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John Leatherman, Compiler

with assistance from

Emily Mollohan, Student Research Assistant

Department of Agricultural Economics

Kansas State University

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Updating and Enhancing IMPLAN's Econometric Regional Purchase Coefficients

Jennifer Thorvaldson[1]
Doug Olson
Greg Alward
MIG, Inc.

Abstract. Determining commodity import and export flows are fundamentally important to deriving regional social accounting matrices. Regional purchase coefficients (RPCs) describe the proportion of each dollar of local demand for a given commodity is purchased from local producers. In IMPLAN, RPCs are estimated using econometric methods or a gravity model. The econometric model currently used in IMPLAN was estimated in 1988 using 1977 data for 51 regions and 84 commodities. The availability of more recent data and additional data not previously available allow for updated and improved econometric equations (and resulting RPC estimates). A new set of econometric equations has been estimated using 2009 data for 3,142 regions and 425 commodities and an enhanced econometric equation. This paper describes the process and results.

Keywords: Input-output models, interregional trade, RPCs

[1] The authors are economists at MIG, Inc. and can be contacted at jenny@implan.com, doug@implan.com, and greg@implan.com, respectively.

Introduction

Determining commodity import and export flows is fundamental to successfully deriving regional social accounting matrices (SAMs), such as those provided by IMPLAN. It has been suggested that estimating inter-regional trade flows is the greatest source of error in deriving non-survey input-output (I-O) models (Stevens and Trainor, 1980). Regional purchase coefficients (RPCs) have long been the primary focus of research in this area (Olson and Alward, n.d.). An RPC describes the proportion of each dollar of demand for a given commodity that is purchased from local producers. RPCs are used in IMPLAN to create the multipliers for each commodity and to estimate the direct impact leakage. RPCs are commodity- and region-specific, with higher RPCs indicating less leakage and larger I-O multipliers.

Currently in IMPLAN, RPCs are estimated by the supply-demand pooling method (SDP), econometric methods, or IMPLAN's national tradeflow model. Because SDP does not account for cross-hauling[2], it

[2]Cross-hauling occurs when a region both exports and imports a particular good or service. Cross-hauling can arise from the product-mix issue, where the level of aggregation is decisive. For instance, a region may export apples and import mangoes. Most I-O models will consider apples and mangoes to be the same commodity – namely, "fruit". Cross-hauling of a commodity can also arise from brand loyalty, long-term contracts, etc. When

is only used at the national level. Due to its internal consistency[3] and by accounting for spatial variables like the proximity and size of alternative markets, the tradeflow model is presumed to be superior to econometric methods for estimating regional RPCs[4]. However, tradeflow data are not currently available at the zip-code level and tradeflow RPCs not responsive to edits to the underlying study area data[5]. In these instances, econometric RPCs are needed.

Problem Statement and Study Purpose

The coefficients IMPLAN currently uses to calculate the econometric RPCs were estimated by Alward and Despotakis (1988) using 1977 data from a 51-region, 84-industry, multi-region input-output model (MRIO) (Jack Faucett Associates, Inc., 1983). The equations were estimated for shippable (i.e., manufactured) commodities only[6]. The availability of more recent data and additional data not previously available allows for updated and improved econometric equations and resulting RPC estimates.

In this analysis, a set of new econometric equations are estimated using 2009 data for 3,142 regions and 425 commodities. Enhancements include a larger sample size, greater number of commodities, more recent data, and an enhanced set of variables. This paper outlines the methodology adopted, showcases the results of the new model, and makes comparisons between the new econometric model, the previous econometric model, and the tradeflow model.

Methodology

Econometric Analysis

Regression models are often used to model the cause-and-effect relationship between variables. The standard linear regression model is not appropriate in cases where the dependent variable is restricted to the interval (0,1), such as is the case with RPCs[7]. One popular solution is to use the logarithmic transformation. This was the approach adopted by Alward and Despotakis (1988) and is followed here.

The current study involved three incremental analyses, yielding three RPC values for each commodity and county pair. In each case, the RPCs themselves were calculated using 2009 IMPLAN data. The differences lie in the variables included in the econometric equations and the data used to estimate those equations:

1. 1988 Method (IMPLAN's current methodology): This analysis uses the same set of variables used by Alward and Despotakis and the same coefficients reported in Alward and Despotakis (estimated using 1977 data). The variables used in this methodology are listed in Table 1.

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cross-hauling is ignored, interregional trade is underestimated and regional multipliers are overestimated (Miller and Blair, 2009, p. 352).

[3] Theoretically, if you sum all states' net domestic exports (domestic exports less domestic imports) for each commodity, they should sum to zero, but when using econometric-based RPCs there is no guarantee of that. Internal consistency is maintained with the gravity model that is part of the trade flow model.

[4] For more information about the trade flow model, see Alward and Olson (undated) and Lindall et al. (2005).

[5] A model may be edited to add a new sector to a region or to make a sector look and behave like a specific firm in that sector, for example.

[6] Non-shippable commodities (i.e., services) were based on the "observed" values for a 51-region MRIO created by John Havens based on 1982 data.

[7] Linear regression may yield fitted values for the dependent variable that lie outside the lower and upper bounds.

2. Intermediate Method: This analysis also uses the same set of variables used by Alward and Despotakis, but re-estimates the coefficients using 2009 data.

3. New Method: This analysis uses a new set of variables (described below) and estimates the coefficients using 2009 data.

Table 1. Variable Set from Alward and Despotakis (1988)

	Reason for Inclusion
Dependent Variable	
Ln (M_i^{UL}/X_i^{LL}) • M_i^{UL} = imports from the ROUS to region L • X_i^{LL} = quantity produced and consumed in region L	Proxy for RPC; converted to RPC using a constant foreign import rate[8]
Explanatory Variables	
Ln $[\text{LaborIncome}_i^L/\text{Employment}_i^L]$	Included to explain differences in consumption and production pattern
Ln $[\text{LandArea}^L/\text{LandArea}^{ROUS}]$	Proxy for transportation costs
Ln $\left(\frac{(\text{Employment}_i^L/\text{TotalEmployment}^L)}{(\text{Employment}_i^{ROUS}/\text{TotalEmployment}^{ROUS})}\right)$	Proxy for establishments
Ln $[\text{Employment}_i^L/\text{Employment}_i^{ROUS}]$	Proxy for output

The new variable set includes the following changes:

1. Presuming the newly-available tradeflow RPCs represent our best estimates of the true RPCs, they represent a better proxy for RPC; thus, the tradeflow RPCs serve as the new dependent variable.

2. In order to capture proprietor's income[8], labor income is used in place of employee compensation as one of the explanatory variables.

3. Data on commodity supply are now available, eliminating the need to use employment as a proxy for output. Supply (as a ratio with demand) is thus used in place of the employment ratio.

4. Population density is introduced as a new explanatory variable. As a proxy for the urban/rural nature of a county, this variable is expected to provide additional information about transportation costs, as well as local supply and demand behavior.

This set of variables is very similar to those that have been used in land-use-transportation planning models (Brown et al., 1972).

Due to simultaneity between the explanatory and dependent variables, the methodology described above will not yield reliable estimates of the structural parameters. However, as was the case in Alward and Despotakis (1988), the ultimate goal is reliable prediction of the RPCs; with the structural relationship between the causal factors

[8] Labor income = employee compensation + proprietor income.

and RPCs being of little concern. Thus, and concerns about simultaneity can effectively be ignored in this instance. To avoid unnecessarily reducing the sample size, zeroes were replaced with $1x10^{-13}$ so that the natural log could be calculated.

It is possible that a county's RPC for a particular commodity may be influenced by neighboring counties' RPC for that commodity. The model does account for neighboring counties, in a sense, by accounting for the rest of the U.S., which of course includes a county's neighbors. Furthermore, the new dependent variable - the Tradeflow RPC - accounts for spatial characteristics; in particular, the distance between each county accounting for the time and cost of travel by each commodity's mode of transportation.

Whenever there are many zero observations, it is tempting to use the Tobit model[9]. However, Maddala (1992, p. 34) cautions against using the Tobit model when no censoring has occurred, emphasizing that the Tobit model is only appropriate for those cases where the dependent variable can, in principle, take on negative values, but those values are not observed because of censoring; in these cases, the observed zero values are due to non-observability of the negative values rather than censoring. For cases where the observed zero values are not due to censoring, the appropriate procedure would be to model the forces that produce the zero observations rather than use the Tobit model.

Data

With the exception of the 1988 coefficients, all data for the analyses came from the 2009 IMPLAN dataset[10]. The sample includes all U.S. counties and all IMPLAN commodities but the following:

- 3034-3038: These commodities represent new construction. All new construction occurs locally[11], so the RPCs are constrained to 1.

- 3361: This commodity represents the imputed rental services of owner-occupied dwellings and is constrained to 1, as again this represents local activity since the homes are located locally.

- 3428, 3430, and 3431: These commodities represent government enterprises. Government supply of these commodities is already represented in the output of their private counterparts, so the RPC for these commodities has already been calculated.

- 3433: This commodity represents used goods. In 2009, U.S. output of used goods was less than U.S. exports of used goods, so this sector represents trans-shipments and the RPC was constrained to 0. This commodity may be included in future analyses.

- 3436: This commodity represents non-comparable foreign imports. There is no local supply, so the RPC constrained to 0.

- 3437-3440: These commodities represent government payroll. Because employment by

[9] The Tobit model is also known as a censored regression model. In a censored model, some sample values are reported at a limit value instead of at actual values (Hallahan, n.d.).

[10] More information about IMPLAN data can be found on the IMPLAN website: http://implan.com/v4/index.php?option=com_multicategories&view=categories&cid=241:datainformation&Itemid=10

[11] This is the way new construction is defined by the BLS data used by IMPLAN. If a construction company in County A sets up a worksite in County B to build a new structure there, this worksite is treated as though it is a separate enterprise that exists in County B.

definition occurs at the site of employment (as opposed to the site of residence), RPC for these commodities is 1.

Results

Model Fit

While the ultimate purpose of the econometric analyses is to obtain a separate equation for each commodity, the only model for which model fit was reported in Alward and Despotakis (1988) is one estimated using the entire (81-commodity x 51-state) dataset. Thus, for comparison purposes, an equation for the entire (425-commodity x 3,142-county) dataset for the manufactured commodities was estimated for comparison with Alward and Despotakis' (84 x 51) equation. An equation for the entire (112-commodity x 3,142-county) dataset for the non-manufactured commodities was similarly estimated. While the coefficients from these models are not used in calculating RPCs, nor do they reveal how well the model fits for each of the separate commodities, it does give a sense of how well the model does, overall, in explaining variation in (M_i^{UL}/X_i^{LL}) or tradeflow RPC.

Table 2 displays the overall model fit and statistical significance of each explanatory variable for the 1988 Method, Intermediate Method, and New Method. The first column of the table describes the model – the dependent variable, the number of observations, and model fit, as measured by the adjusted-R^2. The second column lists the explanatory variables, while the third column displays these variables' estimated coefficients and statistical significance, as measured by the t-statistic. *RPC* refers to the Tradeflow RPC. The superscripts refer to the region, with *L* indicating a county and *ROUS* indicating the rest of the U.S. The subscripts refer to the commodity.

With the exception of the land area variable in the 1988 Methodology and Intermediate Methodology, all explanatory variables in all models were statistically significant at the five percent level. This suggests that each of the variables contribute in explaining variation in RPC.

A comparison between the 1988 Methodology and Intermediate Methodology underscores the importance of sample size in regression analysis – using the same variable set but 229 times as many observations leads to a near doubling of the adjusted-R^2. Because the dependent variable of the New Method differs from that of the Intermediate Method, direct comparisons of their adjusted-R^2s is not particularly meaningful but may nonetheless provide some evidence of the value of the enhanced variable set – using the same sample but with the above-described adjustments to the variable set, the adjusted-R^2 is increased further, though to a smaller degree.

Table 2. Model Fit for Manufactured Commodities

1988 Method		
Dep. Variable:	***Explanatory Variables***	***Coefficient (t-statistic)***
$Ln(M^{UL}/X^{LL})$	Constant	-2.05 (-12.56)
Observations:	$Ln [LaborIncome_i^L/Employment_i^L]$	0.67 (13.5)
4,284	$Ln [LandArea^L/LandArea^{ROUS}]$	-0.005 (-0.026)
Adjusted-R^2: 0.32	$\left(\frac{(Employment_i^L/TotalEmployment^L)}{(Employment_i^{ROUS}/TotalEmployment^{ROUS})} \right)$	-0.83 (-32.72)
	$Ln [Employment_i^L/TotalEmployment^L]$	-0.14 (-8.41)
Intermediate Method		
Dep. Variable:	***Explanatory Variables***	***Coefficient (t-statistic)***
$Ln(M^{UL}/X^{LL})$	Constant	11.8094 (204.81)
Observations:	$Ln [LaborIncome_i^L/Employment_i^L]$	-0.4989 (-133.36)
983,446	$Ln [LandArea^L/LandArea^{ROUS}]$	-0.0086 (-1.597)
Adjusted-R^2: 0.9185	$Ln \left(\frac{(Employment_i^L/TotalEmployment^L)}{(Employment_i^{ROUS}/TotalEmployment^{ROUS})} \right)$	0.2005 (54.66)
	$Ln [Employment_i^L/TotalEmployment^L]$	0.8891 (253.73)
New Method		
Dep. Variable:	***Explanatory Variables***	***Coefficient (t-statistic)***
Ln [RPC/(1-RPC)]	Constant	-1.7248 (-57.11)
Observations: 983,446	$Ln \left(\frac{(LaborIncome_i^L/Employment_i^L)}{(LaborIncome_i^{ROUS}/Employment_i^{ROUS})} \right)$	3.02 E^{-12} (18.44)
Adjusted-R^2:	$Ln [LandArea^L/LandArea^{ROUS}]$	0.7249 (181.15)
0.9446	$Ln \left(\frac{(Employment_i^L/TotalEmployment^L)}{(Employment_i^{ROUS}/TotalEmployment^{ROUS})} \right)$	0.7802 (915.11)
	$Ln [(Supply_i^L/Demand_i^L)/(Supply_i^{ROUS}/Demand_i^{ROUS})]$	0.0325 (36.45)
	$Ln [Population^L/LandArea^L]$	0.7353 (340.42)

Table 3 provides the same information for the non-manufactured commodities. Note that because Alward and Despotakis (1988) did not estimate coefficients for the non-manufactured commodities, comparison to the 1988 model is not possible for these commodities. Again, the improvement in adjusted-R^2 across methods suggests the added value of the new variable set in explaining variation in RPC across commodities and counties.

Table 3. Model Fit for Non-Manufactured Commodities

Intermediate Method		
Dep. Variable: Ln(M^{UL}/X^{LL}) ***Adjusted-R²:*** 0.5291 ***Observations*:** 351,904	***Explanatory Variables***	***Coefficient (t-statistic)***
	Constant	-8.6583 (-52.84)
	Ln ($LaborIncome_i^L$)/($Employment_i^L$)	-1.1836 (-75.33)
	Ln [($LandArea^L/LandArea^{ROUS}$)]	-0.0900 (-6.07)
	$\text{Ln}\left(\frac{Employment_i^L/TotalEmployment^L}{Employment_i^{ROUS}/TotalEmployment^{ROUS}}\right)$	0.8447 (81.41)
	Ln [($Employment_i^L/TotalEmployment^L$)]	-0.2955 (-30.70)
New Method		
Dep. Variable: Ln [RPC/(1-RPC)] ***Adjusted-R²:*** 0.8831 ***Observations*:** 351,904	***Explanatory Variables***	***Coefficient (t-statistic)***
	Constant	3.1593 (44.01)
	$\text{Ln}\left(\frac{LaborIncome_i^L/Employment_i^L}{LaborIncome_i^{ROUS}/Employment_i^{ROUS}}\right)$	-0.0050 (-55.50)
	Ln [($LandArea^L/LandArea^{ROUS}$)]	0.4195 (44.65)
	$\text{Ln}\left(\frac{Employment_i^L/TotalEmployment^L}{Employment_i^{ROUS}/TotalEmployment^{ROUS}}\right)$	0.0871 (78.05)
	Ln [($Supply_i^L/Demand_i^L$)/($Supply_i^{ROUS}/Demand_i^{ROUS}$)]	0.9387 (740.41)
	Ln ($PopulationDensity^L$)	0.4404 (87.54)

Further comparisons between the New Method and the 1988 Method are limited by the fact that the 1988 Method yields RPC estimates for just 84 commodities. Considering that the Intermediate Method uses the same econometric equation as the 1988 Method but with a greater sample size, updated data, and for all 425 commodities, the remaining comparisons are focused on the Intermediate Method and New Method, and how each compares to the Tradeflow Method.

Table 4 displays the commodities for which the model fit (as measured by adjusted-R^2) was lowest. The first column lists the IMPLAN commodity code and description; the second column lists the adjusted-R^2; and the remaining columns show the average RPC (across all counties) as estimated by each of the three methods. According to the U.S. Census Bureau's North American Industry Classification System (NAICS), commodity 3018 includes commercial hunting and trapping guides, commercial game preserves, and hunting preserves. Commodity 3019 includes support services for crop production (e.g., cotton ginning, soil preparation, crop harvesting), animal production (e.g., breeding, boarding, pedigree record-keeping), and forestry (e.g., forest fire fighting and prevention, pest control, reforestation, timber valuation). These support activities may be performed by the agriculture or forestry producing establishment or conducted independently. Commodity 3435 consists of compensation paid to foreign residents, interest and dividends paid to the rest of the world, compensation paid to U.S. residents by foreigners, and income receipts on assets from the rest of the world. There is no corresponding NAICS code for this commodity. It is encouraging to note that despite having such low adjusted-R^2s, the New Method RPCs are closer than the Intermediate Method RPCs to their respective

Tradeflow RPCs, and are actually quite close to the Tradeflow RPCs.

Table 4. Adjusted-R^2 and Average RPCs for Commodities with Lowest Adjusted-R^2

IMPLAN Commodity Code and Description	Adjusted-R^2	Intermediate Method RPC	New Method RPC	Tradeflow RPC
3018 - *Wild game products, pelts, and furs*	0.1577	0.8217	0.5205	0.5771
3019 - *Agriculture and forestry support*	0.1980	0.0984	0.1122	0.2167
3435 - *Rest of world adjustment*	0.2453	0.3141	0.3149	0.3234

<u>Comparison between Econometric RPCs and Tradeflow RPCs</u>

In their exposition of the tradeflow model, Lindall et al. (2005) compare the new tradeflow RPCs with the econometric RPCs (based on the 1988 methodology) for six commodities in Washington County, MN. The authors conclude that, while there is no definitive proof that the tradeflow RPCs are correct, they appear to be more realistic in the cases presented in their paper. We repeat the comparison here, but this time comparing the Intermediate Method and New Method to the Tradeflow Method (Table 5).

Table 5. Comparison of RPCs for Washington County, MN

Commodity	Tradeflow Method	Intermediate Econometric Method	New Econometric Method
Dairy cattle and milk products (3012)	0.4483	0.8955	0.4669
Wood windows and doors and millwork (3099)	0.5736	0.0000	0.5510
Refined petroleum products (3115)	0.9472	0.0031	0.0153
Other plastics products (3149)	0.0302	0.0152	0.0245
Special tools, dies, jigs, and fixtures (3219)	0.0262	0.0003	0.1110
Magnetic and optical recording media (3258)	0.0000	0.5358	0.0000

It should be noted that the tradeflow RPCs are domestic RPCs, and because they serve as the dependent variable in the New Methodology, the new econometric RPCs can also be considered domestic RPCs. Meanwhile, the RPCs estimated with the 1988 Methodology are average RPCs. Domestic RPCs represent the proportion of domestic local demand (i.e., local demand for domestically-produced goods/services) that is supplied locally, while average RPCs represent the proportion of gross local demand (i.e., local demand for domestic and foreign goods/services) that is supplied locally. Therefore, domestic RPCs will always be greater than or equal to average RPCs. Thus, in order to make meaningful comparisons, the Tradeflow RPCs and New Methodology RPCs were converted into average RPCs before being reported here[12]. To ensure that

[12] This is done by multiplying the domestic RPCs by the foreign RPC for that commodity. The foreign RPC equals one minus the foreign import rate for that commodity; foreign RPCs thus vary by commodity but not by region.

local supply consumed locally does not exceed local supply, all RPCs were then constrained to be less than or equal than the SDP ratio. This is the standing practice for all IMPLAN RPCs.

The average difference between the Intermediate Methodology RPCs and the Tradeflow RPCs was 0.4341, meaning that the Intermediate Method tends to overshoot the tradeflow RPC. The average difference between the New Method RPCs and the Tradeflow RPCs was -0.0054, meaning that the New Method tends to undershoot the tradeflow RPC slightly. These trends remained when separate comparisons were made for the manufactured commodities and non-manufactured commodities. The average *absolute value* difference between the Intermediate Method RPCs and the Tradeflow RPCs was 0.5232, while the average *absolute value* difference between the New Method RPCs and the Tradeflow RPCs is just 0.0134.

Overall, the New Econometric RPCs were closer to the Tradeflow RPCs in 93% of all cases (94 percent in the case of manufactured commodities and 91% of all non-manufactured commodities). For those cases where the New Methodology RPCs were farther than the Intermediate Methodology RPCs were from the Tradeflow RPCs, the average absolute difference between the New Methodology RPCs and the Intermediate Methodology RPCs was 0.0394. In other words, these 7 percent of all RPCs tended to be about 4 percent farther than the 1988 Methodology RPCs were from their respective Tradeflow RPC. For these cases, the average absolute difference between the New Methodology RPCs and the Tradeflow RPCs was 0.0977, while the average absolute difference between the Intermediate Methodology RPCs and the Tradeflow RPCs was 0.0495.

It is encouraging to note that, in those cases where the New Methodology RPCs were farther than the 1988 Methodology RPCs were from the Tradeflow RPCs, most of the commodities for which the discrepancy was largest (Figure 1) were not among the commodities for which the discrepancy was prevalent amongst the counties (Figure 2). In fact, the only commodity which shows up in both categories is commodity 3016 - *Logs and roundwood.* It is interesting to note that the two commodities for which the adjusted-R^2 was lowest (commodities 3018 and 3019) were the same two commodities that most often had a New Methodology RPC that was farther than the 1988 Methodology RPC from the Tradeflow RPC.

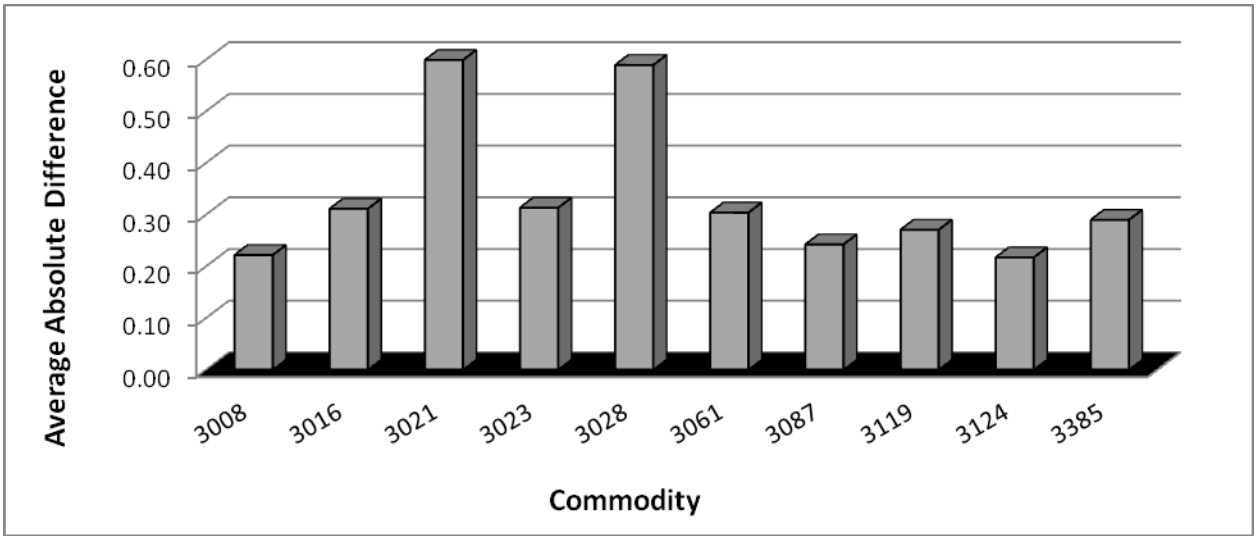

Figure 1. Average absolute difference between Intermediate Methodology RPC and New Methodology RPC, by Commodity

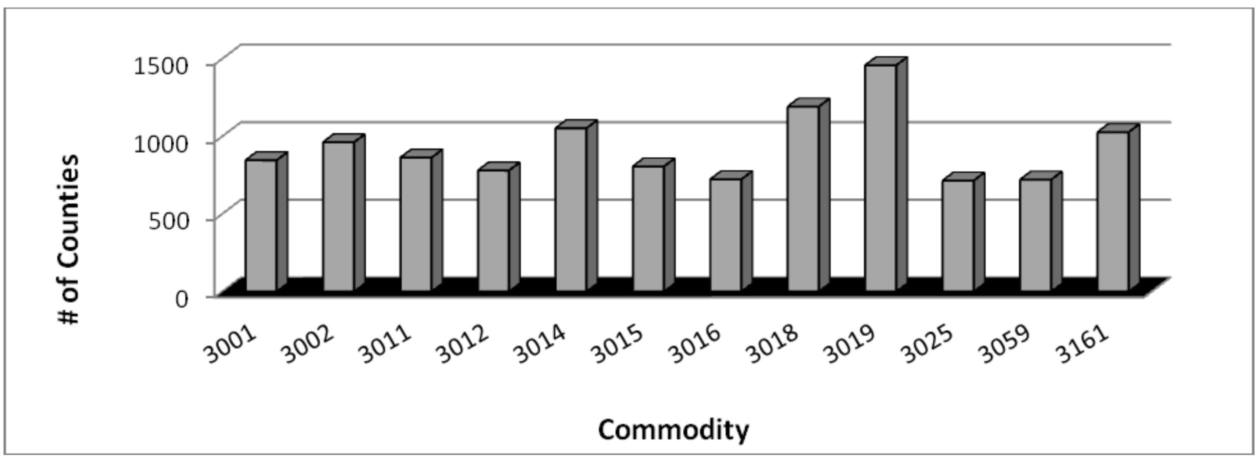

Figure 2. Number of counties for which the Intermediate Methodology RPC was closer than the New Methodology RPC to the Tradeflow RPC, by Commodity

Conclusions and Suggestions for Further Research

The comparisons in Lindall et al. (2005) highlighted the seeming superiority of the tradeflow method over the Alward and Despotakis (1988) econometric method. The comparisons here have shown the superiority of the new econometric method over the 1988 econometric method. Therefore, while the tradeflow method is still recommended for all cases when it can be appropriately used, the new econometric method is clearly an improvement over the old econometric method, and IMPLAN users can have greater confidence in the econometric RPCs.

However, it is apparent that the new methodology does not out-perform the Alward and Despotakis methodology in all cases. It may prove worthwhile to add a spatial error component or make additional adjustments to the econometric model, especially in those cases where the new methodology fares worst. These extensions will be explored in future analyses.

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Appendix A. Mathematical Decompositions

Proof that Alward and Despotakis' (1988) Equation Converts (M^{UL}/X^{LL}) to RPC

From Alward and Despotakis (1988): For commodity *i,* $RPC^L = 1/ [1+(M^{WL}/X^{LL})+(M^{UL}/X^{LL})]$

$RPC^L [1+(M^{WL}/X^{LL})+(M^{UL}/X^{LL})] = 1$

$1/RPC^L = 1+(M^{WL}/X^{LL})+(M^{UL}/X^{LL})$

$1/RPC^L = (X^{LL}/X^{LL})+(M^{WL}/X^{LL})+(M^{UL}/X^{LL})$

$1/RPC^L = (X^{LL} + M^{WL} + M^{UL})/X^{LL}$

$1/RPC^L = (\text{Gross Demand})/X^{LL}$

$1 = RPC^L [(\text{Gross Demand})/X^{LL}]$

$RPC^L = 1 / [(\text{Gross Demand})/X^{LL}]$

$RPC^L = X^{LL} / (\text{Gross Demand})$

= the proportion of gross demand for commodity *i* that is supplied locally

Using Foreign Import Rate (FIMP) to Convert (M^{UL}/X^{LL}) to RPC

While (M^{WL}/X^{LL}) is unknown, [(M^{WL})/(Gross Demand)], otherwise known as the foreign import rate (FIMP), is known. Thus, if one can convert from one to the other, than RPC can be calculated as above.

For commodity *i*:

$M^{WL} = [(M^{WL})/(\text{Gross Demand})]*(\text{Gross Demand})$

$M^{WL} = FIMP *(\text{Gross Demand})$

$M^{WL} = FIMP *(M^{UL} + M^{WL} + X^{LL})$

$M^{WL} – (M^{WL} * FIMP) = FIMP*(M^{UL} + X^{LL})$

$M^{WL} (1 – FIMP) = FIMP*(M^{UL} + X^{LL})$

$M^{WL} (1 – FIMP) = FIMP*M^{UL} + FIMP*X^{LL}$

$(M^{WL}/ X^{LL})(1 – FIMP) = FIMP*(M^{UL}/ X^{LL}) + FIMP$

$(M^{WL}/ X^{LL}) = [FIMP*(M^{UL}/ X^{LL}) + FIMP] / [(1 – FIMP)]$

$RPC^L = 1/[1 + (M^{UL}/ X^{LL}) + (M^{WL}/ X^{LL})]$

$RPC^L [1 + (M^{UL}/ X^{LL}) + (M^{WL}/ X^{LL})] = 1$

$RPC^L + RPC^L (M^{UL}/ X^{LL}) + RPC^L (M^{WL}/ X^{LL}) = 1$

$RPC^L (M^{UL}/ X^{LL}) = 1 - RPC^L – RPC^L (M^{WL}/ X^{LL})$

$RPC^L (M^{UL}/ X^{LL}) = 1 - RPC^L – (X^{LL}/ (X^{LL} + M^{UL} + X^{WL})]*(M^{WL}/ X^{LL})$

$RPC^L (M^{UL}/ X^{LL}) = 1 - RPC^L – (1/ (X^{LL} + M^{UL} + X^{WL})]*(M^{WL})$

$RPC^L (M^{UL}/ X^{LL}) = (1 – FIMP - RPC^L)$

$RPC^L (M^{UL}) = X^{LL} (1 – FIMP - RPC^L)$

$RPC^L (M^{UL}) = X^{LL} – X^{LL} FIMP – X^{LL} RPC^L$

$RPC^L (M^{UL}) + RPC^L (X^{LL}) = X^{LL} (1 – FIMP)$

$RPC^L + RPC^L (M^{UL}/X^{LL}) = (1 – FIMP)$

$RPC^L [(M^{UL}/X^{LL}) + 1] = (1 – FIMP)$

$RPC^L = [(1 – FIMP)/(M^{UL}/X^{LL})]$

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An Analysis of Residential Demand for Electricity in South Region of the United States

Janaranjana Herath
Tesfa Gebremedhin
Jerald Fletcher[1]
West Virginia University

Abstract. The main objective of this paper is to examine the demand for residential electricity consumption in the South region of USA. Ordinary least square (OLS) regression method with IV method is applied to analyze the demand for residential electricity. The south region consisting of 17 states is grouped into three main divisions for analysis. These are south Atlantic division (SAD), east south central division (ESCD), and west south central division (WSCD). A panel state-level data of 24 years (1984-2008) is used for analysis. Results revealed that electricity price, natural gas price, and population as the determinants of the demand for residential electricity consumption. The price elasticity of demand is negatively elastic. The positive cross price elasticity of demand indicates that natural gas is a substitute energy for electricity. According to the positive value of income elasticity, electricity could be considered as a normal good. The divisional dummy variables indicate that demand for electricity is higher in ESCD compared to other divisions. This could be mainly due to climate change, demographic attributes, economic policies, and other factors.

Key words: division, electricity, elasticity

[1] The authors are Graduate Research Assistant, Professor, and Director and Professor in the Division of Resource Management, West Virginia University, Morgantown

Introduction

U.S. households primarily rely on three sources of energy: natural gas, electricity, and fuel oil. Over the recent decades, electricity consumption continues to grow more rapidly than the consumption of natural gas and fuel oil (Regional Energy Profile, 2005). Also, retail sales of electricity to U.S. households exceeded to the sales made to commercial and industrial sectors. There were 107 million electricity consuming households in 2001, which consumed 1140 billion kWh (Regional Energy Profile, 2005). According to U.S. Household Electricity Report (2005), the demand for electricity is projected to increase rapidly. Also, with the continuous growth of new housing in the south, household electricity demand is expected to increase.

Residential sector uses 22 percent of total energy consumption in the United States (Energy Information Agency [EIA], 2005). Of this total consumption, heating, ventilation, and cooling (HVAC) used nearly 31 percent. Kitchen and laundry appliances, refrigerators, freezers, dish washers, and lighting and home electronics are the main electricity consumers in a household. According to the consumption surveys of the Department of Energy (DOE) during the last few decades, residential electricity consumption has increased with increasing population and per capita income. Electricity consumption continues to increase more rapidly than the consumption of other energy forms. *Over the past three decades, the share of residential electricity consumed by appliances and electronics in U.S. homes has nearly doubled from 17 percent to 31 percent, increasing from 1.77 quadrillion Btu (quads) to 3.25 quads (EIA, 2011).* According to the Annual Energy Outlook of U.S. Energy Information Administration (2011), after 9.8 percent annual growth in the 1950s, the demand for electricity increased by 2.4 percent per year in the 1990s. From 2000 to 2009 the demand for electricity increased by 0.5 percent per year. Part of the increase in demand for electricity was offset by efficiency gains from new appliance standards and investments in energy-efficient equipments. *The overall energy consumption remains virtually the same with the enacted federal energy efficiency standards (EIA, 2011).*

Residential energy consumption varies significantly across the United States. For instance, an average home in the Pacific region consumes 35 percent less energy than a home in South Central region (U.S. Household Electricity Report, 2005). Climate differences affect significantly on residential energy consumption. While heavily populated coastal areas of the Pacific states experience mild winters and summers, South Central and South Atlantic regions experience warm humid climates, which demand for more energy (South Atlantic Household Electricity Report, 2006). Differences in the variety of building codes and environmental regulations, building design, and population density also affect energy consumption.

Background information

The south region is composed of the District of Columbia and 16 States stretching from Delaware down to the Appalachian Mountains, including the Southern Atlantic seaboard and spanning from the Gulf Coast to Texas (U.S. Census Bureau, 2008). It is the largest and fastest growing region in the United States, where 36 percent of the nation's population lives. The South consumes 44 percent of the nation's total energy consumption and 43 percent of the nation's electric power (Brown et al. 2010). The South also consumes a particularly large share of industrial energy too. However, it produces a large portion of the nation's fossil fuels and electricity. Of the total energy consumed, 40 percent is consumed in residential homes and 38 percent is used in commercial buildings. Low electricity rates, relatively weak energy conservation ethics, low market penetration of energy-efficient products, lower than average expenditures on energy-efficiency programs, and the significant heating and cooling loads of the southern region, could be the main reasons of this energy-intensive lifestyle (Brown et al. 2010). The U.S. Energy Information Administration (2011) projects energy consumption in the residential, commercial, and industrial (RCI) sectors of the South to increase over the next 20 years, expanding from approximately 30,000 TBtu in 2010 to more than 35,000 TBtu in 2030.

Energy efficiency is highly considered factor in south region with its high consumption of electricity. If the south could achieve substantial energy-efficiency improvements, carbon emissions across the south would decline, air quality would improve, and plans for building new power plants to meet growing electricity demand could be downsized and postponed, while saving tax payers money (South Atlantic Household Electricity Report, 2006). Thus, the general objective of this paper is to examine the demand for residential electricity consumption and to understand the pattern of growth in electricity consumption in south region of the United States and to draw policy implications.

Literature review

Residential energy demand estimates have been used by many researchers to examine demand behavior and to understand, forecast, and manage the demand for energy (Halicioglu, 2007). There are basically two approaches measuring household energy demand. The first approach uses aggregate data, which is normally based on price and income variables along with some other additional factors such as climate or urbanization (Halicioglu, 2007). Some of the studies that used aggregate data are Zachariadis and Pashourtidou (2007) for Cyprus, De Vita et al., (2006) for Namibia, Narayan and Smyth (2005) for Australia, Holtedahl and Joutz (2004) for Taiwan, Kamerschen and Porter (2004) for USA, Hondroyiannis (2004) for Greece, Hunt et al., (2003) for U.K., Nasr et al., (2000) for Lebanon, and Bose and Shukle (1999) for India. The second approach applies microeconomic data with a number of country specific variables. Labenderia et al., (2006) for Spain, Boonekamp (2007) for The Netherlands, Filippini and Pachauri (2004) for India, Larsen and Nesbakken (2004) for Norway and Poyer et al., (1997) for the U.S., are some studies based on micro level data.

In the past, most of the residential electricity demand relied on log-linear functional forms, which provide a convenient framework for the calculation of elasticities (Madlener, 1996). Later, transcendental logarithmic functional forms were introduced in order to get away from some of the restrictive functional forms used in the log-linear estimations. Although translog specifications allowed more flexibility and for the calculation of substitution elasticities between different fuels, they encountered certain drawbacks like large numbers of parameters to estimate, robustness problems, restriction to short-run elasticities, and inability to include the stock of energy using devices (Madlener, 1996). Within the last two decades, many econometric estimation procedures were employed to investigate the energy demand functions. Univariate cointegration and multivariate cointegration procedures, fully modified OLS procedures, and full information maximum likelihood techniques were used by many researchers (Engle and Granger, 1987; Phillips and Hansen, 1990; Johansen, 1988; Johansen and Juselius, 1990; Johansen, 1996; De Vita et al. 2006).
The availability of electricity demand data is often limited and restricted. Thus, in practice, the studies fall well short of the ideal empirical specifications (Narayn and Smyth, 2005). Often, electricity consumption is presented as a function of own price, substitute price, real income, population, and temperature (Neeland, 2009). Most appliances prices are not included due to the data limitations. Previous literature shows that a number of studies included only a single explanatory variable. For Instance, Al-Zayer and Al-Ibrahim (1996) used temperature while Dincer and Dost (1997) used real income. Al-Faris (2002) modeled the demand for energy as a function of own price, a substitute price and real income, but not temperature (Neeland, 2009).

Methodology

<u>Theoretical framework</u>

In a consumer's demand function for a particular good and service, it is affected by its own price, prices of substitutes and complimentary goods, income, expectations, and other socioeconomic factors. Ordinary least square analysis (OLS) can be used to explain such a relationship where efficient and consistent results are expected. However, when the explanatory variables (covariates) are correlated with the error term, it generally produces biased and inconsistent estimates. In overcoming this problem 'instrument variables' are used (i.e. IV method). An instrument is a variable that does not itself belong in the explanatory equation and is correlated with the explanatory variables, conditional on the other covariates.

Thus, instrument variable (IV) method in OLS analysis, is used as follows;

(1) $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + B_3 X_3 + B_4 X_4 + \mu$

If X_4 is contemporaneously correlated with its measurement error (μ), OLS estimators for all β are inconsistent.

Thus, to define an instrumental variable 'Z" to explains X_4;

(2) $X_4 = \alpha_0 X_1 + \alpha_1 X_2 + \alpha_2 X_3 + \alpha_3 Z_1 + v$

Then estimate models in 2SLS;

First OLS: $X_4 = \alpha_0 X_1 + \alpha_1 X_2 + \alpha_2 X_3 + \alpha_3 Z_1 + v$

Second OLS: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + B_3 X_3 + B_4 (\alpha_0 X_1 + \alpha_1 X_2 + \alpha_2 X_3 + \alpha_3 Z_1) + \mu$

Empirical model

A modified residential electricity demand model in semi-logarithmic form in 2SLS is adopted based on Holtedahl and Joutz (2004);

(3) $\ln C_t = a_0 + a_1 \ln Y_t + a_2 \ln P_t + a_3 \ln P_g + a_4 \ln P_{lpg} + a_5 \ln P_w + a_6 X_t + a_7 D_1 + a_8 D_2 + \mu_t$

(4) $\ln P_t = b_0 + b_1 \ln P_o + b_2 \ln P_k + b_3 \ln P_g + b_4 \ln P_c + b_5 X_t + v_t$

Where $\ln C_t$ is the log of residential electricity consumption (million kWh), $\ln Y_t$ is the log of monthly household income, $\ln P_t$ is the log of retail price of residential electricity (cents/kWh), $\ln P_g$ is the log of natural gas price (cents/kWh), $\ln P_{lpg}$ is the log of LPG price(cents/kWh), $\ln P_w$ is the log of wood and wood waste price (cents/kWh), $\ln P_o$ is the log price of distillate oil (cents/kWh), $\ln P_k$ is the log price of kerosene (cents/kWh), $\ln P_c$ is the log price of coal (cents/kWh), X_t is the state annual median population, and D_1 and D_2 are dummy variables for south Atlantic division (SAD), east south central division (ESCD), and west south central division (WSCD).

As for the expected signs in equation (3), it is expected that $a_1 > 0$ because higher monthly household income should result in greater economic activity and accelerate purchases of electrical goods and services. The coefficient of electricity retail price level is expected to be less than zero for the usual economic reasons, therefore, $a_2 < 0$. The coefficients of the substitute prices of P_g, P_{lpg}, and P_w could be either < 0 or > 0. It is expected that $a_5 > 0$ as consumption of residential electricity increases with increasing population. The coefficients of b_1, b_2, b_3, b_4, and b_5 in equation (4) could be either positive or negative based on the relation with P_t.

Types and Sources of Data

A panel state-level data for 24 years (1984-2008) is used for the analysis. Data for the residential electricity consumption, prices for residential electricity, coal, natural gas, LP gas, kerosene oil, distilled oil, and wood are mainly collected from the U.S. Department of Energy. Data for average household monthly income and population are collected from U.S. Department of Commerce (2008). The south region is consisted of 17 states and was grouped into three main divisions of south Atlantic division (SAD), east south central division (ESCD), and west south central division (WSCD) for the analysis. West Virginia, Virginia, North Carolina, South Carolina, Delaware, Maryland, Florida, Georgia, and DC are the states in SAD. Kentucky Tennessee, Mississippi, and Alabama are included in ESCD. Arkansas, Louisiana, Oklahoma, and Texas are the states in WSCD. To represent each division two dummy variables are used. The statistical package of STATA 9.1 is used for the empirical analysis.

Empirical Results and Analysis

Figure 1 shows that residential electricity consumption in the south region of the United States has been increasing from 1984 to 2008. Of the three regions, SAD, which consists of 8 states, indicates the highest electricity consumption. However, the trend seems to be the same for all the three divisions of the region.

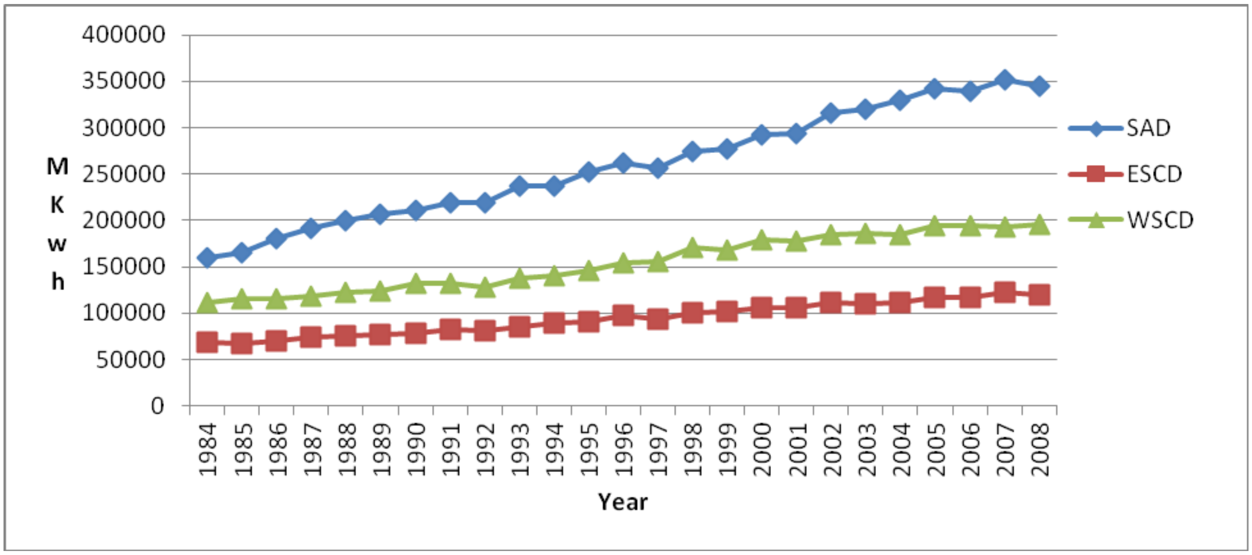

Figure 1. Residential electricity consumption 1984-2008

Table 1. Descriptive Statistics of Variables used in Analysis

Variable	Mean	Std. Deviation	Min Value	Max Value
C_t (mkWh)	29859.63	27105.84	1227	127712
Y_t (US$)	41141.95	10981.87	15674	67926
X_t ('000)	5912.99	4886.03	565	24304
P_t(cents/kWh)	7.1554	2.1633	0.3413	13.9385
P_g(cents/kWh)	2.7192	1.3007	0.3413	7.1263
P_c (cents/kWh)	0.9856	0.3610	0.3412	2.8259
P_k (cents/kWh)	2.7853	1.6842	0.3413	9.0171
P_{lpg}(cents/kWh)	4.7898	2.3556	0.3413	13.2628
P_w (cents/kWh)	1.4313	0.7113	0.3412	3.6587

Table 2. Regression analysis (2SLS) for residential electricity consumption ($\ln C_t$)

Indep. Variable	coefficient	Std. Error	T value	P value
Intercept	4.1962	0.0768	54.63	0.000
$\ln P_t$	-0.3125**	0.1046	-2.99	0.003
$\ln Y_t$	1.94e-07	1.70e-06	0.11	0.909
X_t	0.00007**	2.55e-06	27.77	0.001
$\ln P_{lpg}$	-0.3375*	0.2052	-1.64	0.101
$\ln P_g$	0.6249**	0.2014	3.10	0.002
$\ln P_w$	0.0021	0.1380	0.01	0.988
d1-SAD	-0.1556**	0.0376	-4.13	0.000
d2- WSCD	-0.0366	0.0374	-0.98	0.329
R^2 =0.6980 Adj. R^2 = 0.6922 N = 425 F(8, 416) =120.17				
** significant @ 1% level and *significant at 10% level				

Table 1 depicts the mean standard deviation, minimum and maximum values of the variables. According to the 2SLS regression results in Table 2, the variables of household income, retail price of electricity, population, price of LPG, price of natural gas, and price of wood and wood waste have the expected signs. Of these variables, except income, price of wood and wood waste, and price of LPG, all others are significant at one percent level. Price of LPG is significant at 10 percent level. The significance of the coefficients is supported by the high F-value indicating that the model used is appropriate. The goodness of fit of the equation measured by the coefficient of determination (R^2) is high in value which indicates that 70 percent of the variation of the model is explained by the equation.

The empirical results in Table 2 indicate that price elasticity of demand for electricity is negatively elastic. This explains that when retail price of residential electricity (P_t) increases by 1 percent, whole consumption of electricity decreases by 0.31 percent in the South region. Thus, the electricity consumption is highly related with the retail price of electricity. The positive cross-price elasticity of demand indicates that natural gas (P_g) is substitute energy for residential electricity. When, the price of natural gas increases by 1 percent, the demand for residential electricity consumption increases by 0.62 percent. The cross price elasticity of LPG indicates that LPG works as a complimentary energy for electricity. When the price of LPG increases by 1 percent, electricity demand decreases by 0.34 percent. Electricity is frequently thought as a necessity good or service rather than a luxury commodity. Thus, income elasticity is relatively low as expected. Results indicate that population growth tends to perpetuate the strong rate of growth in the residential demand for electricity. According to the results, when population increases by one unit, residential consumption of electricity increases by 70 percent (kWh).

The demand for the consumption of electricity varies from region to region because it is influenced by the unique nature and characteristics of the regions, such as climate, demographic attributes, economic policies, and other factors. Thus, the dummy variables of D_1 (for the region of south Atlantic division (SAD)) and D_2 (for the region of west south central division (WSCD)) indicate such differences compared to the region of east south central division (ESCD). Table 2 indicates that D_1 for SAD is negatively significant with a value of 0.16. This explains that the percentage change of residential electricity consumption is lower by 0.16 percent in SAD compared to ESCD. In other words, ESCD incurs comparatively high consumption rate of residential electricity. This may be due to many reasons, like high temperature in the summer, household characteristics or energy inefficiency. WSCD shows the same relationship but the coefficient is not significant. Overall, the dummy variables reveal that ESCD demands more residential electricity compared to the other two divisions.

Conclusions

By analyzing some characteristics of demand for electricity in the residential sector of South region of the United States, two conclusions can be made. First, retail price of electricity, price of natural gas, and population, act as the main determinants of demand for residential electricity. Empirical results indicate that price elasticity of demand is negatively elastic. The positive cross-price elasticity of demand indicates that natural gas is substitute energy for electricity. Electricity could be viewed as a normal good, which is confirmed by the positive value of income elasticity. Thus, energy policy makers need to understand and plan the potential future energy supplies based on the demand pattern of the region where states are comparatively less developed.
Secondly, the demand for electricity is different from division to division, and ESCD demands more residential electricity. This might be influenced by many reasons, sometimes building of new houses, inefficiency of electricity consumption, or any other factor. However, more research is essential for sound and specific policy attributes for each division.

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Economic Gardening and Business Incubation: Modern Municipal Economic Growth and Development Strategies

John Girdwood
Wayne State University
Christopher Girdwood
The Mind Utility

Abstract. Economic gardening is an emerging resource utilization mechanism amongst economic developers. Business incubation has been around for a few decades, and we provide an empirical update in order to understand how it may be better utilized as an economic resource. Economic gardening and business incubation may provide opportunities for robust small business development and growth over the long term. We provide City Managers (or Mayors) and City Councils (or Economic Development Teams) with today's explanation of economic gardening and business incubation, and describe when, why, and how each may cause economic development and small business growth and development. Finally, we offer insight into the rational choice and post-positivist perspectives regarding the research of business incubation and economic gardening.

Introduction

Local government revenue may be defined as the money collected by the local government. Economic development, as defined by Deardorffs' Glossary of International Economics, is: "Sustained increase in the economic standard of living of a country's [or localities] population, normally accomplished by increasing its stocks of physical and human capital and improving its technology" (2011). This paper will seek to answer: what resources may a municipal government utilize in order to improve revenue and economic development?

Pinpointing useful economic development strategies for a municipal government (henceforth The City) to activate is very much needed today due to economic liberalism's evolving environment. According to the U.S. Small Business Administration (2011), small businesses have generated 65 percent of net new jobs over the past 17 years…An estimated 552,600 new employer firms opened for business in 2009, and 660,900 firms closed. This amounts to an annual turnover of about 10 percent" (2011, 1). The City must therefore grapple with businesses closing their doors and, certainly, engage opportunities for new businesses. However, a new business might not have the necessary knowledge to grow at its potential. This paper will thus advocate and explain two economic development strategies that The City could utilize to increase real economic growth of new and existing businesses.

The two economic development strategies are: economic gardening and business incubation. Economic gardening is emerging with very positive results, while business incubation has been around for about three decades, but has transformed—and virtual incubators are quite new. Both economic development mechanisms, if implemented correctly, have proven to create jobs and assist in the stabilization of the tax base. Broadly, economic gardening provides technical assistance programs to help small businesses in a community grow locally and eventually expand globally. Gardening is often cited as the alternative to business attraction (i.e., convincing private business to relocate from one community to another). Business incubation, overall, is the grouping of new businesses (entrepreneurs) under the same roof in order to improve economies of scale and business knowledge (share a conference room, copy machine, internet, secretary, marketer, accountant, etc.). Under business incubation, rent is subsidized and the businesses are guided, however, they must graduate from the facility (usually within 3 years) and locate within or in close proximity to The City.

Economic gardening and incubation will be the premier strategies for economic development advocated in the paper. The goal of business incubation, according to IEDC, is "to help new businesses establish themselves sufficiently… to encourage tenant businesses to leave once they no longer depend on incubator support" (2011, 87). The goal of economic gardening is to grow local businesses—to create jobs due to opportunities realized via economic gardening.

Together, economic gardening and business incubation provide opportunities for robust small business development and growth. This paper will provide City Managers (or Mayors) and City Councils (or Economic Development Teams) with variables that cause economic development and stability. This paper will provide economic development advice with respect to resource utilization. We will provide examples of return on investment regarding incubation and economic gardening. Thus, this paper should be useful to economic development researchers and practitioners alike.

Economic Gardening

A salient cleavage with respect to economic development activity by city officials is attraction versus gardening. Briefly, attraction employs the following: use of incentives, tax credits, clawbacks, advertising, a focus on large transplants, site selection, trade missions, and trade shows. On the other side, economic gardening engages: no incentives, no tax credits, no clawbacks, development from within, business intelligence, GIS, database research, network-building, and web marketing. Whereas attraction brings a new business into The City, economic gardening grows local businesses (Girdwood 2011).

Economic gardening employs database research which includes, but is not limited to: marketing lists (e.g., target consumers), financial information (e.g., capitalizing in emerging markets), competitors (e.g., product differentiation), market research (e.g., supply-chain management), industry trends (e.g., consumer preferences), and legislative issues database (e.g. regulation) (Girdwood 2011). This enables local businesses and potential businesses (i.e. entrepreneurs) to discover areas of growth, decay, needs, preferences, laws, et cetera. Thus, database research provides the tools required by serious small business professionals planning to expand.

Economic gardening may maximize resource utilization via an economic development organization (EDO). An EDO could utilize the following: technical assistance providers (e.g., SBTDCs), investment funds (e.g., Angels), philanthropic organizations (e.g., Edward Lowe), higher education (e.g., rural extension programs), workforce agencies (e.g. one-stops), regional networks (e.g., Chambers, technology councils), and community stakeholders (e.g., retired executives) (Girdwood 2011). Like a botanical garden needs a gardener: proper growth may not be achieved without regular maintenance.

Economic gardening requires time investment in order to leverage resources for the long term. Geographic Information Systems (GIS) plot the business community growth and decay. GIS should do the following: plot customer locations, plot consumer expenditure variables, create density maps to find clusters, help target marketing messages, understand retail leakages, compare land uses, and locate efficient smart / enterprise zones (Girdwood 2011). If The City enables the use of this information, then entrepreneurs may design an apposite business plan.

Economic development that creates jobs, such as economic gardening, is more efficient for The City than a transplant of jobs from location F to location G (i.e. attraction). For example, the City of Warren, Michigan, offered General Motors incentives (i.e. 30 year tax abatement) to move its headquarters to Warren—from the Renaissance Center in Detroit, Michigan. This is a leading trait of attraction. In this case, General Motors would simply move workers from Detroit to Warren because of tax incentives (Josar 2011). With respect to job creation, this is a zero-sum game. It actually created no job growth because the employees in Detroit would have simply had a different employment destination. Second, in this case, Detroit ended up offering more incentives than it otherwise would have in order to retain General Motors. This caused decrease tax revenue for Detroit (Josar 2011). It follows that this zero-sum game of attraction leads to reduced municipal revenue. Hence, local officials are reducing their own revenue via attraction.

Attraction can create jobs under certain circumstances. For example, after Hurricane Katrina, many small businesses needed to relocate to Texas or surrounding states in order to remain in business. In fact, The Missouri Economic Research and Information Center (MERIC) analyzed the business data on employers and employees from the "storm-ravaged areas" (Spell, 2005). MERIC found that, "Approximately 43 percent of transportation and warehousing establishments in Louisiana and Mississippi were in the potential impact zone. Likewise, 45 percent of business establishments and 46 percent of all employees were in a corridor of influence from the storm's path…" (Spell, 2005). After Hurricane Katrina, Texas created an attraction campaign. Post-positivists may argue about the ethical structures therein; however, rational choice theorists may show that Katrina impacted businesses did indeed stay in business because of Texas' attraction policy. The dilemma here is whether the small businesses located in Louisiana would have closed permanently if not but for the help of the State of Texas' attraction program. Current research has not indicated whether or not this is the case.

Economic Gardening is a mechanism to grow *existing businesses* in a community, region or state. The City should pay equal attention to second stage companies and Gazelles (high impact companies). According to edwardlowe.org, second stage companies have "grown past the startup stage but has not grown to maturity. They have enough employees to exceed the comfortable control span of one owner/CEO and benefit from adding professional managers, but they do not yet have a full-scale professional management team." (2011). Gazelles, frequently, materialize in business-to-business markets. Gazelles typically form in deregulated or newly emerging industries, where they are able to capitalize on niche opportunities. Of particular salience, gazelles experience a rapid stage of expansion (edwardlowe.org 2011).

Economic gardening increases jobs and is not a zero-sum game. The City of Littleton, Colorado, according to Gibbons (2000), shuns attraction and embraces economic gardening. Fundamentally, Gibbons finds that "Local entrepreneurs are just as good as those in some other state" (2000). Instead of giving "scarce public resources like tax dollars and infrastructure budgets to footloose companies," Littleton "works to provide connections between industry and academia" (Ibid). For example, Gibbons engaged economic gardening to create the Colorado Center for Information Technologies, development of graduate level engineering courses via microwave, and a telecommunications curriculum and E-commerce courses through the local community college (Ibid).

Economic gardening impacts the entire community as an economic development mechanism. The City of Littleton, for example, publishes a report on its economic development webpage (Littleton Economic Notes, 2011, 3):

Here are unemployment numbers for 2010:

- National – 9.6%
- Colorado – 8.2%
- Littleton – 7.2%

And the home foreclosure rates for Jan 2011 (think property tax revenue):

- National .20%
- Colorado .23%
- Arapahoe County .32%
- Littleton .12%

The City of Littleton attributes their success to economic gardening. Economic gardening stabilized the economic revenue of Littleton (and increased it).

As with all economic development activities, performance measurements are required to benchmark success/failure and estimate community impact. The technical assistance services that embody an economic gardening program can be measured using a simple return on investment (ROI) calculation. ROI is typically used in corporate finance to describe earnings as a percentage on short-term investments. ROI can also be used to measure change in performance a specified amount of time, which is the methods adopted here. To begin with, the gardening program should have a technical assistance (T.A.) tracking system that measures:

- Number and annual wage of jobs created or retained;
- Increase in sales locally and abroad;
- Number of new loans and total loan amount;
- Equity capital invested;
- Tax revenues generated from businesses assisted.

Once these measurements are codified, a reasonable total investment figure is required for the ROI calculation. Further, the initial investment in the gardening program (e.g., employee salary, fringe, technical assistance software programs, etc.) will need to be calculated. Once the researcher (or The City) has these two figures (i.e., technical assistance impact measurement and the initial investment in the gardening program) he or she may calculate the ROI. The researcher or practitioner will achieve this by dividing the gain (i.e., technical assistance impact measurement minus the initial investment in the gardening program) by the cost of the gardening program. The result will yield the ROI as a percentage. We expect that if The City engages economic gardening, then they will find a positive ROI.

However, positive ROI regarding economic gardening is not limited to local governments. Economic gardening was formally engaged at the state level in 2009. Florida implemented GrowFL. The initial results are encouraging. For example, Economic Development Now (EDNow), published by the International Economic Development Council, explained (3):

> At the end of the first year, GrowFL had helped 157 companies, which created 418

> direct jobs—and 1,478 jobs total when induced and indirect jobs were added in, according to analysis conducted by an independent consulting firm. What's more, the state's $1.5 million investment for GrowFL produced a 6:1 return on investment. This prompted the state legislature to continue the program for a second year with $2 million in funding (2011).

Most importantly, the EDNow article, authored by Mark Lange, Executive Director of the Edward Lowe Foundation, argues that the Sate of Florida's economic gardening program is a "replicable model" (1). Yet economic gardening is such a new mechanism for engaging economic growth that the standards of the mechanism have not been fully delineated at the time that this paper was published. In fact, Edward Lowe is currently establishing the "National Center for Economic Gardening" (5).

To conclude, there is a salient cleavage between attraction and gardening. Economic Gardening is a mechanism to grow existing businesses in a community, region or state. Gardening requires time investment in order to leverage resources for the long term and is a method to maximize resource utilization. Attraction is too often a zero-sum game, whereas no new net jobs are created. Attraction also, habitually, may negatively impact financial revenue for The City, because more and more incentives are offered in order to retain the business, as opposed to the increase of net jobs proffered by economic gardening. Thus, in general, The City should engage gardening and shun attraction. At this time, there is a clear lack of academic research regarding economic gardening as a mechanism for economic growth, even though published results are very positive.

When the City Considers Economic Gardening

Economic gardening actively advances first stage growth companies into second stage growth companies and beyond, since it provides "competitive business intelligence" (IEDC, 2011, 52). Most importantly, The City must align economic development policy with state and national efforts (GrowFL in Florida, MEDC in Michigan, etc). For example, if The City is in Florida, it should review the Economic Gardening Technical Assistance Program for the State of Florida (GrowFL), because local costs may be avoided in favor of state assistance (http://www.growfl.com, 2011).

GrowFL is an example of how a state may implement economic gardening for local governments. Again, economic gardening provides no incentives, no tax credits, no clawbacks, development from within, business intelligence, GIS, database research, network-building, and web marketing. GrowFL enables local governments to access market research/competitive intelligence for businesses in the financial services industry, internet and social media strategy/search engine optimization, Geographical Information Systems (spatial intelligence for marketing efforts by understanding the competitive environment), Core Strategy Review (transform the company from a niche player to a full-service marketing company), and referrals. Thus, The City should contact The State and incorporate/streamline/advertise the appropriate activities. It is likely that MEDC in Michigan, for example, could service local governments in Michigan—much like GrowFL services businesses in Florida.

Economic gardening requires at least one full-time skilled employee. The City of Littleton, for example, hired an Intelligence Specialist, a Geographic Information Systems Analyst, and an Economic Development Specialist. Their economic gardening program costs about $600,000 annually

(IEDC, 2011, 52). However, the City of Littleton is a success story because many it its start-up and/or first stage companies quickly became second-stage companies as a result of economic gardening. In fact, the job growth rate, as reported on their website, is about 8 percent. Thus, we advise The City to implement an appropriate economic gardening program because it is very likely that the long term revenue will outweigh the overall costs. As written in the IEDC manual, *Entrepreneurial and Small Business Development Strategies*: "Gardening is more about developing a culture that embraces entrepreneurship and creates a thriving place to do business" (IEDC, 2011, 59).

Business Incubation

Unlike economic gardening, there is academic research on business incubation. Briefly, Markley and McNamara (1996) identify the local gross economic and fiscal impacts generated by incubator firms in order to assist in policymaking, because incubation investments may not "generate the quick results required to garner political support" (17). However, the results from two case studies revealed that incubators impact their host communities by much more than a few additional new net jobs. They find that "measurement of direct impacts only (e.g., firm employment, salary and wages, sales) underestimates the total impact these institutions have in a community" (24).

Business incubation in America has proliferated in the past two decades, from 390 in 1989 to 1,100 by 2006 (IEDC, 2011, 85). Incubators are "proactive economic development tools" that may locate several businesses within the same building in order to "accelerate the successful development of new ventures by lowering start-up costs" (IEDC, 2011, 85). Business incubators may be designed to accommodate various industries, sectors, and niche markets (IEDC, 2011, 86). Most incubators happen in a large facility whereas small businesses' costs are subsidized in order to approach economies of scale. Incubators in 2006 serviced: neighborhoods 1%, cities 18%, counties 25%, multi-counties 40%, and states/province 10%, multi-states/province 3%, and the national jurisdiction 3% of the time (KNOPP, 2007, 12). The objectives of the business incubator include, but are not limited to: technology-based development (e.g. college and university research), economic diversification (e.g. manufacturing, service firms), and community revitalization (IEDC, 2011, 87-90). According to NBIA (2007), on average, technology companies took about 34 months to graduate from the incubation program, mixed-use firms left in about 32 months, and manufacturing firms left in about 26 months (44).

In general, business incubators are administered by non-profit organizations and are stable entities. NBIA (2007) reported that 73 percent of incubator administrators offer pre-incubation services and/or post incubation services (2). The former publication also found that 23 percent of incubator clients would need to cease operations if their subsidy was reduced or eliminated, and 32 percent of clients reported that they, indeed, did not receive a subsidy whatsoever (2). The former survey, finally, found that "More than four in five respondents (84 percent) considered creating jobs in their local communities a high-priority goal for their incubation programs (20). Regardless, The City should research the tenets of incubators and attempt to recruit soon-to-be graduates that align with The City's economic development strategy.

When the City Considers Business Incubation

The first step for a City Manager (i.e. local economic development official) regarding incubation should be to complete a feasibility study. A business incubation feasibility study will reveal the incubator's probable success. The feasibility study must: measure the level of the incubator means against the local economic tax base, determine potential incubator facilities and their capabilities (e.g. broadband internet access, shipping dock access, environmental audit, parking, access for employees, utilities, liability) detail community support networks, and analyze state and federal assistance programs (IEDC, 2011, 91-8). If an incubation facility is feasible, then The City should be prepared to: assist in real estate and service planning, increase community awareness, enable and establish contact relationships, assist in application of federal and state funding, determine the appropriate businesses for the facility, (e.g. manufacturing, service, technology), verify demand for incubation space, determine the minimal rental rates, project conservative cash-flow projections (IEDC, 2011, 91-4).

Funding a business incubator may happen through various manners. In general, about 59% percent of incubators are funded via rent and services, 18% through contracts for services, 15% from ongoing cash subsidies, and 8% of funding arises from other sources (equity stake, royalty agreement, grants, private sector, etc.) (KNOPP, 2011, 33). However, many incubators are sponsored. Today, roughly 31% of sponsorship comes from economic development organizations, 21% from government entities, 20% via academic Institutions, roughly 8% from "Hybrids" (more than one sponsor), approximately 8% from other sources, and only 4% from for-profit industries (KNOPP, 2007, 6).

The City may have a facility that it owns and operates and would like to use for incubation. However, simply renting out a building owned by The City at a subsidy for new small business and/or entrepreneur development may not qualify as incubation. Accordingly, incubators are selective with a focus on high-growth potential businesses and on businesses with highest job-creation/highest-wage potential (IEDC, 2011, 101). Incubation enables wealth creation, focuses on the entrepreneurial spirit, provides value to tenants and stakeholders, operates as a business rather than a nonprofit, and includes only firms investable/scalable to $XMM (Girdwood 2011).

There are many reasons for the success and growth of incubators. As rational choice posits that individuals will do what is in their interest in accordance to the likely choices of others; incubators naturally attract various for-profits and entrepreneurs because others (i.e. The City) is invested in the business incubator and all of the tenets success. Incubators do discriminate with respect to which new businesses will be able to enter the facility at a subsidized cost, and so there is competition within and between entrepreneurs whom seek to gain access to the organized structure. Additionally, incubators usually incorporate many specific businesses under the same roof in order to tailor appropriate economies of scale. For example, many businesses under the roof may utilize the same copy machine, secretary, custodial services, lunch room, accounting, marketing, legal, and/or internet service (IEDC, 2011, 101). Hence, incubators have earned a reputation as a workplace that rapidly enables new businesses to grasp the tools and knowledge necessary for success. In short, "funding sources like to know they can send top prospects to a nurturing environment" (Girdwood 2011). Therefore, we advise The City to adopt business incubation as public policy.

The City, fraught for funds, may be able to engage incubation with little of its own start-up money. Nearly three-quarters of incubator sponsorship happens via EDOs, government, and academic institutions (IEDC, 2011, 87). For example, the U.S. Economic Development Administration (EDA) sponsored the start-up of the City of Sterling Heights, Michigan, incubator. According to EDA's website (2011):

> $450,000 to Oakland University, Rochester, Michigan, to support operation of the Oakland University Incubator in Sterling Heights by funding a defense industry corridor strategy which will help the region recover from the automotive industry adjustment, and assists an industry diversification initiative in partnership with the Michigan Small Business Technology Development Center. The projects will all contribute to enhancing entrepreneurship in a variety of new industries, including defense and homeland security. This investment is part of a $630,572 project that the grantee estimates will create 600 jobs and generate $4 million in private investment.

This is a business incubator, supported by the EDA. The former incubator might not be feasible in your city, due to the lack of land and resources required by the former incubator. However, The City should actively seek incubator opportunities that are in line with The City's economic development plan.

Similar to the economic gardening ROI calculation, business incubators can use the same methodology to benchmark success/failure and estimate community impact. The researcher or practitioner will achieve this by dividing the gain (i.e., incubation impact measurement minus the initial investment in the incubation program) by the cost of the incubation program. The result will yield the ROI as a percentage.

The City may decide to initiate the process to develop an incubator, but may not have the political, social, or financial start-up capital. In this case, The City could, first, attempt to raise an incubator fund through structured revenue, either internally or externally. Examples include Peoria $3MM (Arch Development) and Cedar Rapids $3MM (First Iowa). Second, The City could connect with an existing fund. For example, the City Manager should maintain a working relationship with incubator graduates, because these graduates will eventually need commercial or industrial space within or nearby The City. If The City has prepared sites and assistance for the incubator graduates, then the transition for the new business might be quickly established. Third, The City could try to build a relationship with incubator resource specialists, such as National Association of Seed and Venture Funds (http://www.nasvf.org). Finally, two resources for The City to develop once it approaches incubator start-up are: National Business Incubator Association (www.nbia.org) and Kauffman Center for Entrepreneurial Leadership (www.entreworld.org).

Implications and Conclusions

Economic development metrics, such as ROI, can help The City deliver services more effectively, especially in today's fiscally constrained environment. Economic gardening and business incubation ROI calculations can be used to benchmark success/failure and estimate community impact. Moving forward, the exact ROI inputs will need to be agreed upon by the City Commission (or City Council), Mayor and City Manager (economic development specialist). The City should publicly explain its stance on economic gardening and business incubation. We advise that The City proactively engage both policies, beginning with economic gardening.

Economic gardening as resource utilization may create a healthy and robust economic environment. A causal relationship should be reviewed with respect to the links of economic gardening at the local level, i.e. locating areas of growth and decay and economic development across new cities that activate this mechanism. At the local level, economic gardening may begin with a GIS Intern—mapping economic growth and decay for local businesses. At the state level, economic gardening should replicate the GrowFL model (2011), yet be flexible according to each state's comparative advantage.

The City should initiate a plan for business incubation. The City could try to build a relationship with incubator resource specialists, such as National Association of Seed and Venture Funds (http://www.nasvf.org). Additionally, two resources for The City to develop once it approaches incubator start-up are: National Business Incubator Association (www.nbia.org) and Kauffman Center for Entrepreneurial Leadership (www.entreworld.org). The City would greatly benefit from a careful reading of the IEDC Entrepreneurial and Small Business Development Strategies manual (2011). This manual expounds upon modern day best practices of entrepreneurial and small business development in the public, private, and hybrid governance structures. Finally, small business development researchers should follow economic gardening and business incubation developments and reevaluate the variables of economic gardening and business incubation as mechanisms for economic development.

The City may recruit the appropriate business from an incubator by offering economic gardening. Since economic gardening is a mechanism to grow local businesses through business intelligence, and because new incubated businesses are generally of high-growth potential, not fully mature, and in need of business intelligence; indeed, the relationship between economic gardening and business incubation is very likely a win-win. In this manner, rational choice theorists might need to test whether or not Cities that engage economic gardening create a new Nash equilibrium for entrepreneurs whom are aware of Cities that offer economic gardening programs as opposed to surrounding cities that do not. Post-positivists might explore which specific economic gardening practices most influence the normative economic and community agenda.

Additional research should be done regarding grassroots mechanisms that grow businesses. Accordingly, if The City surveyed its constituents, approaching deliberative democracy [of economics], quantitative data might differentiate city growth via levels of economic gardening. Economic gardening is far more efficient as resource utilization than attraction. The first actually creates new jobs and increases City revenue (i,e, stabilization of tax base, new business developments), while the latter only transfers jobs and often decreases the City revenue from the place the business left. Economic gardening is pareto efficient in light of attraction. Local governments may be "creatures of the state," but that doesn't mean that those creatures couldn't be skilled gardeners (Dyson, 2010, 1).

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Federal Spending in Mississippi: A Typological Analysis

Albert E. Myles[1]
Albert J. Allen
Mississippi State University

Abstract. Federal subsidies play a major role in helping rural and urban cities and counties meet the needs of their citizens. Any cuts in federal spending will create many challenges for local governments, when tax revenues, federal and state support are declining and demand for services are increasing. Federal cuts will slow the economic recovery in local economies, particularly in small and rural areas that traditionally lag behind urban areas in the U.S.

Mississippi's dependence on federal aid has grown each year since 1993 to 2009. A trend analysis of federal funds data for Mississippi showed few signs of slowing during this period. In fact, federal subsidies to Mississippi grew faster (5.66%) than population (.76%) between 1993 and 2004. Between 2005 and 2009, growth in subsidies to the state was more than double that of population growth-14.49 percent versus 4.5 percent growth respectively.

More than 40.75 percent of Mississippi's total personal income came from the federal government between 1993 and 2004. This figure rose to 57.82 percent between 2005 and 2009 in the state. Looking at disposal/spending income, federal subsidies to Mississippi accounted for 44.7 percent of disposal income in the state between 1993 and 2004. Federal subsidies share of disposal income in the state rose significantly to 62.6 percent between 2005 and 2009. Trends in personal and disposal incomes and federal subsidies show just how government-dependent Mississippians are for meeting living and quality of life issues.

Key Words: federal funds data, personal income, disposable income, typology, metropolitan, nonmetropolitan, micropolitan, noncore, natural disasters, man-made disasters, growth

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[1] The authors can be contacted at myles@agecon.msstate.edu and allen@agecon.msstate.edu, respectively.

Introduction

The looming budget battles and potential cuts will significantly impact Mississippi in various areas such as, agriculture, community development, income stability, and other areas in the state.

According to the Consolidated Federal Funds data (Census Bureau, 2007), Mississippi received more than $53.7 billion in grants, subsidies, direct loans, retirement and disability benefits, other direct payments to individuals, direct payments (not to individuals), guaranteed loans, procurement contracts, and salaries and wages in 2009. Many of these funds helped to provide a living wage and improve the quality of life in both rural and urban areas of Mississippi and in other states in the country in 2009.

A recent article in the Northeast Mississippi Daily Journal Newspaper quoted first District Representative Alan Nunnelee of Mississippi as saying “he does not know the specifics of funding cuts for agencies like the Federal Highway Administration because decisions on spending will be made at the departmental level in Washington.” Similar views were shared by Senators Thad Cochran and Roger Wicker of Mississippi. Senator Wicker’s communications director (Rick Curtsinger) further said “the impact in Mississippi won’t be known until decisions are made beyond Congress" (Rutherford, 2011). Statements like these and ideas about cutting the national debt raise major concerns among many people who depend on federal support in the country.

Objective

The primary focus of this paper is to examine federal spending by typology in Mississippi and assess the likely impacts of potential federal budget cuts in the state in 2009.

Data and Methods

To perform the analysis, the analysts used Census data on Consolidated Federal Funds for Mississippi and counties in 2009. The analysis looked at federal spending in four typologies: metropolitan, nonmetropolitan, micropolitan, and noncore counties in the state. Within each typology, the paper studied federal spending in nine categories: direct loans (DL), direct payment not for individuals (DX), other direct payment to individuals (DO), Retirement and disability (DR), grants (GG), guaranteed loans (GL), procurement contracts (PC), salaries /wages (SW), and insurance (II). Results are displayed in graphs and tables to show federal spending by typology in Mississippi.

Typology

The analysts grouped Mississippi’s 82 counties into four classifications using a combination of six typologies. The four classifications included: metropolitan (metro)[2], nonmetropolitan (nonmetro), micropolitan, and noncore counties. Metro counties include one or more cities containing 50,000 people or more. Nonmetropolitan counties are outside the boundaries of metro areas and contain no urban areas with 50,000 residents or more. Micropolitan is any county with an urbanized area of at least 10,000 but not more than 49,999 people (ERS, 2010).

Noncore counties have no city, town, or urban cluster of at least 10,000 people. Combining micropolitan with noncore counties equals the nonmetropolitan counties in the study. For those who like the simple dichotomy of rural versus urban, the analysts equate urban to metro and rural to nonmetro counties in the study.

Table 1 shows the population in each typology. Using these typologies, more than 38.3 percent (or 1.13 million) of Mississippi’s 2.96 million people lived in metro counties in 2009 (Census Bureau, 2009). About 61.8 percent of the state’ population lived in no-metro counties during this period (Table 1). Breaking down nonmetropolitan counties into micropolitan and noncore classifications revealed that about 33.14 percent of Mississippians lived in micropolitan counties, while 28.63 percent of

[2] The terms “metro” and “nonmetro” are used interchangeably with “metropolitan” and “nonmetropolitan”, respectively in this paper.

residents lived in noncore counties in 2009. The share of population in the latter two categories was about the same for residents living in "nonmetropolitan" counties in Mississippi during this period.

Table 1. Mississippi Population and Growth Trends by Typology , 1993 – 2009

Typology	Population	Counties	Share of State (%)
Metro	1,128,704	9	0.382
Nonmetro	1,823,292	73	0.618
Micropolitan	978,270	47	0.331
Noncore	845,487	26	0.286
Mississippi	2,951,996		

Note: Table 3 reflects the number of counties and percent of population in each typology. You should not try to sum numbers because they exceed the totals.

Results

The results were obtained by developing an Excel-based spreadsheet[3] model designed to allow the analysts to run various queries on the Federal Funds data for Mississippi in 2009 (Microfsoft, 2007). The model is able to analyze the data in 12 different categories related to congressional districts, economic classification, Extension regions, planning regions, and typological classifications in the state. The model also supports the analysis and interpretation of these classifications by allowing the user to work interactively with all or part of Mississippi's 82 counties.

Four county classifications or typologies were chosen to show which areas in Mississippi might feel the economic "brunt" of federal budget cuts in Washington, D.C. and to shed some light on the common belief that rural areas receive more federal subsidies than urban areas in the U.S. The later was the subject of intense debate (in a March 2001 article in the Washington Post) between Ezra Klein, a Post report, and Secretary of Agriculture of Tom Vilsack in which Klein suggested that nometropolitan or rural counties receive a disproportionate share of the federal aid from Washinton (Bishop, 2011).

Dependent and Growing

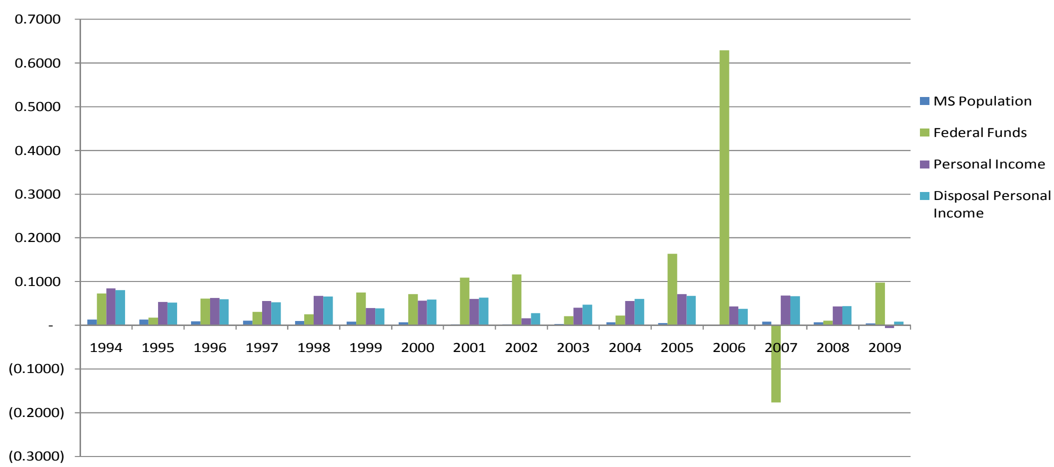
Mississippi and to some extent the nation dependence on federal aid has grown in recent years year (Cauchon, 2011). A trend analysis of federal funds data for Mississippi showed few signs of slowing between 1993 and 2009 (Figure 1, Table 2). In fact, the trend shows two distinct periods of growth during this period. The first covers the period 1993 to 2004. As shown in Figure 1, federal

[3] The analysts programmed the spreadsheet model to sum the federal funds data by object type for each county and the state in 2009. The model then sorted these results from highest to lowest to determine the major recipients of federal aid by county and typology in the state. Results contained in Appendix Table 1 of the report.

funds received in Mississippi increased at a steady rate between $1.5 and $2 billion each year.

Between 2005 and 2009, federal funds increased more than $22 billion or by 48.78 percent in the state. The spike in federal aid between 2005 and 2009 included three of the worse natural (Hurricane Katrina), man-made (deepwater horizon oil spill), and economic (national recession) disasters in the state's history.

Figure 1. Growth trends in Selected Demographic and Economic Statistics in Mississippi, 1993 - 2009



During this period, Mississippi received large amounts of federal aid for cleanup, debris removal, and construction along the gulf coast region. In addition, the state received more than $5 billion to help local and state governments deal with the worst economic recessions since the "Great Depression" in 1929. The huge infusion of federal aid helped to increase the total amount of federal spending in Mississippi. Between 1993 and 2009, the amount of aid Mississippi received from the federal government increased 215 percent.

Federal subsidies to Mississippi grew faster (5.66%) than population (.76%) between 1993 and 2004 (BEA, 2011)[4]. Between 2005 and 2009, growth in subsidies to the state was more than double that of population growth-14.49 percent versus 4.5 percent growth respectively.

More than 40.75 percent of Mississippi's total personal income was from the federal government between 1993 and 2004 (Ibid, 2011). This figure rose to 57.82 percent between 2005 and 2009 in the state. When looking at disposal income[3], federal subsidies to Mississippi accounted for 44.7 percent

[4] Statistics on population in Mississippi were obtained from the Bureau of Economic Analysis, Summary Table.CA1-3.

of disposal income in the state between 1993 and 2004. This figure rose significantly to 62.6 percent between 2005 and 2009. Trends in personal and disposal incomes and federal subsidies show just how government-dependent Mississippians are for some of the basic needs of life.

Mississippians received federal aid that averaged $18,205 per person in 2009. A closer examination revealed that per capita federal assistance averaged $8,278 between 1993 and 2004. However, this figure increased more than twofold to $16,843 between 2005 and 2009. Major causes of the increase were because of the natural and man-made disasters that struck the state during this period. The federal government pumped huge amounts of aid into the state to deal with the aftermath of these events, starting in 2005.

Types of Federal Aid

Analyzing the federal funds data by typology and type of aid for Mississippi in 2009 provided more insight about the programs that will likely be impacted by federal budget cuts in 2012 and beyond. The Census Bureau reports all federal subsidies to states in nine categories. They include: Direct loans (DL), Direct payment not for individuals (DX), Other direct payment to individuals (DO), Retirement and disability (DR), Grants (GG), Guaranteed loans (GL), Procurement contracts (PC), Salaries/wages (SW), and Insurance (II). Mississippi received $53.75 billion in federal aid in 2009. Of this, $903 million were DL, $656 million were DX, $6.8 billion were DO, $8.3 billion were GG, $16.4 billion were II, $9.47 billion were DR, $5.25 billion were PC, $2.63 billion were SW, and $3.37 billion were GL payments. Obviously, programs related to DO, GG, II, DR, PC, SW, and GL might be potential targets for federal budget cuts because they comprise most of the federal aid to the state in 2009.

Combining retirement and disability (DR) and salaries /wages (SW) and calling this income security suggested Mississippi received more than $12.1 billion in federal aid that provided a living wage, contributed to retail spending, improve quality of life, and other areas of the state's economy. Combining grants (GG) and guaranteed loans (GL), the amount of federal aid contributing to income security and quality of life equaled $23.77 billion dollars in Mississippi in 2009. Since these, other direct payment to individuals (DO), and procurement contracts (PC) contribute heavily to the Mississippi economy, these areas will likely be the target of any budget cuts in Washington, D.C.

Federal Aid by Typology

<u>UURegion</u>

Analyzing the federal funds data for Mississippi shed additional light on areas that will likely be impacted by pending federal budget cuts in 2012 and beyond. The analysts grouped the state's 82 counties into four categories: metro, nonmetropolitan, micropolitan, and noncore using USDA Rural Atlas typology classifications. Using these classifications, nine counties were deemed metro in Mississippi and 73 were nonmetropolitan. Of the 73 nonmetropolitan counties, 26 were micropolitan, and 47 were noncore counties in the state during this period (Table 2).

Metro counties received $29.57 billion or almost 60 percent of Mississippi's $53.78 billion in federal aid in 2009. This region represented about 1.13 million of the state's almost 3 million people during this period. Nonmetropolitan counties received $21.57 billion in federal aid and accounted for 1.82 million people in 2009.

Drilling down into the nonmetropolitan counties revealed more disparities in the data for Mississippi in 2009. Micropolitan counties received about $12.83 billion in federal aid and accounted for 978,270 residents of Mississippi's more than 2.9

million people. Noncore counties received about $8.77 billion in federal aid and accounted for 845,487 people of the state's total population.

Per Capita

On a per capita basis, the average Mississippian received $18,205 in federal aid in 2009. This compared to $26,200 for each resident in metro counties in the state during this period (see Table 2). Residents of nonmetropolitan counties in the state received $11,835 each, or about 65 percent of what residents statewide received and 45.17 percent of what residents in metro counties received in 2009.

Dividing the nonmetropolitan region into micropolitan and noncore counties revealed further dichotomies in the data. For example, residents living in micropolitan counties received $13,112 of federal aid per person or 71.98 percent of the state average in 2009. Residents in noncore counties received $10,356 per person or 56.85 percent of the state average during this period.

Who is Vulnerable?

Clearly, noncore counties represent the poorest areas in Mississippi. As previously stated, "Metro" counties received $29.57 billion in federal aid compared to $21.58 billion in aid for "Nonmetro" counties in 2009. Taking a closer look at these numbers and using the analyst's definition of income security (DR+SW), revealed that metro counties relied more on federal aid for income support in Mississippi during this period. Metro counties in the state received a combined $5.1 billion in retirement and disability income and salaries and wages from the federal government in 2009. This compared to about $7 billion in aid for income security in nonmetropolitan counties in the state during this period. However, metro counties in Mississippi relied more on federal aid from insurance ($13.49 billion), procurement contracts ($3.97 billion), and guaranteed loans ($3.35 billion) totaling $20.81 billion in 2009. Nonmetropolitan counties in the state received a combined $4.9 billion for similar programs during this period.

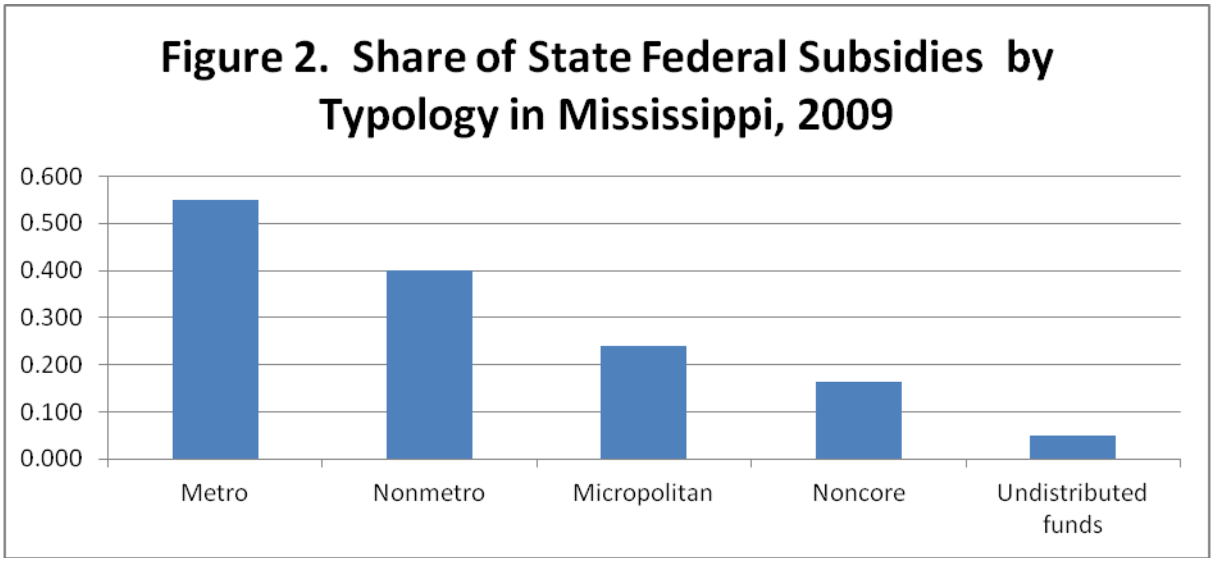
Without exception and in most program categories, noncore counties received less federal aid than micropolitan counties in Mississippi in 2009. During this period, micropolitan counties received more than$12.8 billion in federal aid versus $8.77 billion in aid for noncore counties in the state (see Table 2). Thus, for every dollar of federal aid received by metro counties noncore counties received about $.69 in the state in 2009. For metro and nonmetropolitan counties in Mississippi, the results were a little better but not dramatically. In 2009, for every dollar of federal aid received by metro counties, nonmetropolitan counties received about $.72 in aid.

Distributionally, metro counties received the largest share (55%) of federal aid to Mississippi in 2009 (Figure 2). Nometropolitan counties received more than 40 percent of the aid during this period. The balance (4.9%) of the federal aid in Mississippi was not distributed in 2009.

Dividing the nonmetro region into micropolitan and noncore counties, the impact on noncore counties became even more clearly. In 2009, micropolitan counties received 23.9 percent of Mississippi's federal aid. Noncore counties, which do have a municipality of larger than 10,000 population, received only 16.3 percent of Mississippi' federal aid during this period (Figure 2). Combining metro and nonmetro, these counties received more than 94 percent of the federal aid Mississippi received in 2009. The balance, about 4.9 percent, was not distributed in the state in 2009.

Table 2. Total Amount of Federal Funds Received and Related Statistics Among Typologies in Mississippi, 2009

State Federal Subsidies	**DL**	**DX**	**DO**	**GG**	**II**	**DR**	**PC**	**SW**	**GL**	**Total**
Metro	$ 89,662,183	$ 96,629,420	$ 1,702,301,669	$ 3,345,815,228	$ 13,486,043,752	$ 3,459,552,802	$ 3,968,111,011	$ 1,633,359,104	$ 1,790,043,596	$ 29,571,518,765
Nonmetro	813,342,650	361,535,491	3,866,829,226	4,626,405,800	2,743,655,268	6,007,500,747	1,276,497,882	999,007,920	883,503,026	21,578,278,010
Micropolitan	707,879,410	212,746,030	2,025,309,496	2,373,998,771	1,980,772,151	3,213,836,710	1,106,653,614	703,036,420	502,723,697	12,826,956,299
Noncore	104,686,611	149,558,651	1,844,583,193	2,261,294,848	761,561,717	2,793,613,503	169,847,036	290,762,697	380,579,080	8,756,487,336
Undistributed funds	-	198,064,200	1,230,458,963	332,310,909	168,714,119	617,375	-	206,000	694,353,076	2,624,724,642
Mississippi	903,004,833	656,229,111	6,799,589,858	8,304,531,937	16,398,413,139	9,467,670,924	5,244,608,893	2,632,573,024	3,367,899,698	53,774,521,417
Share of State Subsidies (%)										
Metro	0.002	0.002	0.032	0.062	0.251	0.064	0.074	0.030	0.033	0.550
Nonmetro	0.015	0.007	0.072	0.086	0.051	0.112	0.024	0.019	0.016	0.401
Micropolitan	0.013	0.004	0.038	0.044	0.037	0.060	0.021	0.013	0.009	0.239
Noncore	0.002	0.003	0.034	0.042	0.014	0.052	0.003	0.005	0.007	0.163
Undistributed funds	0.000	0.004	0.023	0.006	0.003	0.000	0.000	0.000	0.013	0.049
Per Capita Subsidy										
Metro	$ 79	$ 86	$ 1,508	$ 2,964	$ 11,948	$ 3,065	$ 3,516	$ 1,447	$ 1,586	$ 26,200
Nonmetro	446	198	2,121	2,537	1,505	3,295	700	548	485	11,835
Micropolitan	724	217	2,070	2,427	2,025	3,285	1,131	719	514	13,112
Noncore	124	177	2,182	2,675	901	3,304	201	344	450	10,357
Mississippi	306	222	2,303	2,813	5,555	3,207	1,777	892	1,141	18,216



Impact of Federal Cutbacks on Local Economies

Most Americans agree that Washington needs to reduce federal spending and the role of government in the economy. But simple statements like the government does not create jobs- only business does -- are not factual and plan wrong. "Government does create millions of jobs including teachers, firefighters, soldiers and elected officials. Government and jobs exist because of taxes and fees generated by individuals and businesses. We can debate the relevant merits of different functions, but anyway you cut it Government is huge in our economy and society playing many desired and important roles (Mackie, 2011)."

Further, local and state governments across the country are facing decreasing tax revenues, stagnant to declining tax revenues, potential declines in both state and federal aid, and growing service demands caused by financial, employment, and family issues (Fluharty, 2011). Thus, reducing the size of the federal government to balance the budget is more complex than simply cutting spending (Mackie, p.2). If federal officials in Washington haphazardly make huge budget cuts, this will create economic harm for millions of American businesses, households, and local and state governments. Given current economic conditions in the state and nation, the growing dependence on federal aid is likely to continue in most states, especially in southern states, which lags behind the nation in almost every economic and social indicator.

Summary

Federal subsidies play a major role in helping rural and urban cities and counties meet the needs of their citizens. Nonmetropolitan counties, which include micropolitan and noncore counties, represent the poorest areas in Mississippi. Although the national debt is large, any cuts in federal spending will create many challenges for local governments, particular when decreasing tax revenues, declines in federal and state support, and significantly expanding service needs in social services in these areas. Federal cuts will slow the recovery in local economies, particularly in small and rural areas that traditionally lags behind urban areas in the U.S.

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APPENDIX

Appendix Table 1. Selected Demographic and Economic Statistics in Mississippi, 1993 - 2009

Year	Population	Federal Funds	Personal Income	Disposal Personal Income
1993	2,655,100	17,040,000	40,957,404	37,376,147
1994	2,688,992	18,280,000	44,399,454	40,394,426
1995	2,722,659	18,600,000	46,764,005	42,485,867
1996	2,748,085	19,740,000	49,683,331	45,017,629
1997	2,777,004	20,350,000	52,428,584	47,382,640
1998	2,804,834	20,870,000	55,948,668	50,477,810
1999	2,828,408	22,430,000	58,137,043	52,437,138
2000	2,848,310	24,020,000	61,396,499	55,516,465
2001	2,853,313	26,650,000	65,089,932	59,054,371
2002	2,858,643	29,740,000	66,124,341	60,697,220
2003	2,867,678	30,360,000	68,754,571	63,534,384
2004	2,886,006	31,040,000	72,578,792	67,385,540
2005	2,900,116	36,120,000	77,747,636	71,909,808
2006	2,897,150	58,850,000	81,097,601	74,603,310
2007	2,921,723	48,460,000	86,585,497	79,542,695
2008	2,940,212	48,980,000	90,346,843	83,031,539
2009	2,951,996	53,740,000	89,743,118	83,723,357

Note: All figures in Table 1 are in thousands of dollars, except population, which are actual values.

Appendix Table 2. Federal Funds and Type Received by County in Mississippi in 2009

County	Population	DL	DX	DO	GG	II	DR	PC	SW	GL	Total
Jackson	132,922.0	$ 5,769,834	$ 18,994,504	$ 200,113,942	$ 109,573,922	$ 4,434,399,505	$ 453,784,861	$ 2,303,255,926	$ 93,613,799	$ 93,245,833	$ 7,712,752,126
Harrison	181,191.0	18,886,930	17,513,719	351,538,327	308,297,131	5,019,624,138	727,205,313	422,381,176	646,203,112	124,272,376	7,635,922,222
Hinds	247,631.0	23,985,428	27,001,794	540,445,312	2,366,010,316	791,678,626	732,968,301	215,339,294	384,354,494	589,965,884	5,671,749,449
Hancock	40,962.0	3,134,286	7,564,956	77,253,746	48,554,909	2,209,023,157	143,528,358	522,457,626	128,095,917	18,912,962	3,158,525,917
Rankin	143,124.0	10,356,838	3,397,431	122,178,646	110,297,457	411,643,212	358,638,912	17,957,065	112,106,935	268,709,473	1,415,285,969
Madison	93,097.0	12,769,242	6,503,442	94,741,837	110,403,868	244,227,952	234,186,907	394,752,439	20,466,953	140,248,737	1,258,301,377
Forrest	81,078.0	5,805,338	10,109,260	175,197,773	159,200,546	137,064,268	302,837,707	81,963,260	210,786,654	173,418,280	1,256,383,086
DeSoto	158,719.0	1,656,396	4,791,382	97,159,404	92,523,761	182,347,000	406,029,519	7,525,373	28,396,390	329,026,761	1,149,455,986
Leflore	34,563.0	536,090,561	17,994,365	103,838,452	119,260,121	169,115,166	101,715,925	16,211,526	19,381,461	9,494,291	1,093,101,868
Washington	54,616.0	8,924,952	33,751,875	133,107,553	242,432,376	387,151,218	180,958,267	10,408,202	42,998,144	11,874,413	1,051,607,000
Lowndes	59,658.0	5,649,259	7,284,326	91,224,181	134,373,245	186,419,897	210,839,643	119,478,901	114,382,707	33,524,433	903,176,592
Warren	48,175.0	6,317,449	7,176,249	112,114,329	73,384,053	64,704,991	180,340,195	306,412,697	115,938,269	33,281,473	899,669,705
Lauderdale	79,099.0	6,723,033	6,080,665	168,243,748	183,111,874	103,565,078	281,462,662	41,831,890	68,896,384	31,685,403	891,600,737
Lee	81,913.0	1,237,934	6,309,188	114,687,878	115,565,884	108,375,540	279,136,562	19,231,500	58,832,618	69,662,779	773,039,883
Pearl River	57,860.0	4,356,525	1,507,043	108,531,850	72,460,917	221,424,553	207,539,590	2,482,051	17,384,485	37,057,515	672,744,529
Yazoo	27,981.0	4,217,461	15,445,932	65,722,086	79,754,616	103,568,020	76,584,386	274,578,516	37,191,048	5,527,681	662,589,746
Bolivar	36,766.0	10,078,061	31,715,603	89,368,149	157,781,673	179,363,936	112,110,946	1,826,240	7,748,880	13,875,608	603,869,096
Jones	67,776.0	4,689,462	2,626,039	142,394,954	112,643,743	41,117,024	228,841,676	9,734,539	22,799,120	31,259,808	596,106,365
Adams	30,722.0	5,524,227	3,104,911	69,096,901	89,238,694	10,260,914	119,359,359	230,160,182	10,375,501	9,872,095	546,992,784
Oktibbeha	44,544.0	5,108,773	2,710,827	64,865,191	161,723,225	41,302,993	110,842,940	18,019,425	30,287,479	23,370,056	458,230,909
Pike	39,834.0	1,966,112	3,890,265	97,257,053	94,982,459	19,709,618	150,094,526	1,822,353	19,302,084	43,723,911	432,748,381
Coahoma	26,936.0	9,561,044	20,163,288	93,353,219	121,341,419	81,954,539	83,116,562	2,488,550	13,219,653	5,831,756	431,030,030
Lafayette	43,975.0	48,480,904	4,253,373	49,631,291	85,431,893	38,939,504	95,979,882	28,898,983	32,790,066	31,914,428	416,320,324
Sunflower	29,610.0	10,545,409	29,782,095	81,989,250	97,808,669	108,010,471	70,641,100	910,072	12,813,245	3,234,856	415,735,167
Alcorn	35,822.0	5,654,092	7,559,188	78,715,728	80,142,342	21,677,579	140,003,180	3,039,539	12,462,270	14,417,588	363,671,506
Monroe	36,905.0	6,615,883	5,975,143	71,964,023	76,399,991	47,244,483	126,770,323	3,286,785	7,990,072	12,608,329	358,855,032
Panola	35,245.0	3,269,683	7,940,377	62,095,875	78,905,741	30,791,943	109,217,821	27,910,959	16,449,659	13,813,714	350,395,772
Marshall	36,900.0	3,276,394	3,101,350	62,948,696	110,018,686	12,519,250	121,831,750	1,875,245	6,663,467	21,510,815	343,745,653
Lamar	49,980.0	7,297,891	752,932	43,672,682	40,953,318	56,035,894	100,372,924	2,478,852	9,334,850	52,243,290	313,142,633
Copiah	29,094.0	1,826,068	1,041,885	75,954,865	80,815,667	5,474,253	105,159,765	19,191,536	12,230,856	8,357,686	310,052,581
Holmes	20,290.0	2,787,061	5,827,940	84,951,229	104,011,019	33,614,164	63,405,286	1,031,289	4,347,653	1,620,885	301,596,526
Neshoba	30,302.0	1,483,342	19,630,799	54,514,609	89,804,852	7,288,000	80,075,351	17,946,404	9,904,641	11,897,288	292,545,286
Marion	25,732.0	1,503,930	1,685,264	62,473,156	72,068,880	44,609,748	89,874,065	805,501	8,063,449	9,110,603	290,194,596
Lincoln	34,830.0	1,255,221	1,910,271	56,922,915	50,858,888	7,696,402	113,760,441	9,551,627	19,766,054	15,911,508	277,633,327
Grenada	23,046.0	3,944,660	2,722,347	61,767,671	40,396,736	39,330,880	88,219,069	4,412,721	20,891,318	15,638,650	277,324,052
Newton	22,568.0	1,015,819	2,234,741	66,015,428	78,224,088	3,549,438	97,914,483	1,167,529	16,341,461	5,904,628	272,367,615
Tate	27,337.0	1,469,458	2,121,621	56,518,464	57,582,190	15,630,280	80,686,625	2,698,747	11,514,653	24,812,086	253,034,124
Prentiss	25,709.0	598,831	2,241,531	53,545,288	73,742,759	5,618,634	94,044,604	773,062	9,184,239	5,765,972	245,514,920
Scott	29,341.0	778,544	982,534	58,693,239	63,573,339	2,726,218	85,967,856	6,558,286	16,345,856	9,769,621	245,395,493

George	22,681.0	4,584,775	687,519	39,958,507	17,039,375	22,195,473	81,616,920	919,050	5,576,844	59,834,345	232,412,808
Simpson	27,920.0	1,837,521	472,870	53,124,970	46,886,657	14,655,809	86,966,748	902,269	10,094,449	12,864,750	227,806,043
Leake	23,132.0	1,995,057	788,990	52,543,880	53,959,340	8,524,584	67,815,114	858,256	5,720,647	32,393,306	224,599,174
Clay	20,722.0	681,071	2,707,429	37,850,307	45,985,157	36,871,083	67,879,796	1,356,080	6,367,838	10,111,849	209,810,610
Union	27,263.0	10,000	1,544,740	40,430,974	57,734,533	6,207,718	83,125,524	1,135,195	5,742,054	13,168,160	209,098,898
Tishomingo	19,034.0	181,527	563,186	43,158,189	36,220,891	6,517,308	86,702,204	21,213,666	5,334,258	4,492,156	204,383,385
Tippah	21,661.0	488,043	1,170,106	49,531,644	51,079,078	6,813,608	79,664,637	2,161,350	4,892,659	6,094,701	201,895,826
Itawamba	23,000.0	22,269,119	1,023,864	56,042,043	37,791,962	8,195,741	62,139,794	559,415	3,078,030	9,372,084	200,472,052
Covington	20,544.0	853,736	517,510	36,432,704	53,981,881	9,221,944	71,697,929	609,387	5,765,233	16,373,682	195,454,006
Attala	19,755.0	1,357,212	1,005,017	46,448,113	60,425,873	3,764,741	71,906,201	1,192,655	4,886,042	4,305,784	195,291,638
Chickasaw	18,683.0	546,779	5,140,834	39,542,677	52,142,875	7,751,202	65,133,506	915,721	13,356,449	6,363,073	190,893,116
Tallahatchie	12,638.0	1,278,675	10,753,959	33,824,738	55,427,629	45,007,578	37,819,513	1,593,485	3,819,036	795,495	190,320,108
Humphreys	9,809.0	6,931,669	10,227,280	33,957,786	42,911,084	54,830,717	31,897,090	6,357,491	1,645,820	424,102	189,183,039
Pontotoc	29,248.0	283,350	2,386,374	39,584,127	40,261,332	6,703,397	81,476,855	1,366,615	4,492,455	12,294,228	188,848,733
Jasper	17,940.0	2,488,038	207,106	34,949,341	47,685,669	4,742,900	62,532,568	660,197	6,649,036	25,544,432	185,459,287
Tunica	10,436.0	5,679,313	13,570,313	19,714,316	36,903,876	71,837,932	27,920,142	2,647,797	1,676,419	3,476,708	183,426,816
Clarke	17,207.0	862,060	393,051	34,043,315	40,910,454	17,602,377	66,408,371	652,774	3,517,635	5,946,214	170,336,251
Winston	19,309.0	247,713	835,548	38,408,017	46,340,491	4,983,736	62,627,948	625,261	7,666,233	7,084,398	168,819,345
Quitman	8,391.0	3,281,038	12,180,395	27,571,004	42,706,974	46,519,316	29,614,759	1,852,225	1,642,820	461,263	165,829,794
Wayne	20,654.0	2,254,359	475,977	32,509,918	50,077,913	8,966,537	55,669,670	584,545	3,689,233	5,593,071	159,821,223
Calhoun	14,422.0	4,095,353	2,867,981	34,469,706	39,208,017	14,525,833	50,356,651	529,250	9,852,227	3,250,787	159,155,805
Stone	16,619.0	2,317,680	372,450	44,087,234	14,225,546	15,133,384	63,027,568	2,451,066	6,235,239	9,418,444	157,268,611
Yalobusha	13,773.0	774,441	1,440,048	37,307,205	38,136,317	6,982,014	61,499,979	732,135	4,484,239	4,923,922	156,280,300
Noxubee	11,631.0	1,534,889	4,216,901	23,417,091	61,988,260	20,359,023	35,272,263	1,321,691	3,080,024	1,874,386	153,064,528
Lawrence	13,308.0	1,551,070	670,858	34,243,742	29,248,498	8,303,414	61,550,513	729,367	9,693,042	5,124,171	151,114,675
Jefferson	8,928.0	27,588,889	1,113,515	31,343,271	46,327,166	1,845,244	21,451,767	1,077,166	7,078,215	12,791,408	150,616,641
Walthall	15,291.0	340,354	665,921	33,210,326	42,834,416	11,165,884	42,042,576	5,466,910	7,253,622	4,193,863	147,173,872
Montgomery	11,129.0	1,072,947	1,314,480	34,091,367	48,721,705	3,452,748	44,409,435	2,394,559	8,218,431	2,167,630	145,843,302
Jefferson Davis	12,543.0	473,238	263,446	30,177,330	50,154,720	490,375	39,348,330	9,886,938	2,479,419	3,840,687	137,114,483
Smith	15,826.0	482,310	244,522	25,459,052	32,708,335	4,276,061	42,457,995	525,613	5,364,826	6,441,784	117,960,498
Sharkey	5,420.0	4,065,768	8,721,944	17,720,895	20,453,980	45,464,042	17,507,285	741,867	2,017,616	774,763	117,468,160
Amite	13,038.0	389,818	444,917	28,408,011	33,792,333	1,537,845	44,405,627	875,454	3,132,030	3,519,800	116,505,835
Kemper	9,833.0	420,651	390,291	32,307,339	40,778,250	128,000	31,476,716	526,784	2,972,227	1,355,508	110,355,766
Perry	12,035.0	1,307,425	638,786	19,541,575	25,343,822	14,430,812	40,132,059	396,118	2,541,221	3,693,539	108,025,357
Webster	9,852.0	786,615	989,917	22,210,461	22,722,508	3,638,702	40,595,853	528,157	3,796,629	3,850,640	99,119,482
Wilkinson	10,143.0	300,898	1,172,586	21,363,519	31,073,311	8,019,557	29,139,372	132,039	510,407	443,967	92,155,656
Claiborne	10,755.0	1,052,893	1,307,314	23,876,778	28,542,674	3,342,364	30,353,882	354,867	1,756,616	1,536,927	92,124,315
Carroll	10,278.0	841,235	1,912,577	17,142,921	20,085,944	8,173,568	33,849,868	512,861	1,734,221	3,533,179	87,786,374
Greene	14,352.0	20,000	396,566	21,410,402	17,797,437	6,669,226	28,433,587	434,869	1,302,419	2,057,243	78,521,749
Benton	7,981.0	37,400	1,088,316	17,623,501	22,050,725	3,716,714	27,893,476	784,476	1,743,622	1,739,404	76,677,634
Franklin	8,324.0	160,928	159,486	17,381,973	20,972,323	474,157	26,763,304	1,862,017	3,694,221	1,264,086	72,732,495
Choctaw	9,023.0	488,194	389,459	14,686,599	20,202,689	397,483	25,814,644	780,850	7,469,018	2,240,351	72,469,287
State_undistributed	-	-	198,064,200	1,230,458,963	332,310,909	168,714,119	617,375	-	206,000	694,353,076	2,624,724,642

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Making Every Dollar Count: Local Government Expenditures and Welfare?

Pedro V. Garay[1]
Yacob A. Zereyesus
Alexi Thompson
Kansas State University

Abstract. The paper aims at examining the relationship between the allocations of funds at the local government level and the economic well-being of citizens. The results of this study help shed light on ways to get the best out of every dollar spent by local governments. Three empirical proxy measures for citizen well-being were used in the estimation of three different panel data models. Results suggest that local government expenditure have influence on citizen well-being. The analysis provides insights into how economic development policies may be conceived in local governments, especially small communities, to ensure sustained economic prosperity of its citizens.

Key words: local government, expenditure, well being

[1] The authors are respectively Doctoral student, research assistant professor, and doctoral student in the Department of Agricultural Economics at Kansas State University. They can be reached at pgaray@agecon.ksu.edu, yacobaz@ksu.edu, and alexit@k-state.edu, respectively.

Introduction

Government spending and taxation can have significant effects on the economy and on the lives of individuals. Government carries out a number of important economic functions. One of those functions is to correct inefficiencies or distortions in the allocation of goods and services. This may take the form of levying taxes or providing subsidies to correct externalities, providing public goods such as national defense and police protection, or regulating monopolies. Other government functions may include redistributing income and wealth through the use of taxes and transfers. Governments can also have an economic stabilizing function to reduce unemployment or inflation (Hungerford T. H., 2006).

Many argue that tax and spending reductions will stimulate economic growth, many others argue that tax cuts will lead to a larger deficit with adverse economic effects and that spending cuts will reduce critical government services. The evidence suggests that public social welfare expenditures can improve economic well-being. There are suggestions that countries with higher public social welfare expenditures relative to GDP have lower relative poverty rates (Hungerford , 2006). Public money is collected by the state and then used to fund social amenities such as public health systems, road infrastructure, construction of schools, housing, etc. It is termed public money because the money is used to build infrastructure so that citizens can benefit from social amenities that help a nation to progress. In advanced societies such as the US and Europe, positive results of the expenditure of public money are clearly evident in most sectors of society such as healthcare systems, infrastructure (education and transport) and social amenities.

The primary activity of the local government is to create an environment that facilitates economic growth and the well-being of its citizens. It is the relationship between government expenditure and citizen well-being that underlies the justification for modern governments to increase spending for their citizens. For example, governments are responsible for the provision of primary and secondary education in many communities because it is seen as a necessary social service that benefits society as a whole in its creation of literate and informed citizenry. The literate and informed citizen is able to make a more positive contribution to society through better decisions and appreciation of value, and in so doing, enhances the welfare of other citizens in the community. Similarly, development and maintenance of roads and other infrastructures are deemed important social services because they facilitate efficient movement of goods and people and reduce the logistics costs associated with trade while increasing the safety and comfort of citizens to allow them to focus on productive activities.

Several studies analyzed the effect of public spending on the well-being of the citizen. For example, Gupta, Verhoeven, and Tiongson (2002) used cross-country data for 44 countries to assess the relationship between public spending on health care and the health status of poor. Their results suggest that increased public spending on health alone will not be sufficient to significantly improve health status. Kenworthy (1999) studied the effects of social welfare policy extensiveness on poverty rates across fifteen industrialized nations over the period 1960-91 using both absolute and relative measures of poverty. The results strongly support the conventional view that social-welfare programs reduce poverty. In a different study, Fan, Hazell and Thorat (2000) developed a simultaneous equation model using state-level data for 1970-1993 to estimate the direct and indirect effect of different types of government expenditure on rural poverty and productivity growth in India. They found that investment in rural road, agricultural research, and education have high impact reducing poverty, but health and others have only modest impact on growth and poverty.

This paper examines the consequences of local government spending, especially public social welfare expenditures, on the well-being of the citizens.

Local Government Revenue Sources and Local Government Expenditure Categories

Local government revenues come from four principal sources: general revenue; utility revenue; liquor store revenue; and insurance trust revenues. Because governments engage in functions that provide non-public goods to consumers or customers, they can generate revenues in the form of charges that are similar to revenues for firms. For example, some government have revenues from utilities—water, electricity and gas supply and transit services. They may also receive some revenues from charges they levy on users of certain highways (toll roads), education, hospitals, airports, water and sewerage, solid waste management and other services they provide to their own citizens and to others. However, its tax revenue may be divided into four principal types: (1) individual and corporate income tax; (2) sales tax; (3) property tax; and (4) motor vehicle licenses. Finally, because local governments provide services to their citizens on behalf of the state and the federal government, there are inter-governmental transfers that accrue to them for these services.

Local government expenditure can be classified in several forms. It can be classified in terms of the kind of goods and services bought, also with very general items: capital goods, consumption goods, and personnel expenditure. Another way to classify the local government expenditure is according to the macro-function at which it is directed which include justice and public safety, transportation, military system, education system, health care, environment and housing, and others.

Local government is defined to encompass counties, municipalities, towns and townships as well as special purpose governments such as water, fire and library district governments and independent school district governments. Using U.S. Census Bureau's Census of Governments data (2007), it was found that there were a total of 39,044 counties and sub-county governments in the United States and 50,432 special purpose governments, giving a total of 89,476. All these governments have varying degrees of revenue generation authority (both tax and non-tax) across the states. The average and the median number of local governments in 2007 was 1,754 and 1,273 respectively while the range was 2 in the District of Columbia to 6,994 in Illinois. The results show that Kansas was the fifth highest-ranked state in terms of total number of local governments—3,931, which is about twice the mean and more than three times the median. Ahead of Kansas were of course Illinois, then Pennsylvania (4,871), Texas (4,833) and California (4,344) in that order. The bottoms five were Nevada (198), Arkansas (177), Rhode Island (134), Hawaii (19) and the District of Columbia. This gives a framework of the number of government entities under consideration in the rest of the paper. However, for the purposes of this paper, the local governments have been aggregated within states and assessed over time, from 1990 to 2005.

Measures of Citizens' Well-Being

In this study, three empirical proxy measures of citizens' well-being are used. They are poverty rate (Smith and Morgan, 1970), median income and disposable income (Smeeding and Sullivan, 1998; Smeeding and Sandstorm, 2005). The poverty rate within a region (e.g., state, county, and municipality) is a common measure used to define citizen well-being. To determine if a family is living in poverty, the U.S. Census Bureau compares a family's total income against a set of money income thresholds which vary by family size and composition. These thresholds are based on the ones designed by Mollie Orshansky in the 1960's. If the total income is less than the appropriate threshold, then the family and all of the individuals within the family are considered to be in poverty. Although the money income thresholds do not vary across the nation, they are modified each year to account for inflation using the Consumer Price Index for All Urban Consumers (CPI-U) (Proctor and Dalaker, 2003).

In the U.S., money income, market income, post-social insurance income and disposable income are four measures of income that can be used to estimate economic well-being and the impact of taxes and governmental transfers. Money income is used in the official definition of poverty and the other income measures differ from each other based on the inclusion or exclusion of certain monetary components. As a result, income distribution changes depending on the income measure used (U.S. Census Bureau, 2007).

Money income includes all money income earned or received by individuals who are 15 years or older before tax deductions or other expenses. This measure does not include capital gains, lump-sum payments or non-cash benefits (e.g., payments from insurance companies, worker's compensation or pension plans). Market income consists of all resources available to families based on market activities. It is similar to money income but government cash transfers and imputed work expenses excluding work expenses are deducted. However, imputed net realized capital gains and imputed rental income are included in this definition. This measure can be used as a reference point when investigating the effect of government activity on income and poverty estimates (U.S. Census Bureau, 2007).

Post-social insurance income measure consists of governmental programs that affect everyone and not those solely created for people with low income. This measure is similar to market income except that non-means-tested government transfers are included (e.g., social security, unemployment compensation and worker's compensation). Therefore, households who receive income from at least one of the non-mean-tested government transfers have a higher median income under post-social insurance income measure than market income (U.S. Census Bureau, 2007).

The final income measure is disposable income, which represents the net income households have available to meet living expenses. According to Smeeding and Sandstorm (2005), the best income definition when determining poverty and poverty rates is disposable cash or near-cash income. This measure includes money income, imputed net realized capital gains, imputed rental income and the value of noncash transfers (e.g., food stamps, subsidized housing and school lunch programs). Excluded from this measure are imputed work expenses, federal payroll taxes, federal and state income taxes and property taxes for owner-occupied homes. Of the four income measures, disposable income has the lowest median income. A comparison between post-social insurance income and disposable incomes highlights the net impact of means-tested government transfers and taxes. By comparing market income and disposable income, the net impact of government transfers and taxes on income and poverty estimates can be determined (U.S. Census Bureau, 2007).

The National Academy of Sciences (NAS) advocates for a revision of the methods used by the U.S. Census Bureau to measure poverty. One criticism of the official poverty definition is that pre-tax income (i.e., money income measure) is used to determine who is in poverty. Therefore, the effect of how taxes, non cash benefits and work-related and medical expenses on people's well-being are not taken into account. Additionally, the effect of policy changes on people who are considered to be in poverty cannot be observed. Another criticism is that the official poverty definition does not reflect variation in costs across the nation. NAS believes that the official thresholds do not accurately represent the increase in expenses or the economies of scales which occur with increases in the family size (Proctor and Dalaker, 2002).

This criticism surrounding how poverty rates are calculated in the U.S. provides the rationale for examining alternative measures of citizen well-being in addition to using poverty rate. That is, we will investigate how local government expenditure affects three different measures of citizen well-being ; poverty rate, median income and disposable income.

The foregoing discussion focuses on objective metrics of well-being. However, there is increasing consensus among sociologists and economists that well-being of individuals cannot be described solely by objective social situation alone (Easterlin, 2002). Thus, there are calls for a more nuanced view of well-being that meshes the broader social trends that is placing higher value on the quality of life rather than on economic success (Inglehart, 1990) and shifts focus within the social sciences to recognize the limits of revealed preferences, upon which most of consumer economics rests. The foregoing have caused the adoption of subjective well-being from its psychology domain and incorporated it into economics and sociology in attempts to understand how individuals within a community assess their well-being. While this paper makes no attempt to incorporate these broader and richer measures of individual subjective measures of well-being, it is discussed here to anchor our observations about the limitations of a macro-level analysis such as this as we search for the influence of local government expenditure on citizen well-being and local economic development.

The Data and Methods

A balanced panel data collected from the U.S. Census Bureau's annual survey of local government finances from 1991 to 2005 for fifty states plus the District of Columbia was used. The expenditure categories presented above are captured in the database and used for the analyses. These expenditure categories encompassed education, health, transportation, public safety, environment and housing, and government administration. The well-being measures were collected directly from U.S. Census Bureau annual data for these communities. In order to avoid scaling problems associated with different sizes of the respective local governments, the expenditure categories were transformed to per capita term. The poverty rate was expressed in percentage term and both the medial income and the disposable income for each state were converted as a proportion of the whole United States average values. A challenge posed to the analysis was that the data was incomplete because local government finances data for 2000 and 2002 were unavailable at the database source we were using. While the data could be obtained from other sources, the problem was how much noise could be introduced by these methods compared to the lost data being treated as "holes" in the analysis.

We use three panel data models: pooled ordinary least square (OLS), fixed effects model (FE), and random effects model (RE) following the work of Wald (1947), Hildreth and Houck (1968), and Swamy (1967, 1970) to assess the relationship between the measures of well-being used in this study and the categories of local government expenditure. The dependent variables, as indicated earlier, are poverty rate, median income and disposable income. The independent variables encompass education, health, transportation, public safety, environment and housing, and government administration.

Under the pooled-OLS model, we have

(1) $$y_{it} = \alpha + X_{it}^{'}\beta + u_{it} \quad i=1,\ldots,N,\ t=1,..,T$$

where y_{it} is the dependent variable (poverty rate, median income, disposable income) of the i^{th} state and at t time, X_{it} represents the independent variables (expenditures in education, health, transportation, public safety, environment and housing, and government administration), βs are the estimated coefficients, α represent the intercept and u_{it} is the unobserved error term. The pooled-OLS model increases the probability of a bias occurring due to unobserved heterogeneity (that is, u_{it} and X_{it} could be correlated) because pooled-OLS relies on a between comparison. If for any reason, it is believed that the error terms and the independent variables are not correlated, then using pooled-OLS can give unbiased estimates. Otherwise the bias can be addressed by decomposing the error term in two components:

(2) $$u_{it} = \mu_i + v_{it}$$

Where μ_i is a state-specific error and v_{it} represents an idiosyncratic error.

Since the state-specific error does not vary over time, every state has a fixed value on this latent variable (fixed-effects). Unlike the state-specific error, the idiosyncratic error, v_{it}, varies over states and time and it should satisfy the assumptions for the standard OLS error terms. In the pooled-OLS model, the assumption is that X_{it} is uncorrelated both with μ_i and v_{it}.

In the Fixed Effect (FE) estimation, after some manipulations we can get

(3) $$y_{it} - \bar{y}_{i.} = \beta(x_{it} - \bar{x}_{i.}) + (v_{it} - \bar{v}_{i.})$$

which can be estimated by the pooled-OLS or FE estimator. Time-constant unobserved heterogeneity is not a problem allowing the FE-estimator to be successful in identifying the true causal effect.

In the Random Effects (RE) estimation, we assume that the μ_i's are random (independent and identically distributed random-effects) and that Cov (X_{it}, μ_i) = 0. However our pooled-OLS model will create serially correlated error terms v_{it}, with biased standard errors. On the other hand, using a pooled generalized least squared estimator results in RE estimator.

We run a set of regressions using each of the above models. The regressions use expenditures in education, health, transportation, public safety, environment and housing, and government administration as the explanatory variables. The dependent variables are poverty rate, median income, and disposable income.

Results

Results from the pooled-OLS model, Fixed Effects (FE) model and the Random Effects (RE) model are displayed in Table 1. Each model was analyzed three times, each time with a different dependent variable: poverty rate, median income and disposable income. The correlation coefficients between poverty rate and median income; poverty rate and disposable income; and between median income and disposable income were respectively -0.7067, -0.3714 and 0.7124.

Fixed effects are tested by the (incremental) F test, while random effects are examined by the Lagrange Multiplier (LM) test (Breusch and Pagan, 1980). If the null hypothesis is not rejected, the pooled OLS regression is favored. When poverty rate and disposable income were used as dependent variables, both the F test and LM test indicated that the null hypotheses are rejected, however when median income was used as dependent variable the test failed to reject the null hypotheses, implying that for this model the Pooled OLS model is preferred to both the FE and RE models.

When either FE and RE models are preferred to the pooled OLS model, the Hausman specification test (Hausman, 1978) was applied to compare the FE and RE models. The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). If correlated (H_0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; so a fixed effect model is preferred. Examining whether the dependent variable (i.e., poverty rate, median income, disposable income) is location dependent is crucial to identify the true causal effect. The FE model controls the state heterogeneity, which is supposed to be time constant, and helps identify the relationship between the dependent variables and explanatory variables. When poverty rate and disposable income were used as dependent variables, we used this Hausman homogeneity test to determine if there was a systematic difference in coefficients between the FE and the RE models. Results indicate that there is a significant difference between the two models suggesting that there is certain covariance present between μ_i's and X_{it}'s and we might need to use the fixed effects model since the assumption of zero covariance isn't holding.

Some of the results, specially the signs on the coefficients, were not consistent in the different models. For example, in the upper panel of table 1, the signs for the transportation variable were positive for the pooled OLS and RE models, but negative sign for the FE model. So, for the forgoing discussions, we have used variables that were consistent in all the models.

Table 1: Regression Results from Pooled-OLS Model, Fixed Effects Model and Random Effects Model

	Pooled-OLS Model	Fixed Effects Model	Random Effects Model
Poverty Rate	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
Education	-0.03203 *** (0.00397)	-0.02672 *** (0.0725)	-0.02847 *** (0.00411)
Health	0.08277 *** (0.00798)	0.00725 (0.00873)	0.01813** (0.00842)
Transportation	-0.06436 *** (0.01184)	0.000883 (0.01452)	-0.01243 * (0.0137)
Public Safety	0.06881 *** (0.01085)	0.0181 * (0.0090)	0.02731*** (0.00941)
Environment and Housing	-0.030351 ** (0.0092)	-0.00508 (0.0064)	0.003127 (0.0063)
Government Administration	-0.04591 *** (0.01297)	-0.051991 *** (0.0072)	-0.05064*** (0.00727)
Constant	0.166663 *** (0.00433)	0.163024 *** (0.003227)	0.16391 *** (0.0050)
Median Income			
Education	0.067189 *** (0.0165)	0.01790 (0.01289)	0.016605 (0.012668)
Health	- 0.39328 *** (0.0331)	0.011239 (0.011239)	-0.01523 (0.02572)
Transportation	0.152504 *** (0.04914)	-0.05631 (0.04292)	-0.03027 (0.0424)
Public Safety	0.02782 (0.04501)	-0.001522 (0.02929)	0.001057 (0.0289)
Environment and Housing	0.228058 *** (0.038169)	0.016186 (0.019003)	0.027291 (0.01909)
Government Administration	0.02158 (0.0538)	-0.005869 (0.02133)	- 0.004976 (0.02177)
Constant	0.866189 *** (0.017956)	0.980516 *** (0.00954)	0.976749 *** (0.018731)
Disposable Income			
Education	0.06446 *** (0.0128)	0.02563 *** (0.00601)	0.02251 *** (0.00623)
Health	-0.22902 *** (0.02579)	0.039973 ** (0.0121)	0.035218 ** (0.012567)
Transportation	-0.03735 (0.0382)	-0.006956 (0.02006)	-0.006809 (0.02082)
Public Safety	0.31361 *** (0.03507)	- 0.039666 ** (0.01369)	-0.026506* (0.014207)
Environment and Housing	0.191926 *** (0.02974)	0.03832 *** (0.00997)	0.043373 *** (0.00927)
Government Administration	-0.05051 (0.04163)	-0.04331 *** (0.00446)	-0.041555*** (0.01048)
Constant	0.80655 *** (0.01399)	0.94023 *** (0.00446)	0.93929 *** (0.01328)

Note: *, **, and *** represents significance at the 10%, 5% and 1% significance level, respectively

When poverty rate is used as a dependent variable, the estimated coefficients for education, government administration expenditures and the constant were strongly statistically significant at 99% confidence level. The coefficient on public safety was statistically significant at 90% confidence level. According to this model, expenditures on both education and government administration would significantly reduce poverty rate. For example, a one unit increase of expenditure by local government in education would cause poverty rate in the United States to decrease by 0.02 units. Given the average per capita expenditure on education for the United States is 1.22 dollars, an allocation of 1 more dollar per capita on education through local governments would reduce poverty rate by 0.02 percentage points, or 10 more dollars per capita expenditure through local government would reduce poverty rate by 2 percentage points. Similarly, increased expenditures on government administration would reduce poverty rate more than expenses on education.

In the pooled-OLS model where the median income is used as the dependent variable, most of the variables including the constant are significant at 1 percent significance level. Public Safety and Government Administration are not significant. Using the pooled-OLS model to predict the median income, a one unit increase in expenditure on education would cause average state disposable income as a proportion of average US median income to increase by 0.06 units. Expenditures on environment and housing (e.g. parks and recreation, and housing and community development) cause the largest increase in median income as a proportion of average US median income compared to other expenditure categories.

Using the FE model, when we analyze the relationship between the local government expenditure and the disposable income, except the transportation variable, all explanatory variables are significant at least at 95 percent confidence level. Expenditures on education and environment and housing have positive effect on disposable income. Government administration expenditures negatively affect disposable income. Using the fixed effects model to predict the disposable income, a one unit increase in expenditure on education would cause average state disposable income as a proportion of average US disposable income to increase by 0.02 units.

Conclusion

In this study, we focused on determining whether a direct relationship between local government expenditure and citizen well-being exist. We hypothesized that the allocation of local government expenditure influenced the wealth status of its citizens. Three panel data models (pooled-OLS, FE model and RE model) each with three different dependent variables (poverty rate, median income and disposable income) were estimated to determine the impact of government expenditure on citizen well-being. Most of the variables in the regressions are statistically significant implying that government expenditures do affect citizen well being. The signs for education variable coefficients unambiguously matched expectations. Expenditure in Education has a strong impact indicated by the 99 % significance level in the three models.

Depending on the objectives of the local government, policy instruments can be designed to target specific citizen well-being measures. For example, based on the results of the current study, if the priority of the local governments is to reduce poverty level, more per capita expenditure may be allocated on government administration. If local government wants to target median income, the results would suggest more expenditure on environment and housing (e.g. parks and recreation, and housing and community development) which cause the largest increase in median income as a proportion of average US median income compared to other expenditure categories.

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