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PRIVATE STRATEGIES, PUBLIC POLICIES & FOOD SYSTEM PERFORMANCE

A Model of the Intra/Interstate
Impacts of State Product Regulation

by

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A MODEL OF THE INTRA/INTERSTATE IMPACTS OF STATE PRODUCT REGULATION

State regulation of firms' business activities and products poses a serious threat to maintenance of a national market for goods and services in the United States. In the food sector, this threat has grown in the 1980s as several states have become more active in regulating food safety, pesticide residues, advertising, and selling practices. Other sectors are similarly experiencing an increase in state regulatory activity. On the positive side, state regulation may significantly contribute to the health and welfare of state residents. This paper first describes the legal environment that constrains state regulation. It then develops a general model for analyzing the desirability of state regulation by quantifying the size and incidence of benefits and costs. An application of the model to food sector regulation indicates that patterns of production, distribution, and regulatory followership (i.e., adoption of a state standard by out-state parties) are important factors in determining the size and incidence of benefits and costs.

The Legal Environment of State Regulation

Under the American federal system, the legitimacy ascribed to state regulations, and therefore their ultimate legality, depends on their purpose and effects. Traditional legitimate purposes for state regulation are protection of the health and welfare of state residents and protection of the environment (Pierce 1985). Regulation that protects one set of in-state interests against another, although it may be rent-seeking in nature (Craig and Sailors 1988, Buchanan et al. 1980), is also generally legitimate from the federal government's point of view since it is assumed that the political

process within the state will assure a reasonably equitable program. State regulation that is motivated by an intention to discriminate in favor of in-state versus out-state interests, however, runs afoul of the commerce clause of the Constitution and is likely to be found illegal by the courts (Smith 1986, Regan 1986).

In addition to limits placed on state regulation by the courts' interpretation of the commerce clause, the scope of state action may also be constrained by the federal government's preemption of specific areas of regulation. Under the supremacy clause of the Constitution, Congress has a very broad ability to circumscribe state activity by simply declaring its intent to do so. Even where such an intent has not been expressly stated, the courts may find that state action is implicitly preempted by federal law. When state regulations are challenged on the basis of preemption, their purpose and effect are again important issues as the courts attempt to determine the degree of conflict between federal and state regulatory activity.

Court judgments on the legality of state regulations based on their purpose can be difficult to make. The expressed reasons for state regulation may differ from the real purpose of the action. This problem is evident, for example, in the record of the prominent case of Hunt v. Washington State Apple Advertising Commission.[1] In this case, Washington state apple producers challenged a North Carolina regulation forbidding the sale of apples in closed cartons bearing nonfederal grades (Smith 1986, Regan 1986, Farber 1986). The state said its purpose was to protect consumers from confusion and deception due to the use of diverse state and federal grading systems. Washington

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[1] 432 U.S. 333 (1977).

producers argued that its real purpose was to deprive them of the competitive advantage they had gained by developing their own grading system (Smith 1986, p. 1242). The Court was faced with deciding whether the regulation was legitimate consumer protection as claimed by the state or had a purpose of protecting in-state economic interests at the expense of out-state interests. In making its judgement, the Court also had to decide to what extent evidence on the regulation's realized effects should be used to ascertain its 'true' purpose. The complexity of these cases and the reluctance of the courts to second guess state legislative purpose confounds the ability of the courts to limit burdens on interstate commerce created by state regulatory actions.

A review of the legal precedents governing the relationship between federal and state regulatory authority is beyond the scope of this paper (see Smith 1986, Regan 1986, Pierce 1985, Rothschild 1984, Downey 1979, Smith 1978). This discussion suggests, however, the need for a comprehensive approach for evaluating the appropriateness of state regulations. Here a general economic model of the intra- and interstate impacts of state regulation is developed that would be useful in court cases as well as in Congressional deliberations on whether to preempt state regulation of an area of economic activity. The premise of the model is that the appropriateness of a particular state regulation, regardless of its expressed purpose, should be judged by the size and incidence of its effects.

A Model for Assessing the Benefits and Costs of State Regulation

The model is designed to be useful in judging the appropriateness of state regulation of a particular area of economic activity. In its general form, the model may be used for a variety of policy analysis purposes. Here it will be applied to develop a spillover model to judge the appropriateness

of state versus federal product regulation. The specific application is the case of a state regulation on pesticide residues in processed foods that is more stringent than that of the federal government. In the 1980s, this particular type of state regulation has been a center of controversy among farmers, growers, processors, consumers, and regulators. Such action was taken by several states in 1983-84 with respect to ethylene dibromide residues in food (O'Reilly 1984b) and by Massachusetts in 1986 with respect to daminozide (Alar^{tm}) residues in heat processed apple products (Ackerman 1986).

A state regulation generates a stream of benefits and costs to in-state and out-state interest groups. These benefits and costs may be short- or long-run. Here the short run is defined as the period following imposition of the regulation during which interest groups (including private parties and state and federal government) adjust their behavior to the new regulation but no new regulatory response is made. The long run is defined as the period during which other states or the federal government alter their regulations in response to the originating state's action. Over time a new regulatory equilibrium will often be reached. If other governmental units make no regulatory response to the original action then the short- and long-run effects are equal.

Let the total short-run benefits (SB) be expressed as:

$$SB = \sum_{i=1}^{2} \sum_{j=1}^{n} sb_{ij} \qquad (1)$$

where sb_{ij} are the benefits accruing to a particular interest group j ($j = 1,2,\ldots,n$) and the i subscript indicates whether the interest group is in-state ($i=1$) or out-state ($i=2$). Thus total short-run, in-state benefits (SB_1) are:

$$SB_1 = \sum_{j=1}^{n} sb_{1j} \qquad (2)$$

and total short-run, out-state or spillover benefits (SB_2) are:

$$SB_2 = \sum_{j=1}^{n} sb_{2j} \qquad (3)$$

Short-run total costs (SC) can be expressed in similar form as:

$$SC = \sum_{i=1}^{2} \sum_{j=1}^{n} sc_{ij} \qquad (4)$$

Long-run total benefits (LB) are expressed in the same form as SB (equation 1) with individual interest group benefits denoted lb_{ij}. Long-run total costs (LC) are expressed in the same form as SC (equation 4) with individual interest group costs denoted lc_{ij}. In all cases, benefits and costs are measured on the basis of their present value.

This model allows total flexibility for performing analyses of the benefits and costs of a state regulation. For example, a policy analysis of the internal impact of a state regulation would focus on comparing SB_1 (total short-run, in-state benefits) to SC_1 (total short-run, in-state costs). Likewise, net benefits (benefits minus costs) can be computed for all states or for individual interest groups in-state, out-state, or nationwide. The model's detail can also be increased, if desired, by expanding the i subscript to track out-state effects on a state by state basis. A complete implementation of the model may not be feasible in many policy analysis situations due to the considerable data requirements. However, the model remains useful, even if used in attenuated form, because it helps to organize thinking about the full scope of a regulation's impact. In the next section, the model is applied to suggest criteria for evaluating the impacts of state regulation.

Spillover Criteria for Evaluating State Regulation

The general model presented provides a framework for analyzing the appropriateness of state versus federal regulation. This application is termed a spillover model because it focuses on the degree to which the benefits and costs of a state regulation accrue to in-state versus out-state interest groups.

Criteria for assessing the appropriateness of a state regulation should, at minimum, recognize that the major advantage of state regulatory authority lies in its ability to tailor programs to the needs and desires of in-state residents. However, this advantage is a double-edged sword. If a state, responding to the demands of its residents, designs a regulation with benefits and/or costs that spill over into other states, then the originating state's actions will impinge on the other states' ability to deliver the degree of regulation desired by their residents. Thus the criteria used to assess a state regulation should focus primarily on the balance of in-state versus out-state benefits and costs generated by the regulation. Due to the difficulty involved in estimating the long-run benefits and costs of a state regulation (see next section), the criteria discussed here focus on short-run impacts.

A simple criteria would be to allow state regulation in cases where there is no spillover ($SB_2 = SC_2 = \emptyset$) or net spillover is positive ($SB_2 > SC_2$). This criteria would assure that a state regulation does not have a negative net impact on other states. But it may be both too restrictive and not restrictive enough. Consider two examples where spillovers exist: 1) a state regulation that simultaneously produces positive in-state net benefits ($SB_1 > SC_1$) and positive out-state net benefits ($SB_2 > SC_2$) and 2) a

state regulation that produces large positive in-state net benefits ($SB_1 > SC_1$) and small negative out-state net benefits ($SB_2 < SC_2$).

In the first case, the regulation would be judged appropriate under the simple criteria since out-state parties are not negatively affected on balance. Yet, they are having regulation imposed from outside at a level different from that demanded through their own state political processes. Furthermore, out-state parties may be experiencing a less favorable ratio of benefits to costs than is experienced in-state. Thus the simple criteria is not restrictive enough because it does not consider the absolute size or relative incidence of in- versus out-state benefits and costs.

In the second case, the regulation would be judged inappropriate because the net spillover is negative. But the large size of in-state net benefits may justify the imposition of a small negative spillover on out-state residents. Thus the simple criteria may prove to be too restrictive as well. Unfortunately, this criteria does not represent much of an improvement over the traditional court decision process of examining state purpose to judge the appropriateness of a state law. While it does provide potential empirical measures of a regulation's impact, it is not a reliable decision criteria.

An alternative criteria might be based on the relative incidence of in- and out-state benefits and costs. This type of criteria is suggested by Pierce's (1985) statement that:

> States should have the power to regulate conduct unless such regulation has the potential to create substantial disproportionate positive or negative interstate spillover (p. 657).

As was true under the simple criteria discussed above, this incidence criteria should allow state regulation in cases where there is no geographic spillover. In addition, it would find state regulation appropriate in cases

where in-state parties experience an equal proportion of the benefits and costs of the regulation. In terms of the spillover model, this is equivalent to requiring that in-state benefits as a percentage of total benefits equal in-state costs as a percentage of total costs or:

$$\frac{SB_1}{SB_1 + SB_2} = \frac{SC_1}{SC_1 + SC_2} \qquad (5)$$

If this equality holds, then the percentage of total benefits experienced by out-state parties will also equal their percentage of total costs.

To a degree this criteria preserves and protects the state's ability to tailor programs to state needs. It allows those regulations that affect the state alone (i.e., cases where both sides of equation 5 are 100%). The criteria does not provide complete protection against burdens on interstate commerce, however, since it allows state regulations involving spillover as long as in-state residents experience an equal proportion of total benefits and costs (e.g., cases where both sides of equation 5 are 70%). It does rule out state regulations where most of the benefits occur in-state and most of the costs are exported (e.g., cases where 70% of the total benefits and 30% of the total costs are in-state). An underlying premise of this criteria is that requiring the ratio of benefits to costs to be the same in- and out-state will protect both sets of residents against unreasonable regulations since in-state residents will block regulations whose costs exceed their benefits.

Like the first rule, the alternative criteria suffers from being both too restrictive and not restrictive enough. It is too restrictive because very few if any regulations will meet the criteria's requirement of strict equality of the proportion of total benefits and costs that are in-state. The

criteria could be relaxed to allow some range of acceptable deviation from equality (e.g., the percentage of total benefits that are in-state is within $\pm$ 10% of the percentage of total costs that are in-state). Yet the relaxed criteria still suffers from not being restrictive enough because it ignores the size of the spillover benefits and costs. For example, it would allow a regulation where 10% of benefits and costs are in-state while 90% of each are out-state. Even where this is not the case (e.g., only 5% of both benefits and costs are out-state), the absolute size of the exported benefits and costs may raise questions about the appropriateness of a state regulation.

Both criteria have a similar limitation in that they do not simultaneously consider 1) the relative in- and out-state incidence of a state regulation's benefits and costs, and 2) the absolute size of the spillover of benefits and costs to other states. Further development of criteria to judge the appropriateness of state regulations will need to integrate these two considerations. Factors that are likely to affect the incidence and size of spillovers from state food product regulation are considered in the next section.

A Spillover Model Application to State Food Product Regulation

In recent years, states have become more active in regulating food product quality and safety. The use of the spillover model to assess this type of regulation is illustrated here by analysis of a state regulation that imposes a more stringent pesticide residue standard for processed food products sold within the state than that of the federal government. In the application, the pesticide is assumed to be used at the farm level. A recent example of such a regulation is Massachusetts' 1986 restrictions on residues of daminozide (Alar^{tm}) in heat processed apple products.

The spillover model focuses on the size of benefits and costs of a state regulation that accrue to in- versus out-state interest groups in the short and long run. The short run is defined as the period following imposition of the regulation during which interest groups adjust their behavior to the new regulation but no new regulatory response is made.

The potential sources of short-run benefits (SB) and costs (SC) of a state pesticide residue standard are listed in Table 1. These benefits and costs are broken down between in-state and out-state interest groups. It is evident from this table that the impacts of such a regulation are complex and sometimes contradictory in nature. This point is returned to below.

Close analysis of the regulatory impacts listed indicates two considerations that are crucial to determining the magnitude of the short-run spillover impacts of a state food regulation. These considerations are 1) the pattern of production and distribution of the affected raw and processed food products and 2) the extent of regulatory followership by private parties.

As might be expected, the pattern of production and distribution of the raw and processed products covered by a regulation directly affects the size of short-run spillovers. If the product is mostly produced, processed, marketed, and consumed in-state then spillovers will be relatively small since the entire output of the farm or processing unit can be altered to meet the new regulation. However, if producers, processors, or distributors operate across state lines then spillovers are inevitable.

Firms with multi-state operations can respond to the regulation in three ways. First, they may decide not to operate in the state with the new, stricter regulation. This choice is unlikely for most firms, especially

Table 1. Potential Short-Run Benefits and Costs of a State Regulation on Pesticide Residues in Processed Food Products.

Interest Groups	Potential Benefits	Potential Costs
1. In-state		
Input Suppliers	Increased sales of substitute inputs	Lost sales of pesticide Unsalable inventories
Farmers/Growers	Higher price for pesticide-reduced product More sustainable growing practices	Smaller crop Lower quality crop Changes in growing, harvesting, and storage practices Increased transportation costs to out-state markets
Food Processors	Higher in-state price for product meeting state reg. Higher price for pesticide-reduced product in non-reg. states	Higher input costs Lack of inputs (quality or quantity) Unsalable inventories Dual processing Dual inventories
Food Distributors	Higher in-state price for product meeting state reg. Higher price for pesticide-reduced product in non-reg. states	Higher product costs Lack of product (quality or quantity) Unsalable inventories Changes in distribution practices Dual inventories Dual distribution channels
Consumers	Better health Longer life	Higher price Less variety Shorter shelf-life
State Government	Lower medical program costs	Program administration
2. Out-state		
Input Suppliers	Increased sales of substitute inputs	Lost sales of pesticide Unsalable inventories

Table 1. (cont.) Potential Short-Run Benefits and Costs of a State Regulation on Pesticide Residues in Processed Food Products.

Interest Groups	Potential Benefits	Potential Costs
2. Out-state (Continued)		
Farmers/Growers	Less competition from reg. state growers Higher price for pesticide-reduced product More sustainable growing practices	Narrower selling market Smaller crop Lower quality crop Changes in growing, harvesting, and storage practices
Food Processors	Higher price for product sold in reg. state Higher price for pesticide-reduced product sold in nonreg. states	Higher input costs Lack of inputs (quality or quantity) Unsalable inventories Dual processing Dual inventories
Food Distributors	Higher price for product sold in reg. state Higher price for pesticide-reduced product sold in nonreg. states	Higher product costs Lack of product (quality or quantity) Unsalable inventories Changes in distribution practices Dual inventories Dual distribution channels
Consumers	Better health Longer life	Higher price Less variety Shorter shelf-life Information search to gauge product safety
State Governments	Lower medical program costs Lower administration costs	Coordination of programs with reg. state
Federal Government	Lower medical program costs Lower administration costs	Coordination of programs with reg. state

where the state is an important market. Second, firms in the industry may pursue a dual product strategy producing separate products for the regulated state and the rest of the country. If they do so, industry and consumers (providing the cost can be passed on) must bear the costs of any losses in economies of scale due to the dual product system. Finally, the industry may avoid losses of economies of scale by opting to produce a single product that meets the more stringent standard and selling it in all markets. This response is labeled private party regulatory followership since it occurs when firms follow a regulating state's lead. In adopting a single product strategy, firms impose the more stringent standard outside the jurisdiction of the regulating state, thus increasing the spillover impact of the regulation. In this case, consumers in other states, as a group, get and pay for more regulation than they demanded through their own state governments.

The geographical pattern of industry operation and the relative costs of dual versus single product strategies will determine the degree of private party regulatory followership in response to a state product regulation. Two examples from Table 1 illustrate the importance of these factors in determining a regulation's impact. With a newly imposed, more stringent state residue standard, in-state input suppliers may experience a decrease in sales of the pesticide in question and an increase in the sale of substitute inputs. However, if most of the state's raw product is sold to processors who sell outside the state then these input suppliers may see no change in sales. Out-state input suppliers may experience no change in demand or, potentially, a complete disappearance of the market for the pesticide if regulatory followership is extensive.

The impact on consumers is equally dependent on patterns of production and followership. In-state consumers will presumably experience better health and a longer life due to consuming products with lower pesticide residues but may pay higher prices and have less product choice. Consumers in other states may experience no change if a dual product strategy in pursued by the industry and economies of scale are not significant or may receive the same distribution of benefits and costs as consumers in the regulating state. Alternatively, products with both levels of pesticide residue may appear in out-state markets requiring consumers to expend time gathering safety information to base their product choice on.

In this model, the long-run benefits and costs of a state regulation are similar to the short-run effects but different in source. The distinction is that the long run allows followership behavior by other states and the federal government, while the short run does not. In the short run, as noted, private party followership may result in a state regulation having broader than statewide effect. If other states or the federal government pass similar regulations, this broad impact becomes formalized in the long run.

Other governmental units may adopt similar standards for a variety of reasons. First, they may simply recognize the wisdom of the regulation. Second, they may want to reduce problems associated with regulatory diversity across states. In the case of regulatory followership by other states, Rice (1985) argues that less protective states will tend to adopt the more protective state's regulatory position in order to stem the redistributive effects of unequal regulation. He argues that companies operating under diverse regulations will pool their costs across states and charge uniform prices. Under this scenario, and assuming a dual product system, consumers in

less protective states pay for protection they do not receive while those in the more protective state do not pay the full cost of protection. In the long run, other states have an incentive to adopt more protective regulation in order to end this redistribution.

Regulatory followership by the federal government may be motivated by a desire to reduce spillover effects and burdens on interstate commerce created by state regulation. In theory, federal preemptive action to establish or reestablish a uniform national market could set a standard that is more lenient than, the same as, or more stringent than that of the originating state. In practice, however, Congress and the federal agencies find it politically difficult to preempt state regulation with less protective federal programs (Foote 1984, O'Reilly 1984a). Thus if there is a long run federal reaction to state activity it usually involves adoption of the same or a more stringent standard.

Estimation of the long-run benefits and costs of a state regulation is inherently complex because it is difficult to judge whether other governmental units' actions are attributable to regulatory followership or other factors. For example, research findings on risk may carry much more weight in their decision process than perceived problems with regulatory spillovers. This difficulty reduces the accuracy of estimates of the long-run benefits and costs of a state regulation to the extent that they are probably of limited usefulness. Thus criteria for evaluating the appropriateness of state regulation over an area of economic activity should, as the earlier section does, focus on the short-run (as defined here) benefits and costs of such regulation.

As state regulatory activism increases in the food and other sectors, close scrutiny of the spillover impacts of new regulations is needed. In the case of food product regulation, the size of the spillovers are likely to depend on patterns of production, distribution, and regulatory followership. The economic model and criteria developed here are useful in guiding the tradeoff necessary in our federal system between the state's right to pass regulations protecting the health and welfare of its residents and the country's right to maintain a uniform, national market free of burdens on interstate commerce.

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PRIVATE STRATEGIES, PUBLIC POLICIES & FOOD SYSTEM PERFORMANCE

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