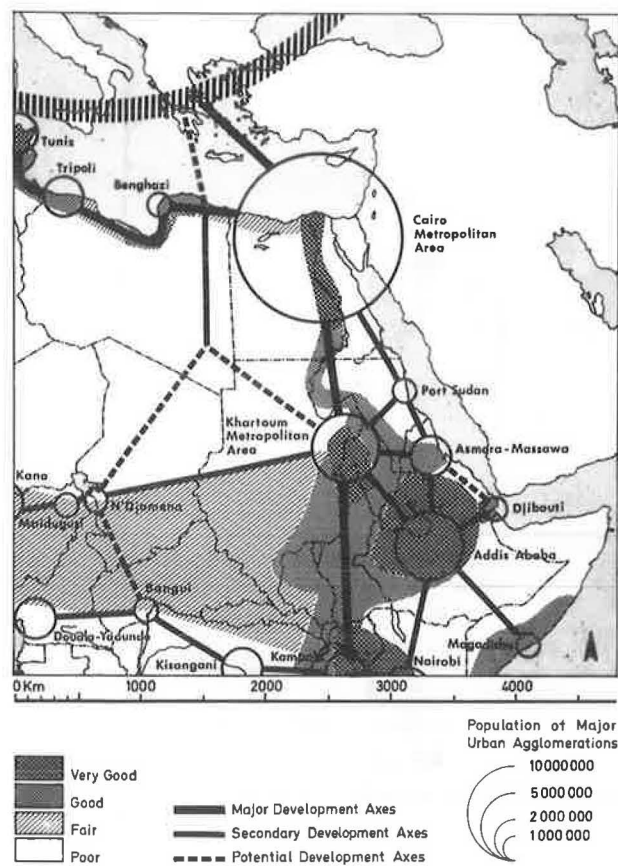Figure 3. General development potential, year 2000.

though trade between Europe and northeast Africa will still tend to be that of northeast Africa-- exporting mostly unprocessed materials and importing finished goods--the semiprocessing of raw materials is expected to become more economical, which is advantageous because of the value added. In addition, the linking of urban systems will result in positive scale effects, such as the increased size of the markets. This will provide new opportunities for the location of market-orientated industries. Finally, the transportation axis is expected to trigger the development of agricultural, mineral, and industrial potential previously not exploited because of limited access.

Although the western alignment does not at present have any potential as a trade route, it may have a completely different potential, namely, that of opening new resource frontiers. In the past, a symbiotic relationship existed between any transportation route and economic activity. Roads were first developed to serve areas of known agricultural and mining potential. With the development of the transportation route, new areas of agricultural and mineral potential were discovered and more roads were then developed to serve these as the cyclical process continued. The development of roads along the Nile is a good example of this process serving either agricultural or mining activities. In the case of the western alignment, its major potential is in opening new resource frontiers and the important question is whether it is necessary to first construct the road before determining the mineral potential of the adjoining land. With remote sensing techniques and mobility other than road transport, it is more advisable to determine the mineral potential to some extent before investing in the road.

CONCLUSION

In conclusion, the research supports the major hypothesis of the paper that there is a case for promoting the development of a permanent, continuous transportation axis to link Europe and northeast Africa as well as to link various African countries. A spillover of this research is the substantiation that transportation routes have different potentials depending on the nature of the economic activity along the alignment. Finally, this study indicates the role of transportation in facilitating the worldwide trend toward economic integration in northeast Africa.

ACKNOWLEDGMENT

Graduated System of Fees for Automobile Registration in Virginia

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A system of graduated registration fees based on the classification of the automobile stock into subcategories by weight is examined for Virginia. The feasibility of such a fee system and other alternatives for classification of the automobile fleet are explored. An econometric forecasting model based on a series of multiple-regression equations is then developed to model the weight classification scheme and to determine the potential impacts of such a system of registration fees on the transportation revenues of the Virginia Division of Motor Vehicles. Registration revenues are expected to decline under any tax scheme. However, a weight-based system of graduated fees that favors smaller automobiles will precipitate the decline. Under the moderate-inflation scenario, the loss may amount to well over $6.5 million/year by 1985. Future fuel and automobile prices will merely dictate the speed and the degree of loss in revenues.

The Division of Motor Vehicles (DMV) of the Commonwealth of Virginia receives revenues from 16 sources. More than 90 percent of these revenues

come from three motor-vehicle sources:

1. Fuel tax,
2. Sales and use tax, and
3. Registration fees.

These funds are allocated for administration and for capital outlays and maintenance of the state's highways. The recent decline in DMV revenues, coupled with the rapidly increasing costs of highway construction and maintenance, made it necessary to improve the revenue base of the Virginia DMV by means of changes in the transportation tax system. Among the options explored in this paper is a system of graduated registration fees based on weight classification of automobiles.

All automobiles in Virginia must now pay a $15 annual registration fee. The increasing of this fee to keep pace with inflation and with rising costs is difficult to do from a legislative point of view because the fee is a highly visible form of taxation.

One measure that is used in many other countries may pose a solution to this dilemma. This option, which has come under consideration by the Virginia General Assembly twice in various forms, is a graduated registration fee for different classes of automobiles.

Such a fee system would have two advantages over the present single-fee system:

1. A tax differential between certain types of vehicles could be justified as promoting the general welfare of the commonwealth. For example, fees that were higher for automobiles that have high air pollution emissions or gasoline consumption could be touted as contributing to the general welfare of the populace or reducing reliance on foreign oil.

2. The institution of penalty fees for certain vehicle classes could provide an additional source of revenue to the DMV and raise less public protest than would an across-the-board increase.

CRITERIA FOR SETTING UP FEE CLASSES

Several different criteria could be used to create classes of automobiles for the purpose of fee differentiation. Among the more frequently discussed possibilities are the following.

Horsepower

Horsepower classes could serve as a way of differentiating according to approximate fuel consumption. A bill was submitted to the general assembly that would have set a horsepower classification scheme three years ago, but it was not passed. Two major problems would confront a horsepower classification scheme:

1. There is no agreement concerning what measure of horsepower would be appropriate to use. Different engines are rated in different ways, at different revolutions per minute levels. Not all engines are designed to provide peak power under the same set of circumstances. Any single rating scheme would be objected to as having a discriminatory effect against certain automobiles.

2. A horsepower tax would not differentiate between energy-efficient and energy-inefficient high-powered cars. For this reason, people who need large, high-powered cars for business or other purposes would complain that this scheme discriminates against them.

Air Pollution Ratings

An argument could be made that the public health would benefit from a fee system that discriminates against automobiles that have high levels of air pollution emissions. Since U.S. Environmental Protection Agency (EPA) air pollution ratings are available for all automobiles sold in the United States since 1968, it would be relatively simple to set up a fee system based on this criterion. The only classification problem would be for pre-1968 automobiles. However, two factors cloud the attractiveness of this option from an equity perspective:

1. During most of the year, critical air pollution problems are isolated in a few urban corridors of Virginia. A statewide tax that is higher for high-pollution vehicles would discriminate unfairly against rural drivers, who make a negligible contribution to air pollution problems. Most federal air pollution regulations discriminate in this way against rural drivers. However, that does not justify the discrimination or mean that such a tax would be palatable to Virginia voters.

2. The reliance on ratings fails to deal with one of the biggest problems in enforcement of air pollution regulations--that of owners of automobiles deliberately having pollution-control equipment disconnected.

Ad Valorem Registration Fee

One option that is currently under review by the general assembly is an ad valorem registration fee. This proposal would replace the fixed registration fee with a tax based on a percentage of the assessed value of the automobile in its current condition. In effect, the registration fee would be converted into a personal property tax. Although this form of taxation would be only remotely related to such public welfare considerations as air pollution and gasoline consumption, it would have an added advantage in that it would make the fee a federal income tax deductible. This would allow the DVM to increase their revenues without increasing the tax burden to Virginia residents.

Some problems would be created by the task of assessing the present value of used automobiles. However, the same problems are surmounted by the many Virginia localities that charge a personal property tax on automobiles. The value of automobiles could either be appraised by using some standard, such as the blue book, or by using state-hired appraisers.

Weight Classification

A weight classification option appears to be relatively simple to administer and easy to justify on social equity grounds. Researchers have found that weight is highly correlated with gasoline consumption for automobiles (1). Weight classification information is readily available for all mass-produced automobiles. It would be simple enough to require weighing for all custom automobiles.

One additional possible justification for this measure is the correlation between vehicle weight and road wear and tear. However, most studies of this relationship have concentrated on trucks and on far greater differences in weight classes of automobiles (2). The difference in road wear between a 5000-lb automobile and a 3000-lb automobile may be negligible.

EPA Mileage Rating Classification

EPA mileage rating classification would draw a more direct connection between automobile fuel economy

Table 1. Sales of automobiles in Virginia by year and weight class.

| Year | Weight Class | | | | | |
	3000 lb	3500 lb	4000 lb	4500 lb	5000 lb	Total
1968	24 779	52 613	67 670	37 158	16 189	198 389
1969	30 741	47 102	32 503	66 808	23 111	200 265
1970	41 724	22 767	43 096	52 683	20 293	180 545
1971	56 307	26 496	44 437	59 510	37 225	223 975
1972	59 072	30 910	50 353	61 103	46 019	247 680
1973	70 703	31 053	32 104	66 943	62 131	262 934
1974	58 174	19 066	22 203	44 252	47 522	191 236
1975	40 024	23 643	29 085	35 994	56 962	185 727
1976	60 299	30 172	31 252	51 234	57 573	220 553
1977	57 697	21 102	72 473	70 101	25 698	247 096
1978	63 978	70 598	52 936	48 489	13 815	249 817

and tax levels. The only problem would be in rating older automobiles that predate the EPA mileage tests.

PROBLEMS COMMON TO ALL CLASSIFICATION SCHEMES

Treatment of Vehicles That Have Already Been Purchased

Changes in the registration fee system that result in increases in fees for automobiles that are already on the road will be resisted by owners of the vehicles that are in the penalty classes. They would assert that, since the automobiles are already on the road, the taxes do not encourage conservation and penalize them for decisions that they cannot reverse. At the same time, an increase in fees that only applies to automobiles purchased after this system was changed would be slow to raise much new revenue. New cars account for less than 10 percent of the automobile fleet in any given year.

Impact of Tax Increase on Consumer Behavior

Unless the fees are increased dramatically, they are not likely to have much of an impact on gasoline consumption, air pollution, or any other aspect of consumer behavior. Most people who can afford to buy a gasoline-guzzling automobile, for instance, are wealthy enough that a doubling of their registration fee to $30 would not serve as much of an inhibition. Dramatic increases in fees for some vehicle classes are not likely to receive legislative support.

Additional Data Processing Costs

Introduction of any of these graduated fee systems would require that additional information be added to all Virginia vehicle registration records. DMV records do not contain a detailed enough description of vehicles to serve any of these classification schemes. The first-time cost for collecting the additional information for all automobiles that are already on the road would be considerable.

MODELING A GRADUATED REGISTRATION FEE SYSTEM

A system of fee differentiation based on classification of automobiles by weight was chosen to model and to illustrate the characteristics of a differential registration fee system. The choice was based on the relative practicality and justifiability of the weight criteria and on the availability of the necessary data to stratify present and future automobiles in Virginia into weight classes. The results are, however, illustrative of many of the possible problems and revenue impacts that the weight

classification scheme shares with all the other classification criteria listed above.

Projecting Future Automobile Purchases by Weight Class

To project automobile sales by weight class for this study, it was necessary to develop a separate regression equation for each weight class. The independent variables used in this analysis were the gasoline price index (CPIGC), the price index for new automobiles (CPINC), and the average household income in 1967 dollars (AHHI67).

Data Base

An estimate of the number of automobiles in each of several weight classes sold in Virginia each year for a period of time was needed in order to explore the relationship between the independent variables and automobile purchases in each class. Information was obtained to show the percentage of total U.S. annual automobile sales that fall into each of 10 weight classes (3). The 10 classes were aggregated into 5 in order to simplify the analysis. For the rest of this paper, the term 3000-lb weight class will denote all automobiles in the 2000- to 3000-lb weight classes, and the term 5000-lb weight class will refer to the combination of the 5000- and 5500-lb weight classes.

The assumption was made that the percentage of automobile sales in each weight class was approximately the same in any year in Virginia as in the entire United States. This assumption makes it possible to apply the national percentages to figures for annual sales of new automobiles in Virginia, obtained from the Virginia DMV.

The resulting estimate of numbers of new automobiles sold in Virginia by year by weight class is shown in Table 1.

Regression Analysis

By using historic values from the period 1968-1978 of the three independent variables (4), a number of different regression relationships were tested. Among the relationships that were experimented with were $\log_e$-$\log_e$, $\log_e$-linear, linear, and power functions.

Although some very strong regression coefficients and F-statistics were obtained by using power functions for gasoline and automobile prices, the use of power functions was ultimately rejected as being unrealistic. With even high assumed rates of price increases, the power functions produced exorbitant increases in automobile purchases in some classes by 1985. For instance, automobile purchases in the 3500-lb weight class were found to increase by 1985 to a number larger than the total purchases in 1978.

The $\log_e$-linear relationships showed a similar tendency to produce extreme and irrational results and were therefore also eliminated from the model. Thus, all equations selected use either $\log_e$-$\log_e$ or linear functions.

The regression equations that produced the best fit were found to vary widely in form from weight class to weight class. Some weight classes showed a stronger relationship to income if purchases were regressed against the previous year's income in 1967 dollars (AHHIL) instead of the current year's income (AHHI67). The income measure that showed the strongest relationship was used in each equation.

Not all of the independent variables could be added to all of the equations to be statistically significant. This is a result of the small size of the historic data base used in the regression analy-

sis (11 years) and the high degree of collinearity among the independent variables.

In order to make the model as effective as possible in showing shifts in purchases from one weight class to another with changes in the independent variables, it was necessary that most of the independent variables be included in all the equations. Thus, as long as the sign of the relationship indicated a logical causal pattern, coefficients that have low F-statistics were allowed in the equation.

After a series of equations were developed by using the three causal variables listed above, it became apparent that there was a need to recognize interrelationships between the five weight classes in the model. It is apparent that, as fewer consumers buy large automobiles, more of them are likely to purchase smaller automobiles. This sort of transfer of consumers from one weight class to another occurred during the 1968-1978 period and was accordingly reflected in the regression equations. However, if at a future date all buyers of large cars have switched to smaller models, transfer of purchasers from the larger to the smaller weight classes ceases to be a contributing factor to increases in sales of small cars.

As the next section will show, two out of three of the scenarios for future prices result in the extinction of at least one of the larger weight classes before 1985. The regression equation predicts a negative purchase of automobiles in these classes after this point. Beyond this point, the purchase of smaller automobiles, particularly in the 3500-lb weight class, continues to rise at a rapid rate. The net result is an unreasonable increase in the total number of automobiles purchased in later years.

Two adjustments to the model were made to alleviate these problems. First, a lower limit of 500 new automobile purchases in any weight class for a single year was added to the model. Then, the projected purchases of automobiles in the 4500- and 5000-lb weight classes were added as independent variables to the equations for projecting purchases in the smaller weight classes. It was hoped that this would result in a moderation of the growth rate for small car sales when sales in the larger classes moderated.

The results of this experiment were mixed. Purchases in the 4500-lb weight class could only be added to the equation for the 3500-lb weight class without producing an illogical relationship and an unsatisfactory F-statistic. However, the sales in the 5000-lb weight class entered into three out of four of the equations for the smaller weight classes with an F-statistic of 1 or more. As the following few pages will show, the modification did not have the full desired effect; however, it did result in improved projections for the years 1983, 1984, and 1985.

Equations Used in Model

The following equations were used to predict future automobile purchases in Virginia by weight class.

5000-lb Weight Class

$$W5000 = -112\,537.8 + (2.159 \times AHHI67) - (785.30 \times CPINC) \tag{1}$$

$R^2 = 0.394$
F-statistics: $AHHI67 = 5.09$, $CPINC = 3.20$.

The 5000-lb weight class proved to be the most difficult to model. Although the R^2 for this equation is relatively low, the predictive characteristics of the equation are reasonable. Under

most circumstances, the equation would predict a decline in purchases of automobiles in future years that is consistent with the sales activity of the last five years. Previously, sales in this class had been on the increase.

4500-lb Weight Class

$$W4500 = -174\,397.6 + (18.57 \times AHHI67) - (729.28 \times CPIGC) + (1079.40 \times CPINC) - (0.15 \times W5000) \tag{2}$$

$R^2 = 0.693\,27$
F-statistics: $AHHI67 = 6.79$, $CPIGC = 8.22$, $CPINC = 2.74$, $W5000 = 0.52$.

Although the relationship between purchases in the 5000- and 4500-lb weight classes was not strong, it was included for the sake of consistency in the model. A positive relationship between the price of new automobiles and purchases may seem strange. This is probably a result of consumers turning from higher-priced automobiles to those in this weight class.

4000-lb Weight Class

$$W4000 = 10\,288.87 - (0.24 \times W5000) + (1602.49 \times CPINC) - (475.99 \times CPIGC) - (7.28 \times AHHIL) \tag{3}$$

$R^2 = 0.62$
F-statistics: $W5000 = 1.30$, $CPINC = 2.78$, $CPIGC = 1.36$, $AHHIL = 0.62$.

This equation shows characteristics that are similar to those described for the 4500-lb weight class equation. The positive relationship between automobile prices and purchases is due to transfers from the 5000- and 4500-lb weight classes.

3500-lb Weight Class

$$W3500 = -280\,430.8 - (0.93 \times W5000) - (1.36 \times W4500) + (36.20 \times AHHI67) - (1070.86 \times CPIGC) + (1374.55 \times CPINC) \tag{4}$$

$R^2 = 0.74$
F-statistics: $W5000 = 9.95$, $W4500 = 5.98$, $AHHI67 = 6.60$, $CPIGC = 4.00$, $CPINC = 1.60$.

This equation showed both a small R^2 and low F-scores until both purchases in the 5000- and 4500-lb weight classes were added as independent variables. The very strong relationship with income is different from that in the other equations. These features indicate that this equation is not as strong as the R^2 would imply.

3000-lb Weight Class

$$W3000 = 2.854 \times 10^{-15} \times (CPINC^{2.81}) \times (CPIGC^{-1.70}) \times (AHHIL^{4.21}) \tag{5}$$

$R^2 = 0.68$
F-statistics: $AHHIL = 8.24$, $CPIGC = 3.40$, $CPINC = 2.47$.

This equation is the only one that uses a natural logarithmic relationship. This is because a higher R^2 was obtained from the $\log_e$-$\log_e$ equation only for this weight class. The relationship shown here was the most consistent through all of the calculations of all the weight classes. However, neither of the larger weight classes could be factored in as an independent variable without producing low F-statistics and irrational results. Although it may have been possible to factor in the 4000- or 3500-lb weight classes as independent variables, it was decided that the adding of another

step to the causal chain would not be wise.

To summarize the characteristics of the regression analysis, the series of equations were chosen first for their high explanatory powers by using historic data on automobile purchases. The equations were further refined to maximize consistency and interdependency. Due to the problems of a small data base for the regressions and strong collinearity among the independent variables, the resulting equations are not perfectly consistent and rational. However, they are adequate to provide an approximation of the future distribution of automobile purchases according to weight class.

PROJECTIONS

These equations were used to forecast future automobile purchases. Three scenarios were developed to depict an array of future economic conditions, and a separate set of projections was made for each scenario.

For all three scenarios, uniform assumptions were used about the level of income for future years. In this way, attention could be focused on the future impact of gasoline and automobile prices, and the number of scenarios is held to a manageable number. Also, we feared that some of the income-based coefficients would tend to produce unrealistic results if the values for income strayed too far from those in the historic data.

The rates of real income growth used in the DMV revenue model ($\underline{4-6}$) were also used in this model. The values for average household income, in 1967 dollars, increase at an increasing rate, ranging

from 1.2 percent in 1980-1981 to nearly 2 percent by 1984-1985.

It was also decided that gasoline prices should vary over a wider range than automobile prices in the three scenarios. This reflects the greater amount of uncertainty about future gasoline prices due to the instability of the world oil market.

The price levels for the three scenarios are as follows:

1. Low-inflation scenario: Gasoline prices up 5 percent/year; new car prices up 4 percent/year.
2. Moderate-inflation scenario: Gasoline prices up 15 percent/year; new car prices up 10 percent/year.
3. High-inflation scenario: Gasoline prices up 20 percent/year; new car prices up 10 percent/year.

The price indexes for gasoline and new cars used for each of these scenarios are listed by year in Table 2. The resultant purchase patterns when these rates are entered into the regression equations are shown in Table 3.

In most respects, the purchase patterns shown in Table 3 are consistent. In response to increased prices, sales of large automobiles decrease, and sales of smaller automobiles increase. As the sales of cars in the larger classes reach the limit of 500, the rate of increase in purchases of small cars should slow. However, the response differs among those weight classes. But, since the distribution of purchases is shifted outward to the two classes on either side of the 3500-lb weight class, the estimate of net revenues collected under a graduated registration fee system that differentiates according to weight class should not be greatly affected.

Survival Rates for Automobiles

The second factor that influences the number of automobiles in Virginia in each weight class in any year is the scrappage rate for old cars. In the original version of the DMV revenue model, a cohort survival model was set up to predict future survival of automobiles according to an assigned percentage survival rate associated with each year of an automobile's age ($\underline{4,5,7}$).

The model used a fast retirement rate and a slow retirement rate, depending on the estimated average age of the automobile fleet. Both rates are shown in the table on the following page.

Table 2. Projected annual gasoline and new-car price indexes under low-, moderate-, and high-inflation scenarios.

Year	Low Inflation		Moderate Inflation		High Inflation	
	Gasoline	New Car	Gasoline	New Car	Gasoline	New Car
1978[a]	200.2	147.8	200.2	147.8	200.2	147.8
1979[a]	265.6	165.9	265.6	165.9	265.6	165.9
1980	281.5	172.5	305.4	182.5	318.7	182.5
1981	298.4	179.4	351.3	200.7	382.5	200.7
1982	316.3	186.6	404.0	220.8	459.0	220.8
1983	335.3	194.1	464.5	242.9	550.7	242.9
1984	355.4	201.8	534.2	267.2	660.9	267.2
1985	376.8	209.9	614.4	293.9	793.1	293.9

[a] Based on actual data.

Table 3. Automobile purchases by weight class under three scenarios.

Scenario	Year	Weight Class					Total
		5000 lb	4500 lb	4000 lb	3500 lb	3000 lb	
Low inflation	1979	26 209	35 926	52 547	40 814	60 173	215 769
	1980	24 049	34 349	53 747	42 093	68 696	222 934
	1981	21 955	32 614	56 458	43 374	72 807	227 208
	1982	19 561	30 464	59 175	44 735	77 516	231 451
	1983	17 126	28 006	61 885	46 114	82 401	235 532
	1984	14 792	25 168	64 292	47 450	87 691	239 393
	1985	12 296	21 995	66 708	48 847	93 714	243 560
Moderate inflation	1979	26 209	35 926	52 547	40 814	60 273	215 769
	1980	16 196	28 889	61 088	45 016	70 065	221 254
	1981	5 228	19 531	71 145	49 450	75 599	220 953
	1982	500	6 275	78 770	48 610	82 030	216 185
	1983	500	500	84 288	27 875	88 887	202 050
	1984	500	500	88 887	500	96 485	186 872
	1985	500	500	92 247	500	105 026	198 773
High inflation	1979	26 209	35 926	52 547	40 814	60 273	215 769
	1980	16 196	19 190	54 757	44 013	65 166	199 322
	1981	5 228	500	56 294	42 015	65 415	169 452
	1982	500	500	52 590	500	66 025	120 115
	1983	500	500	43 258	500	66 545	111 303
	1984	500	500	28 579	500	67 186	97 265
	1985	500	500	7 187	500	68 037	76 724

Year	Survived at Fast Rate (%)	Survived at Slow Rate (%)
0-1	100	100
1-2	100	100
2-3	99	100
3-4	98	99
4-5	97	98
5-6	95	97
6-7	93	94
7-8	89	90
8-9	84	87
9-10	74	89

After much consideration and testing, we decided that, for the period 1980-1985, the fast rate would not be appropriate. This is because, in a period of stagnant or declining automobile sales, people can be expected to keep their automobiles for a longer period of time.

Accordingly, the slow retirement rate was chosen. Other studies have shown that this rate is only slightly slower than that experienced through the mid-1970s (8).

The DMV revenue model (4,5,7) also projected future migration of automobiles into and out of the state. The migration rates were not used in this analysis because the impact of automobile migrations over a five-year period is not likely to be very significant.

Age Distribution of the Automobile Fleet for Future Years

The data base for estimating the number of automo-

biles by age in 1978 was obtained from Automotive News (9). The information was converted into percentages of the fleet in each year class. These percentages were applied to the total number of automobiles registered in Virginia in 1978 to get an estimate of the number of automobiles in each vehicle age in Virginia in 1978. By using the estimates of the percentage of U.S. automobiles in each weight class for each model year from EPA (3), the vehicle stock from each year was divided into groups according to weight classification. The resulting estimate of the number of automobiles by weight group and year in 1978 is shown in Table 4.

By using the survival rates chosen in the above table, the automobiles in the table were moved forward each year to 1985 to find out how many of them in each year class would still be on the road. The projections for new car sales in the period 1979-1985 were also multiplied by the survival rates to project how many would remain on the road.

In using uniform survival rates for all weight classes, we assumed that cars of the same age were scrapped at the same rate regardless of weight. Although the heavier, less-fuel-efficient automobiles will probably be scrapped at a faster rate, no numerical basis for projecting this difference could be derived from available data. Thus, these projections probably underestimate, by a small amount, the speed of the shift in the total automobile fleet to smaller cars.

The projections of total automobiles registered in each year of the period 1980-1985 in each weight class for each of the three scenarios is shown in Table 5. Under the moderate- and high-inflation scenarios, the total number of automobiles declines over the five-year period. This is a direct result of consumer response to increases in automobile and fuel prices.

Although the revised DMV revenue model does not project a steady decline in registrations, as is projected by the moderate-inflation scenario here, it does project a decline in registrations in the early 1980s. However, a steady, but very gradual, increase in registrations is projected by the DMV revenue model for 1984-1985. This is similar to the low-inflation scenario presented here. All inputs considered, the numerical differences between the results of the moderate-inflation scenarios of two models is not very large. Accordingly, the two are considered to be consistent.

The difference in automobile purchases between the moderate- and high-inflation scenarios presented in Table 5 is considerable. By 1985, more than

Table 4. Automobile distribution in Virginia by weight class and year.

Year	Weight Class				
	3000 lb	3500 lb	4000 lb	4500 lb	5000 lb
1978	63 409	69 970	52 465	48 058	13 692
1977	65 722	24 037	82 554	79 852	29 272
1976	70 298	35 174	36 434	59 730	55 462
1975	42 576	25 150	30 939	38 289	60 595
1974	77 745	25 480	29 672	59 139	63 510
1973	76 940	33 791	34 936	72 848	67 612
1972	59 101	30 926	50 378	61 133	46 042
1971	49 929	23 495	39 403	52 769	33 008
1970	42 487	23 183	43 884	53 646	20 664
1969	25 319	38 795	26 770	55 025	19 034
1968	16 655	35 365	45 487	24 977	10 881
Pre-1968	88 007	56 220	134 691	78 126	25 850

Table 5. Virginia automobiles by weight class for 1980-1985 under three alternate price scenarios.

Scenario	Year	Weight Class					Total
		3000 lb	3500 lb	4000 lb	4500 lb	5000 lb	
Low inflation	1980	662 831	429 140	602 824	655 148	500 108	2 850 051
	1981	697 161	431 997	585 339	595 094	430 425	2 740 016
	1982	727 931	446 585	599 509	575 030	413 292	2 762 347
	1983	759 547	461 904	617 524	550 661	389 412	2 779 048
	1984	793 375	478 309	637 870	522 707	361 733	2 793 994
	1985	832 039	494 933	659 293	491 855	332 279	2 810 399
Moderate inflation	1980	706 687	438 230	611 365	643 223	456 031	2 855 536
	1981	701 322	440 996	607 367	576 551	405 845	2 732 081
	1982	736 606	459 459	641 132	532 298	369 651	2 739 146
	1983	774 708	456 539	681 550	480 423	329 145	2 722 365
	1984	817 316	425 965	726 417	427 855	287 252	2 684 805
	1985	867 237	394 124	773 087	375 747	246 325	2 656 520
High inflation	1980	701 818	437 227	605 034	633 524	456 031	2 833 604
	1981	686 239	432 558	586 185	547 821	405 845	2 658 648
	1982	705 518	402 911	593 770	497 793	369 651	2 569 643
	1983	721 278	372 616	593 158	445 918	329 145	2 462 115
	1984	734 636	342 052	577 780	393 447	287 252	2 335 167
	1985	747 767	310 305	539 664	341 721	246 325	2 185 782

Table 6. Total annual automobile registration fees under three alternate scenarios.

Scenario	Year	Fee System ($) Option A	Option B	Option C
Low inflation	1980	42 750 765	45 302 502	59 552 757
	1981	41 100 240	42 729 131	56 429 211
	1982	41 435 205	42 695 053	56 506 788
	1983	41 685 720	42 510 231	56 405 469
	1984	41 909 910	42 247 246	56 217 206
	1985	42 155 985	41 958 590	56 011 585
Moderate inflation	1980	42 833 040	44 799 819	59 227 299
	1981	40 981 215	42 347 099	56 077 504
	1982	41 087 190	41 843 163	55 538 853
	1983	40 835 475	40 956 114	54 567 939
	1984	40 272 075	39 782 166	53 206 191
	1985	39 847 800	33 304 567	52 006 317
High inflation	1980	42 504 060	44 452 313	58 620 483
	1981	39 879 720	41 201 793	54 495 033
	1982	38 544 645	39 383 732	52 231 947
	1983	36 931 725	37 264 674	49 571 523
	1984	35 027 505	34 832 553	46 508 388
	1985	32 786 730	32 058 108	42 987 018

470 000 additional automobiles are registered under the moderate-inflation scenario relative to the high-inflation scenario. However, the total difference between the moderate- and low-inflation scenarios is only about 154 000 automobiles by 1985. The 5 percent additional annual increase in the gasoline prices under the high-inflation scenario is apparently critical to predicting future automobile purchases.

Revenue Impact of Alternative Registration Fee System

Three specific tax systems were chosen for consideration in assessing the possible effects of alternative taxing options. These are shown in the table below.

	Registration Fee Systems by Weight Class ($)				
Option	3000 lb	3500 lb	4000 lb	4500 lb	5000 lb
A	15	15	15	15	15
B	10	13	16	19	22
C	15	18	21	24	27

Option A is the current $15 fee for all automobiles. Option B is a graduated fee based on weight classification, which is designed to produce slightly more revenue in 1980 than does the present flat fee. It increases by $3 increments from a $10 fee for the 3000-lb weight class to $22 for the 5000-lb weight class. Option C also increases according to weight class by $3 increments, but ranges from $15 for the 3000-lb class to $27 for the 5000-lb class.

These fees were applied to the projections of total automobiles registered in each weight class in each year (Table 5) to produce the annual total revenue projections shown in Table 6.

Since options A and B have similar revenue yields in 1980, a comparison between the two is illustrative of the relative disadvantage of the weight classification scheme in terms of revenue production. By 1985, annual revenues are about $197 000 lower under the low-inflation scenario, $6 543 000 lower under the moderate-inflation scenario, and $728 622 lower under the high-inflation scenario. The reason that the gap narrows under the high-inflation scenario is that attrition from the fleet grows much smaller under this scenario with or without the graduated tax scheme. This results in lower total revenues.

Option C will always produce more revenue than the present scheme (option A), because the lowest fee under option C is the overall fee under option A. Yet, on a percentage basis, the revenue yield from option C drops at the same rate as under option B. Clearly, even if a graduated revenue scheme is set up to produce additional revenue, its yields should be expected to decline with time.

CONCLUSIONS

If gasoline prices continue to climb at moderate or high rates, registration revenues are expected to decline under any tax scheme. However, a weight-based system of graduated fees that favors smaller automobiles will precipitate the decline. Under the moderate-inflation scenario, the loss may amount to well over $6.5 million/year by 1985.

Only a graduated revenue scheme that favors larger cars can be expected to appreciate over time. It is inevitable that a large proportion of the state's future automobile fleet will be in the lighter weight classes. Future fuel and automobile prices will merely dictate the speed and degree of the shift.

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