THE INFLUENCE OF POLITICAL FACTORS

ON THE ALLOCATION OF DISASTER RELIEF PAYMENTS

by

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ABSTRACT

There are different models predicting a connection between political variables and the allocation of federal spending. A major focus of this study is the effect of political factors on the distribution of disaster aid payments. Using U.S. state-level data on disaster assistance programs, this research analyzed whether a difference in federal funds flowing to states can be explained by political incentives. Empirical results showed that political factors do matter in explaining that difference.

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CHAPTER 1

INTRODUCTION

The United States' federal government policies have long been a subject of theoretical and empirical research. Some studies developed and tested theoretical models of distribution and redistribution politics (Wright 1974; Plotnick 1986; Fleck 2001, 2008), others performed purely empirical analysis (Gryski 1991; Atlas et al. 1995; Levitt and Snyder 1995). In general, all of this literature has interesting economic implications.

Even though there are many studies related to federal appropriation issues, they have not addressed the question how payments under disaster aid programs can differ across states due to political pressure from those who make decisions. Additionally, there are still some empirical puzzles unresolved and disputed. These puzzles include whether a swing state is favored more than a loyal state in general elections, or whether small population states such as Wyoming and Alaska do better in terms of federal assistance than more populated states due to greater representation of their citizens in the United States Senate.

The principal question this thesis tries to answer is "why do payments on federal disaster relief programs differ from state to state?" Of course, states are differently affected by disasters; they are eligible for different programs, and they differ in population and other characteristics. This study focuses on additional explanations for this difference – the political aspect of disaster aid programs: payments differ because states and counties are represented by different legislators, some of whom are in the

Senate majority, some are in Committees allocating funds, some are chiefs of those committees. Senators differ in status in access to funds, decision making, and most of all political power. Thus, the main objectives of this thesis are to develop a theoretical model explaining the relationship between political variables and disaster aid payments, and to evaluate those relationships across the United States. The method used in this research is a regression analysis of panel data on state political and economic characteristics and disaster payments to farmers in those states for the period from 1996 through 2005.

This research contributes to previous empirical studies on federal distribution politics by focusing on disaster relief payments. It summarizes the history of disaster aid development in the United States, as well as adds new explanations to empirical literature on farm disaster allocations. Another contribution of this thesis is classifying various models of federal distributive politics and testing them.

This thesis is organized as follows. Chapter 2 discusses relevant theoretical and empirical literature, including the theory of public choice and the structure of American federalism. In Chapter 3 a brief history of disaster aid in the United States for the last 20 years is reviewed. In Chapter 4 a theoretical model is developed based on previous research considered in Chapter 2, and comparative static predictions are derived. Chapter 4 also includes a set of hypotheses developed from model predictions and previous empirical studies. Chapter 5 describes the variables and data used for the empirical analysis. Econometric results are given in Chapter 6 and conclusions are presented in Chapter 7.

CHAPTER 2

LITERATURE REVIEW

Theoretical Literature

To develop the idea presented in this paper we first consider the public choice literature. The key assumption from this literature is that politicians, government institutions, and voters behave as rational "selfish" agents. This assumption allows us to use different economic tools such as utility or profit maximization, demand and supply analysis for understanding their behavior.

Public Choice Concepts

The modern literature in public choice has its roots in studies of British scientist Duncan Black, who was called the father of public choice theory by Gordon Tullok (1987). Anthony Down and Kenneth Arrow, among others, contributed to the development of the science. But the foundation of public choice *per se* is associated with Gordon Tullock and Nobel Prize winner James M. Buchanan. In their joint textbook "The Calculus of Consent: Logical Foundations of Constitutional Democracy" (1962) they used the economic concept of Pareto efficiency for analyzing the political organization of society. Tullock was the first to discuss rent seeking issues. George Stigler, another Nobel laureate, and Sam Peltzman also applied public choice ideas in analyzing government regulation.

Presently the theory of public choice covers lobbying, rent seeking, government structure, voting processes, politicians' and voters' behavior, bureaucracy, democracy, dictatorship and others, and the theory is divided across several sub-areas of study.

The government and politicians in public choice are considered to be rational "selfish" agents maximizing their personal benefits. Some theorists, such as those of the Austrian economics school, disagree with this approach, suggesting that politicians are benevolent but have access to limited information.

The theory of public choice has been applied to a wide array of political decisions, and is used in this paper to develop and test some predictions for agricultural disaster payments.

Parliamentarians seeking reelection have strong incentives to better represent their voters, and pass appropriation acts in favor of their constituency. In his review of Fenno's (1966) book, Davidson (1979) stated that there is a modern opinion that reelection is the all-consuming goal of politicians. Fenno argues that sometimes politicians have other altruistic goals in addition to the reelection hypothesis. Those might include Washington changing, policy designing, and etc.

Determining congressmen's' incentives in roll-call voting, Mayhew (1966) distinguished the following two reasons behind votes. First, ideology and attitude towards some issues that might be constrained by responsibilities to constituents. Second, a congressman's social and partisan affiliation influences votes.

American Federalism

As we apply our analysis for the United States, it would be interesting to consider the representative democracy system as historically established.

Federalism is a system of representative government in which sovereignty is constitutionally shared between the central and constituent local (state or province) governments. Some examples of the countries with a federal system are the United States, Canada, Brazil, Australia, Germany, Belgium, Austria, Switzerland.

As a public choice concept, federalism is an alternative to direct democracy representing individual preferences. According to Mueller (2003), a federalist state has two prominent properties: 1) separate and overlapping levels of government and 2) different responsibilities attached to the different levels of government. Mueller describes a federalist state as optimally constituted by a few levels of government with multiple tasks assigned to each, rather than thousands of levels of government with one function each. The key to this distinction is the existence of transaction costs.

In the United States a single district representation is usually used, but sometimes voters select representatives from their geographic area using an at-large representation system. The single district system is applied to both local governments and the United States House of Representatives. The states using at-large representation for filling the House are those having small population such as Alaska, Delaware, Montana, North Dakota, South Dakota, Vermont, and Wyoming. Additionally, in the United States, each state's two senators are elected on an at-large basis.

Previous Empirical Research

Krueger (1974), Posner (1975), Laband and Sophocleus (1988), Lopez and Pagoulatos (1994) estimated the welfare losses from rent seeking. They found that welfare loss in the United States, India, Turkey and Kenya could be from 3% to 38% of GNP (GDP) or domestic consumption depending on country and sector (Mueller 2003).

Many studies have been performed on addressing the effects of macroeconomic conditions on votes for parties and presidents, and on their popularity. They include Kramer (1971), Stigler (1973), Peltzman (1990), Smyth, Dua, and Taylor (1994), Alesina and Rosenthal (1995), Hibbs (2000), and many others. Most estimated coefficients on the macroeconomic variables included in their models were statistically significant, indicating positive relationships between macroeconomic performance and politicians' popularity and wins.

Models explaining the size and growth of government were also empirically tested across countries and within one country. Meltzer and Richard (1983) suggested that all government activity consists of redistridution that occurs by means of grants and taxes. They tested their hypothesis using U.S time-series data from 1938 through 1976, and found empirical support for their model of redistribution.

Glantz, Abramovitz and Burkart (1976), Jacobson (1978), Kau, Keenan, and Rubin (1982), Abramowitz (1988), Coates (1998), and others suggested that votes for a candidate can be a function of campaign contributions. However, the interesting result of their studies is the statistical significance of the estimated coefficient of the challengers' campaign expenditures, while the coefficient on incumbents' expenditures was

insignificant or had the wrong sign. These results suggest that in-office candidates must use different instruments for winning votes among their constituency. One of those tools might be more federal support to their districts.

The question of "how U.S. federal spending is influenced by political incentives" has long been a subject of empirical studies. As was stated by Hall (1993), "there is little doubt that the pork barrel is an overworked metaphor for understanding legislative politics".

Kalt and Zupan (1984) suggested that constituents motivated by their interests can "capture" policymakers and therefore influence federal policy. Levitt and Snyder (1995) performed a regression analysis of data on federal assistance programs for 1984-1990 and presidential elections for 1976-1984. They found that programs with a greater variation in assistance demonstrated the highest bias towards the party in power at the considered time (Democratic).

It is understandable that less inhabited states (e.g., Wyoming, Vermont, North Dakota, Alaska, South Dakota, Montana) have more electoral weight as compared to more populated states (e.g., California, Texas, New York, Florida), because each state is represented in the Senate by the same number of senators (2). Atlas et al. (1995) empirically tested and confirmed their model predicting that a senator's effort allocated to local benefit-seeking rather than national policymaking has a negative relationship with the senator's state population. The allocation of personal staff between local and Washington offices was a proxy for effort allocation in their empirical analysis.

Econometric estimations by Levitt and Snyder (1995) did not support the hypothesis of the effect of state population on federal spending however.

Gryski (1991) estimated econometrically the relationship between federal funding and committee membership, and found a "political connection" for some committees. Fleck (2008) analyzing the distribution politics of the New Deal, and considering how economic and political factors cause policy changes, found no effects of congressional variables on New Deal expenditures such as (i) the length of tenure of the Senate and House delegation, (ii) their membership on the appropriations committees, and (iii) leadership positions on New Deal expenditures.

It is argued that politically uncertain states which are not always in the Democratic or Republican camp – the so-called "swing" states – can be easily lost by the party in power at the next election if not supported. Fleck (2001) put forward a theoretical model showing how loyal voters are favored over swing voters (and vice versa) by benefits distributed by a reelection-seeking incumbent. Using data on job locations and funds allocated by New Deal assistance programs, Fleck found that loyal voters were favored over swing voters. The swing vs. loyal voter prediction, along with other hypotheses, will be tested in the empirical section of this thesis, using swing states versus loyal states instead of swing and loyal voters.

In summary, there are different models of the political influence on federal and legislative policymaking. Some of these consider "capture" politics and ideological incentives (Kalt and Zupan 1984), and the theory of information (Krehbiel 1991) or transaction costs and institutions (North 1990), others support the party "mandate" theory

(Budge and Hofferbert 1990) and suggest a substantial, but limited role of political parties (Cox and McCubbins 1993) or a powerful role of individual representatives and their congressional committee assignments (Anderson and Tollison 1991; Gryski 1991). And of course, some of these models are mixed and do not contradict each other.

Considering the role of political parties in the allocation of federal expenditures versus the role of individual representatives, following Levitt and Snyder (1995), we can conditionally divide the models of distributive politics into three groups:

1) models with a weak role of political parties and a strong role of individual representatives and their congressional assignments;

2) models with a strong role of political parties in the distribution of federal spending;

3) models with a significant role of political parties whose abilities in allocation politics are limited.

This research will investigate how disaster aid programs differ from state to state due to political factors, and extend this literature to the area of federal disaster aid policy.

CHAPTER 3

BRIEF HISTORY OF U.S. DISASTER RELIEF

Disaster aid in the U.S.A. in the form of government loans and payments began in the nineteenth century. According to Goodwin and Smith (1995), disaster relief programs can be thought of as free catastrophic insurance paying an indemnity during periods of widespread yield losses. The *Public Law 100-707 of the United States of America*, known as the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (*Stafford Act*) gives the following description of disaster:

> "'major disaster' can be defined as any natural catastrophe (including any hurricane, tornado, storm, high water, winddriven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."

As any other U.S. governmental policy, each disaster program comes into existence after a voting process, significant part of congressional and presidential discussions. For example, in an article on congressional votes (*The Washington Post*, September 9, 2005) P. Baker and A. Goldstein described that in September 2005 after Hurricane Katrina the U.S. Congress approved $51.8 billion for relief. The House of Representatives' votes for this legislature were 410 against 11, and the Senate's votes were 97 against 0.

In 1949, the Farmers Home Administration emergency disaster loan program was approved, according to which farmers having crop losses after natural disasters could

apply for *ad hoc* low-interest loans. Later, in 1973 and 1975, Congress established the Agricultural and Consumer Protection Act and the Rice Production Act, respectively, for cotton, feed grains, and wheat. The program was renewed through the *Food and Agriculture Act* of 1977, the *Farm Disaster Assistance Act* of 1987, the *Disaster Assistance Acts* of 1988 and 1989.

The problem the federal government encountered with disaster relief programs was their high costs. In 1975 disaster payments of over $555 million were 3.58% of the Department of Agriculture's total expenditures and 0.17% of total federal government outlays. In 1989, disaster payments exceeded $4 billion which was 8.29% of the Department of Agriculture's and 0.35% of federal government spending (Goodwin and Smith 1995). Another problem was moral hazard: since disaster protection was free of charge, it may have encouraged producing in regions susceptible to natural disasters.

In 1993, a very damaging flood event, the Great Midwest Flood, occurred as a result of intense rains over Iowa, Missouri, Minnesota, Wisconsin, Illinois, Kansas, Nebraska, and North and South Dakota. The flood's water overtopped, and damaged more than 1,000 levees, flooding myriads of acres of land, buildings, and homes.[1] This disaster led to the establishment of the *Emergency Supplemental Appropriations for Relief from the Major, Widespread Flooding in the Midwest Act* that provided $2.7 billion of assistance to USDA for losses associated with the flood and other disasters. This Act passed Congress and was signed by President Clinton in 1993. Figure 1 and Figure 2 show agricultural disaster payments in nine states after the Midwestern Flood.

[1] Annual Report of the Council on Environmental Quality (1993).

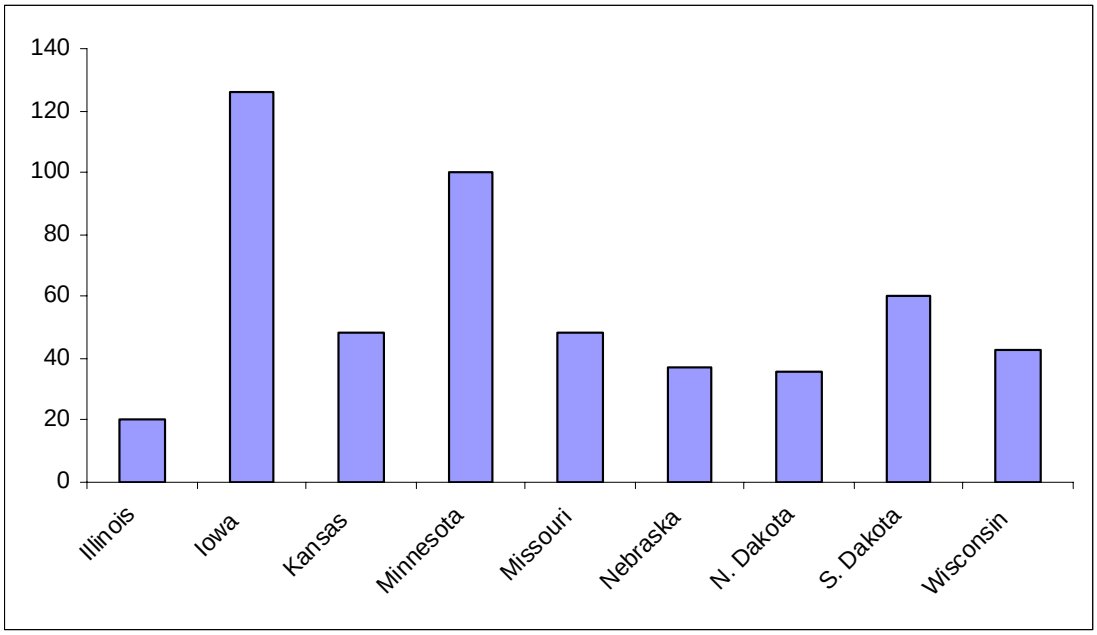

Figure 1. Disaster Payments after the 1993 Midwestern Flood.
(Millions of Dollars)

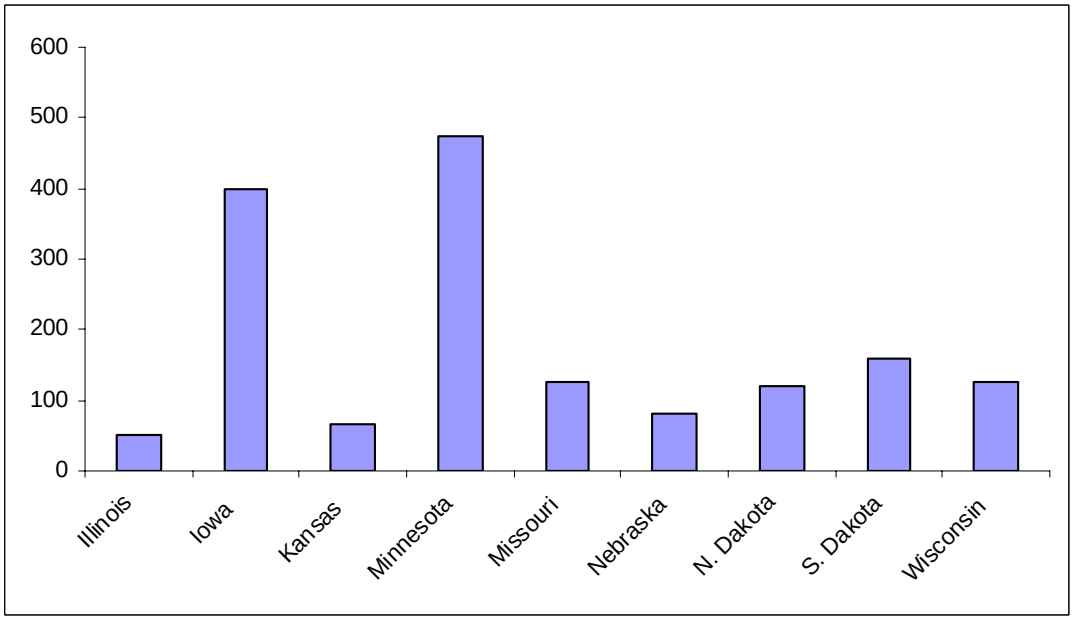

Figure 2. Numbers of Producers Receiving Disaster Payments.
(Thousands)

Note: Adapted from Goodwin and Smith (1995).

The allocation of disaster aid payments to farmers is administered by the United States Department of Agriculture (USDA). Around 75% of total USDA outlays are mandatory, meaning that the description of and eligibility criteria for them are authorized by federal laws. As a result, most annual appropriations are outside the control of the USDA. Examples of USDA mandatory programs are the food stamp program, the farm commodity price and income support programs, the federal crop insurance program, the conservation reserve program, and child nutrition programs.

Traditionally, total USDA outlays have been quite variable and unpredictable. The 1996 farm bill tried to limit direct payments to crop producers, and to remove them from market conditions. Additional or supplemental funding is made in case of an emergency after disasters or when mandatory payments are not enough to cover requested payments. For instance, the *Omnibus Appropriations Act for FY1999 (Public Law 105-277)*, the *Agriculture Appropriations Act for FY2000 (Public Law 106-78)* and other supplemental acts enacted emergency appropriations for about 16 billion dollars to farmers after natural disasters and low market prices (Chite 2000).

Alternatives for current disaster relief programs in the United States include proposals on revenue insurance and assurance known as the Iowa plan, independent insurance for prices and yields, cost-of-production insurance, target price put options coupled with replacement value and yield insurance, and rainfall insurance contracts. Many of these alternatives have been implemented in other countries, like Canada, Japan, Mexico, Brazil, and other (Goodwin and Smith 1995).

CHAPTER 4

THEORETICAL MODEL AND HYPOTHESES

This chapter develops a theoretical model of politicians' rational behavior based on previous empirical studies discussed in Chapter 2. A set of hypotheses are also developed for empirical test of model predictions.

Political economy models are theoretical rationale of disaster relief programs within the framework of this research. Disaster program provision depends on political pressure and influence. Theoretically, disaster aid, as any other form of federal assistance, can be expressed in the transfer of income from taxpayers to beneficiaries. In political context, congressmen from states and counties that suffered disasters have political incentives to provide support for their home districts in exchange for support from their constituencies.

Public choice analysis would hold that the objective of a congressman who can vote for any disaster relief law or has some access to the allocation of resources is to maximize his expected votes or some sort of political support from constituents on the whole. In other words a politician is trying to "buy" support, and being rational he is trying to find an optimal level of political support maximizing his objective function under his constraints. In doing so he uses his access to the federal budget, and available political power.

As discussed in Chapter 3, there are different types of political influence on distribution politics. Some models predict the importance of parties; other models support

the role of individual politicians, and still others focus on interest groups. Whatever the cause and way of political influence on distributive policy, our principal idea is that incumbents and their institutions (e.g., Congress) are determining factors in the allocation of federal resources, and we are interested in modeling and estimating those factors.

By assumption, the "inter-support" of politicians and their constituency develops in the following way: each congressman or party in Congress is introducing and lobbying for appropriation bills of interest to favor their constituents, and after a bill passed and appropriations fulfilled the constituents favored respond to their representatives' performance by adjusting their political support. Incumbents are assumed to be very well informed about political, socio-economic, demographic characteristics of their districts based on census, survey and other available data.

For simplicity, we ignore logrolling, minority and inter-party coalitions and other similar form of impact on legislative appropriation process.

Model

If we consider the Senate on the whole as an economic agent trying to maximize political support from an agricultural constituency, then we can model its objective function as follows:

$$\underset{p_i}{Max}\, F(p_i, \underline{\alpha}_i) = \sum_{i=1}^{n} d_i(\underline{x}_i) f(p_i, \underline{\alpha}_i) \tag{1}$$

$$\text{subject to } \sum_{i=1}^{n} p_i = B$$

where F = the total function of political support;

$d_i(\underline{x}_i)$ = the function that reflects heterogeneity across states with respect to their representation in the Senate (whether a senator is with the majority party, etc.) or affiliation with a powerful interest group;

$f(p_i,\underline{\alpha}_i)$ = some function of political support from constituents in state i indirectly depending on agricultural disaster payments provided to a state and shocks that will be explained below;

$\underline{x}_i$ = the vector of political variables;

p_i = the payments to each state i;

$\underline{\alpha}_i$ = the vector of parameters (shocks) in each state;

B = the total budget to be allocated to states.[2]

Now suppose that the political support function is a linear function of economic rent to voters (r) which in turn depends on payments (p_i) and shocks (α_i):

$$f(p_i,\alpha_i) = m_i\, r(p_i,\alpha_i) + \varepsilon_i \qquad (2)$$

where $m_i > 0$, m_i – the terms exogenously determined, and ε_i – the unknown variable having normal distribution with zero mean.[3]

Applying marginal benefit analysis, we can express the model graphically (Figure 3). For simplicity, assume that there is no cost for the Senate associated with the allocation of payments to voters, and the marginal benefit of the Senate is downward sloping. To maximize its objective function subject to the constraint (the total amount of

[2] We are not interested in maximizing the total budget of payments (B), but assuming instead that it is exogenously determined, and our model is trying to explain how this total budget is allocated between states. Of course, it is possible that the budget might be endogenous, and depend on the allocation of disaster payments. Our assumption is motivated by the nature of our state-level data that will be discussed in Chapter 5. For simplicity we ignore any possibility of endogenous budget.

[3] This equation is similar to Fleck's (2008) voting function v_i, but does not include an exogenous learning variable.

payments, B), the rational Senate should allocate payments such that the marginal effect of payments on the total function of political support is equal across states: $MB_1^C = MB_2^C = \ldots = MB_n^C$. The marginal benefit in state i in this case equals the shadow value of total payments, λ.

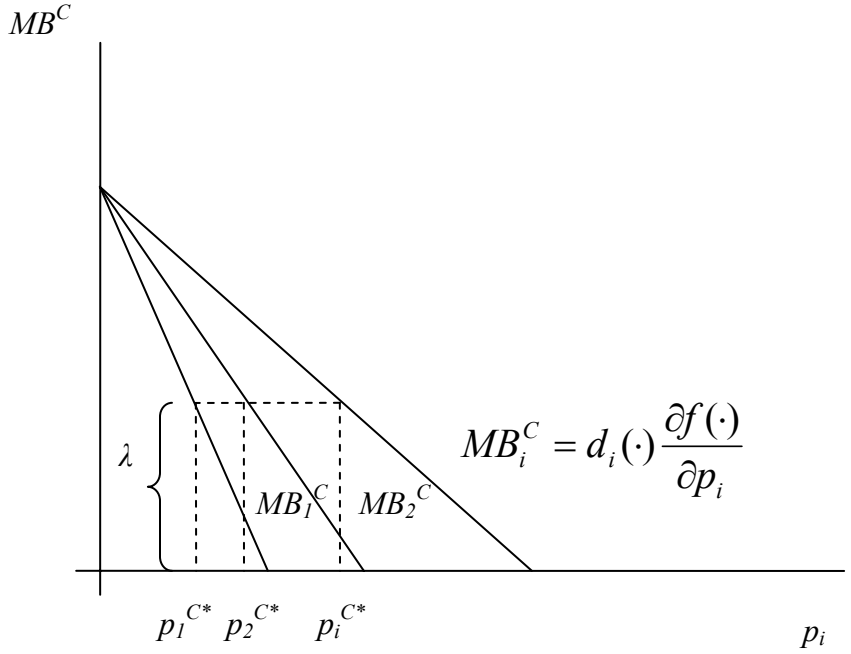

Figure 3. MB Curve of Congress.

where MB_1^C = marginal benefit curve for state 1
MB_2^C = marginal benefit curve for state 2
MB_i^C = marginal benefit curve for any state i

Voters in each district have their total marginal benefit and total marginal cost curves, shown in Figure 4. Costs are associated with some spending to be borne in order to get relief payments, for example gasoline expenses for transportation from home to administration and back which is different for each district. The model's budget

constraint ensures that the optimal-for-Senate payments (p_i^{C*}) are less than the payments optimal from voters' point of view (p_i^{V*}).

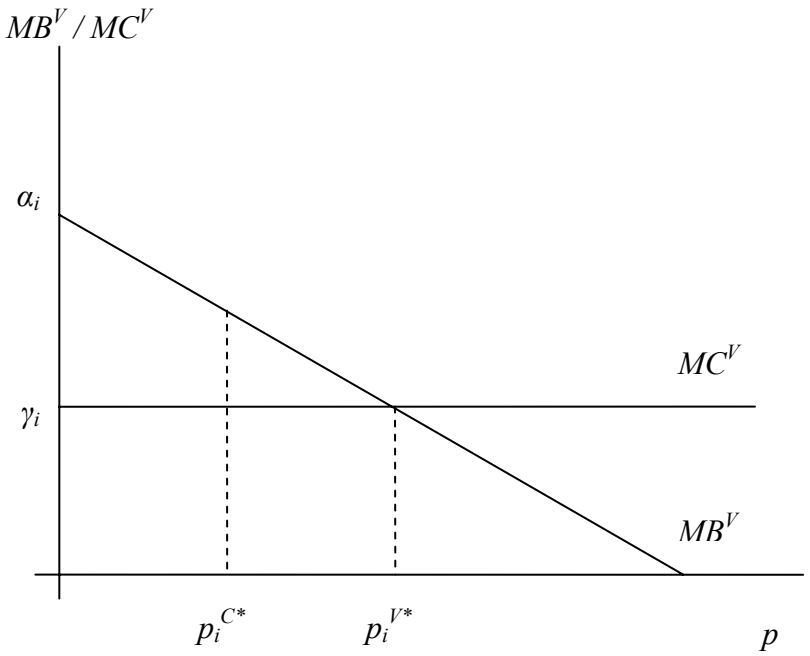

Figure 4. MB and MC Curves of Voters.[4]

where $MB^V = \alpha_i - \beta_i p_i$ is downward sloping and
$MC^V = \gamma_i$ is constant, and less than α_i

Some shock such as bad weather conditions, flood, hurricane and the like can raise the electoral weight of voters in a district, especially among the population suffered from such a disaster. Within the framework of the model this would shift upward the intersect point (α_i) in Figure 4, increasing voters' marginal benefit curve. A shock might alternately rotate the marginal benefit curve outwards, decreasing the slope of the curve

[4] This graphical representation is based on Fleck's 2008 model.

(β_i). In other words, voters expect more support from the government after a disaster. These changes are illustrated by Figure 5.

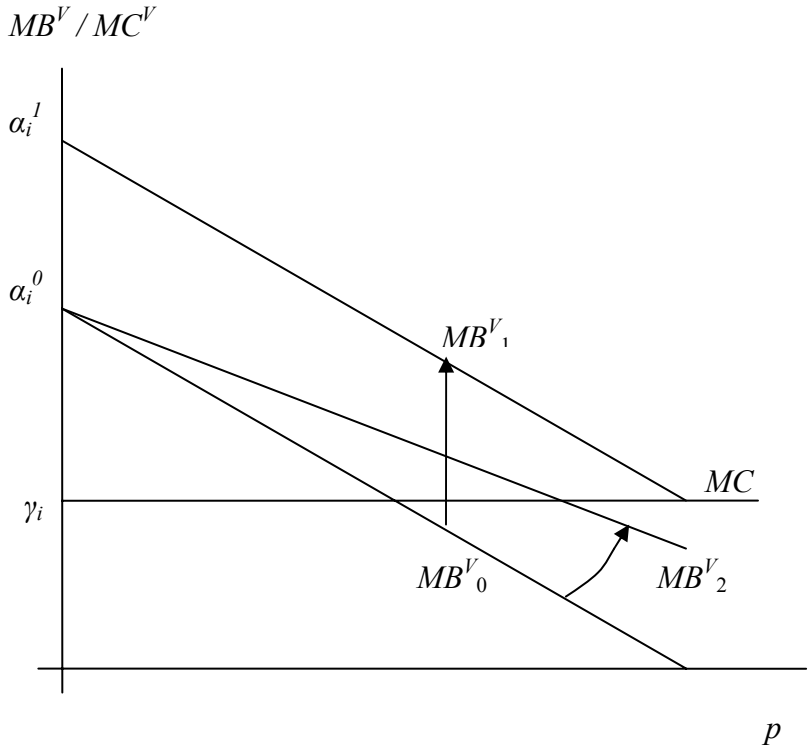

Figure 5. Shift and Rotation in Voters' MB Curve.

Now we can express the function $r(p_i,\alpha_i)$ in terms of the economic rent (surplus) of voters as "consumers" of payments. For some p_i on the graph there is a corresponding rent voters get[5]:

$$r(p_i,\alpha_i) = \frac{1}{2\beta_i}(\alpha_i - \gamma_i)^2 - \frac{1}{2c}\left(\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i\right)^2 \qquad (3)$$

[5] The details of function derivation are available in Appendix A.

As stated in previous empirical research (Fleck 2008), this supply and demand representation for defining the net benefits to voters measured by total surplus (the area between the *MB* and *MC* curves) can simply and easily characterize the process of policymaking. This rent definition in equation (3) is helpful for further derivation of comparative static results in equations (11), (12), (15), (16) through (20).

Defining the Senate's optimization problem using the Lagrangian we get:

$$\Lambda = F(p_i, \alpha_i) + \lambda\left[B - \sum_{i=1}^{n} p_i\right] \tag{4}$$

FOC's:

$$\left.\begin{aligned} \Lambda_{p_1} &= F_{p_1} - \lambda = 0 \Rightarrow F_{p_1} = \lambda \\ \Lambda_{p_2} &= F_{p_2} - \lambda = 0 \Rightarrow F_{p_2} = \lambda \\ \Lambda_{p_n} &= F_{p_n} - \lambda = 0 \Rightarrow F_{p_n} = \lambda \end{aligned}\right\} \tag{5}$$

$$\Lambda_{\lambda} = B - \sum p_i = 0 \tag{6}$$

From the first three FOC's we have $F_{p_1} = F_{p_2} = \ldots = F_{p_n}$ meaning the equality of the Senate's marginal benefits across states, as illustrated in Figure 3.

Applying the Implicit Function Theorem (under the conditions of linearity and a negative semi-definite Hessian matrix) we can rewrite each p_i and λ as functions of exogenous variables: $p_i = p_i^*(\underline{\varphi}_i, B)$, $\lambda = \lambda^*(\underline{\varphi}_i, B)$, with $\underline{\varphi}_i$ being a vector parameters of our interest, namely α_i, β_i and x_i.

Following Silberberg' and Suen's (2000) approach, introduce the following Indirect Objective Function:

$$F^*(\underline{\varphi}_i, B) \equiv F(p_i^*(\underline{\varphi}_i, B), \underline{\varphi}_i) + \lambda^*(\underline{\varphi}_i, B)\,[B - \textstyle\sum p_i^*(\underline{\varphi}_i, B)] \tag{7}$$

Differentiating this function, $F^*(\underline{\varphi}_i, B)$ with respect to parameter φ_{ij} to state i yields:

$$\frac{\partial F^*}{\partial \varphi_{ij}} \equiv \frac{\partial F}{\partial \varphi_{ij}} + \sum_{i=1}^{n} \frac{\partial F}{\partial p_i} \frac{\partial p_i^*}{\partial \varphi_{ij}} + \frac{\partial \lambda^*}{\partial \varphi_{ij}} \left(B - \sum_{i=1}^{n} p_i \right) - \sum_{i=1}^{n} \lambda^* \frac{\partial p_i^*}{\partial \varphi_{ij}} \tag{8}$$

As $B - \sum p_i^* = 0$ and $\frac{\partial F}{\partial p_i} - \lambda^* = 0$ for all i (by FOC), we obtain:

$$\frac{\partial F^*(\varphi_i, B)}{\partial \varphi_{ij}} = \frac{\partial F(p_i', \varphi_i')}{\partial \varphi_{ij}} \text{ at } \underline{p}', \underline{\varphi}_i', B' \tag{9}$$

where $p_i' = p_i^*(\underline{\varphi}_i', B')$

By the Conjugate Pairs Theorem result,

$$\sum F_{\varphi_{ij} p_i} \frac{\partial p_i^*}{\partial \varphi_{ij}} > 0 \tag{10}$$

From our objective function, using equations (1), (2) and (3), we can get:

$$F_{\alpha_i} = d_i \left[\frac{m_i}{\beta_i} (\alpha_i - \gamma_i) - \frac{m_i}{c\beta_i^2} (\alpha_i - \gamma_i)^2 + \frac{m_i}{c\beta_i} (\alpha_i - \gamma_i) p_i \right] \tag{11}$$

$$F_{\alpha_i p_i} = \frac{d_i m_i}{c\beta_i} (\alpha_i - \gamma_i) \tag{12}$$

$$\text{and } F_{\alpha_i p_k} = 0 \ \forall \ k \neq i \tag{13}$$

Equation 13 means that there is no effect of payments in district k on the political function in district i ($i \neq k$).

The last assumption is that $d_i(\underline{x}_i)$ is a linear function of x_i:

$$d_i = g\, x_i \tag{14}$$

such that $g > 0$, and $x_i \geq 1$. The interpretation is pretty straightforward: for example, the more powerful a senator, the greater is this state's variable x_i in the Senate's support [equation (1)]; the lower the degree of powerfulness, the more x_i tends to 1. If say $x_t = 1$, political support from state t depends only on payments to state t (p_t) and shock parameter in state t (α_t).

Therefore, $F_{\alpha_i p_i} > 0$ and respectively $\frac{\partial p_i^*}{\partial \alpha_i}$ is positive. Intuitively, it means that if there is some shock in a state i, say because of disaster that decreases crop yields and consequently can increase losses and reduce incomes, this state would *ceteris paribus* get higher disaster relief payments, as only in that case rational politicians can maximize their political "popularity" among their constituents. This is going to be our priority hypothesis to be tested in an empirical analysis.

The comparative static result with respect to β_i and its interpretation are absolutely the same as those with respect to α_i except it has a negative sign. This result is derived in Appendix B.

Following the same way, we can find a sign of $\frac{\partial p_i^*}{\partial x_i}$:

$$F_{x_i} = \left[\frac{m_i}{2\beta_i}(\alpha_i - \gamma_i)^2 - \frac{m_i}{2c}\left(\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i \right)^2 \right] \frac{\partial d_i}{\partial x_i} \tag{15}$$

$$F_{x_i p_i} = \left[\frac{m_i}{c}\left(\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i \right) \right] g > 0 \tag{16}$$

since $\frac{1}{\beta_i}(\alpha_i - \gamma_i)$ is just p_i^{V*} which is greater than p_i and the signs of the others are known according to our assumptions, and $F_{x_i p_k} = 0 \ \forall \ k \neq i$.

Thus, $\frac{\partial p_i^*}{\partial x_i}$ is also positive, meaning that a state with a higher political variable (x_i) receives *ceteris paribus* greater payments (p_i). If assume a senator gets committee membership in the Senate, or even sits in the chair, that would presumably positively affect his or her state's benefits. Additionally, if constituents in a state are represented by a powerful lobbying group, they most likely can get better-off in terms of disaster payments.

Another comparative static result can be derived knowing that payments should be allocated to equalize the marginal benefits of payments across states:

$$F_{p_i} = \frac{d_i m_i}{c}\left[\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i\right] \ \forall \ i \tag{17}$$

Then for some districts k and l ($k \neq l$) we have:

$$\frac{d_k m_k}{c}\left[\frac{1}{\beta_k}(\alpha_k - \gamma_k) - p_k\right] = \frac{d_l m_l}{c}\left[\frac{1}{\beta_l}(\alpha_l - \gamma_l) - p_l\right] \tag{18}$$

$$d_k m_k\left[\frac{1}{\beta_k}(\alpha_k - \gamma_k) - p_k\right] = d_l m_l\left[\frac{1}{\beta_l}(\alpha_l - \gamma_l) - p_l\right] \tag{19}$$

$$\frac{d_k m_k}{d_l m_l} = \frac{x_k m_k}{x_l m_l} = \frac{\frac{1}{\beta_l}(\alpha_l - \gamma_l) - p_l}{\frac{1}{\beta_k}(\alpha_k - \gamma_k) - p_k} \tag{20}$$

This means that for otherwise identical states k and l, after a shock effect the state having a greater political weight (x_i) along with a higher coefficient of sensitivity to government support (m_i) will have more payments (p_i).

Even if our assumption that due to constraints the optimal-for-Senate payments level (p_i^{C*}) is lower than the optimal-for-voters payments (p_i^{V*}) fails, and they are equalized, the comparative static predictions for that case are the same as derived in this chapter, and they are shown in Appendix C.

Hypotheses

Based on the model and previous empirical studies we can generalize the following hypotheses that will be evaluated in an empirical section of this research (Chapter 6):

1. The states that have a greater "need" for government relief (α_i) due to low yields or low incomes would *ceteris paribus* be favored more in terms of disaster aid payments (p_i), because decreased income or increased loss can negatively affect the popularity of "passive" politicians.

2. The states with a greater political variable (x_i) in terms of partisan affiliation and degree of political power of their representatives in the Senate able to influence the process of allocation or bill passage would *ceteris paribus* get more payments (p_i).

The degree of a senator's political power could be measured in different ways, for example whether a senator is a member or even chairman of a committee in the Senate that makes a decision on the allocation of funds, or how many bills he has offered and

how many of them have passed the Senate. There might be a problem of causality (endogeneity) with respect to membership, because any congressman probably desires to get committee assignment to influence his/her districts' budget allocations. Additionally, Gryski (1991), considering the relationship between committee membership and program expenditures, found that for some committees such as Banking and Agriculture the estimated coefficients on the committee position variable were not significant. Also, the Senate Agriculture Committee has jurisdiction not only for farm programs, but also for some additional programs related to lending, food and nutrition and others. Therefore, in our empirical test we will use the seniority of a senator as a principal proxy for x_i together with the party affiliation of a senator variable, rather than committee membership. However, the tenure of a senator may also be endogenous, because it is supposed that the duration of the senator in office might be depending on how well he represents his or her state. But we assume that this variable is much less endogenous than the senator committee membership / assignment variable.

3. The states' residents overrepresented in the Senate, i.e., having a high number of Senate seats per state population are predicted to receive more federal spending than those underrepresented in the Senate. A state's over- or underrepresentation in the Senate is another proxy for x_i. This hypothesis was tested in numerous previous studies (Wright 1974; Atlas et al. 1995; Lee 1998; Fleck 2008).

4. States represented by politically powerful lobbying or interest groups would *ceteris paribus* receive more payments relative to those not or weakly represented by such groups.

5. The state having a higher coefficient of sensitivity to relief programs (m_i) along with a higher political variable (x_i) would *ceteris paribus* receive more payments as compared to the state that has a lower coefficient of sensitivity, and political variable.

Our proxy for m_i, the measure of sensitivity of a state to federal support, will be the partisan affiliation of a state as a district for presidential elections. According to theory and previous empirical research, swing states are usually favored more than loyal states, because they matter at the margin in general elections. In addition to this hypothesis, we can assume that the partisan states that support a party in power would get more payments versus the partisan states that support another party.

CHAPTER 5

DATA AND VARIABLES

This chapter explains the variables and U.S. panel data set used for an empirical test of the hypotheses developed in Chapter 4. The data is on the state level. Senators' party affiliation was measured using data on their membership with the Senate majority party; level of power in terms of seniority; state under/overrepresentation in the Senate was proxied by state population; and state partisanship was measured by voting proportions in previous elections. Controls include a set of economic and dummy variables.

The data was compiled from the following sources: the U.S.D.A. / F.S.A. unpublished data; the U.S. Congressional Bibliographical Directory; the Regional Economic Information System of the Bureau of Economic Analysis of the U.S. Department of Commerce; the Bureau of Labor Statistics of the U.S. Department of Labor; the Census Bureau; the National Agricultural Statistics Service of the U.S. Department of Agriculture; and additional sources cited below.

The partisan affiliation of states was defined using data on presidential elections rather than congressional elections, because the latter are more affected by the heterogeneity of congressmen (Gelman and King 1990; Levitt and Snyder 1995; Fleck 2001). Therefore, we exclude Puerto Rico and the Virgin Islands from the data set, since they do not vote in presidential elections.

All of the explanatory variables are defined using the year the disaster occurred or the year disaster legislation passed instead of the year of appropriation as explained below. All amounts are deflated using the GDP deflator index for year 2000 dollars.

Only those programs for which all information was available are empirically investigated. Table 2 lists all of the disaster programs included in the analysis, and Table 8 (Appendix D) includes a list of appropriation acts that provided federal funds for each program. The share of crop programs in our database is 70.6%. The total number of observations over all programs is 1,094, with 854 for crop disaster programs and 240 for livestock disaster programs.

Table 1. List of Disaster Programs Considered.

	Program	Years	Number of States in Program	Number of Observations	Percent of Observations
1	Apple and Potato Quality Loss	2002-2003	38	38	3.5
2	Apple Market Loss Assistance	2002-2003	42	42	3.8
3	Crop Disaster Assistance	1999-2005	50	309	28.3
4	Dairy Disaster Assistance	1998-1999	11	11	1.0
5	Disaster Program	1996-2001	48	48	4.4
6	Emergency Conservation	1996-2001	48	176	16.1
7	Flood Compensation Program	2000	1	1	0.1
8	Livestock Compensation Program	2003-2004	50	50	4.6
9	Livestock Emergency Assistance	1996-2003	49	167	15.3
10	Livestock Indemnity Program	2002	8	8	0.7
11	Marketing Loss Assistance	1999-2003	49	147	13.4
12	Nursery Losses in Florida	2001-2003	2	3	0.2
13	Pasture Flood Compensation	2001-2002	4	4	0.3
14	Quality Losses Program	2001-2003	44	44	4.0
15	Sugar Beet Disaster Program	2003	11	11	1.0
16	Supplemental Tobacco Loss	2001-2002	17	17	1.6
17	Tobacco Loss Assistance	2000-2002	17	18	1.7
	Total			1,094	100.0

Dependent Variables

Payment by State: The gross amount of disaster assistance payments under the considered disaster relief program on a state level for the period from 1996 to 2005. Data on gross and net assistance payments come from the U.S.D.A. / F.S.A. unpublished data set.

Payment per 1000 Planted Acres: The gross amount of disaster assistance payments to a state per thousand planted acres in that state. Data on planted acres are available from the National Agricultural Statistics Service.

Payment, % of Cash Receipts: The gross amount of disaster assistance payments to a state as a percentage of a state's cash receipts from marketing of crops or livestock and livestock products. The source of the data on cash receipts is the Regional Economic Information System of the U.S. Department of Commerce's Bureau of Economic Analysis.

Payments are summarized for each legislation passage year across appropriation years. For example, the Marketing Loss Assistance Program's passage years were 1998, 1999 and 2001, and appropriation years were 1999-2003. Cash receipts are at the year of disaster occurrence.

Time: The number of days between the disaster occurrence and the date when a bill authorizing payment was approved. We introduce this variable as an alternative to payments, assuming that the faster disaster legislation passes, the better-off are beneficiaries of payments. Therefore, comparative predictions for this variable are the

same as those for payments, but with the opposite sign. The variable is calculated based on congressional data on appropriation bills.

Explanatory Variables

Returns over Average (ROA): Our proxy for income loss from disasters is the negatively-related difference between (1) cash receipts (CR) from marketing of crops (for crop-related programs) and livestock and livestock products (for livestock-related programs) in the disaster year from (2) the average of similarly defined cash receipts for 5 years prior the disaster year, calculated by the following formula:

$$Returns\ over\ Average = CR_i - \frac{1}{5}\sum_{t=i-5}^{i-1} CR_t \tag{22}$$

The sign on this variable is predicted to be negative in explaining payments. This *ROA* variable and annual cash receipts on crops and livestock products overall for the United States are shown in Figure 6 and Figure 7.

A sharp decrease in incomes on crops in the United States was observed in 1998, 1999, and a slight reduction took place in 2001. These variations could be explained by El Nino driven storms in 1997-1998, droughts and other natural disasters.

For American ranchers the worst year was 2002, when cash receipts from marketing of livestock products dropped by $15 million (in 2000 dollars) or by 13.3% as compared to 2001.

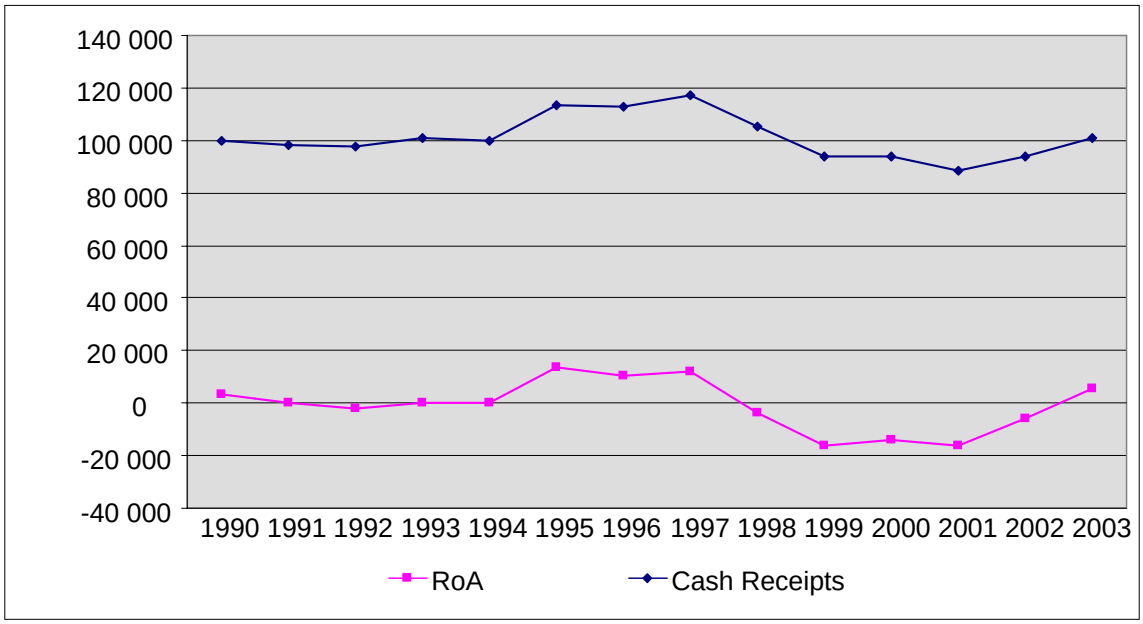

Figure 6. U.S. Cash Receipts and Returns over Average on Crops.
(Thousands of Year 2000 Dollars)

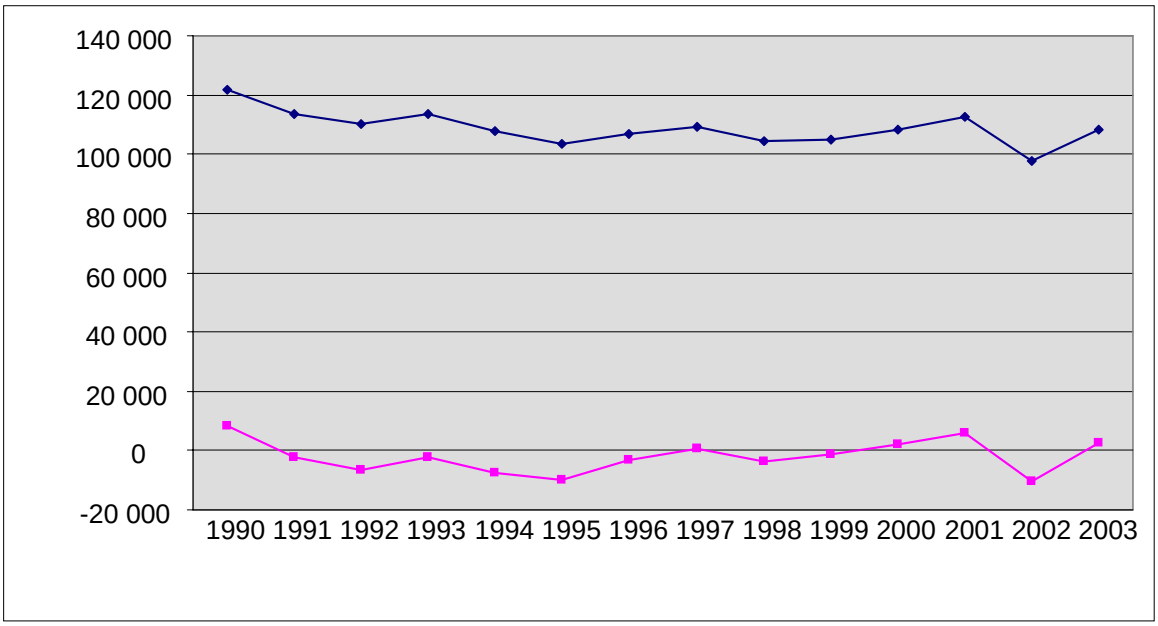

Figure 7. U.S. Cash Receipts and Returns over Average on Livestock.
(Thousands of Year 2000 Dollars)

Swing State: A dummy variable equal to 1 if the state's vote margin in the last presidential election was between -5 and 5%, and equal to 0 otherwise.

Loyal-to-Party-in-Power State: A dummy variable equal to 1 if an overwhelming majority of voters (55% or more) in the state voted for the presidential candidate from the current party in power of the Senate in the last presidential election, and equal to 0 otherwise.

Loyal-to-Other- Party State: A dummy variable equal to 1 if an overwhelming majority of voters (55% or more) in the state voted for the presidential candidate, who was not from the current party in power of the Senate in the last presidential election, and equal to 0 otherwise.

The *Swing State*, *Loyal-to-Party-in-Power State*, and *Loyal-to-Other-Party State* variables are calculated using state level data on the number of votes for a presidential candidate for 1988-2000 from Dendy (1988, 1992), Carle (1996), and Trandahl (2000).[6]

Average Senator Seniority in Years: Days between the date when a state's senator first took office and the date a disaster bill passed, averaged for two senators of each state and divided by 365. The variable is intended to capture an increase in a senator's power over time due to authority and experience.

Highest Senator Seniority in Years: The highest tenure in days of the two senators of each state, divided by 365. This variable allows measurement of a state doing well in terms of disaster payments with greater seniority of only one senator, even if the other senator's tenure is quite negligible.

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[6] The presidential election year is defined before the compared year of disaster appropriation bill passage.

The seniority variables are calculated using Bratman's (2008) database containing the dates of service of U.S. senators as well as data from the U.S. Congressional Bibliographical Directory.

Number of Senators in Majority Party: The number of senators of each state in the Senate's majority party at the date of disaster law enactment.[7] The variable is calculated using Bratman's (2008) database. It is expected that this variable would help proxy for the degree of senators' power in addition to the previous variables. The variable may also measure if the impact of partisan affiliation of senators matters more than their individual seniority characteristics.

State Population: The total number of people in a state in millions for a certain bill approval year (as of July). Annual data on population by state is from the Census Bureau. We expect the sign on state population to be negative if the over-representation of less populated states like Wyoming, Vermont, North Dakota, Alaska and others in the Senate provides them with more payments.

The possible effect of lobbying groups could be measured by, say, a percentage of acres in a state planted into one of the five major crops (wheat, corn, cotton, rice and sugar beet / sugar cane). It would proxy for the effect of the following five politically most powerful crop interest groups nationwide: the National Association of Wheat Growers, the National Corn Growers Association, the National Cotton Council of America, the U.S. Rice Producers Association, and the U.S. Sugar Association. But such a variable is not applicable to livestock programs.

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[7] The majority party in the Senate was Democratic in 1992 and Republican in 1996, 1997, 1998, 1999, 2000, 2003 and 2004.

Number of States in Program: The number of states in the program that received disaster relief payments on the programs considered in this thesis. The variable is expected to show how many states suffered disasters, and to reflect the political "weight" of appropriation programs as well as the importance of an appropriation bill for passage. This variable can be thought of as an alternative measure of interest group influence, which can be applied for both the crop and livestock programs. It is anticipated that the greater the number of states in programs, the more payments are allocated under such programs relative to other programs. This variable is calculated using the unpublished U.S.D.A. / F.S.A. data.

Control Variables

In order to account for some economic and other specific factors explaining a difference in the allocation of funds across states, we include the following state-level controls: the rate of unemployment, the share of agricultural production in GDP, and the share of farm population at each year of the passage of disaster legislation.

State Unemployment Rate: A percentage rate of unemployment by state in the year when the particular disaster legislation passed. Data for the variable is from the Bureau of Labor Statistics of the U.S. Department of Labor. We expect that the higher the unemployment rate in a state, the more payments that state gets, because the variable reflects the potential benefit from government support in a state.

State Ag. GDP in %: A state-level share of farm production in GDP is from the Bureau of Economic Analysis, Regional Economic Analysis Division of the U.S. Department of Commerce.

State Farm Population in %: A percentage of farm population, calculated as the number of farms in a state multiplied by 4 (the presumed average number of persons in a farm family), and divided by the total population of a state. Annual data on number of farms by state is available from the U.S. Department of Agriculture. Data on population by state is from the Census Bureau. Data on the average number of persons in a farm family for states in the United States is not available.

The last two variables (*State Ag. GDP* and *State Farm Population*) reflect the importance of agriculture in each state. It is presumed that the coefficients on both variables will have a positive sign for the payment dependent variables and a negative sign for the time dependent variable.

To account for some other exogenous factors such as a change in legislation procedures in Congress in a particular year that could have an influence on the dependent variables we include a set of dummies for the year in which a disaster bill passed.

CHAPTER 6

EMPIRICAL RESULTS

This chapter reports the results of empirical tests of the hypotheses developed in Chapter 4. The key hypothesis to be tested is that states with greater losses due to disasters would *ceteris paribus* do better in terms of disaster relief payments. The other political hypotheses are that states would be favored more if their senators are members of the majority party of the Senate; if their senators have more experience measured by seniority; if their population is over-represented in the Senate; and if they are swing states.

The method used for an empirical analysis is regression of the state-level data described in Chapter 5. The empirical model was estimated using Ordinary Least Squares.

The analysis of disaster payments are carried out separately for crop and for livestock programs. Data on cash receipts are quite different for crop and livestock products, and consequently losses are calculated differently for these two types of programs. Table 2 and 3 present the separate summary statistics for the set of crop and livestock programs. The maximum amount of payments by state allocated under all the considered programs is greater than their mean by seven standard deviations, while the minimum amount is quite small, suggesting that distributions of payments differ substantially across states.

As discussed in chapter 5, dummies for each year were included to account for year-to-year idiosyncratic differences. Program dummy variables were also included in some specifications to control for heterogeneity across programs.

To test the assumption of the homogeneity of variance of the residuals, graphical and non-graphical methods were applied. The non-graphical method for detecting possible heteroscedasticity included the Breusch-Pagan test. The test's results showed that the variance in most specifications is not constant, and therefore heteroscedastic. To deal with the heteroscedasticity problem, regressions with robust standard errors were used.

Table 2. Summary Statistics of Variables for Crop Programs. (Year 2000 dollars)

	Mean	S.D.	Minimum	Maximum
Payment by State	2.82e+07	7.30e+07	52	5.30e+08
Payment per 1000 Planted Acres	3446.571	7167.715	0.001467	98184.0
Payment (% of Cash Receipts)	1574.197	2969.633	0.002	16972.6
Time (Days)	233.2	161.7	43.0	1397.0
ROA per 1000 Planted Acres	-35.89	175.26	-2803.65	394.70
ROA (% of Cash Receipts)	-11.41	15.79	-65.75	24.52
Swing State	0.25	0.43	0	1
Loyal-to-Party-in-Power State	0.27	0.45	0	1
Loyal-to-Other-Party State	0.48	0.49	0	1
Average Senator Seniority (Years)	11.7	7.4	0.6	40.1
Highest Senator Seniority (Years)	16.4	9.9	0.7	53.4
Number of State's Senators in Majority Party	1.1	0.8	0	2
State Population (Millions)	5.949	6.388	0.473	35.466

Table 2. Summary Statistics of Variables for Crop Programs - continued.
(Year 2000 dollars)

	Mean	S.D.	Minimum	Maximum
State Number	45.93	8.63	1.00	50.00
State Unemployment Rate (%)	4.39	1.18	2.30	10.40
State Ag. GDP (%)	1.42	1.62	0.06	11.27
State Farm Population (%)	4.98	4.41	0.30	20.59

Note: Number of observations = 854.

Table 3. Summary Statistics of Variables for Livestock Programs.

	Mean	S.D.	Minimum	Maximum
Payment by State	5615567	1.41e+07	90	1.42e+08
Payment (% of Cash Receipts)	248.697	431.736	0.004	3179.102
Time (Days)	297.9	323.4	84.0	2532.0
ROA	39150.6	270690.2	-1809007	1412183
ROA (% of Cash Receipts)	1.24	9.09	-32.20	24.95
Swing State	0.26	0.44	0	1
Loyal-to-Party-in-Power State	0.31	0.46	0	1
Loyal-to-Other-Party State	0.43	0.49	0	1
Average Senator Seniority (Years)	11.4	6.9	0.9	38.9
Highest Senator Seniority (Years)	16.3	9.6	1.3	44.2
Number of State's Senators in Majority Party	1.1	0.8	0	2
State Population (Millions)	6.101	6.599	0.492	35.466
State Number	45.35	11.98	4.00	50.00
State Unemployment Rate (%)	5.03	1.47	2.30	11.30
State Ag. GDP (%)	1.42	1.48	0.07	7.59
State Farm Population (%)	4.91	4.32	0.28	19.25

Note: Number of observations = 240.

Crop Disaster Programs by Year

The dependent variables for crop programs are *Payment per 1000 Planted Acres*, *Payment as a % of Cash Receipts* and *Time*. It is expected that the payments (time) variables will have a negative (positive) relationship with *ROA*, which is taken per planted acres, or as a % of cash receipts for compliance, and a positive (negative) relationship with all of the political variables except *State Population*.

Table 4 contains empirical estimates for regression analysis of the determining factors for disaster payments for crops. Most importantly, the estimated coefficients for *ROA* are significantly different from zero at the 1% level for four out of the six specification forms and significant at the 5% level for specifications 1 and 6. The sign of the coefficient for this variable supports our main hypothesis that states having higher losses from disasters received more payments and minimum legislative time. These estimates indicate that a one dollar increase in the returns over average cash receipts (in 2000 dollars) decreased disaster payments to states by $7.2 per planted acre, or reduced by approximately 48 days the time required between variation in cash receipts and the passage of a disaster appropriation bill; a one percent increase in *ROA* decreased the payments by 45.4-57.8% per cash receipts.

Our hypothesis that swing states are favored more than loyal states is not supported by the data, with the variable having the wrong sign and statistically significant coefficient in one out of six specifications. But in comparison with states loyal to the Senate's party in power, swing states had lower days for approval: the estimated

coefficient on *Loyal-to-Party-in-Power State* is significantly positive and greater in magnitude than that on *Swing State* (specification 5).

Average Senator Seniority is significantly positive at the 10% level for payments per thousand planted acres for specification 3 with program and year dummies, and nearly significant for specification 1 without year and program dummies. This finding is slightly strengthened by the other senator power variable – *Number of Senators in Majority Party*, – which has the expected negative sign for the fifth specification. Thus, each additional average year of senators' tenure in the Senate makes them "powerful" enough to direct from $58.7 to $58.9 of federal payments per thousand planted acres more to their state (specifications 1 and 3). And a state's having at least one senator affiliated with the Senate majority party reduces the time required between the disaster's occurrence and the bill approval by approximately 2 weeks and 3 days.

As reported by Appendix E, replacing the *Average Seniority* variable with *Highest Seniority* in Table 4 gives the same qualitative results in terms of the signs and significance of the key coefficients. Additionally, after replacing the *Loyal-to-Party-in-Power State* dummy with the *Loyal-to-Other-Party State* variable virtually the same results occurred, somewhat as expected.

State Population has an unexpected sign and is significantly different from zero at the 5% level in the fifth column of Table 4, not supporting the hypothesis that small population states whose citizens are overrepresented in the Senate are favored more than populous states. Had the coefficient on this variable been significant in specifications 1 and 3, it would be interpreted as follows: holding other factors constant, a state with

population lower by one million residents compared to an otherwise equivalent state gets from $12.6 to $15.8 more of disaster aid payments per thousand planted acres.

As was described in the previous chapter the *State Number* variable is a proxy for the influence of interest groups on distribution politics. We expected a sign on this variable to be positive for *Payment* and negative for *Time*. Empirical testing shows that the coefficient of this variable is significant at a high level and has the expected signs in five of six specifications. Only in specification 5 is the coefficient on this variable not significant. If a disaster program included one more state, the appropriation amount on that program was *ceteris paribus* higher by $108.6-272.7 dollars per 1000 planted acres or by 58.1-95.7 % of state cash receipts compared to another program. Analogously, additional ten states suffered from disasters made a bill in the Senate politically significant and important to be approved in approximately 4 days less than other identical bills.

The *F*-statistic for testing the joint significance of six political variables (*Swing State*, *Loyal-to-Party-in-Power State*, *Average Senator Seniority*, *Number of State's Senators in Majority Party*, *State Population* and *State Number*) is very high for all the models with and without year and program dummies, allowing us to reject the null hypothesis that the political variables are all equal to zero.

The estimated results for the controls show that their effects are quite variable. The sign of coefficient on the percentage of *Unemployment Rate* is not consistent with our expectations in specification 5 with significance at the 1% level.

Ag. GDP appeared to be highly correlated with *Farm Population* (84.8%). Therefore, it is reasonable to use one of these two variables. Since the economic performance of states measured by GDP is more sensitive to disasters, *State Farm Population* was used.

Among the control variables the most explanatory power is from *Farm Population*, which had the expected and significant signs for *Payment, % of Cash Receipts*. Thus, a state with farm population greater by 1 percent in comparison with another otherwise identical state received *ceteris paribus* 117-149 percent more of disaster relief payments per cash receipts. The estimated effect of the percentage of *Farm Population* on the other two dependent variables – *Payment per 1000 Planted Acres* and *Time* – is unexpectedly significantly negative and positive, respectively.

It should be noted that these controls may not be effective measures of the economic or agricultural importance of a state as anticipated. The inclusion of program and year dummies does not substantially change the results, although the significance of some variables of our interest is reduced.

Table 4. Robust Regression Results for Crop Programs I.
(Years Not Pooled)

	(1) Payment/PA	(2) %Payment/CR	(3) Payment/PA	(4) %Payment/CR
Constant	-336.7	-2841.1***	-1051.3	-688.4
	(-0.22)	(-4.57)	(-0.45)	(-0.99)
ROA (per PA or % of CR)	-7.2**	-57.8***	-7.2***	-45.4***
	(-2.34)	(-6.91)	(-2.55)	(-5.65)
Swing State	-360.1	-28.4	-107.8	28.6
	(-0.81)	(-0.13)	(-0.27)	(0.16)

Table 4. Robust Regression Results for Crop Programs I – continued.
(Years Not Pooled)

	(1) Payment/PA	(2) %Payment/CR	(3) Payment/PA	(4) %Payment/CR
Loyal-to-Party-in-Power State	297.7	31.5	222.9	34.2
	(0.55)	(0.12)	(0.39)	(0.16)
Average Senator Seniority (Years)	58.7	5.5	58.9*	10.9
	(1.47)	(0.44)	(1.67)	(1.01)
Number of State's Senators	-345.9	37.4	-339.5	69.5
in Majority Party	(-1.17)	(0.29)	(-1.35)	(0.68)
State Population (Millions)	-15.8	11.2	-12.6	19.2
	(-0.33)	(0.82)	(-0.27)	(1.41)
State Number	108.6***	58.1***	272.7***	95.7***
	(6.70)	(6.89)	(7.05)	(6.87)
State Unemployment Rate (%)	-87.8	75.2	93.7	65.4
	(-0.39)	(1.06)	(0.27)	(0.80)
State Farm Population (%)	-260.2***	117.2***	-217.6***	149***
	(-4.40)	(4.00)	(-3.98)	(6.50)
Program Dummies	No	No	Yes	Yes
Year Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	7.62	8.15	11.25	10.24
P-value for F-test	0.0000	0.0000	0.0000	0.0000
R-squared	0.0935	0.1627	0.2525	0.4914
Number of Observations	854	854	854	854

Notes: PA = 1000 planted acres; CR = cash receipts; t-statistics for 2-tailed tests are in parentheses; ROA in 2000 dollars per 1000 planted acres for columns (1) and (3), and % of CR for columns (2) and (4); *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 4. Robust Regression Results for Crop Programs I - continued.
(Years Not Pooled)

	(5) Time (Days)	(6) Time (Days)
Constant	96.2* (1.82)	234.0*** (27.82)
ROA (% of CR)	2.3*** (6.99)	0.16** (2.46)
Swing State	26.3** (1.96)	-0.28 (-0.13)
Loyal-to-Party-in-Power State	49.6*** (3.25)	-0.54 (-0.25)
Average Senator Seniority (Years)	-1.0 (-1.19)	-0.06 (-0.48)
Number of State's Senators in Majority Party	-16.8** (-2.21)	0.17 (0.16)
State Population (Millions)	-2.2** (-2.39)	0.03 (0.18)
State Number	-0.7 (-0.77)	-0.44*** (-4.01)
State Unemployment Rate (%)	46.9*** (10.31)	-0.16 (-0.17)
State Farm Population (%)	2.5* (1.69)	0.03 (0.12)
Program Dummies	No	Yes
Year Dummies	No	Yes
F-test for 6 Political Variables P-value for F-test	3.33 0.0030	6.58 0.0000
R-squared	0.1785	0.9789
Number of Observations	854	854

Notes: CR = cash receipts; t-statistics for 2-tailed tests are in parentheses;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Livestock Disaster Programs by Year

The per acre definition of crop programs disaster payments can not be extended to livestock programs. Finding a better way of differentiating payments across states is problematic. For instance, one possible ratio defined as payments per head is not correct, because livestock are very heterogeneous consisting of cows, sheep, chickens, and etc. That is why merely *Payment by State* was used here as an additional dependent variable along with *Payment % of Cash Receipts* and *Time*.

Empirical results for livestock programs are presented in Table 5. They are quite different from those for crop programs. The possible explanation is because the dependent variable is for total payments in a state, not for per-acreage payments as for the crop regression. But additionally, there is a substantial difference in the number of observations between the two programs, with far fewer observations for livestock than for crops.

The analysis of these livestock disaster correlations yields the most interesting result of a positive significant sign on *Swing State* in the first four specifications. The estimated coefficients on this variable are significant at the 5% and 10% levels, and their values are substantively greater than the coefficients on *Loyal-to-Party-in-Power State* in those specifications. This provides some evidence that uncertain states are favored more than states whose support politicians are fairly confident in.

The coefficient on *ROA* is insignificant for all of the three dependent variables, but close to significance with the expected positive sign in the last regression model.

At least one of the two senator power variables is significant with the expected sign in each of the first five models in Table 5, supporting our hypothesis of the influence of senators on the allocation process. The coefficient on *Average Senator Seniority* is significantly positive for payments as a percentage of cash receipts (specifications 2 and 4). This means that *ceteris paribus* an increase in senators' seniority by one average year was related to a 7.3-8.9% increase of disaster aid payments per cash receipts.

The *Number of State's Senators in Majority Party* variable is significant at the 5% and 10% levels and its coefficient is positive for *Payment* and negative for *Time* as hypothesized. The empirical analysis shows that states having one more senator affiliated with the Senate majority party *ceteris paribus* received $2.8 - $3.2 million more, and were legally approved for disaster appropriations by 60 days faster than other states. In general, holding everything constant it took from 76 to 740 days for the Senate to pass a bill after the event, depending on a program.

State Population is significant in model 1 and 3, but again with an unexpected sign. The *State Number* variable is significant at the 1% and 5% levels in almost all of the regression models (except column 4), meaning that $205.5-242.8 thousands more of federal outlays (or 5.6% of cash receipts) were directed under the disaster program with one more state involved.

Farm Population is significantly different from zero at the 1% level in specifications 1 and 3. This result shows that a state with farm population greater by 1 percent compared to another identical state *ceteris paribus* obtained roughly $708-711 thousands more of gross disaster payments.

Table 5. Robust Regression Results for Livestock Programs I.
(Years Not Pooled)

	(1) Payment	(2) %Payment/CR	(3) Payment	(4) %Payment/CR
Constant	-1.26e+07**	-86.1	-2.01e+07***	-592***
	(-2.07)	(-0.51)	(-2.91)	(-2.83)
ROA (2000 Dollars or % of CR)	1.5	1.8	2.7	1.5
	(0.30)	(0.54)	(0.53)	(0.53)
Swing State	4906320*	137.9**	5335975**	153.9**
	(1.94)	(2.04)	(2.11)	(2.46)
Loyal-to-Party-in-Power State	-35341	4.8	1095131	50.4
	(-0.02)	(0.06)	(0.67)	(0.78)
Average Senator Seniority (Years)	148241	8.9**	115872	7.3**
	(1.21)	(2.15)	(0.99)	(1.96)
Number of State's Senators in Majority Party	3181091**	14.1	2790196*	-6.8
	(1.96)	(0.36)	(1.80)	(-0.19)
State Population (Millions)	740249**	2.7	704294**	-1.08
	(2.36)	(0.73)	(2.26)	(-0.27)
State Number	205483***	5.6***	242814***	5.6
	(3.55)	(2.86)	(3.03)	(0.91)
State Unemployment Rate (%)	-1086078**	-29.6**	504558	84.7***
	(-2.01)	(-1.96)	(1.05)	(2.84)
State Farm Population (%)	708019***	11.5	710619***	12.8
	(3.07)	(1.21)	(3.02)	(1.41)
Program Dummies	No	No	Yes	Yes
Year Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	2.30	3.25	2.25	1.86
P-value for F-test	0.0357	0.0043	0.0394	0.0886
R-squared	0.1646	0.0744	0.2234	0.2541
Number of Observations	240	240	240	240

Notes: CR = cash receipts; t-statistics for 2-tailed tests are in parentheses;
ROA in 2000 dollars for columns (1) and (3), and % of CR for columns (2) and (4);
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 5. Robust Regression Results for Livestock Programs I - continued.
(Years Not Pooled)

	(5) Time (Days)	(6) Time (Days)
Constant	719.7*** (3.17)	739.7*** (82.74)
ROA (% of CR)	-0.1 (-0.06)	0.2 (1.39)
Swing State	25.4 (0.45)	6.3** (2.09)
Loyal-to-Party-in-Power State	101.7* (1.71)	2.8 (0.83)
Average Senator Seniority (Years)	-1.6 (-0.63)	-0.2 (-0.92)
Number of State's Senators in Majority Party	-60.4** (-2.15)	-2.5 (-1.50)
State Population (Millions)	-0.7 (-0.29)	0.02 (0.11)
State Number	-10.5** (-2.43)	-52.4*** (-232.71)
State Unemployment Rate (%)	9.4 (1.03)	1.7 (1.43)
State Farm Population (%)	11.1 (1.56)	0.4 (1.23)
Program Dummies	No	Yes
Year Dummies	No	Yes
F-test for 6 Political Variables P-value for F-test	1.57 0.1583	9060.98 0.0000
R-squared	0.2068	0.9971
Number of Observations	240	240

Notes: CR = cash receipts; t-statistics for 2-tailed tests are in parentheses;
column (6) contains not robust regression results; t-statistics for 2-tailed tests are in parentheses;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

The variable *Unemployment Rate* is significant at the 1% level in the fourth column with a positive sign, suggesting that a 1 percent increase in the rate of unemployed people in a state was *ceteris paribus* associated with an 85 percent increase in disaster relief payments per cash receipts in that state.

The *F*-test for livestock programs was performed for the same six political variables, and the *F*-statistic is jointly significant at the 1%, 5% and 10% levels for five out of six specifications. The highest R-squared (99.71%) is observed in the last column of Table 5.

Pooling by Congressional Years

As an alternative sort of estimation to those in Tables 4 through 5 the crop and livestock disaster programs were pooled by bi-annual congressional period. Only two years of the 106th Congress (1999 and 2000) appeared to have bills that initiated appropriations under the same programs. The variables other than *Payment* were averaged across the two years for each congressional period.

The results of these estimates are given in Table 6 and Table 7. The number of observations decreased to 738 for crop programs and 206 for livestock programs. These results were qualitatively the same as those in Tables 4 and 5 for most specifications.

Table 6. Robust Regression Results for Crop Programs II.
(Years Pooled by Bi-annual Congressional Period)

	(1) Payment/PA	(2) %Payment/CR	(3) Payment/PA	(4) %Payment/CR
Constant	299.2	-3287.9***	-356.1	-850.9
	(0.16)	(-4.57)	(-0.11)	(-1.08)
ROA (per PA or % of CR)	-7.1*	-73.5***	-7.0**	-53.4***
	(-1.83)	(-7.65)	(-1.98)	(-5.55)
Swing State	-620.2	-31.3	-205.2	98.9
	(-1.16)	(-0.12)	(-0.42)	(0.45)
Loyal-to-Party-in-Power State	150.6	55.5	227.2	151.2
	(0.23)	(0.18)	(0.32)	(0.60)
Average Senator Seniority (Years)	57.1	3.8	57.8	10.3
	(1.13)	(0.26)	(1.26)	(0.80)
Number of State's Senators in Majority Party	-327.0	80.6	-377.2	77.9
	(-0.91)	(0.56)	(-1.21)	(0.65)
State Population (Millions)	-14.9	19.5	-19.6	22.3
	(-0.25)	(1.15)	(-0.33)	(1.32)
State Number	137.0***	76.4***	304.3***	104***
	(7.07)	(7.70)	(7.01)	(7.77)
State Unemployment Rate (%)	-299.0	-14.3	118.7	97.3
	(-1.04)	(-0.18)	(0.28)	(1.00)
State Farm Population (%)	-316.9***	132.1***	-261.2***	177***
	(-4.00)	(3.95)	(-3.49)	(6.30)
Program Dummies	No	No	Yes	Yes
Congressional Period Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	8.43	10.01	9.84	10.62
P-value for F-test	0.0000	0.0000	0.0000	0.0000
R-squared	0.0880	0.2071	0.2301	0.4779
Number of Observations	738	738	738	738

Notes: PA = 1000 planted acres; CR = cash receipts; t-statistics for 2-tailed tests are in parentheses; ROA in 2000 dollars per 1000 planted acres for columns (1) and (3), and % of CR for columns (2) and (4); *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 6. Robust Regression Results for Crop Programs II - continued.
(Years Pooled by Bi-annual Congressional Period)

	(5) Time (Days)	(6) Time (Days)
Constant	75.8 (1.38)	1351.4*** (178.88)
ROA (% of CR)	2.1*** (5.59)	-0.01 (-0.25)
Swing State	27.5* (1.83)	0.19 (0.11)
Loyal-to-Party-in-Power State	53.8*** (3.20)	-0.89 (-0.49)
Average Senator Seniority (Years)	-1.1 (-1.09)	-0.11 (-0.99)
Number of State's Senators in Majority Party	-17.7** (-2.10)	0.19 (0.21)
State Population (Millions)	-2.2** (-2.14)	0.03 (0.22)
State Number	-0.4 (-0.42)	-25.8*** (-396.49)
State Unemployment Rate (%)	48.7*** (9.84)	0.09 (0.12)
State Farm Population (%)	2.5 (1.38)	-0.12 (-0.60)
Program Dummies	No	Yes
Congressional Period Dummies	No	Yes
F-test for 6 Political Variables P-value for F-test	2.99 0.0068	30527.77 0.0000
R-squared	0.1728	0.9881
Number of Observations	738	738

Notes: t-statistics for 2-tailed tests are in parentheses;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 7. Robust Regression Results for Livestock Programs II.
(Years Pooled by Bi-annual Congressional Period)

	(1) Payment	(2) %Payment/CR	(3) Payment	(4) %Payment/CR
Constant	-1.38e+07	-75.0	-3.55e+07**	-1166.8**
	(-1.50)	(-0.29)	(-2.56)	(-2.16)
ROA (2000 Dollars or % of CR)	3.1	1.5	6.5	4.5
	(0.85)	(0.40)	(1.44)	(1.20)
Swing State	5628201	170.8	6744079*	209.1**
	(1.45)	(1.55)	(1.72)	(2.08)
Loyal-to-Party-in-Power State	-1175777	-14.9	1235775	73.6
	(-0.46)	(-0.14)	(0.52)	(0.83)
Average Senator Seniority (Years)	208283	11.2*	151205	8.4
	(0.98)	(1.71)	(0.77)	(1.48)
Number of State's Senators	4314091	33.9	3453607	-8.4
in Majority Party	(1.59)	(0.56)	(1.41)	(-0.15)
State Population (Millions)	928327*	5.4	868479*	0.4
	(1.76)	(0.87)	(1.69)	(0.07)
State Number	295024***	8.5***	431331***	12.3*
	(2.79)	(3.06)	(3.20)	(1.74)
State Unemployment Rate (%)	-2130838**	-64.5***	524934	103.2**
	(-2.02)	(-2.59)	(0.69)	(2.05)
State Farm Population (%)	927448**	16.8**	993892***	22.3
	(2.43)	(1.07)	(2.68)	(1.38)
Program Dummies	No	No	Yes	Yes
Congressional Period Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	1.79	3.01	1.90	1.62
P-value for F-test	0.1026	0.0077	0.0821	0.1427
R-squared	0.1337	0.0705	0.2185	0.2813
Number of Observations	206	206	206	206

Notes: CR = cash receipts; t-statistics for 2-tailed tests are in parentheses;
ROA in 2000 dollars for columns (1) and (3), and % of CR for columns (2) and (4);
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 7. Robust Regression Results for Livestock Programs II - continued.
(Years Pooled by Bi-annual Congressional Period)

	(5) Time (Days)	(6) Time (Days)
Constant	735.5*** (3.27)	2941.6*** (500.18)
ROA (% of CR)	-0.3 (-0.11)	0.3** (2.26)
Swing State	29.6 (0.45)	3.2 (1.55)
Loyal-to-Party-in-Power State	107.2 (1.57)	0.4 (0.17)
Average Senator Seniority (Years)	-1.6 (-0.55)	-0.06 (-0.41)
Number of State's Senators in Majority Party	-63.2** (-1.99)	-1.9 (-1.49)
State Population (Millions)	-0.1 (-0.05)	0.004 (0.04)
State Number	-9.4** (-2.27)	-51.9*** (-377.66)
State Unemployment Rate (%)	-2.6 (-0.26)	1.4* (1.82)
State Farm Population (%)	14.3* (1.68)	0.1 (0.55)
Program Dummies	No	Yes
Congressional Period Dummies	No	Yes
F-test for 6 Political Variables P-value for F-test	1.39 0.2194	60535.81 0.0000
R-squared	0.2118	0.9982
Number of Observations	206	206

Notes: t-statistics for 2-tailed tests are in parentheses;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Model Specification Diagnostics

Another approach considered was running a state-fixed-effects model in order to control for variations within states over the considered years. This model reduced the explanatory power of all the coefficients of our key variables (*ROA* and the Senate political variables) as expected.

A final specification considered pooled data by programs to get multi-program amounts for each state.[8] As for previous regressions these empirical tests were performed separately for crop and livestock programs. The estimates for both programs were quite consistent with those in Tables 4 and 5. Pooling by programs and congressional years led to the same qualitative results as well. Thus, these estimations are not presented.

[8] The variables other than *Payment* were averaged.

CHAPTER 7

CONCLUSION

In the 20th century the foundation and development of the economic theory of politics has extended our understanding of many political issues. Economic models and methods applied to the analysis of distribution politics has advanced economic and political science.

This thesis developed a theoretical model of rational politicians' objectives and tested it empirically using a panel data set of federal disaster payments across the United States. The study achieved some success in applying public theory concepts and demonstrated its usefulness and reasonableness.

The main result and primary finding of this thesis is that states having lower returns over average cash receipts during the disaster years *ceteris paribus* received more federal assistance payments on crop programs and were more quickly authorized for appropriations. Therefore, the effect of this economic variable, which is based on political incentives, is greater than the effect of political factors themselves.

The variation of the number of states under different programs as a proxy for interest groups influence is a good predictor of disaster assistance amounts allocated on those programs. This result adds additional findings to previous studies of interest groups (Lowry and Potoski 2002).

The econometric results presented in the previous chapter of this study lead to the following additional conclusions supporting our hypotheses:

- disaster outlays on livestock programs were directed towards swing states defined based on general presidential elections;
- states with a higher degree of power of their senators measured by either seniority in the Senate or membership in the majority party were *ceteris paribus* favored more in terms of the level of disaster relief payments and reduced time for appropriation approval.

The first additional result is consistent with some previous literature (Wright 1974; Fleck 2001, 2008) showing that after the Great Depression federal spending was directed to electorally sensitive states. But although the empirical tests of the New Deal data in those studies provided evidence that federal funds flowed to less populated states, the data used in this study did not. The findings of this research suggest in the contrary that the states having a high number of Senate seats per state population receive more federal disaster assistance that is still consistent with Levitt and Snyder (1995).

Both of the additional conclusions are consistent to some extent with Levitt's and Snyder's (1995) result that political parties are important in the distribution of federal outlays. Our state partisan affiliation variables along with states' senator partisanship provide this evidence. Also, in this thesis the role of senators' power expressed by their tenure is also supported as already mentioned.

In summary, it is shown in this study that political factors also matter in the allocation of U.S. federal spending and that disaster payments as form of distributive policy can be better explained by the models of an important role of interest groups rather than the models of strong political parties and individual characteristics of congressmen.

It should be noted that the econometric analysis of this thesis was restricted by available state level data. In future studies the model's predictions can be applied for U.S. congressional districts or counties. And this research could be logically extended by empirically testing county-level data and with respect to the House of Representatives. It is possible that results for the House would be different than those here, because the structure and organization of the two chambers differ; for example, the appropriations committee-parent-chamber relationship is substantially different in the Senate from that in the House as was found by Fenno (1966).

Changing senators' power variables, especially seniority, or testing for the potential problem of endogeneity and reducing it if necessary could be a way to develop this study. As our results on control variables are inconclusive, finding other better proxies for economic variables would provide an opportunity for further empirical study as well.

The models developed in this thesis could be modified to better incorporate the idea of interest groups, and heterogeneity of districts with respect to the political influence of districts' representatives separately from their partisan affiliation.

Due to inapplicability for the considered congressional periods, some issues were not addressed in this study, for example, how a majority party's simultaneous control of both Congress houses, and perhaps presidential power would affect the difference in appropriations. In this respect additional research may explore those questions.

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APPENDICES

APPENDIX A

DERIVATION OF FUNCTION OF ECONOMIC RENT

This appendix derives a function of voters' economic rent used in Chapter 4. Assume the level of payment where *MB* equals zero is $P = c\,\alpha_i$, where c is some constant more than or equal to 1. As we discussed in Chapter 4, the model's budget constraint keeps the level of payments (p_i) less than a state's voters' optimal payment level (p_i^*), which is determined by the intersection between the *MB* and *MC* curves:

$$\alpha_i - \beta_i p_i^* = \gamma_i \tag{23}$$

$$p_i^* = (\alpha_i - \gamma_i) / \beta_i \tag{24}$$

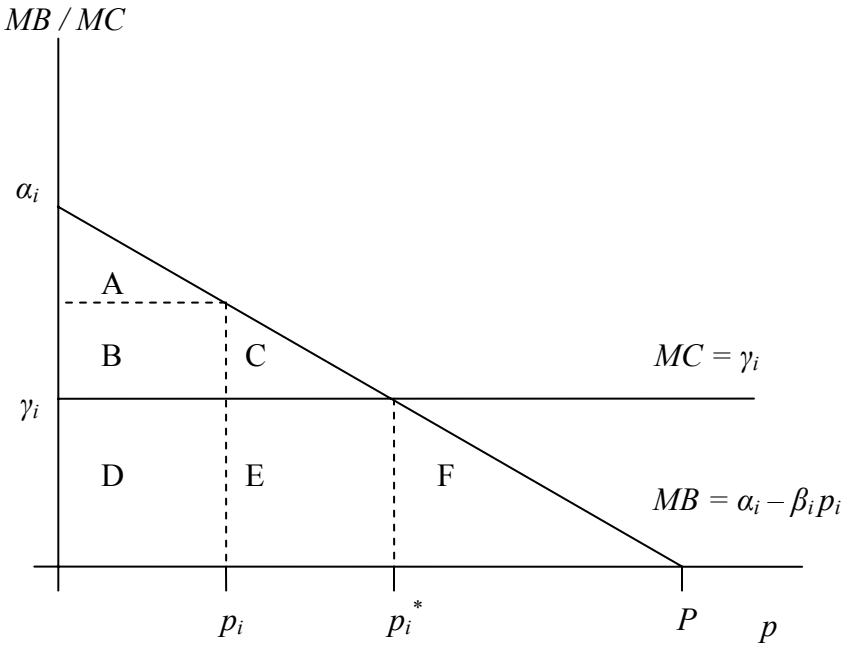

Figure 8. Economic Rent as a Function of Payments.

For $p_i < p_i^*$ on Figure 8, economic rent is the area bounded by the *MB* and *MC* curves, or the amount of the areas of triangle A and rectangle B. Geometrically, it can be easily found as the difference between the areas of triangle ABC and triangle C, because

triangles ABCDEF, ABC and C are similar, and the length of a leg of each of these triangles is equal to the length of another leg corrected by constant *c*:

$$r(p_i,\alpha_i) = \frac{1}{2}(\alpha_i - \gamma_i)(\alpha_i - \gamma_i)\frac{1}{\beta_i} - \frac{1}{2}\left((\alpha_i - \gamma_i)\frac{1}{\beta_i} - p_i\right)\left((\alpha_i - \gamma_i)\frac{1}{\beta_i} - p_i\right)\frac{1}{c}$$

$$= \frac{1}{2\beta_i}(\alpha_i - \gamma_i)^2 - \frac{1}{2c}\left(\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i\right)^2 \qquad (25)$$

APPENDIX B

COMPARATIVE STATIC RESULTS IN CASE OF ROTATION

This appendix derives the comparative static results for a case when the *MB* curve discussed in Chapter 4 rotates after a shock.

The derivative of the total political support function is as follows:

$$F_{\beta_i} = d_i m_i \frac{\partial r}{\partial \beta_i} = d_i m_i \left[(-1)\frac{1}{2\beta_i^2}(\alpha_i - \gamma_i)^2 - \frac{1}{c}\left(\frac{1}{\beta_i}(\alpha_i - \gamma_i) - p_i \right)(-1)\frac{1}{\beta_i^2}(\alpha_i - \gamma_i) \right]$$

$$= d_i m_i \left[-\frac{1}{2\beta_i^2}(\alpha_i - \gamma_i)^2 + \frac{1}{c\beta_i^3}(\alpha_i - \gamma_i)^2 - \frac{1}{c\beta_i^2}(\alpha_i - \gamma_i) p_i \right] \tag{26}$$

Differentiating this equation with respect to p_i we get the following:

$$F_{\beta_i p_i} = -\frac{d_i m_i}{c\beta_i^2}(\alpha_i - \gamma_i) < 0 \tag{27}$$

$$\text{and } F_{\beta_i p_k} = 0 \ \forall \ k \neq i \tag{28}$$

Thus, $\frac{\partial p_i^*}{\partial \beta_i}$ is negative.

APPENDIX C

COMPARATIVE STATIC RESULTS IN CASE OF EQUAL PAYMENTS

This appendix develops a function of voters' economic rent discussed for a case when the Congress optimal payments (p_i^{C*}) are equal to the voters optimal payments (p_i^{V*}), and proves that comparative static results in this case are the same as derived in Chapter 4.

Then economic rent $r(p_i, \alpha_i)$ now is just the area of triangle A on Figure 9:

$$r(p_i, \alpha_i) = \frac{1}{2}(\alpha_i - \gamma)p_i \tag{29}$$

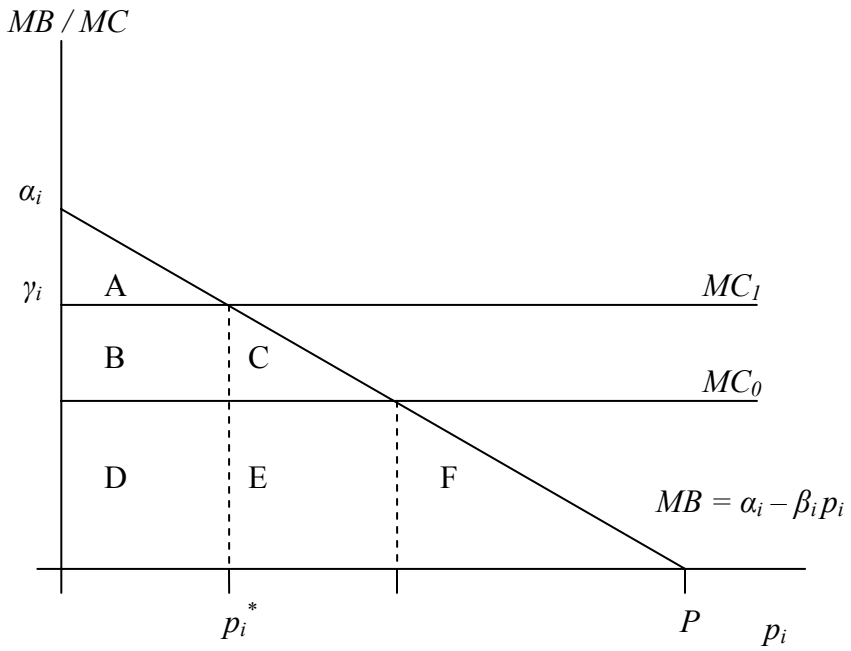

Figure 9. Economic Rent for Equal Optimal Payments.

The comparative static predictions for $\frac{\partial p_i^*}{\partial \alpha_i}$ and $\frac{\partial p_i^*}{\partial x_i}$ can be easily found by following the same derivation technique as in Chapter 4:

$$F_{\alpha_i} = d_i \frac{\partial f}{\partial \alpha_i} = d_i m_i \frac{\partial r}{\partial \alpha_i} = \frac{1}{2} d_i m_i p_i \tag{30}$$

$$F_{\alpha_i p_i} = \frac{1}{2} d_i m_i > 0 \tag{31}$$

$$F_{\alpha_i p_k} = 0 \ \forall \ k \neq i \tag{32}$$

$$F_{x_i} = \frac{1}{2} m_i (\alpha_i - \gamma_i) p_i \frac{\partial d_i}{\partial x_i} = \frac{1}{2} g m_i (\alpha_i - \gamma_i) p_i \tag{33}$$

$$F_{x_i p_i} = \frac{1}{2} g m_i (\alpha_i - \gamma_i) > 0 \tag{34}$$

$$F_{x_i p_k} = 0 \ \forall \ k \neq i \tag{35}$$

APPENDIX D

DISASTER PROGRAMS AND CORRESPONDING BILLS

This appendix contains data on legislation corresponding to the programs considered in this thesis.

Table 8. List of Disaster Programs and Corresponding Bills.

	Program	Act	Public Law	Passage Year
1	Apple and Potato Quality Loss	Appropriations Act (FY2001)	106-387	2000
2	Apple Market Loss Assistance	Appropriations Act (FY2002)	107-76	2001
3	Crop Disaster Assistance	Omnibus Appropriations Act of 1999	105-277	1998
		Appropriations Act (FY2000)	106-78	1999
		Appropriations Act (FY2001)	106-387	2000
		Consolidated Appropriations Resolution (FY2003)	108-7	2003
4	Dairy Disaster Assistance	Supplemental Appropriations and Rescissions Act of 1998	105-174	1998
5	Disaster Program	Supplemental Appropriations Act of 1993	103-50	1993
6	Emergency Conservation	Omnibus Consolidated Rescissions and Appropriations Act of 1996	104-134	1996
		Omnibus Consolidated Appropriations Act of 1997	104-208	1996
		Emergency Supplemental Appropriations Act of 1997	105-18	1997
		Emergency Supplemental Appropriations Act of 1999	106-31	1999
		Consolidated Appropriations Act (FY2000)	106-113	2000
		Emergency Supplemental Act (FY2000)	106-246	2000
		Appropriations Act (FY2001)	106-387	2000
7	Flood Compensation Program	Consolidated Appropriations Act (FY2000)	106-113	1999

Table 8. List of Disaster Programs and Corresponding Bills - continued.

	Program	Act	Public Law	Passage Year
8	Livestock Compensation Program	Consolidated Appropriations Resolution (FY2003)	108-7	2003
9	Livestock Emergency Assistance	Dire Emergency Supplemental Appropriations Act of 1992	102-368	1992
		Emergency Supplemental Appropriations Act of 1997	105-18	1997
		Omnibus Appropriations Act of 1999	105-277	1999
		Emergency Supplemental Appropriations Act of 1999	106-31	1999
		Appropriations Act (FY2000)	106-78	1999
		Appropriations Act (FY2001)	106-387	2000
		Consolidated Appropriations Resolution (FY2003)	108-7	2003
10	Livestock Indemnity Program	Emergency Supplemental Appropriations Act of 1999	106-31	1999
11	Marketing Loss Assistance	Omnibus Appropriations Act of 1999	105-277	1998
		Appropriations Act (FY2000)	106-78	1999
		Supplemental Authorization Bill (FY2001)	107-25	2001
12	Nursery Losses in Florida	Consolidated Appropriations Act (FY2000)	106-113	1999
13	Pasture Flood Compensation	Agriculture Risk Protection Act of 2000	106-224	2000
14	Quality Losses Program	Appropriations Act (FY2001)	106-387	2000
15	Sugar Beet Disaster Program	Consolidated Appropriations Resolution (FY2003)	108-7	2003
16	Supplemental Tobacco Loss	Supplemental Authorization for Agriculture (FY2001)	107-25	2001
17	Tobacco Loss Assistance	Consolidated Appropriations Act (FY2000)	106-113	1999
		Appropriations Act (FY2000)	106-78	1999

APPENDIX E

ADDITIONAL EMPIRICAL RESULTS

This appendix contains additional empirical results discussed in Chapter 6.

Robust regressions were used to correct for the heteroscedasticity problem.

Table 9. Additional Robust Regression Results for Crop Programs.
(Years Not Pooled)

	(1) Payment/PA	(2) %Payment/CR	(3) Payment/PA	(4) %Payment/CR
Constant	-280.4	-2858.1***	-941.1	-691.4
	(-0.19)	(-4.63)	(-0.41)	(-0.99)
ROA (per PA or % of CR)	-7.1**	-57.7***	-7.1**	-45.3***
	(-2.31)	(-6.87)	(-2.51)	(-5.61)
Swing State	-369.3	-28.7	-111.9	28.5
	(-0.83)	(-0.13)	(-0.28)	(0.16)
Loyal-to-Party-in-Power State	307.3	29.6	232.3	32.8
	(0.56)	(0.11)	(0.40)	(0.15)
Highest Senator Seniority (Years)	40.6	4.8	41.4*	8.7
	(1.48)	(0.50)	(1.67)	(1.07)
Number of State's Senators	-372.7	38.5	-364.9	69.0
in Majority Party	(-1.31)	(0.31)	(-1.51)	(0.69)
State Population (Millions)	-16.9	11.6	-13.8	19.5
	(-0.35)	(0.84)	(-0.30)	(1.43)
State Number	108.7***	58.1***	269.9***	95.1***
	(6.70)	(6.89)	(7.04)	(6.89)
State Unemployment Rate (%)	-87.3	74.7	97.3	65.4
	(-0.39)	(1.05)	(0.28)	(0.81)
State Farm Population (%)	-261.6***	117.8***	-218.6***	151***
	(-4.36)	(4.01)	(-3.96)	(6.50)
Program Dummies	No	No	Yes	Yes
Year Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	7.64	8.20	11.04	10.31
P-value for F-test	0.0000	0.0000	0.0000	0.0000
R-squared	0.0930	0.1628	0.2521	0.4915

Notes: PA = 1000 planted acres; CR = cash receipts; t-statistics for 2-tailed tests in parentheses; N = 854; ROA in 2000 dollars per 1000 planted acres for columns (1) and (3), in % of CR for columns (2) and (4); *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 9. Additional Robust Regression Results for Crop Programs - continued.
(Years Not Pooled)

	(5) Time (Days)	(6) Time (Days)
Constant	93.4* (1.76)	233.5*** (27.82)
ROA (% of CR)	2.3*** (6.99)	0.16** (2.48)
Swing State	26.5** (1.97)	-0.27 (-0.13)
Loyal-to-Party-in-Power State	49.2*** (3.22)	-0.63 (-0.29)
Highest Senator Seniority (Years)	-0.6 (-0.93)	-0.02 (-0.17)
Number of State's Senators in Majority Party	-16.1** (-2.13)	0.29 (0.26)
State Population (Millions)	-2.1** (-2.30)	0.04 (0.26)
State Number	-0.7 (-0.77)	-0.44*** (-3.99)
State Unemployment Rate (%)	46.9*** (10.25)	-0.19 (-0.21)
State Farm Population (%)	2.6* (1.73)	0.04 (0.19)
Program Dummies Year Dummies	No No	Yes Yes
F-test for 6 Political Variables P-value for F-test	3.26 0.0035	6.55 0.0000
R-squared	0.1778	0.9789

Notes: CR = cash receipts; t-statistics for 2-tailed tests in parentheses; N = 854;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 9. Additional Robust Regression Results for Crop Programs - continued.
(Years Not Pooled)

	(7) Payment/PA	(8) %Payment/CR	(9) Payment/PA	(10) %Payment/CR
Constant	26.9	-2828.5***	-708.8	-658.6
	(0.02)	(-3.98)	(-0.35)	(-0.93)
ROA (per PA or % of CR)	-7.1**	-57.7***	-7.1**	-45.3***
	(-2.31)	(-6.87)	(-2.51)	(-5.61)
Swing State	-676.6	-58.4	-344.2	-4.2
	(-1.23)	(-0.21)	(-0.69)	(-0.02)
Loyal-to-Other-Party State	-307.3	-29.6	-232.3	-32.8
	(-0.56)	(-0.11)	(-0.40)	(-0.15)
Highest Senator Seniority (Years)	40.6	4.8	41.4*	8.7
	(1.48)	(0.50)	(1.67)	(1.07)
Number of State's Senators in Majority Party	-372.7	38.5	-364.9	69.0
	(-1.31)	(0.31)	(-1.51)	(0.69)
State Population (Millions)	-16.9	11.6	-13.8	19.5
	(-0.35)	(0.84)	(-0.30)	(1.43)
State Number	108.7***	58.1***	269.9***	95.1***
	(6.70)	(6.89)	(7.04)	(6.89)
State Unemployment Rate (%)	-87.3	74.7	97.3	65.4
	(-0.39)	(1.05)	(0.28)	(0.81)
State Farm Population (%)	-261.6***	117.8***	-218.6***	151***
	(-4.36)	(4.01)	(-3.96)	(6.50)
Program Dummies	No	No	Yes	Yes
Year Dummies	No	No	Yes	Yes
F-test for 6 Political Variables	7.64	8.20	11.04	10.31
P-value for F-test	0.0000	0.0000	0.0000	0.0000
R-squared	0.0930	0.1628	0.2521	0.4915

Notes: PA = 1000 planted acres; CR = cash receipts; t-statistics for 2-tailed tests in parentheses; N = 854; ROA in 2000 dollars per 1000 planted acres for columns (7) and (9), in % of CR for columns (8) and (10); *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

Table 9. Additional Robust Regression Results for Crop Programs - continued.
(Years Not Pooled)

	(11) Time (Days)	(12) Time (Days)
Constant	142.6*** (2.57)	232.8*** (27.43)
ROA (% of CR)	2.3*** (6.99)	0.16* (2.48)
Swing State	-22.7 (-1.55)	0.34 (0.15)
Loyal-to-Other-Party State	-49.2*** (-3.22)	0.63 (0.29)
Highest Senator Seniority (Years)	-0.6 (-0.93)	-0.02 (-0.17)
Number of State's Senators in Majority Party	-16.1** (-2.13)	0.29 (0.26)
State Population (Millions)	-2.1** (-2.30)	0.04 (0.26)
State Number	-0.7 (-0.77)	-0.44*** (-3.99)
State Unemployment Rate (%)	46.9*** (10.25)	-0.19 (-0.21)
State Farm Population (%)	2.6* (1.73)	0.04 (0.19)
Program Dummies	No	Yes
Year Dummies	No	Yes
F-test for 6 Political Variables	3.26	6.55
P-value for F-test	0.0035	0.0000
R-squared	0.1778	0.9789

Notes: CR = cash receipts; t-statistics for 2-tailed tests in parentheses; N = 854;
*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.