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Empirical Analysis of Food Assistance Program Participation: A Case Study of West Virginia

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Abstract:- This study aims at examining the relationship between macroeconomic and policy variables and food stamp program participation in West Virginia. Static and dynamic econometric models are employed. Results indicate that macroeconomic conditions significantly explain food stamp program participation. Results could be helpful to welfare programs in West Virginia.

Key Words: Food stamp participation, static model, dynamic model, macroeconomic, policy.

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Introduction

Despite the fact that the United States is one of the wealthiest nations, poverty-related malnutrition has been a long-standing social and economic challenge that researchers and policy makers have been facing for decades. The number of people living in poverty has been increasing for the last consequent four years in the United Sates. The nation's poverty rate in 2004 was 12.7 percent, 37 million people, 1.1 million more compared to 2003 (DeNavas et al. 2005).

According to ERS estimates, in 2000, more than 33 million people experienced food insecurity at some time during the year. Those households were uncertain of having or unable to acquire a supply of food sufficient to meet basic needs at all times because of inadequate resources (Winicki et al. 2002). Low-income households are much more likely to experience hunger, and lack of access at all times to enough food for an active, healthy life (Nord et al. 1999). The high costs of housing, health and medical care, and other expenses supplemented with low economic performance create pressure on households especially who live on low income. Since from the household's budget the budget allocated to food items is more flexible, households are more likely to cut from food and allocate for other expenses.

For the past decades, policy makers have been attempting to address the problem of low income households by introducing numerous assistance programs to improve the lives of low-income households. Food Assistance Program, Aid to Families with Dependent Children (AFDC), Supplemental Security Income (SSI), and Medicaid Program are some of the

assistance programs introduced to assist low income families. These programs have been security for low-income households by proving financial and in-kind assistance.

Currently there are fifteen food assistance programs aimed at improving the nutrition of low-income households administered by USDA. In the year 2004, the total expenditure of USDA for food assistance programs totaled $46 billion, of which 94 percent of the total expenditure accounted for five major programs: Food Stamp Program, the National School Lunch Program, the Special Supplemental Nutrition Program for Women, Infant and Children (WIC), the School Breakfast Program, and Child and Adult Care Program (The Food Assistance Landscape, 2005)

Among these nutritional assistance programs, food stamp is the largest and the only assistant program available for all households nationwide based on the financial need of the household regardless of the family structure, age and disability. The program accounted for 59 percent of the total food assistant expenditure in 2004, with monthly average 23.9 million participants or 1 in 12 Americans (The Food Assistance Landscape, 2005)

West Virginia is one of the nation's poorest states. Many parts of the state continue to experience high unemployment, a shrinking economic base, deeply rooted poverty, low human capital formation, and out-migration (Deavers and Hoppe, 1992). West Virginia ranks second to last in per capita income and lags the nation and the rest of the Appalachian region in almost every other indicator measuring income, employment, and wealth, making it a classical example of persistent poverty (Dilger and Witt, 1994, Haynes, 1996, Maggard, 1990, U.S. Census Bureau, 2000). Slow income and employment growth, out-migration, and the disappearance of rural households, are both causes and effects of persistently declining public services and high rates of poverty. Lagging economic development negatively affects the

economic and social well-being of West Virginia's rural population and the ability of local governments to provide basic social services (Cushing and Rogers, 1996). These realities have not changed much in recent years. Recently, West Virginia has experienced very low level of per capita income, sluggish economic growth, very low level of educational attainment compared to other states, loss of non-farm jobs and rising unemployment rate (WV Economic Outlook, 2001; 2002; 2003; 2004; 2005).

West Virginia has the largest poverty rate following New Mexico, Louisiana and Mississippi. For the last four consecutive years, the poverty rate was above 16 percent higher than the national average rate of 12.4 percent. According to the American Community Survey Report (2005), in 2004, in West Virginia 371,000 people (around 20.4 % of the population) live in poverty. The poverty rate is even higher for children below 18 years. According to the report 70,000 children (24.4 percent) under age of 18 were living in poverty in 2004.

So far, little research has been done on the relationship between food stamp participation and macroeconomic indicators and policy change at the state level. The main objective of the study is to examine the relationship between food stamp participation and macroeconomic trends in West Virginia and to draw a relevant policy implication from the empirical findings and analysis of the study.

Methodology

To empirically analyze the impact of macroeconomic and policy factors on food stamp participation, two econometric models are used: static and dynamic models. In the static model, the explanatory variables for period *t* are assumed to affect participation in the same period *t*. In the dynamic model the dependent variable (food stamp participation) depends on lagged food stamp participation in period *t-1*, lagged macroeconomic variables in period *t-1* as

well as current macroeconomic and policy variables. The rationale for using the dynamic model is that an event on one period may affect program participation for several subsequent periods due to lags in the adjustment of econometric variables. The econometric models are developed following the modeling approaches of Wallace and Blank (1999), Figlio et al. (2000) and Ziliak et al. (2002).

Static Model

In the static model, the effect of the independent variables at year *t* on the dependent variable at the same period t is examined. The presumption of the static model is that prior events that occurred before do not significantly affect the present event. A zero correlation between current food stamp participation and lagged independent variables is assumed.

Following the above stated argument, the static empirical econometric model can be specified as:

$$FSP_{it} = f(UEMPR_{it}, EMPGR_{it}, PCPI_{it}, POV_{it}, PRWORA_{it}, GOV_{it}, T) \quad (1)$$

where FSP_{it} = represent the percentage of food stamp participants out of the total population in county i at time t

$UEMPR_{it}$ = unemployment rate in county i in year t

$EMPGR_{it}$ = employment growth rate in county i in year t

$PCPI_{it}$ = per capita personal income of county i in year t

POV_{it} = the percentage of the people lives in poverty out of the total population for all age group in county i in year t

$PRWORA_{it}$ = indicator of Personal Responsibility and Work Opportunity Reconciliation Act

T = time trend in food stamp participation

The functional relationship in equation (1) hypothesizes that food stamp caseloads are functions of employment and income opportunities, welfare reform, the Electronic Benefits Transfer, proportion of the people that live in poverty, proportions of people with high school and higher education as a measure of human capital accumulation, proportions of single parent families, price level and a time trend variable.

From equation (1), a static empirical model can be specified as:

$$FSP_{it} = \beta_0 + \beta_1 UEMPR_{it} + \beta_2 EMPGR_{it} + \beta_3 PCPI_{it} + \beta_4 POV_{it} + \beta_5 PRWORA_{it} + \beta_6 T + \upsilon_i \qquad (2)$$

Though the static model is important in informing the relationship between economic and policy variable and food stamp participation, the argument that past economic conditions may not affect current food stamp participation levels make the model restrictive. Last period economic performance may affect the current food stamp participation decision and eligibility. For example, lagged unemployment and employment rates affect the current food stamp participation decision and eligibility. Since most of the food stamp recipients are characterized as less-skilled and less-educated, they are less-likely to be employed instantaneously as the economy booms. Also unemployed people may not be eligible in the program instantaneously, rather after adjusting down their initial asset level to the eligibility requirement level (Figlio et al. 2000 and Ziliak et al.2002). Hanson and Gundersen (2002) also explained the effect of lagged unemployment on current food stamp participation that for some people who lose their jobs during economic downturn, unemployment insurance benefits offset a portion of the lost earning. As a result, many households or individuals remain ineligible for the program. However, the FSP is particularly important for many workers not covered by unemployment insurance particularly those in low wage. Conversely, Ziliak et al. (2002) indicate that during

economic expansion FSP does not respond instantaneously as new employed persons may only exit the program when food stamp must be renewed.

Unlike static models, the use of dynamic model makes it possible to see the effect of economic changes beyond the current period. In a dynamic model, the presumption is that food assistance recipients of this year are more likely to be food stamp recipients next year than someone who is not receiving food stamp this year (Hanson and Gundersen 2002; Figlio et al. 2000). Dynamic model allows capturing the delay of non-recipients to enroll in the program after becoming unemployed. Dynamic model also allows the sluggish adjustment of food stamp caseload to lagged food stamp caseload, unemployment rate, employment, and per capita income. Hence, the assumption that past economic patterns may not affect current period food stamp participation is relaxed.

Dynamic Model Specification

Based on the previous discussion on lagged economic variables, a dynamic food stamp participation model can be specified as follows:

$$FSP_{it} = f(FSP_{it-j}, UEMPR_{it-k}, EMPGR_{it-l}, POV_{it-m}, PCPI_{it-n}, R) \tag{3}$$

Where $R = (UEMPR_{it}, EMPGR_{it}, PCPI_{it}, POV_{it}, PRWORA_{it} GOV, T)$ includes the variables specified in equation (1).

Following equation (3), a dynamic food stamp caseload estimation model can be specified as:

$$FSP_{it} = \beta_0 + \sum_{j=1}^{J} \beta_{1j} FSP_{it-j} + \sum_{k=1}^{K} \beta_{2k} UEMPR_{it-k} + \sum_{l=1}^{L} \beta_{3l} EMPGR_{it-l} + \sum_{n=1}^{N} \beta_{4n} PCPI_{it-n} + \sum_{m=1}^{M} \beta_{5m} POV_{it-m} + \sum_{\beta(n=6)}^{n=11} \beta_n R_{it} \tag{4}$$

where $\sum_{\beta(n=6)}^{n=11} \beta_n R_{it} = \beta_6 UEMPR_{it} + \beta_7 EMPGR_{it} + \beta_8 PCIP_{it} + \beta_9 POV_{it} + \beta_{10} PRWORA_{it} + \beta_{11} T + \upsilon_{it}$

Thus, this dynamic model integrates the static model variables and develops a lagged variable argument for food stamp participation, unemployment rate, employment rate, and poverty.

Method of Estimation

The two models are separately estimated to explain food stamp participation using Ordinary Least Square (OLS) method.

Simple OLS method is based on the assumption that all coefficients of the variables in the model and the intercept are identical for all counties across time. This method of estimation assumes that all counties have the same characteristics. It also assumes that food stamp participation is time invariant. This restricted assumption might distort the true picture of the result since all counties might not possess the same characteristics. Hence, food stamp participation could differ from county to county and over time.

Fixed effect or group effect specification is one way of accounting the individual differences among counties by relaxing the restricted assumption and letting the intercept to vary across the counties but not across time, and keeping the slope constant for all counties. This method of estimation captures the difference in food stamp participation in different counties. It also explains by how much each county's food stamp participation differs from the base county. Fixed effect and time (year) effect variables attempt to control for unmeasured, systematic variation in food stamp participation that could otherwise bias estimates of the effects of food stamp program and economic factors. Without controlling of fixed effects, the model could overstate (understate) the impact of policy changes on participation decline if

counties with historically low (high) participation rates imposes policy these policy change (Kornfeld, 2002).

The fixed effect model is estimated using Least Square Dummy Variable (LSDV) method. LSDV method necessitates the introduction of dummy variables for all counties to capture the county food stamp participation difference.

However, introducing dummy variables for large number of cross section observation in the model reduces the degrees of freedom for statistical test. Also it might create multicollinearity problem which might make precise estimation of one or more parameters difficult (Gujarati, 2003). In order to avoid the possible problem, since the cross section has 55 observations, counties are categorized in to five geographical regions; eastern, western, northern, southern and central. Eastern region comprises of eleven counties, western region constitutes ten counties, northern region comprises of fifteen counties, southern region constitutes eleven counties and central region comprises eight counties.

Using OLS estimation procedure, both static and dynamic models with regional dummies and without regional dummies is estimated. To determine which model (restricted or unrestricted) fits the panel data better, a restricted *F* test is employed. Using this test, it is found that the fixed effect model with regional dummies is statistically significant for both models than the pooled estimation indicating that indeed counties categorized into regions have different food stamp participation. Thus, the model estimated using LSDV method fits the data better.

Data Type and Sources

For the purpose of this study pooled data from 1995-2002 for 55 counties is used. Employment growth rate and unemployment rate of each county is used to examine the impact of economic

cycles on food stamp participation. Both employment and unemployment variables are based on time series data included in the model to capture the labor market condition of West Virginia counties.

To examine the impact of poverty level on food stamp participation, data on percentage of the people who live in poverty is used.

The policy variable is constructed as discrete dummy variables that correspond to the enactment of the policy. For the time period prior to the introduction of PROWR, the dummy variable is assigned a value of 0 and for the time period from 1996 to 2002 it is assigned a value of 1.

The political variable measures the political climate in of the West Virginia over the period under consideration. States can not propose major policy change or directly alter eligibility rule or payment rules through state legislation or regulation (Wallace and Blank, 1999). However, states can impact food stamp participation indirectly. However, the objective of this variable in this study is to find out people's behavior towards food stamp program with the coming of governors with different political affiliation. Dummy variable is introduced to account the political affiliation of West Virginia's governors. The values of dummy assigned for democrat governor is 1 and 0 for republican governor.

County level time serious data for each variable included in the model is collected from different sources. Table 1 presents the variables with their respective data sources.

Result and Analysis

Static Model Results

The estimated coefficients of the static model are presented in column 3 of table 2. The adjusted R square indicated that the 74.8 percent of the variation of the static model is explained by the explanatory variables specified in the model.

The result indicated that unemployment rate (UEMPR) is positively related with food stamp participation. The coefficient is significant at 1 percent level of significance. A one unit increase in unemployment growth rate is expected to increase food stamp participation by 0.38, controlling other explanatory variables. County level FSP is expected to increase in counties with high unemployment rate and decrease with low unemployment rate.

Employment growth rate (EMPGR) has no significant effect on food stamp participation. The result indicates that people might use food stamp despite the fact that employment opportunities are expanded. The result might suggest that food stamp participant might not leave the program after they got employed due to the fact that their income is still below or at the required poverty level which qualify them to participate in the program. The other possible explanation would be food stamp participants might not leave the program instantaneously as they got employed. This might suggest that participants might not report to the food stamp office about the raise in their income until they are required to report by the office quarterly. However, the above possible explanations has not supported by the data available in the model.

Income (PCPI) has an inverse and significant relationship with food stamp participation. County per-capita income is used as a proxy of household income. An increase in income by one unit ($1) is expected to decrease food stamp participation by 0.15*, ceteris*

paribus. The result is statistically significant at 5 percent level of significance. The result indicates that as income decreases, more people would be eligible and participate in the food stamp program. Also the opposite also true, as income increases new applicants will be ineligible and existing participants would be disqualified and exit the program. However, income decrease might possibly have an effect on food stamp in two ways: income decrease might trigger new food stamp participants to participate in the program regardless of their previous participation history in the program, or increase the amount benefit for the existing once since food stamp benefit is always adjusted against family size and income level. Similarly income increase might possibly affect food stamp participation in a ways that existing participants would be forced to leave the program if their income is above the eligibility requirement level. It is also possible participants leave the program after income increment despite they are qualified for benefit due to many reason such as small amount of benefit, or they might think they no longer quailed in the program. Another possible impact of increase in income on food stamp would be participants might not leave the program but their benefit level would be downward adjusted against income increase. However given county level general per-capita income data the, it is difficult to test the about explanations.

Poverty has the expected positive effect on food stamp participation. It is found that it is significant at 1 percent level. An increase of people who live in poverty by one percent will increase the percentage of food stamp participants by 0.77, *ceteris paribus*.

Different policy changes may affect food stamp participation and the potential effect of policy changes are likely to vary considerably across different types of households or individuals. The introduction of Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) is expected to reduce food stamp participation at least for two groups: non-

citizens and able-bodied individuals without children between the ages of 18-49. However, PRWORA is found to be statistically insignificant. Even though demographic variables are not included in the model, the result might suggest about the characteristics of food stamp recipients in West Virginia. Food stamp participants in West Virginia might be composed of group of individuals or households who are able bodied individuals without dependents that fulfill the work requirement but their income is below the required level to make them eligible to participate in the program. Moreover it might suggest that food stamp participants could also be comprised of able-bodied individuals with dependent, senior citizens or disabled individuals that the policy didn't influence or limit their eligibility. However, this argument can be supported better with survey information that accounts for demographic information.

Political variable (GOV) is included in the model to control the people's attitude that may have an effect on food stamp participation. It is expected that if democrat governor come to office more people participate in the program. However, the result indicated that there is no statistically significant relationship between food stamp participation and the political affiliation of governors come to office.

The dummy variable estimates for regions indicate that dummy variables that represent western, southern and central regions have positive signs as compared to the base region (eastern). The percent of food stamp participants in western, southern, and central regions are significantly higher than percentage of food stamp in the eastern region. Food stamp participation in western and central region is statistically significant at 1 level and southern region at 5 percent level. Food stamp participation in western region is higher by 4.07, keeping other variables constant, than the percentage of participants in eastern region. Similarly, percentages of food stamp participants in southern and central regions are higher by

1.42 and 2.48, *ceteris paribus*, respectively. However, dummy variable that represents northern region food stamp participation is not significant, meaning there is no food stamp participation difference in northern and eastern region. These results reveal existence of significant differences in food stamp participation in different regions of West Virginia.

The coefficient of the trend variable is negative and statistically significant The result reveals that food stamp participation has decreased over the periods under consideration.

Dynamic Model Results

The dynamic model explains variations in FSP by the explanatory variables of lagged and current change in total employment (ΔTEMP), lagged and current unemployment rate (UEMPR), lagged and current change in per capita personal income (ΔPCPI), dummy variable of Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), governors political affiliation dummy variable (GOV), and lagged dependent variable. This specification explains 75.5 percent of the variation in food stamp participation. The estimated coefficients are given in column 4 of table 2.

In the dynamic model estimated lagged and current independent variables exhibited high level of multicollinearity. High multicollinearity among the explanatory variables creates econometric problems, for instance, increasing the probability of obtaining estimated coefficient significantly different from the true estimate, change the value of estimated coefficients and resulted in statistically insignificance of the relevant variables with unexpected sign of coefficients. Therefore, this paper address the problem of multicollinearity by transforming some of the observations used in static estimation. Data for per-capita income is transformed to change in per-capita income (ΔPCPI), employment growth rate is transformed

to change of total employment (ΔTEMP) and lagged percentage of food stamp participation is transformed to change in total food stamp participation (ΔFSP).

Unemployment rate is positively and significantly related with food stamp particpation. A one unit increase in unemployment rate is expected to increase food stamp participation by 0.33. This result is robust and consistent with the static model result as the relationship between unemployment rate and food stamp participation remains consistent. Counties with high unemployment rate are expected to have more participants in food stamp program. However, one-period lagged unemployment rate (LG1UEMPR) is found to be statically insignificant. The result suggests that unemployment rate beyond the current period does not have a significant impact on FSP.

Similar to findings in the static models, employment change has no significant effect on FSP. Likewise, it is found that one-period change in total employment has no significant influence on FSP. Employment change may not have immediate effect on food stamp participants who may not quickly adjust to changes in the labor market.

One-period lagged per capita personal income is (LG1PCPI) negatively related with FSP and is statistically significant at 5 percent level. A one unit increase in LG1PCPI is expected to increase FSP by 0.19, *ceteris paribus*. However, unlike the static model current per-capita personal income (PCPI) found to be statistically insignificant.

Current FSP is negatively related with its one-period lagged food stamp participation (LG1ΔFSP). The coefficient found to be statistically significant at 1 percent level of significance. As last period food stamp participation increase current program participation decrease and vise versa. The result might suggest that, keeping other factors constant, if people participate in the program last period they would not participate in current period.

Both lagged and current poverty levels are other important variables that explain food stamp participation. The result indicates that both variables are directly related to FSP. Lagged and current poverty levels are more likely to increase FSP in current year. Both current and one-period lagged poverty are statistically significant at 1 percent level of significance.

The policy variable of PRWORA is statistically insignificant in this model as well. Food stamp participation is found to be not systematically different before and after the introduction of PRWORA in West Virginia. Similarly, the political affiliation variable GOV is not statistically significant; indicating that people's perception of participating in FSP is not affected by the political affiliation of the governors in office.

Dummy variables that represent western, southern and central regions are found to be statistically significant. This indicates that the percentage of food stamp participation in western, southern and central regions was higher as compared to percentage of food stamp in eastern region (the base of comparison). The percentage of food stamp participants in western region is higher by 3.47, *ceteris paribus,* than the percentage of participants in eastern region. Similarly, percentages of food stamp participants in southern and central regions are higher by 0.88 and 2.16, *ceteris paribus*, respectively as compared to the eastern region. The result also shows that the dummy variable that represents northern region is not significant; indicating that participation rates in northern West Virginia is not statistically different from the base region. These results reveal the existence of significant differences in food stamp participation patterns in different regions of West Virginia. This conclusion is supported by the static model results as well. The trend variable is not statistically significant in the dynamic model.

Conclusion

This study aims at examining the relationship between macroeconomic and policy variables and FSP participation in West Virginia. Static and dynamic econometric models are introduced to test for the relationship between economic and policy factors and food stamp program participation using county level data. Results from these models revealed that only economic variables are found to be the important factors in determining food stamp participation in West Virginia. These results could be helpful in designing effective welfare programs in West Virginia.

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Table 1. Type and source of data

Data Type	Source
Population by county	*WVBEP, Census Bureau*
Employment and Unemployment by county	*WVBEP & BBER*
Per capital Personal Income by county	*WVBEP*
Poverty by county	*US Census Bureau*
Food Stamp Participation by county	*WVDDHR & USDA*
Governor	*NGA*

Note: *WVBEP = West Virginia Bureau of Employment Program*
BBER = Bureau of Business and Economic Research
WVDDHR = West Virginia Department of Health & Human Service
USDA = United States Department of Agriculture
NGA = National Governors Association

Table 2. Empirical result of both static and dynamic model estimation

Variables	*Discription of Varaibles*	*Static Model*	*Dynamic Model*
EMPG	*Employment Growth Rate*	*-5.958*	*-*
		(1.072)	
UEMPG	*Unemployment Rate*	*0.379****	*0.332***
		(2.859)	*(2.277)*
PCPI	*Per-capita Personal Income*	*-0.151***	*-*
		(2.062)	
POV	*Poverty level*	*0.775****	*0.407****
		(8.837)	*(3.049)*
ΔTEMP	*Change in total employment*	*-*	*-0.261*
			(1.072)
ΔPCPI	*Change in Per-capita Personal Income*	*-*	*-0.783*
			(0.271)
LG1ΔTEMP	*One-period lagged change in total employment*	*-*	*-0.489*
			(1.588)
LG1UEMPR	*One-period lagged unemployment rate*	*-*	*0.608*
			(0.506)
LG1ΔFSP	*One-period lagged change in total food total food stamp participation*	*-*	*-0.115****
			(2.795)
LG1PCPI	*One-period lagged Per-capita Personal Income*	*-*	*-0.194***
			(2.377)
LG1POV	*One-period lagged poverty*	*-*	*0.336****
			(2.941)
PRWORA	*Personal Responsibility and Work Opportunity Reconciliation Act*	*1.180*	*0.528*
		(1.132)	*(0.454)*
GOV	*Political affiliation of governor*	*0.751*	*0.705*
		(0.115)	*(0.893)*
T	*Time trend*	*-0.338**	*-0.167*
		(1.704)	*(0.793)*
RD2	*Region 1 Dummy*	*4.066****	*3.614****
		(4.145)	*(3.877)*
RD3	*Region 2 Dummy*	*0.578*	*0.397*
		(1.555)	*(1.095)*
RD4	*Region 3 Dummy*	*1.425****	*1.160***
		(2.514)	*(2.139)*
RD5	*Region 4 Dummy*	*2.488****	*2.171****
		(3.822)	*(3.569)*
Adjusted R^2	*Region 5 Dummy*	*0.748*	*0.755*
Constant		*-0.114*	*0.381*

***, ** and ** denotes level statistical significance at 1 percent, 5 percent and 10 percent respectively.