THE IMPACT OF AGRICULTURAL GROWTH ON RURAL NON-FARM INCOMES AND EMPLOYMENT IN ALABAMA

LaTravis Brazil, Graduate Student
Department of Agribusiness
P. O. Box 1042, Normal AL 35762
Email: brazil_latravis@hotmail.com

James O. Bukenya, Associate Professor
Department of Agribusiness
P. O. Box 1042, Normal AL 35762
Email: james.bukenya@aamu.edu

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Orlando, FL, February 6-9, 2010

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ABSTRACT

The rural nonfarm economy is the backbone of the economy of numerous small towns scattered throughout the Black Belt region, as well as the primary source of income and employment. Seen in this light, the rural nonfarm economy will play a key role in determining future prospects for employment growth and poverty alleviation in the Alabama Black Belt region. The objective in this paper therefore is to examine the importance of rural-urban growth linkages with a focus on the Black Belt region and estimate agricultural growth multipliers. The analysis uses cross-section data to estimate econometrically the indirect rural employment and income generated by agricultural growth. Two major sections address the study objective. The first examines the importance, composition and location of nonfarm activity, as well as general trends over the past decades. After reviewing previous growth linkage studies, the second section explores the relationship between agriculture and changes in nonfarm activities.

INTRODUCTION

Traditionally, development policy and related research have adopted a simplified concept of rural and urban areas, with the words rural referring to more "remote farming areas" and urban to "crowded cities" (von Braun, 2007). To a large extent, this view has facilitated the isolated treatment of issues affecting each space, and it has failed to acknowledge the important inter-linkages[1] that exist between the two spaces and the many variants of the spaces (Douglass, 1998; von Braun, 2007; Seraje, 2007). In countries that are at early stages of urbanization and where poverty is predominantly a rural phenomenon, the development agenda has been dominated by rural concerns whereas in countries with higher levels of urbanization, efforts have been biased towards urban interests. However, it is now increasingly recognized that rural and urban development is interdependent (IIED, 2009).

In an economic sense, rural producers need markets, services, information and capital that are mostly found in the urban areas while demographic linkages (rural-to-urban migration and commuting) form a critical means of access to nonfarm employment and livelihood diversification for the rural poor (Tacoli, 2004; ADB, 2007).

[1] According to the International Institute for Environment and Development (IIED), rural-urban linkages can be defined as interactions across space (such as flows of people, goods, money, information and wastes) and linkages between sectors (for example, between agriculture and services and manufacturing). In broad terms, they also include 'rural' activities taking place in urban centers (such as urban agriculture) and activities often classified as 'urban' (such as manufacturing and services) taking place in rural settlements (IIED, 2009).

These linkages between urban and rural areas mean that changes in one affect the other: investments in urban and rural areas are not mutually exclusive, but can be mutually supportive, if they are properly planned (Satterthwaite, 2000; ADB, 2003; Seraje, 2007).

Past studies indicate that the nature of the rural-urban linkages differs from one place to another and differs for different sectors in the same place. In economic terms, three types of rural–urban linkages are usually distinguished: *consumption* linkages (demand for final products), *production* linkages ('backward' or 'forward' supply of inputs among businesses), and *financial* linkages (e.g., rents extracted by urban landlords, remittances by migrants and rural savings channeled through urban institutions (Rotge, Mantra and Rijanta, 2000). This paper examines, in an empirical approach, the strength of agricultural demand linkages and estimates the agricultural growth multiplier in Alabama. Because agricultural productivity growth triggers the generation of non-market mediated linkages between the agricultural sector and the rest of the economy, the paper first highlights trends in nonfarm employment across rural and urban areas in Alabama.

Trends in Nonfarm Employment in Alabama

The most readily available indicator of the relative importance of the rural nonfarm economy is its employment share, and these shares for 2006 are reported in Table1. Not surprisingly, the density of nonfarm activity increases dramatically in urban areas compared to rural areas. In rural settlements with 10,000 to 19,999 in

population, about 90 people per county work in nonfarm occupation. In rural areas with 50,000 to 99,999 in population, about 343 people per county work in nonfarm occupation. Yet in even bigger urban area of 100,000 plus in population, 1,471 people per county work in nonfarm occupation and 8 per county work in farm occupations.

Table 1: Nonfarm Employment Density by Size of Settlement, 2006

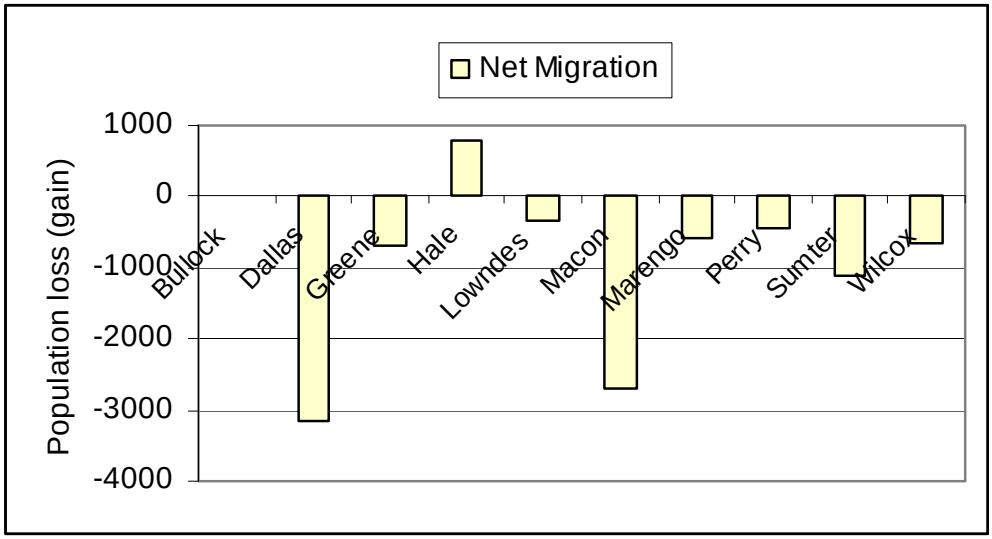
Size of Locality	**Rural**		**Urban**	
(Employment per County)	Farm	Nonfarm	Farm	Nonfarm
100,000 plus	2.016	116.062	8.15	1471
50,000-99,999	13.049	343.44	2.439	208
20,000-49,999	14.451	289.864	1.458	48
10,000-19,999	7.775	90.311	-	-

Demographic Flows

A significant portion of rural to urban migration and rural to rural migration occurs at the county level as exemplified by the millions of rural Alabamians migrating to fill rural and urban jobs. It is imperative to note, however, that residential mobility in rural Alabama, particularly in many of the distressed counties in the Black Belt region (Figure 1) may be a cause of and a solution to high poverty rates. Mobility is one of the means for individuals to seek better economic opportunities and a process by which a local economy corrects the imbalances between labor supply and labor demand. The

predicament for distressed areas, however, is that the most likely to migrate out of these areas are the young, the well-educated, and the affluent individuals. In cases of severe distress and decline, those that remain will be those who are immobile, and therefore stuck in poverty with little choice. High psychic costs and unaffordable financial costs of moving, lack of information about alternatives, obsolescence of job skills (structural unemployment), and often age are some of the major reasons that substantially reduce mobility for these individuals. Thus, the high mobility of the most employable and the low mobility of the least employable result in a very low average standard of living and high rates of poverty as out migration from a severely distressed county occur.

Figure 1: Net migration across Black Belt counties—1990-2000

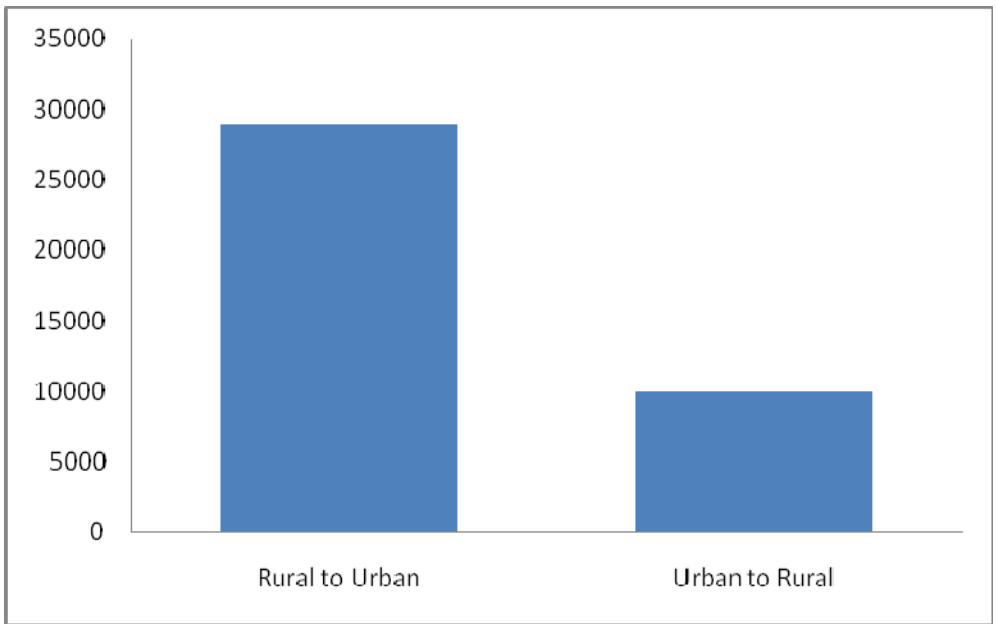


Note: Negative values represents out-migration and *vice versa*

Employment and Earning Flows between Rural and Urban Regions

An important set of economic linkages between the urban core and its periphery is the commuting into the core of workers who live in the periphery and the commuting of those living in the core to the periphery (Figure 2). In the recent years, the number of rural-to-urban commuters has roughly tripled from 1982 to 2006 from about 16,000 to about 45,000 workers. The number of urban-to-rural commuters has also increased, though not nearly as quickly, from 8,500 to 18,500 over this period. The proportion of rural residents who work in urban areas increased from 2.7% in 1982 to 4.9% in 2006.

Figure 2. Alabama Net Commuting Flow: 1982—2006



This phenomenon of increased commuting is also present in labor flows of urban residents to the rural areas for work. Between 1982 and 2006, the percentage of urban residents that work in the rural counties in Alabama increased from 1.5% to 2.3%. Although the urban and the rural regions are not strongly linked through flows of labor and income, we see that the regions have over time become more interdependent through labor commuting. As shown in Figures 3 and 4, there was decreasing and increasing trends in rural farm and nonfarm employment, respectively between 2001 and 2007.

Figure 3. Alabama Rural Farm Employment

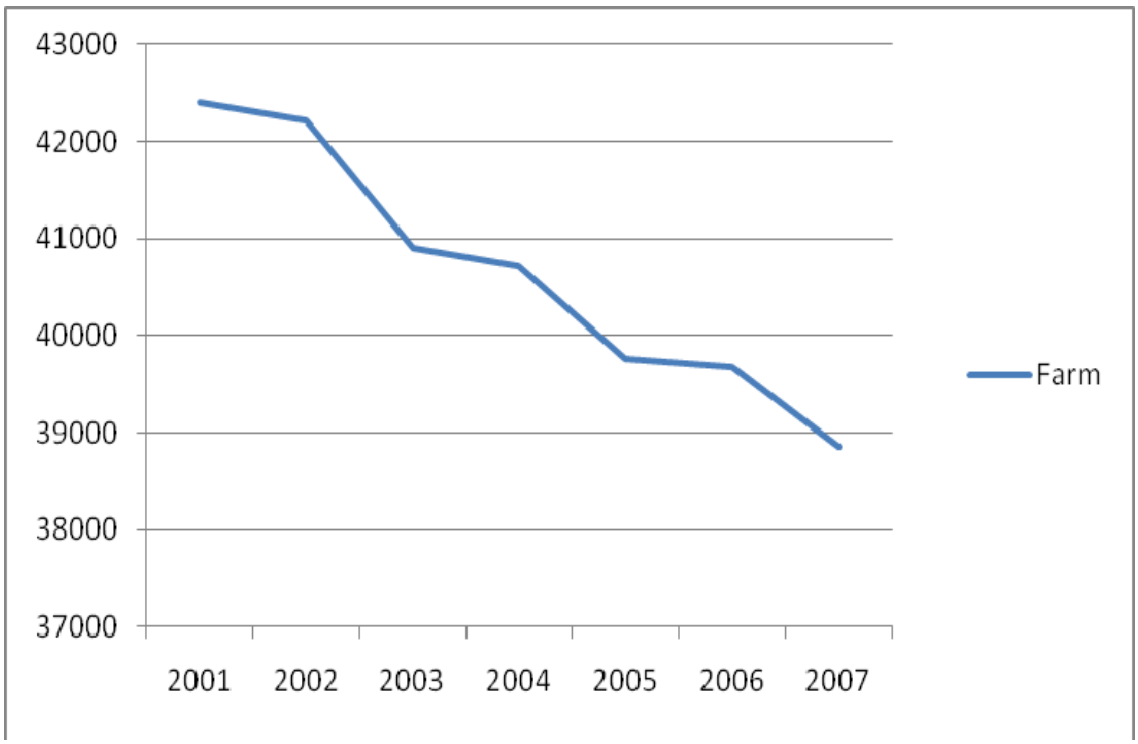
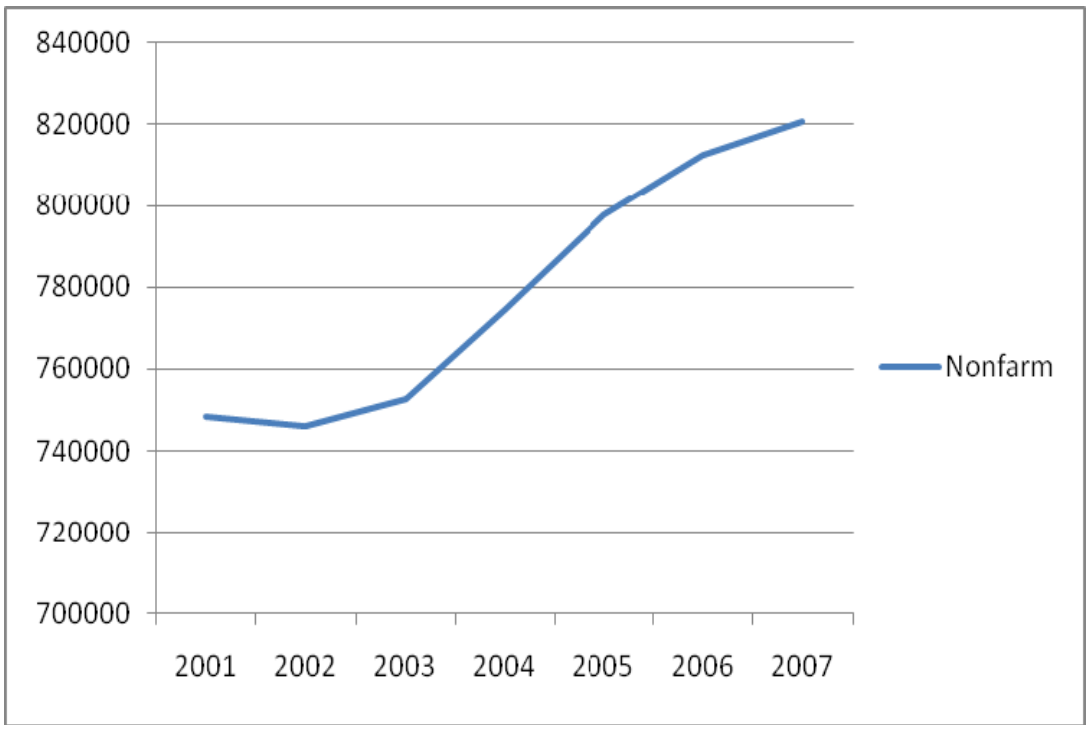


Figure 4. Alabama Rural Nonfarm Employment



LITERATURE REVIEW

There is a large literature looking at the determinants of rural income diversification. One of the central themes of the literature has been the effect of the household's level of education on nonfarm employment. In spite of the large and varied nature of the human capital literature for rural households, the primary focus until the 1980s was on the effect of education on the household's behavior on the farm. Recently the focus has shifted to the issue of how education affects the nonfarm behavior of rural households. Schultz (1988) documents in a survey that farmer with more schooling often first supply family labor off the farm. Yang and An (2002) show that education

improves the allocation of household resources between agricultural and non-agricultural activities. Jolliffe (2004) estimates returns to education in farm and off-farm work, and finds that they are much higher in the latter, thus affecting the allocation of labor. By and large, the empirical evidence is unanimous in finding positive effects of education on participation in nonfarm activities.

While it is known that agricultural expansion is critical to growth in nonfarm sectors of rural regions, the extent and mechanisms of economic interdependency between agriculture and other sectors remains inadequately understood aspect of the rural-urban economic growth dynamic. A study done by Hazell and Haggblade (1990) examined the importance of rural-urban growth linkages in India, by assessing the impact of agricultural growth on national demand for nonfarm products. Because growing land scarcity raises concerns about prospects for rural labor absorption, the author highlighted the impact of agricultural growth on rural nonfarm incomes and employment. First, they provided a descriptive overview of nonfarm activity in India by examining the importance, composition and location of nonfarm activity as well as general trends over the past 30 years. Second, explores the relationship between agriculture and changes in nonfarm activity. After reviewing previous growth linkage studies, they compared nonfarm activity in high- and low-productivity agricultural states cross-sectionally and over time. Third estimated the volume of rural nonfarm income and employment generated by agricultural growth and lastly, they projected

the projects patterns of demand for nonfarm goods emanating from alternative agricultural growth scenarios.

Rural Canada is experiencing considerable "demographic pressure" as 1.76 rural persons are now looking for a job for each rural person retiring from the workforce. Rural Canada appears disadvantaged. Among OECD countries, Canada has the biggest urban-rural gap in the share of the workforce (aged 25 to 44) with university or college graduation. New jobs in the globalizing economy require a high capacity to deal with disequilibria. Improving the human capital of the local workforce is essential to provide opportunities for the individuals in the workforce, regardless of where they will work. However, local economic development strategies should focus on more than human capital development to stimulate local job growth. Bollman's (1998, 2000) studies offer four measures of local community development. His equations explain only 21 to 34 percent of the variability in these measures of local community development in the 1980s. Contrary to the research findings in the United States, the findings reported in his paper suggest that the human capital complement in Canada's communities did provide a positive (albeit weak) boost to job growth in the locality during the 1980s. Thus, what are the linkages between human capital and rural development? First, the literature suggests human capacity is largely developed by the nutrition and nurturing of children, specifically in the period of minus nine months to plus three years. Secondly, a higher human capacity in a community (as proxied by years of schooling) is weakly associated with a higher growth in community employment but is weakly

associated with a lower growth in wages that appears to cause a weak association with lower aggregate community earnings. Investment in nutrition and nurturing of children is a key factor. A higher education level in a community provided only a weak employment boost during the 1980s.

Schmitt, Henry, Piguet, and Hilal (2006) examines how the spatial pattern of urban growth in functional economic regions influences the interplay of rural export employment, rural services employment, and population change in rural areas. Using an extension of the Boarnet's model (Papers in Regional Science 73:135–153, 1994), they found that urban spread effects to rural areas in France are more likely than urban backwash effects, and that spatial urban (both dynamic and static) externalities affect rural population and employment growth. In the functional economic regions where the urban core is declining and the urban fringe is expanding, urban population growth involves an increase in rural export employment, and larger change in service employment favors rural population growth. However, urban export job growth reduces the growth in rural service jobs and expanding urban service jobs reduce rural export jobs, suggesting that expanding urban employment opportunities draws employees away from proximate rural communities. Conversely, where both urban core and fringe are growing, they observed an urban spread effect from the urban export sector to rural services—an export base multiplier effect with a spatial dimension—and from urban population growth to rural service employment.

METHODOLOGY

Data and Analysis

To examine the importance of rural-urban growth linkages, the paper utilizes annual county level data on factors that may impact rural non-farm employment. The data were collected from several government sources. Specifically, data was drawn from the Alabama Data Center (ASDC)[2] and US Census Bureau. The economic base model adopted in the analysis was developed by Richardson (1985). The model assumes that while agricultural output is constrained by technology, land and agro-climate, rural nonfarm activity is constrained only by demand. Improved agricultural technology increases farm output and hence the demand for nonfarm inputs and consumer goods. In the specification, Richardson (1985) assumes that since agricultural output varies across regions, the following relationship would allow a rough estimate of the growth multiplier:

$$\textbf{Rural Nonfarm Employent (RNFE)} = \beta_0 + \beta_1 \textbf{Farm Employment (RFE)} \quad (1)$$

where $\beta_1 = \frac{d\mathbf{RNFE}}{d\mathbf{RFE}}$ is the agricultural employment multiplier; assuming that other factors besides the level of agricultural employment vary across counties, and they too may affect the size of the nonfarm economy.

[2] ASDC is a network of 27 public agencies working together through a cooperative agreement with the US Census Bureau since 1978 to analyze and provide socioeconomic and demographic information for the state of Alabama.

Different types of agriculture may generate different linkages since input intensity and processing requirements vary across cropping systems. Outside of agriculture, researchers generally single out infrastructure, population density and per capita income as candidates most likely to increase growth multipliers. Infrastructure facilitates communication, transport and credit flows and should improve the responsiveness of the nonfarm economy to demand increases from agriculture. Likewise population density, especially in rural areas, may reduce the geographic catchment area necessary to achieve minimum efficient scales of production, reduce transport costs and thereby improve prospects for rural responses. And higher agricultural employment should lead farm families to diversify their consumption into nonfoods, thus increasing their incremental expenditure on nonfoods. To take account of these other influences on the growth linkages, the following equation is considered:

$$\mathbf{RNFE} = \beta_0 + \beta_1(\mathbf{RFE}) + \mathbf{RFE}[\beta_2(\mathbf{POPDEN}) + \beta_3(\mathbf{GOVEXP}) + \beta_4(\mathbf{EDUC})] + \beta_5(\mathbf{BLACK\ BELT})\,\varepsilon \quad (2)$$

where **RFE** refers to rural farm employment, **POPDEN** to the population density, **GOVEXP** to county government real expenditure, **EDUC** to the proportion of rural population with high school diploma and above, and **BLACK BELT** to a dummy variable coded 1 for Black Belt counties and 0 otherwise. The three ancillary variables are included as multiplicative interaction terms because in this form the employment multiplier becomes:

$$\frac{d\mathbf{RNFE}}{d\mathbf{RFE}} = \beta_1 + \beta_2\,\mathbf{POPDEN} + \beta_3\,\mathbf{GOVEXP} + \beta_4\,\mathbf{EDUC} \quad (3)$$

That is, rural population density, county government real expenditure and education affect the multiplier itself (the slope) rather than merely the level of nonfarm activity (the y-intercept). Note that other factors influencing the level of nonfarm activity are captured in the error term. Raw material availability, historical accident, location, ethnicity, and differential policies all undoubtedly influence nonfarm activity to some extent, but they are difficult to measure and it seems reasonable to model them as varying randomly across counties.

Equation 2 is estimated using both ordinary least squares (OLS) and instrumental variable (IV) procedures. The latter seemed necessary to correct for potential endogeneity problems with some of the right-hand side variables. For example, it could be argued that the rural nonfarm economy has its own stimulatory effects on agriculture, in which case **RNFE** and **RFE** would be simultaneously determined. Also, population and government expenditure may be concentrated in regions with higher agricultural potential, leading to selectively bias problems.

In the IV estimation, the rural farm employment is treated as an endogenous variable and instrumented by farm concentration, proportion of irrigated farmland, IT access and number of trucks. The reason for using farm concentration and proportion of irrigated farmland as an instrument for rural farm sector growth is obvious. Meanwhile, number of trucks is also used as an instrument for rural farm sector growth because both agricultural inputs and outputs are bulky, so the number of trucks available in a province provides a good indication of the intensity of economic activities in the

agricultural sector in that province. Finally, access to information technology is also important for marketing and purchasing farm inputs and outputs.

RESULTS

Table 2 shows the results of estimating Equation (2) using both ordinary least squares (OLS) and instrumental variable (IV) procedures. In both estimations, the dependent variable is rural non-farm employment (**RNFE**) and the independent variable is rural farm employment (**RFE**). The control variables are rural population density, initial proportion of rural population with high school education and above as a measure of human resources quality, and log of county government real expenditures. In both the OLS and IV estimation results, the coefficients of rural farm employment are statistically significant. However, the magnitude of the coefficient obtained from the IV estimation is smaller than that obtained from the OLS estimation. Also, only three of the control variables (Black Belt region, government expenditure and education) in both estimations have statistically significant coefficients.

Given that it is more likely that the endogeneity problem does exist in the data, the discussion of the estimated results focuses on the IV model. First, the coefficient of rural farm employment is negative. This indicates that indeed the growth of the farm sector negatively drives down employment in the nonfarm sector across rural counties in Alabama. The magnitude of the coefficient (7.39) obtained from the IV estimation implies that increase in rural farm employment reduced nonfarm employment by

approximately seven jobs, all other things held constant. This finding suggests that rural development strategies with agricultural focus might not lead to employment growth in the nonfarm sector.

Table 2: Rural Nonfarm Employment Model Results

	OLS Model			IV Model		
Variable	Coefficient	S E	t-Stat	Coefficient	S E	t-Stat
Intercept	-5.18*	3.00	-1.73	-4.45	3.75	-1.19
Farm Employment	-9.57***	3.35	-2.86	-7.39**	3.85	-1.92
Population Density	29.16	39.95	0.73	-88.72	103.03	-0.86
Govt. Expenditure	0.01***	0.00	6.27	0.02**	0.01	1.91
Education	3.05***	0.20	15.25	3.47***	0.45	7.63
Black Belt region	-1.35*	0.70	-1.93	-1.64**	0.76	-2.15
R-squared	0.97			0.97		
Adjusted R-squared	0.96			0.96		
S.E. of regression	12712.13			13613.08		
Durbin-Watson stat	2.35			2.12		
Mean dependent var	38315.97			38315.97		
S.D. dependent var	71486.95			71486.95		
F-statistic	506.30			432.68		
Prob(F-statistic)	0.00			0.00		

Note: *, ** and *** denotes significance at the 0.10, 0.05, and 0.01 levels, respectively.

Turning to the control variables, the coefficient for the education variable is positive and statistically significant at the 1% level, implying that increasing human capital leads to increased nonfarm employment. The magnitude of the estimated coefficient suggests that increasing the level of human capital across rural counties in Alabama would increase employment in the nonfarm sector by approximately 3.5 jobs,

ceteris paribus. On the other hand, the estimated coefficient for government expenditure is positive and statistically significant at the 5% level. However, the magnitude of the coefficient (0.02) is relatively small, implying that although increasing government expenditure increases nonfarm employment, the number of nonfarm jobs resulting from increases in government expenditure is relatively small. Plausible explanation for this result is the observation that state and local governments in Alabama have consistently underfunded government programs and or projects in rural counties, especially in the Black belt region.

Similarly, the estimated coefficient for the variable representing the Black Belt region is negative and statistically significant at the 5% level. This finding supports the previous argument advanced in explaining the small magnitude of the government expenditure variable. The negative sign for the Black Belt variable suggests that conditions in the Black Belt region weaken the growth of rural nonfarm employment. Such conditions include poor infrastructure, the lack of entrepreneurial base, low education to name a few. Particularly, looking at individual counties, only half of the counties in the Black belt region (Macon, Greene, Hale, Lowndes and Marengo) have high school graduating rates better than the rate for Alabama at 29 percent. With the exception of Macon, all the Black belt counties have low rates of people with more than high school education (some college, college graduates and above) compared to the rates for Alabama. Thus, these conditions in addition to recent economic forces such as

technological change and greater global competition are plausible explanations for the observed results.

Conclusion

The objective of this paper was to examine the strength of agricultural demand linkages and to estimates the agricultural growth multiplier in Alabama. County level annual data on factors that have impact on rural nonfarm employment were collected from the Alabama Data Center and the US Census Bureau websites. These data were analyzed using the economic base model developed by regional scientists. The estimated results from the instrumental variable model showed four variables (rural farm employment, government expenditure, education and the dummy variable representing the Black Belt counties) to be statistically significant. Overall, the results showed a negative rural-urban growth linkage, implying that agricultural based rural development policies did not lead to employment growth in Alabama over the studied period.

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