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Causes of State Cost-Share Programs for Non-industrial Private Forest Landowners

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ABSTRACT

State cost-share programs for non-industrial private forest landowners are public assistance programs in the form of direct subsidy payments. A total of nineteen states have such programs. This paper presents the results of an empirical investigation on the political and economic factors that determine their presence. No matter what the rationales or justifications for these programs are, the forest industry's political pressure made them possible, and a healthy state economy made them a reality.

INTRODUCTION

Non-industrial Private Forest (NIPF) lands account for about half of the total timber supply in the U.S. As a result of timber harvesting reduction on public lands, this number is expected to increase to about 60 percent by the year 2030 (Haines 1995; Harrell 1989). Because of their importance in the country's economy, NIPF landowners rightfully warrant attention from public policy makers. In the last few decades, many federal and state programs have been created to assist landowners in achieving their management goals. The nature of assistance ranges from technical assistance to exemption or deferred payment of taxes to direct payments or subsidies. Cost-share programs are a direct payment where the government shares a certain portion of NIPF management costs.

Many studies have been done on both state and federal forestry cost-share programs (e.g., Flick and Horton 1981; Royer and Moulton 1987; Romm et al. 1987; Bullard and Straka 1988; Bliss and Martin 1990; Lee et al. 1992). However, most of them deal with the nature and effectiveness of such programs, and none is focused on the political and economic factors that influence the presence of these programs.

Understanding the causes and impacts of governmental forestry programs such as the cost-share programs is a prerequisite for students in forest policy. However, the cause of such programs is a subject of much speculation but very little empirical evidence. Further, it has not received nearly the attention in forestry that it has received in other sectors, notably agriculture (e.g., Gardner 1983, 1987).

This paper presents the results of an initial attempt to investigate the political and economic determinants of state cost-share programs for NIPF landowners. It differs from others insofar as it uses an econometric method to determine the direct cause of these programs. This paper starts, in the next section, with a review of economics of public subsidy programs and a summary of all state cost-share programs in forestry. It is followed by a discussion of hypothesis and data used in this study. The remaining sections present empirical results and conclusions.

LITERATURE REVIEW

Economics of Public Subsidy Programs

Public subsidies are payments from governments designed to form a wedge between consumer's price and producer's cost so that the price is less than the marginal cost (Pearce 1992). Often subsidies are backed by arguments for the presence of market failure. The underlying reasoning is that the market either will not produce at the desired level or is not equipped to internalize the externalities of production (Lee et al. 1992). Therefore, subsidies are instituted in order to achieve one or more of the following: (1) to transfer wealth from taxpayers to the producers or consumers of certain goods, (2) to influence producer or consumer behavior, and (3) to keep prices of certain goods low or stable (Pearce 1992).

All three of these objectives, directly or indirectly, have been used to justify financial incentive (cost-share) programs for forest landowners. In particular, it has been argued that these programs are needed as (1) productivity of NIPF lands is low, (2) rising demand may exceed supply in the future causing real prices of wood products to rise, (3) NIPF lands are becoming increasingly important in meeting the nation's demand for wood products given rising demand and diminishing supply from public lands, (4) NIPF landowners need to be encouraged to invest in timber production which takes longer to mature than most other investments, and (5) these programs help minimize the externalities of timber production and maintain a socially desirable environmental quality (de Steiguer 1984).

Cost-share programs, however, have their controversy and considerable criticisms. Boyd (1984) and Boyd and Hyde (1989) find that landowners who would have invested on their land anyway use public funding instead. Bliss and Martin (1990) report that most active forest managers believe that they would have practiced the same level of forest management in the absence of cost-share programs. This means that substitution of public for private funding exists among NIPF landowners. On the other hand, de Steiguer (1984) finds no evidence of such substitution in NIPF reforestation investment, and Lee et al. (1992) fail to find any evidence of substitution of public for private funding in both industrial and non-industrial private lands. Bliss and Martin (1990) report an increase in management activities due to cost-

share funds while Lee et al. (1992) find the presence of an inducement effect. It is also possible that landowners may delay reforestation in the absence of cost-share funds (Bullard and Straka 1988), though no empirical evidence has been found to support this hypothesis.

Although views and justifications for such programs differ, these programs result in a transfer of wealth from the taxpayers to a certain targeted group of landowners. One obvious result of this transfer is deadweight losses. Many economists have tried to measure the extent of the deadweight loss and quantify the efficiency of the redistribution of wealth in public subsidy programs. However, no studies could be found on the size of the deadweight loss created by forestry cost-share programs.

Federal and State Financial Assistance Programs

Federal financial assistance programs started with the Clarke-McNary Act of 1924 and then evolved into several farm and forestry programs, including the Forestry Incentives Program (FIP), the Stewardship Incentive Program (SIP), and the Conservation Reserve Program (CRP) (Harrell 1989; Cubbage et al. 1993). Since most of these programs are often created in much larger legislation such as the Farm Bill, conducting empirical analysis aimed at identifying the causes of federal forestry cost-share programs is difficult, if not impossible. Most state forestry cost-share programs are stand-alone for forestry, and thus they offer a better opportunity for empirical analysis.

Table 1 provides a brief summary of currently available state cost-share programs. Characteristics of these programs vary widely, but all have a ceiling on cost-share (both proportional and absolute) and a limit on size of ownership, duration, and covered forestry practices. The cost-share rates vary from 40 percent to up to 90 percent, but usually they are about 50 percent. Funding mostly comes from timber yield taxes and other forms of state revenues, such as state appropriations and lottery revenues.

Most of the state programs started in the 70s and 80s. Over the years, however, there have been some changes in the management intention and practices. In the early years, most of these programs were aimed at timber production. While timber still remains as the principal goal, various non-timber benefits

have also been included in the programs. Management activities aimed at restoring and improving wildlife habitats, water quality, and wetlands are now covered by these programs (Haines 1995).

HYPOTHESIS AND DATA

Three groups are on the demand side for the cost-share programs: the forest industry, NIPF landowners, and state forestry agencies. The forest industry and NIPF landowners must possess some political power to make the politicians respond to their demand. The economic factors that promote the political power of these two groups are those that give them common economic interests and that reduce the costs of investing in lobbying, including the costs of organizing, formulating a common position, preventing free-riding, and mitigating opposition (Gardner 1987). The acreage of NIPF ownership, the number of NIPF landowners, their geographical dispersion, the importance of timber economy in a state, and the size and stability of the forest industry are factors that may influence the political power of the demanders for such programs. Apart from forest industry and NIPF landowners, state forestry agencies are often on the demand side and are usually responsible for administering cost-share programs.

The larger the forest industry in a state, the more economic influence it has and the more political pressure it can generate. We therefore hypothesize that the contribution of the forest industry to a state's gross domestic products is a positive factor influencing the chance of the state's having a forestry cost-share program. The total number of NIPF landowners and the relative size of NIPF land ownership in each state, two measures of the influence of NIPF landowners, should also be positive factors. However, the larger the number of NIPF landowners (the share of NIPF lands in the state land area), the more costly for them to organize and to control the free-riding problem. Therefore, the sign of this variable has to be determined empirically.

The state forestry agencies, the third group on the demand side, are hypothesized to support them because these cost-share programs bring a bigger budget, more personnel, and greater influence to the agencies. As the size of state forestry agencies is probably related to their political power, we further

hypothesize that the bigger the state forestry service, the more likely that the state will have a forestry cost-share program.

Lawmakers are on the supply side of these programs. Theories of public choice indicate that lawmakers' decisions to subsidize a certain group are based upon several factors. Because the subsidy comes from taxing the rest of the citizens, the cost of such programs is a factor. In fact, deadweight losses resulting from subsidy can be seen as the cost of redistribution (Stigler 1971; Peltzman 1976; Becker 1983; Gardner 1987). Therefore, the lower the cost, the more efficient the transfer. In the context of the timber market, the subsidy to NIPF landowners can be measured as producers' gains in economic rents at the expense of taxpayers' incomes and consumer surplus, and the deadweight loss is affected by the timber supply and demand elasticity. The greater the elasticity of supply and the less the elasticity of demand, the less costly the transfer (Gardner 1987). Unfortunately, state-specific estimates for timber supply and demand elasticity are rare. Although such estimates for a few specific states do exist (e.g. Daniels and Hyde 1986), there are simply not enough estimates in the literature to build a data set for all of the states. Our effort to use regional estimates of stumpage supply and demand elasticity as a substitute was not successful since the variable was not significant. This ultimately resulted in elimination of the variable from our empirical model.

Apart from the efficiency consideration, the health of a state's economy is relevant. If the state has a large amount of revenue and is debt free and its residents are relatively wealthy, there may be less opposition to cost-share programs in general. We therefore hypothesize that the health of state economy, measured as the per-capita state debt and per-capita state revenue, influences the likelihood of the state's having a forestry cost-share program. Everything else being equal, the smaller the state debt and the larger the per capita state revenue, the more likely the state will have a cost-share program.

Now we have identified all important parties on both sides of the cost-share programs: the legislature which considers the status of state economy on the supply side and the forest industry, the NIPF landowners, and the state forestry agencies on the demand side. The empirical model for this study

includes variables that capture the influence of all these parties. Specifically, the empirical model estimated is

$$CSP = f(GSP, TIMBER, ACRE, EXP, DEBT, REVENUE, SOUTH)$$

Table 2 provides definitions and descriptive statistics for the variables in the model. The variable CSP is a binary variable. It took the value of one if a state cost-share program is present and zero otherwise. Although a total of nineteen states had cost-share programs, the nature of the program in Texas was in contrast with all other states as its cost-share funding is raised entirely from private sources. This presented a conflict with several hypotheses in the model. Therefore, the cost-share program in Texas was not considered, and the state was entered as one with no cost-share program. The variable GSP is the percent of contribution of forest industry in the 1996 gross state products. It represents the importance of forestry industry in the state economy. Since a higher contribution from the forestry industry is likely to translate into more willingness on the state government's part to support forest landowners, we predict a positive sign for this variable. Even if the forest industry is important to a state economy, the forest industry could not support a cost-share program if NIPF lands account for a small proportion of state timber supply. A variable, TIMBER, which measures the percent of timber supply from NIPF lands in 1996, is included in the model to account for the impact of timber supply from NIPF lands. This variable signifies the importance of NIPF lands in the state forest sector and is expected to have a positive sign. The variable ACRE is the percent of total state land area under NIPF control. It measures the significance and visibility of NIPF lands in a state. Since NIPF lands provide timber and many non-timber benefits, the larger the percent of NIPF acreage, the more influence the NIPF landowners have. This would imply a positive sign for ACRE. However, as mentioned earlier, transaction costs involved in organizing NIPF landowners may cause the variable to have a negative sign.

We have tried to use another variable—the total number of NIPF landowners in a state, NUMBER— to account for the influence of NIPF landowners. However, this variable is highly correlated with ACRE. Therefore, we had to estimate the model with each of these two variables separately.

The variable EXP is the total expenditures in 1996 by state forestry agencies, in millions of dollars. State forest agencies support cost-share programs because they bring the agencies a bigger budget. Therefore, a positive sign for EXP is expected. However, additional budgets may be hard to get if the state agencies have already had a relatively large budget. Therefore, the sign of this variable will be determined empirically.

The variables DEBT and REVENUE are measures of the state economy. The amount of per capita debt, represented by the variable DEBT, is a burden on the finance of a state. The larger the per capita debt, the less likely the state will devote new financial resources to subsidize NIPF landowners or any other interest groups. Therefore, a negative sign for DEBT is expected. The variable representing the per capita state revenue, REVENUE, on the other hand, is likely to have a completely opposite effect. The more the per capita state revenue, the more abundant the financial resources are and the more likely the state will use tax revenue to subsidize NIPF landowners. Therefore, REVENUE is expected to have a positive sign. Because the southern states are leading the nation in timber production, the variable SOUTH is expected to have a positive sign.

All of the 50 U.S. states were included in the data set. Data for CSP were collected from Haines (1995). Data for GSP, DEBT, and REVENUE are from The U.S. Department of Commerce. Data for ACRE and TIMBER were collected from Power et al. (1992) and data for NUMBER were from by Birch (1996b, 1997a, 1997b). The 1996 State Forestry Statistics Report by the National Association of State Foresters was the data source for EXP.

RESULTS AND DISCUSSION

The variables DEBT and REVENUE were found to have a positive correlation coefficient of 0.61. A correlation of this magnitude is likely to affect the estimates. However, because both of these variables came out to be significant and there is no theoretical reason to drop any of them, we decided to keep them in the model.

The model is estimated using binomial logit model, and Table 3 presents the results.[1] Columns 2 and 3 of Table 3 are the results using the variable ACRE as the measure of NIPF influence, and Columns 4 and 5 are the results using the variable NUMBER as a measure of NIPF influence. The log-likelihood tests in both cases are significant at the 1 percent level. The variables GSP, TIMBER, DEBT, and REVENUE, and SOUTH have the expected signs. The variables ACRE, NUMBER, and EXP have negative signs, which are not totally unexpected.

The coefficient for GSP is positive and significant, although weakly (at the 15 percent level). This implies that the more important the forestry sector to the state's economy, the more likely the state will have a forestry cost-share program. As expected, the variable TIMBER is positive. The coefficient of ACRE is negative and not significant. The coefficient of the substitute variable—NUMBER—which represents the total number of landowners, is negative as well (Column 4 of Table 3). This means that,

[1] In logistical regression, the probabilities for each outcome are

The likelihood function for the model is

The impacts marginal effects for each independent variable can be calculated as

where, P_i and $(1-P_i)$ are the probabilities that the dependent variable takes the value "1" and "0" respectively and β represents the coefficients.

although large numbers give NIPF landowners more political power and influence, overcoming the free riding problem in lobbying is increasingly difficult and costly as the number of NIPF landowners increases.

As expected, the coefficient for the DEBT variable is negative and significant at the 10 percent level. The presence of a large state debt is likely to be a negative deterrent to all subsidy payments and to provide incentives for lawmakers to manage state finances carefully and minimize transfer payments. The coefficient for the variable REVENUE is positive and significant at the 5 percent level. A relatively high per capita state revenue means a strong state economy. It also implies less resistance for collecting additional tax revenues. Consequently, available funds for cost-share payments are also likely to be higher. Therefore, these states with high per capita revenue are more likely to have cost-share programs.

The coefficient for the expenditure variable for state forestry agencies is negative but not significant at any reasonable level. One possible explanation is that states with large budgets for their forestry agencies may be more reluctant to put additional money into a cost-share program. The variable representing the southern region is positive and highly significant at the 1 percent level, confirming that southern states are leading the nation in cost-share programs. Many communities in these southern states are rural and largely forestry dependent. Furthermore, compared to states in other regions, the southern states have a very small proportion of their land under public control, and NIPF lands are vital to the forest industry in the South. Not surprisingly, these states provide financial support for NIPF landowners.

Table 4 presents the predicted outcomes with those of actual ones. This is a measure of the performance of the model in predicting the different outcomes correctly. Our model predicts the presence or absence of cost-share program correctly for a total of 39 (27+12) states. The model performs quite well in predicting the absence of cost-share programs in a state (i.e. dependent variable equal to zero), correctly predicting 84 percent of the cases. In case of the presence of cost-share programs (i.e. dependent variable equal to one), the model does not perform as well but still predicts correctly in 67 percent of the

cases. For the model estimated by including the variable NUMBER, the predicted outcomes are identical and are subject to similar interpretation.

CONCLUSIONS

This paper has identified the determinants of state cost-share programs. The importance of the forestry sector in a state's economy, cost of lobbying, and the characteristics of state finance are found to be significant factors. As more landowner assistance programs such as cost-share, tax deferment, technical assistance, and education continue to be promoted and debated at state and federal levels, the results of this study may be used in predicting where and if such programs might develop. Furthermore, this study shows that forest policy is largely driven by interest groups. Therefore, examining interest groups is an effective way to study forest policy. Third, the results from this study suggest that contrary to common wisdom, NIPF landowners may not be the primary stakeholders in cost share programs. The negative and insignificant coefficients for the variables ACRE and TIMBER, and the positive and significant coefficient for GSP imply that cost-share programs may be more in the interest of forest industry. No matter what the explicit goals or justifications for these programs are, interest-group pressures makes the cost-share programs possible, and a healthy state economy made them a reality.

The extent to which cost-share programs actually help in NIPF land management and promote public goals is debatable. Understanding the causes of state cost-share programs is the first step towards promoting or eliminating them.

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Table 1. Summary of state cost-share programs.

Program	Cost-share rate (percent)	Max. payment ($/year)	Ownership limit (acres)	Project area limit (acres)	Min. project continuation (years)
Alabama Agricultural and Conservation Development Program	60	3,500	min. 20	min. 1	10; 5 for timber stand improvement
Calif. Forest Improvement Program	75-90		20-5,000	min. 1-5 depends on practice	10
Florida Plant a Tree Program	50	10,000	10-1,000		2
Hawaii Forest Stewardship Program	50 max.		min. 5		10
Illinois Forestry Development Program	80		min. 5		10
Iowa Resource Enhancement and Protection Program	75	365/acre		min. 3-5 depends on practice	20
Maryland Woodland Incentives Program	50	5,000 15,000/3 years	10-500		15
Minnesota Forestry Improvement Program	50-65	25/acre		min. 5-10 depends on practice	10
Mississippi Forest Resources Development Program	50-75	8,000			10
Missouri Soil and Water Conservation Program	up to 75				10
Missouri Streams for the Future Program	up to 75				
New Jersey Farmland Preservation Program	50	50,000/8 years			8
North Carolina Forest Development Program	40-60			1-100	
Oregon Forest Resource Trust	up to 100	100,000/2 years	10-5,000		Until harvest
South Carolina Forest Renewal Act	50		max. 100	max. 100	10
Tennessee Agricultural Non-Point Source Pollution Program	75 for BMPs	5,000			

Texas Reforestation Foundation Program	50		min. 10	10
Virginia Reforestation Timberlands Act	40	75/acre	min. 1-5 depends on practice max. 500	10

Table 2. Definition and descriptive statistics for dependent and independent variables.

Variable	Description	Mean	St. dev.
CSP	Cost-share program; binary variable, "1" if such a program is present, "0" otherwise.	0.36	
GSP	Percent contribution of forest industry in the 1996 gross state products. This includes lumber, paper, and wood furniture sectors	2.01	1.80
ACRE	Percent of total state area under NIPF control	24.14	19.91
NUMBER	Total number of NIPF owners in thousands	186.39	171.23
TIMBER	Percent of timber supply from NIPF lands	64.83	24.54
EXP	Total expenditures in 1996 by state forestry agencies, in millions of dollars	19.11	28.26
DEBT	Per capita state debt at the end of 1996 in thousands of dollars	1.97	1.47
REVENUE	Per capita state revenue in thousands of dollars in 1996	18.19	2.76
SOUTH	Whether or not the state is in the South; binary variable: "1" if the state is in the South, "0" otherwise. The southern states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.	0.30	

Table 3. Logit estimates of the model identifying the determinants of state cost-share provisions

Variables	Coefficients (t-ratio)	Marginal effect	Coefficients (t-ratio)	Marginal effect
Constant	-15.0976**		-12.3020***	
	(-2.4950)		(-2.4840)	
GSP	0.4427*	0.0899	0.3701*	0.0762
	(1.5390)		(1.4220)	
TIMBER	0.0104	0.0021	0.0043	0.0009
	(0.5530)		(0.2490)	
ACRE	-0.0341	-0.0069		
	(-1.004)			
NUMBER			-0.0024	-0.0005
			(-0.7880)	
EXP	-0.0032	-0.0006	-0.0023	-0.0005
	(-0.2320)		(-0.1690)	
DEBT	-0.7619**	-0.1547	-1.0171**	-0.2093
	(-1.7180)		(-2.1390)	
REVENUE	0.6654***	0.1351	0.6622***	0.1363
	(2.4080)		(2.3820)	
SOUTH	2.9434***	0.5978	2.7554***	0.5670
	(2.3980)		(2.3470)	
No. of observation	50			
Log-likelihood	-23.3936		-23.5963	
Restricted log-likelihood	-32.6709		-32.6709	
Chi-square value	18.5546***		18.1493***	

* significant at the 15 percent level

** significant at the 10 percent level

*** significant at the 1 percent level

Table 4. Actual and predicted outcomes for the model with ACRE

	Actual	Predicted		% correct
		0	1	
0	32	27	5	84
1	18	6	12	67
Total	50	33	17	