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IMMIGRANTS, MINORITIES, AND LABOR MARKET COMPETITION

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ABSTRACT

This paper analyzes the extent of labor market competition among immigrants, minorities and the native population. The study reveals that immigrants tend to be substitutes with some labor market groups, and complements with others. However, all these effects of shifts in immigrant supply on the earnings of native-born men are numerically very small, so that even if immigrants are substitutes with some native-born groups their numerical impact on the native-born wage is trivial. In addition, increases in the supply of immigrants do have a sizable impact on the earnings of immigrants themselves. Increases of 10 percent in the supply of immigrants reduce the immigrant wage by about 10 percent. Thus the main competitors of immigrants in the labor market are other immigrants.

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Immigrants, Minorities, and Labor Market Competition

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1. Introduction

The literature on the economics of immigration has, in the past decade, been dominated by analyses of two questions: How do immigrants do in the U.S. labor market and what do immigrants do to the U.S. labor market? Beginning with the work of Chiswick (1978), most of the empirical studies have focused on the first of these issues (see also Borjas, 1985). The literature on the second question of what immigrants do to the labor market is much less developed. Little is still known about the labor market adjustments caused by the large influx of immigrants in the last twenty years. Some studies in this literature (e.g., Johnson, 1980) develop theoretical models of the labor market interaction between the native- and the foreign-born populations. In effect, these models build in the basic assumption that the two groups are substitutes in production, even though the type of technological relationship between the two groups is _entirely_ an empirical question.

The empirical determination of the extent of substitutability or complementarity between any two labor inputs is, of course, based on neoclassical input demand theory. The main methodological tool of such studies is the estimation of the production technology in which various race, gender, and other (demographically defined) labor inputs, as well as capital, enter as inputs in the producton process (see Borjas, 1983; Grant and Hamermesh, 1981; and the survey by Hamermesh, 1986). The parameters of the production technology provide important information about the technological relationships among the various inputs, and are used to infer the extent of substitutability or complementarity between any two inputs. The application of this framework to the relationship between native- and foreign-born workers has been conducted by Borjas (1986a, 1986b) and Grossman (1982). These studies, despite major differences in methodological approach and in the data sets analyzed, conclude that immigrants have a very small numerical impact on the earnings of the native-born population.[1] However, these studies aggregate rather different groups of individuals (e.g., Mexicans, Vietnamese, Chinese, Cubans, Italians, etc.) into a single immigrant population. It is well known that the national origin of the immigrant population (as well as the racial/ethnic background of native-born men) is an important characteristic in the determination of earnings. Thus the existing result that immigrants have had little impact on native earnings may well be masking important country or race specific distinctions in the extent of substitutability. This paper extends the analysis available in the literature by presenting estimates of the extent of labor market competition between immigrants and natives where both the native- and foreign-born population have been disaggregated by race and national origins.

Section II of the paper presents the basic conceptual framework used in the analysis. This framework utilizes the Generalized Leontief production function as the cornerstone of the analysis. Using this framework, Section III presents the basic empirical results of the analysis, while Section IV discusses the sensitivity of the results to changes in the underlying assumptions of the study. Finally, Section V summarizes the main results of the paper.

II. Framework

Assume that the production technology is characterized by the Generalized Leontief production function (Diewert, 1971):

$$Q = \sum_j \sum_i \gamma_{ij}(X_i X_j)^{\frac{1}{2}}, \qquad (1)$$

where Q is output, X_i are the various inputs, and γ_{ij} are the technology coefficients. The production function in (1) is linearly homogeneous and restricts the values of the technology parameters so that $\gamma_{ij} = \gamma_{ji}$.[2] The sign of γ_{ij} determines whether inputs i and j are substitutes ($\gamma_{ij} < 0$) or complements ($\gamma_{ij} > 0$).

The assumption that firms in the labor market maximize profits and face constant input prices leads to the following system of labor demand functions:

$$r_i = \gamma_{ii} + \sum_{j \neq i} \gamma_{ij}(X_j/X_i)^{\frac{1}{2}} \quad . \qquad (2)$$

The system of equations in (2) illustrates the usefulness of the Generalized Leontief functional form: wage equations are linear-in-parameters and hence can be easily estimated by standard least squares techniques. Further, the functional form in (2) provides an intuitive understanding of the underlying process. In particular, the wage of group i, r_i, is affected by the number of type j individuals in the labor market per member of group i (X_j/X_i). Thus the relative quantities of other factors of production affect group i's wage through the technological parameter γ_{ij}, and when group i is complementary (substitutable) with group j, an increase in the supply of group j increases (decreases) group i's wage. Finally, the simplicity of the wage equation arising from the production function (2) indicates that the Generalized Leontief technology may provide a much needed link between demand theory and the many studies of wage determination in the literature.

Although the signs of the parameters γ_{ij} contain useful information about the possibilities for technical substitution among the n inputs, it is instructive to transform these parameters into quantities which are more tractable. Define the Hicks partial elasticity of complementarity (Hicks 1970):

$$c_{ij} = \frac{QQ_{ij}}{Q_i Q_j} \tag{3}$$

where $Q_i = \partial Q/\partial X_i$, $Q_{ij} = \partial^2 Q/\partial X_i \partial X_j$. The Hicks elasticity of complementarity measures the effect on the relative price of factor i of a change in the relative quantity of factor j, holding constant the marginal cost and the quantities of other factors. Since the analysis in this paper is mainly concerned with estimating the impact of changes in the supply of immigrants on the earnings of the native-born population, the elasticity of complementarity (rather than its dual, the elasticity of substitution) is the natural measure to quantify this impact.

A useful property of the elasticity of complementarity is given by:

$$\frac{d \ln r_i}{d \ln X_j} = s_j c_{ij} \tag{4}$$

where $s_j = r_j X_j/Q$, the relative share of income accruing to factor j. Hence the elasticity of factor price ($d\ln r_i/d\ln X_j$), which measures the percentage change on the earnings of group i due to a one-percent increase in the supply of group j, is proportional to the elasticity of complementarity. Knowledge of the elasticities of complementarity, therefore, provides a complete picture of price shifts occurring among the native-born as a result of a supply shift in the immigrant population.

It can be shown that under the Generalized Leontief technology, the elasticities of complementarity are given by:

$$c_{ij} = \frac{\gamma_{ij}}{2(s_i s_j r_i r_j)^{\frac{1}{2}}} \qquad \text{for } i \neq j, \qquad (5)$$

and,

$$c_{ii} = \frac{\gamma_{ii} - r_i}{2 s_i r_i} \qquad \text{for } i = j. \qquad (6)$$

As implied by the earlier discussion, the sign of γ_{ij} determines the sign of the (cross) elasticity of complementarity, which, in turn, determines the sign of the elasticity of factor price.

The estimation of the demand system in (2) is affected by two major econometric problems. First, equations (2) are not wage-determination functions unless (relative) supply conditions are also specified. It is common in the input demand literature (see, for example, Grant and Hamermesh, 1981, p. 355) to estimate the production technology under the assumption that input supply is exogenous. The usual justification for this assumption is that the supplies of age-specific sex/race groups are essentially fixed at a point in time. However, this assumption ignores the fact that although the total stock of specific labor inputs may be treated as fixed, its distribution across labor markets is likely to be guided by input price differentials. In the empirical analysis below the assumption of inelastic relative supplies will be used, and the sensitivity of the results to more complex supply models will be addressed.

The second econometric problem that has also been ignored in the labor demand literature concerns the aggregation of workers into the labor inputs X_i. An implicit assumption in specifying production functions such as (1) is that all group i workers are homogeneous within <u>and</u> across labor markets. Of course, there exist marked differences in the skill levels of individuals within each of these groups, and this may lead to group i individuals having different average skills across different labor markets. Hence wage differentials across labor markets may simply reflect an unequal distribution of skill levels, seriously biasing the estimates of the production function.

This problem can be approached (in the Generalized Leontief framework) by characterizing an individual's effective labor supply in terms of a fixed effect indicating the skill level of the individual. In particular, the wage paid to individual ℓ in group i, $r_{i\ell}$, depends on: (a) the market-determined wage level for the average group i person, r_i; and (b) how the skills of individual ℓ vary from the skills of the average group i person, f_ℓ. Hence, in general, $r_{i\ell} = r_{i\ell}(w_i, f_\ell)$, and the individual's wage rate depends both on market forces and on his (relative) skill level.

To make this approach useful it is necessary to add structure to the model. Two possible simplifications are $r_{i\ell} = r_i f_\ell$ and $r_{i\ell} = r_i + f_\ell$. The additive fixed effect assumes that the wage premium due to differential skills is independent of the demographic characteristics of the labor market, while the multiplicative specification allows for the possibility of such an interaction.[3] For simplicity, the analysis in this paper uses the additive specification. If it is assumed that f_ℓ can be written in terms both of observable socioeconomic characteristics, Z_ℓ, and a random uncorrelated error, ε_ℓ, the stochastic equivalent of (5) is given by:

$$r_{i\ell} = Z_\ell \beta_i + \sum_{j \neq i} \gamma_{ij} (X_j/X_i)^{\frac{1}{2}} + \varepsilon_j, \qquad i,j=1,\ldots,n. \qquad (7)$$

Equation (7) specifies the wage-determination process at the individual level and will be used throughout the empirical analysis. It is important to note that estimates of the demand system in (7) control for observable differences in socioeconomic variables <u>within</u> each of the labor inputs, but do not control for differences in these variables across the groups. It is these differences in socioeconomic variables, as well as differences in unobserved characteristics captured by the error term, which prevent the production technology from degenerating into a system where all inputs are perfect substitutes.

III. Data and Basic Results

The data set used in the analysis is the 1980 5/100 A Sample from the U.S. Census.[4] The analysis was restricted to working-age individuals ($18 \leq age \leq 64$) who: (a) are not in the military; (b) are not self-employed or working without pay; and (c) had records containing complete information on the variables used in the analysis. The "local labor market" is defined to be the SMSA where the individual resides.

To account for the differences in ethnicity and race among persons, as well as for the difference between native- and foreign-born status, the analysis is initially conducted using a nine-way breakdown of the labor force: white native males (WN), black native males (BN), Hispanic native males (HN), Asian native males (AN), white immigrant males (WI), black immigrant males (BI), Hispanic immigrant males (HI), Asian immigrant males (AI), and females (F). Three points should be made regarding this particular decomposition of the labor force. First, the analysis allows for the disaggregation of the four largest racial/ethnic groups that can be identified in the 1980 Census. Secondly, all women are aggregated into one group because previous research (e.g., Smith, 1977) shows that earnings differentials among different types of women are much narrower than earnings differentials among different types of men. This fact suggests that employer differentiation of women is likely to be less important than employer differentiation of men. Finally, the samples defined as "white", in fact, contain all non-black, non-Asian, non-Hispanic observations.

The employment data necessary for the estimation of equations (2) are obtained from the Census files. The labor input X_i (in the SMSA) is defined as the number of individuals in group i who are of working age and were employed in 1979. Finally, the capital (K) data is drawn from Grant (1979). It gives the capital stock in each of 84 SMSAs for over a ten-year period up to 1969, and was constructed from the Census of Manufactures and the Annual Survey of Manufactures.[5] The capital data, used below is the 1979 extrapolation made from the time-series.[6] It is well known that capital stock calculations are subject to large measurement errors. To complicate matters, the capital data is available only for manufacturing industries. Since the analysis in this paper is conducted over all industries, the capital data leads to biased parameter estimates unless it is assumed that the aggregate capital stock in the SMSA is (roughly) proportional to the manufacturing capital stock. The capital data is only available for 84 SMSAs, hence the analysis is restricted to persons residing in these labor markets.

Before proceeding to the estimation of the demand system, it is useful to present summary statistics on the earnings and relative sizes of the 9 labor groups under study. Table 1 presents these basic statistics which illustrate the well-known differences in earnings across groups, and also show how the large Hispanic immigration is creating a labor force with almost as many Hispanics as blacks.

Equation (2) was estimated on the micro Census data using 1979 annual earnings as the dependent variable. The estimation was conducted by stacking the data for all 9 labor force groups (so that all the coefficients of the nine earnings functions were estimated jointly), and by simultaneously introducing the across-equation restrictions implied by the symmetry constraints. The use of annual earnings, instead of the wage rate, facilitates comparison between the results in this paper and those available in the labor demand literature which uses the average income share in a given year to estimate translog equations.[7] The variables held constant in the vector Z include: years of schooling, years of labor market experience (age-schooling-6), and years of labor market experience squared.

Table 2 presents the estimated technology parameters. Several findings are worth stressing. First, all immigrant groups have had a negative impact on the earnings of the white native-born population. Thus immigrants, as a group, are substitutes with the single largest demographic group in the labor force. Second, this strong degree of substitutability is not evident in the black native-born population. Table 2 provides no evidence that black native-born men have been adversely affected by white or Asian immigrants, and only marginal evidence that black natives and black or Hispanic immigrants are substitutes. Surprisingly, the technological relationship between black natives and white immigrants (who make up over 40 percent of the immigrant population) is one of strong complementarity. Finally, there is no evidence of substitutability between the Hispanic native-born population and the three other native-born groups under analysis (whites, blacks, and Asians). This result resembles the finding obtained by Borjas (1983) in his study of the 1976 Survey of Income and Education.

It is of substantial interest that the results in Table 2 show a different kind of technological relationship between black natives and white immigrants than between black natives and either Hispanic or black immigrants. In particular, the former relationship indicates complementary inputs, while the latter relationships indicate (weakly) substitutable inputs. These findings are consistent with the theoretical expectation that "like" inputs are more substitutable than "unlike" inputs. White immigrants, for instance, tend to originate in Western European countries and have high levels of education. On arrival to the U.S., these immigrants - unlike black natives - perform relatively well in the labor market. Black and Hispanic immigrants, on the other hand, are characterized by low levels of education and - like black natives - do not perform well in the labor market. The finding in Table 2, therefore, implies that the impact of immigration on black natives is likely to shift over time as the skill composition of the immigrant population in the United States changes.

A more insightful way of assessing the substantive implications of these technological relationships can be obtained by calculating the corresponding elasticities of factor prices, $d \ln r_i / d \ln X_j$, for the relevant technology parameters. Table 3 presents the estimated changes in the earnings of the four native-born male groups as the supplies of the four immigrant groups increase. These cross-elasticities of demand are most revealing for what they do not show. In particular, despite the statistical significance of many of the technological parameters, Table 3 does not show these effects to be numerically important. For example, the cross-elasticity of the earnings of white native-born men with respect to the quantity of white foreign-born men is -.025. This implies that a 10 percent increase in the supply of these immigrants decreases white native earnings by less than three-tenths of one percent, and that even a doubling in the number of these immigrants reduces white native earnings by only 2.5 percent.

This remarkable result is evident in each of the 16 elasticities presented in Table 3. None of the elasticities take on a value exceeding $|.03|$. Thus even if some immigrant groups compete with the native-born in the labor market, the numerical impact of this competition is trivial.

It is worth noting that this result has also been obtained in the earlier paper by Grossman (1982). Using a different methodology (estimating translog production functions) and a different data set (the 1970 Census), Grossman estimates that a 10 percent increase in the number of immigrants reduces the native-born wage by between .2 and .3 percent (Grossman) 1982, p. 600). The similarity between these results and those of Table 3, despite the major differences in their derivation, suggests that indeed immigrants have not played a major role in the determination of wage levels for native-born men in recent years.

Immigrants, however, have had a sizable impact in the determination of their own wage levels. Table 4 presents the set of price elasticities of demand describing what happens to the earnings of immigrant men as the quantities of immigrant men increase. These elasticities, on the average, are much larger than the cross-elasticities between native earnings and immigrant supplies. In particular, the own-elasticities presented in Table 4 reveal that increases in the supply of type i immigrants significantly reduce the earnings of those immigrants. For example, a 10 percent increase in the number of white immigrants reduces the earnings of white immigrants by 10.9 percent; a 10 percent increase in the number of black immigrants reduces black immigrant earnings by 5.8 percent; a 10 percent increase in the number of Hispanic immigrants reduces Hispanic immigrant earnings by 13.9 percent; and a 10 percent increase in the number of Asian immigrants reduces Asian immigrant earnings by 7.9 percent. Therefore, even if increases in the supply of immigrants have little impact on the earnings of the native-born, they induce a sizable reduction in their own earnings.[8]

IV. Extensions of Empirical Analysis

1. Endogeneity of Supply

The validity of the assumption of inelastic labor supplies, implicitly used in the estimation of the results in the previous section, can be questioned. After all, the wage differentials created across labor markets by the interactions among labor inputs are likely to induce internal migration patterns where the groups move to areas where they are likely to do relatively well. The present of mobility costs and/or imperfect information suggests that the wage differentials do not vanish in the long run and that the correct estimation of (2) requires that the supply of inputs to labor markets be modeled more fully.

To account for the endogeneity of the supply variables, it is assumed that at the SMSA level relative supplies of labor inputs are affected by a vector of socioeconomic characteristics, A, describing the SMSA. Hence:

$$(X_j/X_i)^{\frac{1}{2}} = A\beta + \varepsilon. \qquad (6)$$

The vector A includes the proportions of the labor force employed in each of the one-digit industrial groups, the probability of receiving Supplementary Security Income (SSI) assistance (relative to the poverty rate), and the mean level of SSI payments (relative to the mean wage level in the SMSA).[9] The industrial composition of the SMSA is likely to affect supplies since particular combinations of industrial concentrations will attract individuals with specific skills to the locality. Similarly, the chances of receiving a particular form of public assistance (SSI), <u>relative</u> to the SMSA's poverty rate, as well as the "real" levels of that assistance, measure the economic welfare of low income individuals in the SMSA. If the expected value of public assistance payments differs significantly across SMSAs, geographic differences in the location of racial and/or immigrant groups are likely to arise.

The demand system in (2) was reestimated using two stage least squares, and the resulting estimates are summarized in Table 5. This table parallels the cross-price elasticities presented in Table 3. A comparison of these two tables shows that the qualitative impact of immigrants on the earnings of the native-born is generally unaffected by the estimation procedure (except for the effects on black natives), although the 2SLS cross-price elasticities tend to be slightly larger than the corresponding OLS estimates. Despite the absolute increase in the numerical impact, however, it must be stressed that even the 2SLS elasticities predict numerically small impacts. For example a 10 percent increase in the number of white immigrants reduces white native-born earnings by .4 percent according to the 2SLS regression and by .25 percent according to the OLS regression. Thus even though the 2SLS technique roughly doubles the size of the cross-price elasticity, the numerical impact remains trivially small.

2. The Heterogeneity of Hispanics

In the previous sections, male Hispanics have been disaggregated by nativity status rather than by national origin. There are four major national groups in the Hispanic/American population: Mexicans (MX), Puerto Ricans (PR), Cubans (CU), and "other" Hispanics (OS), where the last group is composed mostly of Hispanics of Central and South American origin. Previous research (Reimers, 1983; Borjas and Tienda, 1985) has documented that differences in labor market outcomes across these four Hispanic groups are as large, if not larger, than the differences by nativity status. These findings suggest that an alternative substantively important decomposition of the Hispanic labor force exists. The demand system in (2) was reestimated, using ordinary least squares, after replacing the Hispanic native and Hispanic immigrant group with four Hispanic groups based on national origin. The cross-elasticities of demand between the four Hispanic groups and the other male labor force groups are presented in Table 6. Several interesting findings are provided by these selected results. First, Mexicans -- who make up nearly 60 percent of the male Hispanic population -- have had a negative impact on the earnings of both white and black native born men. This impact, however, is numerically small: a 10 percent increase in the number of Mexicans reduces the earnings of white native born men by .03 percent, and that of black native born men by .07 percent. Second, Puerto Ricans are substitutable inputs only with black immigrants; there is a complementary or independent relationship between Puerto Ricans and all other native-born male groups. Third, Cubans have not had an adverse impact on the earnings of any of the native-born male groups. In fact, a significant complementary relationship exists between Cuban men and white, black, and Asian native-born men. Interestingly, Cubans are substitutable only with one of the immigrant groups -- Asian immigrants. It is of interest to note that this immigrant group, like Cubans, tend to exhibit above average success in the labor market. It must be stressed, however, that despite the statistical significance of these cross effects their numerical magnitude is small.

Table 7 shows that, on the other hand, the numerical impact of increases in the supply of the different types of Hispanics on their own wage is much larger. The own price elasticities of demand for the various Hispanic groups range around unity (in absolute value) for three of the groups, and is perversely positive but insignificant for the fourth (Cubans). Thus a 10 percent increase in the supply of Mexicans, Puerto Ricans, or other Hispanics will lead to about a 10 percent decease in the wage of the own group.

V. Summary

This paper has analyzed the extent of labor market competition between immigrants, minorities and the native-born population. Using a Generalized Leontief production function, the demand system for the various labor inputs was estimated. The main empirical results of the analysis were:

1. Immigrants tend to be substitutes with some labor market groups, and complements with others. White native-born men tend to be adversely affected by the increase in immigrant supply, while black native-born men, if anything, have gained slightly from increases in the immigrant supply. All these cross-effects of shifts in immigrant supply on the earnings of native-born men are numerically very small, so that even if immigrants are substitutes with some native-born groups their numerical impact on the native-born wage is trivial.

2. Increases in the supply of immigrants do have a sizable impact on the earnings of immigrants themselves. Increases of 10 percent in the supply of immigrants reduce the immigrant wage by about 10 percent. Thus immigrants' main competitors in the labor market are other immigrants.

3. These results are robust to changes in the estimation procedure, and to disaggregations of Hispanics into national origin groups. Increases in the supply of the various Hispanic groups -- Mexicans, Puerto Ricans, Cubans, and other Hispanics -- have small effects in the earnings of non-Hispanics, but sizable effects on the earnings of the groups themselves.

Despite these varied results, the empirical study of the impact immigrants have had on the U.S. labor market is still in its infancy. Difficult substantive and technical problems remain to be resolved. Perhaps the most important of these issues is the modelling of the labor supply decisions of immigrants and native workers. In particular, it is well known that a large fraction of immigrants reside in a relatively small number of labor markets.

The factors motivating these internal migration decisions among the foreign-born population need to be specified explicitly in the wage determination processs. In addition, since the geographic concentration of immigrants in a small number of labor markets is likely to exaggerate their impact within those labor markets, the native population may respond by initiating its own set of migration flows. These problems, therefore, suggest that future work in this area is likely to lead to an increased understanding of the wage determination process for both native- and foreign-born persons. It is important to note, however, that at this stage of the research process, the often assumed large impacts of immigrants on native earnings are not confirmed by Census data. Even a detailed disaggregation of the immigrant population by racial/ethnic background and of the Hispanic population by national origin fails to reveal a single instance in which cross-effects are numerically important.

Footnotes

* Professor of Economics, University of California, Santa Barbara, and Research Associate, National Bureau of Economic Research. I am grateful to Daniel Hamermesh for helpful comments on an early draft of this paper, and to the Rockefeller Foundation for financial assistance.

1 One crucial difference between the Borjas and Grossman studies is the use of different functional forms to describe the production process (i.e., the Generalized Leontief versus the translog). There is no á priori reason to prefer one function over the other since both are second-order approximations to any arbitrary production function. In addition, experiments by Griffin (1982) and Wales (1977) show that over certain ranges of the data the translog function provides a better fit while over other ranges the Generalized Leontief equation does a better job.

2 In addition, diminishing marginal productivity for input ℓ requires that not all $\gamma_{\ell j}$ $(y=1,\ldots,\ell-1,\ell+1,\ldots,n)$ be negative. For a discussion of this and other related restrictions see Diewert (1971), and Sato and Koizumi (1973).

3 Note that the definition of the fixed effect requires that $E(f_\ell) = 1$ in the multiplicative specification, and $E(f_\ell) = 0$ in the additive model.

4 Since the Census data is quite large random samples were drawn for some of the larger population groups. The sampling proportions used are available from the author on request.

[5] The 84 SMSAs used by Grant (1979) to construct the capital time series are not a random sample of the 310 SMSAs identified in the A sample of the 1980 Census. Instead they tend to be the largest SMSAs in the country.

[6] The analysis also experimented with using the 1969 level of the capital stock, rather than the 1979 extrapolation made from the 1959-1969 trend. The impact of this change in the definition of the capital variable on the estimated coefficients was trivial.

[7] The study was replicated using the wage rate as the dependent variable with similar qualitative results.

[8] One important criticism of these results - as well as of most of the labor demand literature - is that substantive findings are being obtained from across-SMSA correlations between wage levels and relative supplies. If, as is likely, some small groups are concentrated in a relatively few labor markets, "outlying" labor markets may play a relatively large role in the estimation procedure. However, recent work by Borjas (1986a), using the 1970 Census, shows that restricting the analysis to the few SMSAs which contain relatively large numbers of minority groups (e.g., blacks or Hispanics) or to SMSAs in a particular region (e.g., the South) does not have a major impact on the estimated demand system.

[9] The industrial composition variables were calculated from the 1980 Census file while the public assistance variables were obtained from the 1976 Survey of Income and Education.

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TABLE 1
Summary Statistics

Group	Mean 1979 Annual Earnings	Percent of Labor Force	Number of Observations
White Native Males	$18892	42.6	5831
Black Native Males	13660	5.2	4136
Hispanic Native Males	13702	2.5	25726
Asian Native Males	18393	.3	4247
White Immigrant Males	20293	2.3	1902
Black Immigrant Males	12261	.3	1747
Hispanic Immigrant Males	11600	2.3	23253
Asian Immigrant Males	16487	.8	13557
Females	9305	43.7	62710

Source: 1980 U.S. Census of Population, A Sample.

TABLE 2

Estimates of Technology Parameters in 1980 Census†

	BN	HN	AN	WI	BI	HI	AI	F	K
WN	-1158.6* (-4.56)	-98.5 (-.90)	-120.0 (-.93)	-3972.7* (-10.62)	-527.1* (-2.68)	-396.5* (-3.46)	-586.8* (-4.33)	-1370.0* (-5.40)	1771.5* (7.68)
BN		-79.2 (-.74)	-156.5 (-1.37)	876.2* (2.34)	-287.6 (-1.72)	-149.9 (-1.44)	-9.9 (-.08)	482.6* (2.24)	549.4* (7.01)
HN			179.3 (1.29)	-425.4* (-2.45)	-1590.3* (-8.43)	278.9* (2.66)	686.4* (4.61)	-212.4* (-2.09)	247.6* (11.27)
AN				80.6 (.42)	-190.8 (-.64)	182.6 (1.48)	319.5 (.79)	-86.1 (-.58)	89.9* (3.84)
WI					1554.7* (5.32)	-84.4 (-.50)	890.1* (3.85)	4606.2* (14.72)	277.3* (2.28)
BI						129.7 (.82)	108.6 (.37)	639.8* (2.88)	34.4 (1.07)
HI							-722.7* (-5.30)	226.5 (1.80)	235.8 (1.80)
AI								438.6* (2.82)	105.0* (4.14)
F									-173.6* (-3.70)

† The t-ratios are presented in parentheses. * Significant at the 5 percent level.

TABLE 3
Elasticities of Factor Prices in 1980 Census†

With Respect to the Quantity of:	The Change in the Wage of: WN	BN	HN	AN
WI	-.025* (-10.62)	.021* (2.34)	-.015* (-2.45)	.006 (.42)
BI	-.001* (-2.68)	-.003 (-1.72)	-.021* (-8.43)	-.005 (-.64)
HI	-.002* (-3.46)	-.004 (-1.44)	.010* (2.69)	.013 (1.48)
AI	-.002* (-4.33)	-.000 (-.08)	.014* (4.61)	.013 (.79)

† The t-ratios in parentheses refer to the technological parameter γ_{ij}.

* Significant at the 5 percent level.

TABLE 4
Elasticities of Factor Prices
Within Immigrant Population in 1980 Census†

With Respect to the Quantity of:	The Change in the Wage of: WI	BI	HI	AI
WI	-1.087*	.167*	-.004	.048*
	(-2.35)	(5.32)	(-.50)	(3.85)
BI	.015*	-.576	.002	.002
	(5.32)	(-1.48)	(.82)	(.37)
HI	-.002	.014	-1.395*	-.039*
	(-.50)	(.82)	(-1.97)	(-5.30)
AI	.012*	.007	-.018*	-.787
	(3.85)	(.37)	(-5.30)	(-1.88)

† The t-ratios in parentheses refer to the technological parameter γ_{ij} for the cross-elasticities, and to $(\gamma_{ii}-r_i)$ for the own-elasticities.

* Significant at the 5 percent level.

TABLE 5
Elasticities of Factor Prices in 1980 Census,
Adjusted for Endogeneity of Supply†

With Respect to the Quantity of:	The Change in the Wage of: WN	BN	HN	AN
WI	-.042*	.024	-.005*	.030
	(-10.16)	(1.61)	(-3.78)	(.86)
BI	-.001	.005	-.017*	-.032*
	(-.82)	(1.55)	(-4.19)	(-2.00)
HI	.002	.014*	.024*	.010
	(1.11)	(2.91)	(4.19)	(.69)
AI	-.003	-.007	.025*	.020
	(-1.63)	(-1.86)	(4.28)	(.54)

† The t-ratios in parentheses refer to the technological parameter γ_{ij}.

* Significant at the 5 percent level.

TABLE 6
Elasticities of Factor Prices
Across Hispanic and Non-Hispanic Groups in 1980 Census†

With Respect to the Quantity of:	The Change in the Wage of: WN	BN	AN	WI	BI	AI
MX	-.003*	-.007*	-.002	-.004	-.003	-.004
	(-3.76)	(-2.19)	(-.28)	(-.94)	(-.19)	(-.69)
PR	.000	.004*	-.016	.005*	-.056*	.017*
	(.18)	(3.90)	(-1.49)	(2.29)	(-3.47)	(2.32)
CU	.001*	.004*	.010*	.006*	.024*	-.020*
	(2.42)	(3.36)	(2.09)	(2.81)	(2.44)	(-4.77)
OS	-.001*	.004	.004	.010*	-.134*	-.003
	(-2.17)	(.41)	(.75)	(3.17)	(-6.59)	(-.38)

† The t-ratios in parentheses refer to the technological parameter γ_{ij}.

* Significant at the 5 percent level.

TABLE 7
Elasticities of Factor Prices
Within Hispanic Groups in 1980 Census†

With Respect to the Quantity of:	The Change in the Wage of: MX	PR	CU	OS
MX	-1.275*	.0078*	.003*	.001
	(-2.43)	(5.65)	(2.48)	(.70)
PR	.031*	-1.020	.000	-.013*
	(5.65)	(-1.76)	(.04)	(-3.00)
CU	.016*	.000	.482	-.004
	(2.48)	(.04)	(1.03)	(-.49)
OS	.003	-.015*	-.002	-.828
	(.70)	(-3.00)	(-.49)	(-1.89)

† The t-ratios in parentheses refer to the technological parameter γ_{ij} for the cross-elasticities, and to $(\gamma_{ii}-r_i)$ for the own-elasticities.

* Significant at the 5 percent level.