U.S. Interregional Trade and Migration*

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Abstract

This paper explores the theoretical and empirical implications of national output maximization on the real as well as relative wages between regions within the same national economy. It is shown here that the maximization postulate yields the equalization of both the real wage rate and the relative wages between regions, which in turn implies a determinate pattern of labor migration that is similar to the pattern of an exchange of labor services through interregional commodity trade which embodies these services. An empirical investigation into the U.S. southern region's migration and interregional commodity trade finds evidence that is broadly consistent with the implications deduced from the initial assumptions made in the paper.

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I. Introduction

There exists an extensive literature that examines migration and wages within the U.S. spatial (urban and/or regional) economic context[1]. What determines the pattern of migration within the U.S.? How does migration respond to wages, and how does it, in turn, impact on wages? Are there in fact significant spatial disparities in wages and income in the U.S.? If so, do they persist, and how do they change over time?

Somewhat independently of the traditional urban and regional interest in some of these migration issues, recent years have also seen a resurgence of interest in regional economics among international trade economists[2]. Also frustrated by the failure to find empirical support for the modern theory of international trade named after Eli Heckscher and Bertil Ohlin, when international trade data are used, many researchers have recently turned to regional economics as a more fertile ground for examining the empirical relevance of the theory[3]. I am motivated in this paper to bring the two seemingly separate

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[1] The literature is too numerous to list here. For the more recent examples with new and interesting insights into this long–standing topic, see Hanson and Slaughter (1999, 2002).

[2] The intellectual catalyst for this is Paul Krugman who has contributed a series of influential works in this area, most notably his 1991 publication. It is fair to state, however, that Bertil Ohlin, one of the progenitors of the modern theory of trade, clearly recognized the relevance of the theory of comparative advantage in the regional context in his 1933 publication.

[3] See, for example, Harrigan (1995), Davis, *et al* (1997), Bernstein and Weinstein (2002), Davis and Weinstein (2001), Hanson and Slaughter (1999, 2002), and Kim (1999).

developments—interregional migration and commodity trade—together within a general framework that was laid down nearly a half century ago by two Nobel Laureates in Economics, James Meade (1955) and Robert Mundell (1957). Mundell (1968, ch.9), in particular, emphasized that under appropriate conditions concerning production technologies, competitive market mechanism and the structure of consumer demand, commodity trade and factor migration are a perfect substitute in the sense that absolute as well as relative factor–price (wage) equalization between countries will be brought about either with free commodity movement combined with complete factor immobility, or with perfect factor mobility combined with no commodity trade. In the real world characterized by the presence of non–zero transportation and other costs associated with both factor migration and commodity shipments, however, the substitutive relationship posited in the theory can only serve as a benchmark reference.

Specifically, the purpose of this paper is to demonstrate the following:

(1) The interregional *real* (but not *absolute*) wage rate equalization as well as the *relative* wage rate equalization, both of which have been observed among the U.S. regions[4], can be shown to hold necessarily on theoretical grounds under a simple postulate that the national economy is efficient in the maximization of output produced in all regions.

(2) The *real* wage rate equalization implies a determinate and testable pattern of labor migration that is similar in form to the pattern of embodied labor–service content of traded goods that is familiar in the H–O–V version of the H–O theory of trade.

(3) There is some empirical support from the U.S. regional data for the type of labor migration and commodity trade that is deduced from the initial assumption of national output maximization.

II. Implications of National Output Maximization with Profit Maximization

Consider an economy consisting of two regions, A and B, producing n goods with production technologies that are identical between the two regions, where labor can migrate freely. All goods that are consumed are commonly produced in each region. Let there be m different types of labor, with the corresponding money wage rates denoted by $W_1, \ldots, W_m$.

Maximization of profit from production implies that in each region and for each output produced, the value of additional output produced by each kind of labor must be equated with the nominal wage rate. Hence,

$$W_j^r = P_i^r \, MP_{ij}^r \; (i = 1, \ldots n;\; j = 1, \ldots m) \tag{1}$$

where the superscript denotes the region $(r = A, B)$, P_i^r is the price of good i in r, and MP_{ij}^r designates the marginal physical product of labor of type j used in the production of output i in region r. Note that quation (1) contains mxn equations as follows:

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[4] See Coelho and Ghali (1971), for example, for evidence on the real wage rate equalization, and Hanson and Slaughter (1999 and 2002) for the relative wage rate equalization.

$$\begin{cases} W_1^r = P_1^r \, MP_{11}^r = P_2^r \, MP_{21}^r = \cdots = P_n^r \, MP_{n1}^r \\ W_2^r = P_1^r \, MP_{12}^r = P_2^r \, MP_{22}^r = \cdots = P_n^r \, MP_{n2}^r \\ \quad \cdots\cdots\cdots\cdots \\ W_m^r = P_1^r \, MP_{1m}^r = P_2^r \, MP_{2m}^r = \cdots = P_n^r \, MP_{nm}^r \end{cases}$$

Now, if the national economy is efficient in the sense that the sum of each output produced in the two regions is maximized, then the marginal product of each variety of labor in each output produced is necessarily equalized between the two regions. This follows simply from the fact that if the marginal product of type j is higher in region A than in B in the production of output i, for example, then the national output of that good can be increased by reallocating labor j in the same line of production from region B to A, since that labor can produce greater additional output i in A than in B. But the increased labor j in A brings down its marginal product in output i, given the law of diminishing marginal returns, while the converse holds in region B, until the marginal product is equalized between the two regions.

Hence,

(2) $$W_j^A / P_i^A = W_j^B / P_i^B \; (i = 1, ...n; \; j = 1, ...m)$$

Equation (2), containing *mxn* equalities, states that the nominal wage rate deflated by any commonly produced commodity price is equal between the two regions, implying the equalization of the *real* wage rate in the sense of an equalized purchasing power of the prevailing nominal wage in each region[5]. But equation (2) also implies that

$$\begin{cases} W_1^A / W_1^B = P_1^A / P_1^B = P_2^A / P_2^B = \cdots = P_n^A / P_n^B \\ W_2^A / W_2^B = P_1^A / P_1^B = P_2^A / P_2^B = \cdots = P_n^A / P_n^B \\ \quad \cdots\cdots\cdots\cdots \\ W_m^A / W_m^B = P_1^A / P_1^B = P_2^A / P_2^B = \cdots = P_n^A / P_n^B \end{cases}$$

Hence,

(3) $$W_1^A / W_1^B = W_2^A / W_2^B = \cdots = W_m^A / W_m^B$$

It immediately follows from equation (3) that

(4) $$W_j^A / W_k^A = W_j^B / W_k^B \quad \forall \; j, k = 1, ... m \; (j \neq k)$$

Equation (4) states that the *relative* wage for any paired set of wages is equalized between the two

5 This requires that each of the m labor inputs enters into the production of all produced goods, a condition that is satisfied in our empirical context which breaks down labor by sex, education and race employed by the U.S. Census classification (approximately at the 2–digit level) of manufacturing industries.

regions. Thus, we have shown that the efficiency requirement for national output maximization implies the equalization of the structure of *relative* wage rates as well.

III. The Real Wage Rate Equalization and the Pattern of Interregional Labor Migration

The perfect labor mobility posited in the preceding section that will bring about the real wage rate equalization between regions implies a certain pattern of interregional labor migration that can now be deduced under the simplifying assumption that both the production technologies and consumer preferences are identical between the regions[6]. These assumptions are standard in the H–O trade theory that also assumes perfect factor immobility between trading areas. My motivation here is to deduce the pattern of migration when the latter assumption is replaced by that of perfect labor mobility consistent with the efficiency implications of national output maximization.

Consider two regions that are different in size (population base) and in the initial relative labor–supply endowments among different categories of labor. If there is perfect labor mobility between the two regions, but no commodity trade, then the *real* wage rate equalization for each category of labor will be realized between the regions only when the *relative* supplies of the different types of labor are equalized interregionally through migration. This follows from the fact that with identical technologies and consumer preferences, differences in the *relative* labor supplies will result in interregionally different equilibrium *real* wages in the absence of commodity trade.

Let X_0^A and X_0^B denote diagonal matrices containing the respective region's initial labor supplies measured in terms of the absolute number of persons along the diagonal, and zeros for all off–diagonal entries. Then, with perfect labor mobility that equates the respective real wages between the regions, the post–migration labor supplies will become proportional between the regions such that $X_p^A = \alpha X_p^B$, where X_p designates the diagonal matrix of post–migration labor supplies, and α is a scalar denoting the common factor of proportionality linked to the relative size of the two regions[7].

Let M^{AB} denote the diagonal matrix of net migration (number of out–migrants minus in–migrants) from A to B, containing zeros in the off–diagonal. It follows that

$$M^{AB} = X_0^A - X_p^A = X_p^B - X_0^B = X_0^A - \alpha X_p^B$$

Hence,

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[6] I earlier presented in Horiba (1979) an empirical evidence regarding the acceptability of the assumption of identical and homothetic consumer preferences among the U.S. regions. Regional differences in production technologies could undermine the pattern of interregional migration to be deduced, but such differences will have to be substantial and systematic in order to break the determinacy of the migration pattern to follow. Indeed, the empirical result presented below may be viewed as an indirect test of the maintained hypothesis that there is no regional gap in the technologies employed in production in the United States. This is also consistent with earlier findings reported in Horiba and Kirkpatrick (1981, 1983).

[7] By multiplying each diagonal entry by the corresponding nominal wage, and summing across the diagonal, it is easy to see that α is the ratio of regional aggregate wage income.

$$M^{AB} = X_0^A - \beta\left(X_0^A + X_0^B\right), \text{ where } \beta = \alpha/(1+\alpha).$$

Therefore,

(5) $$M^{AB}\left(X_0^A\right)^{-1} = I - \beta Z^A$$

where I is the identity matrix with zeros in the off–diagonal, and Z^A is a diagonal matrix given by $Z^A = \left(X_0^A + X_0^B\right)\left(X_0^A\right)^{-1}$

The pre–migration relative plentifulness of the different types of labor in the given region (region A) is revealed by the diagonal entries of the matrix $X_0^A\left(X_0^A + X_0^B\right)^{-1}$ where the relative supply of each type of labor is expressed as fraction of the corresponding total (region A plus region B) supply. The argument Z on the right–hand side of equation (5) is the inverse of this marix, which therefore contains in the diagonal the inverse of A's initial relative supplies of labor. Hence, equation (5) implies that there is a positive rank correlation between the relative plentifulness of labor supplies as revealed by $X_0^A\left(X_0^A + X_0^B\right)^{-1}$ and net migration from A expressed as fraction of the corresponding supply in that region.

Consider a typical diagonal element m_j^{AB} of the matrix $M^{AB}\left(X_0^A\right)^{-1}$. Equation (5) states that this element is directly linked to the corresponding diagonal element z_j in matrix Z^A as follows:

(6) $$m_j^{AB} = 1 - \beta z_j^A \quad \left(j = 1, \dots m\right)$$

This serves as a simple and testable reduced–form migration equation of the real wage rate equalization model.

IV. Empirical Evidence

The 1980 U.S. Census of Population contains data on interregional migration between 1975 and 1980, broken down by age, sex, race, and years of school completed[8]. Using this census data, we can examine whether, and to what extent, the net migration followed the predicted paths consistent with equation (6). Since the U.S. Southern region stands out as possessing the most notable demographic characteristics among the U.S. census regions, we conduct our test using this geographic division[9].

Many researchers have noted the persistence of substantial nominal wage disparity between the South and the rest of the country[10]. Interestingly, however, existing evidence also suggests that when the heterogeneity of labor is explicitly recognized, the average North–South *real* wage disparity, adjusted by the cost of living, tends to disappear[11].

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8 U.S. Bureau of the Census, 1985, Subject Reports PC 80–2–2A, table 26.

9 The South comprises the District of Columbia and the sixteen States of Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma and Texas.

10 For earlier evidence on this, see, for example, Gallaway (1963) and Scully (1969).

11 See, for example, Bellante (1979), and Coelho and Ghali (1971).

Following equation (6), I first estimate the simple bivariate regression for the U.S. interregional migration from the South,

$$m_j = a - bz_j + u_j$$

where m_j denotes the net (outflow minus inflow) migration from the South to the rest of the country, expressed as fractions of the South's labor force in the given labor category, and z_j stands for the reciprocal of the relative plentifulness of the South's labor category expressed as fractions of the corresponding national labor supply. In addition, a and b are the regression estimates of the corresponding parameters of equation (6) and u_j is the error term assumed to be normally and independently distributed with zero mean.

Table 1 presents regression analysis of the 1975–80 net migration for the U.S. South, broken down and run separately by race and sex. Since we have only the 1970 and 1980 census tabulation of the population with no data for intervening years, I use both sets of data as an alternative specification of the independent variable in equation (6). I also report regression estimates I have obtained both with and without constraining the intercept to be unity.

Table 1. Regression Analysis for Net Migration, U.S. South 1975–80

Race/Sex	β–Estimate, Constrained		β–Estimate, Unconstrained		Correlation Coefficient		Spearman's Rank Correlation	
	Z_{1970}	Z_{1980}	Z_{1970}	Z_{1980}	r_{1970}	r_{1980}	ρ_{1970}	ρ_{1980}
Black								
Male	–0.469[a]	–0.492[a]	–0.103[c]	–0.050[a]	–0.695	–0.883	–0.543	–0.943
	(0.029)	(0.025)	(0.053)	(0.013)				
Female	–0.489[a]	–0.510[a]	–0.047	–0.027[c]	–0.489	–0.704	–0.714	–0.714
	(0.039)	(0.030)	(0.042)	(0.014)				
Both Sexes	–0.481[a]	–0.503[a]	–0.071	–0.039[b]	–0.594	–0.808	–0.714	–0.714
	(0.034)	(0.027)	(0.048)	(0.014)				
White								
Male	–0.296[a]	–0.492[a]	–0.079[c]	–0.034[b]	–0.672	–0.821	–0.657	–0.771
	(0.010)	(0.025)	(0.043)	(0.012)				
Female	–0.295[a]	–0.510[a]	–0.077[b]	–0.029[a]	–0.765	–0.915	–0.657	–0.600
	(0.012)	(0.030)	(0.033)	(0.006)				
Both Sexes	–0.296[a]	–0.503[a]	–0.078[c]	–0.033[b]	–0.715	–0.868	–0.657	–0.600
	(0.011)	(0.027)	(0.038)	(0.010)				
All Races								
Male	–0.307[a]	–0.335[a]	–0.083[b]	–0.038[b]	–0.754	–0.866	–0.657	–0.771
	(0.013)	(0.016)	(0.036)	(0.011)				
Female	–0.312[a]	–0.335[a]	–0.077[b]	–0.032[a]	–0.748	–0.907	–0.714	–0.771
	(0.015)	(0.017)	(0.034)	(0.007)				
Both Sexes	–0.310[a]	–0.335[a]	–0.079[b]	–0.036[a]	–0.759	–0.884	–0.600	–0.771
	(0.014)	(0.016)	(0.034)	(0.009)				

Notes: Figures in parenthesis are standard errors; statistical significance is indicated by the superscripts at the 0.01 level ([a]), 0.05 level ([b]), and 0.10 level ([c]), respectively.

The constrained regression analysis has yielded statistically significant result (at the 0.01 level) in all cases broken down by race and sex. Unconstrained regression analysis, however, has resulted in the reduction of the significance level, although significance at least at the 0.10 level is retained in all cases except two (black female 1970 and black both sexes combined 1970).

Pooling the data across race and sex, multiple regression analysis with dummy variables, one for race (D_1 = 0 for white, = 1 for black) and another for sex (D_2 = 0 for male, = 1 for female), yields result as given below. The simple correlation coefficient r and the Spearman rank correlation coefficient ρ are between M^{South}, the South's net migration scaled by the South's labor supply, and Z, the respective census year aggregate labor supplies expressed as the U.S.–to–South ratios.

Constrained Regression

$$M^{South} = 1.0 - 0.289^{a} Z_{1970} - 0.424^{a} D_1 - 0.030 D_2$$
$$(0.009) \qquad (0.034) \qquad (0.039)$$
$$R^2 = 0.993 \qquad r = -0.444 \qquad \rho = -0.810$$

$$M^{South} = 1.0 - 0.321^{a} Z_{1980} - 0.377^{a} D_1 - 0.003 D_2$$
$$(0.011) \qquad (0.034) \qquad (0.040)$$
$$R^2 = 0.992 \qquad r = -0.835 \qquad \rho = -0.810$$

Unconstrained Regression

$$M^{South} = 0.193^{a} - 0.076^{a} Z_{1970} - 0.096^{a} D_1 + 0.009 D_2$$
$$(0.073) \quad (0.020) \qquad (0.032) \qquad (0.015)$$
$$R^2 = 0.459$$

$$M^{South} = 0.064^{a} - 0.035^{a} Z_{1980} - 0.020^{a} D_1 - 0.000 D_2$$
$$(0.018) \quad (0.006) \qquad (0.008) \qquad (0.004)$$
$$R^2 = 0.778$$

The multiple regression analysis with the dummy variables reveals a similar and consistent pattern as observed in the bivariate regression, but it also shows that race, but not sex, enters significantly in the migration equation[12]. The regression analysis confirms that the pattern of net migration from the South generally follows the predicted paths derived from the national output maximization postulate and the associated real wage rate equalization.

A closer examination of the net migration pattern reveals, however, that the magnitude of direct migration in relation to the stock of labor in each category is not that large. This is seen in Table 2 that compares the 1970 stock with the 1975–80 net migration, expressing the latter as fraction of the former. What we have confirmed is that there is an interregional convergence toward more similar relative labor endowments through direct labor migration, but this process appears to work fairly slowly. As a result, the regional labor endowment profile in terms of the relative abundance or scarcity

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[12] Another set of regression estimates using the interaction term, D_1 times D_2, has shown that this term is statistically insignificant in all cases.

Table 2. Net Migration from the South, 1975–80, as Fraction of the Southern Labor Supply

Race/Sex	Years of School Completed					
	Elementary	High School		College		
	0 to 8 years	1 to 3 years	4 years	1 to 3 years	4 years	5 or more years
Black						
Male	–0.0083	–0.0175	–0.0685	–0.1659	–0.0771	–0.1275
Female	–0.0055	–0.0111	–0.0431	–0.1095	–0.0400	–0.0930
Total	–0.0068	–0.0137	–0.0539	–0.1350	–0.0526	–0.1086
White						
Male	–0.0236	–0.0361	–0.0718	–0.1054	–0.1042	–0.1406
Female	–0.0226	–0.0317	–0.0693	–0.0878	–0.0883	–0.1530
Total	–0.0231	–0.0336	–0.0703	–0.0961	–0.0967	–0.1442
All Races						
Male	–0.0235	–0.0352	–0.0756	–0.1182	–0.1114	–0.1573
Female	–0.0223	–0.0303	–0.0706	–0.0956	–0.0927	–0.1669
Total	–0.0229	–0.0324	–0.0727	–0.1063	–0.1023	–0.1603

Source: Constructed from U.S. Bureau of the Census, 1985, Subject Reports PC 80–2–2A, table 26, and U.S. Bureau of the Census, 1983, United States Summary, PC80–1–C1, table 83.

of the respective categories of labor persists over time. The appendix table presents the relative labor–endowment profile of the U.S. South derived from the five census years of 1940 through 1980. The strong demographic characteristics of the South (i.e., the relative concentration of the less educated and the black population) remained over the period.

V. Interregional Trade

Given that the magnitude of interregional migration is somewhat limited, even for the otherwise mobile and efficient U.S. economy, the obvious question that arises is how this fact can be reconciled with the implications of national output maximization. In particular, what is the mechanism that allows the attainment of real (and hence, relative) wage rate equalization between regions? The key to this puzzle can be found in the H–O theory of trade, and in particular, in the H–O–V (Heckscher–Ohlin–Vanek) factor–content version of the theory.

According to the H–O–V model, the commodity trade can be viewed as a vehicle that carries out the exchange of factor services that are used (and hence, embodied) in the production of the traded goods. It turns out that under conditions that bring about factor–price equalization, the pattern of embodied factor trade is determinate and can be linked directly to the endowment characteristics of the trading areas, as initially demonstrated by Vanek (1968). Interestingly, this pattern of embodied factor trade closely resembles in its form to eq. 6, in which the net labor migration on the left–hand side is to be replaced by embodied net labor services traded. This can be demonstrated as follows.

Following Bowen *et al* (1987), we can write the H–O–V equation in the present 2–region framework as

(7) $$CT^{AB} = (X_0^A)I - \gamma(X_0^A + X_0^B)I$$

where $C = mxn$ matrix of labor coefficients of production, indicating each of the m–type labor requirements per unit of output produced in the respective industries; $T^{AB} = nx1$ vector of net commodity trade (outflow minus inflow) of A in trade with B; X_0^A, X_0^B = mxm diagonal matrix containing the respective region's labor supplies as in equation (5); $I = nx1$ identity vector; and γ = region A's share of total national (A plus B) consumption, which is identical across goods under identical and homothetic consumer preferences. Because of the interregionally identical production functions and the relative wage rate equalization, the proportion of factor services consumed in A is also identical across all factors and equals γ [13]. Hence,

(8) $$(X_0^A)^{-1} CT^{AB} = I - \gamma(X_0^A)^{-1}(X_0^A + X_0^B)I$$

Note that the left–hand side of equation (8) maps the n–dimensional net commodity trade into the m–dimensional factor space, expressing in vector form A's net trade–embodied factor–service flow as a fraction of the corresponding aggregate supply in A. Denote that typical element of trade–embodied net labor service flow as t_j^{AB}, $j = 1, ...m$. It immediately follows from equation (8) that

(9) $$t_j^{AB} = 1 - \gamma z_j^A \ (j = 1, ... m)$$

where z_j^A is the same argument as given in equation (6). We can now turn to an empirical test of this implication of trade.

VI. Empirical Evidence

The interregional trade data used in this section comes from the 65–industry (manufacturing) state–by–state shipments contained in the Multiregional Input–Output (MRIO) Accounts for 1977, compiled for and distributed by the U.S. Department of Health and Human Services[14]. I aggregated the state–by–state shipments into the South vs. non–South regional classification, netting out all intra–regional inter–state shipments to conform with the two–region specification of the U.S. national economy.

The labor coefficients contained in the C–matrix are assessed on the basis of the 1970 Census tabulation of the educational attainment characteristics of civilian labor force employed by industry[15]. Since the census industry classification used for this tabulation is more aggregative than the MRIO classification, I aggregated the latter to 20–industry classification for maximum conformity with the census classification, following the detailed SIC codes in the two data sources. In addition, since this census source reports only the total (all races combined), and the black only labor force educational

[13] It can be shown that the parameter γ also equals the region's share in the national income adjusted for commodity trade imbalance (if any) as follows: $\gamma = (y^A - b^A)/(y^A + y^B)$, where y^A and y^B denote the respective region's aggregate income and b^A equals A's overall trade imbalance ($b^A > 0$ for trade surplus, and $b^A < 0$ for trade deficit).

[14] For details on this MRIO model see Weinberg (1983).

[15] U.S. Bureau of the Census, 1973, Subject Reports PC(2)–7B, table 4.

characteristics in terms of the number of school years completed, I am unable to obtain the three-way breakdown of race as in Section IV. Therefore, what follows is assessed only in terms of the total embodied labor flows, combining all races and both sexes.

Constrained Regression

$$T^{South} = 1 - 0.288^{a} Z_{1970}$$
$$(0.016)$$
$$r = -0.851 \qquad \rho = -0.714$$
$$T^{South} = 1 - 0.322^{a} Z_{1980}$$
$$(0.017)$$
$$r = -0.799 \qquad \rho = -0.657$$

Unconstrained Regression

$$T^{South} = 1.039^{a} - 0.014^{b} Z_{1970}$$
$$(0.15) \qquad (0.004)$$
$$r = -0.851 \qquad \rho = -0.714$$
$$T^{South} = 1.025^{a} - 0.010^{b} Z_{1980}$$
$$(0.12) \qquad (0.003)$$
$$r = -0.799 \qquad \rho = -0.657$$

The estimated regression coefficients are negative as predicted and statistically significant in all cases. The level of significance is reduced in the unconstrained regression, but significance at the 0.05 level is retained. Interestingly, the unconstrained regression has yielded intercept estimates that are very close to unity, the theoretical parametric value. The simple correlation coefficient indicates that about 72% of the variation in the net embodied labor-service flows is explained by the 1970 relative labor-supply ratios, and 64% with the 1980 ratios. These are strong empirical results that are consistent with the notion that the U.S. interregional commodity trade essentially replicates the pattern of labor migration that would occur under conditions of perfect labor mobility.

VII. Concluding Remarks

It is well known that under appropriate conditions, free trade with complete factor immobility between trading areas can bring about factor-price equalization, a powerful implication of the consequence of trade on domestic income distribution. But within a national economy, both real and relative wage rate equalization is an efficiency requirement of national output maximization as emphasized in this paper. Absolute wage rate equalization may also occur, but only if the absolute commodity prices are equalized between regions. It requires an additional interregional arbitrage mechanism with perfect commodity mobility that may be difficult to satisfy, as the persistence of substantial nominal wage disparities among the U.S. regions amply attests. Absolute wage rate equalization is not an efficiency requirement of output maximization.

The real wage rate equalization, in turn, implies a pattern of net migration that will make the regional labor–supply characteristics similar between regions. Our empirical evidence is consistent with this homogenizing implication of migration. We have also observed, however, that the extent of convergence is somewhat limited, implying the presence of substantial costs associated with direct labor migration. As a consequence, strong regional labor–endowment characteristics remain over time. In this respect, it is of particular interest to discover that the interregional commodity trade is mimicking the same pattern of labor migration, albeit in an indirect and embodied form.

The embodied trade adjustment must, of course, occur on a continuing flow basis, in contrast with the one–time stock adjustment of direct labor migration. What our evidence suggests, therefore, is that with less than perfect labor mobility as well as imperfect commodity mobility, the actual interregional labor migration and commodity trade between the U.S. South and the rest of the country are complementary in the sense that they reinforce each other with a similar stock *and* flow adjustment satisfying the efficiency requirement of national output maximization.

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Appendix Table. The Relative Supplies of Labor, South/U.S., Census Years 1940–1980

Year Race/Sex	Elementary 0 to 4 years	Elementary 5 to 7 years	Elementary 8 years	High School 1 to 3 years	High School 4 years	College 1 to 3 years	College 4 years	College 5 or more years
1980								
Black								
Male	0.7338	0.6456	0.5336	0.5050	0.4678	0.4187	0.4748	0.4493
Female	0.7218	0.6623	0.5625	0.5198	0.4603	0.4156	0.5511	0.5128
Total	0.7283	0.6547	0.5501	0.5136	0.4635	0.4170	0.5179	0.4830
White								
Male	0.5160	0.4602	0.2832	0.3387	0.2808	0.2995	0.3096	0.2865
Female	0.4412	0.4608	0.2846	0.3666	0.2804	0.2939	0.3120	0.2766
Total	0.4788	0.4605	0.2839	0.3543	0.2805	0.2966	0.3107	0.2829
All Races								
Male	0.5356	0.4740	0.3006	0.3555	0.2940	0.3049	0.3115	0.2884
Female	0.4684	0.4804	0.3076	0.3831	0.2930	0.3007	0.3214	0.2893
Total	0.5024	0.4773	0.3044	0.3710	0.2934	0.3027	0.3161	0.2887
1970								
Black								
Male	0.7339	0.6136	0.4763	0.4461	0.3855	0.3608	0.4831	0.4484
Female	0.7260	0.6368	0.5184	0.4810	0.3865	0.3805	0.5861	0.5333
Total	0.7304	0.6260	0.4999	0.4664	0.3861	0.3714	0.5465	0.4913
White								
Male	0.4515	0.3944	0.2359	0.2924	0.2442	0.2690	0.2842	0.2529
Female	0.3877	0.3991	0.2408	0.3218	0.2416	0.2732	0.2927	0.2404
Total	0.4204	0.3967	0.2384	0.3083	0.2427	0.2712	0.2882	0.2491
All Races								
Male	0.5187	0.4275	0.2522	0.3080	0.2520	0.2718	0.2876	0.2557
Female	0.4607	0.4405	0.2632	0.3408	0.2496	0.2771	0.3059	0.2550
Total	0.4910	0.4340	0.2579	0.3260	0.2506	0.2746	0.2962	0.2555
1960								
Black								
Male	0.7644	0.6252	0.4421	0.4230	0.3793	0.3837	0.5107	n.a.
Female	0.7674	0.6718	0.5001	0.4785	0.3980	0.4061	0.6180	n.a.
Total	0.7657	0.6503	0.4741	0.4549	0.3903	0.3957	0.5725	n.a.
White								
Male	0.4187	0.3550	0.1998	0.2486	0.2321	0.2565	0.2603	0.2403
Female	0.3728	0.3741	0.2052	0.2667	0.2348	0.2607	0.2824	0.2387
Total	0.3975	0.3642	0.2025	0.2581	0.2337	0.2587	0.2702	0.2399
All Races								
Male	0.5043	0.3921	0.2140	0.2618	0.2377	0.2605	0.2661	0.2446
Female	0.4680	0.4248	0.2260	0.2866	0.2416	0.2661	0.3000	0.2558
Total	0.4877	0.4081	0.2201	0.2750	0.2400	0.2635	0.2816	0.2479
1950								
Black								
Male	0.8109	0.6657	0.4580	0.4575	0.3519	0.4523	0.5511	n.a.
Female	0.8115	0.7058	0.5155	0.5013	0.3797	0.5228	0.6238	n.a.
Total	0.8112	0.6875	0.4897	0.4828	0.3680	0.4914	0.5924	n.a.
White								
Male	0.3961	0.3587	0.1775	0.2560	0.1932	0.2507	0.2327	n.a.
Female	0.3550	0.3659	0.1822	0.2732	0.1981	0.2607	0.2556	n.a.
Total	0.3769	0.3622	0.1799	0.2669	0.1960	0.2560	0.2424	n.a.
All Races								
Male	0.5030	0.4012	0.1900	0.2718	0.1981	0.2569	0.2395	n.a.
Female	0.4717	0.4232	0.2006	0.2902	0.2040	0.2700	0.2701	n.a.
Total	0.4884	0.4121	0.1953	0.2815	0.2015	0.2640	0.2526	n.a.
1940								
Black								
Male	0.8238	0.7078	0.4029	0.4960	0.3986	0.4793	0.5501	0.4383
Female	0.8371	0.7565	0.4668	0.5581	0.4699	0.6264	0.6570	0.5127
Total	0.8299	0.7340	0.4366	0.5320	0.4396	0.5621	0.6049	0.4613
White								
Male	0.3591	0.3569	0.1376	0.2488	0.2100	0.2606	0.2242	0.2140
Female	0.3344	0.3697	0.1416	0.2553	0.2098	0.2730	0.2713	0.2140
Total	0.3480	0.3630	0.1395	0.2522	0.2099	0.2674	0.2455	0.2140
All Races								
Male	0.4860	0.4030	0.1469	0.2600	0.2153	0.2670	0.2325	0.2178
Female	0.4742	0.4320	0.1550	0.2727	0.2172	0.2843	0.2837	0.2200
Total	0.4807	0.4172	0.1508	0.2666	0.2164	0.2766	0.2557	0.2184

Source: Constructed from U.S. Bureau of the Census, 1983, United States Summary, PC80–1–C1, table 83.