# THE EFFECT OF STATE ENTRY REGULATION ON RETAIL AUTOMOBILE MARKETS

by

Robert P. Rogers

Bureau of Economics Staff Report
to the Federal Trade Commission

January 1986

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SUMMARY

Between 1963 and 1984, thirty-six states passed laws restricting the establishment of new automobile dealerships in the vicinity of present dealers selling cars of the same make. Determining the effects of these regulations on economic efficiency and on the price of automobiles is important because so many states have adopted them and the industry is such a large one. It is the purpose of our study to estimate these effects.

Economic theory suggests two hypotheses about when these regulations, often called Relevant Market Area (RMA) or entry laws, would increase price and decrease output in a market. First, prices may rise in those markets with the entry-restricting laws where individual dealers have some market power. Second, prices may rise in those restricted markets where the demand for automobiles is growing.

Individual auto dealers could have some market power, and therefore have some ability to price above cost, in areas where there are so few firms in the market that some form of collusion is possible. They could also have market power even in a large-numbers market if the individual dealers face downward sloping demand curves due to location and/or some other source of product differentiation.

In order to attract and keep good dealers, manufacturers will want to provide them with the opportunity to earn a reasonable rate of return. Where dealer market power exists, however, it will not always be in the interest of the manufacturer to allow its dealers to charge profit-maximizing prices. Thus, the manufacturer will seek to limit the ability of his franchisees to develop independent pricing strategies. One way in which this could be done is by threatening to establish new dealers in competition with an existing dealer if he does not operate as the manufacturer wishes.

If the threat of establishing new dealers provides a significant constraint on dealer pricing behavior, the RMA laws could have an effect in either the collusion or product differentiation situations. By removing or lessening the threat of new entry, the laws would limit the ability of the manufacturer to control the behavior of his franchisees. This would increase the market power of the incumbent dealers thereby allowing them to charge relatively high prices and possibly garner above-normal profits.

In the rapidly growing areas (the second general situation), the RMA laws could benefit dealers through another mechanism. In this kind of area, the manufacturers may find it optimal to establish new franchises to handle the increased demand. If this process were frustrated, or at least partly frustrated, by the entry laws, excess demand would be created for the existing dealers allowing them to increase their sales volume. When the established dealers increase output, they may find that their average cost rises. This would cause them to increase price. While the market supply curve may be flat if the number of dealers is variable, it could very well be upsloping when the number of dealers is held constant or at least held close to constant. If the market supply curve is positively sloped, the established dealers could earn economic rents or profits even under a competitive pricing situation. This could occur because the price would be equal to marginal cost, the cost of producing and selling the last vehicle, and with rising dealer cost it would be above average cost.

The RMA laws may benefit dealers through this rising-cost mechanism not only in a competitive market but also in a market where price is already greater than marginal cost. Although the dealer market power would remain unchanged in these instances, the entry laws would increase the already positive difference between price and average cost. Furthermore there may be situations in which both mechanisms are at work; here the RMA laws would both result in firms operating further up on the rising portions of their cost curves and also facilitate collusion and/or permit certain dealers to more fully exercise any location or product differentiation advantages that they may enjoy. Consequently, under the laws, prices could rise due to either increasing dealer market power or dealer-rent-creating higher costs, and in some areas, both mechanisms may be operating at the same time.

The RMA laws will not necessarily totally preclude the establishment of new dealerships in growing areas. Rather, beyond some level of growth, the manufacturer may find the gains from establishing one or more new outlets are so great that it will incur the transactions costs involved in obtaining approval for those new dealerships. This could involve persuading an existing dealer to not object to a new dealership. Presumably, a dealer would be willing to agree not to object in response to a sufficient payment from the manufacturer. Alternatively, the manufacturer may be able to get permission to establish a new dealership by petitioning the body that enforces the RMA law. To the extent manufacturers are successful in these efforts, new entry will mitigate the rise in price in response to growing demand.

If the RMA laws either enhance the exercise of dealer market power or cause the costs of the auto dealer function to rise, the result is reduced efficiency in the dealership network.[1] Not only do the laws transfer wealth to the dealers, they also result in output reductions and consequently in social welfare losses. Because the laws result in higher prices in those areas where the laws have an effect, they reduce sales and output in those areas. If the laws cause costs to increase in high growth areas, the result is increased resources being expended for each vehicle sold.

In this study, we estimate a cross-sectional supply and demand equation system for local automobile dealer markets. This approach is similar to those of earlier studies by Smith and Eckard, but in order to better reflect reality, we add two refinements.[2] First, we use a statistical technique that takes into account the possibility that conditions in the auto retail market could affect the likelihood of these laws

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[1] In addition to laws restricting where new dealerships can be established, laws that restrict the manufacturer's ability to require his dealers to sell certain quantities of vehicles and laws that increase the difficulty a manufacturer faces in attempting to terminate a poorly performing dealer are apt to reduce the efficiency of the dealer network. The effects of these additional types of laws are discussed in the report at pages 63-66.

[2] See Eckard, E. W., Jr. "The Effects of State Automobile Dealer Entry Regulation on New Car Prices," Economic Inquiry, Vol. XXIV, No. 2 (April 1985), p. 223-42, and Smith, R. L. "Franchise Regulation: An Economic Analysis of State Restrictions on Automobile Distribution." Journal of Law and Economics Vol. XXV (April 1982), p. 125-57.

being passed. With this methodology, we arrive at consistent estimates for the influence of the entry laws. This type of analysis includes not only variables reflecting conditions in the retail automobile market but also those indicating the ability of dealers to influence the political process. In the latter group are variables that depict both the comparative political strengths of the dealers and/or their opponents and the attributes of the state government that might help or hinder the passage of the laws.

The second refinement allows us to test whether the entry law impact varies with population growth. To do this, we add to the analysis a set of variables that interact the RMA law presence with absolute population growth.

In what follows, we give the reader some estimates of the impacts of the RMA laws. These estimates are based on data for each of nine Chevrolet body-types for the year, 1978.[3] We employed Chevrolet data in our analysis because Chevrolet is the largest selling brand of automobile in the U.S. with a wide range of models or car-types. By focusing on Chevrolet, we were able to limit the amount of data collection and processing

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3 The year 1978 was used because at the time the study was designed, data were not available for any subsequent year in which the auto market was not undergoing major dislocations due to oil price changes and/or the business cycle.

work while still obtaining results that are indicative of the general impact of the RMA laws.

Table I displays estimates of the impact of the RMA laws for each of nine body-types produced by Chevrolet. The estimates are for the thirteen states where the laws had been in place for at least two years as of 1978. The two year cut-off is used because it was found that some time is needed for the impact of the laws to be fully felt in the marketplace.

The first two columns show, respectively, the average RMA-law-induced percentage price increases in the growing sample areas and these average increases over the whole set of observations. Our results indicate that increasing population growth leads to greater RMA effects. In areas where population had increased since the passage of an RMA law, our estimates of the effect the RMA laws had on the average price of a new Chevrolet range from 3.68 percent for the Sportvan to 16.82 percent for the Corvette. We estimate that the RMA laws caused the average price across all nine models to increase by 7.63 percent.[4] Averaging across all areas, including those with zero or negative population growth, the estimated average price effects ranged

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4 While this is our best estimate of the price effect, it is only an estimate. The effect could be smaller or larger. The 99 percent confidence interval for this average runs from 2.56 percent to 12.09 percent.

from 2.22 percent for the Sportvan to 13.82 percent for the Corvette, with an average across models of 6.14 percent.[5] Thus, it appears that the RMA laws raised car prices by a significant amount.

These price increases can be translated into RMA-induced total expenditure increases by Chevrolet car buyers. Using our estimated price effects, we find that total expenditures on Chevrolets was increased by over $132 million (shown by the third column).[6] These payments consist of only the additional money paid by the consumers who actually bought the cars, and they do not include the losses resulting from other consumers being priced out of the market.

The numbers in the fourth column show the estimated effect of the laws on the volume of automobiles sold. The estimated decline in auto volume is quite

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[5] The 99 percent confidence interval on this estimate runs from 1.64 percent to 10.05 percent. The average increase in the growing areas is significantly above zero for all body-types except the Sportvan, while the price impact averaged over all areas with an RMA law is statistically significant for all models except the Sportvan and the Nova. Both averages across models are significant at the 99 percent level. Examination of the regression coefficients reported in the study shows that the effect of growth on the RMA impact is also statistically significant.

[6] Of course, if the actual price effect is smaller (larger) than this estimate, the increased consumer expenditures as a result of the law, as well as all of the other welfare measures discussed below, will be smaller (larger) than we estimate.

large. Sales of all nine Chevrolet models are estimated to be 18,513 vehicles lower than they would have been were there no RMA laws. This is 4.5 percent of total Chevrolet sales in the thirteen states in which there was an effective law in 1978.

Minimum estimates of the deadweight loss to society resulting from the Relevant Market Area laws are found in the fifth column of the table. The deadweight loss resulting from these laws is the difference between the costs the laws impose on consumers and the increase in profits earned by the auto dealers. We estimate that this cost amounts to at least $9.8 million dollars per year for the nine Chevrolet models.[7]

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[7] Two different estimates of the costs of the RMA laws are provided in the text of this report. They are based on different assumptions about the elasticity of demand for automobiles. The more conservative estimates are the ones presented here.

The estimates of the societal cost of the laws understate the actual social costs for at least two reasons. First, if the RMA laws cause the cost of providing dealer services to rise, these increased costs are additional costs to the economy resulting from the RMA laws. Second, the costs incurred in convincing state legislatures to enact the laws are also societal costs resulting from the laws. (For discussions of this type of rent-seeking expenditure, see J. M. Buchanan and G. Tullock, Toward A Theory of the Rent-Seeking Society, College Station: Texas A&M University Press, 1980, and R. A. Posner, Antitrust Law, Chicago: University of Chicago Press, 1976) Both of the these factors require resources; and if these resources are used in this way, they are not available to produce other goods and services desired by consumers.

The last column on the table displays our estimates of the total loss to consumers resulting from the RMA laws. These losses combine the losses to consumers who continue to buy new Chevrolets and have to pay a higher price with the losses to consumers who are priced out of the market at the higher price. For the nine Chevrolet models, this total cost to consumers is estimated to be about $142.4 million.

If the laws were in effect in more states, this cost would have been considerably higher. Furthermore the above estimates only take into account the increased prices for the cars in our sample, which consists of the bulk of the Chevrolets sold to non-commercial or non-fleet users in the continental United States. This constitutes about 18 percent of the total U.S. car sales. In the states with RMA laws, the total sample sales were 410,994. If the RMA laws had similar effects on the prices of other cars, then, consumer losses could run into additional hundreds of millions or even billions of dollars.

To give an idea of what these costs might be for all automobile consumers, let us use the following procedure. We start with the 1978 results for Chevrolets in the 13 states where the law had been in place for at least two years. Then we extrapolate to the 36 states that had the law in 1983 and then to the non-Chevrolet cars assuming that the RMA effects for them are the same on average as for the Chevies. Under those assumptions, the total annual consumer cost of the laws would be about $3.2 billion per year in 1985 prices. This figure is a rough indication of the total costs of the current RMA laws.

The entry laws have a significant impact on price in growing areas. These results give support to the growing-area-rising-cost-curve theory, because it predicts a larger RMA effect in such areas. In contrast, if the RMA laws were enhancing the ability of dealers to exercise market power, we would expect prices to rise in those markets where the exercise of market power is possible. We do not expect that these markets would be particularly concentrated among high growth areas. Rather, we would expect to find similar average price increases among high and low growth markets. Since we do not find similar effects independent of growth, we tentatively conclude that the market power theory is rejected.[8] Also refuted is a less plausible

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[8] Of course, if the exercise of market power was more prevalent in high growth areas, then our results would not permit us to differentiate between the enhanced market power and rising cost theories. We are unaware, however, of any theoretical reason to expect a positive correlation between growth and the ability to exercise market power. In addition, we have some empirical evidence that suggests that there is a very low correlation between growth and market power in our data. (See p. 60.)

It may be that the ability to exercise market power is related to the size of the market with market power being greater in small markets. Since there are serious econometric problems in attempting to test whether the effect of the RMA regulations was greater in small markets than in larger ones, we can only tentatively conclude that the market power enhancement story is rejected.

alternative RMA law explanation discussed in the report, the contract failure theory. It would predict a larger RMA impact in low and negative growth areas.

Our analysis, using a model that includes the interplay between the market and the political system and the interaction between population growth and the RMA law impact, suggests that the costs of these entry regulations are much higher-than previously estimated (by Smith and Eckard). Consequently the pay-off from opposing the passage of the laws and from repealing them where they already exist seems to be even greater than we had previously thought. Finally efforts to oppose or repeal these laws should be concentrated on the states containing areas with absolutely large population growth because it is there that the laws appear to have the greatest effect.

Table I

The Impact of the RMA Laws on the Price and Sales of

Chevrolet Cars in 1978

| Body Type | Average Percentage Price Change (For Areas with Positive Growth) | Average Percentage Price Change (For All Areas) | Per Year Increase in Consumer Expenditure (thousands) | Per Year Decrease in Automobile Sales1/ | Per Year Welfare Loss2/ (thousands) | Total Per Year Consumer Loss2/ (thousands) |
|---|---|---|---|---|---|---|
| Regular | 5.90** | 4.17** | $23,456 | 1,417 | $637 | $24,093 |
| Malibu | 14.31** | 12.90** | 38,179 | 5,892 | 2,230 | 40,409 |
| Camaro | 8.43** | 7.12** | 22,587 | 1,243 | 684 | 23,271 |
| Nova | 4.18* | 3.30 | 6,477 | 1,116 | 269 | 6,746 |
| Monte Carlo | 5.30** | 4.14** | 15,398 | 2,055 | 694 | 16,092 |
| Monza | 8.81** | 6.94** | 9,502 | 3,036 | 1,339 | 10,841 |
| Chevette | 5.87** | 4.24* | 7,436 | 2,001 | 595 | 8,031 |
| Sportvan | 3.68 | 2.22 | 785 | 87 | 51 | 836 |
| Corvette | 16.82** | 13.82** | 8,722 | 1,666 | 3,382 | 12,104 |
| Total | 7.63** | 6.14** | $132,542 | 18,513 | $9,881 | $142,423 |

1/ These estimates are based on the demand elasticities measured by our model which previous studies indicate may be smaller than the actual figures. Therefore these estimates are conservative.

2/ As with the volume measurements, these numbers are based on our measured elasticities.

* significantly above zero at the 95 per cent level.

** significantly above zero at the 99 per cent level.

## I. Introduction

In recent years, many states have passed laws restricting the establishment of new automobile dealerships in the vicinity of present dealers of the same car-make. These regulations are often called Relevant Market Area (RMA) or entry laws. There are three possible economic theories to explain the incidence and effect of these laws. Two of them predict that the laws could significantly increase the price and lower the quantity of automobiles sold to consumers. The third hypothesis based on market failure in contracting is suggested by the franchise relationship between the auto dealers and their manufacturers. Whatever the explanation, determining the actual effects of these regulations is of considerable interest to the policymaker.

The laws are relatively recent phenomena, the first having been passed in Colorado in 1963. However, they have spread rather rapidly; as of 1978, twenty-two states had the RMA regulation; and by 1983 thirty-six states had it. While there has been much speculation and some theoretical predictions, not a great deal is known about the actual effects of the laws. Although two studies have attempted to estimate this impact, Smith (1982) and Eckard (1985), each has its weaknesses. Smith has a fairly complete model but poor data, while Eckard has good data but an incomplete empirical model.

Consequently there is a need to more accurately estimate the effects of the RMA laws on the price of automobiles and on economic efficiency. This is the purpose of our study. It aims to remedy the major deficiencies of the above-mentioned papers by combining a model similar to Smith's with the data used by Eckard. These data include for each dealer the average wholesale price, average retail price, and quantity sold for each of nine types of 1978 Chevrolet cars.

There are two problems common to the two earlier studies. First, given the political power of the auto dealers, conditions in the market may have led to the passage of the laws, and neither Smith nor Eckard adequately deal with the estimation biases that could result from this possibility. In this study, we deal with this problem by using a statistical technique that takes into account the simultaneity between these market conditions and the presence of the RMA laws. With this methodology, we arrive at consistent estimates for the influence of the entry laws.[1] This type of analysis includes not only variables indicating conditions in the retail automobile market but also

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[1] Consistency in a statistical method means that as the sample increases in size, the estimate from the procedure converges to the real value being measured. See Johnston (1972), p. 271.

those reflecting the ability of dealers to influence the political process.

Second, neither Smith nor Eckard developed a satisfactory way to distinguish empirically between the various theories on exactly how the RMA laws affect the marketplace. This problem is addressed here by using a model that allows the entry law impact to vary over different observations in the sample. With this addition, we can test various hypotheses on the effect of the laws.

Section II of this report outlines and discusses the various theories on how the laws may impact on the price and quantity of automobiles. Past work on the dealer laws is briefly reviewed in section III, and an empirical model to test our hypotheses is developed in section IV. Finally in sections V and VI, the results are described, and the implications are analyzed.

## II. The Theoretical Explanations for the Impact of the RMA Laws

The Retail Market Area (RMA) laws limit but do not preclude the entry of new car dealers into local areas where incumbent dealers of the same car-make already exist. Under the RMA laws, once it becomes known that a manufacturer is planning to put a new car dealer into a locality, the nearby established dealers can protest to a given state authority.[1] When a protest has been made, the franchisor has to justify the establishment of the new firm in terms of the public interest or some similar criterion. Even if a manufacturer could ultimately succeed in getting the new dealer placed, the cost of going through the process may be prohibitive (see Eckard 1985, p. 224-26). Consequently, new dealers that would be economical under normal conditions are, in many instances, not established.

The particular state authority administering the RMA law may be important. In some states, the established dealer can protest only to the state courts, while in others the enforcement authority is the Attorney General or the Department of Motor Vehicles. In another set of states, the RMA laws are administered

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[1] Under most automobile franchise agreements, the manufacturer must notify the established dealers in a locality in which it intends to open a new franchise.

by a special board exclusively concerned with dealer franchise problems. Often this board is at least partially composed of car dealers. One might expect that the manufacturers would have the greatest difficulty obtaining approval for new dealers in the last set of states.

There are three theories on the impact of the entry regulations. The first -- which we will refer to as the enhanced-market-power hypothesis -- posits that the RMA laws, by restricting the entry of new dealers, may facilitate the exercise of market power by the existing ones. There are at least two situations under which dealers may have market power. First, in areas with small populations, there may only be enough customers to support a few or even a single dealer of any given brand. In such markets, the dealers may be able to collude and charge supra-competitive prices if the threat of new entry is reduced because of an RMA law, though the market power of such dealers may be attenuated by the ability of buyers to shop in other areas or buy other brands of cars.[2] Second, even in areas with several dealers where inter-dealer competition would be expected to prevail, some

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[2] The average number of Chevrolet dealers in the market areas used in this paper is 2.54 with a minimum number of one and a maximum of 83.

individual dealers may have physical location advantages and perhaps special appeals to population segments such as ethnic groups that allow them to raise prices above marginal costs.

In order to attract and keep good dealers, manufacturers will want to provide them with the opportunity to earn a normal rate of return. Where dealer market power exists, however, it will not generally be in the interest of the manufacturer to allow its dealers to charge profit-maximizing prices. The quantity sold at these prices will usually be less than the optimal one for the manufacturer. Thus, the manufacturer will seek to limit the ability of his franchisees to develop independent pricing strategies. One way in which this could be done is by threatening to establish new dealers in competition with an existing dealer if he does not conform to the manufacturer's expectations.[3]

If the threat of establishing new dealers provides a significant constraint on dealer pricing behavior, the RMA laws -- by removing or reducing the threat of new entry -- would limit the ability of the manufac-

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[3] There are other means available to the franchisor such as setting the retail price or establishing sales quotas, but these practices are frequently precluded by other laws. (See p. 63-66.)

turer to control the behavior of his franchisees. This would increase the market power of the incumbent firms thereby allowing them to charge relatively high prices and possibly garner above-normal profits.

Our second theory, the rising cost hypothesis, states that RMA laws result in increased prices and decreased quantities in rapidly growing areas. Such increases will benefit dealers by increasing their profits, while they will reduce economic efficiency. Where growth is occurring, the manufacturers may find it optimal to establish new franchises to handle the increased demand. If this process were frustrated, or at least partly frustrated, by the entry laws, existing dealers would be able to increase their sales.

This increase in dealer sales may be accompanied by increasing costs, which would in turn lead to higher prices. While the market supply curve may be flat if the number of firms is variable, it could very well be upward sloping when the number of dealers is held constant or at least held close to constant. In this situation, increases in quantity would come from additional output by established firms and not from new entrants. If the incumbent dealers have rising cost curves, then, the total output of the area can not be increased without increasing average cost. If this is the case, the established firms could earn economic rents or profits even under a competitive pricing situation. This would occur because the price would be equal to marginal cost, the cost of producing and selling the last vehicle, and with rising dealer cost, this marginal cost would be above average cost.

The RMA laws may benefit dealers through this mechanism not only in a competitive market but also in a market where price is already greater than marginal cost. Although dealer market power would remain unchanged in these instances, the entry laws could increase the already positive difference between price and average cost.[4]

The RMA laws will not necessarily preclude the establishment of new dealerships in growing areas. Rather, beyond some level of growth, the manufacturer may find that the gains from establishing one or more new outlets are great enough to justify incurring the transactions costs involved in obtaining approval for the new dealerships. The franchisor may be able to get permission to establish a new dealership by petitioning the body that enforces the entry law. Alternatively,

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[4] Furthermore situations could exist where both mechanisms are at work; here the RMA laws would not only result in firms operating further up on the rising portions of their cost curves but also facilitate above-marginal cost pricing. This could occur in growing areas with either a small numbers market or firms enjoying product differentiation advantages. Consequently, under the laws, prices would rise due to either increasing firm market power or dealer-rent-creating higher costs, and in some areas, both mechanisms may be operating at the same time.

it could try persuading an existing dealer not to object to a new dealership. Presumably, a dealer would be willing to agree not to object in response to a sufficient payment from the manufacturer. To the extent that manufacturers are successful in these efforts, new entry will mitigate the rise in price in response to growing demand, and the relationship between the RMA law effect and growth will be nonlinear with the rate of price change declining as growth increases.

If either of these first two hypotheses is the correct one, the entry laws make the dealer network less efficient.[5] The laws result not only in pure transfers of wealth to the dealers but also in output reductions and consequently social welfare losses. The higher prices reduce sales and output in all areas where the RMA laws have an effect. In the high growth areas, the increasing costs resulting from the increased established firm outputs also lead to greater resources being expended on each unit of product.

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[5] Other regulations could possibly reduce the efficiency of the dealer network. Among them are laws that restrict the manufacturer's ability to require his dealers to sell certain quantities of vehicles and laws that increase the difficulty a manufacturer faces in attempting to terminate a poorly performing dealer. The effects of these additional types of laws are discussed below.

Furthermore, all these costs are in addition to the expenses incurred by the dealers in obtaining the laws.

The third theory on the RMA laws, which we will call the contract failure hypothesis, downplays the effect of the laws on price but emphasizes its impact on the relative bargaining power of the dealers and manufacturers. It suggests that the laws may correct for the asymmetrical bargaining position of the dealers vis-a-vis the manufacturers. The dealers, it is argued, develop resources that cannot be readily transferred to another use because they are specialized to the selling of a particular car at a particular location. As a result, a manufacturer may be able to take actions that reduce the profitability of a dealership without causing the dealer to quit distributing the manufacturer's vehicles.

It can be argued that because of these specialized assets, if the manufacturer was not constrained by the RMA laws, he could increase sales by establishing new dealerships and covering a given geographic area more thoroughly. This would be true even if the present dealers were made economically unprofitable as a result. By using the threat of new franchises, the manufacturer could also coerce its retailers into behaving as it desires even if it means an unprofitable dealer operation.[6] The contract failure hypothesis posits that the RMA laws, by preventing or at least discouraging the manufacturer from creating or threatening to create new competing dealers, give the present franchisees some protection from this eventuality.

In the case of auto dealers, there are strong theoretical and empirical arguments against this "hold-up" hypothesis. First, even if the auto manufacturer could hold up its dealers, it may not be in its interest to do so. The constantly changing geographic location of the U. S. population leads to a demand on the part of the manufacturers for new dealerships in new locations. In addition, some existing dealers will wish to sell their franchises at any point in time.[7] Therefore the auto companies need a ready supply of new franchisees, and a reputation for "holding up" dealers will attenuate that supply.[8]

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6 This is an example of a genre of situations called "hold-up" problems (Klein, Crawford, and Alchian, 1978).

7 For the period, 1977 to 1983, General Motors established on average 125 new dealers per year at new locations. Between 1979 and 1983, a per year average of 169 General Motors dealers were relocated. (To put this figure in context, we should realize that in 1984 the company had altogether 10,040 dealers.) Moreover the number of dealers changing ownerships is so large that dealership brokerage businesses exist.

8 For evidence on the effect of such a hold-up policy on the Ford Motor Company in the 1920's and 1930's, see Nevins and Hill 1962, p. 575-86.

Second, even if there were a potential hold-up problem, it could possibly be handled by the franchise contract as suggested by certain provisions in the GM contract. For instance, in the event of a dealer termination, the GM franchise contract has fair-market-value repurchase agreements for much of the inventory and equipment. Consequently, terminated dealers are not burdened with all of their specialized assets. Thus, the threat of termination does not appear to be something that the franchisor can illegitimately hold over the dealer. At present it seems that the auto manufacturer does not have a particularly large incentive to inflict significant losses on its dealers.[9]

Therefore, we place the most credence on the first two theories, enhanced-market-power and rising-costs, that suggest that the RMA laws are designed to raise retail prices and increase dealer profits by preventing

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[9] A manufacturer's ability to hold up its dealers is further limited by several factors. For one thing, the specialized assets of most auto dealers may not be that large. As of 1977, on average, 81 percent of a new car dealer's assets consisted of obviously fungible items such as inventory, customer credit, and cash. Furthermore many of the remaining assets were not specialized to the selling of a particular brand of car. In fact some of these goods such as buildings were not at all specialized to auto retailing. Others can be used by dealers of any kind of car. So while 19 per cent of the assets were not fungible, a good portion of them were not highly specialized. The same can be said for much of the unmeasurable human capital. These data come from the IRS Source Book: Statistics of Income 1978 Corporation Income Tax Returns.

or at least attenuating entry. Before describing our methodology and results, we review the past work of Smith and Eckard to show more specifically where our study makes its contribution.

## III. Past Work

Two previous studies deal with the impact of state automobile dealer regulation, Smith (1982) and Eckard (1985). The former purports to measure the effect on the automobile retail market of the overall stringency with which states regulate the dealer franchise system. The paper generally finds statistical support for the hypothesis that the state laws were able to decrease the number of dealers and quantity sold and to increase prices after the passage of the Federal Dealer's Day-in-Court law in 1956, but not before. He also concludes that the passage of the Dealer's Day-in-Court law led to greater stringency in the state automobile dealer regulations.

Important for our paper are Smith's results on the interaction of growth with the effect of the auto dealer regulations.[1] He found that the impact of these laws was statistically significant in high growth states but not in the others. However, he does not give an adequate explanation for these results.

There are two significant problems with Smith's paper. First, he does not have data on state regulations in 1954 and 1972, the two years for which

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[1] In addition to the RMA law, Smith includes in his analysis required state licensing of the dealers and manufacturers, the regulation of franchise terminations, and the prohibition of manufacturers forcing unwanted products on the dealers.

he estimates his relationships. Rather, he uses data on the presence or absence of these laws in 1979 to represent the conditions in the earlier years. This assumption appears questionable.

Data quality is the other major problem with this paper. Because Smith's quantity data are for total sales of all makes of cars in the given states, he has an aggregation problem. The price differences between various types of automobiles make it difficult to determine whether or not the apparent regulation effects result from the differences across states and over time in the composition of the vehicles sold. For dealer costs and other variables, he also uses aggregate state data which might present a similar problem.

In contrast, Eckard (1985) has very accurate and disaggregated data; the dataset includes average wholesale and retail prices for each of seven Chevrolet car-types in 1978. He focuses on the RMA laws, using a reduced-form model for price, with a dummy for the presence of the law. With the dealer as the observation, he finds that the entry regulations do affect price.

Three problems exist with this study. First both the demand and supply sides of the auto market are inadequately represented in the model. The implied structure behind Eckard's reduced-form equations has only car price in the demand function and only the wholesale price, population change, and dealer employee wages on the supply side. Economic theory predicts that, at the very least, area income and population also influence demand. (Smith had these variables in his model.) In the supply equation, perhaps some other input cost variables such as advertising and land rents should also be included.

Second, Eckard treats the presence of the RMA regulations as being exogenous. He does not take into consideration the possibility that the presence of these laws depends at least partially on automobile supply and demand conditions, making the relationship between the laws and price simultaneous. If the relationship is indeed simultaneous, some way should be found to take into account the effect of these market conditions on the incidence of regulation.

Third, in his empirical model, Eckard does not account for the possibility that the effect of the RMA laws is greater in areas with growing demand and population. This omission is strange because he bases his theoretical argument on the increasing cost RMA-effect hypothesis developed in section II. This theory not only recognizes but also assumes a connection between the RMA effect and demand growth. Eckard, however, does not include an interaction variable between these two influences.

Consequently while both studies are suggestive, they have their weaknesses.

## IV. The Model

In this paper, we will attempt to develop a complete model of the demand and supply of automobiles and use this model to estimate the impact of the Relevant Market Area laws. In addition, we take into account the possibility that market conditions led to the passage of the laws. This also entails incorporating into the analysis political and institutional variables that affect the probability of regulations being enacted. These variables and others will be used to develop reduced-form equations that explain the presence or absence of the various autodealer laws.

### a. The Unit of Observation

The unit of observation for our model should fulfill two requirements. First it should be numerous enough to allow significant results for statistical analysis, and second it should approximate an actual local retail market or at least a unit around which data relevant to such a market can be organized.[1] Smith used the state, while Eckard used the individual dealer as the unit of observation.

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[1] The exact definition of any given geographic market is often subject to debate; so our objective is to find a geographic unit for which the available data reasonably approximate actual markets.

We feel that the state is too big an area for our study. The conditions affecting retail car sales, such as income level and population composition, vary considerably within any one state. Furthermore dealers in one part of a state may well not compete with dealers in another part of the state. In addition, given the large number of variables that are included in a full model, using the state as the unit of observation would result in too few observations to permit statistical analysis.

There are also problems with using the individual dealer as an observation. The quantity sold by any individual dealer depends not only on observable and measurable phenomena such as local population, income, and firm cost but also on the ability of the dealer to attract customers. To measure or even make an assessment of this ability for the approximately 5800 dealers in the sample would be extremely difficult. So we are left with some type of locality as the unit of observation. The geographic area closest to the relevant market for a car dealer would seem to be some kind of local jurisdiction such as a county, town, city, or Standard Metropolitan Statistical Area (SMSA).

In urban areas, the logical unit of observation is the SMSA. Usually consisting of the immediate city and much of the suburban and other surrounding area, it most closely coincides with what dealers and manufacturers would consider a relevant market for urban areas. For the SMSA, the Census Bureau collects data on population, income, and other variables relevant to the automobile market.

Restricting the sample to SMSA's, however, would result in excluding the rural areas where 27 percent of the population live and where a disproportionate share of the new autos are probably sold. In these areas, Census collects population and demographic data for counties and towns. Normally dealers focus their effort on areas consisting of several towns.[2] Therefore along with the SMSA for urban areas, the county is used as the observation unit for rural areas.[3]

Having chosen our geographic market, we now turn our attention to the issue of product definition. Before doing so, however, we need to describe the data

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[2] See Pashigian 1961, p. 136-46. He demonstrated that there is a considerable degree of cross-elasticity between the demands of car dealers in different towns.

[3] In most states, the SMSA encompasses at least one county and often more than one. In New England, however, the SMSA's are usually smaller than counties, but since the urban areas are generally small anyway, nothing is lost by using the county as the observation in these cases. In the New England areas where the SMSA is composed of portions of more than one county, the observation consists of all the relevant counties.

In the rest of the country, there may be a few cases where a county is so large that perhaps it ought to be broken up into smaller units (for instance Riverside California), but since there are no good data for the appropriate sub-divisions we will stay with the county and SMSA.

that will be used in the study. The dataset we will use is a combination of GM data on Chevrolet car dealers and publicly available statistics on population, income, and other variables related to the demand and supply of automobiles.[4] The Chevrolet data file provides information on sales and prices for nine separate Chevrolet models.

By focusing our study on Chevrolet, we reduced the amount of data collection and processing work that had to be done, since we were able to get all the data from one manufacturer. Chevrolet is the largest selling brand of automobile in the U.S., and by examining the nine models of Chevrolet, our analysis covered 18 percent of U.S. auto sales in 1978.[5] Inclusion of additional models in the analysis would have increased

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[4] General Motors provided the data for price and quantity after the Federal Trade Commission made an official request and indicated a strong interest in obtaining the data. The data for most of the other variables in our model come from the U.S. Bureau of the Census. Other sources are detailed in the description of the individual variables.

The GM data provided information for each individual Chevrolet dealer. Dealers were placed in the appropriate county or SMSA by matching dealer ZIP codes and city addresses with ZIP code information available through the Bureau of the Census. We then aggregated GM dealer data into our geographic unit of observation.

[5] Total Chevrolet sales were 21 percent of U.S. auto sales in 1978. However, our sample includes only the continental United States. Automobile data for Hawaii, Puerto Rico, and much of Alaska were not available. In addition, fleet sales were not included in our analysis.

the analytic work proportionally but would not have increased our coverage at the same rate.

We believe that the results are representative of the auto market as a whole. While Chevrolets are at the lower end of the price range for domestic automobiles, they include a wide assortment of models ranging from subcompacts such as the Chevette and Monza to large cars like the Caprice. They also include expensive specialty items such as the Corvette.

An additional reason for using Chevrolet data in our analysis is that this is the data used by Eckard. Use of the same data will facilitate comparison of our results with his.

Since separate data are available for different models of Chevrolet, we will use the model (i.e., body-type or car-type) as our product. By doing this, we avoid aggregation problems that would arise if we combined data for different models such as Chevettes and Corvettes. Table IV:1 lists the models for which data were collected.

b. <u>The Demand Equation</u>

In what follows, the specifications of the supply and demand models are described -- starting with demand. The measured demand function is the aggregation of individual consumer demand curves for automobiles over the observation locality, while the supply equa-

Table IV:1

The Names of the 1978 Chevrolet Car-Types (i.e., Body-Types) Used in Our Analysis

| GM Code | Designated Car-Type Name |
|---|---|
| B | Regular |
| A | Malibu |
| F | Camaro |
| X | Nova |
| Asp | Monte Carlo |
| Hsp | Monza |
| T | Chevette |
| None listed in the data set | Sportvan |
| None listed in the data set | Corvette |

tion indicates the prices at which the retailers in the market-observation area would sell a given number of cars.[6] Because of its flexibility, we use the constant-elasticity demand curve,

$$Q = a\ P^f\ Z^b\ e^v, \qquad \text{IV:1}$$

where $f$ = price elasticity of demand,

$Q$ = the quantity of a particular automobile body-type demanded in a particular observation locality,

$P$ = the local retail price of the automobile body-type,

$Z$ = a vector of exogenous demand variables,

$b$ = a vector of parameters,

$v$ = a multiplicative residual term.

The Z vector would, of course, consist of a number of variables impinging on the local level of demand for a given car-type, such as population size, the prices of complements and substitutes, income, and tastes and preferences.[7]

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6 Since data on commercial car fleets are separated out in the Chevy reporting system, we can construct a demand function that reflects primarily the desires of individual consumers not fleet buyers. (The latter would not be so much affected by the RMA laws because in buying large lots of cars they may find it worthwhile to shop around to different geographic areas both within and across states.)

7 For cars, one can employ a more sophisticated exposition of the demand function such as that of Becker (1971) or of Lancaster (1966), which regards the auto as an instrument for delivering other goods (such as transportation, speed, prestige etc). However, it seems unlikely that this methodology would alter the list of arguments or lead to better predictions for this study.

We will now define the specific demand variables used in our model starting with the dependent variable, quantity (Q). The GM data set is taken from annual reports made by the dealers to the company, and it lists the number of units for each body-type k, sold by each dealer. Summing these quantities, we arrive at $Q_{jk}$, the number of vehicles of type k sold in county or SMSA j. The price variable (P) is also derived from GM data. We calculated this variable for each observation by dividing the total revenue from sales of each car-type in the area by the total number of units sold, $Q_{jk}$. For county or SMSA j and car-type k, the price variable is

$$P_{jk} = \$Sales_{jk} / Q_{jk} ,$$

where $\$Sales_{jk}$ = the dollar receipts of all the dealers in county or SMSA j for car-type k.

While the bulk of the variables in the Z vector reflect the demand by individual consumption units, i.e., average income, tastes and preferences, etc., we need to include a variable to account for the size of the observation market. For the county or SMSA level, one of two variables seems appropriate: the number of registered vehicles or the area population. Because the former is not readily available on a county or SMSA basis, population will be used.[8] It will be called POP for each county or SMSA j.

As an income measure (Y), we use per capita income as reported in the Census Bureau Annual Report for 1978 for the localities of the United States.

The prices of substitutes and complements should also be included in the model.[9] The substitutes for our sample products are other types of new automobiles, used cars, and other transportation modes. However, no specific county or locality data are available on the prices of non-Chevy new cars or late model used cars. The closest approximations we have are price data on used cars for five regions of the country. Obviously very little intercounty variation would be captured by

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8 Subscripts will be used hereafter only when referring to data connected with or pertaining to the individual dealers. The source for county population is the Census Bureau's Annual Population Estimates for 1978.

9 Over our sample of local U. S. geographic areas, the prices of some of these goods may not vary much in a single year. Nevertheless we can take into account the variation that does exist.

variables based on these numbers. So the car substitutes are left out of the analysis.[10]

While price data on the substitute transportation modes (such as rapid transit, railroads, buses, and taxis) are often hard to collect and sometimes unavailable, the presence of these substitutes can be modeled. One proxy for this varying availability is population density. Other things equal, increasing population density generally means greater viability for alternative private (e.g. taxis and charter buses) and public transit modes. Even if the latter are not economically self-supporting, greater density means smaller subsidies which lessen the system's political cost. Consequently, a variable equal to the population per square mile (DENS) will be included in the equation. Smith found this variable to be insignificant, but its coefficient had the right sign.

We also model public transit availability by setting up dummy variables for the presence of some

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10 This omission might bias the coefficients of the other variables in the equation. The amount of this bias for any given included variable is a positive function of the real coefficient of the omitted variable and of the correlation coefficient between the omitted variable and the particular included one. See Johnston 1972, p. 169. For the price elasticity of demand for the car under analysis, one would expect the bias to be positive; first the coefficient of the omitted substitute price would be positive. Second the correlation between two car prices is probably positive because the same supply and demand conditions are likely to affect both of them.

particular mode of rail transportation. These are used in addition to the DENS variable which is needed to reflect the presence of more taxis and bus services. Two dummies are used: one for the presence of rapid transit (subways), DP1, and one for the presence of light transit (surface street cars or railroads), DP2.[11]

Important complementary goods to the auto are auto credit, gasoline, and insurance. For 1978, the Federal Reserve Board collected data on automotive loan interest rates for a sample of 254 banks located throughout the country. With these data, one could use several weighting techniques to assign a given interest rate (I) to each county or SMSA. However, no matter what method is used, some error is unavoidable; and since no good way exists to compare the potential biases, we will use a simple state average.

Data for the price of gasoline, PG, are available for 55 U.S. cities (at least one in each state) from Platt's Oilgram for 1978. Since error can arise from any procedure assigning a given PG to any given obser-

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11 For the following areas, DP1 will be equal to one: Boston, Camden N.J., Chicago, Cleveland, New York, Newark and other north Jersey areas, Philadelphia, San Francisco, and Washington D.C. The rest will be zero. For DP2, the observations assigned a value of one are Boston, Chicago, Cleveland, New York, Newark and other north Jersey areas, Philadelphia, Pittsburgh, and San Francisco.

vation unit, we again simply use an unweighted state average.

State-wide total value of premiums or aggregate sales data are available for all motor vehicle insurance.[12] This total can be divided by the total number of insured vehicles in a state to get an average insurance premium. This measure has three weaknesses. First, the figure does not exactly correspond to the average car insurance price because it includes some other vehicles (such as trucks). Second, differences in the composition of state automobile fleets would lead to different average insurance prices even if the prices per given type of car were all equal. Third, as with I and PG, the state average does not capture any variation that exists between counties in the same state. Even so, since it is the only available statistic, the state-wide insurance price variable, PI, will also be included.

Consumer tastes for particular types of cars may vary over the social and geographical span of the United States, and account should be taken of those differences. The literature on the demand for autos suggests some hypotheses. A major source for these

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[12] Most auto purchasers and sellers view insurance as a tied good particularly for financed cars.

conjectures is the Wharton dynamic automobile demand and supply model paper (1977). To account for differences in the product mix over time, the Wharton group set up state by state cross-sectional market share equations for different sized cars. Also helpful are models of consumer automobile purchase decisions (see Johnson 1978 and Lave and Train 1979).[13]

Both the Wharton and the consumer-purchase studies found that the composition of households affected the demand for certain kinds of cars. The latter studies found that increasing the age of the household head attenuated somewhat the per-capita unit demand for autos. The Wharton study found that, the larger the proportion of younger household heads, the greater the market share of the smaller types of cars. Consequently we will use two variables to gauge the population age distribution:

POPY = the proportion of the population between 15 and 35 years old,

POPO = the proportion of the population 55 years old or over.

Since a demand increase for one type of car may mean a decrease for another, we will include these variables in all the equations. We, then, would expect POPO

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13 The Wharton model employed universe data on the American economy as a whole from sources such as the Census, while the other above-mentioned studies used consumer panels.

to have a positive effect on the demand for larger cars and a negative effect on that for small ones. POPY probably has the opposite effects: positive for small cars and negative for large ones.

In the Wharton study, it was also found that the market share of midsize and large cars varied directly with the proportion of families or households with more than two members.[14] In other words, large family size may increase the demand for large cars relative to that for small ones. Because of its availability, we use average household size to capture this effect; it is defined as follows:

LFAM = the average household size found by dividing the county or SMSA population by the number of households.

The Wharton study also found that regional differences in tastes and preferences significantly affect the per capita demand for certain types of cars.[15] In particular consumers in New England and on the Pacific

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[14] In our sample the larger size Chevrolets are called Regulars; this category includes such cars as the Belair, the Caprice, and the Impala.

[15] These differences could reflect the relative cost differences of owning certain kinds of cars in different regions as well as varying tastes. In urban and hilly areas such as California and the East, owning a small car may be cheaper, while in flat sparsely populated areas with long driving distances a larger car may be more economical overall. Given the available information, the modeling is still the same whether there are cost or taste differences or both.

Coast preferred subcompacts, compacts, and midsize cars, while consumers in the West South Central area bought proportionately fewer of these cars. The Rocky Mountain states showed a greater preference for subcompact and compacts but a lesser preference for midsize cars.[16] Because a preference for one car implies a lack of desire for another, the following variables are added to all the demand equations:

NEW = one for New England and zero otherwise,

PAC = one for the Pacific states and zero otherwise,

RMTN = one for the Rocky Mountain states and zero otherwise,

WSC = one for the West South Central states and zero otherwise.

Last, the problem of product heterogeneity should be addressed. Differences even within the same body-type in terms of extras can lead to considerable variation in the price. Examples of the extras are large engines, radios, power steering, automatic transmissions, and air conditioning. The percentage of autos sold with these items could vary significantly over

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16 New England consists of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The Pacific states are Washington, Oregon, California, Hawaii, and Alaska. The West South Central consists of Arkansas, Louisiana, Oklahoma, and Texas, and the Mountain states are Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada.

geographic space, but we do not have data on this variation.

Only for air conditioning do we have any variable on the county level that may indicate its incidence, mean July temperature (TEM). Increasing the demand for air conditioners would raise the position of the demand curve for cars as a whole by increasing the apparent price of the cars that were purchased.[17] From this analysis, we would expect a positive TEM coefficient, but in this country there may be an off-setting tendency. Cars in colder climates do not last as long, and so there may be fewer used-car substitutes. That would increase the new car demand in colder climates, implying a negative TEM coefficient. So TEM could take on either sign, but since either effect could be significant we will add it to the equation.

To sum up, the demand function, which is specified as log-log (or ln-ln since we use natural logarithms as is the standard practice), can be shown as follows:

Q = D( P, POP, Y, DENS, DP1, DP2, I, PG,
PI, POPY, POPO, LFAM, NEW, PAC,
RMTN, WSC, TEM). IV:1a

(The definitions of the individual variables are summarized in Table V:1.)

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[17] On the supply side, the additional expense of the item is already reflected in the wholesale price.

c. <u>The Supply Equation</u>

We will now describe the supply equation. Since the RMA laws are hypothesized to affect dealer behavior, it is on the supply equation that they would have a direct effect. A primary consideration in dealing with the supply side of the retail automobile market is market structure. Since the retail market for autos is a local one, there are often only a few sellers, and the assumption that price equals marginal cost cannot be made. Rather we can expect some sort of markup over marginal cost. Several structural factors -- such as concentration, the size of the market, and differing seller characteristics -- may affect this deviation of price from marginal cost.[18] If the enhanced-market-power hypothesis is correct, we expect that the presence of the RMA laws and other state regulations will also influence this margin and therefore price.

In addition, the cost situation will also determine the level of price and quantity supplied under any

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[18] In these markets the traditional supply function which is independent of demand conditions does not exist. Therefore the discussion actually refers to an equation denoting the amount supplied at a given price under a given set of demand, market structure, and behavior conditions. This concept can be called a quasi-supply relation.

kind of structural and regulatory environment. To develop a way to incorporate these disparate elements into an analysis of supply, we will begin by comparing the two extreme market outcomes: the monopolistic and the competitive. In the former, the sellers are so successful at colluding that industry marginal revenue equals industry marginal cost, while in the latter, price equals industry marginal cost:

$$MR = MC \quad \text{(monopoly)} \qquad \text{IV:2}$$

$$P = MC \quad \text{(competition).} \qquad \text{IV:2a}$$

Industry marginal revenue, being derived from the industry demand curve, is related to price as follows:

$$MR = P\,(1 + (1/f)) = P\,((f + 1)/f), \qquad \text{IV:3}$$

where f = the market price elasticity of demand. Substituting this into equation IV:2 above, for the monopoly outcome we arrive at

$$P = (f/(f + 1))MC. \qquad \text{IV:2b}$$

Most local retail auto markets are not monopolies. Even in small areas where only one Chevy dealer exists, the buyers can purchase their cars in other places or from dealers selling different makes of cars. Consequently one can not assume a monopoly outcome. Rather the outcome will be some intermediate situation between monopoly and perfect competition. One way to model this result is to hypothesize a given markup (m) over marginal cost that characterizes the position of the market on the competitive-monopoly spectrum. So

$$P = (1 + m)MC \qquad \text{IV:4}$$

where m = the percentage markup of P over MC, divided by 100.

At the monopoly extreme, (1 + m) would equal (f/(f+1)), and at the competitive extreme, it would equal one.[19]

The ability of sellers in a market to raise prices above marginal cost will depend on the structural and legal conditions they face and on their behavior. We propose to model these influences by making (1 + m) a function of the various structural and regulatory conditions as follows:

$$1 + m = d0\ STR^{d1}\ REG^{d2} \qquad \text{IV:5}$$

where STR = a vector of market structure variables,

REG = a vector of regulatory variables representing the effects of the laws pertaining to the retail automobile market.

This equation can be combined with the marginal cost function to form an oligopolistic supply relation. For reasons given below, we will assume a Cobb-Douglas cost function as follows:

$$MC = h0\ Q^{h1}\ PI^{h2}\ X^{h3}\ REG^{h4}, \qquad \text{V:6}$$

where PI = a vector of input prices,

X = a vector of other variables that might affect the level of marginal cost.

REG is included in the MC equation because as shown above in the rising cost theory, the RMA laws could

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19 See Slade 1980, Bresnahan 1982, and Rogers 1984 for examples of this methodology.

very well have an impact on marginal cost. Putting these two equations together, we arrive at the following form of equation IV:4:

$$P = c0\ Q^{c1}\ PI^{c2}\ X^{c3}\ REG^{c4}\ STR^{c5}\ e^{u}, \qquad \text{IV:7}$$

where u = a multiplicative residual term denoting the stochastic nature of the supply relation.[20]

Let us now consider the specific variables that make up the cost equation (IV:6). The first variable identified there is the quantity of vehicles sold. Quantity can alter costs in a market in two ways. First, the total number of automobiles sold in a market can affect firm costs through economies or diseconomies of scale in the firms supplying production factors. The proportion of total dealer costs accounted for by many of these inputs is too small to be included explicitly in the model, and no summary variable proxies are available. These effects, however, may be reflected by the size of the market. To illustrate, as the market gets larger, firms supplying inputs such as advertising and special equipment may become more specialized and thereby attain lower costs. Furthermore, firms in larger markets may have lower

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[20] Some regulations may only affect cost; some may just impact on the markup of price over cost, and perhaps others affect both. In this paper, one of the goals is to determine whether the RMA law affects the markup over costs (the enhanced-collusion theory) or the cost curve itself (the rising-cost hypothesis).

costs because they can draw on larger, more specialized pools of manpower.

Since this argument suggests that it is total sales and not sales of a specific model that should affect supply price, we use a measure of aggregate sales. The variable we use in the supply relationship is QS which is simply the total number of new Chevrolets plus new light and medium trucks sold by Chevrolet dealers in each market area.[21]

Consider now the variables that make up the vector of input prices in equation IV:6 (PI). An examination of the sources on dealer operations indicates that the major dealer input costs are for the wholesale car price, labor, debt, advertising, and real estate.[22]

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21 Because we do not have data on repair or parts sales, they are not included in the supply model, even though one would expect them to have some impact on costs. Nevertheless, this should not create any serious distortions because these sales are probably correlated with the number of new cars sold, as are the quantities of used cars.

22 We do not have a complete set of data on the proportion of total dealer costs accounted for by each of the expenses. According to our data set and the sources discussed below in this footnote, somewhere between 80 and 92 percent of the total retail price of a new car is accounted for by the wholesale price. So the dealer gross margin is between 8 and 20 percent. In the 1960's, rent and advertising each amounted to about one percent of the total retail price of the car (Davisson and Taggert, 1974). In 1980 advertising accounted for about 0.9 percent of total dealer sales (National Automobile Dealers Association, N.A.D.A. 1981). As of 1980, labor costs made up 8.1 percent of total dealer revenue (N.A.D.A. 1981). Since dealer sales consist also of used cars, parts, and repair services, one can not expect all these figures to sum to 100.

The largest of these costs, of course, is the wholesale price of the vehicle. So for car-type k and county or SMSA j, we have

$$PW_{jk} = \text{Cost of Sales}_{jk} / Q_{jk},$$

where Cost of Sales $_{jk}$ = the total amount of money that the dealers in county or SMSA j paid to GM for the cars of body-type k that they handled.

Labor has the second largest share of the dealer cost for new cars. To measure the cost of labor, we use the average weekly wage rate for dealer employees (WAGE). These data are provided by The National Automobile Dealers Association (N.A.D.A.). They are measured at the state level; wage data for car dealers are not available at the county level.

No data exist on the interest expenses of the dealers in our sample, and consequently no interest-rate variable can be included in our model.

For advertising expense, we start with a simple average of the "morning and afternoon line rates" for daily newspapers in each state (computed by the <u>Editor & Publishers International Yearbook 1979</u>). The cost per consumer or message unit is the relevant variable here. To model this effect we divide the total rate by the circulation of the average newspaper in the state.

For our analysis, this variable is called ADV. It indicates cost in only one advertising medium used by the dealers, but since the various media compete with each other, it is likely that the cross-sectional variation in this figure would be highly correlated with the variation in the prices of the other media. Like the wage rate and some demand side variables, ADV is also a state-wide average.

Although no good data exist for real estate cost, we have available a reasonable proxy, population density (DENS). Because DENS and real estate costs are probably highly correlated, we include DENS in the cost function.

In the X vector, which consists of the other variables affecting cost, we include only one variable, the observation area population growth rate. To see why it is needed, we examine here the nature of our data. Because our sample is cross-sectional, we assume that the equations reflect long-run relationships in the automobile retail market. It is likely, however, that at any given time some of the observations are out of equilibrium. Changes in certain conditions may be so recent and/or rapid that, at the time of our observation, price deviates considerably from the hypothesized long-run relation. If demand increases rapidly, suppliers may not have time to adjust their capacity, forcing them to increase their output along a short-run supply curve instead of the long-run one. Consequently the cost level will be higher than if the sellers have more time to adjust to the new circumstances. The major measurable variable reflecting recent demand changes is recent change in the population of the locality. So to account for disequilibrium situations, we add a variable for relative population growth, GR. It is defined as the ratio of the observation year population to that in 1970 -- the last Census year prior to 1978.

Finally, because the rising cost theory hypothesizes that the presence of RMA laws may force dealer costs to move along a short-run rather than long-run supply relationship, we include the REG variables in the cost function. That is, if a state RMA law makes it difficult or impossible to establish new dealerships, then any increase in the demand for cars is more likely to be met by existing dealers. This may be more costly than meeting the new demand with new dealerships. The specific form taken by the regulation variables is discussed below.

In sum, the cost vector would be

COST = (QS, PW, WAGE, ADV, DENS, GR, REG).

We now turn to the markup variables. The difference between price and marginal cost is affected by the structural conditions in the market and perhaps by some firm behavior not accounted for by those conditions.[23] However, the influence of market structure may be limited by the franchise relationship. Under the franchise system, the manufacturer may have the ability to force the dealers to act in its interest by pricing at cost.

The possible presence of dealer scale economies and certain state and Federal laws may attenuate the franchisor's ability to control the dealer allowing the latter to earn above competitive profits in some local markets. Given economies of scale, there may be room for only a few dealers in small markets, and having little to fear from entry, incumbents in those areas could possibly collude and set above-cost prices. Therefore, in some circumstances, structural factors may determine the price level through differences in the markup of price over marginal cost.

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[23] Individual firm behavior may also affect this margin. It might arise from differences in marketing strategy and entrepreneurial specialization. Examples of this phenomenon are the presence of a particularly aggressive dealer or a franchisee that specializes in selling cars to a particular ethnic group. Such behavior by increasing the product differentiation advantages of certain firms could increase the difference between price and marginal cost.

There are no measurable aspects of these phenomena among car dealers that vary systematically across geographic space. So we assume that these individual firm factors have a distribution uncorrelated with the other variables in the model, and consequently they can be subsumed in the residual without biasing the results.

No good proxies are available for the structural variables in our markets. A major structural characteristic that varies over the sample is concentration. However, we do not have the data to compute concentration for our local market areas since we only have individual dealer data on sales for Chevrolet dealerships. On the other hand, the absence of a concentration variable may not pose significant problems. In our sample it seems reasonable to assume that dealer concentration is negatively correlated with the size of the market.[24] Another measurable market structure variable, scale economies, is also correlated with market size. Consequently the QS variable may be picking up most of the variation in two of the major elements of industry structure.

One can expect the retail markup over marginal cost to depend on regulations as well as structure. The regulation of the franchise relationship may prevent the manufacturer from inducing the dealers to behave in his interest, and this could give them a chance to raise price above or further above cost.[25]

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24 Most of the sample consists of areas with only one Chevrolet dealership. It is only in the really large metropolitan areas that enough dealers exist for atomistic behavior without the control over the seller exerted by the franchisor.

25 Since Federal auto dealer laws cover the whole country, we expect differences in the state laws to explain the bulk of any variation that may be due to the legal environment. So we focus on those regulations.

d. Regulation Variables

As we have seen, our hypotheses about the effects of the RMA laws suggest that the laws may affect either the dealers' costs or the markup of price over costs. Below we will develop a test of the rising-cost hypothesis. However, first we specify the form of the variables indicating the presence of an RMA law.

For this presence, we first include two dummy variables. Like Eckard, we distinguish between old and new RMA laws by using two variables, ROLD and RNEW. The former equals one for the states where this law was passed before 1976 and zero otherwise. RNEW is one for the states where the entry laws were in effect in 1978 but not in 1976 and zero otherwise.[26] The reason for this distinction is that time may be needed for these regulations to have an impact on prices. It may take some time for the dealers, by trial and error, to develop rational responses to the new situation. Their problem involves first discovering how stringently the state enforces the law and second discerning the direct effect of the law on the market and coming up with an appropriate price: be it either equal to their new

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26 The following states had RMA laws before 1976: Arizona, California, Colorado, Iowa, Minnesota, Nebraska, New Hampshire, New Mexico, North Carolina, Ohio, Rhode Island, South Dakota, and Vermont. These states passed the law after 1975 but before 1978: Florida, Louisiana, Massachusetts, Montana, Nevada, Tennessee, Texas, Virginia, and West Virginia.

marginal cost or at a new collusive equilibrium. Consequently, the price change resulting from a recently-passed law may be different from that of an older law, and including the dummy, RNEW, allows the model to account for this difference.[27]

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[27] Although the exact provisions of the RMA laws vary across states, we can only account for the difference in the enforcement mechanism. In many states, the entry laws are enforced by the attorney-general or by officials of the motor vehicle department or some similar state agency. In others, established dealers must go to the state courts to prevent entry by a new firm. In still other states, the RMA laws are enforced by special boards concerned exclusively with the relationship between dealers and their manufacturer-suppliers. Often these boards are composed, at least partly, of established dealers, and the other members are often sympathetic to them. It seems likely that the dealers in the last group of states would have a better chance of preventing entry.

Consequently we could add or substitute for ROLD, RNEW, or both, a dummy variable for the presence of a special auto dealer board, DB. Since we hypothesize a lagged effect, DB would be zero unless the particular law had been in effect before 1976.

Interstate differences in the way the relevant market areas are defined seem another obvious source of measurable variation in the RMA law's effect on price. Some laws specify a given mileage limit from the old dealer. Others use the relevant market area as defined by the manufacturer. A third set uses certain political or geographic units such as the town, county, or "community," and some others do not explicitly define a relevant market area.

However, given the wide variation in the way the laws specify the distance restrictions, it does not appear feasible to differentiate the laws on this basis. First none of the laws has language specific enough to permit careful modeling. Second to account for the many differences in language, a large number of dummy variables would have to be created. Therefore the gain in accuracy from setting up these dummies seems unlikely to outweigh the difficulties arising from the possible multicollinearity (between the various dummy variables) and the interpretation problems that the addition would create.

We can perform a more complete test of the rising-cost hypothesis on the effects of the RMA laws. If this theory is correct, the effect of the laws should depend on the growth in demand in an area. Where demand is growing sufficiently rapidly, a manufacturer's desire to locate a new dealership can be frustrated by an RMA law. By contrast where demand is not growing, there is no need for an additional dealer. As a result, the laws would not inhibit a manufacturer's desire to establish new dealerships. In other words, one would expect a positive relationship between the RMA impact and demand growth.

To test this theory, in addition to the variable, ROLD, we include in our model a variable that interacts the presence of the RMA laws with a measure of demand growth. The rising-cost hypothesis would be supported by a positive coefficient on the interaction variable. Such a coefficient would indicate higher prices where the presence of the law is combined with high growth. If the coefficient on the variable is not significantly different from zero, then the rising-cost hypothesis would not be supported.

Inclusion of a combined RMA law and growth variable may also allow us to perform a limited test of the enhanced-market-power hypothesis. If we assume that the ability of auto dealers in a particular area to exercise market power is unrelated to the amount of growth in that area, then we should expect to see the RMA laws lead to increased prices in some low growth areas and some high growth areas.[28] Because the exercise of market power results in higher prices in some low-growth markets, the average price level in low-growth areas will be raised somewhat. The same will be true of high-growth areas. As a result, if the enhanced-market-power story is correct, the law should have an effect even where growth is zero -- that is ROLD should be significantly greater than zero. If ROLD is not significantly greater than zero, the enhanced-market-power theory would not be supported.[29]

The best measurable indicator of demand growth that we have available is population growth. This suggests that an interaction term between population growth and the incidence of the entry law should be added. The variable used is an interaction between the dummy variable for a pre-1976 RMA law -- ROLD -- and

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28 We have argued that market power may be proxied by the size of the market (see p. 55-56). To the extent that this is true, we can test the assumption that growth and market power are uncorrelated. In our data set the correlation between market size, QS, and the variable we shall use to measure growth, AGR, is an extremely small 0.002.

29 If the extent of market power can be proxied by market size, a more complete test of the enhanced-market-power theory might involve the inclusion of an interaction variable that combines market size and the presence of an RMA law. We have not performed such a test because the size of the market would be an endogenous variable in our system of equations and having an interaction term containing an endogenous variable would substantially complicate our estimation problems.

the absolute change in an area's population since the RMA law was enacted, AGR. The change in population since enactment is estimated by multiplying population growth between 1970 and 1978 by the fraction of those years during which the state had an RMA law in effect.[30]

As noted in section II, increases in growth lead to increases in the RMA-law-induced loss to the auto companies. This could lead them to attempt to circumvent the law by either paying the incumbent dealers not to object to entry or by increasing the political pressure on the regulatory agencies. Either way, when population growth becomes very large, the RMA induced price increase may be somewhat attenuated. This possibility can be modeled by adding a quadratic term to the ROLD-AGR interaction variable.[31]

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30 The AGR variable is put in natural logarithms to reflect any nonlinearity inherent in the relationship. Since no logarithm exists for numbers less than zero, we have to normalize by adding 6902 to the raw AGR number; the negative of that number is less than the smallest sample raw AGR observation. In our data set, the raw population has been divided by 100, and the number, 6902, actually represents a population change of 690,200 which is only minimally larger than the absolute value of the largest sample population decrease. So for AGR at zero, the logarithmic variable used in our equations is valued at ln 6902.

31 Even with a logarithmic specification for AGR, the quadratic term may be needed because with the log specification the effect of AGR on the impact of the RMA law will always be positive no matter how large growth becomes. After a certain threshold is reached, however, this relationship may no longer hold for further increases in growth.

An asymmetry exists between areas where growth was positive and areas where it was negative. Under the increasing-cost hypothesis, an RMA law should not have any effect if population is decreasing. In response to declining demand, some incumbent dealers will contract their sales (moving along their short-run marginal cost curves), while others exit the market (moving the industry along its long-run marginal cost schedule). This same retrenchment will occur whether there is an RMA law or not. As a result where growth is negative, one would expect no interaction between growth and the entry law.

With the enhanced-market-power theory, a relationship between these two variables might exist in the negative growth range. In this situation, any threat from the manufacturer to create more dealers is not all that credible, and the more negative the growth rate, the less credible it would be. Therefore, it might be argued that the impact of the law should be interacted with growth even when growth is less than zero.

Thus, in the negative growth range, the rationale for this interaction is different from that in the positive range. Consequently the coefficient of the ROLD-AGR interaction is probably different in an area with above-zero growth than in a place with negative growth.[32] To reflect this situation, we add the following variables to the equation:

IAGR0 = ROLD*ln(AGR + 6902), if the change in population is less than or equal to zero, and ROLD*ln 6902, if the change in population is greater than zero,[33]

IAGR1 = ROLD*(ln(AGR + 6902) - ln 6902), if the change in population is greater than zero, and zero, otherwise,

IAGR1SQ = $(\text{IAGR1})^2$.

Other laws and regulations affecting the dealer-manufacturer relationship should also be included in our estimating equation. Brown (1980) and Smith (1982) describe and analyze the other laws that they feel had a significant impact on dealer behavior; the latter used them in a model such as ours. In Table IV:2, we list the regulations other than the RMA laws that they thought most important and the states in which they were not present in 1978.

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[32] This type of situation requires what is called a spline function which allows the coefficient of the ROLD-AGR interaction to be different in different parts of the AGR range. See Suits, Mason, and Chan 1978 for an example of the methodology behind this technique.

[33] As noted in footnote 31, AGR has been adjusted to avoid attempting to take the logs of negative values. This adjustment explains the presence of ln(AGR + 6902) and ln 6902. The second part of the IAGR0 definition is added to prevent a discontinuity at the zero growth point in the price-ROLD-AGR relationship.

Table IV:2

State Regulations of Automobile Franchising in 1978

| Policy Variable | Description | Unregulated States (in ZIP code Abbreviations) |
|---|---|---|
| FORCE | Manufacturer cannot force dealers to accept unordered vehicles | AL, AK, CT, DE, DC, GA, IN, MI, MO, NE, NJ, NY, ND, OR, PA, WV, WY |
| CANCEL | Franchises cannot be canceled without the authority | AL, AK, DE, DC, GA, MI, MO, OR, WY |
| LD | Dealers are required to be licensed or registered | AK, ME, NH, NY, VT |

Some of these variables could affect not only entry conditions but also specific firm behavior. The laws against forcing prevent the manufacturer from controlling dealer volume. This allows the dealer to set output in conformance with his goals instead of those of the manufacturer, perhaps leading to a price above marginal cost. The laws attenuating the ability of the auto company to terminate or cancel its franchises take away one weapon the manufacturer can use to control its dealers. This law could also possibly increase the ability of the dealers to use any market power they may have. Smith posits that the dealer licensing requirement could be used to prevent or attenuate entry. Therefore dummies for the presence or absence of these laws (on a state basis) will be added to our model. So, for the effect of regulations, we have the following vector of variables:

REG = (RNEW, ROLD, IAGR0, IAGR1, IAGR1SQ, FORCE, CANCEL, LD).

To summarize, the following supply equation is used:

P = S(QS, RNEW, ROLD, IAGR0, IAGR1, IAGR1SQ, PW, WAGE, ADV, DENS, GR, FORCE, CANCEL, LD).[34] IV:7a

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[34] In an alternative formulation, DB and variables representing the interaction of it with AGR were used instead of ROLD. Also we experimented with other variations on these variables.

Since the other regulations are not the variables of primary interest, we will not include in the analysis the distinction between the old and the new laws as was done for the RMA law variable.

As with demand, the functional form for the supply equation will be log-log or ln-ln.[35]

c. Endogenous Regulations

Our approach accounts for the endogeneity of the regulations by positing additional equations in the model. These equations reflect the conditions leading to the presence or absence of a given regulation. The first step is to hypothesize a demand and supply relationship for each regulation. The demand equation of this system would have a quantity variable which is either one or zero depending on whether or not the state had the law. The dependent variable of the supply equation would be the price of the regulation. Usually not enough is known about the mechanism leading to the occurrence of any given regulation to confi-

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35 The ln-ln specification in the demand equation means a constant demand elasticity. When the supply function has the same specification, the deviation between price and marginal cost is not directly affected by variables on the demand side. This simplifies our estimation procedure, and the ln-ln specification probably does not badly distort reality. The range of the variable in which we are most interested, price, is not great compared to many variables measured by econometric methods. For instance, the standard deviation of Regular Chevrolet prices across the states for 1978 is only 3.75 percent of the mean. Therefore, with our data sample, we are not measuring the function over a wide range, and in this range the forms of the actual functions are probably well approximated by the ln-ln specification. Nevertheless, if the actual functions are nonlinear, this specification should sufficiently allow for it.

dently specify the structural equations of such a system.[36]

Our objective, however, is not to estimate such systems but to use the concepts to find suitable exogenous variables for the presence-of-regulation equations. The latter equations, then, can be viewed as reduced-form equations for the regulation market systems. These equations can be incorporated into our retail automobile model, but vis a vis our system, they would be structural equations for the presence of regulations.

Given the idea of a market for each regulation, we can ascertain what variables are needed to estimate each presence-of-regulation equation. Included in the variables that affect the presence of the laws are the losses and benefits that the legislation imposes on the participants in the retail automobile market: that is on the buyers and sellers. Both the buyers and sellers in these markets are potential voters and campaign contributors, and therefore the legislators would ultimately, at least partly, depend on them for their jobs.

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36 The major problem is that no data on the price of the various regulations exist; even if direct monetary compensation had occurred (i.e., bribery), information on it would not be generally available. Usually transactions in the political arena are made with non-monetary compensation. For example a legislator well-disposed toward auto-dealers, perhaps a dealer himself, will vote for a pet project of some other legislator in exchange for a favorable vote on the RMA law (this process is called log-rolling).

For our model, the losses are the decreases in consumer surplus for the buyers (DCS), and the benefits are the increases in producer surplus for the sellers (DPS).[37] Both of these variables are dependent on changes in the retail auto markets. In fact, it is the impact of these conditions on the regulation market system that accounts for the simultaneity between the presence of regulation and automobile price. In general, a presence-of-regulation equation can be represented as follows:

$$REG = R(DCS, \; DPS, \; POL), \qquad \text{IV:8}$$

where POL = a vector of variables reflecting the ability of dealers to influence the political process or the vector of exogenous variables in the demand and supply system for the given regulation other than DCS and PCS.[38]

Equation IV:8 can be estimated as a reduced form equation to give us an instrumental variable ($\overline{REG}$) to

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[37] The major effect of the laws on the automobile manufacturer is the loss in revenue due to decreases in the number of cars sold. It is not specifically represented in this formulation, but its impact on the presence of the RMA laws will be represented in the vector of other relevant variables.

[38] It is possible that the conditions in the auto market that led to the passage of the laws no longer exist. In that case, the laws would be predetermined. Most of the RMA laws, however, were enacted in the decade before 1978, and it is not likely that a significant set of the relevant local conditions would have changed that much.

Using similar variables, McCormack and Tollison (1981) modeled the actions of legislatures and explained about half of the variations in the behavior they were examining (the largest R-Square for any of their models being 0.60).

be included in the automobile supply equation (IV:7a). To do this, we posit that DCS and DPS are determined by the same exogenous market variables as are demand and supply in the automobile market. These variables are denoted by the Z, PI, and X vectors in equations IV:1 and IV:7. Since consumer and producer surplus are functions of Q and P, this seems to be a reasonable assumption.

This substitution gives us a reduced-form specification of the regulation market:[39]

$$REG = REG(Z, ECOST, POL) \qquad IV{:}9$$

where Z = the vector of exogenous demand-side variables.

ECOST = the vector of exogenous variables impinging on dealer costs consisting of the exogenous variables in equation IV:7.

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[39] Some readers may wonder why we derive an explicit reduced form for our regulation equation rather than using a simultaneous equation method for the three equation system consisting of the demand and supply equations for automobiles and the regulation equation. There are two reasons we chose the approach we did. First, equation IV:8 is not actually a complete structural equation. A complete structural system would include separate demand and supply equations for regulations. We cannot utilize such a complete model because we have no data on the price of regulation. Second, our regulation equation contains the variables DCS and DPS which we posit are functions of the exogenous variables included in the demand and supply equation. In order to employ a system's approach to estimating our model, we would have to explicitly model DCS and DPS. Given that our primary interest is in the auto demand and supply equations and the effect of the regulations on those equations, we did not feel that the gains from doing this additional modelling were sufficient to justify the effort that would have been required.

The POL vector should include indicators of the ability of dealers to exert political influence; these variables determine the effective demand for regulation. Examples of variables that may reflect this ability are the ratio of dealers and dealer employees to all voters or workers and the organizational characteristics of dealer trade groups.[40] The only readily available variable of this type, however, is the ratio of auto dealer employees to total state employment (AD) which we include in the analysis.[41]

Two sets of factors influence the supply of regulations. The first is the strength of the groups likely to oppose the regulation: consumers, the auto manufacturing management, and auto worker unions. The opposition of consumer groups does not have to be explicitly modeled in this analysis because the exogenous auto-demand variables representing the RMA-law-induced loss of consumer surplus probably act as an adequate collective proxy for opposition from this quarter.

The auto manufacturing managements are keenly aware of the negative effect of the entry laws on their sales and profits. Consequently a variable reflecting the influence of the auto manufacturing industry will

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40 These types of variables are analogous to the income variables in the demand equations for ordinary goods. As with income, political influence gives the demanders the ability to obtain their desires.

41 The sources for this information are N.A.D.A. and the Census Bureau.

be included in our model. This variable is the ratio of auto manufacturing employment to total state employment (AW). Where auto employment is concentrated, politicians are particularly sensitive to the interests and desires of the industry. It accounts for many votes not only from workers in the industry but also from other people dependent on it.

The second set of factors affecting the supply of the favorable laws is the nature of the state government. McCormack and Tollison (1981) suggest several variables that may affect the vulnerability of state governments to special interest group pressure. Two are the size and composition of the legislature. The larger the size of the legislature, the greater the number of legislators who must be convinced that a given law is desirable and the more costly it is for a group to obtain favorable laws (McCormack and Tollison 1981, p. 32). So we include a variable, SIZE, equaling the total number of members in both houses of the state legislature.

The ratio of the sizes of the two legislative houses can affect the cost of obtaining special interest legislation. McCormack and Tollison posit that the more unequal the sizes of the two houses the more costly it is for interest groups to obtain their desires. Given a total number of lawmakers, increasing the size of one house increases the number of votes needed for it to pass a bill. On the other hand, the expected number needed in the other house is smaller. If one assumes (as do McCormack and Tollison, p. 44) diminishing returns to the process of obtaining votes in a legislative house, then the cost of obtaining the additional votes in the lower house will exceed the savings from not having to win as many in the upper. So we include in the model the ratio of the size of the lower house to that of the upper (RATIO).

The income and the population of a state may influence the ability of interest groups to obtain favorable legislation. Increasing wealth raises the opportunity cost of monitoring legislation to the voters outside of interest groups because it increases the value of their time. The greater the population, the less any given voter has to lose from any wealth redistribution resulting from special interest legislation, and the less the probability of any of his efforts influencing the process.[42] This would raise the expected cost of any given amount of effort by any given voter (see McCormack and Tollison 1981, p. 32.). So we add state per capita income (STY) and population (STP) to our regulation equation.[43]

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42 This effect is on the supply of regulations in general, and it does not pertain to any particular regulation the per capita cost of which may or may not vary with the state population.

43 Per capita income on a county level is already in the equation, but low income counties exist in high income states and vice versa. Since state income is the variable that affects the incidence of the laws, we include both income variables in the model.

Therefore, the system for retail supply, demand, and regulation of automobiles, the reduced-form instrumental variable for REG would be:

$$\overline{REG} = \overline{REG}(POP, DENS, DP1, DP2, I, PG, PI, POPY, POPO, LFAM, NEW, PAC, RMTN, WSC, TEM, PW, WAGE, ADV, GR, AD, AW, SIZE, RATIO, STY, STP).^{44} \qquad IV:9a$$

Equation IV:9a will be used to obtain instrumental variable estimates for each of the regulation variables -- RNEW, ROLD, IAGRO, IAGR1, IAGR1SQ, CANCEL, FORCE, and LD.[45] Since the same political forces affect the incidence of each of these regulations, this seems to be a reasonable approach. Following Heckman (1978), the predicted values resulting from the measurement of equation IV:9a are used as instruments in estimating the supply equation (IV:7a).

As with the exogenous REG variables, instruments are used for P in the demand equation and QS in the supply equation because they are simultaneously determined by market conditions. To recapitulate,

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44 This is actually a detailed version of equation IV:9.

45 This equation can be estimated by means of a linear probability model. Heckman (1978) shows that this OLS estimator can be used as an instrumental variable in estimating a structural equation that is part of a simultaneous system.

then, the following structural market system will be used with a ln-ln specification:

$$Q = D(\overline{P}, POP, Y, DENS, DP1, DP2, I, PG, PI, POPY, POPO, LFAM, NEW, PAC, RMTN, WSC, TEM) \qquad \text{IV:1(}$$

$$P = S(\overline{QS}, \overline{RNEW}, \overline{ROLD}, \overline{IAGR0}, \overline{IAGR1}, \overline{IAGR1SQ}, PW, WAGE, ADV, DENS, GR, \overline{FORCE}, \overline{CANCEL}, \overline{LD}).$$[46]

(The variables denoted by overscored letters are represented by instrumental variables in this equations.)

Because of the impact of the regulations on price, the variables in the POL vector are included in the instrumental variables for P and QS. For the regulation variables, the instrumental variable is represented by equation IV:9a. Therefore the instruments for P and QS would be as follows:

$$\overline{P} = \overline{p}(POP, DENS, DP1, DP2, I, PG, PI, POPY, POPO, LFAM, NEW, PAC, RMTN, WSC, TEM, PW, WAGE, ADV, GR, AD, AW, SIZE, RATIO, STY, STP), \qquad \text{IV:11a}$$

$$\overline{QS} = \overline{qs}(POP, DENS, DP1, DP2, I, PG, PI, POPY, POPO, LFAM, NEW, PAC, RMTN, WSC, TEM, PW, WAGE, ADV, GR, AD, AW, SIZE, RATIO, STY, STP). \qquad \text{IV:11b}$$

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[46] For now, we assume a model with ROLD but one with DB in its place could also be used.

Now that the model and its component variables have been described, we will discuss the results and conclusions.

## V. Results and Implications

In this section, we first report the results from the estimation of our models, and then we show what these results imply about the above-discussed theories on the effects of the RMA laws. Last we use our econometric estimates to calculate the cost of the laws to automobile consumers.

### a. Estimation Results for the Demand Equation

Table V:2 shows the estimates of the structural demand equations for the nine 1978 Chevrolet car-types, while Table V:4 shows the supply equation measurements.[1] (Table V:1 lists the variables used in the two models and their definitions.) We first examine the demand results starting with the price elasticity estimates that are listed in Table V:3.[2] For the Nova, the

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[1] Our two-stage instrumental variable technique limits the bias introduced by possible specification errors in either the supply or demand equation. With this method, these errors will only affect the measurement of the equation where they occur and not any other. See Johnston 1972, p. 408-20.

[2] We considered the possibility that while the law only influences the supply of autos, the absence of data on variations in product quality could cause the presence of the laws to bias our measurement of the demand function. Some of Smith's results indicate that the introduction of the laws led to changes in the amount of extras that consumers bought. He hypothesized that the laws increased search costs and then somehow impelled the consumers to buy more expensive (Footnote continued)

Monza, the Chevette, and the Corvette, these elasticities are significantly less than zero as expected. For the Regular and the Camaro they are below zero but insignificant. Finally those for the Malibu, Monte Carlo, and Sportvan are positive but not significantly different from zero.

Although insignificant, these positive elasticity estimates raise questions about our demand measurements. Also leading to questions are the rather low absolute values for the other price elasticities, which ranged from -0.329 for the Camaro to -1.281 for the Corvette. Most total automobile demand models have shown somewhat higher elasticities, usually over one in absolute value.[3] In our results, only two elasti-

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(Footnote continued)

cars, other things equal. This would change the position of the measured or apparent demand curve. Therefore, we made a second estimate of each demand equation which includes the eight regulation variables (RNEW, ROLD, IAGR0, IAGR1, IAGR1SQ, FORCE, CANCEL, and LD). We, then, performed F tests of the hypothesis that these regulation variables affect the position of the demand equation. The null hypothesis of no influence can not be rejected for eight of the nine Chevrolet body-types. Given the negative results, we proceed on the assumption that the regulations do not affect the demand for any of the auto-types.

3 For a discussion of these, see Langenfeld 1983. Examples of such studies are Chow 1957, Carlson 1978, Johnson 1978, Wycoff 1973, and Bresnahan 1981. Because past price elasticity estimates varied considerably, they can not be viewed as definitive.

cities are over one. Furthermore our measurements are for the demand for particular car-types, and so one might expect even higher absolute values.

There are two possible reasons to believe that our elasticity estimates have a positive bias. First, the demand equations include no variable for the price or availability of substitute types of cars (either new or used). As noted above in section IV, one would expect this deficiency to lead to an upward bias in the elasticity estimate. Second the lack of variables reflecting cross-sectional differences in options would also bias the elasticity estimates in the positive direction.[4]

Despite these sources of bias, four of the car-type elasticities are not significantly greater than minus one (the Nova, the Monza, the Chevette, and the Corvette). For the purposes of calculating a quantity effect for the RMA laws, these estimates are used, and for the other car-types, other procedures are followed; they are described below.

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4 The bias of the elasticity estimate is a positive function of first the correlation between the omitted variable and price and second the true regression coefficient of the omitted variable with respect to the dependent variable (see Johnston 1972, p. 168-79). A variable representing the presence of a given option would be the ratio of the cars with the option to total car sales. This variable would be positively correlated with average price, and its coefficient in the demand equation would be positive. This would give the price elasticity bias a value greater than zero.

We now consider the results for the other demand-side variables. All the influence-of-population coefficients are above zero as expected and significant at the one percent level. For seven of the equations, the same is true of the income (Y) parameter, suggesting that these seven Chevrolet body-types are normal goods. Only the coefficient for the Nova is less than zero, and this result is not significant.

According to economic theory, the coefficients of the prices of the complementary goods should have negative signs. This is the case for eight of the nine rate-of-interest (I) coefficients and for seven of the gasoline price parameters (PG), but only three of the insurance price (PI) coefficients have the predicted sign. For these variables, however, few of the coefficients are statistically significant in a one tail test (one for the interest rate, two for the gasoline price, and one for the insurance price). This lack of significance may be explained by the inadequacies of the data which are available only on a state-wide basis.

For the demographic and regional variables, several results are consistent with economic theory and past studies. For instance the greater presence of older people (POPO) significantly increases the sales of the Regular car and of the medium-sized Malibu but decreases the sales of the Camaro. This result is consistent with our predictions in section IV. On the

West Coast, the other-things-equal sales of seven Chevrolet car-types are significantly lower than elsewhere, but those of the Camaro are significantly higher. In New England, the sales of Camaros are significantly less than elsewhere, but the sales of Malibus, Novas, and Chevettes are significantly greater.

The results also indicate that the average July temperature (TEM) raises the demand for some cars but lowers it for others. This writer, however, has no insight into why the net effect of temperature on the demand for particular cars has a particular sign.

The variables measuring the presence of substitutes for automobiles essentially reflect not price but product availability, and therefore the signs of the coefficients should be negative. The density (DENS) variable, which should indicate the presence of other transit modes, has unpredicted positive coefficients for eight of the equations. So this variable might be reflecting some unknown influence other than transit mode availability.

Similarly the variable for the presence of subways, DPl, has positive signs for all nine of the equations. One problem with this variable is that the areas covered by our observation units are often considerably larger than the areas served by the particular subway system.[5] The dummy for the presence of light transit systems also has an unpredicted sign for five of the car-types, and none of the four with the predicted sign are statistically significant.[6]

In general, the following conclusions can be made about the demand equations and the sometimes unexpected results. First the data are often only crudely connected with the real world variables: examples being DP1, the presence-of-subways dummy, and PI, the price-of-insurance variable. This may account for some of the counter-intuitive results. Nevertheless the results for the income and complementary goods price variables usually have the right signs and are often significant, and the $R^2$'s were generally quite high for

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[5] For instance the subway in the Boston area only extends over the city itself and to some immediately adjoining towns such as Cambridge, Brookline, and Newton. By contrast, the observation unit covers several counties in Eastern Massachusetts outside the reach of the underground railroad.

[6] There are positive correlation coefficients between these variables which suggests a multicollinearity problem, but the coefficient between DP1 and DP2 is only 0.683. Neither of these variables is highly correlated with DENS, the coefficients for DP1 and DP2 being 0.242 and 0.186 respectively. The coefficients are all below the levels where other writers believe problems would occur. To see if the exclusion of these variables made a difference, the model was run again with some variables left out. Left out in these experiments were DP2 and POPO. (The latter is correlated with POPY; the coefficient being -0.82). The results were not materially different. See Kennedy 1981, p. 130-31.

cross-sectional equations, ranging from 0.607 to 0.770.[7]

b. Estimation Results for the Supply Equation

Table V:4 shows the estimates of the structural supply functions for the nine Chevrolet auto-types. Before discussing the coefficients making up the supply-side effect of the RMA laws, we should consider the effect of quantity on the supply equation. Our model posits that it is total new vehicle volume, QS, rather than the volume of a particular body-type, Q, that impinges on the marginal cost and therefore the price.

Our estimates, however, suggest that there is no relationship between QS and cost. For only one model is the regression coefficient of QS significantly different from zero, and in general, the absolute values for this parameter are small, meaning that the supply curves are quite flat. Therefore, given the small values and the lack of statistical significance, we reestimated the supply equations without QS. These are the results displayed in Table V:4.

We now examine the coefficients of the variables making up the impact of the entry regulation on price.

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7 In these as in all instrumental variable models, the $R^2$'s indicate the percentage of the variation in the dependent variable that can be accounted for by the variation in its predicted value as measured by the regression model.

As shown above, there are four variables for the over-two-years-old RMA law impact: a dummy, two interaction variables, and a quadratic term.[8] Thus the percentage effect on price can be modeled as follows:

$$\text{RMA impact} = c2\ \text{ROLD} + c3\ \text{IAGR0} + c4\ \text{IAGR1} + c5\ \text{IAGR1SQ}. \qquad \text{V:1}$$

where ci = the coefficient in the supply equations displayed in Table V:4 with respect to the ith variable.

This formulation of the impact of the laws is essentially derived from the supply equation in system IV:10 (see page 74). Given the above-discussed zero restriction on the QS parameter, we arrive at this equation because the denominator of the total (reduced-form) RMA impact equals one. Below in sub-section V:d, we will use equation V:1 to calculate the RMA law impacts on car prices, but first we describe the estimation results for the individual variables making up this impact.

In our supply function estimates of the nine Chevrolet car-types, the coefficients of ROLD and IAGR0 are not significantly different from zero. In other words,

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[8] Since we have found that RMA laws that have been in place for less than two years do not have a significant effect on prices, we consider only the effect of older RMA laws in measuring the impact of these laws.

the RMA laws appear to have little or no effect in areas where population growth is zero or negative.[9]

In contrast, the coefficient for IAGR1, the variable interacting the presence of the law with positive population growth, is significantly above zero at the one percent level for all models. In other words, more rapid growth of population is associated with a larger impact of the RMA laws on the price of Chevrolet cars.[10]

The coefficients for the quadratic terms are negative for all the body-types, and for the Regular, Malibu, Camaro, Nova, and Monte Carlo, they are significantly less than zero. Consequently for these models, linearity in the relationship between growth and the RMA impact can be rejected. For all the auto body-types, the quadratic term is quite large even where it is not significantly different from zero. Therefore, we will include it when evaluating the effect of the entry law in the next sections.

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9 One problem, however, is the high correlation between ROLD and IAGRO, the coefficient being 0.98. Such multicollinearity may lead to positively biased variance estimates, and consequently the conclusion based on the results can only be tentative.

10 When the regressions were run with DB, the variable for enforcement by auto dealer regulation boards, in place of ROLD, the results were not materially different. Models with combinations of ROLD and DB were also run, but again the results were similar to those described above.

Next, in order to assess the model's veracity, we should look into the results for the other explanatory variables. Among the input price variables, the most important, the wholesale automobile price (PW), has parameter estimates that are significantly above zero as expected for all the car-types. By contrast, the effects of the other input prices are not all as predicted. The WAGE coefficient is unexpectedly negative for one car-type (but not significantly so on a two tail test), and it is significantly above zero for only four. The advertising variables also have negative coefficients for eight of the body-types. Both of these variables are measured only on a state-wide basis; so much of the total variation is not captured. Also the ADV variable may be a rather weak proxy in that it represents the cost of only one advertising medium which may not be as highly correlated with the prices of other media as we expected. The DENS variable, supposedly reflecting the price of real estate, also did not have the expected signs, being negative for eight of the models. Apparently, DENS is a poor proxy for real estate costs.

The results for the population growth variable, GR, are inconclusive. Five of our models have the usual expected positive sign, but only two are significantly different from zero.

For two of the other regulation variables, FORCE, the dummy variable indicating the presence of laws against forcing, and LD, the dummy for the presence of laws requiring dealers to have licenses, there are unexpected signs for eight of the car-types.[11]

In contrast, the results for CANCEL, the laws regulating the terminations of franchises by manufacturers, were in accordance with past theory on this subject. For all of the models the signs are positive, and for six, significantly so.

All in all, the measurement of the supply curves was successful. The coefficients for the important cost variables, wholesale price and wages, are usually as expected and often significant. Furthermore the $R^2$'s are quite high for cross-sectional equations, with all except one -- that for Corvette -- above 79 percent. The problems that do exist may well be the result of data inadequacies.

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[11] Smith's results were different in that they usually indicate a significant positive coefficient for LD, but as mentioned in section III there were some data problems in Smith's paper.

Table V:1

Definitions of the Variables Used in the Retail Supply and Demand Models

| Variable* | | Definition |
|---|---|---|
| Q | = | the number of units of a given automobile body-type sold in the observation county or SMSA. |
| P | = | the average retail price of a given automobile body-type sold in the observation county or SMSA. |
| POP | = | the population of the observation county or SMSA. |
| Y | = | per capita income of the observation county or SMSA. |
| I | = | the average automobile loan interest rate for the state in which the observation county or SMSA is located. |
| PG | = | the average price of gasoline for the state in which the observation county or SMSA is located. |
| PI | = | the average motor vehicle insurance premium for the state in which the observation county or SMSA is located. |
| DENS | = | the population per square mile for the observation county or SMSA. |
| DP1 | = | one for each observation county or SMSA with a rapid transit (subway) system, and zero otherwise. |
| DP2 | = | one for each observation county or SMSA with a light transit system (surface street cars or railroads), and zero otherwise. |
| POPY | = | the proportion of the population between 15 and 35 years old in the observation county or SMSA. |
| POPO | = | the proportion of the population 55 years old or over in the observation county or SMSA. |
| LFAM | = | the average household size, found by dividing the county or SMSA population by the number of households for the observation county or SMSA. |
| NEW | = | one for New England, and zero otherwise. |
| PAC | = | one for the Pacific states, and zero otherwise. |

Table V:1 (Continued)

| | | |
|---|---|---|
| RMTN | = | one for the Rocky Mountain states, and zero otherwise. |
| WSC | = | one for the West South Central states, and zero otherwise. |
| TEM | = | the mean July temperature in the observation county or SMSA. |
| QS | = | the total number of units of all nine of the sample automobile body-types plus the total number of new light and medium trucks sold by Chevrolet dealers in the observation county or SMSA. |
| RNEW | = | one for the states in which the RMA law was in effect in 1978 but not in 1976, and zero otherwise. |
| ROLD | = | one for the states in which the RMA law was passed before 1976, and zero otherwise. |
| AGR | = | the absolute change in the population of the observation county or SMSA. |
| IAGR0 | = | ROLD*ln(AGR + 6902), if the change in population is less than or equal to zero, and ROLD*ln 6902, if the change in population is greater than zero. |
| IAGR1 | = | ROLD*(ln(AGR + 6902) - ln 6902), if the change in population is greater than zero, and 0, otherwise. |
| IAGR1SQ | = | $(IAGR1)^2$. |
| PW | = | the average wholesale price of a given automobile body-type sold in the observation county or SMSA. |
| WAGE | = | the average weekly wage rate for dealer employees for the state in which the observation county or SMSA is located. |
| ADV | = | a measure for advertising expense, the simple average of the "morning and afternoon line rates" for daily newspapers in the state divided by the circulation of the average newspaper for the state in which the observation county or SMSA is located. |

Table V:1 (Continued)

| | | |
|---|---|---|
| GR | = | the percentage change in the population of the observation county or SMSA. |
| FORCE | = | one for the states in which the law against the manufacturers forcing the dealers to accept unordered vehicles was in effect in 1978, and zero otherwise. |
| CANCEL | = | one for the states in which the law against the manufacturers canceling franchises without the permission of a state authority was in effect in 1978, and zero otherwise. |
| LD | = | one for the states in which the law requiring dealers to be licensed or registered was in effect in 1978, and zero otherwise. |

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* In the models, all the variables except AGR and the dummy variables are included as natural logarithms.

Table V:2

The Estimated Regression Coefficients for the Retail Demand Function for the Nine Chevrolet Automobile Body-Types for 1978. a/

| Variable | Body-Type Regular | Malibu | Camaro | Nova | Monte Carlo |
|---|---|---|---|---|---|
| Const. | -10.829 | -2.262 | -5.263 | 13.285 | -13.542 |
| P | -0.378 (-1.19) | 0.028 (0.08) | -0.329(-1.13) | -0.807(-2.69)** | 0.360 (1.08) |
| POP | 0.825 (28.48)** | 0.833(27.01)** | 0.853(23.63)** | 0.862(27.45)** | 0.847(25.75)** |
| Y | 0.362 (4.19)** | 0.436 (4.74)** | 0.356 (3.27)** | -0.030(-0.31) | 0.105 (1.07) |
| I | -0.082 (-0.29) | -0.204(-0.69) | -0.143(-0.42) | -0.248(-0.83) | -0.400(-1.28) |
| PG | 1.799 (3.77) | -0.267(-0.52) | -1.117(-1.89)* | -0.483(-0.94) | -0.096(-0.18) |
| PI | 0.139 (1.49) | 0.127 (1.27) | -0.050(-0.43) | 0.125 (1.21) | 0.131 (1.24) |
| DENS | 0.046 (1.71) | 0.147 (5.18) | 0.154 (4.62) | 0.119 (4.07) | 0.161 (5.29) |
| DP1 | 0.442 (1.58) | 0.304 (1.02) | 0.229 (0.67) | 0.489 (1.64) | 0.077 (0.24) |
| DP2 | 0.136 (0.39) | 0.011 (0.03) | -0.009(-0.02) | -0.026(-0.07) | 0.218 (0.56) |
| POPY | -0.014 (-0.07) | 0.004 (0.02) | -0.395(-1.60) | -0.043(-0.20) | 0.123 (0.55) |
| POPO | 0.356 (2.94)++ | 0.325 (2.53)+ | -0.389(-2.58)++ | 0.169 (1.29) | -0.021(-0.16) |
| LFAM | 0.207 (1.51) | 0.057 (0.39) | -0.089(-0.53) | 0.134 (0.91) | -0.165(-1.06) |
| NEW | 0.055 (0.53) | 0.343 (3.10)++ | -0.287(-2.24)+ | 0.363 (3.28)++ | -0.026(-0.22) |
| PAC | -0.983(-11.09)++ | -0.561(-5.96)++ | 0.379 (3.63)++ | -0.302(-3.22)++ | -0.176(-1.81) |
| RMTN | -0.617 (-8.89)++ | -0.252(-3.41)++ | 0.115 (1.32) | -0.145(-1.90) | -0.096(-1.22) |
| WSC | -0.024 (-0.47) | -0.156(-2.81)++ | 0.016 (0.25) | -0.083(-1.48) | -0.016(-0.27) |
| TEM | 0.670 (2.45)+ | -0.329(-1.10) | 1.813 (5.24)++ | -1.346(-4.14)++ | 2.132 (7.00)++ |
| $R^2$ b/ | 0.750 | 0.770 | 0.730 | 0.762 | 0.754 |
| Number of Observations | 2102 | 2080 | 1989 | 2019 | 2089 |

Table V:2 (Continued)

| Variable | Body-Type Monza | Chevette | Sportvan | Corvette |
|---|---|---|---|---|
| Const. | 14.181 | 9.953 | -8.783 | -3.319 |
| P | -1.201(-4.71)** | -0.970(-3.46)** | 0.440 (1.77) | -1.281(-6.73)** |
| POP | 0.898(24.08)** | 0.786(23.78)** | 0.655(14.26)** | 0.775(25.46)** |
| Y | 0.700 (6.07)** | 0.505 (5.09)** | 0.847 (5.52)** | 0.561 (6.13)** |
| I | -0.625(-1.77)* | -0.246(-0.78) | 0.535 (1.26) | -0.278(-0.97) |
| PG | -1.863(-3.04)** | -0.447(-0.82) | -0.334(-0.45) | 0.961 (1.92) |
| PI | -0.123(-1.03) | 0.023 (0.21) | 0.287 (1.94) | -0.293(-3.03)** |
| DENS | 0.138 (4.00) | 0.160 (5.22) | 0.039 (0.90) | -0.009(-0.33) |
| DP1 | 0.014 (0.04) | 0.259 (0.82) | 0.448 (1.25) | 0.842 (2.94)++ |
| DP2 | -0.005(-0.01) | -0.045(-0.11) | 0.375 (0.85) | 0.027 (0.08) |
| POPY | 0.303 (1.18) | 0.306 (1.35) | -0.743(-2.27)+ | -0.404(-1.93) |
| POPO | -0.212(-1.35) | -0.013(-0.10) | -0.413(-2.10)+ | -0.058(-0.46) |
| LFAM | -0.024(-0.14) | 0.049 (0.31) | 0.098 (0.54) | -0.018(-0.13) |
| NEW | -0.030(-0.23) | 0.304 (2.58)++ | 0.021 (0.14) | -0.101(-0.92) |
| PAC | -0.378(-3.45)++ | -0.477(-5.01)++ | -0.529(-4.18)++ | -0.294(-3.35)++ |
| RMTN | 0.070 (0.77) | -0.153(-1.93) | -0.362(-2.91)++ | -0.223(-3.03)++ |
| WSC | -0.252(-3.73)++ | -0.230(-3.85)++ | 0.070 (0.79) | -0.182(-3.32)++ |
| TEM | -0.532(-1.44) | -1.066(-3.27)++ | -1.764(-3.96)++ | 1.343 (4.83)++ |
| $R^2$ b/ | 0.746 | 0.749 | 0.608 | 0.707 |
| Number of | | | | |

Table V:2 (Continued)

a/ t values are parentheses.

b/ This value is the square of the correlation coefficient between the actual and predicted values for price. This gives a good indication of the goodness-of-fit.

* significant at the 95 percent level on a one tail test.

** significant at the 99 percent level on a one tail test.

+ significant at the 95 percent level on a two tail test.

++ significant at the 99 percent level on a two tail test.

Estimates of Demand Elasticity for the Chevrolet Body-Types Used in this Study

| Auto Body-Type | Demand Elasticity Estimate (t-Values in Parentheses) | |
|---|---|---|
| Regular | -0.378 | (-1.19) |
| Malibu | 0.028 | (0.08) |
| Camaro | -0.329 | (-1.13) |
| Nova | -0.807 | (-2.69) |
| Monte Carlo | 0.360 | (1.08) |
| Monza | -1.201 | (-4.71) |
| Chevette | -0.970 | (-3.46) |
| Sportvan | 0.440 | (1.77) |
| Corvette | -1.281 | (-6.73) |

Table V:4

The Estimated Regression Coefficients for the Retail Supply Relation for the Nine Chevrolet Automobile Body-Types for 1978. a/

| Variable | Body-Type Regular | Malibu | Camaro | Nova | Monte Carlo |
|---|---|---|---|---|---|
| Const. | 0.7875 | 0.5426 | 0.2226 | 0.7723 | 0.4099 |
| RNEW | -0.0028(-0.94) | -0.0032(-1.16) | 0.0032 (1.10) | -0.0006(-0.20) | -0.0023(-0.82) |
| ROLD | -0.1013(-1.68) | -0.0941(-1.70) | 0.0395 (0.66) | 0.0155 (0.30) | -0.0990(-1.79) |
| IAGR0 | 0.0103 (1.49) | 0.0095 (1.50) | -0.0067(-0.97) | -0.0024(-0.40) | 0.0100 (1.58) |
| IAGR1 | 2.0869 (4.72)** | 1.6992 (4.17)** | 2.8680 (6.65)** | 1.5946 (4.06)** | 1.7007 (4.02)** |
| IAGR1SQ | -5.3485(-1.91)* | -4.5297(-1.75)* | -9.1689(-3.42)** | -5.0244(-2.03)* | -4.6208(-1.73)* |
| PW | 0.9077(69.83)** | 0.9306(77.80)** | 0.9926(99.74)** | 0.9067(90.34)** | 0.9495(81.92)** |
| WAGE | 0.0121 (1.32) | 0.0208 (2.43)** | -0.0118(-1.28) | 0.0151 (1.72)* | 0.0172 (1.96)* |
| ADV | -0.0043(-3.61) | -0.0038(-3.43) | -0.0014(-1.14) | -0.0021(-1.96) | -0.0027(-2.44) |
| DENS | -0.0039(-5.46) | -0.0022(-3.38) | 0.0014 (1.95)* | -0.0007(-1.10) | -0.0021(-3.05) |
| GR | -0.0031(-0.40) | 0.0053 (0.73) | 0.0150 (1.96)+ | 0.0108 (1.54) | 0.0017 (0.23) |
| FORCE | -0.0135(-2.53) | -0.0121(-2.39) | -0.0071(-1.41) | 0.0031 (0.63) | -0.0162(-3.22) |
| CANCEL | 0.0174 (3.34)** | 0.0172 (3.52)** | 0.0074 (1.48) | 0.0036 (0.76) | 0.0179 (3.68)** |
| LD | -0.0131(-2.47) | -0.0160(-3.14) | -0.0116(-2.22) | -0.0087(-1.82) | -0.0121(-2.37) |
| $R^2$ b/ | 0.779 | 0.816 | 0.872 | 0.866 | 0.805 |
| Number of Observations | 2102 | 2080 | 1989 | 2019 | 2089 |

Table V:4 (Continued)

| Variable | Body-Type: Monza | Chevette | Sportvan | Corvette |
|---|---|---|---|---|
| Const. | 0.6682 | 0.5561 | 0.2245 | 0.4131 |
| RNEW | -0.0045 (1.28) | -0.0025(-0.81) | -0.0077(-1.61) | 0.0033 (0.36) |
| ROLD | -0.0231 (-0.32) | -0.0672(-1.03) | -0.0280(-0.24) | 0.3033 (1.69) |
| IAGR0 | 0.0008 (0.09) | 0.0053 (0.70) | 0.0012 (0.09) | -0.0402(-1.95) |
| IAGR1 | 1.3734 (2.70)** | 1.9861 (4.33)** | 1.7323 (3.45)** | 3.1587 (2.36)** |
| IAGR1SQ | -0.9754 (-0.31) | -4.4453(-1.54) | -3.6972(-1.31) | -1.7200(-0.21) |
| PW | 0.9235(104.68)** | 0.9289(95.60)** | 0.9649(89.67)** | 0.9743(39.72)** |
| WAGE | 0.0103 (0.95) | 0.0198 (1.99)* | 0.0222 (1.39) | 0.0044 (0.15) |
| ADV | -0.0015 (-1.04) | -0.0038(-2.99) | -0.0056(-2.76) | 0.0002 (0.06) |
| DENS | -0.0016 (-1.84) | -0.0005(-0.66) | -0.0019(-1.72) | -0.0087(-3.82) |
| GR | 0.0201 (2.22)+ | -0.0022(-0.27) | -0.0060(-0.46) | -0.0169(-0.70) |
| FORCE | -0.0062 (-1.00) | -0.0096(-1.71) | -0.0120(-1.60) | -0.0031(-0.19) |
| CANCEL | 0.0128 (2.09)* | 0.0186 (3.38)** | 0.0222 (3.25)** | 0.0124 (0.79) |
| LD | -0.0168 (-2.77) | -0.0212(-3.93) | -0.0050(-0.67) | 0.0222 (1.37) |
| $R^2$ b/ | 0.867 | 0.843 | 0.897 | 0.470 |
| Number of Observations | 1966 | 2071 | 1289 | 2002 |

a/ t values are parentheses.

b/ This value is the square of the correlation coefficient between the actual and predicted values for price. This gives a good indication of the goodness-of-fit.

* significant at the 95 percent level on a one tail test.

** significant at the 99 percent level on a one tail test.

\+ significant at the 95 percent level on a two tail test.

++ significant at the 99 percent level on a two tail test

c. Implications

Our model indicates that the RMA laws affect the supply and therefore the price and quantity of automobiles. Moreover, the results allow us to tentatively discriminate among the market-power, demand-growth, and contract-failure theories. The positive coefficients on IAGR1 indicate that the entry laws have their biggest impacts in fast growing areas, where manufacturers are more likely to want to place new dealers. Further, the negative coefficients on IAGR1SQ suggest that as the growth rate increases, prices of new vehicles rise less rapidly. These findings are consistent with the predictions of the demand-growth or rising-cost hypothesis.

By contrast, the results do not provide support for the enhanced-market-power hypothesis. According to this theory, the RMA laws allow established firms in markets where fewness of dealers or differentiation of dealers creates dealer market power to increase profits by raising price. As argued above, the enhanced-market-power story would predict that the laws would have an effect in low or zero growth markets as well as in rapidly growing areas. As a result, the coefficient on ROLD should be positive and significant. Since our results find ROLD to be insignificant, they do not support the enhanced-market-power hypothesis.

In addition, our results do not support the contract-failure hypothesis. If the automobile manufacturers are holding up their dealers, we would expect this to occur to a greater extent in areas that are not growing or are growing only slowly. In rapidly growing areas, the car companies have the greatest need for new dealers and therefore the most to lose by holding up their existing dealers. In slow growth areas, by contrast, the franchisor does not need to attract as many new dealers.

If manufacturers are holding up dealers in slow growth areas and if the RMA laws eliminate this hold up and permit prices to rise to cover the dealer's costs, it is in the slow growth areas that the RMA laws should be associated with the largest increase in price. Therefore, this theory predicts a negative sign on the variable IAGR1 which measures the change in RMA law impact as growth increases. Since the sign on IAGR1 is positive, we do not find support for the contract failure theory.

d. The Cost to Consumers

Here we estimate the total costs of the RMA laws to consumers. Our results for the coefficients present in equation V:1 indicate that the RMA laws raise prices. The resulting cost to consumers has two components. The first, borne by the consumers who actually buy the product, consists of the increase in expenditure induced by the RMA law; that is, the price increment times the number of cars sold. The second component is the loss in the consumer surplus of the buyers who are priced out of the market.[12]

As stated above, our results support the rising-cost theory, which predicts a larger RMA law effect in growing areas. Figure V:1 illustrates the impact of the entry laws under this theory. In the initial period, the car dealers in this market face a demand curve, D, and the buyers face a flat long-run supply schedule, MC. The demand curve in this illustration is curvilinear as posited by the ln-ln functional form in our estimating equations, and the flat supply curve is consistent with our empirical analysis. Apparently, cost conditions are such that, if the franchisor is free to add new dealers as local demand increases, the supply price will not rise. Under this situation, the market equilibrium before an RMA law is enacted is at point E with price, P, and quantity, Q.[13]

Assume that the area population increases, resulting in the demand curve moving to D1. Under normal conditions, the new long-run equilibrium falls

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12 Consumer surplus is the difference between the price a buyer is willing to pay for a good and the price he actually has to pay. If consumers are priced out of the market, they no longer obtain this surplus.

13 To simplify the illustration, we assume a competitive market with price equal to marginal cost. The analysis could also be applied to a monopoly or monopolistically-competitive market where price does not equal marginal cost.

at point B with price, P, and new quantity, Q1. With the presence of an RMA law, however, this situation is changed; since the law limits the number of new dealers, the established firms will increase output along their rising firm cost curves. This results in a rising industry marginal cost or supply curve, MCr. The new market equilibrium point would, therefore, be A with price, Pr, and quantity, Qr. The price difference wrought by the RMA law, then, would be (Pr - P); this leads to a rent or profit to the dealers of Pr-A-E-P and a total expenditure increase by the consumers of Pr-A-C-P. The latter constitutes the first component of the cost of the RMA laws to consumers. The second component of the consumer cost is the loss of the consumer surplus of the people priced out of the market. In figure V:1, it would consist of the area, A-B-C.[14]

In what follows, we provide estimates of the cost to consumers of the RMA laws. That is, we estimate Pr-A-C-P and Pr-A-B-P. In addition, we provide estimates of the percentage increase in price, (Pr-P)/P, and the

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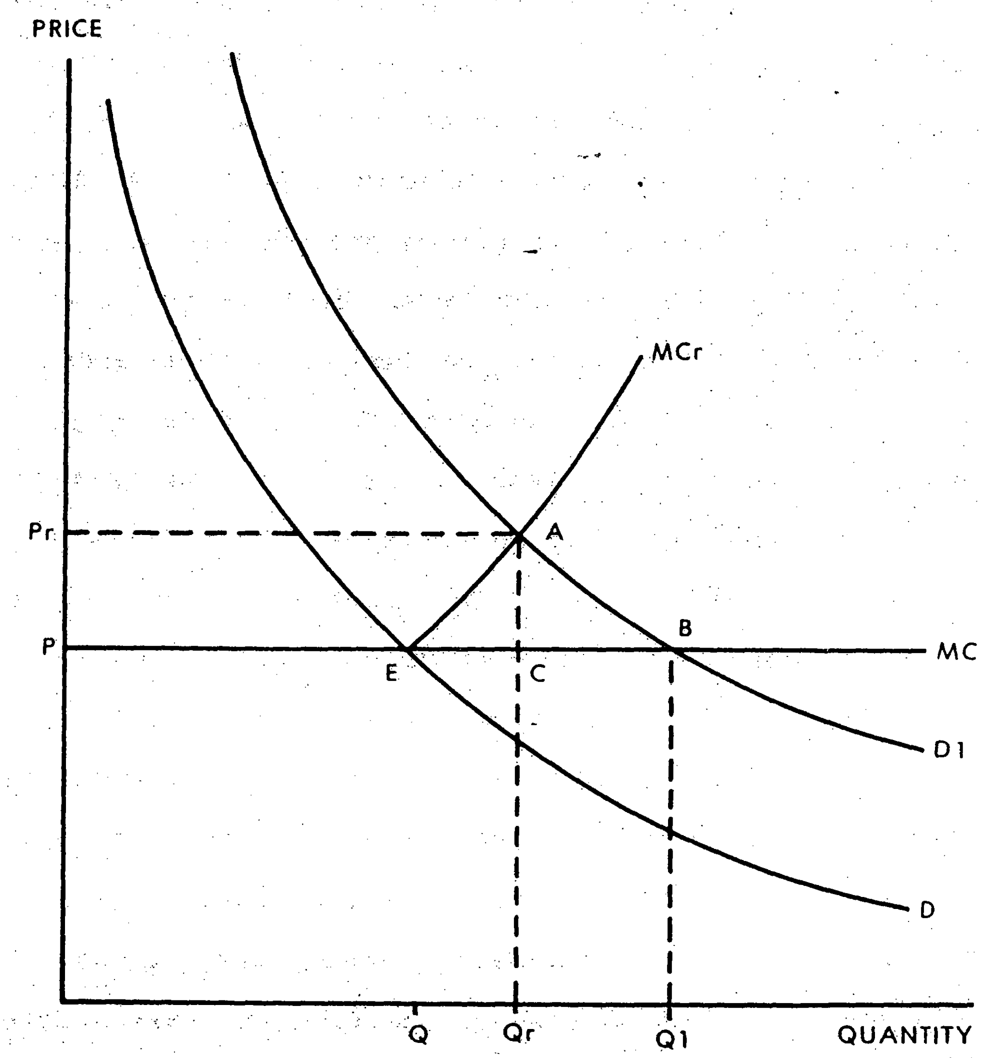
14 This graph can also be used to illustrate the concept of consumer surplus. For instance, the consumer located at point A on the demand curve, D1, is willing to pay price, Pr, for the product. Absent the RMA law, he has to pay only P; his consumer surplus, then, is (Pr - P). Under the RMA regime, however, he has to pay Pr, and his surplus is zero. The total consumer surplus in a market is the area under the demand curve and above the price level; A-B-C, then, is the consumer surplus of the people priced out of the market by the law.

Figure V:1 The Effect of the RMA Law

on A Growing Retail Automobile Market



absolute decrease in automobile output, (Ql - Qr). These figures are reported in Tables V:5 and V:6.

We also provide a lower-bound estimate of the cost of these laws to society or to the economy. This cost concept can be defined as the losses to one group in society that are not gained by another group. Thus, the costs to the economy of the RMA laws are the losses to consumers less the increased profits earned by auto dealers as a result of the laws. In Figure V:1, we have described the cost to consumers as being area Pr-A-B-P and the gains to auto dealers as Pr-A-E-P. Thus, the net cost to the economy is the area E-A-B.

It is not possible to estimate the area E-A-B. However, we can estimate the area A-B-C which provides a lower bound estimate of the cost to the economy. These estimates are also provided in Tables V:5 and V:6. They are lower-bound estimates not only because they fail to include the area E-A-C -- the extra resources utilized in automobile distribution as a result of the law -- but also because they do not include the costs incurred in getting the laws enacted or the costs involved in enforcing the laws.[15]

In developing these estimates, we have to make allowances for the difficulties that we encountered in measuring demand elasticity. As noted before, our

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[15] For discussions of this problem, see Buchanan and Tullock (1980) and Posner (1976).

elasticity estimates are low in absolute value relative to those in earlier studies. To deal with this problem, we perform a sensitivity analysis by providing two alternative estimates of the RMA quantity effect. The first one uses the demand elasticity measurements found by our model except where the estimate has an implausible positive value. In those cases (for the Malibu, the Monte Carlo, and the Sportvan), we use an elasticity of -0.8. This elasticity assumption is a compromise based partly on our findings for the other car-types and partly on the results of past studies.[16] For the second set of estimates, we assume a demand elasticity of -1.3 which is based on the results of earlier automobile demand studies.[17]

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16 As suggested above, none of these positive coefficients were significantly different from zero.

17 The majority of the earlier automobile demand studies arrived at price elasticities in the range between -0.5 and -1.6; these were similar to the ones found by our analysis. However, the earlier papers used an OLS estimating methodology, which could lead to simultaneous equation bias. When Langenfeld (1983) employed a Two Stage Least Squares technique, he arrived at demand elasticity estimates ranging from -1.7 to -7.0. This suggests a price elasticity for cars somewhat greater than those indicated by the earlier papers. Nevertheless, the Langenfeld estimates cover a wide range, and furthermore, our much lower elasticity figures are also the results of a simultaneous measurement technique.

Consequently, for the alternative simulation, we will use an assumption that takes into account not only the highly elastic demand estimates of Langenfeld but also the previous papers with results similar to ours. This will result in conservative estimates. Therefore, we use -1.3, which is at the lower end of the absolute elasticity range found by Langenfeld and the other earlier papers.

Tables V:5 and V:6 display these estimates for the nine 1978 Chevrolet body-types in the thirteen states where the laws had been in place for at least two years.[18] In the two tables, the first two columns show, respectively, the average RMA-law-induced percentage price increases, (Pr - P)/P, in the growing areas and the average increases over the whole set of observations.[19]

As noted above, our results indicate that faster population growth leads to greater RMA law effects. In areas where population increased since the passage of an RMA law, the average estimated increase in price caused by the law ranges from 3.68 percent for the Sportvan to 16.82 percent for the Corvette. The average price increase across all nine Chevrolet car-types is 7.63 percent. The 99 percent confidence interval on this 7.63 percent estimate is 2.56 percent to 12.09 percent. Averaging across all areas, including those with zero or negative population growth, the estimated average price effects ranges from 2.22 percent for the Sportvan to 13.82 percent for the Corvette, an average across all auto body-types of 6.14 percent. The 99 percent confidence interval on this estimate of the

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18 The rationale for the two year cut-off is described in section IV.

19 This relative increase is equal to the exponential of the right-hand side of equation V:1 minus one (Exp(RMA)-1) which is the difference between the price with and the price without the law.

Table V:5

The Impact of the RMA Laws on the Price and Sales of Chevrolet Cars in 1978 Based on the Demand Elasticities Found by our Model

| Body Type | Average Percentage Price Change (For Areas with Positive Growth) | Average Percentage Price Change (For All Areas) | Per Year Increase in Consumer Expenditure (thousands) | Per Year Decrease in Automobile Sales1/ | Per Year Welfare Loss1/ (thousands) | Total Per Year Consumer Loss1/ (thousands) |
|---|---|---|---|---|---|---|
| Regular | 5.90** | 4.17** | $23,456 | 1,417 | $637 | $24,093 |
| Malibu | 14.31** | 12.90** | 38,179 | 5,892 | 2,230 | 40,409 |
| Camaro | 8.43** | 7.12** | 22,587 | 1,243 | 684 | 23,271 |
| Nova | 4.18* | 3.30 | 6,477 | 1,116 | 269 | 6,746 |
| Monte Carlo | 5.30** | 4.14** | 15,398 | 2,055 | 694 | 16,092 |
| Monza | 8.81** | 6.94** | 9,502 | 3,036 | 1,339 | 10,841 |
| Chevette | 5.87** | 4.24* | 7,436 | 2,001 | 595 | 8,031 |
| Sportvan | 3.68 | 2.22 | 785 | 87 | 51 | 836 |
| Corvette | 16.82** | 13.82** | 8,722 | 1,666 | 3,382 | 12,104 |
| Total | 7.63** | 6.14** | $132,542 | 18,513 | $9,881 | $142,423 |

1/ These estimates are based on the demand elasticities measured by our econometric demand model, which previous studies indicate may be smaller than the actual figures. Therefore these estimates are conservative.

* significantly above zero at the 95 percent level.

** significantly above zero at the 99 percent level.

Table V:6

The Impact of the RMA Laws on the Price and Sales of Chevrolet Cars in 1978 Based on a Demand Elasticity of -1.3

| Body Type | Average1/ Percentage Price Change (For Areas with Positive Growth) | Average1/ Percentage Price Change (For All Areas) | Per1/ Year Increase in Consumer Expenditure (thousands) | Per2/ Year Decrease in Automobile Sales | Per2/ Year Welfare Loss | Total2/ Per Year Consumer Loss (thousands) |
|---|---|---|---|---|---|---|
| Regular | 5.90** | 4.17** | $23,456 | 5,211 | $2,284 | $25,740 |
| Malibu | 14.31** | 12.90** | 38,179 | 9,940 | 3,726 | 41,905 |
| Camaro | 8.43** | 7.12** | 22,587 | 5,349 | 2,780 | 25,367 |
| Nova | 4.18* | 3.30 | 6,477 | 1,842 | 437 | 6,914 |
| Monte Carlo | 5.30** | 4.14** | 15,398 | 3,435 | 1,147 | 16,545 |
| Monza | 8.81** | 6.94** | 9,502 | 3,327 | 1,463 | 10,965 |
| Chevette | 5.87** | 4.24* | 7,436 | 2,755 | 809 | 8,245 |
| Sportvan | 3.68 | 2.22 | 785 | 147 | 85 | 870 |
| Corvette | 16.82** | 13.82** | 8,722 | 1,702 | 3,448 | 12,170 |
| Total | 7.63** | 6.14** | $132,542 | 33,708 | $16,179 | $148,721 |

1/ The percentage change and expenditure change figures do not change with a change in the estimated demand elasticity.

2/ These estimates are based on a demand elasticity estimate of -1.3 which is based on the findings of many previous studies. See pages 100-101 above.

* significantly above zero at the 95 percent level.

** significantly above zero at the 99 percent level.

average price change for all models runs from 1.64 percent to 10.05 percent.[20] Thus, it appears that the RMA laws raise car prices by a significant amount.

These estimated price increases can be translated into estimated RMA-induced total expenditure increases by Chevrolet car buyers of over $132 million (shown by the third columns in the two tables). In figure V:1, this equals area Pr-A-C-P. These payments are only the additional money spent by the consumers who actually bought cars, and they do not include the losses resulting from other consumers being priced out of the market.

Differing demand elasticity assumptions lead to differing estimates of the effect of the RMA law on output. The numbers in the fourth columns of Tables V:5 and V:6 showing the RMA-law-induced loss in automobile volume (Ql - Qr) give some indication of these effects. Under either of our two elasticity assumptions, they are quite large. For the measured elasticity, the indicated total annual decrease in volume was 18,513 Chevrolet cars or 4.5 percent of the sample in the RMA states. For the -1.3 elasticity

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20 The average increase in the growing areas is significantly above zero for all body-types except the Sportvan, while the price impact averaged over all areas with an RMA law is statistically significant for all car-types except the Sportvan and the Nova. Both averages across car-types are significant at the 99 percent level.

estimate, this volume decrease was 33,708 or 8.2 percent of the total.

The fifth column of figures displays our lower-bound estimates of the total deadweight loss to society as a result of the RMA laws (A-B-C in figure V:1). Given our elasticity measurements, the total loss for all the markets comes to about $9.8 million per year, and for the -1.3 elasticity, it would be $16.2 million. Society lost at least these amounts because of the entry laws.

The last column of figures displays our estimates of the total loss to consumers as a result of the RMA laws. These figures consist of the increased car expenditures plus the loss incurred by consumers who do not purchase Chevrolets at the higher price. (This amount equals the third column added to the fifth, and in term of figure V:1, Pr-A-C-P plus A-B-C or Pr-A-B-P.) Total lost consumer surplus comes to about $142.4 millio[n] per year for the measured elasticity assumption and about $148.7 million for the -1.3 elasticity assumption.

If the laws had been in effect in more states, this cost would have been considerably higher. Furthermore the above estimates only take into account the increased prices for the cars in our sample, which consists of the bulk of the Chevrolets sold to non-commercial or non-fleet users in the continental United States. This constitutes about 18 percent of the total

U.S. car sales. In the 13 states with the two year old RMA law in effect in 1978, the total sample sales were 410,994. If the RMA laws had similar effects on the prices of other cars, then annual consumer losses could have run into additional hundreds of millions or even billions of dollars.

To obtain an idea of what these costs might be for all automobile consumers, let us use the following procedure. We start with the 1978 results for Chevrolets in the 13 states where the law had been in place for at least two years. Then we extrapolate to the 36 states that had the law in 1983 and then to the non-Chevrolet cars, assuming that the RMA-law effects for them are the same on average as for the Chevies. Under those assumptions, the total cost per year of the law to the consumers would be about $3.2 billion in 1985 prices. This figure is a rough indication of the present-day costs of the RMA laws.

## VI. Conclusion

Our analysis shows that the presence of a Retail Market Area (RMA) law increases the price of new Chevrolet cars in areas with sufficiently large population growth, but that this effect is somewhat attenuated at very high levels of growth. This result is significant and large, and it is also about the same size across all nine Chevrolet car-types.[1]

To sum up, the results indicate that the entry laws raised the average price in our sample of 1978 Chevrolet cars about 6 percent and that the laws cost actual and potential consumers of these cars over $140 million per year. These figures suggest that, given the current prevalence of the RMA laws, the cost to all car buyers could run to well over $3 billion per year.

These statistical results also support the rising-cost-curve theory, which predicts a larger RMA effect in growing areas. In contrast, the results are not

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1 In other specifications of the supply equation, we obtain similar significant relationships, and even though problems exist with some of our measurements, the RMA law impact persists across most models and specifications. In other words, our results are robust and not particularly sensitive to the assumptions made by the model specification.

We ran the model with linear terms for the absolute growth-RMA law interactions. We also added to the supply equations variables for differences in the RMA law enforcement agencies. In none of the resulting models were the RMA effects very different.

consistent with the enhanced-market-power hypothesis. While, under this hypothesis, we would have expected prices to rise in some markets with low growth, we find no evidence of any increase in average price in low growth areas.

Also refuted is the less plausible alternative explanation, the contract failure theory, which could possibly be used as a defense for the RMA laws. Contrary to our results, this theory predicts the greatest RMA-law impact in non-growing markets.

Finally our analysis, using a model that includes the interplay between the market and the political system and the interaction between population growth and the RMA-law impact, suggests that the costs of these entry regulations are much higher than previously estimated by Smith and Eckard. Consequently, the payoff from opposing the passage of the laws and from repealing them where they already exist seems to be even greater than we had previously thought. Efforts to oppose or repeal these laws should be concentrated in the states containing areas with absolutely large population growth because it is there that the laws appear to have the greatest effect.

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