AN ANALYSIS OF ALLOCATION OF LISA RESEARCH AND EXTENSION FUNDING

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Abstract

This paper considers the political economic factors associated with allocation of federal LISA funds among states. A simultaneous equation, tobit model is estimated with LISA allocations and pressure group memberships the endogenous variables. Economic, environmental, and political exogenous variables and the endogenous variables are significant in the model.

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Concern is growing among farmers, public officials, and the general public about the environmental and health effects of agricultural chemicals. The LISA (Low-Input/Sustainable Agriculture) program, which was initiated in 1987, is intended to help farmers use management, scientific information, and on-farm resources in order to reduce the use of these chemical inputs (Madden). The 1990 farm bill authorizes $40 million for LISA research and extension programs. Although this is less than 4% of the total annual authorization for agricultural research and extension, many feel that this program will expand substantially in coming years (*Congressional Quarterly*).

Most federal agricultural research and extension funding is allocated among states on the basis of well-established formulas. The LISA program, however, is different. It is administered through host institutions in four regions. In the first two years of the program, these institutions were the University of Vermont in the Northeast region, the University of Nebraska in the North-Central, the University of Georgia in the South, and the University of California in the West. Within each region, LISA project proposals are reviewed by committees appointed by the host institution.

The objective of this paper is to consider the political economics of the distribution of LISA money among states. The initial motivation for this paper was the disproportionate amount of LISA money granted to the four host institutions. Of the $5.52 million in LISA funding during fiscal years 1988-89, $1.07 million (19%) went to these four universities (USDA, *LISA 88-89*). By comparison, they received only 7.8% of total federal agricultural research dollars during FYs 1988-89 (USDA, *Inventory of Agricultural Research*). Obviously, different considerations have been involved in these allocations than other agricultural research funds. This paper estimates the relative influence of various political economic factors on the allocation of LISA money among states during FY's 1988-89.

The Market for LISA Funds

Prior studies have examined the political economy of state agricultural research and extension funding (Guttman; Huffman and Miranowski; Rose-Ackerman and Evenson; White and Araji). Political factors consistently play a critical role in expenditure decisions. One recurrent finding is that expenditures are an increasing function of membership in groups benefiting from research or extension.

In modeling the allocation of LISA research and extension funds among states, it is helpful to follow these earlier studies in using the theoretical concept of a market for LISA funds. Such a political market has both demanders and suppliers of government programs. For LISA, public-interest groups in the state with a concern about the environmental and health effects of agricultural chemicals, researchers at state universities and other institutions seeking LISA funds, state farm groups and perhaps the state population at large are important groups on the demand side. The farm groups could have a negative or positive effect on demand. On the positive side, financial stress has created interest in cost reducing technologies (Daberkow and Reichelderfer). In addition, states compete with each other in agricultural markets. Farm groups in one state may lobby for LISA funds simply to prevent the money from going to another state. However, farm groups may also fear future mandated adoption of LISA technologies that may reduce profits.

On the supply side are those who make allocation decisions: members of Congress, US Department of Agriculture officials, and the decentralized administrators of the LISA program. Clearly, it is easier to secure LISA money for a state if its Congressional delegation is in a position to influence allocation decisions. It is also easier if LISA administrators or USDA officials are partial to that state. Standard political economic reasoning suggests that LISA administrators may favor grant applications from their own institution or state for self-interest motives. While such motives may not be explicit, standard economic reasoning suggests it is a likely implicit outcome.

The "price" of LISA funds has political and monetary components. For members of Congress, it is measured in votes, campaign contributions, in-kind campaign assistance, and other political favors. For USDA officials and LISA administrators, it is measured in salaries, benefits, research support, and other types of assistance provided by their respective institutions. Some components of this price are easily observable (e.g., campaign contributions), but others are not because of privacy considerations (e.g., salaries and benefits). In any case, estimating the marginal impact of LISA funds on votes for members of Congress, campaign contributions, or other observable components of this price would be difficult and fraught with error. This research therefore uses a reduced-form formulation expressing LISA expenditures in a given state as a function of the above demand and supply shifters.

Data and Variables

This section presents the data, variables, and estimation methods. Summary statistics for the variables are shown in table 1. The dependent variable in the analysis is annual per capita LISA expenditures during fiscal years 1988-89, using data in the USDA's *LISA 88-89* and the *Statistical Abstract of the United States*. Of the 48 states in the sample, 42 received LISA money. Alaska and Hawaii were excluded because of missing data on some of the explanatory variables.

On the demand side, the sum of per capita 1990 membership in the Institute for Alternative Agriculture (IAA) and the American Farmland Trust (AFT) was used to represent pressure group membership.[1] IAA includes researchers and others directly interested in LISA. It has grown rapidly since its creation in 1983 (Swenson). The focus of AFT is on broader agricultural conservation issues, but it was included because of its substantial political influence (Browne). The sum of IAA and AFT membership was used rather than two separate membership variables because of correlation between membership in these two organizations. While this sum may introduce double-counting, that is not necessarily undesirable. A person belonging to both groups may be more active than a person belonging to just one; more concretely, a person belonging to both is contributing membership dues twice.

The fraction of the state population in 1980 judged to be at risk from public groundwater supplies contaminated by agricultural chemicals (Nielson and Lee) was also a variable.[2]

In addition, 1987 per capita expenditures by farmers on commercial fertilizer, as well as 1987 per capita expenditures on other agricultural chemicals, which are largely pesticides, are included. These data are from the *Census of Agriculture* and the *Statistical Abstract of the United States*. These three variables may proxy the level of concern among environmental organizations and the general public about agricultural pollution in their state. However, they also measure the economic importance of chemicals to agriculture in the state and therefore the interest of the agricultural sector in funding benign substitutes.[3] To the extent that farmers oppose (support) LISA funding, even in their own state, these variables may proxy for that opposition (support).

On the supply side a set of dummy variables was used. The first dummy variable equals one if the state has a host LISA institution and zero otherwise. Another dummy variable equals one if the state had a Senator on the Agriculture Committee or the Agriculture Subcommittee of the Appropriations Committee in the 100th (1987-88) or 101st (1989-90) Congresses. A similar dummy variable is included for the House of Representatives.[4] Data are from the *Congressional Quarterly Almanac*.

Many potential supply and demand shifters are not listed above. Per capita annual federal agricultural research expenditures (on all programs) in the state during FY's 1988-89 were included to proxy many of these variables common to LISA and other federal agricultural research programs. Data are from the USDA's *Inventory of Agricultural Research*. Dummies for the North-Central, South, and West regions were also included.

For estimation, a simultaneous model was assumed. Besides per capita LISA allocations, membership in IAA and AFT is assumed to be endogenous. The usual assumption in the public choice literature is that interest group sizes are exogenous. In this application such an assumption seems questionable. The IAA has a significant stake in the LISA program, and this is true to a lesser extent for AFT. For members of these groups, LISA expenditures open up opportunities to receive money or influence where the money is going. Furthermore, LISA grants may stimulate membership in these organizations among recipients and their clienteles. In addition to LISA expenditures, the membership in IAA/AFT is hypothesized to be a function of groundwater contamination from agricultural chemicals, fertilizer expenditures, expenditures on other chemicals, and regional dummies for the North-Central, South, and West as defined above. IAA/AFT membership is also hypothesized to be a function of the combined 1988 per capita membership in four major environmental organizations: the Audobon Society, Greenpeace, the National Wildlife Federation, and the Sierra Club.[5] Once again, multicollinearity precludes using membership in each organization separately.

Results and Discussion

Because of the truncation of LISA allocations at zero, a tobit formulation of the allocation equation was assumed. Maximum-likelihood estimates for the simultaneous equation model are shown in table 2. The results support the simultaneous equation formulation since the relationship between LISA expenditures and IAA/AFT membership appears to be two-way. The effect of IAA/AFT membership on LISA expenditures is highly statistically significant, while the effect of LISA on IAA/AFT is marginal but still significant at the 10% level. The results indicate that, at the sample means, a 10% increase in IAA/AFT membership causes about a 13% increase in LISA spending, a substantial effect. Conversely, a 10% increase in LISA spending leads to about a 2% increase in IAA/AFT membership. The estimated impact of a 10% increase in total federal agricultural research expenditures on LISA expenditures is approximately 6%. States with larger allocations of total agricultural research funds therefore receive more LISA funds but less then proportionately.

LISA spending is not significantly affected by groundwater contamination or fertilizer expenditures.[6] In fact, point estimates for these two variables are negative which supports the farmer opposition to LISA hypothesis. Many LISA projects directed at reducing fertilizer usage were funded, especially in the

North-Central region. However, overall spending decisions do not seem related to fertilizer use. On the other hand, expenditures on other agricultural chemicals exert a significant, positive influence on LISA spending. At the sample means, a 10% increase in chemical expenditures leads to about a 10% increase in LISA spending. Perhaps allocations are more directed towards reducing pesticides than fertilizers. The relative importance of horticulture in the funded projects (USDA, *LISA 88-89*) supports this view.

The results do support the original motivation of the research: states with host LISA institutions do receive more money. However, the effect is less than the raw numbers would indicate. States with host institutions received about 220% more money per capita than the average. Controlling for other factors, these results indicate that having a host institution translates into about 90% more money per capita. Nevertheless, 90% is a large impact. Congressional representation on key committees has no statistically significant effect on LISA funding.[7]

Aside from LISA spending and regional effects, IAA/AFT membership is most strongly associated with membership in major environmental organizations. A 10% increase in membership in major environmental organizations is associated with approximately an 11% increase in IAA/AFT membership.

Conclusions

The objective of this paper was to consider the political economy of state allocation of research and extension spending on the LISA program. Results indicate that the allocation is related to political variables. LISA spending is substantially greater in states with host LISA institutions. Spending is also highly responsive to membership in two groups (the Institute of Alternative Agriculture and the American Farmland Trust) with a significant stake in the LISA program. However, spending is also responsive to environmental considerations, as measured by expenditures on agricultural chemicals, as well as total federal agricultural research funding.

The model undoubtedly does not reflect all potential political economic influences associated with LISA funding. For example, designation of host institutions could also be an endogenous variable. Unfortunately, data are not available on variables such as past research and extension programs in the state related to LISA activity. If such a variable were available, it might better explain the allocation to these states than the host institution variable. Nevertheless, the influence of political variables seems to result in a different pattern of allocations than for other federal agricultural research.

The influence of politics is much more evident in many other agricultural programs. For example, the FY 1991 agricultural appropriations law includes $100 million in line-item special research grants, on topics ranging from Belgian endive in Massachusetts to oil from jojoba in New Mexico. However, such line-item spending is coming under increasing scrutiny, while the pressure to increase LISA expenditures is growing. Considerable support exists for the LISA Program organization (e.g., National Research Council). However, this analysis suggests that the methods of allocation of LISA funds may need to be reexamined.

Footnotes

[1]Membership data were kindly supplied by the organizations themselves. We requested 1988 data, but both had only 1990 data.

[2]While these data are tenuous, better data were unavailable. At the time this paper was written, state-level figures from the EPA's *National Pesticide Survey* were not yet available.

[3]Fertilizer and chemical expenditures as a fraction of the market value of farm products sold were also considered as variables. The results were qualitatively the same as those shown below.

[4]In preliminary specifications, two separate dummy variables were included for each chamber of Congress, one for the committee and one for the subcommittee. Together, neither ever came close to statistical significance. In analysis with only one of these variables, each performed better. However, the combined variables defined above had the best overall results.

[5]Membership data were graciously provided by the organizations themselves. Greenpeace data are for 1990. At the national level, these are the four largest environmental organizations.

[6]Multicollinearity is not the problem here: deleting the fertilizer and chemical expenditure variables did not significantly improve the performance of the groundwater contamination variable.

[7]In regressions not reported here, LISA expenditures as a percentage of total federal agricultural research spending in the state was used as dependent variable. In these regressions, representation on key committees had a significant, positive effect for the House but not the Senate.

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Table 1. Summary Statistics

Variable	Definition	Mean	Standard Deviation
LISA	Per capita annual expenditures, FYS 1988-89 (x 100)	2.11	3.48
Federal Agricultural Research	Per capita annual expenditures, FYs 1988-89	1.22	0.79
IAA/AFT	Combined membership per capita, 1990 (x 100,000)	6.06	6.18
Major Environmental Organizations	Membership per capita in Audobon Society, Greenpeace,* National Wildlife Federation, and Sierra Club, 1988 (x 100)	2.44	1.23
Groundwater	Fraction of population at risk from pollution by agricultural chemicals, 1980 (x 10)	1.44	1.61
Fertilizer	Per capita expenditures on fertilizer, 1987 (x 100)	4.24	5.35
Agricultural Chemicals	Per capita expenditures on other agricultural chemicals, 1987 (x 100)	2.90	3.87
Host Institution	Equals 1 for CA, GA, NE, VT, 0 otherwise	0.08	0.28
Senate	Equals 1 if a Senator on Agriculture Committee or Appropriations Subcommittee on Agriculture, 0 otherwise	0.54	0.50
House	Similarly defined	0.71	0.46
North-Central	Dummy for IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI	0.25	0.44
South	Dummy for AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA	0.27	0.45
West	Dummy for AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY	0.23	0.43

NOTE: Greenpeace (*) membership data are for 1990. Alaska and Hawaii are excluded from the sample.

Table 2. Maximum Likelihood Results

Variable	Dependent Variable: LISA	Dependent Variable: IAA/AFT
LISA		0.62* (1.7)
IAA/AFT	0.45*** (4.6)	
Fed. Agr. Research	1.08* (1.9)	
Major Env. Orgs.		2.71*** (3.0)
Groundwater	-0.23 (0.9)	0.14 (0.5)
Fertilizer	-0.27 (1.1)	0.16 (0.5)
Agr. Chemicals	0.76** (2.3)	-0.51 (1.1)
Host Institution	1.90* (1.9)	
Senate	-0.07 (0.1)	
House	0.63 (1.2)	
North-Central	1.45 (1.0)	-3.97*** (2.7)
South	1.51 (1.0)	-3.12** (2.2)
West	1.52 (1.3)	-4.41*** (3.8)
Intercept	-4.50*** (3.4)	-1.70 (0.7)
Efron's R^2	0.80	0.86

NOTE: Absolute values of asymptotic Z-scores are in parentheses. An * denotes significance at the 10% level, ** significance at the 5% level, and *** significance at the 1% level.