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DISCUSSION PAPER

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DISCUSSION PAPER

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TEMPORAL STABILITY OF REGIONAL WAGE DIFFERENTIALS IN BRAZIL^{*}

William D. Savedoff^{**}

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ABSTRACT

This paper focuses on regional differentials in income, and particular wages. It discusses some of the explanations for these differentials, and their implications. Using evidence from several sources, the paper shows that regional wage differentials are highly stable in Brazil, raising questions about neo-classical theories of wage determination and lending support to structural and market segmentation theories.

I. INTRODUCTION

Regional income distribution is more highly concentrated in Brazil than in any other country in the world. The regional disparities appear to have persisted over a long period of time in spite of enormous changes in the Brazilian economy. Many authors have predicted the convergence of regional incomes, yet in the 1980s a Northeastern unskilled worker can still almost double his or her income by obtaining comparable employment in São Paulo. This paper focuses on regional differentials in income, and particularly wages. It discusses some of the explanations for these differentials, and their implications. Using evidence from several sources, the paper shows that regional wage differentials are highly stable, raising questions about neo-classical theories of wage determination and lending support to structural and market segmentation theories.

II. APPROACHES TO REGIONAL WAGE DIFFERENTIALS

Three approaches to regional wage differentials can be identified in the literature: an equilibrium approach focusing on compensating differentials, a disequilibrium approach with temporal adjustment, and a structural approach which incorporates theories of labor market segmentation.

In the equilibrium approach regional nominal wage differentials are seen as a reflection of compensation for conditions which vary across regions, affecting the real value of earnings to the individual worker. More specifically, nominal wage disparities may reflect differences in the cost of living, i.e. regional price levels. This approach is taken by Vinod Thomas (1987:267) in his appraisal of regional wage differentials, arguing that they predominantly, if not solely, reflect the difference in cost of living across regions. By implication, nominal wages will only converge when the regional price levels equalize.

The disequilibrium approach takes a more dynamic view of economic patterns and incorporates a wide variety of market mechanisms. This approach, like the first, argues that market forces act to equalize wages across regions; however, it accepts the idea of real wage differentials which are a temporary result of imperfect market adjustments.

Obstacles to market adjustment can generate costs which hinder wage equalization. For example, transportation costs can act as an obstacle to market adjustment, since the incentive for labor to migrate to high wage areas would be offset by costs of travel. Along these lines, Meneghetti (1988) argues that transportation costs were significant in deterring migration until the 1950s, but that they have declined in the last few decades. He estimates that in 1960 a 10% increase in distance reduced migration by some 18% while in 1980 it reduced migration by only 0.6%. This view then sees regional differentials as a reflection of the costs of adjustment. Since these costs have been declining over time, this would imply a convergence in wages as well.

A disequilibrium approach can also emphasize lags in labor market adjustment. In a rapidly growing and industrializing economy, wage differences between workers with varying skill levels might increase due to the low short-run elasticities of supply for educated workers. To the degree that the Southeast of Brazil has a more educated and skilled workforce, this argument would view the regional disparities as a temporary phenomena that will resolve itself once adjustments are made by workers entering the labor force, and those who choose to undergo more training to obtain the premium wages offered to skilled labor (consider Langoni 1974:72-76). This view would imply that regional differences in average real wages may persist as long as the regional composition of the workforce varies in terms of skill and productivity. Regional variation in real wages for comparable workers, however, should not persist.

Factor price equalization may occur in developing economies through other channels as well: capital flows, labor flows, regional product specialization, as well as compensating public policy. Williamson (1965) considered a full range of such mechanisms in his study of 24 countries, among which Brazil had the highest measured level of regional inequality (using data from 1950-1959). He argued that economies of agglomeration in initial periods of growth favor regional concentration of income, but that as growth continues these advantages are lost. Poorer regions, then, will begin to match and surpass the pace of growth in richer areas. Based on Brazil's level of per capita income, he predicted that it had passed its secular peak of regional disparities and income would become increasingly more equally distributed with time (p. 11-13). More recent evidence has not borne this out (Almeida dos

Reis 1989).

The expectation in such disequilibrium views that real wages will converge is stated explicitly by Pfefferman and Webb (1983). Using a variety of data sources from 1960 to 1980, they conclude that "the convergence of rural and urban wages for unskilled labor as well as the convergence between wages in different parts of Brazil suggest the emergence of an increasingly homogeneous national labor market." (p. 108). Their own work, however, shows a very stable relationship between the Northeast and São Paulo in urban differentials, and bases its claim for regional convergence on the rapid rise in wage rates for agricultural and skilled construction workers in the Northeast relative to those in São Paulo over a fairly short period of time, the decade of the 1970s.

These arguments that regional wage differentials will converge over time are based on evidence of the increasing integration of the Brazilian economy. Interstate trade tripled from 1943 to 1961 and then increased about ten-fold in the next 20 years (Ablas & Fava 1985). As a share of GDP, interstate commerce grew from 16% in 1947 to 33.5% in 1976 (Ablas & Fava 1985). In physical terms, kilometers of roadway increased 200% from 1960 to 1980; the bus fleet grew 1622% and the number of telephones installed increased by 669% over the same period. (Meneghetti 1988). Public policy with incentives for regional redirection of investment led to an integration of capital markets across Brazil in the 1960s (Guimarães Neto 1984). The economy which was characterized in the early 1960s by Werner Baer as an "archipelago of island economies" is today frequently discussed as a vibrant well-integrated national economy. As a consequence of this increased integration, those who take the disequilibrium approach predict a continued convergence of regional income and wages.

The third approach, the structural approach, is the only one that predicts the continuance of regional wage differences. It argues that regional wage variation reflects underlying differences between regions which are continually reproduced in spite of the increasing integration of national markets--and sometimes because of this increasing integration. For example, Werner Baer argues that "centripetal" processes--mechanisms leading toward continuing regional polarization of income--dominated in Brazil through the early 1960s. In his estimation, the Southeast was favored by net flows of

private capital, the internal balance of trade, and exchange rate and industrial policies that subsidized the import-substituting industries of the Southeast. Furthermore, the net impact of migration had been negative for the Northeast by in draining the region of its skilled and educated workers. He concluded that regional disparities would continue to grow (Baer, 1964:283). Numerous studies also articulate this view (Furtado 1976; Mitchell 1981).

In this structural approach, a stable pattern of wage differentials reflects two major features. First, poorer regions have fewer productive resources and thereby remain at a disadvantage relative to more dynamic growth centers in expanding their productive base. For example, the workforce in the Northeast is less educated on average than in the Southeast, which hinders future education and educational opportunities (Consider Berhman and Birdsall 1983). Secondly, the structure of labor demand is such that workers with comparable skills and experience have fewer opportunities for high paid employment in the Northeast. Regional differences in wages, then, will be visible in the composition of the regional workforce in terms of education, and the composition of regional labor demand in terms of sectors of economic activity. This has been confirmed for Brazil in various studies (Fishlow 1972; Almeida dos Reis 1989).

This structural approach looks at the dynamics of spatial development in Brazil. The metropolitan region of São Paulo became the the center of economic growth and capital accumulation in Brazil around the turn of the century (Ablas & Fava 1985). Since that time, the most rapid growing and highest paying sectors of industry have all continued to be concentrated in São Paulo, with some slight deconcentration occurring in the 1970s (See Abilas & Fava, also Storper for the 1980s). The dispersion of economic growth in terms of high productivity industries is concentrated on areas which have traditionally been linked to São Paulo: Rio de Janeiro, Belo Horizonte, and Paraná. More recently, Bahia and Recife have experienced rapid industrialization, but their commerce and pace of growth remain strongly tied to the performance of the Southeast (Gomes, Jatobá, Guimarães Neto, Abilas & Fava). Consequently, this view of spatial economic development sees the growth process as spurred by central dynamic areas (primarily São Paulo) which impel related growth in peripheral areas. Wage and income differentials will persist in this view, so long as the peripheral areas do not match the productivity or self-sustaining vigor of the center.

It is important to note that structural views of spatial economic development are not in themselves sufficient to explain the divergence of wages. Fishlow's work is instructive in this regard since it lays out the basis for regional differentiation of income based on differential composition of labor supply and demand, but it leaves implicit the notion that wages do not equalize for comparable workers across sectors. Hence, any structural view of regional disparities must incorporate as well theories of labor market segmentation--sectoral, occupational or geographical--to account for continued divergence of wages.¹

If regional wage differentials are a persistent phenomena, then it presents a serious challenge to the equilibrium and disequilibrium approaches. The disequilibrium approaches in particular predict a convergence in regional wages as a consequence of the growing integration of the Brazilian economy. The equilibrium approach would be challenged by the persistence of real wage differentials, nominal wages adjusted for variations in the regional price levels. The persistence of regional wage differences would support the structural approach, but require that such approaches incorporate theories of labor market segmentation.

III. A CROSS-SECTIONAL ANALYSIS

In 1986, nominal wages were on average 80% higher in the metropolitan region of São Paulo than in the metropolitan region of Fortaleza.² This in itself does not refute equilibrium or disequilibrium approaches since, as mentioned above, it could be a result of cost of living differences or obstacles to migration according to the equilibrium approach, or a temporary

¹Of the potential explanations for market segmentation, the one most widely studied and which is gaining considerable theoretical rigor is that of inter-industry segmentation. Empirical work includes Summers, Lang, Dickens and Katz. Theoretical pieces include Stiglitz, Bulow and Summers, etc. Recent findings support the contention that a large part of regional variation in Brazil is accounted for by sectoral composition of labor demand (Savedoff, forthcoming).

²Except where noted, any reference to cities in the text is a reference to the metropolitan region associated with that city.

and passing aberration according to the disequilibrium view.

Table 1 shows the results of a study of the regional wage differentials for 1986 using a sample of non-agricultural employees in Brazil's nine major metropolitan regions.³ The differentials in this table are derived from the coefficients of an earnings function which regressed log hourly wages on a variety of variables, including regional price level, education, experience, work card status⁴, gender, head of household status, occupation, sector of economic activity, and metropolitan region of residence. This cross-sectional analysis, using observations on individuals, makes it possible to estimate the regional wage differences which remain after controlling for spatial variation in the composition of the employed workforce and of labor demand.⁵

³The nine metropolitan regions are: Belém, Recife, Fortaleza, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, and Porto Alegre. The Distrito Federal was excluded because of the concentration of public sector activity in that region.

⁴Private employers in Brazil are required by law to sign an employee's work card. This card entitles the worker to all of the rights, guarantees and benefits provided by law, including a year-end bonus salary, vacation and sick pay, access to employment security, etc. In my interviews with representatives of businesses and unions in Rio de Janeiro and Recife during 1989, it was generally agreed that firms largely control the decision of whether to provide work cards. In making this decision, the firm weighs the benefits in terms of reduced labor costs (no wage bill taxes) against the potential fines and penalties imposed by the government if they are caught. Hence, work card status is strongly related to the visibility and permanence of the workplace--more likely for retail sales people in an open bakery than for a subcontracted construction worker, regardless of their personal characteristics.

⁵Details of the estimation and methodology appear in Savedoff (forthcoming).

Table 1

Effects of Adjustments for Cost of Living and Controls
on Regional Wage Differentials

PNAD 1986 -- All Employees -- N=27,575

(Differences from Sample Mean)

-----Without Controls for Other Characteristics-----

	Nominal Hourly Earnings		Real Hourly Earnings		N
	Difference	STD	Difference	STD	
Belem	-21.1%	2.0%	-11.7%	2.0%	1,941
Fortaleza	-43.5%	1.9%	-24.5%	1.9%	2,116
Recife	-32.3%	1.9%	-18.2%	1.9%	2,323
Salvador	-10.7%	1.9%	-9.6%	1.5%	2,177
Belo Horizonte	-7.7%	1.3%	-2.5%	1.3%	4,068
Rio de Janeiro	-0.7%	1.4%	-10.2%	1.4%	3,944
Sao Paulo	36.8%	1.1%	23.1%	1.1%	5,536
Curitiba	9.8%	1.5%	15.4%	1.9%	2,172
Porto Alegre	11.7%	1.5%	7.6%	1.5%	3,500
Standard Deviation of Differentials	24.0%		15.4%		

-----With Controls for Other Characteristics-----

	Nominal Hourly Earnings		Real Hourly Earnings		N
	Difference	STD	Difference	STD	
Belem	-17.3%	1.2%	-7.8%	1.2%	1,941
Fortaleza	-25.1%	1.2%	-6.0%	1.2%	2,116
Recife	-25.7%	1.1%	-11.6%	1.1%	2,323
Salvador	-11.9%	1.2%	-10.8%	1.2%	2,177
Belo Horizonte	-1.0%	0.8%	4.1%	0.8%	4,068
Rio de Janeiro	-7.4%	0.8%	-16.9%	0.8%	3,944
Sao Paulo	29.9%	0.7%	16.2%	0.7%	5,536
Curitiba	6.8%	1.1%	12.4%	1.1%	2,172
Porto Alegre	7.4%	0.9%	3.3%	0.9%	3,500
Standard Deviation of Differentials	18.2%		11.7%		

STD = Standard Deviation of Estimated Differential

Control Characteristics include years of education and its square; experience and its square; interaction of education and experience; gender; head of household; work card status; 9 occupation dummies; and 37 sectoral dummies.

As can be seen in Table 1, nominal earnings are widely dispersed, with a weighted standard deviation of 0.240. This nominal wage dispersion is slightly less than the dispersion of nominal monthly income, indicating that to some degree people in lower wage areas try to compensate by working longer hours. The difference is very small, however, so that we can think equally of the disparities in monthly income or wages.

Adjusting the nominal wage differentials for variation in the cost of living does diminish the variation significantly by some 36% to 0.154. Controls for worker characteristics and composition of labor demand reduce the variation further to 0.117. Nevertheless, even after all these adjustments, regional wage differentials remain large and significant. An average worker in Recife can obtain a 27% real wage gain by obtaining comparable employment in São Paulo. Also, notice that the pattern of regional wage differentials is not significantly altered by the price adjustments or controls. The two sets of regional wage differentials, before and after adjustment, have a corrected⁶ and weighted correlation of 0.833, significantly different from zero at the 1% level.

The regional wage differentials shown in Table 1 exclude the impact of factors--occupational composition, industry-mix, share of jobs with work cards--which are themselves an integral part of the regional economy. If personal productivity were the only determinant of attained wages then these other factors would have limited impact on earnings. Although it was found that measures of personal productivity--education and experience--can by themselves account for some 51% of the variation in log hourly earnings, much of this explanatory power is due to the close correlation of these features with family resources and social status (Medeiros 1982). It is also largely due to the covariance of education and experience with the remaining

⁶The Pearson correlation coefficient underestimates the true correlation because the regional wage differentials are estimated with error. For example, if α and ψ are the true coefficients and they are measured with error such that, $x = \alpha + \varepsilon$ and $y = \psi + \mu$, then the uncorrected correlation is:

$$\rho = S_{xy} / \sqrt{S_x^2 S_y^2} = S_{\alpha\psi} / \sqrt{(S_\alpha^2 + S_\varepsilon^2)(S_\psi^2 + S_\mu^2)}.$$

The true correlation can be estimated as,

$$P = \rho (\sqrt{S_x^2 S_y^2}) / (\sqrt{\hat{S}_x^2 \hat{S}_y^2}),$$

where $\hat{S}_x \cong S_x - (1/n) \sum S_\varepsilon$.

explanatory variables; job characteristics and place of residence by themselves can also account for more than half of the variance in log hourly earnings, some 56%. Therefore, in addition to the residual regional impact on wages shown above, the kinds of jobs available in each region have a significant impact on an individual's potential earnings.

In sum, a careful cross-sectional analysis of 1986 survey data, controlling for regional price levels, worker characteristics, and composition of labor demand, shows that average nominal wage differentials across regions are reflective of a similar underlying pattern of average real wage differentials--which has a little less than half the dispersion of the former. Additionally, the variables associated with the structure of job opportunities in each region have a significant impact on earnings.

IV. HISTORICAL STABILITY OF REGIONAL DIFFERENTIALS

Thusfar, only one sample has been analyzed, that of PNAD data from 1986. This part of the paper shows that the disparities described above are highly stable through time, using three separate sources of data--the Instituto Brasileira de Geografia e Estatística's Industrial Census, Demographic Census, and household surveys of the 1980s (PNAD).

The Industrial Census of Brazil allows one of the longest series of regional wage comparisons (from 1949 to 1980). I selected the textile industry for analysis because a sizable sample of firms existed in each of the states selected. From the industrial census it is possible to calculate the average wage bill for male production workers as a proxy for average wages. Clearly there are problems with using this measure, since it assumes that variation in hours worked across regions and across individuals does not contribute to the variation in results.

The findings, shown in Table 2, are striking. From 1949 through 1980, the industrial census shows a highly stable pattern of regional wage differentials. The lowest correlation between any two years is a highly significant 0.88 for 1959 and 1980. All the other correlations are above 0.90. The dispersion of regional wage differentials in textiles declines from 0.218 to 0.159 in 1960, but the subsequent period--a period with the most

rapid economic integration--shows a slight increase in regional dispersion to 0.170 in 1970 and again to 0.178 in 1980. Hence, the evidence points toward some structural determination of regional wage differentials, and raises questions about theories of convergence.

Table 2

Regional Wage Differentials for Textile Industry Workers
Average Wage Bill of Male Production Workers
(% relative to weighted mean)

	1949		1959		1970		1980	
	RWD	N	RWD	N	RWD	N	RWD	N
Para	-56.5%	839	-24.4%	729	-32.0%	2917	-41.3%	2690
Ceara	-49.1%	4039	-47.9%	4596	-50.4%	4750	-48.4%	9730
Pernambuco	-31.5%	27434	-29.9%	20130	-27.8%	12616	-13.4%	14522
Bahia	-22.6%	6096	-23.3%	4298	-36.2%	3406	-15.7%	1336
Minas Gerais	-31.8%	28424	-17.9%	30063	-25.6%	30498	-25.9%	33292
Sao Paulo	14.8%	144516	9.6%	152809	10.2%	167017	11.8%	169440
Parana	-31.5%	1264	-18.4%	1989	-2.9%	3532	-12.4%	6177
Rio Grande do Sul	8.2%	7305	6.9%	6730	-11.7%	8470	-15.0%	13351
Wtd. Std. Dev.	21.8%		15.9%		17.0%		17.9%	

Temporal Weighted Correlations

	1949	1959	1970	1980
1949	1.00	-	-	-
1959	0.98 (13.88)	1.00	-	-
1970	0.98 (11.92)	0.95 (7.54)	1.00	-
1980	0.91 (5.38)	0.88 (4.56)	0.97 (9.07)	1.00

Note: t-statistics in parentheses.

Source: Calculated from IBGE, Industrial Census.

The analysis was also undertaken for 1960 to 1980 using the Demographic Census. The results (see Table 3) show a similar stability of regional wage differentials. In this case, the data was obtained for men with four years of schooling in each of 8 states. The pattern is highly correlated across all three censuses. The dispersion increases between 1960 and 1970 from 0.135 to 0.173 and declines slightly to 0.150 in 1980.

Table 3

Regional Wage Differentials for Men with Four Years of Education
Demographic Census - 1960, 1970, and 1980

	-----	1960	-----	-----	1970	-----	-----	1980	-----
	Diff	MEAN	N	Diff	MEAN	N	Diff	MEAN	N
	From Mean			From Mean			From Mean		
Para	-27.3%	6870.98	19711	-34.8%	224.89	28928	-16.9%	2.63	136176
Ceara	-30.9%	6532.02	21832	-36.4%	219.28	28585	-29.6%	2.23	125011
Pernambuco	-35.2%	6125.09	51411	-26.8%	252.40	60141	-29.5%	2.23	210548
Bahia	-29.3%	6682.98	45145	-24.5%	260.26	57963	-9.8%	2.86	269766
Minas Gerais	-11.9%	8322.27	368486	-18.5%	281.04	473111	-14.8%	2.70	926581
Sao Paulo	10.9%	10474.72	1020270	15.0%	396.56	1477417	18.6%	3.76	2196785
Parana	-1.9%	9270.15	153494	-11.7%	304.36	231743	-7.3%	2.94	496959
Rio Grande do Sul	-19.5%	7600.58	180265	-28.7%	245.76	186339	-5.5%	3.00	796396
Wtd. Std. Dev.	13.5%			17.3%			15.0%		

Temporal Weighted Correlations

	1960	1970	1980
1960	1.00	-	-
1970	0.96 (8.32)	1.00	-
1980	0.93 (6.44)	0.94 (6.77)	1.00

Note: t-statistics in parentheses.

Source: Calculated from IBGE, Demographic Census.

The patterns from all three sources (See Tables 1, 2, and 3) are very similar. All show São Paulo, or the state of São Paulo, as the leading high wage area, with the northeastern regions among the lowest. The areas of the South (Curitiba in Parana and Porto Alegre in Rio Grande do Sul) show important differences from one data set to the next, but these differences may have more to do with switching geographical definitions (metropolitan region to state) or types of control (sectoral in the industrial census, education in the demographic census).

More detailed analysis of regional differentials is possible for the 1980s, using the IBGE's household survey data (PNAD). These surveys show the regional wage pattern to be highly stable over short periods as well. Table 4 shows the regional wage pattern from 1981 to 1987 after adjustment for regional price level, work card status, gender, head of household status, occupation, and sector. Again the pattern is highly consistent and the dispersion increases from 0.09 (1981) to 0.12 (1987).

Table 4

Adjusted Real Regional Wage Differentials
Relative to Mean for Metropolitan Regions
PNAD Data, 1981-1987

	1981	1982	1983	1984	1985	1986	1987
Belem	-0.16	-0.12	-0.08	-0.02	0.05	-0.08	-0.12
Fortaleza	-0.07	-0.06	-0.05	-0.04	-0.08	-0.06	-0.16
Recife	-0.07	-0.04	-0.02	-0.06	0.04	-0.12	-0.13
Salvador	-0.04	0.03	0.05	0.01	0.01	-0.11	0.04
Belo Horizonte	0.12	0.10	0.05	0.01	-0.00	0.04	0.04
Rio de Janeiro	-0.10	-0.13	-0.13	-0.14	-0.16	-0.17	-0.16
Sao Paulo	0.08	0.07	0.06	0.07	0.07	0.16	0.14
Curitiba	0.12	0.10	0.11	0.10	0.10	0.12	0.17
Porto Alegre	0.01	0.03	0.02	0.06	0.06	0.03	0.09
Standard Deviation	0.09	0.09	0.07	0.08	0.08	0.12	0.12



Temporal Correlations
of Adjusted Real Regional Wage Differentials

	1981	1982	1983	1984	1985	1986	1987
1981	1.00	***	**	*	*	**	**
1982	0.97	1.00	***	**	*	***	**
1983	0.87	0.93	1.00	***	**	**	***
1984	0.72	0.83	0.91	1.00	***	**	***
1985	0.58	0.72	0.83	0.96	1.00	*	**
1986	0.83	0.88	0.83	0.89	0.81	1.00	**
1987	0.84	0.88	0.91	0.92	0.84	0.89	1.00

Notes: Adjustments for workforce composition, labor demand, and price levels are listed in Table 1.

- * Indicates statistically significant at the 5% level;
- ** Indicates statistically significant at the 1% level;
- *** Indicates statistically significant at the 0.1% level.

The middle of the decade is less correlated with the remaining years--for 1985 in particular.⁷ Nevertheless, this pattern is not synchronized with Brazil's recessions and recoveries. Highly correlated patterns occur in years of economic growth (1986, 1987) and stagnation (1981, 1982), while lower correlations also occur in years of growth (1984, 1985) and recession (1983). Further analysis of this short term variation is necessary. For the purposes of this paper, however, it is sufficient to show that overall the 1980s display highly correlated regional wage differentials and, if anything, a trend toward greater dispersion.

V CONCLUSIONS

Regional wage and income disparities are highly correlated across time as shown by a variety of controlled and uncontrolled data sources. This stability challenges equilibrium and disequilibrium theories of regional wage differentials and lends support to structural theories. Further investigation is necessary to determine the nature of the structural differences that generate and sustain these disparities. A large part of the regional wage differences, not accounted for by individual characteristics of workers, appears to derive from segmentation of labor demand, by industry, occupation, and work card status; but the evidence is only suggestive.

The stability of the regional wage differentials, however, bears on the regional concentration of poverty among the working population, to the degree that it indicates a persistent skewing of income opportunities by place of residence. Although many Brazilians have improved their incomes through migration to high wage areas, the stability of regional wage differentials indicates some limitations on access to jobs and income opportunities, in contrast to the relatively unfettered access implicit in the equilibrium and disequilibrium theories.

⁷The pearson correlation coefficient underestimates the true correlation as noted on page 10. Correcting for the errors in estimation would yield even stronger measures of correlation. For example, the corrected correlation between the regional wage differentials of 1981 and 1985 is 0.73 with a t-statistic of 2.79, instead of the uncorrected correlation of 0.58.

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