Worker Mobility, Residential Choice, and the Allocation of New Jobs

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Keywords: Fiscal impact models, economic impact assessment, commuting

Selected paper to be presented at the 2001 American Agricultural Economics Association meetings, Chicago, IL, August 5-8,. 2001.

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ABSTRACT

We estimate a local labor market model for North Carolina. The model accounts for inter-county commuting – in addition to within-county labor market adjustments – when a labor demand shock occurs. Econometric results indicate that migration accounted for no more than 20 to 30 percent of county labor market adjustment to employment growth during the decade of the 1980s, and that most employment growth was accommodated by changes in commuting flows.

INTRODUCTION

Economic development policies at the municipal, county, and state levels are typically oriented toward stimulating employment growth. The measuring stick most commonly used for gauging the success of a particular development policy or program – as well as the individuals charged with formulating and implementing it – is the number of new jobs it creates. Widespread appreciation for spillovers of direct employment shocks via local production and consumption linkages reinforces the competition among jurisdictions of all sizes for attracting new firms and industries.

To the extent that it stimulates additional commercial and residential development, local employment growth is accompanied by increasing demands for publicly provided goods and services such as schools and infrastructure. The local fiscal impacts of this may be profound, particularly in an era in which devolution has shifted an ever greater share of public goods provision from the federal government to state and county governments. Correspondingly, there has been growing interest among regional economists in developing fiscal impacts models capable of predicting the impacts of employment growth on local government revenues and demands for publicly provided goods and services.

Accurately modeling the local fiscal impacts of employment growth requires knowledge of who actually gets those new jobs. Early fiscal impacts models tended to assume – often implicitly – that local labor markets cleared internally in the sense that the new jobs that a firm or industry brings to a community are taken entirely by residents of the community (Burchell, et al., 1985; Siegel and Leuthold 1993). The new employees might be new residents (in-migrants). In this case employment growth within a county translates into a one-to-one increase in population, and with it a concomitant rise in the demands for publicly provided goods and services. Alternatively, the new employees might be current residents of the county, either emerging from the ranks of the unemployed or newly entering the labor force. In this case, population would remain constant, and demands for publicly provided goods and services would increase by a much smaller amount.[1]

While at the state level the great bulk of newly created jobs appear to go to in-migrants – at least in the long run (Blanchard and Katz, 1992; Bartik, 1993) – the situation is likely to be much more complex at a lower level of spatial aggregation level. Recent empirical work indicates that increased mobility has led more and more workers to commute ever-greater distances in response to shifting employment opportunities (Shields, 1999; Swenson and Eathington, 1999; Renkow and Hoover, 2000). Moreover, theoretical work by Zax (1994) suggests that given positive relocation costs, households are less likely to simultaneously change residence and workplace *within* a given geographical region than they are to only change workplace.

[1] Recently, a number of researchers have come together under the aegis of the Community Policy Analysis Network (CPAN) to develop county-level fiscal impact models that seek to take explicit account of residential and workplace mobility (Swenson, 2000). Employing a common macroeconomic framework, the CPAN models link county employment growth to county population growth, inter-county commuting patterns, local tax revenue generation, and shifts in local demand for publicly provided goods and services (Halstead and Johnson, 1987; Swallow and Johnson, 1987; Johnson, Scott, and Ma, 1996; Shields, 1998; and Swenson and Otto, 2000).

To the extent that laborers respond to new employment opportunities by changing their workplace without changing residence, models that assume that new jobs in a community are taken exclusively by residents of that community, or exclusively by in-migrants, will provide inaccurate estimates of local labor supply response to labor demand shocks. This in turn will bias estimates of the fiscal impacts of employment growth.

In this paper a county labor market model is estimated that explicitly accounts for movements of workers across county lines – in addition to within-county labor market adjustments – when a labor demand shock takes place. The model features structural equations for in-commuting, out-commuting, labor supply, and local unemployment, relating these variables to employment changes and migration while controlling for spatial wage and housing price differentials and the spatial distribution of workers and employment opportunities within the larger regional labor market in which the county is located. The model thus allocates newly created jobs between residents of nearby counties and local residents, the latter group comprising both residents currently working outside the county and new entrants into the local labor force (including in-migrants).

We estimate the model in first differences using a two-period panel of North Carolina county level data from 1980 and 1990. Having data from two points in time is advantageous because it facilitates explicit consideration of migration flows, and because time-invariant county fixed effects that are difficult to measure can be differenced out. Econometric results indicate that between two-thirds and three-quarters of the adjustment of labor supply to new employment opportunities is accounted for by adjustments in commuting flows, and most of the remainder (20 to 30 percent) is accounted for by migration. We conclude from this that the fiscal impacts associated with residential demands for publicly provided services (e.g., schools) and residential provision of tax revenues (e.g., property taxes) will be substantially smaller than is commonly supposed.

The paper is organized as follows. The next section lays out an analytical framework for examining the allocation of new jobs in a local economy. Next, an empirical model is suggested for implementing the analytical framework. Following discussions of data used, estimation results are presented and discussed. Some concluding remarks are found in the final section.

ANALYTICAL FRAMEWORK

To model the market level response of labor demand shocks, we employ the analytical framework that underpins the fiscal and economic impact models of Johnson, Scott, and Ma (1996), Swenson and Otto (2000), and Yeo and Holland (2000). Consider a spatial labor market composed of mobile workers living in a multiple-county commutershed. Workers are assumed to be able to move between counties in response to changes in employment and residence opportunities within the multi-county area. Thus, a working person may choose to live and work in the same county, or s/he may live in one county and commute to another.[2]

Within a given county, total employment at time t (EMP_t) is accounted for by individuals who both live and work within the county (L_t^H) plus workers who commute in from nearby counties ($INCOM_t$):

$$EMP_t = L_t^H + INCOM_t \tag{1}$$

The labor force (LF_t) within a given county is composed of individuals who both live and work in the county, workers who live in the county but work in a different county ($OUTCOM_t$), and unemployed persons ($UNEMP_t$):

$$LF_t = L_t^H + OUTCOM_{\mathrm{t}} + UNEMP_{\mathrm{t}} \tag{2}$$

Combining these expressions yields an identity partitioning a county's labor force:

$$LF_t \;=\; EMP_t \;-\; INCOM_t \;+ OUTCOM_t + UNEMP_t \qquad \textbf{(3)}$$

Totally differentiating (3) and re-arranging makes it clear that aggregate labor market responses to an employment shock in a particular county can take a variety of forms, including changes in the number of in-commuters and out-commuters, changes in the level of unemployment, and changes in size of the labor force:

$$dEMP \;=\; dLF \;+\; dINCOM \;-\; dOUTCOM \;-\; dUNEMP \qquad \textbf{(4)}$$

Equation (4) demonstrates the multiplicity of effects that may accompany employment shocks within a given county. The size of the labor force might change due to migration response and/or changes in participation rates. Unemployment rates may change. And adjustments in the volume of both out-commuting and in-commuting may occur. In-commuting adjustments are of particular interest. In the context of standard economic impact analysis, they represent "leakages" that would attenuate the impact of changes in labor demand on final demands. In the context of fiscal impact analysis, the in-commuting adjustments would tend to reduce both the demands for publicly provided services and the contribution of tax revenues (especially property tax revenues) associated with labor demand shocks. Our empirical analysis is oriented toward quantifying these adjustments.

EMPIRICAL MODEL

We posit the following set of equations describing changes in in-commuting, out-commuting, unemployment, and labor force size within a given county i:

$$\Delta INCOM_i \;=\; f^{1}(\underset{+}{\Delta EMP_i},\; \underset{?}{\Delta LF_i},\; \underset{+}{\Delta CZLF_i},\; \underset{+}{\Delta RWAGE_i},\; \underset{+}{\Delta RHOUSE_i},\; \underset{+}{METRO_i}) \qquad \textbf{(5)}$$

[2] In this paper "commuting" refers to crossing county lines to go to work.

$$\Delta OUTCOM_i = f^O(\underset{-}{\Delta EMP_i},\ \underset{?}{\Delta LF_i},\ \underset{+}{\Delta CZEMP_i},\ \underset{-}{\Delta RWAGE_i},\ \underset{-}{\Delta RHOUSE_i},\ \underset{+}{METRO_i}) \tag{6}$$

$$\Delta LF_i = f^L(\underset{+}{\Delta EMP_i},\ \underset{+}{\Delta CZEMP_i},\ \underset{+}{\Delta RWAGE_i},\ \underset{+}{METRO_i}) \tag{7}$$

$$\Delta UNEMP_i = f^U(\underset{-}{\Delta EMP_i},\ \underset{-}{\Delta CZEMP_i},\ \underset{?}{\Delta RWAGE_i},\ \underset{+}{METRO_i}, \tag{8}$$

where

$CZLF_i$ = labor force in other counties within county i's commuting zone

$CZEMP_i$ = total employment in other counties within county i's commuting zone

$RWAGE_i$ = the wage in county i relative to other counties within the same commuting zone

$RHOUSE_i$ = the cost of housing in county i relative to the cost of housing in other counties within county i's commuting zone

$METRO_i$ = a dummy variable equal to 1 for metro counties and 0 for rural counties

The expected signs of the first derivatives are given underneath the individual variables. We take the employment variables *EMP* and *CZEMP* to be proxies for labor demand within the county and within the larger commuting zone within which the county is located.[3] Hence, a positive shock to within-county employment (ΔEMP) is expected to have a positive impact on in-commuting and a negative impact on out-commuting, while a positive change in *CZEMP* is expected to have a positive effect on the number of out-commuters.[4] We further expect changes in both employment variables (ΔEMP and $\Delta CZEMP$) to be positively related to changes in the size of the labor force through effects on in-migration and participation rates, and a negatively related to unemployment.[5]

[3] We employ the 1990 delineation of commuting zones established by Killian and Tolbert (1991).

[4] Similarly, the size of the labor force in other counties within the commuting zone is indicative of the pool of potential workers; hence we expect $CZLF_i$ to be positively related to $INCOM_i$.

[5] It is possible, albeit unlikely, that unemployment could be increased by employment growth if that employment growth caused labor force participation to grow by more than the number of new jobs created.

The inclusion of the labor force change variable (ΔLF) in the two commuting equations captures the relationship between commuting and migration. The sign of its coefficient is indeterminate *a priori*; it depends on whether commuting and migration are substitutes or complements (Evers). An example of substitution between commuting and migration is the case in which positive local labor market shocks were to simultaneously lower the propensity of households to out-commute and increase the rate of in-migration – i.e., when a strong local economy *pulls in* new residents and new workers. In this event, the sign on the migration variable would be negative in the out-commuting equation and positive in the in-commuting equation. Coefficients would be of the opposite sign when commuting and migration are complements – e.g., when net in-migration into a county is a reflection of suburbanization and exurbanization.

We expect changes in relative wages to exert a positive influence on in-commuting and a negative influence on out-commuting. *Ceteris paribus*, higher relative wages may be expected to draw in workers from nearby counties and make employment opportunities in other counties comparatively less attractive to out-commuters. Higher wages are also expected to have a positive impact on labor force size by stimulating both in-migration and greater labor force participation rates.[6] Their effect on unemployment is ambiguous, however, depending on whether the positive impacts on labor force size cause more laborers to enter the market than can be accommodated by greater employment opportunities underlying wage increases.

Changes in relative housing prices are also included in the in-commuting and out-commuting equations. Increases in the relative cost of housing in a county is expected to increase the likelihood that individuals employed within that county choose to live elsewhere. Thus, we expect the sign of

[6] Strictly speaking, labor force participation is a function of the real wage within the county and its relationship to the average reservation wage of the county's workers. However, proxy for the relative wage used here – the mean county wage relative to the commuting zone average – will pick up this effect, since a change in our constructed wage variable will be dominated by within-county wage movements.

the coefficient on the housing cost variable ($\Delta RHOUSE$) to be positive for in-commuting and negative for out-commuting.

Finally, in order to account for rural-urban differences (including possible agglomeration economies in urban labor markets and other time-varying fixed effects) we included a dummy variable taking the value of 1 for a metro county and 0 for a rural county. The metro dummy is expected to have positive coefficients in all cases.

DATA AND VARIABLE CONSTRUCTION

The empirical model was implemented using 1980 and 1990 county-level data for North Carolina.[7] The commuting, employment and wage data came from the Journey-to-Work files of the Census Bureau. County-level data on unemployment and labor force size were obtained from the Employment Security Commissions of North Carolina and adjoining states, and population data were taken from the BEA's Regional Economic Information System. Employment is the number of full time job equivalents by place of work, while labor force and unemployment data are by place of residence. Commuting zone employment (*CZEMP*) for each county was calculated as the total employment within the county's commuting zone net of county employment. Commuting zone labor force (*CZLF*) data were similarly constructed. Designation of metro and rural counties is based on the BEA's 1980 definition. By this definition, North Carolina is composed of 25 metro and 75 rural counties.

Relative wages were computed based on the county average wage for six one-digit SIC categories – construction, government, manufacturing, services, transportation and communication, wholesale and retail trade. Together, these account for more than 90% of total

[7] The analysis also employed data from a handful of counties in adjoining states that belong to commuting zones also containing North Carolina counties. These include 12 counties in Virginia, 6 counties in South Carolina, 3 counties in Georgia, and one county in Tennessee.

employment in North Carolina (Renkow, Hoover, and Yoder 1997). The average wage for each industry was weighted by the number of individuals working in that industry to compute the countywide average wage. The relative wage variable ($RWAGE_i$) was then computed as the ratio of the average wage in county i to the commuting zone average wage. This is similar to the procedure used by Tokle and Huffman (1991) for measuring relative wages in their study of male and female labor force participation.

Relative housing costs were computed using Census data on the median price of a single family house in each county. Each county's median house price was divided by the weighted average of median prices for all counties within the relevant commuting zone (the weights being the number of housing units in each county).

Table 1 presents summary statistics, broken down by metro and rural counties. These indicate substantial variation in all workforce and population size components, and considerably less spatial variation in wages and housing prices. Not surprisingly, all figures are larger for metro counties than for rural counties; t-tests confirmed that these differences are significant.

RESULTS

Equations (5) - (8) were estimated by three stage least squares. An advantage of estimating the model in first difference form is that it effectively eliminates time-invariant county fixed effects that are difficult to measure. Endogenous variables in the system included the first differences (1990 – 1980) of the four dependent variables – in-commuting ($\Delta INCOM$), out-commuting ($\Delta OUTCOM$), labor force size (ΔLF), and unemployment ($\Delta UNEMP$) – as well as employment changes (ΔEMP).[8] The instrument set included 1980 values of county population,

[8] Wu-Hausman tests unequivocally rejected the null hypothesis that ΔEMP was exogenous.

population density, housing price, relative wage, commuting zone labor force and employment, county area, and the metro dummy.

The system was constrained to satisfy the identity partitioning changes in county employment into its component parts (equation 4). This meant imposing the cross-equation restriction $\beta_I - \beta_O + \beta_L - \beta_U = 1$ where β_I, β_O, β_L, β_U denote the coefficients on employment in the in-commuting, out-commuting, labor force, and unemployment equations, respectively. Finally, based on existing evidence of significant rural-urban differences in the response of commuting to various factors (Renkow and Hoover 2000), the regressions included variables interacting the metro dummy with employment, relative wages, and relative housing prices.[9]

Table 2 presents the regression results. The data fit the model well, as indicated by a system weighted R^2 of .776. In the main, parameter estimates were significant and of the hypothesized sign. In only one case – the wage by metro dummy variable in the labor force equation – was the sign wrong and the parameter estimate statistically significant.

Examination of the interactive dummies indicates that significant rural-urban differences exist in the response of the commuting variables to changes in employment. The positive impact of increased employment on in-commuting is significantly greater for metro counties than rural counties. In other words, a relatively greater fraction of new jobs in metro counties are filled by (non-resident) in-commuters than is the case for rural counties. In contrast, the negative relationship between out-commuting and employment is more pronounced in rural areas.

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[9] In addition, we experimented with two variables – the percentage of the adult population having completed either high school or college – to account for spatial differences in human capital endowments. These were uniformly not significant, nor did their inclusion have an appreciable impact on the coefficients of other independent variables. We also included county area and population density variables as proxies for travel distances (cost of commuting) and locational amenities in the two commuting equations. These variables, too, were neither significant nor did they alter the other empirical relationships presented below.

Both of these findings are consistent with the strong complementary relationship between commuting and migration in North Carolina reported by Renkow and Hoover (2000) – a phenomenon that they link to growing exurbanization of rural counties located close to metropolitan centers. The negative relationship between in-commuting and labor force growth and the positive relationship between out-commuting and labor force growth is similarly supportive of this complementarity.

Interestingly, changes in real wages and housing prices appear to be much more important determinants of labor market adjustment in metro counties than in rural counties. None of the estimated coefficients for these two variables are significant for rural counties. In contrast, wages are significant determinants of in-commuting, out-commuting and labor force in metro areas, while the relative cost of housing is significant (and of the correct sign) in the in-commuting equation.

The key empirical result of interest here lies in a comparison of the relative size of the response of the dependent variables to changes in employment. Given the cross-equation restriction forcing the employment coefficients to sum to one (as indicated in equation 4), the relative magnitudes for rural counties can be read directly off the first row of Table 2; for metro counties, employment responses are the sum of the coefficients on the employment and employment $\times$ metro dummy variables in each of the four regression equations.

The implied responses of changes in in-commuting, out-commuting, labor force size and unemployment to employment growth are summarized in Table 3. There it will be observed that the bulk of labor market adjustment to employment growth – 68.5% in rural counties and 78.5% in metro counties – is accounted for by changes in commuting flows. Changes in labor force size

– in-migration plus any increases in labor force participation – accounts for nearly all the remainder of labor market adjustment.

These findings have important implications for economic impact analysis. The fact that between one-third and one-half of new jobs are accommodated by increased in-commuting suggests that leakages associated with employment shocks are substantial. Failure to take account of these leakages translates into overstatement of increases in final demands for the county in which the shock occurs. Of course, were the spatial unit of observation to expand from county to, say, commuting zone, the magnitude of this overstatement would be attenuated.

The implications for assessing fiscal impacts of employment growth are perhaps even more striking. There has been a tendency in the impacts literature to assume that employment growth translates into equivalent population growth. Our results offer a starkly contrasting view, indicating that in-migration accounts for only about 30 percent of rural employment growth and 20 percent of metro employment growth.[10] As such, fiscal impacts associated with changes in both residential demands for publicly provided services (e.g., schools) and residential provision of tax revenues (e..g., property taxes) will in fact be quite a bit smaller than is usually supposed.

Concluding Remarks

In this paper a county labor market model has been estimated that explicitly accounts for movements of workers across county lines – in addition to within-county labor market adjustments – when a labor demand shock takes place. The model features structural equations for in-commuting, out-commuting, labor supply, and local unemployment, relating these variables to employment changes and migration while controlling for spatial wage and housing

[10] Note that this is an upper bound that takes any increase in the size of the labor force to be the result of in-migration. Any positive impact of employment growth on labor force participation rates will reduce this estimate.

price differentials and the spatial distribution of workers and employment opportunities within the larger regional labor market. The model thus allocates newly created jobs between residents of nearby counties and local residents, the latter group comprising both residents currently working outside the county and new entrants into the local labor force (primarily in-migrants).

The model was estimated using county level data from North Carolina for the period 1980 – 1990. The empirical results indicate that one-third of new rural jobs and one-half of new metro jobs are filled by (non-resident) in-commuters. Failure to take account of these "leakages" in economic impact analysis would lead to significant overstatement of changes in final demands resulting from employment shocks.

The empirical results also indicate that between 70 and 80 percent of the adjustment of labor supply to new employment opportunities is accounted for by changes in commuting flows (including both increased in-commuting and reduced out-commuting), and that in-migrants account for no more than 20 to 30 percent of new jobs. From this, it is reasonable to conclude that fiscal impacts associated with residential demands for publicly provided services (e.g., schools) and residential provision of tax revenues (e..g., property taxes) will in fact be quite a bit smaller than is usually supposed.

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Table 1. Sample Statistics

Variable	Mean	Coefficient of Variation	Minimum	Maximum
	--------------------------	Metro counties	--------------------------	
1990 Labor force	80,722	0.86	14,846	282,183
1990 Employment	83,397	1.03	7,629	356,994
1990 In-commuters	19,110	1.22	1,439	98,051
1990 Outcommuters	13,984	0.53	3,714	33,585
1990 Unemployment	2,450	0.80	504	8,211
1990 CZ employment	359,478	0.50	119,889	594,552
1990 Population	150,304	0.84	27,544	511,433
1990 Real wage[a]	17,948	0.15	14,090	24,503
∆ Real wage, 1980-1990[a]	2,029	0.62	–629	5,831
1990 Real median house price[a]	61,871	0.20	48,070	93,290
∆ Real house price, 1980-1990[a]	7,949	0.52	1,635	17,458
	--------------------------	Rural counties	--------------------------	
1990 Labor force	18,073	0.74	1,666	54,144
1990 Employment	16,031	0.80	832	53,473
1990 In-commuters	3,025	0.87	139	14,363
1990 Outcommuters	4,299	0.77	337	17,303
1990 Unemployment	768	0.74	89	3,096
1990 CZ employment	204,850	0.92	14,872	594,552
1990 Population	38,281	0.70	3,856	107,924
1990 Real wage[a]	14,897	0.15	10,442	22,012
∆ Real wage, 1980-1990[a]	783	2.00	–3,687	6,717
1990 Real median house price[a]	50,006	0.22	34,375	99,357
∆ Real house price, 1980-1990[a]	5,782	1.04	–2,916	31,071

a. Wages and housing price were deflated by the 1988 GNP deflator.

TABLE 2 REGRESSION RESULTS [a]

	Dependent variable			
Variable	**In-commuting**	**Out-commuting**	**Labor Force**	**Unemployment**
County employment	0.328 ***	–0.358 ***	0.299 ***	–0.0152 ***
	(.054)	(.052)	(.018)	(.0042)
County labor force	–0.269 ***	0.476 ***	––	––
	(.065)	(.063)		
Commuting zone employment	––	0.014 ***	-0.001	0.001
		(.003)	(.007)	(.001)
Commuting zone labor force	0.013 ***	––	––	––
	(.002)			
Relative wage[b]	2660.5	1695.1	1922.4	143.7
	(1655.7)	(1577.2)	(4375.6)	(300.3)
Relative housing price[b]	-674.1	- 559.4	––	––
	(1714.1)	(1622.2)		
Metro dummy	334.8	546.4	10953.1 ***	143.3 **
	(799.5)	(392.8)	(883.9)	(68.8)
Employment × metro dummy	0.190 ***	0.092 ***	-0.100 ***	-0.001
	(.021)	(.021)	(.008)	(.004)
Wage × metro dummy	16487.7 **	13703.4 **	-89853.8 ***	-1556.2
	(6743.4) ***	(6426.4)	(16480.4)	(1150.4)
Housing price × metro dummy	20216.7 ***	-402.6	––	––
	(7650.9)	(7283.1)		
Intercept	201.4	222.2	2016.3 ***	–111.4 ***
	(206.7)	(195.9)	(509.8)	(36.3)
R^2	.941	.752	.917	.292
N	100	100	100	100

a. These are three-stage least squares estimates. Standard errors are in parentheses. ***, **, and * denote significance at the .01, .05, and .10 levels, respectively. System weighted R^2 = .776. Except for the metro dummy, all variables are first differences (1990 value less 1980 value).

b. These are mean county values divided by commuting zone average values for wages and housing prices, respectively. See text for detail.

TABLE 3 PROPORTION OF EMPLOYMENT GROWTH ACCOUNTED FOR BY DIFFERENT ACTIVITIES

Activity	Rural Counties	Metro Counties
Increased in-commuting	32.7%	51.8%
Decreased out-commuting	35.8%	26.7%
Decreased unemployment	1.5%	1.6%
Increased labor force size	29.9%	19.9%