The Social Sciences 1(3): 216-222, 2006

Measuring the Impact of Rural Transit Operations on Their Local Economies: A Case Study of Alabama

Oluwoye, J. and E. Gooding
Department of Community Planning and Urban Studies,
Alabama A and M University, P.O. Box 938, Normal, AL 35762, USA

Abstract: Impacts of rural transit system can be viewed from at least two of perspectives. They can be analyzed from the transit users (users' impacts) or that of the transit providers (public impacts). From the viewpoint of transit providers, rural transit systems will have impacts on overall economic development and on fiscal revenue. If rural transit operations have measurable impacts on their local economies, one should be able to observe and measure those impacts by looking at similar sets of counties whose chief distinction is that one set of counties has rural public transportation services and the other set of counties does not. The aim of this study is to determine the local share of county expenditures. This study considers the relative concentration of retail sale and service industry in the county to the state average. Specifically, the objective is to estimate the portion of local expenditure. The main research method employed in this study is the use of secondary data. The study focuses on extraction of information from U.S. Census Bureau and County Business Patterns (NAIS), etc. The data analysis reveals that the impact of rural transit service depends on county resident flow. The theoretical model behind the county flow: If P is > than 1 it means that the county resident flow is outside the county and their expenditure are assumed to be expended outside the county boundary, but if P is < than 1 it suggests that the county residents flow is within the county and their expenditure will be spent locally. The study concludes that some counties resident flow is within the counties and their expenditure were spent locally. In overall the hypothesis for this study was confirmed that the county employees in retail and service industry per thousand populations and the expenditures of local residents are more likely to be spent locally.

Key words: Rural transit, transit operation, local economies

INTRODUCTION

Rural transportation is one of the most important services in the rural community; it contributes towards a significant improvement in the quality of life of the citizens it serves by allowing accessibility to social services education, health care and other vital needs. In addition to the above, rural transportation make as a significant contribution to the local economy.

Impacts of rural transit system can be viewed from a variety of perspectives. They can be analyzed from the perspective of transit users (users' impacts) or that of the transit providers (public impacts). However, from the viewpoint of transit providers, rural transit systems will have impacts on overall economic development and on fiscal revenue.

Highway Investment/Expenditure: Investing in highways has often been viewed as catalysis of change and an effective economic development strategy, particularly for underdeveloped rural areas.

The impact of transportation infrastructure on rural economy and investment is a complex issue; it enhances development and also has its potential risks. Brown[1] acknowledged that there are maintenance burden and potential risks to rural communities concerned. Peckham and Issernman[2] also noted the potential in the maintenance of highway infrastructure. Highway maintenance expenses can be burdens to counties that have fewer funds to pay for infrastructure upkeep. Underdeveloped counties may be vulnerable to maintenance costs of highway infrastructures. Also, evidence exists in support of unforeseen risk and evolving sprawl in rural areas[3]. In support of location theory by Alonson[4] originated by von Thumen[5], people tend to locate farther from high-density areas because of the related high cost of living, however highway investment has great potential to open up economic growth and redistribute development opportunities in the counties. While Peckham and Issernman[2] have particularly argued the macroeconomic benefits of increased highway investments, Peckham and Issernman[2]

Corresponding Author: Oluwoye, J., Department of Community Planning and Urban Studies, Alabama A and M University, P.O. Box 938, Normal, AL 35762, USA

noted concern on the upkeep of highway infrastructure. It was also reported that off-interstate counties benefit little from major interstate highway investment in contrast to greater benefit often anticipated. Further, Rephman[6] reported the short-term highway economic effects as opposed to longer-term post-highway construction effects. The study revealed that highway infrastructure greatly benefits rural economy mainly in the short-term.

Rural economic development: Georgia DOT, Office of Materials and Research evaluated the economic impact of rural public transportation within the counties. The report identified various factors considered highly sensitive to the use of public transportation investment. Also reported is positive relationship between economic development and rural highway expenditure. Improved highway infrastructure have been linked to growth in local rural area's economic activities. Implicitly; it could also bring higher incomes for workers and more revenue/ polits for local investors. The authors also proposed methodologies for qualifying a multiplier effect for rural transit and economic activity[7]. Similarly, Huddleston and Pangotra[8] earlier examined and reported on regional and local economic impacts of highway and transportation investments. The impact assessment presented identified an array of local economic variables- such as educational programs, job opportunities that could be enhanced by rural transportation investment.

Sullivan[9] using input-output methodology reported both the direct and indirect user benefits of transportation infrastructure investments and rural economic development in the costal regions of the Western part of United States.

Other literature, including that of middle Georgia Regional Development Center reported the Economic Impact of Rural Public Transportation and enumerated the links between public transit and economic development in rural counties.

Anderson and erstig and Harsman[10] examined relationships between infrastructure and regional productivity in Sweden and identified specific variables that are positively correlated to regional productivity. The study correlated with earlier views of Alonso[4] that highway infrastructure investment exerts positive influence on economic productivity. Peckham and Isserman[2] have documented that highways have network properties that are both spatial and economic in nature. Using a quasi-experimental matching method to examine the effects of highways on counties, economic growth of counties is greatest for those close to large cities, while rural counties have limited benefits. Similarly, Howe[11] reported that there is a growing recognition of the link between infrastructure investment and sustainable long-term economic growth. 'New growth' theorists in economics argue a strong correlation between the level of net public capital spending and the level of private sector output and labor productivity growth. It emphasized the potential for infrastructure investment to play a leading role in facilitating faster rates of economic growth.

Economic impact of rural transit services: Munnell[12] examined the regional economic development and performance related to public infrastructure. The findings revealed that the probability of a business choice of location and that performance depends on its entity. The authors reported that the choice of a specific location depends on whether the business is a branch firm or a simple establishment firm. Munnell[12] also indicated that highways have greater effect on economic productivity. He also suggested the need for further research to assess regional output as related to understanding of business choosing location.

Forkenbrock[13], putting transportation and economic development in perspective using qualitative descriptive analysis, presented positive relationship between a vector of factors and economic change and development at the county level. Apart from use of descriptive analysis, Forkenbrock suggested use of factor and cluster analysis to group counties and estimate economic impacts of rural transit infrastructures. Also, American Public Transit Association (APTA) presented a comprehensive analysis of economic benefits of public transit across the United States. Among the measurable and immeasurable benefits reported are: Attraction of new business and related services, increased retail trade and sales, employment or jobs, increased property values and fiscal improvement.

Other literature[14] has estimated the economic effects of highway investment using input-output modelling. The model estimates the direct and indirect effects of highway investments based in a disaggregated industrial framework. Rephann[6] evaluated planning theories and transportation modelling including input-output modelling as related to highway management and economic analysis. The author argues that regional economic theory is a useful economic tool and indicated that various regional and extra-regional characteristics significantly influence highway economic performance. However, Rephann[6] critised that input-output adapted for transportation analysis may be impracticable and require data that are inadequate or available.

Transportation infrastructure: Transportation infrastructure provides rural residents improved access to opportunities outside the local community. Earlier,

Table 1: Selected demographic data for counties and alabama

	Counties				
Item	Autauga	Baldwin	Jefferson	Morgan	Alabama
Population, 2000	43,671	140,415	662,047	111,064	4,447,100
Population, percent change, 1990-2000	27.6	42.9	1.6	11.0%	10.1
Persons per square mile, 2000	73	88	59.5	191	87.6
Populations by age, percent of total, 2000					
Under 19	31.1	26.8	27.5	27.7	28.3
19-60	54.4	52.7	55	55.6	58.8
60-older	14.7	20.6	17.6	16.7	13
Race					
White	35,221	122,366	384,639	94,485	3,162,808
Black	7,473	14,444	260,608	12,485	1,155,930
Household size, 2000 (avg)	2.71	2.50	2.45	2.51	2.49
Household income, 2000 (median)	$42,013	$40,250	$36,868	$37,803	$34,135
Persons below poverty, %	10.9	10.1	14.8	12.3	16.1

Sources: http://www.census.gov http://recenter.tamu.edu

Moon[15,16] reported global development impacts of interstate highway within rural communities in Kentucky. The study examined factors that explained development prospects along highway interchanges on rural Kentucky during mid 1980's. Also presented are possible developmental effects for remote and isolated transportation interchange sites.

According to Peckham and Isserman[2] transportation infrastructure has proven the ability to enhance linkage between people, business and community and its vital for rural economic development. Transit infrastructure does influence location decisions of households within the community settings.

Using dichotomous choice modeling Peckham and Isserman[2] confirmed that residential choices and community patterns do attract business and industries and also affects the location decisions of firms. Transportation Equity Act for the 21st century (TEA-21) is the single largest public works bill in U.S. history that provided $175 billion in Federal funding for the Nations most important roads over 1998 to 2003. TEA-21 has also pointed to the benefits of the business sector of improved transport system within rural areas from additions to rural infrastructure.

Issue: Are county gains local retail sales by transporting consumers from their homes to the shopping areas of a county?

Aim and objectives: The aim of this study is to determine the local share of resident flow; this study considers the relative concentration of retail sale and service industry in the county to the state average. Specifically, the objective is to estimate the portion of local expenditure. The limitation of this study is that the costs and benefits of vehicle ownership are not discussed here.

Proposition: It is hypothesized that, if there is a high concentration of retail sale and service industry in the county, the local residents will be more likely to patronage these local retail and services and thus more likely to span the money inside the county.

Research methods: The main research method employed in this study is the use of secondary data. The study focuses on extraction of information from U.S. Census Bureau, County Business Patterns (NAIS).

Data analysis and results

County by county demographics analysis: Alabama's population in 2000 was 4,447,100, up 10.1% from 1990. Nationally, population increased 13.1% during the 1990s. The population of Alabama is 71.1% white and 26% African American. By comparison, 75.1% of the total US population is White and 12.3% is African American.

Autauga county: In Table 1 below shows the selected population information detailing historical growth, population density, current age distribution and household information for Madison County and Alabama are presented. As shown in Table 1, between 1990 and 2000, Alabama's population increased by 10.1% and Autauga County also experienced an increase of 27.6%. Furthermore, Autauga County has a population density of 73.0 persons per square mile and the State with 87.6 persons per square mile. It should be noted that the County's older residents is 1.7% higher than the state as a whole.

With reference to the 2000 census, the population of Autauga County was 80.7% White and 17.0% Black. These numbers are vastly different than those of the State.

Baldwin county: As shown in Table 1, with a population of 4,447,100 on April 2000, Alabama had added 406,513 residents in the 10 years since the 1990 census. However, Baldwin County experienced an increase of 42.9%. The population density of

Table 2: Selected economic data for counties and alabama

	Counties				
Item	Autauga	Baldwin	Jefferson	Morgan	Alabama
Personal Income, 2000 ($1,000)	$29,013.5	$28,788	$31,292.5	$28,822	$27,450.5
Personal Income per Capita, 2000	18,518	20,826	20,892	19,223	18,189
Civilian Labor Force, 2000	21,180	70,812	321,254	54,250	2,039,381
Unemployment, 2000	3.7	3.0	3.4	4.0	3.7
Full-time and part-time employment by place of work, 2000					
Management, professional and related occupations	27.1	29.5	34.0	27.1	29.5
Service occupations	14.1	14.5	13.7	12.6	13.5
Sales and office occupations	28.7	27.5	30.7	23.6	25.9
Farming, fishing and forestry occupations	0.8	1.0	0.1	0.6	0.8
Construction, extraction and maintenance occupations	11.3	13.8	8.8	11.7	11.3
Production, transportation and material moving occupations	18.0	13.7	12.7	24.4	19.0
Retail Sales 1997, ($1000)	$367,299	$1,215,305	$7,636,774	$1,136,530	$36,623,327
Retail Sales per Capita, 1997	$8,895	$9,438	$11,567	$10,487	$8,477

Sources: http://www.census.gov http://recenter.tamu.edu

88 persons per squares mile and the State with 87.6 persons/sq mile.

The County's older residents are 7.6% higher than the State as whole. The distribution of race population within the county based on the 2000 census, are 87.1% white and 10.3% Black. These numbers are vastly different than those of the State.

Jefferson county: The Table 1 reveals that Jefferson county population increased by 1.6% only between 1990-2000, with population density of 59.5 persons per square mile. The number of residents in the 65 and over category however, is expected to increase by 17.6% in the county and by more than 135 in the State. According the 2000 census, the population of Jefferson county was 58.1% White and 39.4% Black. These numbers are vastly different than those of the State.

Morgan county: Data presented in Table 1 shows that between 1990 and 2000, Alabama's population increased 10.15 and Morgan County also experienced an increase of 11.15. Morgan County has a population density of 191 persons per square mile. The County's older residents represent 16.75 while the State is 135.

County by county economic indicators: The US poverty rate in 1999 based on Census 2000 was 12.4%. In Alabama the poverty rate was 16.1%. The poverty rate in Alabama counties range from 6.3% (Shelby County) to 39.9% (Wilcox County). The Economic Research Service, USDA defines persistent poverty counties as those with poverty rates of 20% or higher in 1969, 1979, 1989 and 1999. As one can see from the Table 1 above, none of the counties selected for this study can be classified as persistent poverty counties.

Autauga county: The data presented in Table 2 give general observations of economic activity in Autauga County and Alabama. In 2000, the County's annual personal income was more than $29million, providing slightly more than $18,000 of annual income per person, which is about the same with the state average of $18,518. The median household income in Autauga county is income value $42,013 and the county's poverty rate at 10.9% is lower than the state's (30.3%).

Baldwin county: In Table 2 below one can see that in 1999, the county's annual personal income was more than 28 million's providing slightly more than 20, 000 of annual income per person, which is about $2,000 higher than the State average of $18,189. Furthermore, the median household income in Baldwin county is income value $40,250 and the County's poverty rate at 10.15 is lower than the State's (30.3%).

Jefferson county: Data presented in Table 2 give general observations of economic activity in Jefferson County and Alabama. In 2000, the County's annual personal income was more than $31 million, providing slightly more than $20,000 of annual income per person, which is about 42,000 greater than the State average of $18,189. The median household income in Jefferson County is $36,868 above $2,000 higher than the State's income value ($34,135) and the County's poverty rate at 14.8%, which was roughly half of the State's 30.35 poverty rate. Persons unemployed in year 2000 was 3.4% slightly lower than State's 3.7%.

Morgan county: As one can see from Table 2 above, in year 2000 the personal income for Morgan county was above $ 28million slightly higher that the State's $27

million, providing above $19,000 of annual income per person, which is about 41000 less than the States average of 418,189. The median household income in Morgan county is $37,803 about $3000 greater than the State's income value and the county's poverty rate at 12.35 less than half of the State's 30.3%.

Analysis of the scale of economic rural transit impact and its benefit to rural economy and communities

Employment structure

Population: Alabama with a population of 4,447,100 on April 2000 had added 406,513 residents in the 10yrs since the 1990 census.

Retail sales: Retail sales in Alabama totaled $37.9 billion in 1998, 6.0% above the 35.7 billion rung up in 1997. Across the state, 1998 growth was strongest in sales of general merchandise, up 10.1 %; hardware and lumber, 8.2% higher and the automotive sector, where sales climbed 7.8%. At 2.1%, food store sales showed the slowest growth. The average Alabamian spent $8,709 on retail purchases in 1998. Sales for the first four months of 1999 were 4.9% above the same four months of 1998.

County by county retail sales: Table 2 above shows the per capita retail sales for the four counties under investigation and rages from $8,895 to $10,487 are higher than the state average of $8,477 as of 1977.

Autauga: In Autauga County, the per capita retail sales of $8,895 were about $400 above the state average.

Baldwin: Baldwin area sales averaged $9,438 per resident, over $900 above the state average.

Jefferson: Retail sales per residents averaged $11,567 in 1997, over $3,000 above the state average.

Morgan: Morgan per capita sales, with an average of $10,487 in retail purchases per residents, over 42,000 above the state average.

Theoretical conceptual model and its applications: Economic-base concepts originated with the need to predict the effects of new economic activity on cities and regions. However, the above discussions are similar to the economic-base concepts-location quotients concept that widely used in the regional economics in the analysis of regional import and export sectors[9]. The location quotient is probably responsible for the long-life and continuing popularity and use of economic-base multipliers. It should be noted that the quotients provide a compelling and attractive method for estimating export employment (or income).

A location quotients is defined as the ratio in Eq. 1

$$LQ_i = (e_i/e)/(E_i/E) \quad (1)$$

Where,

e_i is the area employment in industry I

e is the total employment in the area

E_i is employment in the benchmark economy in industry i

E is total employment in the benchmark economy

The author modifying Eq. (1) above to estimate the portion of local expenditure (P) is

$$P_i = (CE/CP)/(SE/SP) \quad (2)$$

Where,

P_i = Portion of local expenditure in county i

CE =County employees of retail sale and service industry

CP = County population

SE = State employees of retail sale and service industry

SP = State population

It should be noted that the denominator is the share of retail sale and service employees in the state. If P is equal or larger than 1, all consumers expenditures are assumed to be expended locally, i.e. within a county boundary. If P is smaller than 1, the total expenditures will be adjusted by the factor P. It assumes that only P percent of expenditure will be spent locally.

Alabama Counties sale of economic rural transit trends have mirrored the state. In 1997 retail sales per capita for the selected counties ranges from $8,895 to $11,567 compared to $8,477 for the State. The results of Eq. 2 is shown in Fig. 1. As one can see from the above figure, the county gains local retail sales, but those sales are merely diverted from other counties or states where those people may shop or to order by mail. In Oluwoye[17] data analysis indicate that trip purposes for rural transit riders are widely distributed among shopping, medical, social and recreation, work, school and other unclassified trips.

The Autauga County shows that high concentration of retail sale and service industry within their county, the residents patronage local retail and

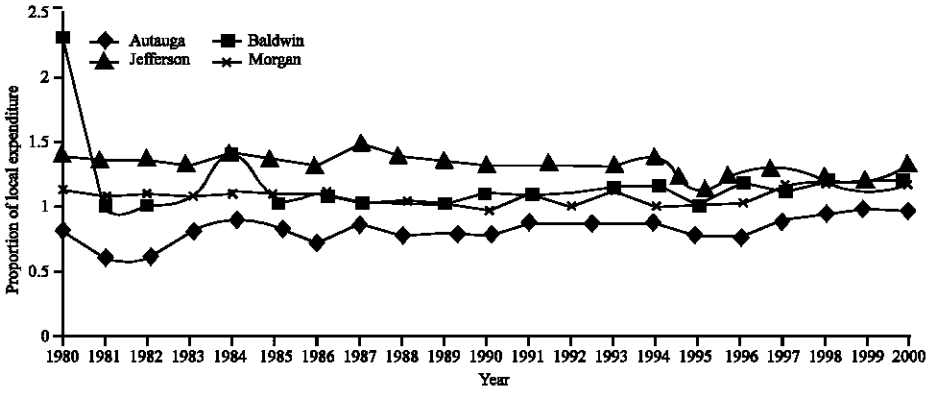

Fig. 1: The county gains local retail sales

services and thus spend their money inside the country. The other three countries graphs shows that their local retail and service industry is small and shows that they cannot meet the needs of local residents, their residents go to larger countries.

In Eq.1 above the denominator is the share of retail sale and service employees in the state. It provides a measure of how many retail and service employees are needed to satisfy to local demand for retail and services for the state average. The above graph is an example for the State as a whole in year 2000 Autauga county P is less than 1, the expenditure of their local residents was spent locally that is the percent of expenditure will spent locally, Notwithstanding, some of the retail and services acquired from outside the County. For example the P of Baldwin, Jefferson and Morgan in year 2000 were greater that 1, their expenditure of the residents spent outside the County, that is expended to nearby county.

It should be noted that the match and mismatch of retail and service industry and local demands depend on the type of services and goods that are provided by the industry and are desired by local residents.

CONCLUSION

one may argue that the national economy may not benefit much from a local county transit system, but the local economy certainly improves. Furthermore, the transfer benefits may not be important for the national economy as a whole in the pure economic sense, they are very important to retain the vitality of rural economy and rural communities.

ACKNOWLEDGEMENT

I am profoundly grateful to the Alabama Department of Transportation (ALDOT) for providing on going research grant number 930-628M.

REFERENCES

1. Brown, D.M., 1999. Highway Investment and Rural Economic Development: An Annotated Bibliography.Economic Research Service/USDA, Washington DC. Bibliographies and Lituatare of Agric., pp: 133.
2. Peckham, T.J. and A.M. Isserman, 1994. New Highways as Economic Development Tools: An Evaluation Using Quasi-Experimental Matching Methods. Regional Science and Urban Economics, 24: 723-751.
3. Peck, R.A., 1991. Editorial: Taming America's Highway System. Connecticut Preservation News, 14: 8.
4. Alonso, W., 1964. Location and Land Use. Cambridge, MA: Harvard University Press.
5. Von Thumen, D.H., 1842. Der Isoliertte Staat in P. Hall, Ed. Von Thumen's Isolated State. 1966. Londan: Pergamon.
6. Rephann, T.J., 1997. Highways and Regional Economic Development : What can we learn from Regional Economics Theory and Models? Allegany College of Maryland; Discussion Study Appalachia, (1982). Appalachian Highways are Catalysts of Change, 15: 8-17.
7. Meyer, M., C. Nelson and Peng, 1996. Development of a Methodology for evaluating the Economic Impact of Rural Public Transportation in Georgia Counties. Final Report, Georgia Dept of Technology Office of Materials and Research... Georgia Institute of Technology.
8. Huddleston, J.R. and P.P. Prem, 1990. Regional and Local Economic Impacts of Transportation Investments. Transportation Quarterly, 44: 579-594.
9. Sullivan, A.M., 1990. Urban Economics. Homewood, Illinois. IRWIN Inc.

10. Anderson, A.E., C. Anderstig and B. Harsman, 1990. Knowledge and Communications Infrastructure and Regional Economic Change. Regional Science and Urban Economics, 20: 359-376.
11. Howe, B., 1994. Building Wealth: A Strategy for Infrastructure development. Investing in Infrastructure, Workshop Studys #5, Australian Urban and Regional Development Review.
12. Munnell, A.H., 1990. How Does Public Infrastructure affect Regional Economic Performance? New England Economic Review, Federal Reserve Bank of Boston, pp: 11-33.
13. Forkenbrock, D.J., 1990. Putting Transportation and Economic Development in Perspective. Transportation Research Record, 1274: 3-11.
14. Liew, C.K. and C.J. Liew, 1984. Measuring the Development Impact of a Proposed Transportation System. Regional Science and Urban Economics, 14: 175-198.
15. Moon, H.E. Jr., 1987. Interstate Highway Interchanges Reshape Rural Communities. Rural Development Perspectives, 4: 35-38.
16. Moon, H.E. Jr., 1988. Interstate Highway Interchanges as Investigators of Non metropolitan Development. Transportation Research Record, 1125: 8-14.
17. Woye, J., E. Gooding and J. Lee, 2005. The Development of a Conceptual Framework for Evaluating the Impact of Rural Transit-Dependent Riders Benefits for Alabama Counties. Proceedings of the 24th Southern African Transport Conference (SATC 2005), Pretoria, South Africa, pp: 653-662.