999) and Brueckner and Zenou (2003).

Let us consider a linear city with unit width and two centers: Central Business District (CBD) and Suburban Business District (SBD).

Individuals[5] consume land, h, and a general good, c, so that the preferences are identical and expressed by a utility function $z(h, c)$. In the city there are natives occupying R units of land and I immigrants, occupying θI units of land, with $\theta < 1$ reflecting the lower immigrant incomes.

Each individual earns a wage $w_R > w_I > w_A$ by supplying one unit of labor.

For CBD commuters, bid-rent functions can be written as follows:

[4]See Collins and Margo (2000); Vigdor (1999, 2001).

[5]In what follows R, I, A subscripts denote urban residents (natives), immigrants and rural residents respectively.

$$r_{IC} = \frac{w_{IC} - tx - z_I}{\theta} \tag{1}$$

$$r_{RC} = w_{RC} - tx - z_R \tag{2}$$

where t is the commuting cost per unit of distance. Similarly, for SBD commuters, we have:

$$r_{Is} = \frac{w_{Is} - t(\overline{x} - x) - z_I}{\theta} \tag{3}$$

$$r_{Rs} = w_{Rs} - t(\overline{x} - x) - z_R \tag{4}$$

Following Brueckner and Martin (1997) and Brueckner and Zenou (2003), if immigrants are free to live everywhere in the city, the equilibrium is expressed as in Figure 1. It should be noted that in this case the agricultural rent (r_A) is an opportunity cost for urban rents and then it is an element capable to higher the level of prices of the other rents.

[Insert Figure 1 about here]

If immigrants are prevented from living in the interval $[\theta I, \overline{x}]$, so that there is housing discrimination in the suburbs, then the situation is described in Figure 2. To better understand the pattern of the bid-rent curves we need to first notice that:

a) natives face no competition for suburban land;

b) immigrants must outbid natives for land in the central part of the city.

c) in the city center, immigrants bids are higher than those of native commuters;

d) housing market imperfection leads to a discontinuity point in the figure, implying a discrepancy in the commuting choice between natives and immigrants.

[Insert Figure 2 about here]

The point of discontinuity $\widetilde{x}$ is given as the solution of the equation:

$$\frac{w_{Is} - t(\overline{x} - \widetilde{x}) - z_I}{\theta} = \frac{w_{Ic} - tx - z_I}{\theta}$$

which yields:

$$\widetilde{x} = \frac{\overline{x}}{2} + \frac{\Delta w}{2t} \tag{5}$$

where $\Delta w = w_{Ic} - w_{Is}$. It should be noticed that the expression in (5) is strictly dependent on the immigrant income differential between the centers.

2.2 The Minimum Wage Framework

Let us assume that the urban economy has two types of jobs, one requiring high skills and the other low skills. Following the results of Pastor and Mercelli (2001), we assume that immigrants are low skilled while all natives are high skilled. Furthermore we assume the presence of a minimum wage ($w_{\min}$) to be applied to low-skilled workers at both the CBD and SBD. We also assume that the native wage is higher than the minimum wage at both the CBD and SBD.

To analyze the equilibrium resulting from the minimum wage framework we need a set of assumption as following ones (Brueckner and Zenou, 2003).

A1: Employed workers lose their jobs with a constant exogenous probability, v, denoted as the *job separation rate*. We also assume a *job acquisition rate* denoted as a_s for the SBD and a_c for the CBD.

A2: We assume that workers find job only in the districts where they previously worked.

The last condition, in particular, reflects the idea that laid-off workers do not simultaneously search for job at both the CBD and SBD. This is motivated by the empirical evidence (Holtzer, 1987 and 1988; Borjas, 1995) that shows that the source of information about jobs for low-skilled workers is strongly related to their own social networks or word-of-mouth contact[6].

[6] In the context of spatial mismatch literature, Pastor and Mercelli (2001) find the same job-searching way for new immigrants, implicitly arguing for the existence of economies of agglomeration.

Given the assumptions A1-A2, we can treat the CBD and SBD labor markets for immigrants as effectively separate. But for the following analysis we need a further assumption:

A3: The utility of CBD immigrant workers equals the utility of the SBD immigrant workers so that there is no incentive to switch between the markets.

Within each labor market equilibrium, layoffs must equal job acquisitions. Letting I_c denote the size of the immigrant labor pool attached to the CBD and u_c denoted the unemployment rate among these workers, this requirement can be rewritten as:

$$v(1-u_c)I_c = a_c u_c I_c$$

Solving for a_c:

$$a_c = \frac{v(1-u_c)}{u_c}$$

Rearranging the previous equation, the CBD unemployment rate can be written as:

$$u_c = \frac{v}{(v+a_c)}$$

To solve the problem for the unemployment rate at the CBD and SBD one further assumption is needed:

A4: Immigrant workers engage in income smoothing as they cycle in and out of unemployment. In this case, the worker's average income over time is $\frac{a_c w_{\min}}{v+a_c}$, which reduces to $(1-u_c)w_{\min}$ using the above conditions.

Given the set of assumptions A1-A4, we can compare unemployment rates at the CBD and SBD. Let us assume that $F(L)$ is the immigrant portion of the separable production function, which is common to both employment centers, where L denotes the labor input. We assume the standard regularity conditions that $\frac{\partial F}{\partial L} > 0$ and $\frac{\partial F^2}{\partial^2 L} < 0$, so that the following relation must hold:

$$F'(\overline{L}) = w_{\min} \tag{6}$$

Given the set of assumptions A1-A5 and the properties of the production function, the equilibrium follows from the relations:

$$I_c = \frac{\widetilde{x}}{\theta} \tag{7}$$

$$I_s = I - \frac{\widetilde{x}}{\theta} \tag{8}$$

$$(1 - u_c)I_c = \overline{L} \tag{9}$$

$$(1 - u_s)I_s = \overline{L} \tag{10}$$

$$\widetilde{x} = \frac{\overline{x}}{2} + \frac{(u_s - u_c)\, w_{\min}}{2t} \tag{11}$$

Following Brueckner and Zenou (2003) and assuming that there is no unemployment in the countryside ($u_A = 0$), it can be proved that:

$$u_c > u_s > u_A \tag{12}$$

$$u_c > \widehat{u} > u_s > u_A \tag{13}$$

where $\widehat{u}$ is the common unemployment rate for immigrants.

2.3 The Condition to Migrate

After analyzing the labor market mechanism we turn to the central problem of the migration decision in the presence of housing segregation.

Migration condition requires that the expected utility of an urban resident equals the utility of a rural resident:

$$\frac{(1 - u_s)I_s}{I_s + I_c} z_s + \frac{(1 - u_c)I_c}{I_s + I_c} z_c = z_A \tag{14}$$

The left-hand side of the previous equation, which is the expected utility of an urban resident[7], is modified to incorporate the unemployment as a

[7]It should be noted that we are concerned with the presence of discrimination, then the probability to gain a native income is null.

decision variable. With the size of native population fixed, as explained above, the migration condition in Eq. (14) determines the equilibrium size of the immigrant population $I_c + I_s$. To see this, recall that Eqs. (7)-(11) determine both utilities as functions of the other variables, yielding:

$$z_c = f(I_c, I_s, w_c, w_s, t, r_A)$$

$$z_s = f(I_c, I_s, w_c, w_s, t, r_A)$$

It should be noted that this formulation implicitly treats the rural variable r_A and z_A as fixed and thus is independent of the division of population between the city and the countryside.

For the following analysis we need the Hartwick et al. (1976) conditions:

$$\frac{\partial z_s}{\partial I_s} < 0; \frac{\partial z_s}{\partial I_c} < 0; \frac{\partial z_c}{\partial I_s} < 0; \frac{\partial z_c}{\partial I_c} < 0 \tag{15}$$

$$\frac{\partial z_s}{\partial w_s} > 0; \frac{\partial z_c}{\partial w_s} < 0 \tag{16}$$

$$\frac{\partial z_s}{\partial w_c} > 0; \frac{\partial z_c}{\partial w_c} > 0 \tag{17}$$

As pointed out in Brueckner and Zenou (1999), the first group of conditions in (15) shows that the utility of both central and suburban immigrants[8] falls when the size of either group increases. So, using the conditions (15)-(17), we can use comparative statics.

As a first step, it is convenient to rewrite Eq. (14) as:

$$V = I_c \left[(1 - u_c)\, z_c - z_A\right] + I_s \left[(1 - u_s)\, z_s - z_A\right] = 0 \tag{18}$$

We first examine the relationship between the migration condition and the size of immigrant population at both the CBD and SBD. In this case, our first result is:

$$\frac{\partial V}{\partial I_s} = \left[(1 - u_s)\, z_s - z_A\right] + \frac{\partial z_s}{\partial I_s}(1 - u_s) I_s + \frac{\partial z_c}{\partial I_s}(1 - u_c) I_c \tag{19}$$

[8] In what follows we use the terms "central/suburban immigrant" or "CBD/SBD immigrant" to indicate immigrant working at the CBD or SBD.

which is indeterminate because $(1-u_c)\, z_c - z_A > 0$ and the rest of the expression is negative. We now turn to assess the impact of a change in the size of immigrant population in the central district:

$$\frac{\partial V}{\partial I_c} = [(1-u_c)\, z_c - z_A] + \frac{\partial z_c}{\partial I_c}(1-u_c)I_c + \frac{\partial z_s}{\partial I_c}(1-u_s)I_s < 0 \tag{20}$$

the previous derivative is negative because the results in (15). By considering the cross effect of populations, we have:

$$\frac{\partial I_c}{\partial I_s} = -\frac{V_{I_s}}{V_{I_c}} \tag{21}$$

which is indeterminate because $\frac{\partial V}{\partial I_s}$ is indeterminate. This means that an increase in the size of the immigrants in the SBD does not imply an increase in the CBD population. It should also be noted that this result is consistent with the assumption A3.

Let us consider the effect of a change in wages. The following results hold:

$$\frac{\partial V}{\partial w_c} = I_c(1-u_c)\frac{\partial z_c}{\partial w_c} + I_s(1-u_s)\frac{\partial z_s}{\partial w_c} > 0 \tag{22}$$

$$\frac{\partial V}{\partial w_s} = I_c(1-u_c)\frac{\partial z_c}{\partial w_s} + I_s(1-u_s)\frac{\partial z_s}{\partial w_s} \tag{23}$$

The sign of (20) is ambiguous because $\frac{\partial z_c}{\partial w_s} < 0$ and $\frac{\partial z_s}{\partial w_s} > 0$. This in turn implies that an increase in the suburban wage raises the utility of SBD workers but lowers the utility of CBD immigrants, as explained in Hartwick et al. (1976).

We have also the fallowing results:

$$\frac{\partial I_c}{\partial w_c} = -\frac{V_{w_c}}{V_{I_c}} > 0 \tag{24}$$

$$\frac{\partial I_c}{\partial w_s} = \text{ ambiguous} \tag{25}$$

The previous expressions mean that an increase in the CBD wage raises the immigrant population of the district, while an increase in the suburban wage has an ambiguous sign because of the conditions (15)-(17). Besides, we find that an increase in the level of the rural utility lower both the expected utility of migration and the city size (in terms of CBD population):

$$\frac{\partial V}{\partial z_A} = -I_c - I_s < 0 \tag{26}$$

$$\frac{\partial I_c}{\partial z_A} = \frac{1}{V_{I_c}}(I_s + I_c) < 0 \tag{27}$$

Let us turn to the effect of the spatial mismatch on the expression (18), the profitability to migrate. The following Proposition can be proved.

Proposition 1 *The absence of housing segregation in the city maximizes the expected utility of migration.*

Proof. Let $I_c = \frac{I}{2} + \lambda$; $I_s = \frac{I}{2} - \lambda$; $u_c, u_s = f(\lambda)$. The condition in (18) becomes:

$$V = \left(\frac{I}{2} + \lambda\right)\left[\left(1 - u_c\left(\lambda\right) z_c\right) - z_A\right] + \left(\frac{I}{2} - \lambda\right)\left[\left(1 - u_s\left(\lambda\right) z_s\right) - z_A\right] \tag{28}$$

by differentiating with respect to λ :

$$\frac{\partial V}{\partial \lambda} = \left[\left(1 - u_c\right) z_c - (1 - u_s) z_s\right] - \frac{I}{2}\left[\frac{\partial u_c}{\partial \lambda} z_c + \frac{\partial u_s}{\partial \lambda} z_s\right] + \lambda\left(\frac{\partial u_s}{\partial \lambda} z_s - \frac{\partial u_c}{\partial \lambda} z_c\right) \tag{29}$$

if $\lambda = 0$, then the previous equation equals zero and $\lambda = 0$ could be a maximum point if the second derivative is negative:

$$\left.\frac{\partial V'}{\partial \lambda}\right|_{\lambda=0} = 2\left(\frac{\partial u_s}{\partial \lambda} z_s - \frac{\partial u_c}{\partial \lambda} z_c\right) - \frac{I}{2}\left[\frac{\partial u_c'}{\partial \lambda} z_c + \frac{\partial u_s'}{\partial \lambda} z_s\right] < 0$$

■

Proposition 1 implies: 1) that $\lambda = 0$ is a maximum point for V and 2) that moving from $\lambda = 0$ to $\lambda > 0$ corresponds to a movement from the unrestricted equilibrium in Figure 1 to the restricted equilibrium in Figure 2. This pattern can globally lower the expected utility of migration, even if in what follows we will demonstrate that V is not monotonic and then the sign of $\frac{\partial V}{\partial \lambda}$ is not obvious.

2.4 On the Efficiency Wage Framework

To make the model more realistic, we can analyze the previous conditions in an efficiency wage framework, as developed in Shapiro and Stiglitz (1984). In this context, workers can choose between an effort level on the job, $e > 0$, or just shirk, so that $e = 0$. The firms monitor workers and with an exogenous probability q they catch the shirkers.

Applying the formula (8) in Shapiro and Stiglitz (1984), we obtain the following expressions in the context of housing discrimination model:

$$w_c = e + \frac{ev}{qu_c} \tag{30}$$

$$w_s = e + \frac{ev}{qu_s} \tag{31}$$

Substituting the previous relations in condition (6), we have:

$$F'\left[(1-u_c)\,I_c\right] = e + \frac{ev}{qu_c} \tag{32}$$

$$F'\left[(1-u_s)\,I_s\right] = e + \frac{ev}{qu_s} \tag{33}$$

At this point, to assess the impact of endogenous wages on the migration profitability, we have to modify the condition (18), by recalling that:

$$y_c = tx + z_c + \theta r_c$$

$$y_s = t(\overline{x} - x) + z_s + \theta r_s$$

and then, by rewriting these formulas for the level of the utilities and by substituting (30) and (31), we have:

$$z_c = \frac{ev(1-u_c)}{qu_c} - tx - \theta r_c \tag{34}$$

$$z_s = \frac{ev(1-u_s)}{qu_s} - t(\overline{x} - x) - \theta r_s \tag{35}$$

In the case of efficiency wage, the migration condition (18) is then:

$$
\begin{aligned}
V &= \left[(1-u_c)\left(\frac{ev(1-u_c)}{qu_c} - tx - \theta r_c\right) - z_A\right] I_c + \\
&\quad + \left[(1-u_s)\left(\frac{ev(1-u_s)}{qu_s} - t(\overline{x}-x) - \theta r_s\right) - z_A\right] I_s
\end{aligned} \tag{36}
$$

It is interesting to notice that $\frac{\partial V}{\partial e} > 0$: as e increases, the income increases because the salaries are a function of the worker's effort. The same rational applies to the result $\frac{\partial V}{\partial v} > 0$. It should also be noted that the trivial condition $\frac{\partial V}{\partial q} < 0$ holds because the probability to be caught lowers the expected level of the income.

Regarding the impact of an efficiency wage on the migration condition, the equilibrium is given by the set of equations (11), (32), (33) and (36). In addition, an analogous result to Proposition 1 can be proved:

Proposition 2 *In the efficiency wage framework too the presence of spatial mismatch can lower the profitability condition for migration.*

Proof. See the Appendix ■

The economic meaning of the Propositions presented in this section is straightforward. The presence of spatial discrimination implies a market failure determining a sub-optimal equilibrium solution.

If immigrants decide whether to migrate or not on the basis of the expected income, then the presence of discrimination lowers the mobility expected profitability by increasing the unemployment rates.

3 The Case for Asymmetric Information

As argued in Katz and Stark (1987), the choice to migrate is often affected by asymmetric information. According to the general aim of the present paper, we can consider the more realistic case for an incomplete information set for potential migrants, i.e. they do not perfectly know the labor and housing markets conditions in the segregated city. In particular, we can think that migrating workers have a distorted information such as they consider, in making their choice, the global average utility, defined as:

$$
\overline{z} = \frac{z_R R + z_s I_s + z_c I_c}{R + I_s + I_c} \tag{37}
$$

and the average unemployment rate $\overline{u} = \frac{u_c+u_s}{2}$. In this case, the condition to migrate in Eq. (14) becomes:

$$(1-\overline{u})\overline{z} = z_A \tag{38}$$

or

$$\overline{V} = (1-\overline{u})\overline{z} - z_A \tag{39}$$

A direct implication of this change in the assumptions of the model is the following Proposition:

Proposition 3 *Under the assumption of spatial segregation, if*

$$\overline{z} > z_s > z_c \tag{40}$$

and

$$u_s \geq \frac{u_c\overline{z}}{2z_s - \overline{z}} \tag{41}$$

then the number of immigrants in the case of asymmetric information is higher than in the case of symmetric information.

Proof. See the Appendix ■

Proposition 3 implies that if there is imperfect information among the migrating workers in the rural area about the housing segregation practices in the city, then they would expect a salary higher then the real one. By increasing the expected utility of migration, this expectation will directly increase the number of immigrants in the city. It could be interesting to note that in this case the immigrants' choice is not affected by the underlying uncertainty of the derivatives in Eqs. (22) and (23). An interesting corollary of Proposition 3 will result by modifying the conditions (40) and (41). In particular, let us assume, as in Section 2, that the skilled immigrants will get a job in the suburb (so that I_s is the number of skilled immigrants) and the unskilled ones will work in the central city (the size of unskilled population is, then, I_c). The following result can be proven.

Proposition 4 *If the conditions (40) and (41) do not hold, then the number of skilled migrants will be higher under symmetric information.*

Proof. By assumption we have $(1-\overline{u})\overline{z} \geq z_A$, but by removing the conditions of Proposition 3, we also have $(1-u_s)u_s \geq (1-\overline{u})\overline{z}$, so that if I_s migrate under asymmetric information, they will do so also in the case for perfect information. ■

The previous simple result formalizes the fact that, in the case of spatial segregation, if the expected utility from migration is lower than the effective salary earned in the suburbs (this case can raise if there is a deep difference between u_s and u_c, i.e. $u_s < \frac{u_c\overline{z}}{2z_s-\overline{z}}$), then skilled immigrants will find profitable to migrate because of the low expectations.

Often, potential immigrants may invest in order to buy information about the quality of life and the market conditions in the city they are moving to. Let us assume that the cost of information is C. In addition, as we are not considering the dynamic case, for a worker who invests z_i $(i = s, c)$ is important rather than $\overline{z}$. Using this set of assumptions, we can prove the following Proposition.

Proposition 5 *If potential immigrants can buy information at a fixed cost C and if migrating workers I_c invest, then also I_s will do it.*

Proof. See Appendix. ■

There are at least three implications for this Proposition. First, given a constant price for information, the most skilled immigrants are the most likely to invest. Second, if I_s workers do not find beneficial to buy information (because the cost is higher than the expected utility, then also the unskilled ones will not invest. Third, as seen in Sections 2, the presence of spatial segregation in the city can increase the unemployment rate and then the expected utility for migrants. In this case the presence of housing segregation can provide a disincentive to buy information.

In the context of asymmetric information, it is interesting to consider the case for the discovery. Therefore, let us suppose that immigrants, after moving to the city, discover the cruel reality and chose whether or not to remain.

Proposition 6 *If the conditions (40) and (41) do not hold and the immigrants have the possibility to come back to the rural area, then I_s remain in the city.*

Proof. If $(1-\overline{u})\overline{z} \geq z_A$ and $(1-u_s)u_s \geq (1-\overline{u})\overline{z}$, then I_s find good economic conditions and stay. Instead, as $(1-u_c)u_c \leq (1-\overline{u})\overline{z}$, then I_c will remain in the city until the size of unskilled population will higher u_c until the point $(1-u_c)z_c = z_A$. ■

Notice that spatial segregation, by increasing the unemployment rate also provides an incentive to come back to the rural area. In addition, if the conditions (40) and (41) hold, then the condition to migrate and remain in the city (39) becomes (18).

4 Some Preliminary Empirical Results

In this section we will provide some simple empirical evidence of the model developed in Section 2.

The first step in the test of spatial mismatch hypothesis is to find a right measure of segregation. To this extent we will use the framework (and the data) by Cutler et al. (1999). In their article, they expand the approach first proposed by White (1983) and construct, in particular, two indexes: the dissimilarity index and the isolation index.

The *index of dissimilarity* (DISM in the following econometric evidence) is defined as:

$$\text{Index of dissimilarity} = \frac{1}{2}\sum_{i=1}^{N}\left|\frac{\text{black}_i}{\text{black}_{total}} - \frac{\text{nonblack}_i}{\text{nonblack}_{total}}\right|$$

where i.e. black_i is the number of black people in area i. This index ranges from zero to one and, according to Cutler et al. (1999), it measures the unbalanced distribution of races in the city.

The *index of isolation* (ISOL) is:

$$\text{Index of isolation} = \frac{\sum_{i=1}^{N}\left(\frac{\text{black}_i}{\text{black}_{total}} \cdot \frac{\text{black}_i}{\text{persons}_i}\right) - \left(\frac{\text{black}_{total}}{\text{persons}_{total}}\right)}{\min\left(\frac{\text{black}_{total}}{\text{persons}_i}, 1\right) - \left(\frac{\text{black}_{total}}{\text{persons}_{total}}\right)}$$

The previous index is meant to measure the socio-spatial distance between the races in the city.

The quantitative measures of spatial inequality presented above will be considered as a proxy for the discrimination that immigrants of different races face.

According to the results of the model, both the index of dissimilarity and the index of isolation are variables that are meant to affect the decision of migration. To preliminary test this hypothesis, we use a part of the dataset kindly provided by Cutler, Glaeser and Vigdor[9] for a cross section of about 350 American cities over the period 1890-1990 with ten observations over the time.

As a proxy for immigration we use the foreign-born population and we will consider this variable as the dependent one.

In Table 3 the first OLS estimates are presented. As the variable are not expressed in logs, the differences in the estimated parameters are quite large. At this point in the discussion, two issues deserve attention. Firstly, the variable BLACK (the number of blacks in the city) has a positive impact on the number of immigrants. Even if this variable were endogenous, we can argue that black people locate in the same place as immigrants, so that they contribute to the creation of economies of agglomeration. Secondly, the population density (POP/AREA) appears to be a deterrent of the migration decision, corroborating the result in Equation (20). It implies that for the duration of the data-set the expression in (19) is negative.

[Insert Table 3 about here]

In Table 4 the OLS estimates have been run using variable expressed in logs. As shown in the table, both Model 1 and Model 2 present a negative relation between the level of segregation and the number of immigrants. Finally, in Model 3 we find little evidence of the interaction between the two indexes of segregation.

[Insert Table 4 about here]

4.1 Explaining the Great Black Migration

In 1863 the slavery was abolished and between 1910 and 1970, 6.5 million of black Americans moved from the South to the North; 5 million of them moved after 1940, during the mechanization of cotton farming. According to Cutler et al. (1999), during that period U.S. cities have experienced the rise of ghettos combined with an increasing number of immigrants from rural

[9]As of October 2002, the data can be downloaded from the web site http://www-pps.aas.duke.edu/~jvigdor/segregation

and overseas areas. This positive association seems at a first look to do not confirm the results of the model presented in Section 2 and in particular the Proposition 1 and 2. But the following proposition can be demonstrated.

Proposition 7 *If* $\left|\frac{\partial u_s}{\partial \lambda}\right| > \frac{\partial u_c}{\partial \lambda}$, *then* $\frac{\partial V}{\partial \lambda} > 0$.

Proof. See the Appendix ■

Proposition 7 is particularly interesting because it shows that the migration condition is not monotonic and that it could be a locally increasing function of the spatial mismatch. As Cutler et al. (1999) argued, the presence of ghettos in the cities also has some positive effect on the urban economy through low-wage labor. In particular, the condition $\left|\frac{\partial u_s}{\partial \lambda}\right| > \frac{\partial u_c}{\partial \lambda}$ implies that if the effect of housing segregation on the central city (in term of induced unemployment) is less than the impact on the suburban center, then spatial mismatch could be optimal for immigrants as well.

The result in Proposition 7, under some restrictive conditions, also means that the economies of agglomeration can produce positive externalities among people of the same social origin increasing the neighborhood effect as argued by Borjas (1995).

5 Concluding Remarks

In this paper we have focused on the impact of the presence of spatial mismatch in the cities on the decision to migrate by assuming the existence of discrimination against immigrants.

We have shown that housing and labor market discrimination can lower the expected utility of mobility from rural areas to the city both in the exogenous and endogenous wage framework. By considering the imperfect information case, we have also shown that the spatial segregation will result in a selection of the immigrants. We have also found some preliminary empirical evidence supporting these results by analyzing data for 350 American cities over a century. By using the basic findings of the model, an economic theoretic explanation of the Great Black Migration has been proposed. In particular, it can be proved that the function of expected utility of migration is not monotonic, so that it could be a locally increasing function of the level of segregation.

Future research could focus on the impact of housing policies and growth of city size (urban sprawl) on the level of spatial mismatch and then on the immigration. In addition, this model could be used to analyze the level of integration of immigrants in European cities in order to provide suggestions for public policies.

Appendix

Proof of Proposition 2. Following the same procedure of Proposition 1, we have

$$\begin{aligned} V &= \left[(1-u_c(\lambda))\left(\frac{ev(1-u_c(\lambda))}{qu_c(\lambda)} - tx - \theta r_c\right) - z_A\right]\left(\frac{I}{2}+\lambda\right) + \\ &+ \left[(1-u_s(\lambda))\left(\frac{ev(1-u_s)}{qu_s(\lambda)} - t(\overline{x}-x) - \theta r_s\right) - z_A\right]\left(\frac{I}{2}-\lambda\right) \end{aligned}$$

and maximizing the previous expression with respect to λ, we have:

$$\begin{aligned} \frac{\partial V}{\partial \lambda} &= \left[\frac{ev(1-u_c)^2}{qu_c} - (1-u_c)(tx+\theta r_c) - z_A\right] + \\ &+ \left(\frac{I}{2}+\lambda\right)\left[\frac{2ev(1-u_c)\frac{\partial u_c}{\partial \lambda} - q\frac{\partial u_c}{\partial \lambda}}{(qu_c)^2} + \frac{\partial u_c}{\partial \lambda}\right] + \\ &- \left[\frac{ev(1-u_s)^2}{qu_s} - (1-u_s)(t(\overline{x}-x)+\theta r_s) - z_A\right] + \\ &+ \left(\frac{I}{2}-\lambda\right)\left[\frac{2ev(1-u_s)\frac{\partial u_s}{\partial \lambda} - q\frac{\partial u_s}{\partial \lambda}}{(qu_s)^2} + \frac{\partial u_s}{\partial \lambda}\right] \end{aligned} \tag{A1}$$

It is easy to see that the structure of this derivative is the same of the derivative of Equation (28), so that it can be proved that if $\lambda = 0$ then $\frac{\partial V}{\partial \lambda} = 0$ and also that $\left.\frac{\partial V^2}{\partial^2 \lambda}\right|_{\lambda=0} > 0$. ■

Proof of Proposition 3. A sufficient condition that the number of immigrants under asymmetric information is higher than under perfect information is

$$(1-\overline{u})\overline{z} \geq (1-u_s)z_s > (1-u_c)z_c$$

or

$$u_s z_s \geq \overline{uz}$$

By assuming that $\overline{z} > z_s > z_c$ and by solving for $\overline{u}$, we have

$$u_s z_s \geq \frac{u_s + u_s}{2}\overline{u}$$

and then

$$u_s \geq \frac{u_c \overline{z}}{2z_s - \overline{z}}$$

■

Proof of Proposition 5. If I_c workers find beneficial to invest, then the following condition must holds:

$$(1 - u_c)z_c - C \geq z_A$$

or $C \leq (1-u_c)z_c - z_A$. But, as $(1-u_s)z_s > (1-u_c)z_c$, then we also have:

$$(1 - u_s)z_s - C \geq z_A$$

so that also I_s workers invest in signal device. ■

Proof of Proposition 7. Let us consider the derivative $\frac{\partial V}{\partial \lambda}$ in the context of minimum wage:

$$\frac{\partial V}{\partial \lambda} = [(1 - u_c)\, z_c - (1 - u_s) z_s] - \frac{I}{2}\left[\frac{\partial u_c}{\partial \lambda} z_c + \frac{\partial u_s}{\partial \lambda} z_s\right] + \lambda \left(\frac{\partial u_s}{\partial \lambda} z_s - \frac{\partial u_c}{\partial \lambda} z_c\right) \tag{A2}$$

We see that $[(1 - u_c)\, z_c - (1 - u_s) z_s] > 0$ because $z_c = z_s$ and $u_c > u_s$. By the assumption that $\left|\frac{\partial u_s}{\partial \lambda}\right| > \frac{\partial u_c}{\partial \lambda}$ we also have that $\frac{\partial u_c}{\partial \lambda} z_c + \frac{\partial u_s}{\partial \lambda} z_s < 0$ and that $\frac{\partial u_s}{\partial \lambda} z_s - \frac{\partial u_c}{\partial \lambda} z_c > 0$. ■

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Table 1: Black Population Shares in Central Cities and Suburbs (1990; %)

	Blacks in Central City	Blacks in Suburbs
New York	29	12
Los Angeles	14	9
Chicago	39	7
Washington	66	19
Philadelphia	40	9
Boston	26	2
Detroit	76	5
Dallas	30	7

Source: Brueckner and Zenou (2003) from The State of the Nation's Cities

Table 2: Foreign Born Population (1997; %

	Foreign Born
New York	22.8
Los Angeles	30.5
Chicago	13.0
Washington	11.0
Philadelphia	6.2
Boston	8.1
Detroit	6.7
Dallas	9.6

Source: Profile of the Foreign-Born Population in the United States: 1997

Table 3: Explaining The Migration Choice (Dep. Var.: Foreign Born Population)

	Model			
Variable	1	2	3	4
Black	0.563	0.661	0.67	0.592
	(20.57)	*(26.04)*	*(23.93)*	*(21.18)*
Dism	0.0002		0.0007	0.0007
	(15.65)		*(27.102)*	*(23.38)*
Isol		-0.001	-0.012	-0.004
		(-6.55)	*(-29.37)*	*(-9.39)*
Pop/Area	-5.97	-9.50	-10.48	-4.649
	(-3.29)	*(-8.05)*	*(-7.99)*	*(-2.47)*
Isol*Dism				-1.33E-10
				(-15.35)
R^2	0.49	0.52	0.71	(-15.35)
N. Obs.	512	512	512	512

Table 4: Explainig The Migration Choice (Dep. Var.: Foreign Born Population/Pop.)

	Model		
Variable	1	2	3
Black/Pop	-0.431	-0.521	-0.511
	(-36.84)	(-44.26)	(-40.66)
Dism		-0.22	-0.13
		(-65.94)	(-5.4)
Isol	-0.263		
	(-79.37)		
Pop/Area	0.03	0.044	0.07
	(7.97)	(3.86)	(8.37)
Isol*Dism			-0.054
			(-4.02)
R^2	0.99	0.97	0.97
N. Obs.	326	326	326

Note: All variables are expressed in logs

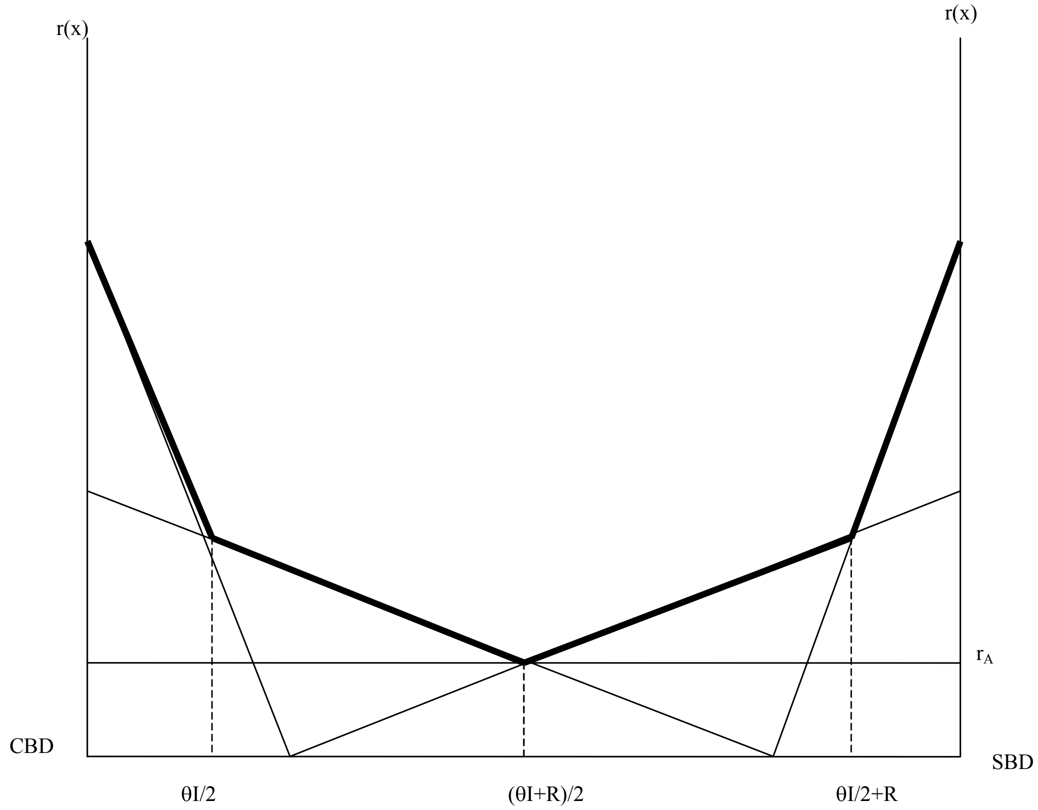

Figure 1: The unrestricted equilibrium

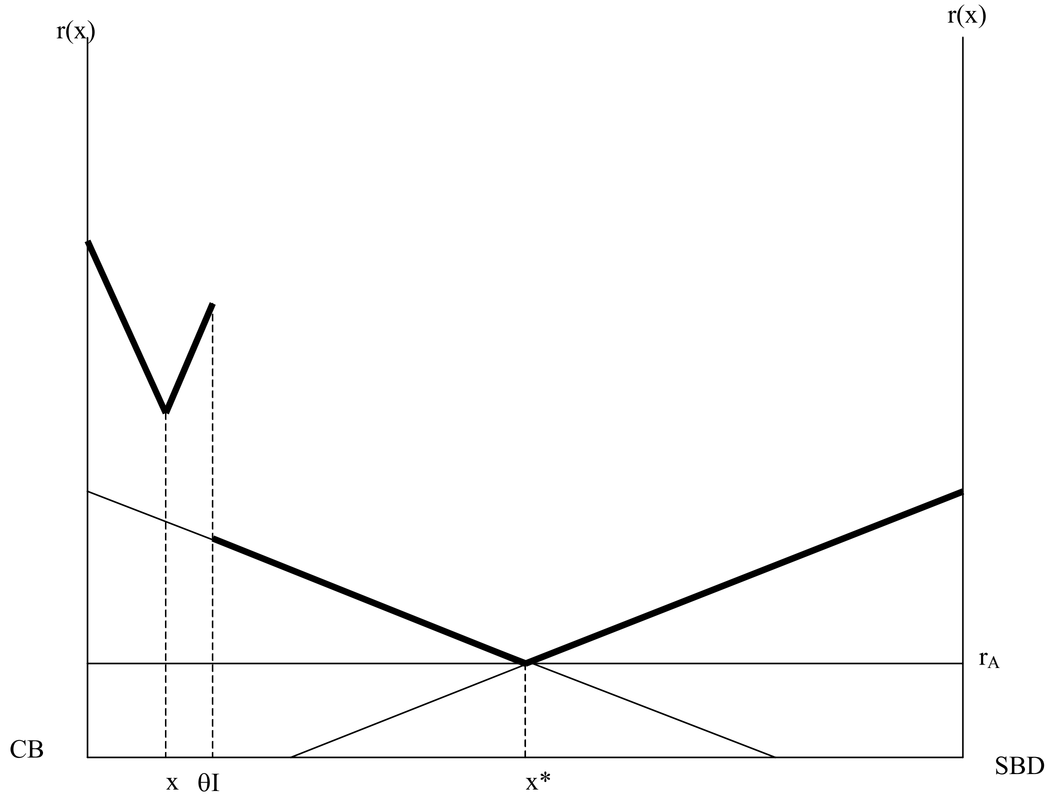

Figure 2: The equilibrium in the case of housing discrimination