CLEMSON UNIVERSITY

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ESTIMATING THE COMMUNITY-LEVEL IMPACTS OF ATTRACTING NEW BUSINESSES: THE IMPLICATIONS OF LOCAL LABOR MARKET ADJUSTMENTS

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I. Introduction

Communities recruit manufacturing plants and other economic activities (e.g., tourism and retirement developments) with the goal that such activities will provide income and employment opportunities for local residents. These communities also hope that the new businesses will enhance the local tax base and provide revenue sources to support additional public goods and services. The potential benefits associated with attracting a new employer (jobs and income for local residents and tax revenues for the public sector) have contributed to intense competition among communities for new businesses. Much of this competition takes the form of incentives such as tax abatements and infrastructure investments, inducements that may significantly increase public expenditures and/or reduce the tax revenues associated with attracting a new firm. Communities that offer incentives must carefully estimate the community-level impacts associated with new economic activity to ensure that the anticipated increase in tax revenues is sufficient to cover the expected additional government expenditures.

An important determinant of the local impacts of industrial development is the source of employees for the new business. If, for example, employees come from the local pool of unemployed, the new employer and its workforce add little to the cost of local public services (costs may even go down) but local tax revenues increase. Alternatively, if all new employees are in-migrants, local costs may increase significantly to provide the required additional public goods and services.

The purpose of this report is to estimate short- and long-run labor market adjustments associated with employment change for South Carolina counties. An appreciation of the source of employees for new jobs enables community leaders to better select the appropriate level of industrial incentives and to better plan for changes in demand for public goods and services. The discussion of South Carolina labor market adjustments is organized as follows. First, we provide an overview of the components of a local labor force and the implications of component change on local income and expenditures for public goods and services. Second, we present the results of the Clemson University Community Policy Analysis (CPAN) Model for county labor markets. This model estimates the allocation of new jobs in a county among the components of a county's labor force (e.g., unemployed, in-commuters, in-migrants, second jobs). Third, we summarize the concepts of "job chains" and "leakages" and discuss the relationship between these concepts and community-level impacts. Finally, we conclude the paper with a discussion of how insights into labor market adjustments may be used to improve public policy in community planning and industrial development.

II. Labor Force Components

New jobs in a community offer the promise of higher income for community residents. The amount that community income increases, however, is determined by who takes the new jobs. Workers to fill these jobs may come from seven sources or components of the local labor force (Figure 1). Local residents not in the labor force (A) or residents in the labor force but not working (B) may take jobs. Local residents currently working at local or non-local jobs (i.e., out-commuters) may take a second job (C), or they may quit their old jobs to take new ones (D, E). Finally, non-local residents may in-commute (F) or move (in-migrate) to the community (G) to take one of the new local jobs.

Table 1 summarizes the principal local income and public services impacts for the seven labor force components. The reader should note that the principal income effect of interest to the residents of a community is the change in income of individuals who resided in the community before the arrival of the new firm. For this analysis, the residents of the community do not benefit directly if the new jobs are taken by in-commuters (or in-migrants).

The local income effect of a new employer is greatest if the jobs are taken by residents who previously were unemployed or not in the labor force (e.g., students, retired individuals, stay-at-home spouses, welfare recipients). In this case, the direct income effect is the income from the new job less any transfer payments lost. Similarly, if an employed local resident takes one of the new jobs as a second job, the direct income effect is the income from the new job. Alternatively, community income will increase relatively little if the new jobs are filled by individuals who previously out-commuted to non-local jobs or by residents who quit a local job (that subsequently was not filled). The change in income in these situations is the difference between the resident's new and old incomes. Finally, no change in local residents' income will be realized if the new jobs are filled by in-commuters (or in-migrants).

Additional costs for public goods and services also are sensitive to the component of the labor force that benefits from the employment opportunities. If the jobs are taken by current residents of the community (A, B, C, D, E) there will be little or no increase in public expenditures because community size is not affected. Local public expenditures (e.g., social services) may even be reduced when the jobs are taken by the unemployed or welfare recipients. A small increase in local public expenditures may be associated with an increase in in-commuters (F) if the local government now must provide services (roads, water, sewer, police protection, etc.) for the in-commuters as well as permanent residents. A significant increase in public expenditures should be anticipated if new jobs are filled by in-migrants (G). New residents result in additional homes on local water and sewer systems, additional students in local schools, additional participants in local recreational programs, and additional traffic on area roads.

Figure 1.

Allocation of New Jobs Among Components of the Local Labor Force

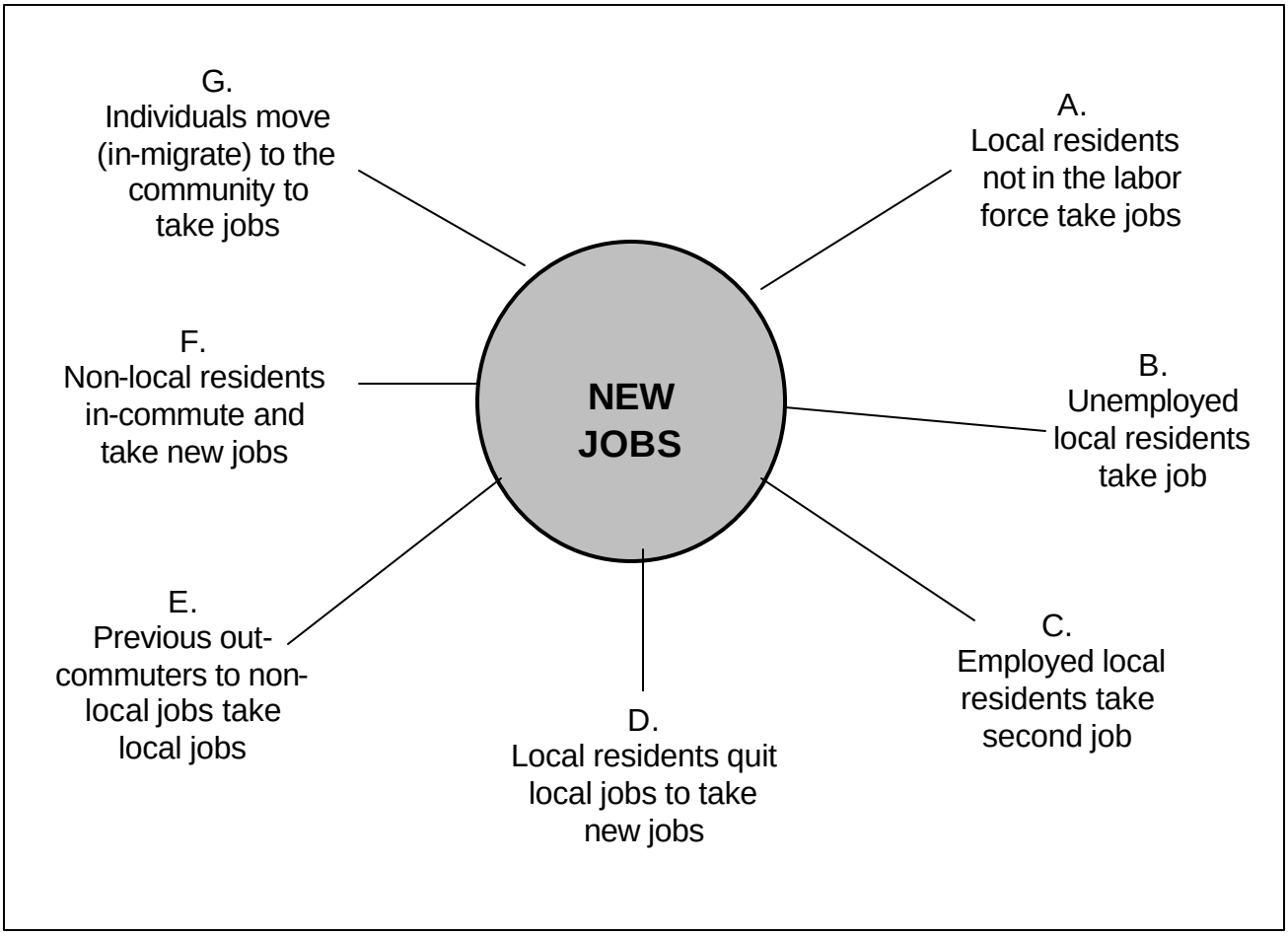


Table 1. Principal Direct Local Income and Public Services Expenditure Impacts Associated with a New Job, Based on Who Fills the Job

Component of Local Labor Force	Direct Local Income Effect	Principal Public Services and Goods Expenditures
A. Local resident not in labor force (e.g., retired student, welfare recipient, stay-at-home spouse) takes job	Income from new job	Insignificant unless expenditures for social services are reduced
B. Unemployed local resident takes job	Income from new job above any transfer payments (e.g., unemployment compensation, welfare) the unemployed individual received	Reduced expenditures for local social services
C. Employed local resident takes second job	Income from new (second job)	Insignificant
D. Employed local resident quits one local job to take new local job	Income from new job above income from previous job	Insignificant
E. Previous out-commuter to non-local job takes local job	Income from local job above income from previous non-local job	Insignificant
F. Non-local resident in-commutes to take local job	No local income effect	Insignificant unless the number of in-commuters is large
G. Individual moves to the community to take job	No direct local income effect	Increased spending required to serve larger population

Table 2. Components of County Labor Force, South Carolina, 1990

COUNTY	Jobs[a]	Reswork[b]	Incom[c]	Outcom[d]	Sjobs[e]	Unemp[f]	Emppeop[g]
ABBEVILLE	9265	6400	1728	4117	1137	623	8128
AIKEN	74239	41688	18437	12736	14114	3236	60125
ALLENDALE	4638	2534	1276	1406	828	492	3810
ANDERSON	68141	51126	8844	18062	8171	3782	59970
BAMBERG	5898	4112	1074	2212	712	691	5186
BARNWELL	9186	5547	2279	3008	1360	952	7826
BEAUFORT	56692	40206	4747	2297	11739	1735	44953
BERKELEY	35263	24233	10316	34975	714	2864	34549
CALHOUN	4790	2022	1059	3492	1709	385	3081
CHARLESTON	227794	134071	54000	11381	39723	7414	188071
CHEROKEE	21999	15267	3494	5564	3238	1566	18761
CHESTER	14427	9225	3409	4729	1793	1116	12634
CHESTERFIELD	18119	11888	3664	5132	2567	1281	15552
CLARENDON	9945	7148	1449	3811	1348	991	8597
COLLETON	14360	10029	1059	3972	3272	1055	11088
DARLINGTON	26775	18701	4667	8365	3407	1633	23368
DILLON	11491	8482	1231	3052	1778	946	9713
DORCHESTER	27549	14876	7435	24058	5238	1922	22311
EDGEFIELD	6383	3941	1273	4223	1169	502	5214
FAIRFIELD	9039	5640	2638	3680	761	742	8278
FLORENCE	67465	44668	12143	6671	10654	2932	56811
GEORGETOWN	22511	14663	4842	4680	3006	1341	19505
GREENVILLE	229113	143844	42382	15472	42887	7791	186226
GREENWOOD	35546	24368	5155	2985	6023	1639	29523
HAMPTON	7336	4636	1191	2338	1509	469	5827
HORRY	87695	63619	8062	6504	16014	3551	71681
JASPER	5300	2689	1076	3347	1535	412	3765
KERSHAW	21174	13224	4286	7155	3664	1113	17510
LANCASTER	22745	15874	3283	9486	3588	1691	19157
LAURENS	25521	18384	3511	8072	3626	1838	21895
LEE	5598	4015	1363	3150	220	716	5378
LEXINGTON	77079	43711	19091	44885	14277	3461	62802
MARION	3077	1737	840	1433	500	303	2577
MARLBORO	14772	10863	2064	2974	1845	1243	12927
MCCORMICK	11408	7921	2302	3686	1185	1252	10223
NEWBERRY	14782	10751	1975	4129	2056	1036	12726
OCONEE	31104	20102	3959	6732	7043	1517	24061
ORANGEBURG	40305	27628	4639	6845	8038	3294	32267
PICKENS	43260	28131	10297	16352	4832	2267	38428
RICHLAND	226117	124163	56547	19873	45407	7342	180710
SALUDA	5867	3296	765	3992	1806	608	4061
SPARTANBURG	129761	91259	16918	17971	21584	5907	108177
SUMTER	48604	40967	5044	5837	2593	3242	46011
UNION	12374	10031	1173	3472	1170	970	11204
WILLIAMSBURG	14755	9339	2814	5033	2602	1177	12153
YORK	61723	42675	9017	23316	10031	3633	51692

[a] Number of full and part-time jobs in county, 1990.
[b] Number of people who both reside and work in county.
[c] In-commuters from outside the county.
[d] Out-commuters from the county.
[e] Second jobs held in the county.
[f] Number of county residents unemployed.
[g] Number of people who work in the county.

Local labor markets vary significantly with respect to the sources of workers for local jobs and sources of jobs for local residents (Table 2). Core counties in metropolitan areas generally rely on in-commuters for much of their work force. In Charleston County, for example, approximately one-fourth (54,000) of the jobs are filled by in-commuters. Alternatively, in suburban counties out-commuters are an important source of local income. Calhoun County (a fringe county in the Columbia MSA) had 3,492 out-commuters in 1990 but only 2,002 individuals who both resided and worked in the county and only 1,059 in-commuters. Finally, some rural counties are relatively self-sufficient with respect to labor needs. Union County reported 12,374 jobs in 1990, 11,201 of which were taken as first or second jobs by county residents.

III. Distribution of New Jobs

Model. The Community Policy Analysis Network (CPAN) developed a methodology for estimating the distribution of an employment shock among the components of the local labor market (see, for example, Swensen and Eathington, 1998; and Shields, Kelsey, and Smith, 1999). Short-run and long-run CPAN models were estimated for South Carolina using a pooled cross-section, time series data set for the state's 46 counties for the years 1970, 1980, and 1990. The short-run model limits local population change while the long-run model permits population to adjust in response to the new employment opportunities. An overview of the Clemson University CPAN model is provided in the Appendix.

The results of the CPAN model were used to estimate county level changes in labor force components from two employment change simulations. Simulation 1 is an increase in a county's jobs by 1000, where the 1000 includes the jobs at a new employer plus additional employment opportunities at related businesses (multiplier effects). Under simulation 1, employment remains unchanged in all other counties in the state. That is, only one county at a time is "shocked" with 1000 new jobs. Simulation 2 shocks one county at a time with 1000 new jobs plus it assumes that all counties adjacent to the "shocked" county also experience employment growth at the same rate as the "shocked" counties. For example, if 1000 new jobs represented a 10 percent increase in jobs in county x, then simulation 2 increased jobs in all counties adjacent to x by 10 percent.

The simulations provide estimates of changes in labor force components (unemployed, second jobs, in-commuters, out-commuters, new labor force members) for each of the 46 South Carolina counties. Table 3 provides definitions of the labor force components and data sources for county-level estimates. Tables 4 and 5 provide the means of the estimates for the 46 counties plus the means of the estimates for the 16 metropolitan and 30 nonmetropolitan counties separately. The county averages (state, metro, and nonmetro) are provided for both the short-run and long-run models.

Table 3. Components of Local Labor Force, Relationships Between Labor Force Components, and Data Sources

Component	Definition, Data Source
1. Employment, jobs (JOBS)[a]	number of full- and part-time jobs in the county (U.S. Bureau of Economic Analysis: Regional Economic Information System)
2. Resident workers (RESWORK)	number of people who both reside and work in the county (U.S. Census: Journey to Work)
3. In-commuters (INCOM)	number of people who work in the county but reside outside the county (U.S. Census: Journey to Work)
4. Out-commuters (OUTCOM)	number of people who reside in the county but work outside the county (U.S. Census: Journey to Work)
5. Employment, people (EMPPEOP)	(resident workers) + (in-commuters)
6. Unemployed (UNEMP)	residents of the county in the labor force but not employed inside our outside the county (U.S. Census: Journey to Work)
7. Labor force (LABFORCE)	(employment, people) + (out-commuters) – (in-commuters) + (unemployed)
8. Working age population (WRKPOP)	county population aged 16-65
9. Second job (2NDJOBS)	(employment, jobs) – (employment, people)

[a]Abbreviation for the component that may be used in later tables.

Table 4. Simulation Results, Employment Shock Equals 1000 Jobs in the County

	Short-Run Model		
County Labor Market Component	State Average	Metro Average	Nonmetro Average
CHOUTCOM	-350	-311	-370
CHINCOM	5	5	5
CHLABFORCE	131	128	132
CH2NDJOBS	301	278	313
CHUNEMP	-3	-3	-3
CHJOBS[a]	790	726	824
CHWRKPOP	--------	--------	--------

	Long-Run Model		
County Labor Market Component	State Average	Metro Average	Nonmetro Average
CHOUTCOM	207	151	236
CHINCOM	124	116	128
CHLABFORCE	870	816	899
CH2NDJOBS	288	289	287
CHUNEMP	50	41	55
CHJOBS[a]	1025	1029	1023
CHWRKPOP	1141	1045	1193

[a]CHJOBS = CHLABFORCE + CH2NDJOBS-CHOUTCOM+CHINCOM-CHUNEMP

Table 5. Simulation Results, Employment Shock Equals 1000 Jobs in the County Plus an Equal Percentage Increase in Economic Activity in Adjacent Counties[a]

	Short-Run Model		
County Labor Market Component	State Average	Metro Average	Nonmetro Average
CHOUTCOM	-277	-249	-293
CHINCOM	-7	-8	-7
CHLABFORCE	147	146	148
CH2NDJOBS	293	271	305
CHUNEMP	10	8	11
CHJOBS[b]	700	648	728
CHWRKPOP	--------	--------	--------
	Long-Run Model		
County Labor Market Component	State Average	Metro Average	Nonmetro Average
CHOUTCOM	361	261	415
CHINCOM	140	131	144
CHLABFORCE	985	925	1017
CH2NDJOBS	223	224	222
CHUNEMP	73	60	80
CHJOBS[b]	914	960	890
CHWRKPOP	1285	1177	1342

[a] Exogenous change is an increase in county jobs by 1000 plus all adjacent counties have the same percentage increases in jobs, labor force, and working population.

[b] CHJOBS = CHLABFORCE + CH2NDJOBS-CHOUTCOM+CHINCOM-CHUNEMP.

Simulation 1. The Clemson University CPAN model predicts that, on average, a "shock" of 1000 new jobs in a county will result in a short-run net increase of approximately 790 jobs (Table 4). The short-run net increase in county jobs (including the multiplier effects) is less than the 1000 jobs created at the new and related businesses. This difference (790 vs. 1000) reflects jobs left unfilled when workers moved to new jobs and jobs eliminated because local wages increased as a result of new business activity.

The 790 net increase in jobs was filled primarily from two sources: 350 residents took local jobs instead of out-commuting to work (CHOUTCOM = -350) and 301 residents took second jobs (CH2NDJOB = +301). Of the remaining 139 jobs, three were taken by the previously unemployed, five by in-commuters from outside the county, and 131 by new members to the labor force (in-migrants or residents not previously actively seeking work). Since the short-run impact was limited primarily to reduced out-commuting and more second jobs, county population increased little and there was little additional demand for public goods and services.

The metro and nonmetro counties were similar in terms of the principal components responsible for filling the new jobs (reduced out-commuting and increased second jobs). Nonmetro areas, however, realized a larger net increase in jobs than metro counties (824 vs. 726). The larger net impact may reflect "looser" labor markets in rural areas of South Carolina. That is, nonmetro counties were able to fill more of the new jobs through residents taking second jobs or quitting non-local jobs. Thus, there may have been less upward pressure on the nonmetro wage rate and less "crowding-out" of other local jobs.

The long-run impact was significantly different from the short-run in terms of both total change in jobs and allocation of jobs among labor force components. In the long-run, a "shock" of 1000 new jobs resulted in an average of 1,025 net new jobs. The additional 25 jobs reflected new employment opportunities created by population growth.

The principal component of long-run employment change was the increase in the local labor force (county average for the state equaled 870). Additional individuals in the county labor force resulted primarily from the in-migration of new workers and their families and the growth of the indigenous population. The long-run increase in the number of residents who out-commuted (207) or who were unemployed (50) also was attributed to the population growth stimulated by the jobs "shock". In summary, labor force growth was a larger component of long-run county employment change, thus, counties should anticipate higher public service expenditures to accommodate the new residents. The long-run results for metro and nonmetro counties were similar except that nonmetro counties, on average, experienced greater growth of the labor force and greater out-commuting of local residents to jobs outside the county.

Simulation 2. Table 5 presents the simulation results under the scenario that each county receives 1000 new jobs plus all surrounding counties experience the same rate (percent) of employment growth as the county with 1000 new jobs. This scenario

provides county employment change estimates if businesses in a county are competing for labor with businesses in growing adjacent counties.

The results of the second simulation differ from those of the earlier shock (1000 new jobs in one county only) in three principal ways. First, under the second simulation, in-commuting to the "shocked" county was less and out-commuting from the county was more. These changes in commuting flow reflect enhanced employment opportunities in neighboring counties. Second, in-migration played a larger role in filling job openings, both in the short- and long-run. Thus, under scenario 2, counties should anticipate higher expenditures for public services associated with population growth. Third, the change in the number of jobs in the county (700 in the short-run, 914 in the long-run) was less than the initial shock of 1000 new jobs. The model's results suggest that the competition for workers among area businesses placed upward pressure on regional wage rates, and as a result, encouraged labor force reductions in some businesses that offset part of the employment gains at the new firm.

Who Benefits? Table 6 summarizes the average long-run county-level impacts associated with attracting a new business with 1000 jobs. The shock of 1000 new jobs resulted in a net increase of a little over 1000 jobs if the surrounding counties were stagnant and a net increase of approximately 900 jobs if the surrounding counties were growing. Of greater importance from a local economic development perspective is the net increase in jobs held by county residents (regardless of where the jobs are located). Net new jobs for county residents were estimated as net new jobs in the county less the increase in in-commuters plus the increase in out-commuters. For both scenarios, net new jobs for county residents were approximately 1100, indicating a relatively large increase in the number of residents that out-commuted for work. Finally, most (800-900) of the net new jobs for county residents were filled by individuals new to the county labor force (in-migrants, individuals previously out of the labor force, or additions from indigenous population growth). If most of the new labor force members were in-migrants, then county residents benefited relatively little from the new activity. That is, the income benefits from attracting a new business were realized primarily by "outsiders." If so, high reported numbers for jobs at new businesses (1000), job growth in the county (1025), and growth in county residents with jobs (1108) disguised the fact that few of these jobs were filled by the original local residents.

How many of the new members of the labor force will be in-migrants? The share of jobs taken by current residents versus in-migrants will vary depending on characteristics of the new employer and county. For example, if the employer required job skills not available locally, then much of the increase in the labor force will be through in-migration. Similarly, the larger the employment "shock" and the more rapid the rate of employment growth at the new activity, the more likely the jobs will be filled by in-migrants.

An estimate of the "average" allocation of potential new labor force members between in-migrants and county residents is provided by the Census components of population change (natural increase versus net migration). From 1990 to 2000, South

Table 6. Summary of Changes in County Labor Markets, Simulations 1 and 2, Long-Run Models.

Net Changes (County Averages)	Simulation 1 (Shock = 1000 Jobs) State	Metro	Nonmetro
Net New Jobs in County (for residents and in-commuters)[a]	1025	1029	1023
Net New Jobs Taken by Current County Residents (jobs in and out of county)[b]	1108	1064	1131
Net New Jobs Taken by New Members of County Labor Force[c]	820[d]	775	844

Net Changes (County Averages)	Simulation 2 (Shock = 1000 Jobs + Growth in Adjacent Counties) State	Metro	Nonmetro
Net New Jobs in County (for residents and in-commuters) [a]	914	960	890
Net New Jobs Taken by Current County Residents (jobs in and out of county)[b]	1135	1090	1161
Net New Jobs Taken by New Members of County Labor Force[c]	912	865	937

[a] Net new jobs in county = CHJOBS (see Tables 5 and 6).
[b] Net new jobs held by county residents = CHJOBS – INCOM+OUTCOM.
[c] Net new jobs taken by new members of the labor force = net new jobs taken by current residents less increase in second jobs.
[d] The 820 net new jobs equals the 870 increase in labor force (Table 4) less the 50 increase in unemployed.

Carolina counties reported population growth of 525,702 -- 210,785 (40.1%) from natural increase and 314,917 (59.9%) from net in-migration. Thus, on average, approximately 60.0 percent of county-level population growth in South Carolina was attributable to the attraction of new residents. Using the 60 percent average, the 820 jobs taken by new members of the labor force (Table 6, Simulation 1) were allocated as 492 to in-migrants and 328 to local residents previously not in the labor force.

IV. Job Chains and Leakages

The CPAN model demonstrates that a simple accounting of jobs anticipated at the new firms (plus those at linked businesses) will likely: (1) underestimate the long-run increase in jobs held by county residents and (2) overestimate the number of original county residents that benefited from the new jobs. Similarly, a simple accounting of wages and salaries paid at new jobs will significantly overestimate the change in county income attributable to the new employer. A more accurate estimate of the "income effect" of an employment shock requires that wages and salaries be adjusted for job chains and leakages.

Job Chains. The net income effect of an additional job depends on the characteristics of the individual taking the new job (e.g., employed locally, unemployed, in-migrant) and what happened to the job previously held by the individual (Felsenstein and Persky, 1999). The concept of job chains suggests that the welfare gain to the community from a new job is the change in income realized by a resident who takes the job plus the increase in the income of the individual who filled the job vacated by the new employee at the new business, and so on down the chain. The job chain stops (in terms of measuring welfare gain for a specific community) when a job in the chain is taken by an in-commuter or in-migrant.

Examples of three chains for a new job (salary = $40,000/year) are provided in Figure 2. In case 1, all links of the chain are filled by county residents, and the sum of individual income gains ($5,000 + $10,000 + $25,000) equals the salary of the new job ($40,000). In this situation, the welfare gain to the county from the new job equals the salary of the new position. Case 2 also starts with a local resident taking the new job and realizing a $5,000 increase in income. However, the resident's old job is filled by an "outsider" and the chain stops with a welfare gain to the community of only $5,000. Finally, in case 3, an outsider takes the now job, so no local job chain exists and no community welfare gain is realized. An exact accounting of welfare gain requires the tracing of the job chain associated with each position at the new firm. However, in the absence of such information, Felsenstein and Persky (1999, p. 49) suggest that ". . . the estimate of welfare gains should be set at about 47 % of total new wages."

Leakages. A second consideration regarding the income benefits of a new business is the leakages of income and spending outside the community. In the case of cities, counties, or metropolitan areas, these leakages can be significant. For example, Figure 3 summarizes the derivation of net local personal consumption expenditures for Greenville Hospital System (GHS) employees for the six county Greenville-Anderson

Figure 2.
Job Chains in the Local Labor Market:
Implications for Local Benefit from Economic Development

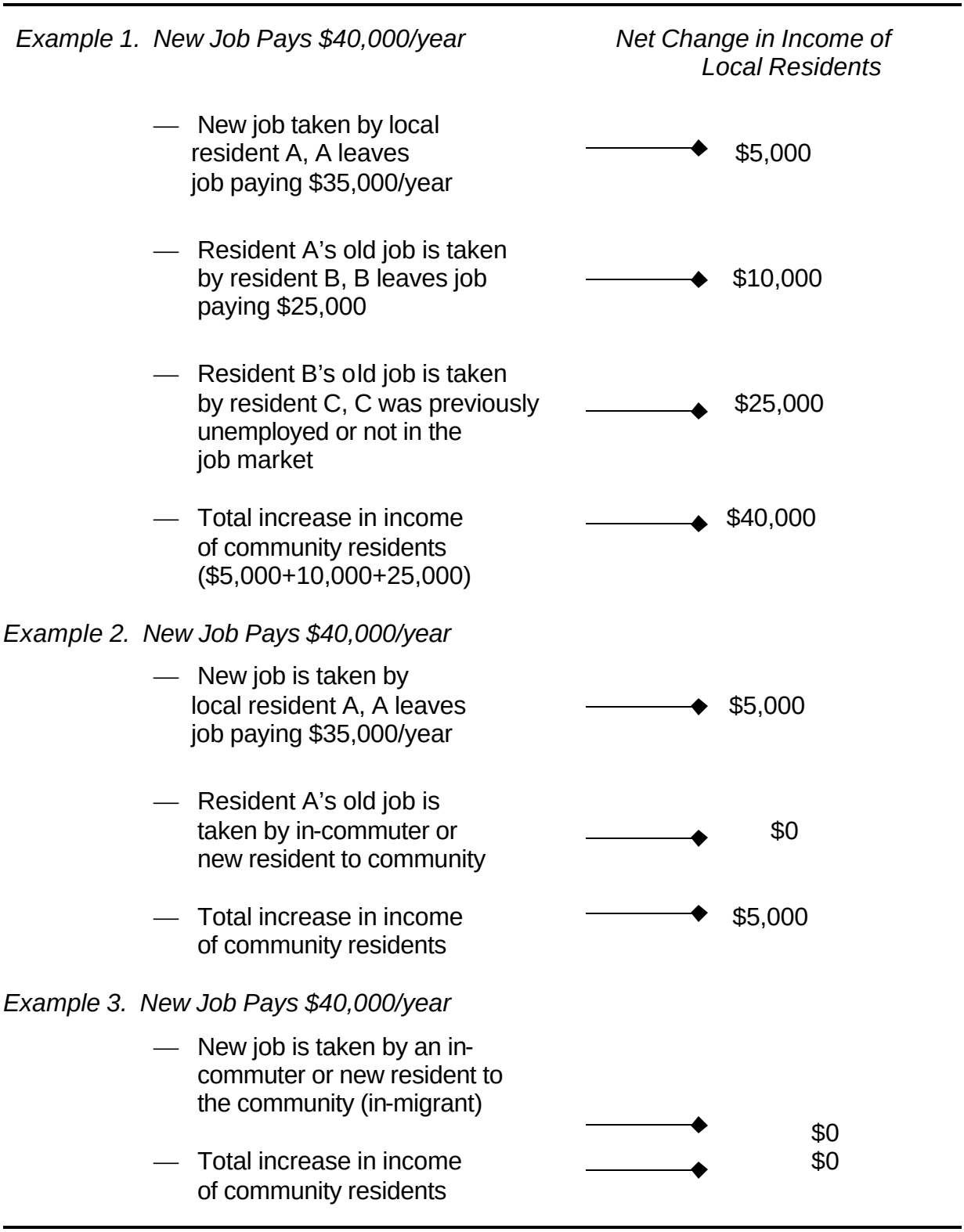
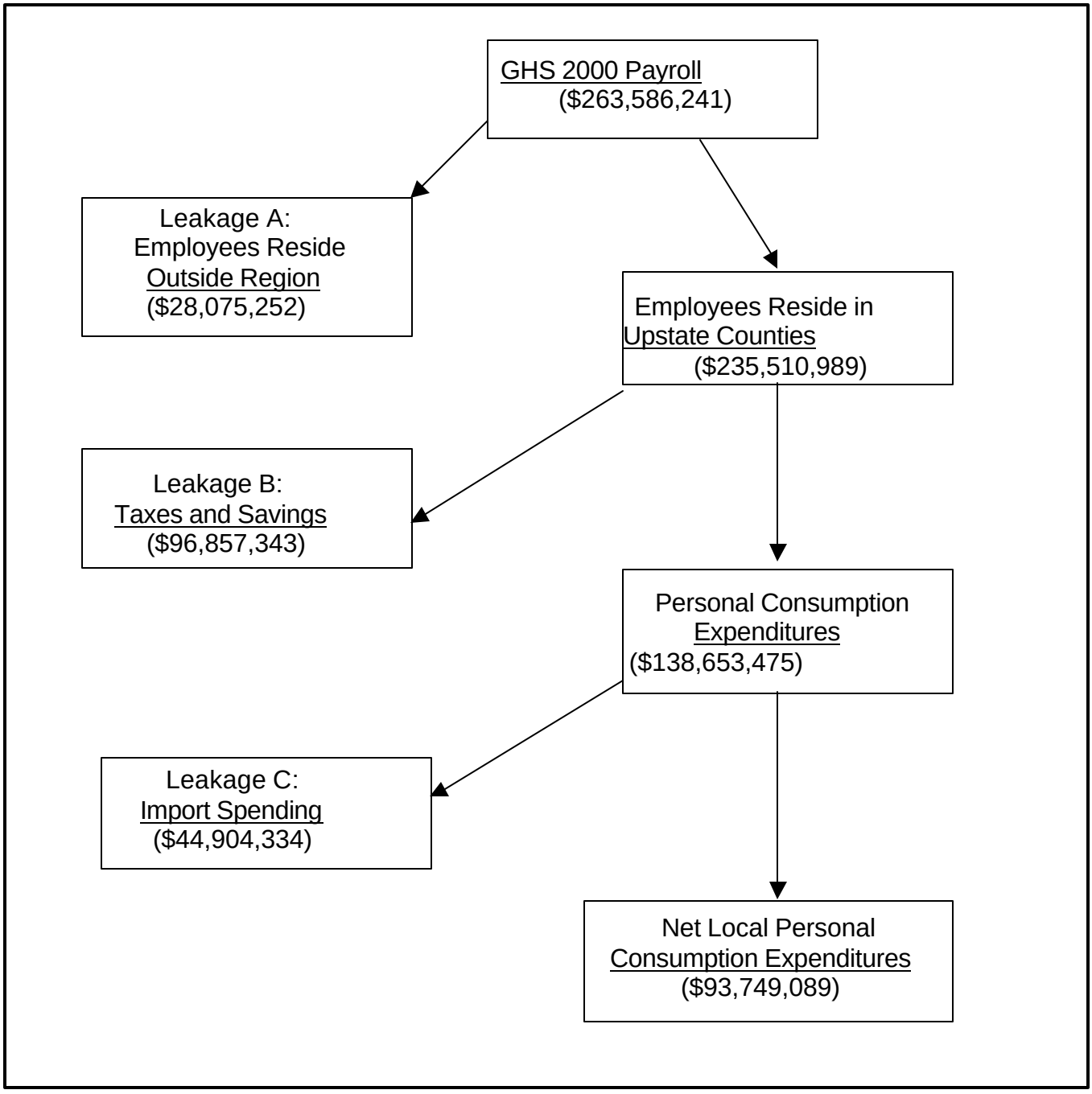


Figure 3.

Derivation of Net Local Personal Consumption Expenditures:
Greenville Hospital System (GHS) and the Six Upstate Counties



Spartanburg, SC MSA (see Barkley, Henry, and Warner, 2000). The 2000 GHS payroll was approximately $264 million, of which $28 million was earned by nonresidents and $97 million was withheld for taxes and savings (e.g., retirement accounts). Of the remaining $139 million of personal consumption expenditures, $45 million was allocated for import spending. In sum, only $94 million or approximately 35 percent of GHS payroll was used for local consumption expenditures. An even smaller share of payroll would be allocated for local spending if the analysis were restricted to the home county of GHS instead of the six county MSA.

V. Summary and Conclusions

Industrial development and the resulting residential growth create positive and negative impacts for the host community. An accurate estimate of these impacts is crucial to designing the appropriate incentives programs and preparing for the likely effects on public goods and services.

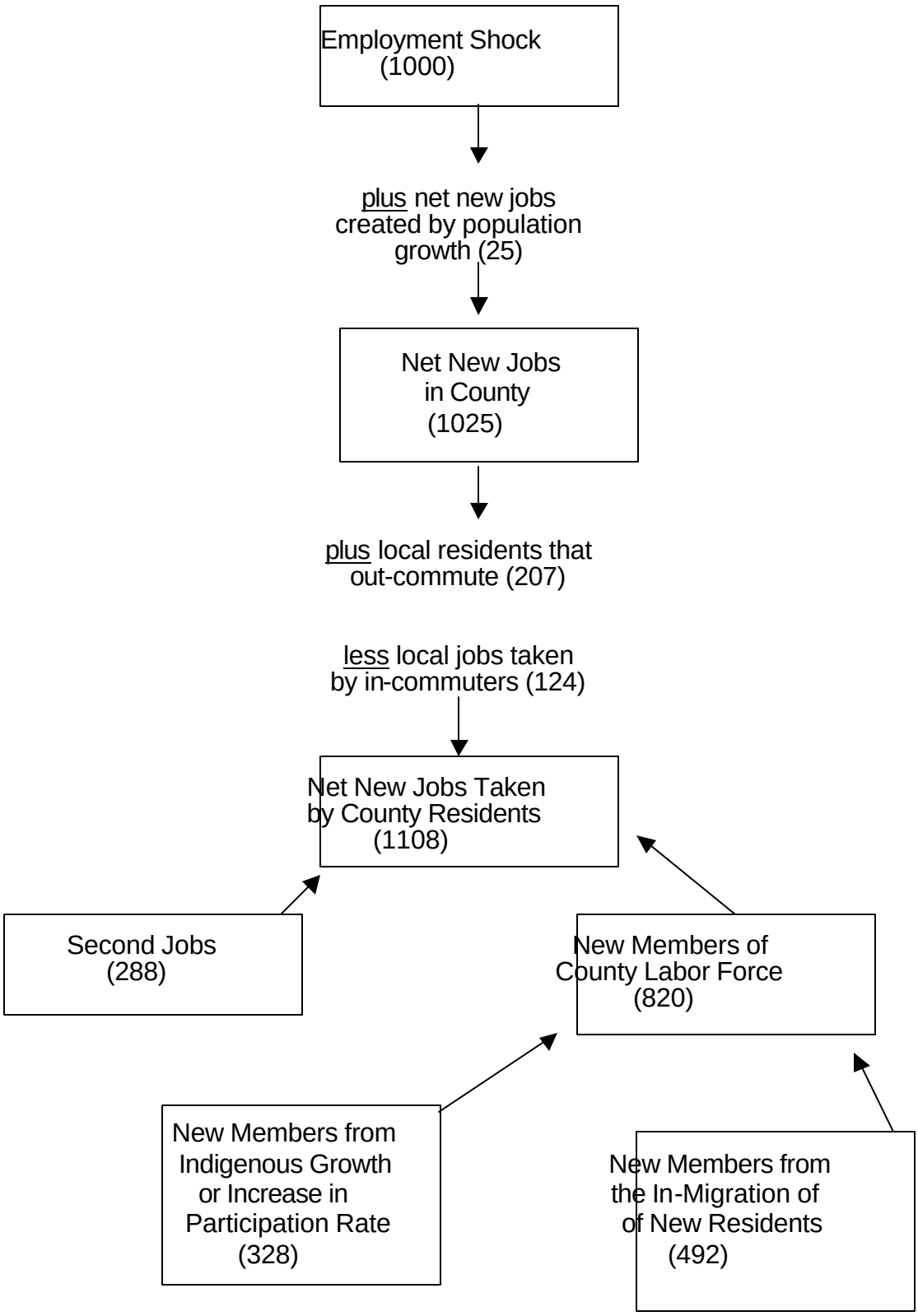
One scenario of the consequences of attracting a new business is that all new jobs are taken by local residents who previously were unemployed or not in the labor force. Under this scenario, economic development provides significant positive net gains to the community: gains equal the value of new payroll (including multiplier effects) and public costs remain fixed or may even go down. This best case situation often is used to justify large financial incentives or expensive public works projects in the name of economic development.

The CPAN model for South Carolina counties indicates that the long-run net gains associated with the "average" employment shock are smaller than the best case scenario (Figure 4). First, a "shock" of 1000 jobs was estimated to provide only 616 net new jobs for county residents (288 second jobs plus 328 jobs for residents previously not in the labor force). In addition, the estimated 492 in-migrants provide "job equivalents" of approximately 230 (492 x .47) after adjusting for the consequences of job chains. Thus, after adjustments for changes in labor market components and job chains, our estimate of income gain is the payroll associated with 846 jobs (616 + 230).

Second, the long-run impact on industrial development is an increase in community size. The CPAN model predicts that 1000 new jobs will lead to the in-migration of approximately 490 workers and their families. Therefore, communities should anticipate significant new expenditures for public goods and services associated with new residential development.

In sum, the findings of this study indicate that evaluations of local industrial development efforts must go beyond simply counting jobs and payroll. Our analysis of South Carolina counties demonstrates that the income effects will be exaggerated and public costs underestimated if local labor market considerations are not included in the evaluations. Inaccuracies in measuring local costs and benefits may result in the promotion of economic development programs that reduce the overall welfare of community residents.

Figure 4.
Example of Long-Run Effect of Employment Shock on County Labor Market, State Average, Scenario 1



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Appendix

Clemson University CPAN Model

The Clemson University labor market models are systems of equations representing the functional relationships between the components of the labor force and county characteristics (see Yeo and Holland, 2000). The long-run empirical model takes the following form:

(1) $OUTCOM = \acute{a}_0 + \acute{a}_1\ JOBS + \acute{a}_2\ LF + \acute{a}_3\ EXTJOBS + \acute{a}_4\ RWAGE + \acute{a}_5\ RHOUSE + \acute{a}_6\ EXTOUT + \acute{a}_7\ \%\ NW$

(2) $INCOM = \hat{a}_0 + \hat{a}_1\ JOBS + \hat{a}_2\ LF + \hat{a}_3\ RWAGE + \hat{a}_4\ EXTLF + \hat{a}_5\ EXTIN + \hat{a}_6\ \%\ NW + \hat{a}_7\ RHOUSE$

(3) $LF = \tilde{a}_0 + \tilde{a}_1\ JOBS + \tilde{a}_2\ EXTJOBS + \tilde{a}_3\ RWAGE + \tilde{a}_4\ WRKPOP + \tilde{a}_5\ EXTLF + \tilde{a}_6\ \%\ NW + \tilde{a}_7\ PCY$

(4) $UNEMP = \ddot{a}_0 + \ddot{a}_1\ JOBS + \ddot{a}_2\ EXTJOBS + \ddot{a}_3\ RWAGE + \ddot{a}_4\ WRKPOP + \ddot{a}_5\ EXTUN + \ddot{a}_6\ \%\ NW$

(5) $RHOUSE = \ddot{e}_0 + \ddot{e}_1\ WRKPOP + \ddot{e}_2\ POP\ 65 + \ddot{e}_3\ RWAGE + \ddot{e}_4\ PCY$

(6) $SCNJOB = \emptyset_0 + \emptyset_1\ JOBS + \emptyset_2\ LF + \emptyset_3\ EXTJOBS + \emptyset_4\ RWAGE + \emptyset_5\ EXTLF + \emptyset_6\ EXJSCN + \emptyset_7 + \emptyset_8\ \%\ NW + \emptyset_9\ PCY$

(7) $WRKPOP = \ddot{O}_0 + \ddot{O}_1\ JOBS + \ddot{O}_2\ EXTWRK + \ddot{O}_3\ \%\ NW$

with the restriction that

(8) $1 = \tilde{a}_1\ (LF/JOBS) + \emptyset_1\ (SCNJOB/JOBS) + \hat{a}_1\ (INCOM/JOBS) - \acute{a}_1\ (OUTCOM/JOBS) - \ddot{a}_1\ (UNEMP/JOBS)$

Where,

OUTCOM is outcommuters from county *x* to all adjacent counties.

INCOM is incommuters into county *x* from all adjacent counties.

LF is the labor force residing in county *x* (resident workers + outcommuters + unemp).

UNEMP is the number of unemployed people in county *x* (unemployment rate * civilian labor force).

RHOUSE is the relative housing price in county *x* as compared to the adjacent counties (mean value of houses in county *x* divided by the mean value of houses in the adjacent counties).

WRKPOP is the working age population (18<age<65) in county *x*.

JOBS is full- and part-time employment in county *x*.

SCNJOBS is the number of second jobs in county *x* (SCNJOBS = JOBS – number of people employed in county *x*).

EXTJOBS is full- and part-time employment in adjacent counties.

RWAGE is the relative wage in county *x* as compared to the adjacent counties (mean wage in county *x* divided by mean wage in adjacent counties).

EXTOUT is the sum of outcommuters from counties adjacent to county *x* to their own adjacent counties.

EXTLF is the sum of the labor forces in the counties adjacent to county *x*.

EXTIN is the sum of the incommuters into counties adjacent to county x from their own adjacent counties.

EXTUN is the sum of unemployment in the adjacent counties.

POP65 is the population 65 and older in county *x*.

EXTSCN is the sum of second jobs in the adjacent counties.

The short-run CPAN model is identical to the above eight equation model except that equation 7 (*WRKPOP*) is deleted. That is, in the short-run model working age population is treated as an exogenous variable, while in the long-run model *WRKPOP* is included as an endogenous variable.

All variables in the short-run and long-run modes were entered as logs (ln), and the models were estimated for the 46 South Carolina counties for the census years 1970, 1980, and 1990. A three-stage least squares estimations procedure was used, and the resulting reduced form equations provided the parameters for estimating the baseline and "after shock" values for the labor force components. A more extensive explanation of the Clemson CPAN model is provided in Henry, Barkley and Warner (2001).

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