Anticipating state revenue for Iowa through regression on personal income

Thomas Michael Hoenig
Iowa State University

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Anticipating state revenue for Iowa through regression on personal income

by

Thomas Michael Hoenig

A Thesis Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of MASTER OF SCIENCE

Major: Economics

Signatures have been redacted for privacy

Iowa State University Of Science and Technology Ames, Iowa 1972
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CHAPTER I. INTRODUCTION

Changes in the Role of State Governments and Implications for Revenue Estimating

Prior to 1930 states had primarily regulating functions. They were law-enacting and law-enforcing agencies and as such, their expenditures were modest in comparison to present state fiscal requirements. Since the 1930's state governments have assumed new responsibilities or broadened existing efforts in development and compensatory policies within the state. State governments have continually increased expenditures for "people-oriented functions" such as increased social services, local school aid, and the cost of "higher" education. Capital expenditures have grown by 9 percent per year since 1960 with the bulk of this increase being for new highway systems and expansion of educational facilities. Although the federal government has assisted the states in meeting these needs, federal aid frequently is in the form of cooperative help. That is, the federal government will match state expenditures only. To obtain additional federal aid a state must increase its own revenue and expenditures. It is not surprising therefore to find that even though total federal aid or revenue sharing to state and local governments have been increasing at a rate of 6 percent per year since 1960, state expenditures have themselves risen by 7 percent per year for the same period (32).
State governments no longer deal primarily with matters of enactment and enforcement of civil laws. Today states find themselves in an ever-widening debate concerning development policy and income redistribution. Vast financial responsibility requires that larger sums of money not yet collected be committed to future projects.

The average per capita state revenue for the U.S. has risen from 93.68 dollars in 1957 to 199.34 dollars in 1968. Iowa State revenue paralleled the U.S. growth with a change from 89.91 dollars in 1957 to 184.63 dollars in 1968 (see Chart 1.1 (32)). Note also that while the average rate of growth for state governments for the U.S. was 5 percent per year from 1950 to 1957, after 1957 this rate increased to over 9 percent per year. Iowa revenue increased at a rate of 6 percent per year from 1950 to 1957 and then it too accelerated to a level of over 7 percent increase per year after 1957. Other states reveal similar acceleration patterns in the rate of growth of revenue collected (see Table 1.1 (32)).

Until after World War II estimating revenues as a specialized function was not considered by many state governments to be an essential aspect of the state budget-making process. Before this period state revenue could be estimated with sufficient accuracy using methods involving merely averaging previous years receipts or trending percent changes in receipts. In more recent years with the large volume of revenue involved in state government policy, small percentage
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<table>
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<tr>
<td>1950</td>
<td>8967.0</td>
<td>435.3</td>
<td>154.6</td>
<td>125.3</td>
<td>196.3</td>
<td>184.3</td>
<td>56.9</td>
</tr>
<tr>
<td>1951</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1952</td>
<td>9837.5</td>
<td>455.2</td>
<td>158.2</td>
<td>132.9</td>
<td>232.6</td>
<td>194.9</td>
<td>56.2</td>
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<tr>
<td>1953</td>
<td>10542.1</td>
<td>514.4</td>
<td>159.3</td>
<td>137.3</td>
<td>227.6</td>
<td>207.2</td>
<td>58.8</td>
</tr>
<tr>
<td>1954</td>
<td>11071.4</td>
<td>545.8</td>
<td>197.9</td>
<td>140.1</td>
<td>246.5</td>
<td>224.4</td>
<td>63.5</td>
</tr>
<tr>
<td>1955</td>
<td>11583.5</td>
<td>551.8</td>
<td>197.8</td>
<td>144.5</td>
<td>245.4</td>
<td>225.8</td>
<td>68.5</td>
</tr>
<tr>
<td>1956</td>
<td>13335.0</td>
<td>641.1</td>
<td>230.4</td>
<td>159.7</td>
<td>283.9</td>
<td>257.4</td>
<td>74.4</td>
</tr>
<tr>
<td>1957</td>
<td>14530.7</td>
<td>690.7</td>
<td>247.9</td>
<td>158.0</td>
<td>292.6</td>
<td>266.2</td>
<td>73.7</td>
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<td>1958</td>
<td>14905.0</td>
<td>731.9</td>
<td>237.1</td>
<td>168.3</td>
<td>319.8</td>
<td>279.6</td>
<td>84.8</td>
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<td>1959</td>
<td>15831.4</td>
<td>742.5</td>
<td>250.0</td>
<td>199.0</td>
<td>313.7</td>
<td>289.4</td>
<td>81.0</td>
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<tr>
<td>1960</td>
<td>18017.1</td>
<td>836.4</td>
<td>255.8</td>
<td>206.6</td>
<td>351.9</td>
<td>312.9</td>
<td>91.3</td>
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<td>1961</td>
<td>19001.0</td>
<td>874.3</td>
<td>268.2</td>
<td>214.3</td>
<td>383.0</td>
<td>340.9</td>
<td>94.3</td>
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<td>1962</td>
<td>20562.0</td>
<td>980.4</td>
<td>276.5</td>
<td>228.3</td>
<td>403.4</td>
<td>395.3</td>
<td>94.8</td>
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<td>1963</td>
<td>22099.4</td>
<td>1079.9</td>
<td>290.3</td>
<td>239.0</td>
<td>442.5</td>
<td>413.5</td>
<td>98.5</td>
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<td>1964</td>
<td>24244.3</td>
<td>1122.3</td>
<td>311.3</td>
<td>248.6</td>
<td>479.9</td>
<td>463.7</td>
<td>111.2</td>
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<td>1965</td>
<td>26104.0</td>
<td>1218.7</td>
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<td>265.3</td>
<td>519.5</td>
<td>503.8</td>
<td>115.2</td>
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<td>1966</td>
<td>29374.2</td>
<td>1365.2</td>
<td>418.0</td>
<td>347.0</td>
<td>615.0</td>
<td>579.8</td>
<td>127.3</td>
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<tr>
<td>1967</td>
<td>31909.0</td>
<td>1450.3</td>
<td>453.6</td>
<td>355.2</td>
<td>660.1</td>
<td>615.1</td>
<td>136.5</td>
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<tr>
<td>1968</td>
<td>36414.0</td>
<td>1730.6</td>
<td>502.5</td>
<td>357.0</td>
<td>814.1</td>
<td>657.0</td>
<td>194.0</td>
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<td>1969</td>
<td>41981.0</td>
<td>1927.4</td>
<td>588.6</td>
<td>385.1</td>
<td>914.6</td>
<td>711.1</td>
<td>217.3</td>
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<td>1970</td>
<td>49537.0</td>
<td>2183.0</td>
<td>698.4</td>
<td>484.2</td>
<td>1113.4</td>
<td>821.4</td>
<td>291.9</td>
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avg. % growth | 7.7 | 7.7 | 7.2 | 6.5 | 8.4 | 7.2 | 7.7 |

Source: (32)
errors in revenue estimation involve intolerable absolute errors of many millions of dollars. For example, in 1935 a 2 percent error in estimating Iowa's revenue involved approximately 300,000 dollars; however, the same 2 percent error today would involve closer to 12 million dollars. In contrast to this, there remains the need to plan total expenditures and revenue to avoid deficits or surpluses of over a few million dollars. State governments are, therefore, seeking better and more reliable methods with which to forecast revenues and plan state expenditures.

The Nature of the State Revenue Systems and Implications for Estimating Procedures

To obtain needed revenue, state governments have used higher rates and broader coverage of consumption and income taxes. For Iowa, 1959 sales tax collections and gross receipts from consumption taxes were 76 million dollars and income tax collections were 36 million dollars. Ten years later collections were 207.5 million dollars and 106.9 million dollars respectively (32).

During the ten-year period in which these changes in revenue figures occurred, Iowa experienced three different income tax schedules. There was a one percent increase in the sales and use tax rates accompanied by addition of items to which the tax was applicable. Iowa residents also raised the rates on other consumption taxes such as all cigarette sales and
beer consumption.¹

All of the states listed in Table 1.1 have made comparable increases in tax rates and comparable additions to the tax base. In some instances, states have implemented new taxes to acquire the revenues necessary to match state expenditures (32).

Frequent rate changes and significant base changes imply a need to develop special estimating techniques which can assure accurate and responsible fiscal management during such rapid change. Revenue estimating procedures must be able to anticipate the impact on state revenue collections of changes in rate and base in the tax structure.

**Alternative to accurately estimating revenue**

State governments can compensate for revenue uncertainty or poor forecasting by permitting a non-balanced budget. A relatively permissive policy of non-balanced budgets would require less accurate forecasting than a policy of a carefully balanced budget. For example, one might obtain stability in state expenditures with variable revenue by creating a budget surplus in years with more revenues than expected to be used in years with lower-than-expected revenue receipts. Also, one might go into debt if receipts were less than ex-

¹A more detailed analysis of rate and base changes concerning the revenue sources is given in the following chapters to this study.
pected to maintain the promised level of services to the public. However, taxes to create surplus or pay debts are difficult for taxpayers to accept as necessary. A debt or surplus means that either expenditures or tax rates were too high in a previous year. Thus, a non-balanced budget, though it reduces the need for accuracy in forecasting, does not avoid the consequences of poor forecasting. Severe unbalancing is a political liability and not practical for implementation into the state fiscal system as an alternative to accurate forecasting.

A policy of averaging income would smooth short-run fluctuations in revenues by changing the income base from one year to a three or four-year moving average. Such a policy would tend to reduce large fluctuations in the tax system. The difficulties with this are that the procedure is applicable directly only to the income tax, which contributes only 30 percent of revenue to the state's general fund. Also, such averaging procedures affect the after tax income of residents of the state, which affect other consumption tax revenues. For example, if income for an individual was to fall below previous years' incomes, his tax obligation would be higher than it would have been if such a system did not exist. With a smaller income and higher tax obligation his consumption would tend to be reduced by more under this system than under the non-averaging type system. Too, revenue from taxes
on consumption goods would be reduced. However, since consumption taxes are less volatile than the income tax to changes of income, the total net effect of such a system should be stabilizing for total state revenues.

Finally, the cost of implementation and administration of such a system would likely outweigh any benefits. For instance, if such a system had been implemented in 1969, over 834 thousand pay returns would have required adjustment and checking. Maintenance of the system would then require continued recalculation and records control of past data, all at accelerated cost to the state. Even though the procedure might stabilize revenue, its cost would be higher than its introduction would warrant.

**Personal income: stability and influence on state revenues**

Broader coverage and higher tax rates on income and expenditures have resulted in an increasing dependence of state revenues on the future level of personal income within the state. With increased dependence on this unstable tax source, difficulties increase in maintaining stability of state revenues over time. Personal income is dependent on the general level of economic conditions existing in a state which vary considerably over time. Personal income fluctuates with employment and wage rates and increasingly now so also will state revenue. For example, if state revenues are predominantly dependent on income and consumption taxes, and a
nominal rise is expected in state personal income of, say, 10 percent, there would be expected an increase in state consumption expenditures of about 8 percent. For the state treasury, there would result a final revenue growth in income tax receipts and sales and consumption tax receipts from 6 to 8 percent, depending on the state taxing structure. Conversely, however, if state personal income was to rise less than the expected 10 percent or was actually to decline, revenues to the state treasury would reflect this fact as well. A 5 percent decline in personal income would imply a fall in revenues of perhaps 2 or 3 percent, just at a time when larger expenditures had already been authorized!

A future year's revenue may rise, remain constant or decline depending on economic conditions regardless of what state expenditures may have been planned.

Personal income for Iowa from 1950 through 1970 is listed in Table 1.2 along with changes in the level and the percent changes in the level of personal income. Changes in personal income vary from as high as a positive 13.80 percent in 1965 to as low as a minus 04.81 percent in 1955. Revenues to the state vary from a plus 5 percent in 1955 to a plus 26 percent in 1966 (see Table 1.1 (32)). Such figures reflect the influence of changes in the tax structure, not only fluctuation in income. Still, they do give some idea of the volatile nature of the revenue system.
Table 1.2 State personal income and change in personal income for Iowa from 1953 to 1969. (Income in millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income</th>
<th>Change in Personal Income</th>
<th>% Change Personal Income</th>
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</thead>
<tbody>
<tr>
<td>1950</td>
<td>3847</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1951</td>
<td>4127</td>
<td>230</td>
<td>5.90</td>
</tr>
<tr>
<td>1952</td>
<td>4338</td>
<td>211</td>
<td>5.11</td>
</tr>
<tr>
<td>1953</td>
<td>4200</td>
<td>-138</td>
<td>-3.18</td>
</tr>
<tr>
<td>1954</td>
<td>4525</td>
<td>325</td>
<td>7.73</td>
</tr>
<tr>
<td>1955</td>
<td>4307</td>
<td>-218</td>
<td>-4.81</td>
</tr>
<tr>
<td>1956</td>
<td>4580</td>
<td>273</td>
<td>6.33</td>
</tr>
<tr>
<td>1957</td>
<td>5077</td>
<td>497</td>
<td>10.95</td>
</tr>
<tr>
<td>1958</td>
<td>5202</td>
<td>125</td>
<td>2.46</td>
</tr>
<tr>
<td>1959</td>
<td>5319</td>
<td>117</td>
<td>2.24</td>
</tr>
<tr>
<td>1960</td>
<td>5475</td>
<td>156</td>
<td>2.93</td>
</tr>
<tr>
<td>1961</td>
<td>5743</td>
<td>268</td>
<td>4.89</td>
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<td>1962</td>
<td>6005</td>
<td>262</td>
<td>4.56</td>
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<td>1963</td>
<td>6352</td>
<td>347</td>
<td>5.77</td>
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<td>6649</td>
<td>297</td>
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</tr>
<tr>
<td>1965</td>
<td>7567</td>
<td>918</td>
<td>13.80</td>
</tr>
<tr>
<td>1966</td>
<td>8327</td>
<td>760</td>
<td>10.04</td>
</tr>
<tr>
<td>1967</td>
<td>8523</td>
<td>196</td>
<td>2.35</td>
</tr>
<tr>
<td>1968</td>
<td>9123</td>
<td>600</td>
<td>7.04</td>
</tr>
<tr>
<td>1969</td>
<td>9870</td>
<td>747</td>
<td>7.57</td>
</tr>
<tr>
<td>1970</td>
<td>10418</td>
<td>548</td>
<td>5.55</td>
</tr>
</tbody>
</table>

Source: (34), (35)

Unfortunately, the most sophisticated models of income determination cannot perfectly anticipate future levels of income. Thus, revenue-estimating procedures cannot estimate with complete accuracy revenues to be received from taxation where the base of that tax is income. However, reasonable assumption may be developed for personal income in future years. It is because of the awareness of the volatile nature
of income that new methods of revenue estimation are being developed.

Responsiveness of the state tax structure to income

State revenue yields can be more or less responsive to changes in personal income. How income and revenue are linked depends on the nature of the tax structure for the state. That is, revenue yields usually change by a smaller percent than changes in income, how much smaller depending on the structure of the tax system. If expenditures for the state are rising at 9 percent per year, revenues need to rise at the same 9 percent regardless of the percent income may change for that year. Since state expenditures usually rise faster than revenues if tax rates are held constant, state tax rates have been increasing. Tight budget and revenue shortages occur for two reasons. First, the rate of change in personal income is usually smaller than the rate of change in state expenditures; and second, the percent change in revenue is usually smaller than the percent change in personal income. This combination has necessitated the relatively frequent increases in tax rates and wider coverage of tax base which have occurred since 1950 and at an accelerated pace since 1960.

The responsiveness of a state tax structure is usually defined by an income elasticity coefficient. A tax is considered income inelastic if the response of change in the tax
yield $T$ to changes in the level of total state income $Y$ is less than one (3).

That is, if

$$E_t = \frac{\Delta T/\Delta Y}{\Delta T/\Delta Y} < 1$$

where $T_0$ and $Y_0 =$ initial levels of tax yield and income, respectively

$\Delta Y$ and $\Delta T =$ changes of tax yield and income, respectively

$E_t$ then is the income elasticity coefficient which measures the percentage change in the tax yield that results from a given change in income. The closer the income elasticity coefficient $E_t$ is to 0, the less responsive the tax to income changes.

A study by J. Dockel (3) estimated the income elasticity for various tax sources for Iowa and also a weighted average of the elasticity of the combined state tax structure. 1 Dockel found that the elasticity of the Iowa income tax structure with respect to its base is 1.7, indicating a better than proportional change in revenues for a given change in income. The elasticity coefficient for sales tax receipts was estimated to be .9393 and .5153 for the cigarette tax. The weighted elasticity for the entire tax

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1For an explanation of the method of measurement for these coefficients, see reference 4, p. 103-104.
structure was estimated to be .8548. This last figure implies that the overall response of state revenue to changes in state personal income is less than proportional.

In general, most state tax structures have elasticity coefficients relatively close to 1 although they may vary around 1. For example, the elasticity coefficient for Missouri is 1.1. The coefficient determined for Nebraska is .7 and that for Minnesota is 1.3. The coefficient for Illinois is .9 and for Kansas is 1.0 (2).

The next question must then concern how personal income and state expenditures change in comparison to one another. For Iowa the average rate of change in personal income since 1950 has been 5.08 percent while the average rate of change in expenditures has been closer to 7.85 percent (32). In other words, expenditures have been growing 2.77 percent faster than personal income. Comparing this to the response coefficient, $E_t = .8548$ for revenues and neglecting the impact of rate changes, expenditures have been rising on the average of 3.11 percent more than revenues for Iowa.

The desired level of $E_t$ for a tax structure predominantly depend on the rising expenditure needs and the degree of fluctuation in the economic conditions of the state in question. Most states find themselves in the paradoxical position of wanting a tax structure which is income elastic in order to meet rising expenditures while still wanting the structure
to be stable by being income inelastic so that revenues do not change radically for fluctuations in income. This paradox occurs because state governments cannot control directly the economic situation that might prevail in the state for any given time period. The fact is that states are not determinants of economic circumstances but are subject to them and as such, they must attempt to estimate the expected revenues and expenditure needs.

Finally, it is the unresponsive nature of the state's tax structure combined with tendency of state governments to increase expenditures that have occasioned the changes in rate and base which have accrued over time in the state revenue systems. It is within this context that budget and fiscal management must be conducted. It is within this context that judgments will be made as to the extent the rate and base will be required to change for a tax system. Past methods of revenue estimating techniques are inadequate. Simple averaging of previous data cannot anticipate future revenues which will result from a range of tax rates that might be implemented. Methods are needed to anticipate the possible conditions that may exist and may affect revenue yields for the state while at the same time remaining within a simple one or two equation estimating model.
The Experience of Others in Developing Revenue Estimating Techniques

Income - population and estimating revenues

The first models describing revenue as a function of income often focused on the question of whether existing state tax sources could provide sufficient revenue to conduct government affairs without reference to tax rates. For example, Groves and Kahn (13) concentrated on calculating income elasticities of various states using a model of the form

$$\log R = \log a + b \log Y$$  \hspace{1cm} (1.1)

where
- $R =$ total tax revenue from specific source
- $Y =$ state personal income
- $a =$ regression coefficient
- $b =$ regression coefficient

The function was only fitted for those taxes where no rate or administrative change occurred.

Expansion of the model to include taxes where rate changes had occurred interfered with measuring income elasticity coefficients because of fluctuations in revenue data associated with rate changes. Consequently, it was often assumed that the response of revenue to rate changes was
proportional. That is,

\[ \frac{dR}{dr} \frac{r}{R} = 1 \]

where \( R \) = revenue
\( r \) = tax rate

Under such an assumption, no specific attention was required for tax rate changes introduced into the system; thus, income elasticity coefficients could be estimated for different tax sources.

A modification to this method suggested by Wilford (38) was to include administrative rate changes in the model having it take the form

\[ \log R = \log a + b \log Y + c \log r \]  

(1.2)

where \( R \) = tax revenue
\( Y \) = state income
\( r \) = tax rate

Using this function with the impact of tax rate changes accounted for, Wilford suggested that states neglect stability questions concerning revenues to income as this factor is, in general, out of their control and concentrate on designing the tax system so as to ensure an income elasticity greater than 1. Other discussion concerning the model focuses on the type of income variable to be used.

Legler and Shapiro (24) criticized these earlier models, specifically Wilford's modifications, on two grounds. First,
it ignores the specific mechanism by which tax revenue varies with income. Second, it is based on the assumption that the yield of one tax is independent of other state taxes.

By estimating parameters of the model from regression of past data for each tax source separately and independently of how changes in other taxes affect the income-revenue relationship of the tax in question, the model does not represent the reality of the interdependency in the system. For example, this procedure assumes that an increase in the income tax rate will not affect the revenue to be received from the sales tax in any way. This criticism is, in general, quite valid. Specifically, it is valid if the model is designed to be used for a number of years where frequent changes in the tax structure may occur or if changes in the tax base or rate, though few in number, are of significant size. That is, if the time period is twenty years or there is a twenty percent change in the tax rate of a particular revenue source, most certainly this may change the value of the parameters of other estimating equations in the tax structure. If, however, the question of interdependence concerns a short period where fewer changes may occur, then perhaps for purposes of constructing simple operational estimating equations, the assumption can be made.

Legler and Shapiro set forth a number of assumptions which they believed would alleviate earlier difficulties of
independence.

They assume that:

1. There are only two distinct types of taxes, an income tax and a sales or consumption type tax.

2. The supply of taxed and untaxed goods are perfectly elastic; the non-taxed component of price is unaffected by the introduction of the tax.

3. State income and growth is independent of the tax yields. Based on these assumptions they develop a model as follows:

\[ R = r_1Y + r_2C \]  \hspace{1cm} (1.3)

where

- \( R \) = tax revenue
- \( r_1 \) = income tax rate
- \( r_2 \) = sales tax rate
- \( C \) = expenditures on taxable goods
- \( Y \) = income

To equation (1.3) is then added

\[ C = C(y,Y,N,P,r) \]  \hspace{1cm} (1.4)

where

- \( Y \) = per capita income
- \( N \) = population
- \( P \) = before sales price

Combining equation (1.3) and (1.4) is derived

\[ R = R(y,N,P,r_1,r_2) \]  \hspace{1cm} (1.5)

This equation was estimated then for various states by multiple regression.
The model drops the independence assumption of taxes and considers the entire tax system (or a majority of it) rather than each particular type of tax separately. Though the objective of the model is to construct a general equilibrium type system, in implementation it suffers from the common problem of aggregation. That is, the difficulties of tying different items which are taxed differently under a single measure makes operation of the model somewhat limited. Finally, though the approach is specifically designed to account for the interdependence of the tax system, it does not determine the degree of interdependence which for future estimates might be crucial. The authors of the study themselves recognize that in order to apply the methodology of the study to more exact policy questions, it is necessary to concentrate on the tax legislations of each state individually (24).

**Expenditures approach**

It is argued that even with the shortcoming of the general income-population approach to revenue estimation, it is the most plausible approach since population and income are the marks of need and source respectively. However, it is argued by others that revenue-population and revenue-income ties are in fact not capable of indicating future revenue needs (29). It is argued that if one must predict the population and income values that are to serve as inputs, the
statistical significance of the model's forecast is restricted or made indeterminant. That is, because the projected income variable cannot be directly estimated, its values as to being a reliable variable is subject to question.

What is offered in the place of these earlier hypotheses and models is a theoretical approach proposed by H. Thomassen (30) based on expenditure policies of a state rather than the responsiveness of revenues to income. It is noted by Thomassen that there exists an explicit demand for the goods that a state can supply to its citizens and revenue will respond to meet this need. For example, as a function of increased automobile and truck use, there is an increase in the demand for primary and secondary road and highway construction. It is held that any model designed to estimate revenues for a state should be based on state needs dependent on both implicit and explicit private spending. The indicator of the demand for public goods in this type analysis are variables which lead the revenue series by at least one year. They include, for example, population, employment and investment data.

A particular model for this approach to revenue estimation designed by Thomassen does present some useful results (29). However, the model indirectly, though no less importantly, depends on population and income for an estimate of the demand for public goods and since it has no direct con-
constraint on the revenue figure, the model may and does give incorrect results for any given time period. This is not surprising since indicators can be as misleading in regard to demand for public goods as they are in estimating incomes.

The conclusion to be drawn, therefore, is that in estimating revenues to be received by a state, there may be statistical errors associated with a projection no matter what the approach employed since any projection requires looking into the future. Whether this error is incurred directly or indirectly is of little difference to the final outcome.

Purpose

This study will not correct or improve general theory of revenue estimating or propose a new technique. It will construct revenue estimating for Iowa using the contributions already made by others when possible and recognizing the various shortcomings to meet the requirements of the Iowa tax structures. Specifically, the purpose is:

1. To identify correlates and explanatory variables of trends in base and yield of selected sources of revenues for the State of Iowa.

2. Estimate revenue yields for selected income and consumption taxes for a defined time period.

3. Evaluate the usefulness of these revenue-estimating techniques in the State of Iowa.
This study will deal with individual taxes, not with the entire system as suggested by Legler and Shapiro. This approach is taken because it is individual taxes within the system which separately and substantially may affect the final outcome; and to see how this may happen, the individual tax must be considered. Though this necessarily requires once again the independence of taxes be assumed, it does not, given Iowa's taxing structure, affect the results substanti ally. Finally, this approach has also been chosen because the difficulty of accounting for interdependence has not been adequately solved to date. Though Legler and Shapiro have provided an insight, they have not provided a solution.
CHAPTER II. PERSONAL INCOME TAX

State income taxation for Iowa in the nineteenth century and early twentieth century was for the most part a failure. Success was limited because income taxes were imposed as emergency measures with public support disappearing with the emergency. Also in the early twentieth century agriculture composed approximately 50 percent of the state's economy. Pau-
city of farm business records and payroll data rendered the collection of a general income tax extremely difficult. Per-
haps, however, the most significant cause of failure of the income tax was local administration by unqualified and un-
trained officials.

The modern era of income taxation began in 1911 when Wisconsin enacted the first successful general income levy. The tax provided central administration through a state tax commission staffed with civil services employees.

Difficulties with the Iowa tax structures during the 1920's led to a reconsideration into the possibility of an income tax for the state. It became recognized during this period that the Iowa tax structure did not distribute the tax burden in accordance with ability to pay. Also, the tax base was so narrow that only a small percentage of the population was directly effected by expenditure policy, with about 80 percent of all state and local tax revenues coming from prop-
erty taxes and only 19 percent of the people being property
owners. Finally, the depression had depleted the state's revenues and new sources were urgently needed. In 1932, therefore, the first extensive state personal income tax was proposed for Iowa (22).

Though collections began in 1935, the relative importance of the personal income tax has only increased in significance since World War II. In 1935, for instance, the personal income tax contributed less than 7.0 percent to state receipts; whereas, for fiscal 1970 it has been estimated to have produced 113.3 million dollars in net revenue or 30.0 percent of total revenues collected by the state, second only to the sales tax in overall collections. The rise in revenues from income taxation has been most noticeable since 1964 (see Chart 2.1 (20)). This sharp rise has occurred, first, because the ever-increasing need for revenue combined with greater emphasis on equity in the tax system has caused legislators to shift to the income tax for needed revenues. Second, revenues have risen because the tax base (i.e., personal income) grew at a significantly higher rate during this period than during previous periods. Thus, given a response coefficient for the income tax of \( E_t = 1.7 \), large increases of personal income caused revenues to increase by significant magnitudes (see Table 1.2 (34) for level of personal income).
Chart 2.1 Gross revenue collected per year by the state from the income tax in Iowa from 1953 to 1970 (20) (17)
Structure of the Income Tax System in Iowa

The income tax base for Iowa is defined as:

\[
TI = AGI - FD - D \\
TP = r(TI) - C
\]

where

- \( TI \) = taxable income
- \( AGI \) = adjusted gross income
- \( FD \) = federal tax paid
- \( D \) = state deductions (itemized and standard)
- \( TP \) = tax payable to state
- \( C \) = personal and dependence credits of 15 and 10 dollars respectively
- \( r \) = applicable tax rate

During the period considered in this study the only major legal change which occurred in the base has been the increased allowance from $7.50 to $10.00 for each dependency credit. The only influences effecting the base have been those initiated by changes in the federal tax structure which is deductible on the Iowa Tax Report. This would include, for example, the effects of the tax reform of 1964.

Though no major changes occurred in the tax base itself, a number of changes have occurred in the applicable tax rates. From 1958-59 to 1964-65 the rates were:

- 0.75\% on the 1st $1000 of taxable income
- 1.50\% on the 2nd $1000 of taxable income
2.25% on the 3rd $1000 of taxable income
3.00% on the 4th $1000 of taxable income
3.75% on the 5th to nth $1000 of taxable income

For the period 1965-66 to 1966-67, one aspect of the rate structure was changed to where the rates for the 10th to nth $1000 of taxable income was 4.50 percent. The rates were changed again for the period 1967-68 to December 31, 1970. The rates for the 1st thru 4th $1000 taxable income remained as before. Changes which then occurred were as follows:

3.75% on the 5th to 7th $1000 of taxable income
4.50% on the 8th to 9th $1000 of taxable income
5.25% on the 10th to nth $1000 of taxable income

Effective January 1, 1971, tax rates for the 1st to 2nd $1000 of taxable income remain as before. Other changes are as follows:

3.00% on the 3rd $1000 of taxable income
4.00% on the 4th $1000 of taxable income
5.00% on the 5th to 7th $1000 of taxable income
6.00% on the 7th to 9th $1000 of taxable income
7.00% on the 9th to nth $1000 of taxable income

The nature of a state's tax rate structure, that is, whether it is progressive or regressive, is best understood by computing the ratio of the percent of tax paid to the percent of income earned (AGI in this instance) and observing its movement as higher income levels are examined. Whether a tax
system is progressive or regressive is determined by observing whether this ratio is rising or falling as income increase. The degree of progression or regression of the tax structure is determined by the range the values of the ratio assumes as incomes rise. If the ratio increases as incomes rise, it is an indication that the structure is progressive and similarly, if it remains constant or declines, this implies it is proportional or regressive. For Iowa, in 1969, the ratio of percent of tax paid to percent of AGI ranges from 0.8004 to 1.07 for the income group of 6 to 10 thousand dollars. This ratio is 1.073 for the income group of 10 to 15 thousand dollars. The ratio ranges from 1.6 to 1.7 for the remaining 15th to nth income group. Also, the 6th to 10th income group paid approximately 36 percent of the income tax revenue the state received. The 10th to 15th income group contributed 26.5 percent of income revenues for the state while the remaining 15th to nth group contributed 30 percent of the revenues to the state (see Table 2.1 (17)). This suggests that the Iowa income tax structure is slightly progressive with the main tax burden falling on the middle and upper middle income groups.¹

Finally, a minor change in the tax administration occurred with the introduction of a withholding system into the struc-

¹One should be cautious when interpreting these results. Adjusted gross income is, as the name implies, an adjusted figure. Data concerning personal income and its distribution with respect to tax paid would perhaps be a more valid measure of the tax burden in Iowa. However, such figures are not readily available.
ture in 1966.

Table 2.1 Distribution among income brackets of adjusted gross income and state tax payment with estimates of relative tax burden derived from 1969 state tax returns. a

<table>
<thead>
<tr>
<th>AGI Bracket</th>
<th>Share of AGI (percent)</th>
<th>Share of Tax Paid (percent)</th>
<th>Tax Burden b</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 3000</td>
<td>8.25</td>
<td>.82</td>
<td>.0994</td>
</tr>
<tr>
<td>3000-3999</td>
<td>5.53</td>
<td>1.65</td>
<td>.2983</td>
</tr>
<tr>
<td>4000-4999</td>
<td>6.37</td>
<td>3.03</td>
<td>.4754</td>
</tr>
<tr>
<td>5000-5999</td>
<td>7.09</td>
<td>4.60</td>
<td>.6497</td>
</tr>
<tr>
<td>6000-6999</td>
<td>8.12</td>
<td>6.50</td>
<td>.8004</td>
</tr>
<tr>
<td>7000-7999</td>
<td>8.94</td>
<td>9.15</td>
<td>.9116</td>
</tr>
<tr>
<td>8000-8999</td>
<td>9.72</td>
<td>9.68</td>
<td>.9954</td>
</tr>
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<td>9000-9999</td>
<td>7.77</td>
<td>5.34</td>
<td>1.0030</td>
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<td>15000-19999</td>
<td>6.52</td>
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<td>20000-24999</td>
<td>3.16</td>
<td>5.70</td>
<td>1.8030</td>
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<td>25000-29999</td>
<td>1.91</td>
<td>3.58</td>
<td>1.8740</td>
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<td>30000 to nth</td>
<td>6.85</td>
<td>11.86</td>
<td>1.7310</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

a Source: (17)

b Column 3 divided by column 2

An Income Tax Model

The income tax revenue estimating model developed in this study is comparable to completing a single simple state income tax return. First, the expected income for the state is determined. Second, the expected allowable deductions are estimated. Net taxable income is derived by subtracting state and federal deductions from income and the expected tax rate is
applied to this net figure to estimate the income tax levied by the state. Finally, to get expected taxes to be paid, the estimated personal and dependency credits are subtracted from the tax levied figure.

That is,

\[ \text{NTI} = \text{AGI} - \text{FD} - \text{D} \]
\[ \text{TL} = (\text{NTI})(\text{ATR}) \]
\[ \text{TP} = \text{TL} - \text{M(DC)} - \text{N(PC)} \]

where

- \( \text{NTI} \) = net taxable income
- \( \text{AGI} \) = adjusted gross income
- \( \text{TL} \) = tax levied
- \( \text{TP} \) = tax payable to the state
- \( \text{DC} \) = dependency credits
- \( \text{PC} \) = personal credits
- \( \text{ATR} \) = aggregate tax rate
- \( \text{FD} & \text{D} \) = federal tax paid and state deductions
- \( \text{M} \) = dollar value of one dependency credit
- \( \text{N} \) = dollar value of one personal credit

and where each of the variables on the right side of the equation must be individually estimated over time.

The method of estimation described here will yield useful results if the following assumptions hold. First, the distribution of income within the state does not shift significantly over time. Second, the population of the state does not
drastically change over time. Finally, the income tax structure does not change in essence over time. These assumptions are reasonable with respect to Iowa and are not likely to be effected significantly in the foreseeable future.

**Adjusted gross income**

For Iowa, AGI is personal income excluding transfer payments. It includes personal contributions for social insurance by residence but does not include social security or unemployment payments to residents. Employer contributions to retirement systems, life insurance and medical insurance are included in personal income but not AGI. On balance, AGI is smaller than personal income but is effected by economic circumstances in relatively the same manner. It has remained about 70 percent of personal income over time.

Precisely because AGI and personal income are effected similarly by the general economic circumstances existing in the state and because they have shown a definite proportional relationship to one another over past years, a regression analysis was conducted and model constructed for estimating the dependency relationship between the two variables. The equation estimated was for AGI a function of personal income. The results were as follows:¹

¹Throughout this chapter the superscript (*) indicates the coefficient to be significant at the 5 percent level while (**) indicates the coefficient to be significant at the 10 percent level. Absence of the asterisk superscript indicates the coefficient to be nonsignificant.
Log AGI = -0.870* + 1.1848* Log Y
(0.1869) (0.0487)

where AGI = adjusted gross income
Y = personal income

and where, because a constant proportional relationship between Y and AGI is observed, a log functional form is estimated.1

The R^2 term for the equation is .984. Since the coefficients in the model are significant and with the high R^2 coefficient, indications are that the relationship as hypothesized does indeed hold and reliable values may be obtained for AGI from this equation which will be used in the final estimation of income tax paid to the state.

Federal deductions

As incomes rise, tax obligation to the federal government rises. Thus, in Iowa, deductions against AGI for federal tax payments must also increase assuming no changes take place in the state policy concerning federal deductions.

However, exogenous changes in the federal tax structure may occur and if so, will shift the level of federal deduction. For example, the 1964 federal tax reform lightened federal tax obligations and decreased total federal deductions

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1In the remaining analysis of the income tax, the models identified all assume constant rate of growth between the variables. As log functions are used, therefore, a separate comment will not be made in each instance.
on Iowa returns by 5 percent as opposed to a normal increase of 5 percent brought on by changes in incomes.\textsuperscript{1} Thus, Iowans paid more state income tax because they paid less federal tax.

Federal tax changes cannot be anticipated directly for future years. They may for past years be taken into account by the introduction of dummy variables which will shift the linear function to allow for the effect of a change in the federal system. The dummy variable is determined by constructing a column of 1's and 0's for each major change in the federal tax rules which occur over time. A 1 is entered in the column for years in which the specific tax structure was in effect and 0's are entered elsewhere. These separate columns are then combined with the columns of observed data on which a regression analysis is to be conducted. In this manner separate intercept coefficients are estimated for each of the different federal structures which were in effect during the period from which the data was drawn.

Therefore, contending that federal deductions can be determined as a function of income if account is taken for outside changes in the federal tax structure, a regression analysis and equation is developed to test the feasibility

\textsuperscript{1}Changes in federal deductions can be observed in Table 7.1 of the Appendix.
of the relationship. The results are as follows:

$$\log \text{FD} = -2.52 - 2.61D_1 - 2.52D_2 + 1.38 \log \text{Y}$$

where

- FD = deductions to state tax obligation resulting from federal tax payments
- Y = personal income
- D_1 = dummy variable used to derive a shift parameter for 1964 tax reform
- D_2 = dummy variable used to derive a shift parameter for introduction of surtax in 1968

Note that the introduction of the surtax in 1968 brings the intercept coefficient to its 1964 level and since the surtax was only a temporary phenomenon, ending in 1971, the particular coefficient may be omitted from the model.

The $R^2$ term for this equation is 0.862. This lower $R^2$ coefficient is not a surprising result, given the explanation that the federal tax system is a relatively volatile structure and difficult to judge as to total effect on deduction to the state. However, the $R^2$ term and significance levels of the coefficients still indicate a functional relationship between personal income and federal tax deduction and the equation can be used to determine estimates of federal deductions for Iowa.

**State tax deductions**

As with federal deductions the prime determinant for the
level of state deductions will reasonably be the level of income for the state. As incomes rise so also do demands on the individual incomes within the state. So, more opportunity for deductions to the state increase as well. Also, as incomes rise there is cause to be more aware of allowable deductions since larger incomes imply larger tax obligations and it is to the individual's advantage to minimize his tax obligation through deductions.

Also, since standard deductions have a maximum limit of 250 dollars, it is assumed here that this figure will remain a relatively constant proportion of total deductions over time and, therefore, not require strict separation as an estimated variable for the general model.

The model then derived based on this discussion is as follows:

\[
\log D = -2.470^* + 1.3428^* \log Y
\]

\[
(\cdot.2947) \quad (\cdot.07681)
\]

The \( R^2 \) term was estimated to be .967. This result, together with the observed significance levels for the coefficients in the equation, support the argument that state deductions are directly a function of income.

**Aggregate tax rate**

In order to construct an equation for estimating an aggregate rate of taxation for the state, it is important not that rate changes occur over time but rather that these changes do not effect the basic structure of taxation. What
this means is that though the rate may be altered over time, the important fact is that it does not change, for instance, a regressive tax system to a progressive system. For Iowa, in past years and indications are that for future years, no extreme structural changes in the system with respect to the tax rate have or will occur. Therefore, it may be assumed that the Iowa structure will remain slightly progressive with the burden remaining on the middle income bracket. The effective aggregate tax rate (the percent of tax levied to taxable income) is then a function of the average existing tax rate and the taxable income for the state.

Finally, in estimating an equation for this variable from past data, it is necessary that allowance be made for the impact of the 1966 introduction of a state tax withholding system. Again account may be taken for this influence on tax receipts with the introduction of a dummy variable into the model.

The equation then derived is as follows:

\[ \log ATR = -2.047^* - 2.035^*D_1 + \log .2094^* (NTI)(AR) \]

\[ (.0303) \quad (.0349) \quad (.0166) \]

where

- AR = average tax rate for all levels of AGI
- ATR = aggregate tax rate
- NTI = net taxable income
- \( D_1 \) = dummy variable designed to account for influence of introduction of withholding into Iowa tax system in 1964

The coefficient for the \( D_1 \) variable was determined to be
significantly different from the constant term, indicating an improvement in collections brought on by the administrative change.

The $R^2$ term for the model is .989. This is not a surprising result when one considers that the only explainable variation for the model might be that there is a tendency toward a more progressive system with changes in the tax rate. However, this would be slight given the explanation that the tax structure is designed so that the majority of the burden falls on the middle level of income.

**Dependency credits**

What remains then for completion of the income tax model is the determination of personal and dependency credits which must be subtracted from the tax-levied figure to derive a tax payable figure. These estimates could best be determined if figures were available for the distribution of age groups within Iowa and their relative changes over time. However, data for these figures are only available for five years and use of this approach is, therefore, precluded at this time.

Attempts were made for regressing combinations of total population data and time in an effort to determine trends in the credit figures. However, the fits were quite poor and the coefficients were in one instance negative for population and in each instance statistically insignificant at the 5 percent level.
It was, therefore, decided that the best estimates could be made by merely using an average change in the respective figures for recent years and applying this average to the year in which an estimate is desired. \(^1\)

Restatement of the income tax model

Having dealt with the major elements in the tax structure, it is desirable to review the general model for estimating revenue from the income tax source. The model is again stated as follows:

\[
\begin{align*}
\text{NTI} &= \text{AGI} - \text{FD} - \text{D} \\
\text{TL} &= (\text{NTI})(\text{ATR}) \\
\text{TP} &= \text{TL} - m(\text{DC}) - n(\text{PC})
\end{align*}
\]

where the variables have been defined on page 36 above.

Implementing the model for years 1958-59 through 1969-70, the estimates derived are quite good (see Chart 2.2 (20)). The comparison of the figures for actual data obtained for these years to estimated data obtained from the general model shows that the estimated values follow closely the actual figures for income tax paid to the state. Deviations of actual and estimated data are less than 1 million dollars or 3 percent.

\(^1\)This method hopefully will not be necessary for future years since figures are now being made available for population by age on a yearly basis for states. From these figures it may be possible to determine accurately how these respective credits will behave.
The results derived from implementation of the model for estimating future state revenues from this source remain consistent with past observed data (see Table 2.2 and Chart 2.2 (20)). The income variable used for the model was derived

Table 2.2  Estimated state income tax revenue for Iowa for 1970-1973 based on estimated personal income assumed by extrapolation of past growth trends from 1948 to 1969. (millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income</th>
<th>State Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>9985</td>
<td>109.5</td>
</tr>
<tr>
<td>1971</td>
<td>10450</td>
<td>133.1</td>
</tr>
<tr>
<td>1972</td>
<td>10950</td>
<td>143.3</td>
</tr>
<tr>
<td>1973</td>
<td>11500</td>
<td>155.0</td>
</tr>
</tbody>
</table>

by extrapolating income trends. These estimates show a slight drop in revenue for 1970 of about 2 percent due to the fact that the level of income increases by less than 100 million dollars. This relatively small increase in income implies an increase in the tax levied figure of less than

1A more detailed discussion of the origin of the income variable is considered in Chapter V of this study.
Chart 2.2 Revenue estimates per year for the Iowa income tax from 1958 to 1973 with actual collections for comparison (20)
one million dollars. Also, the credits from the state tax liability figure increased by four million dollars. This, therefore, caused net taxes paid to decline by nearly four million dollars or 3.5 percent. The following year shows a rise in revenue of about 22 percent caused by an increase in income of about 5 percent and a general increase in the tax rate schedule (for rate schedule, see "Income tax structure" in this chapter). For years 1972 and 1973 the revenue path continues to rise at a rate of about 7 percent.

These results are entirely reasonable and if the income projections themselves are correct, the revenue model can be of considerable use for estimating revenues to the state from the personal income tax.
Sales Tax

The sales tax is a tax on the retail sales of tangible property or services by individual economic units. It is an ad valorem tax which is a tax on the value of the items sold, not the quantity involved in the sale. It is, therefore, a tax on the dollar volume of expenditures by the residents of a state.

The sales tax was delayed from implementation into the tax structure of most states because of a fear that taxation of sales might cause migration into tax-free states. This fear was based on the fact that the Supreme Court had been zealous in barring taxation of transactions of an interstate character. Sales made to customers outside a taxing state and sales made by merchants who were outside a taxing state to customers in a taxing state could not be taxed. This ruling had the effect of stifling any attempt to impose a tax on sales.

The depression of the 1930's broke through some of these obstacles. The states saw that the general taxation of sales was a source of revenue which fluctuated less over time than did the income tax. States receiving increased pressure to reduce the property tax burden and experiencing critical financial difficulties saw the sales tax as a means to help remedy their situation. In 1933 thirteen states
enacted a general tax on retail sales and by 1938 the number had increased to 24 states. World War II halted this movement, but afterwards, as states began once again to provide increased services, the growth of the sales tax soon followed. This growth was evident not only in the number of states using the tax but also in the amount of revenue the tax provided to the states. In 1950 twenty-eight states levied a general sales or gross receipts tax involving 1.68 billion dollars. In 1969 the number of states using the tax had increased to 44, and the revenue had grown to 12.44 billion dollars (32).

There were several specific factors which led to the implementation and increased dependence on the sales tax as a source of revenue in Iowa. First, there was the need to ease financial stresses resulting from the depression of the 1930's. Directly related to the depression was the increased pressure on the state to provide additional government services. A second cause was the strong pressure to broaden the tax base away from reliance on property taxation for state revenue. Finally, income taxes were regarded as unreliable and unstable producers of revenue, fluctuating directly with movements of income. This contrasted with consumption expenditures which were observed to be more stable and thus more dependable as a source of state revenue.

From 1952 and until the mid-sixties, revenue from sales
tax grew at a rate averaging a little below 4 percent per year. This involved an increase from 51.6 million dollars in 1952 to 77.4 million dollars in 1964. After 1964 receipts from the sales tax increased substantially, rising from 77.4 million dollars to 181.4 million dollars in 1969 (see Chart 3.1 (16)). This accelerated growth after 1964 was the result of three interrelated factors. The first was simply the normal rise in sales tax revenues associated with rising income. Given that the income elasticity of the sales tax is approximately equal to .9, then the rapid growth of income after 1964 (see Table 1.2 (34)) should have indeed been accompanied by a significant increase in sales tax receipts. A second cause for the accelerated growth was an increase in the applicable tax rate from 2 to 3 percent in 1967. This tax increase implied an additional 36 million dollars over the revenue that a rate of 2 percent would have yielded for the same tax base. The third factor causing the rapid increase in revenue was the expansion of the applicable tax base to include selective services. This widening of the base implied additional taxable sales in 1967 amounting to roughly 400 million dollars or 12 million dollars in tax revenue.

Though receipts from the sales tax have become the dominant source of revenue to the state, the more recent emphasis on equity in taxation has caused a movement away
Chart 3.1 Revenue collected per year by the general sales and use tax in Iowa from 1953 to 1970 (16)
from relatively strict reliance on the sales tax for state revenue. In 1952 the 51 million dollars of revenue the sales tax furnished the state was approximately 54 percent of total state revenue collected. The 1969 figure of 181.81 million dollars was closer to 45 percent of state revenues. Most of the 9 percent drop in relative yield in the sales tax was assumed by the income tax which increased from 21 percent of state collections in 1952 to nearly 30 percent in 1969.

Use Tax

The use tax is a state levy on commodities purchased outside a state but brought into the state for use. As state retail taxes grew in number, the strong protection then given by the Supreme Court to interstate commerce was troublesome to state tax administrators and retailers alike. States handled the problem by introduction of the use tax which, in 1938, the Supreme Court held to be constitutional. Designed merely as a supplement to the sales tax, its rates and application are usually identical to the retail sales tax.

The use tax was assumed into the Iowa tax structure shortly after the introduction of the sales tax. It is specifically designed for the task of preventing the potential sales tax avoidance by out-of-state purchases and to
give some degree of protection to merchants in broader areas of the state. The use tax has assumed a growth path nearly parallel to that of the sales tax (see Chart 3.1 (16)). In volume the revenue has increased from 7.6 million dollars in 1952 to 39.1 million dollars in 1970. As with the sales tax, the most rapid period of growth in revenue from the use tax was from 1964 through 1969. The reasons for this growth is the fact that the tax is indeed a supplement to the sales tax. It assumes the same basic nature and income and tax rate changes apply nearly identically to each. Thus the rate, base, and income changes which occurred during this period and caused significant gains in sales tax revenues also caused significant gains in the use tax collections.

Prospects for the Sales and Use Taxes

The most severe criticism of the sales and use tax has been its inequity among taxpayers. The tax is on consumption and it is argued that since consumption must absorb a higher percentage of income for the poor than for the rich, it is regressive. That is, its rate as a percentage of income is higher for the poor man than for the rich. The extent of regression depends on the extent of the coverage.

With the existing pressure for a more equitable tax structure, the State of Iowa has for the most part already increased the bounds of the sales and use tax to their
feasible limits. In 1969 expenditures on items subject to the tax was 7.2 billion dollars or 71.9 percent of personal income received by residents of the state. The type of item which would require inclusion into the Iowa tax base, if it were to be broadened, generally tends to either increase the regressive nature of the tax or is difficult to administer. For example, if the sale of new housing was assumed into the sales tax base, a definite increase in state revenues would result since new housing sales ranged between 161 and 183 million dollars per year from 1965 through 1969. However, such a broadening of the base would, it is often believed, also tend to extend the regressive aspect of the tax. This regressive aspect, whether imaginary or real, accompanying the inclusion of housing into the tax base would severely increase resistance to the sales tax in general.

Some difficulties of administration which reduce the possibilities of broadening the base can perhaps best be pointed out by referring to a past example. In 1967 when the extension of the base was made to include selective services, two of these services were to be advertising and construction. However, the taxes were strongly opposed by the special interests involved which reduced possibilities of voluntary compliance. With the help of a strong lobby, both types of services were removed from the tax base within a year and a half of their institution.
For similar reasons other services such as medical care will most likely not be included in the tax base within the near future.

If the goal of the state is to provide a more equitable tax structure, it is probable that the relative importance of the sales tax will decline. Pressure to hold the rate and base of the sales and use taxes at their present levels in Iowa will indeed slow the growth of revenue from this source. As additional revenues are required it is reasonable to assume that the income tax, not the sales tax, will be the more severely and frequently changed revenue source in the state taxing structure.

Iowa Sales and Use Tax Structure

Sales tax

A tax of 3 percent is levied on the retail sales of goods and services to consumers of the State of Iowa. In Iowa, a retail sale is defined as a sale to consumers or users for any purpose other than for processing or resale. This does not include rents, doctor fees, advertising or electricity and steam used in the processing of tangible personal property, for ultimate retail sales. However, it does include the sale of tangible personal property, electricity, water and communication services. Admission and operation of amusement enterprises are also included in the definition.
Exempted from the tax are purchases by manufacturers where these materials are used in the performance of construction contracts or for purposes of resale or for further processing. Also, exemptions include gross receipts from transportation services, tickets of admission to state, county or local fairs or such receipts from charitable, educational, or religious institutions, and the trade-in value of an item which is not in excess of the original purchase price, provided proper records are kept. Exemptions are granted to farmers on material used in the production of agricultural products for the market. The exemptions consist of materials used in disease and weed control, insect control, the health promotion of livestock and plants as well as fuel consumed in implementation of husbandry engaged in agricultural production.

Major changes in the tax have consisted of either raising the tax rate or broadening the tax base. In 1949 the base was extended to the sale of building material to owners or builders for the creation of buildings, repair and improvement of the real property. In 1955 gross receipts from bowling alleys were defined as a retail sale. Also, in 1955 the retail sales of beer and cigarettes were no longer tax exempt. In 1965 hotel services were defined as taxable under the retail sales tax. In 1967 the base was extended to selective services. These included most types of repair
services, services in construction of personal private property and advertising services. New construction and advertising were only in effect a year and a half and then repealed in 1969.

The sales tax rate was changed in 1955 from 2 percent to 2.5 percent and then reduced once again to 2 percent in 1957. In 1967 the sales tax rate was raised from 2 percent to 3 percent.

**Use tax**

The use tax is a tax on the use of tangible property in Iowa. It is divided into three primary categories.

1) Use tax paid directly by users
2) Use tax paid by out-of-state sellers for the sales to Iowa residents where transactions are subject to taxation
3) Use tax collected on new motor vehicles and trailers

For items to fall under the use tax the only evidence required to establish sales for use in Iowa is evidence of sales for delivery in Iowa. Taxes paid in a state other than Iowa are deductible from the liabilities imposed by the Iowa use tax.

A major change in the tax structure came with the repeal of the "not readily available clause" in 1967. This clause had previously exempted from taxation tangible personal property not readily available in Iowa and which is used directly in the fabrication, compounding, manufacturing, or securing
of tangible personal property intended to be sold at retail.

Sales and Use Tax: Revenue Model

Revenue derived from the sales and use tax in Iowa is a set percent of taxable consumption (sales) in the state. For the United States consumption is known to be primarily dependent on the level of income (23). More specifically, for Iowa taxable sales and personal income over past years have, in fact, grown at a relatively constant proportion to one another. In years where this has not occurred, it is usually attributable to administrative changes in the tax base. Therefore, a model using income as the determining variable and which makes adjustment for changes in the tax base would seem a suitable means with which to estimate actual sales in the state for future years. The appropriate tax rate can then be applied to the determined sales figure to estimate expected revenue.

In setting up an estimating model for Iowa, it is useful to recognize that the use tax as a supplement to the general sales tax is not separate from or independent of it. Consequently, the two taxes may be considered as one and this figure calculated as a function of taxable sales or aggregate consumption. Because the coverage of the Iowa sales and use tax is extensive, it is probable that relative price and tax rate changes will not influence the relationship between
income and expenditures on taxed and non-taxed items. Finally, since the tax rate is the same on all taxed items, tax collections need not for short-run analysis be examined by type of sale.

Given this assumption the estimating model takes the form:

\[ TS = a + D_1 + D_2 + Y^b \]

(3.1)

\[ R = r(TS) \]

(3.2)

where

- \( T \) = taxable sales
- \( Y \) = personal income
- \( R \) = revenue
- \( r \) = tax rate
- \( b \) = exponent identifying the proportional changes of revenue to income
- \( D_1 \) and \( D_2 \) = dummy intercept coefficient measuring the impact of applicable base changes in the tax structure

A shortcoming of equation 3.1 is that it cannot directly anticipate changes in revenue resulting from relevant base changes. However, in dealing with any type of forecast model it is nearly an impossible task to determine in advance the extent of effect some future change in base will have on revenues to be collected. What may be done in developing a model of this type is to estimate the various shifts in the relationship between income and taxable sales for past years in which significant changes have occurred and to assume the last major change will be in effect for future projection.
needs.

This has been done by introducing dummy intercept variables, $D_1$ and $D_2$, into equation 3.1. The variables are estimated by placing a column of 1's and 0's into the observed data set on which a regression analysis is to be conducted. For each tax base 1's are entered into a separate column for the years the base was in effect and 0's elsewhere. In this way the analysis estimates a different intercept coefficient for each base.

The model estimates revenue only after taxable sales have been determined. This is done, of course, by applying the tax rate to the taxable sales figure. It would be incorrect to follow such a procedure if, in fact, changes in rates were to have a direct impact on the nature of the consumption function. That is, if a 5 percent tax rate reduced consumption significantly below what would have occurred had the rate been 4 percent, this procedure would be invalid. It was determined from separate studies, one by J. Dockel (3), for Iowa, and another by R. Hansen (14) for the U.S. that the rate effect on total expenditures is nil. Therefore, a two-stage model, the first stage estimating the volume of taxable sales, the second stage estimating revenue from the determined sales figure, is valid. It is possible, therefore, to anticipate directly any effects on revenue that changes in the tax rate might cause.
In discussing the form of the tax model and the variables to be included in the model, it is necessary to review briefly the specific hypothesis on which the assumption of an aggregate consumption function has been based. It has long been noted that revenues from the sales tax are more stable than income tax revenues. This indeed seems to have been one factor for its development as the single most important revenue source for state government. The most widely held explanation for this observed phenomena is the "permanent income hypothesis" (11). This hypothesis states that consumption is more correctly a function of income in terms of wealth rather than income in terms of current receipts. The hypothesis implies that when a consumer unit experiences a transitory increment of income, that is, when an individual's measured income exceeds the expected or permanent income, the "transitory" component is added to his assets or used to reduce liabilities rather than spent on consumption. Similarly when the individual experiences a transitory decrement of income, the consumer adjusts consumption to permanent income financing any excess over measured income by drawing down assets or increasing liabilities.

Empirically, the hypothesis is implemented by approximating the wealth variable by means of a weighted average of present and past levels of income. The weights are so calculated that the current year's level of income is most
heavily weighted and subsequent years are weighted in a geometrically declining manner such that the sum of the weights is equal to one (11).

The extensive coverage of the sales tax in Iowa allows one to assume that such an hypothesis is feasible in estimating consumption of taxable items for Iowa. Also, in implementing the empirical analysis and constructing the appropriate equation for Iowa, the specific technique described above is employed.

The equation developed for the model is stated as follows:¹

\[
\log \text{TS} = 0.1123 + 0.1131D_1 + 0.1610**D_2 + 0.9399* \log Y_w \\
(0.1225) (0.1268) (0.1336) (0.0340)
\]

where \( \text{TS} = \) taxable sales

\( Y_w = \) income variable (weighted)

\( D_1 = \) dummy variable for tax base effect for 1956-1967

\( D_2 = \) dummy variable for tax base in effect after 1967

and where the weights for the income variable are 0.400, 0.240, 0.184, 0.070, and 0.044 for income \( Y_t \) through \( Y_{t-4} \).

¹ The superscript (*) indicates the coefficient in the equation to be significant at the 5 percent level while (**) indicates the coefficient to be significant at the 10 percent level. Absence of the asterisk superscript indicates the coefficient to be non-significant.
The $R^2$ term for the equation was .9794. This figure is considerably higher than what might have been expected, given that a number of changes in the tax base introduced over the period considered were not directly taken into account. However, for this equation in the two instances in which it was decided to measure the effect of broadening the base, only one of the coefficients, that for $D_2$, was significant and it was marginally significant at the 10 percent level. For the base change of 1956 the coefficient $D_1$ was not significant. This implies the base changes had very small effect in changing revenue for the state. The implication is that for other base changes which were not statistically measured, there was no significant impact on revenues which would cause a fundamental shift in the taxable sales function. This observation offers some explanation for why the $R^2$ term was indeed high even when for each instance of occurrence, changes in revenue caused by changes in the base were not explicitly accounted for in the model.

Before any acceptance of the model is made, it should first be compared to an analysis which does not rely on a "permanent income hypothesis" but rather on one which assumes consumption to be a simple function of current income. Such an analysis, omitting a lagged income variable and using instead a simple yearly income figure, resulted in a reduction
of the $R^2$ term to .962 and a slight reduction in the significance of the income coefficient for the general model. The reduction was not large but this is of no surprise for this particular model since the weighted income variables are not extremely different from actual yearly figures. The fact remains, however, that the weighted figures do give best results and it is consistent with the theoretical concepts concerning consumption and its relation to income.

Comparing actual and estimated taxable sales figures, the maximum deviations occurring in the data amount to 180 million dollars or about 4 percent of the actual taxable sales figures (see Chart 3.2 (16)). Also, the largest differences between actual and estimated revenue figures is 2.5 million dollars or 4 percent of actual revenue data (see Chart 3.3 (16). These results, when placed in the context that the levels of sales for years (1959, 1960) in which these errors occurred was 4 billion dollars and revenue was 80 million dollars, imply that the model does approximate well actual data.

To project levels of taxable sales and revenue for future years, it is necessary to assume as already determined the value of the income variable (see Table 3.1).¹

¹A more complete discussion of the income variable is considered in Chapter V.
Chart 3.2 Estimated volume of retail sales per year subject to sales tax in Iowa from 1952 to 1973 with actual sales for comparison (16)
Chart 3.3 Estimated revenue collected per year from sales tax plus use tax in Iowa from 1952 to 1973 with actual collections for comparison (16)
Table 3.1 Estimated taxable sales, total sales tax revenue plus use tax revenue for Iowa for 1970-1973 based on estimated personal income assumed by extrapolation of past growth trends from 1948 to 1969. (millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income</th>
<th>Taxable Sales</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>9986</td>
<td>7550</td>
<td>226.5</td>
</tr>
<tr>
<td>1971</td>
<td>10450</td>
<td>7864</td>
<td>235.9</td>
</tr>
<tr>
<td>1972</td>
<td>10950</td>
<td>8136</td>
<td>245.6</td>
</tr>
<tr>
<td>1973</td>
<td>11500</td>
<td>8551</td>
<td>256.5</td>
</tr>
</tbody>
</table>

Estimates of taxable sales and sales tax revenue are consistent with past trends (see Chart 3.2 (16) and 3.3 (16)). The model predicts a general rise in taxable sales and revenue with some slowing down in the rate of growth from nearly 6 percent for 1965-1969 (disregarding tax rate changes in revenue) to a rate of 4 percent for 1970-1973. This is, of course, caused by the lower 5 percent growth rate of the weighted income variable used in the model, down from over 5.5 percent for the period 1965-1969.

Results yielding such relatively small deviations between actual and estimated data when a model of the type described here is used would suggest that it is in fact a valid procedure to estimate sales tax revenue for Iowa. Further, future projections which are consistent with past movement in revenue would indicate that such results may be used for
purposes of basing future state revenue and expenditure policy decisions.
CHAPTER IV. OTHER SELECTIVE SALES TAXES

Besides the general sales tax, special taxes are levied on selected consumption items such as motor fuel, cigarettes, liquor and beer. The tax on motor fuel is not discussed here even though it provides a large amount of revenue to the state. Motor fuel tax is a charge for use of public roads and does not contribute to revenue for general state use.

The taxes on consumption of cigarettes, liquor, and beer constitute as much as 25 percent of the purchase price of the item and might be thought of as fulfilling a sumptuary purpose of diminishing their consumption. In fact, however, the taxes seem to serve the purpose of securing for the state large revenues but do not actually prevent consumption. If the consumer wishes to pay a penalty tax of which the proceeds are used for collective purposes, he may do so (26).

In general, the taxation of these items was introduced during the 1930's when financial difficulties for the states, brought on by the depression were rapidly increasing. By 1930 eight states taxed cigarettes and by 1936 forty-eight states had imposed a tax on liquor or beer. Today all states tax liquor and beer by one means or another and only North Carolina does not tax cigarettes or tobacco products. The growth in revenue from these sources has been substantial in absolute terms moving from .6 billion dollars in 1946 to .9 billion dollars in 1951 and to 3.3 billion dollars in 1969.
As a percent of total revenues received by all states, the growth of this type of revenue has been declining. This is due to the significant increase in state income tax receipts and retail sales taxes. As a percent of total revenues they have moved from 9.8 percent in 1946 to 9.9 percent in 1951 and to 7.8 percent in 1969.

Selective sales taxation was introduced into the Iowa tax structure in 1921 with the appearance of a tax on cigarettes sold within the state. Then, with the repeal of prohibition, control of the sale of liquor was assumed by state government and consumption of beer was immediately taxed. In 1935 these revenues contributed about 26 percent of the states general revenue obtained from non-property tax sources. In 1946 the figure was 20 percent. Because of the significant increase in reliance on the income and retail sales tax for state revenues, the relative yield of this type of selective tax has steadily declined to where in 1969 they contributed only 13 percent of state revenues. This has occurred despite the notable increases in the absolute size of revenues from these sources. They have increased, for example, from about 11 million dollars in 1946 to 59 million dollars in 1969. A description and development of revenue models for cigarettes, liquor, and beer follow.
Cigarette Tax

In 1921 Iowa law began requiring all cigarette wholesaler's to pay a tax on each package of cigarettes for sale. Since then, the tax rate has increased from 2 cents per pack to 13 cents per pack and the consumption of cigarettes has risen from 74 million packs in 1935 to 300 million packs in 1969. It has, therefore, become an important source of revenue to the state. Tax receipts from cigarettes composed approximately 6.0 percent of the total state receipts for 1969. Revenue from cigarette taxes has grown rapidly but unevenly since the end of World War II caused by the fact that though consumption has risen at a steady pace from 1946 to 1963 and has been constant or declined slightly since then, a number of rate increases have led to uneven increases in receipts (see Chart 4.1 (8)).

These increases in the tax rate on cigarettes are frequent because the payer of a cigarette tax is politically vulnerable. The cigarette tax makes expensive a consumption item which is generally considered hazardous. It is a tax paid only on those who smoke, and thus, in theory, it could be avoided by anyone objecting. As a result an increase in the cigarette tax meets with the smallest amount of public resistance as compared to proposed increases in the income or sales tax. The cigarette tax is therefore often the first tax to be increased when additional revenues are needed. To
Chart 4.1 Revenue collected per year by the State of Iowa from the taxation of cigarettes for years 1953 to 1970 (8)
demonstrate, note that the cigarette tax has been increased 7 times since 1950.1

Tax structure on cigarettes

The tax on cigarettes is a tax per unit of physical volume, not per dollar of cost. The only changes which have occurred have been in the applicable rates. The rate was 2 cents per pack from 1921 to 1953. It was raised to 3 cents per pack in 1953, to 4 cents in 1959, to 5 cents in 1963, to 8 cents in 1965, and to 10 cents in 1967. Finally, the tax rate was increased to 13 cents in March, 1971.

As a percent of the total cost of cigarettes the 2-cent tax by the state in 1946 was approximately 14 percent of the cost of a pack of cigarettes. In 1969 the percent of state taxes contribute approximately 26 percent of the cost.

Cigarette tax model

The volume of cigarettes consumed in any time period has been observed to exhibit two fundamental characteristics: First, the demand for cigarettes is price inelastic. That is, if a 10 percent increase in the price of cigarettes occurs, for example, through a tax rise, the quantity of cigarettes demanded decreases by a smaller proportion of

1In fiscal 1968 collection of taxes on other tobacco began. However, in 1969 the tax contributed only .14 percent of receipts for Iowa and therefore will not be dealt with in this study.
of about 2 percent. Second, the quantity of cigarettes consumed per capita rises with real income.

In 1950 Richard Tennant examined the demand for cigarettes and found that for the United States the consumption data for cigarettes from 1900 through 1949 seemed consistent with these observations of price inelasticity and income elasticity. The income elasticity was estimated to average .8 (28). In the study, Tennant compared prices of cigarettes with actual per capita consumption and in terms of the $R^2$ coefficient, he found that not only were the deviations from trend remarkably small, but they did not fall in such a pattern as to indicate even minor influences of price upon consumption. Also, for the relation of cigarette consumption to real per capita income, Tennant found that his analysis accounted for 96.7 percent of the variability. The explanation given by Tennant for these results is that tobacco is an urgently desired commodity of small cost and its consumption is a matter of habit. However, it is also regarded as a luxury item and when incomes are low or when they decline, it is natural that people should attempt to cut down on its consumption.

For Iowa, expanding the data to 1962, the results continue to agree with those of Tennant. However, when the data is extended to include 1970, it is found that after 1962 the linear relation of consumption to income no longer holds
(see Chart 4.2 (8)). In Iowa per capita cigarette consumption has remained constant or has actually declined after 1962, while per capita personal income has increased by a substantial amount (see Chart 4.3 (8)). The same pattern is displayed when real income is substituted for personal income in the comparison, as was done by Tennant. To examine further the hypothesis that consumption of cigarettes is a function of income, per capita consumption of cigarettes is regressed on per capita income. The results of this analysis rendered an $R^2$ term of .757 as compared to Tennant's $R^2$ coefficient of .967. The more recent data does not, therefore, agree with Tennant's observations concerning the relationship of income to consumption of cigarettes.

The impact of price changes on the demand for cigarettes in Iowa continues to agree with Tennant's conclusion and in general, the demand remains price inelastic. However, this conclusion must be qualified somewhat since it can be observed in past data that a tax increase on cigarettes was often accompanied by a short run effect of a decline in consumption (1959-1960, 1963-1964, 1965-1966, 1967-1968) averaging 2.37 percent for each one cent increase in the tax (see Chart 4.3 (8)). The effect is referred to as being a short run phenomena since generally the rate of consumption is restored to its dominant trend within one year after the initial tax increase. This fact is understandable when one
Chart 4.2 Scatter diagram plotting per capita cigarettes consumed in Iowa by level of per capita income from 1955 to 1970 (8)
Chart 4.3 Per capita cigarette consumption and per capita personal income per year for Iowa from 1955 to 1970 (8)
considers the immediate reaction to any price increase given a normal demand function. However, the important fact here is that the acquired habit of smoking seems to overpower a tendency to reduce smoking caused by a price increase. Consumption, therefore, is restored within a short period of time to its observed trend.¹

A more reasonable explanation into the determination of the demand for cigarettes and for the decline in per capita consumption of cigarettes is not that it is linked to personal income but, rather, that it is linked to more fundamental psychological factors. For example, the effects of an intensive campaign against cigarette smoking conducted by the American Cancer Society seems to have had a definite impact on reducing per capita smoking in the United States.

To give some idea of how intensive this campaign has been, some examples may be sighted. In January, 1960, the Board of Directors of the Society made known that clinical, epidemiological, experimental, chemical and pathological evidence presented by the many studies reported indicate beyond reasonable doubt that cigarette smoking is the major

¹As noted by Tennant and emphasized by the cigarette industry, the price inelasticity for cigarettes cannot go on indefinitely if price rise to unreasonable levels. At some point the demand can become price elastic and cause permanent reductions in consumption of cigarettes.
cause of the unprecedented increase in lung cancer (1). In 1965 the Society set a five-year objective of reducing cigarette smoking among teenagers by 50 percent, in the general public by 25 percent and among physicians by 50 percent.

Finally, strongest support of the effort against cigarette smoking was received in 1964, in the definite Report of the Surgeon Generals Advisory Committee on Smoking and Health, which on reviewing the evidence made the judgment that cigarette smoking is a health hazard of sufficient importance to warrant appropriate action (1).

Though no specific data is available on the overall effectiveness of this campaign it is known that the per capita consumption of cigarettes for the nation dropped from a high of 4,266 cigarettes in 1961 to a low of 4,195 in 1968, and data for 1969 and 1970 indicate further reductions should occur (36). Thus, it would seem in general that the campaign has had some influence at least in turning the trend away from increases in smoking and toward an actual decline.¹

¹There is some dispute to this since the largest gaining population age-group during the 1970's probably will be the 25 to 34 year olds. This age group has the highest per capita smoking rate of all age groups over 18 and thus overall per capita smoking may begin to increase once again.
Though the influence of the anti-smoking campaign has been important, it certainly has not been completely successful and thus there must exist other influences to be accounted for. The causes of the less-than-perfect success of the campaign is most likely to be the habit for smoking acquired by people over time and the disregard to warnings published by the various agencies rather than, as suggested originally, levels of personal income.

The best method of determining the demand for cigarettes would be to obtain complete studies on the formation of smoking habits; the effect of anti-smoking campaigns on smokers; and finally, the changing age distribution of smokers over time. With this information one would then be able to anticipate just what the level of consumption in the future might be. Unfortunately no data adequate for fulfilling this need is at present available. Therefore, the best estimates that have been obtained thus far are from the construction of a curvilinear time trend which simply fits per capita consumption to time in terms of years. Such a method using per capita data picks up as well as possible the shifting attitudes toward cigarette smoking and at least some aspects of changes in population distribution of those who are smoking.

A model based on this analysis would then be as
follows:

\[ R = r(TCC) \quad (4.4) \]
\[ TCC = C \times \text{population} \quad (4.5) \]
\[ C = a + bt + ct^2 \quad (4.6) \]

where

- \( R \) = revenue from taxation of cigarettes consumed in Iowa
- \( TCC \) = total cigarette consumption
- \( C \) = per capita cigarette consumption
- \( r \) = tax rate
- \( t \) = time
- \( a, b, c \) = parameters

Before determining the parameters for equation 4.6, it is necessary to allow first for the short run effect of the tax rate changes. That is, observing that a rate increase temporarily reduced consumption of cigarettes, the data for these years was adjusted upward to its anticipated trend by the average of 2.37 percent for each one cent increase in the tax rate.⁴ Using the adjusted data the equation for per capita consumption is:²

---

¹Because of simple statistical techniques used in this study, a model employing a dummy variable to estimate the impact of rate changes on consumption could not be determined for the polynomial equation.

²Throughout this chapter the superscript (*) indicates the coefficient in the equation to be significant at the 5 percent level, while (**) indicates the coefficient to be significant at the 10 percent level. Absence of the asterisk superscript indicates the coefficient to be non-significant.
\[ C = -1026.2^* + 35.14^*t - 0.2705^*t^2 \quad (4.7) \]

where \( C \) = per capita consumption  
\( t \) = time  
The \( R^2 \) term for the equation is 0.916. This result implies that better than 91 percent of the variation in consumption of cigarettes is accounted for in the model. The actual degree of smoking and the direction it may turn in the future is uncertain and dependent on a good deal more psychological factors than can be picked by a simple time trend. A model accounting for better than 91 percent of the variation of per capita consumption over time is indeed acceptable as a tool for estimating future levels of revenue.

Comparing actual and estimated per capita consumption (see Chart 4.4 (8)), the model tends to dampen the fluctuations in observed consumption. This is a consequence of the regression analysis used to determine the estimating equation. Even with this damped effect on the estimates, the deviations do not exceed two packs per capita or 9 percent of the actual consumption figure for any year. For years in which tax increases have occurred, adjustment of the data (a fall in the trend line in Chart 4.4) reflect the decline of consumption resulting from these changes.

Projecting per capita consumption for years 1970 through 1973 indicates rather sporadic movement (see Table 4.1).
Chart 4.4 Estimated per capita consumption of cigarettes in Iowa from 1954 to 1973 with actual consumption for comparison (8)
Table 4.1  Estimated cigarette tax revenue for Iowa based on estimated personal income assumed by extrapolation of past growth trends from 1948 to 1969.

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue ($'000)</th>
<th>Population (000)</th>
<th>Per Capita Consumption (units)</th>
<th>Total Consumption (000,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>30248</td>
<td>2825</td>
<td>107.1</td>
<td>302.5</td>
</tr>
<tr>
<td>1971</td>
<td>36192</td>
<td>2847</td>
<td>97.9</td>
<td>278.4</td>
</tr>
<tr>
<td>1972</td>
<td>37382</td>
<td>2869</td>
<td>101.6</td>
<td>291.4</td>
</tr>
<tr>
<td>1973</td>
<td>36582</td>
<td>2891</td>
<td>97.5</td>
<td>281.4</td>
</tr>
</tbody>
</table>

\(^a\) Source: (33)

In 1971 consumption fell by 9.3 packs or nearly 9 percent because of a rate increase which occurred in that year. In 1972 recovery in demand from the short run effect of a tax increase resulted in an increase in consumption of 4.8 packs or 5 percent. Finally, in 1973 consumption once again fell by 4.1 packs or 4 percent reflecting the observed declining per capita trend in demand for cigarettes. Consumption should continue to decline if, as expected, private and public agencies continue their policy of educating the public on the dangers of smoking and the public respond to these warnings.

Using population figures and tax rates already
determined\(^1\) and substituting these figures into equations 4.4 and 4.5, revenue estimates may be determined and compared to observed data for the time period on which the regression was conducted (see Chart 4.5 (8)). Since population is stable for Iowa, these estimates reflect closely the movements of per capita consumption estimates. Consequently, deviations between actual and estimated data do not exceed .5 million dollars or 2 percent of actual data.

Regarding future estimates, it is not surprising to observe a marked increase in revenue of 20 percent for 1971 since the tax rate increased from 10 to 13 cents (see Chart 4.5 (8) and Table 4.1). The following year, 1972, demonstrates a further increase in revenue of about 5 percent after the short run effects of the decline in consumption caused by the tax increase work their way out of the demand for cigarettes. The last year, 1973, demonstrates a decline in revenue of nearly 4.8 percent which reflects the hypothesized trend toward reduced smoking by individuals even though total number of people smoking may be rising with increased population.

These observations referenced with the statistical results determined by the regression analysis itself would

\(^1\)The population figures used for 1954-1969 are from statistical abstract (33) and tax rates used are those described under "Tax structure on cigarettes" in this chapter. Future projections assume a rate of 13 cents per pack.
Chart 4.5 Estimated revenue collected per year from the taxation of cigarettes in Iowa from 1954 to 1973 with actual collections for comparison (8)
therefore imply the model to be acceptable as a tool for estimating revenue to be received by the state from this source.

Liquor Revenue and Tax

With the repeal of the Eighteenth Amendment to the Constitution, Iowa was given access to a lucrative source of revenue from the sale of alcoholic beverages within the state. In setting up control over its sale, Iowa chose a monopolistic approach which delegated all selling rights and control solely to the state government under the direction of a liquor control commission.

Net income from operations of the commission, though declining in relative importance, contribute a significant percent to total revenue for the state. In 1970 this amount averaged 6.2 percent of state revenue as compared to 8 percent, approximately in 1954. In absolute terms, increases in revenue have been important going from 7.8 million dollars in 1954 to 23.8 million dollars in fiscal 1969-70 (see Chart 4.6 (18)). Most notably, it has increased at an accelerated rate since the mid 1960's. This increase has paralleled quite remarkably the movement of personal income.

Policy structure of state liquor commission

Revenue received by the state from its control over the sale of liquor is obtained by two separate methods. First, from the commission's operations as a retailer of liquor stores, it earns gross receipts on the sale of liquor to the
Chart 4.6 Revenue collected per year for the state from the sale and taxation of liquor in Iowa from 1952-53 to 1969-70 (18)
general public and to licensed establishments entitled to sell liquor by the drink. From each of these sources the commission receives a set price for the goods it sells. These prices, which are charged for each of the different types of liquor sold per package and not gallons consumed, range between a markup of 50 and 70 percent of cost, depending on the particular item sold. Second, from the licensee who purchases a particular type of liquor, the commission receives an additional 15 percent tax on the retail price of the item sold.¹

From gross receipts, not including the 15 percent tax, is then deducted the necessary operating expenses of the commission which have been a relatively proportional figure of 6 percent of sales over time. With this is of course deducted purchasing cost of the goods sold. The remainder, net income, is subject to transfer to the state treasury.² No major changes in the general pricing or policy procedures by the commission have occurred in the time period studied here.³ Passage of legislation to allow sale of "liquor by

¹It should be noted that a retail sales tax is also imposed on the sale of liquor in Iowa. However, since Chapter III concerns the retail sales tax, it will not be discussed separately at this time.

²This disregards any mention of funds earmarked for specific state agencies or levels of government.

³Change did occur in the administrative structure of the commission as of January 1, 1972.
the drink" in 1963 gave control of this aspect of the sale of liquor to the commission also.

**Development of a revenue model for liquor sales and taxes**

Liquor is a luxury item and it is assumed that the consumption of it is dependent on the level of income in the state. For example, as incomes rise, people become more socially oriented and have occasion to spend more of their income on this type of item.

It is assumed that for small changes in price, the elasticity of demand for liquor is close to zero. Further, it is assumed that for small price changes which occur over time the proportion of total sales to income will not be significantly effected by these changes. The net income figure from the operation of the liquor commission in Iowa is dependent on the cost of operation as well as the level of sales. If it is assumed that the cost of operations will continue to be a constant percent of sales, it is then possible to set up a model stating net income from operations of the commission to be a function of total sales. This

---

1I have been unable to find specific detailed studies on the impact of income and prices on the demand for liquor. The best that is available to me generally points out that the liquor industry itself believes that income and the social mood tend to dominate the demand for its products. Price competition is usually closely controlled and price responses are in general considered to be quite inelastic. I refer this reader to reference (27).
assumption is a reasonable one since it has already been noted that costs have run at a fairly constant rate of 6 percent of sales.

Since the state receives revenue from the taxation of sales of liquor to licensed establishments, this must be accounted for in the final revenue estimate. This can be done by first estimating the proportion of sales to licensed establishments and then applying to this figure the appropriate tax rate to determine tax revenue.

The estimating model for this procedure is of the form:

\[ TR = NI + dSL \]  
\[ SL = eS \]  
\[ NI = a + S^c \]  
\[ S = a + Y^c \]

where

- \( S \) = sales of liquor in the state
- \( NI \) = net income
- \( SL \) = sales to licensed establishments
- \( TR \) = total revenue to state
- \( Y \) = personal income
- \( a \) = intercept coefficient respectively
- \( c \) = measures percentage change of respective variables
- \( d \) = tax rate of sales to licensed establishments
- \( e \) = proportion of sales of licensed establishments to total sales

Whether this model is feasible depends first of all on
the pricing policies of the commission, and secondly on consumers response to this policy. For example, a change in the commission's policy for pricing its goods could noticeably effect profits either by changing dollar volume of goods sold holding quantity constant or by changing the demand for the goods themselves, or some combination of these two possibilities. Upon speaking with the office of the comptroller of the commission, it was determined that pricing of the items is set by the commission and varies only insofar as changes in the purchase price to the commission itself occur. Therefore, no erratic or violent price changes should occur over time which would cause significant underestimation of total sales. Also, the assumption of price inelasticity of demand for liquor implies that for those price increases which do occur, the demand for liquor will not be reduced by any drastic amount which would make the model inoperable.

Thus, the model best suited for the purpose of estimating revenue from this source is one where sales are a function of income, where operating expenses are considered a relatively constant proportion of sales, where prices are stable, and where the demand for liquor is assumed to be price inelastic.

The equations then estimated for sales and net income are as follows:

\[
\log S = -1.2969^* + 0.7851^* \log Y \quad (4.12)
\]

\[
(0.1151) \quad (0.0304)
\]
Log NI = -1.099* + 1.295* Log S

(4.13)

(0.0897) (0.0533)

where the variables have been defined in equations 4.6 and 4.7 above.

The $R^2$ term for equation 4.12 was .987 and that for equation 4.13 was .976. The coefficients for both equations were statistically significant at the 5 percent level. The coefficients indicated that for each 1 percent increase in income, sales increased by nearly .8 of one percent and for each 1 percent increase in sales, net income rose by 1.2 percent. These results are in agreement with earlier observations concerning the growth of revenue from this source as compared to the growth of personal income in the state. This suggests that the basic hypothesis and assumptions set forth in the above discussion relating to the nature of the demand for liquor and cost incurred in the operation of the commission are acceptable.

To complete the model one must add to the results of equation 4.13 a 15 percent tax collected on sales to licensed establishments. It is, therefore, necessary that the proportion of sales to this group be determined. Because "liquor by the drink" has been in effect in Iowa only since 1963, exact estimates on the percent of sales to licensees is rather difficult to derive. When first introduced the proportion of sales to this group was only 23.68 percent.
Since then, of course, it has steadily increased until, in fiscal 1970, the figure had risen to 30.15 percent of total sales. However, in the past three years this percentage has increased at a substantially reduced rate. In fact, the rate has risen by less than 1.5 percent over this three-year period. The percentage figure which will be used for purposes of projecting the proportion of future sales to licensees is 31 percent, reflecting the tendency for it to remain around this level in recent years. The final stage of the model outlined in equation 4.9 and 4.10 will take the following form:

\[ TR = NI + (0.15)(SL) \]  \hspace{1cm} (4.14)

\[ SL = 0.31(S) \]  \hspace{1cm} (4.15)

where the variables are as defined for equation 4.8 through 4.11 above.

Applying the 31 percent figure to the total estimated sales gives the amount of sales made to licensees. To this is applied the 15 percent tax rate to determine the additional revenues to be received by the state.

Implementing the model for years 1954-1955 through 1969-1970 (adding actual tax figures to estimated net profit for years 1963-1970) the estimated data fall close to observed levels of revenue (see Chart 4.7 (18)). This pattern displayed is entirely consistent with the movements in income over time and show no deviations over .6 million dollars.
Chart 4.7  Estimated revenue collected per year from the sale and taxation of liquor in Iowa from 1953-54 to 1973-74 with actual revenue for comparison (15)
or 3 percent of actual revenue. Because continued updating of the model is required, any effects to the estimate brought on by price changes which occur over time should always be minimal.

To derive estimates of expected future revenue from the sale of liquor in Iowa, it is necessary to assume the value of the income variable as given.¹ Expected future revenue as determined by equations 4.12 through 4.15 are consistent with past trends (see Chart 4.7 (18) and Table 4.2).

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Personal Income</th>
<th>Net Profit</th>
<th>Tax Receipts</th>
<th>Liquor Sales</th>
<th>Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-71</td>
<td>9986</td>
<td>19.4</td>
<td>3.23</td>
<td>69.5</td>
<td>22.6</td>
</tr>
<tr>
<td>1971-72</td>
<td>10450</td>
<td>20.3</td>
<td>3.35</td>
<td>72.1</td>
<td>23.6</td>
</tr>
<tr>
<td>1972-73</td>
<td>10950</td>
<td>21.3</td>
<td>3.48</td>
<td>74.3</td>
<td>24.8</td>
</tr>
<tr>
<td>1973-74</td>
<td>11500</td>
<td>22.4</td>
<td>3.62</td>
<td>77.3</td>
<td>26.0</td>
</tr>
</tbody>
</table>

Estimates for 1970-1971 fell slightly from the 1969-1970 level. This occurred first because income for this year

¹A discussion of the assumed income variable and its derivation is considered in Chapter V.
remains about the same as it had for the previous year and second, because only at this point are estimates rather than the actual tax receipts added to estimates of net income to compute estimated total revenue. Because the tax figure for 1970-1971 was below the actual figure for 1969-1970, total estimated revenue shows a decline.

Finally, estimates of total revenue for year 1971-1972 through 1973-1974 increased at a steady rate of nearly 4.5 percent per year. This reflects similar increases of personal income of 5 percent and of net profits and tax receipts for the commission of 4.5 and 4 percent, respectively.

These results would imply that the model as described here is valid for purposes of estimating future revenues to the state from this source. Such estimates may then be added to total estimated revenue figures for the state upon which state revenue and expenditure policy decisions can be made.

Taxation of Beer

Unlike liquor, the sale of beer is not directly administered by the state. Nevertheless, with the repeal of prohibition the sale of beer was immediately taxed. For 1969 the revenues from the tax on beer contributed 1.2 percent of the total revenue to the state, which is a drop from the 1946 level of 3 percent. Though the taxation on beer
contributes a relatively small amount to total revenues for the state, it is considered in this study because of its relationship to income; and also because the tax rate may be readily altered to yield predictable additional revenues to the state as may be needed. For example, the increase in the tax rate on beer from 8 cents to 12 cents in 1967 increased revenues from this source by nearly 55 percent between 1966 and 1968 (see Chart 4.8 (31)). In years where no tax rate increase occurs, revenues increase at a rate of about 2 percent, reflecting a similar rate of growth in consumption. From 1954 to 1969 consumption of beer in Iowa increased by 8.4 million gallons, from 38.2 million gallons in 1954 to 46.6 million in 1969. Though not as easy politically to increase the tax rate on beer as it is that on cigarettes, it is nevertheless a sumptuary tax which can be changed with considerably less difficulty than can be those of sales or income taxes. As a result, consideration and construction of a model to estimate revenues from the taxation of beer is indeed useful when considering types of revenue sources available to the state.

Structure of the Iowa beer tax

Taxation of beer is a unit-per-physical-volume tax. The only changes in the beer tax structure have been changes in the rate per gallon of beer sold. The tax was increased from 4 cents a gallon to 8 cents in 1947. It was increased
Chart 4.8 Revenue collected per year for the state from the taxation of beer consumed in Iowa for years 1953 to 1970 (31)
to 12 cents a gallon in 1967. Finally, in March, 1971, the tax was increased to 15 cents per gallon consumed.

Development of a revenue model

Revenue received by the state from the consumption of beer is derived by a single per unit tax on consumption. It is apparent that to estimate the amount of revenue going to the state, it is necessary first to determine the amount of beer consumed and second, to apply the appropriate tax rate to this consumption figure.

As with the demand for liquor, the demand for beer is assumed to be price inelastic. Past data of beer consumption patterns in Iowa indicate that beer is a non-necessity and that the level of consumption is determined by income in the state. Note, however, that though the secular trend of per capita consumption of beer and personal income move in a similar increasing manner, cyclical movements around each of the respective trend lines often move in an opposite direction to one another (see Chart 4.9 (31)). That is, for sharp increases in income, beer consumption may fall or conversely for decreases of income, consumption of beer may rise. Therefore, the demand for beer displays a behavior pattern which is similar to what is expected of an
Chart 4.9 Actual per capita beer consumption and per capita income per year for Iowa from 1955 to 1970 (31) (34)
inferior good.¹

A model which is expected to estimate beer consumption for the state must, therefore, account for this pecularity in the demand for beer. This can be accomplished by incorporating into the estimating model a change of income variable as well as a level of income variable. The specific purpose of the change of income variable would be to anticipate the direction consumption of beer would move for any noticeable increases or decreases of income.

In an effort to eliminate the difficulty of separating population influences effecting total consumption as opposed to the influence income has in determining the level of consumption, per capita consumption data is used. Once per capita consumption is estimated, population figures may be employed to determine total consumption. To total consumption may be applied the appropriate tax rate to determine estimated revenue to the state.

The model for determining beer tax revenue would then

¹In an article by Stephen Greyser (12) it was noted that researchers have found that an increase of income does, in fact, lead to a decline in consumption of beer in a locality, while decreases of income may lead to an increase.
be:
\[ R = r(TBC) \]  \hspace{1cm} (4.16)
\[ TBC = BC \times \text{(population)} \]  \hspace{1cm} (4.17)
\[ BC = a + bY + c(\Delta Y) \]  \hspace{1cm} (4.18)

where
- \( BC \) = per capita beer consumed
- \( TBC \) = total beer consumed
- \( Y \) = level of per capita personal income
- \( \Delta Y \) = change in or first difference of per capita personal income
- \( R \) = revenue
- \( r \) = tax rate
- \( a, b, c \) = determined parameters

To be more certain that the form of equation 4.18 is of use, results of the regression analysis used to determine the equation were compared to those obtained from conducting a regression analysis for a similar equation leaving out the change in income variable. For the analysis using only an income variable, the \( R^2 \) term was .88 and the coefficients for the model were significant at the 5 percent level. For equation 4.18 using both the income and change of income variables, the \( R^2 \) coefficient was .911. The coefficient for the income variable was significant at the 5 percent level and that for the change of income variable was significant at the 10 percent level. Note below in equation 4.19 that the coefficient takes on a negative sign which agrees with the contention that beer is, in fact, an inferior good.
Thus, all indications are that a model of the type described in 4.18 above is a valid representation of consumption of beer in Iowa.

The equation for this model is given as:

\[ BC = 11.3738 + .0016712Y - .0017109\Delta Y \]  
\[ (3.462) \quad (.00017328) \quad (.000966) \]  

The \( R^2 \) term is .919.

The model indicated that for each one dollar of per capita income .0016 gallons of beer would be consumed. And that for each one dollar change in personal income, there would be a .0017 gallon change in consumption of beer in the opposite direction. The income variable is the dominant variable and accounts for over 88 percent of the variability. However, its first difference is significant at the 10 percent level and it is believed that it should be included in the model.

Comparing estimates of per capita consumption derived from equation 4.19 to actual data for the same period suggests that the equation does approximate reasonably well the observed data (see Chart 4.10 (31)). Deviations of estimated and actual data do not exceed .6 of one gallon or alternatively, they do not exceed 9 percent of the actual consumption data. Both actual and estimated figures rise at a rapid pace from 1964 to 1970, reflecting the sharp increase in the rate of growth of income for this period. The cyclical pattern of beer consumption has been dampened in the
Chart 4.10  Estimated per capita consumption of beer in Iowa from 1954 to 1973 with actual consumption for comparison (31)
analysis. This fact explains why the deviations were as large as 9 percent. However, the model still reflects in part the cyclical variations in trend displayed by the data. For example, the decline of income of 4 percent in 1955 is displayed in the estimate by a rise in consumption of about .2 gallons. The sharp rise of income of 13 percent in 1965 is reflected in the estimate, though not significantly, by a slow down in the rate of growth of consumption from about 1 percent to about .8 percent. For future estimates, this factor may be of important use for estimating consumption if fluctuation of income is anticipated to be significant.

Using population figures and the tax rates already determined and substituting this figure into equations 4.16 and 4.17 revenue for the state is determined (see Chart 4.11 (31)). The deviations between observed and estimated data are no more than 200,000 dollars or 3 percent of actual figures.

By assuming that the value of the income variable is already determined, expected future levels of consumption and revenue can be estimated (see Table 4.3) and Chart 4.11 (31)). Both consumption and revenue increased slowly for 1970 where

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1The population figures used for 1954-1969 are from statistical abstract (33) and tax rates are those described under "Tax structure of the Iowa beer tax" in this chapter. Future projections assume a rate of 15 cents per gallon.

2Chapter V discusses the income variable.
Chart 4.11 Estimated revenue collected per year by the State of Iowa from the taxation of beer consumed in Iowa with actual collections for comparison (31)
Table 4.3 Estimated beer tax revenue for Iowa for 1970-1973 based on estimated personal income assumed by extrapolation of past growth trends from 1948 to 1969.

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income (000,000)</th>
<th>Revenue (000)</th>
<th>Population (000)</th>
<th>Per Capita Consumed (units)</th>
<th>Total Consumed (000,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>9986</td>
<td>5.85</td>
<td>2825</td>
<td>17.26</td>
<td>48768</td>
</tr>
<tr>
<td>1971</td>
<td>10450</td>
<td>6.90</td>
<td>2847</td>
<td>17.32</td>
<td>49329</td>
</tr>
<tr>
<td>1972</td>
<td>10950</td>
<td>7.57</td>
<td>2869</td>
<td>17.59</td>
<td>50475</td>
</tr>
<tr>
<td>1973</td>
<td>11500</td>
<td>7.75</td>
<td>2891</td>
<td>17.88</td>
<td>51693</td>
</tr>
</tbody>
</table>

a Source: (33)

income was assumed to have remained at nearly the 1969 level of income. Revenue then increased by nearly 20 percent in 1971 reflecting the increase in the tax rate rather than any significant change in consumption or the level of population. Finally, after 1971 the rate of growth in revenue from this source leveled off increasing at a rate somewhat over 2 percent. This rate is consistent with a rate of growth in per capita consumption of just over 1 percent and an average increase in population of nearly 1 percent.

These results of comparing estimates and observed data of consumption and revenue for beer lend further support to the hypothesis that personal income and changes in personal income determine the level of consumption of beer in Iowa and
thus the amount of tax revenue derived from beer in the state. Therefore, the model described in this section may be used to anticipate future levels of revenue going to the state from the taxation of beer.
CHAPTER V. PERSONAL INCOME

In the preceding sections of this study, income was found to be a highly significant explanatory variable of past trends and variations in state revenue. As a consequence, the accuracy of future revenue estimates are, in fact, contingent on the reliability of the income variable itself. One might attempt to avoid this dependency and source of uncertainty by utilizing instead a procedure which simply calls for extrapolation of past revenue trends on into the future. However, this does not work since changes may occur in the applicable tax base, tax rate or income which may directly and substantially affect revenues. It is more useful for estimating purposes to recognize that state revenue is dependent on the relationship of state income to its tax structure.

Though it has been hypothesized that an estimating procedure recognizing income as the primary determinant of revenue in Iowa is the best procedure available, such an approach for revenue estimation brings forth further difficulties in terms of obtaining reliable estimates of state income. The fact is that at present no error-free procedure for estimating income at any level exists. Uncertainty concerning the value of the determinants of income is one primary cause of this difficulty. No one knows what investment or consumption levels will be in the future. Even when the government
conducts policies to stimulate or constrain economic growth, there is no way to be certain the economy will respond as the planners wish. Therefore, in determining an estimate of income, the best that can be done is to attempt to define major determinants of personal income and establish an estimating model from this information; or more simply, to extrapolate levels of personal income from past data as the best indication of what future levels of income will be.

Iowa Personal Income in Perspective

Personal income is current income of persons or households from all sources. It includes both receipts for productive services provided by persons living in Iowa and receipts such as transfer payments made to Iowans for which no productive services were provided by the recipient.

Personal income in Iowa has increased by more than 6 billion dollars since 1950. From 1950 through 1959 state personal income increased at an average annual rate of 2.6 percent. More notable, however, is the fact that from 1960 through 1969 this average rate climbed to over 5 percent, increasing to as much as 13 percent in 1964 (see Table 1.2 (35)).

Also, variation around the linear 20 year trend of state personal income has been as high as 18.9 percent and as low as -7.4 percent, displaying an ordered cyclical movement over time (see Chart 5.1 (35)).
Chart 5.1 Percent deviation of personal income from twenty-year trend for the United States and Iowa for years 1948 to 1970 (35)
Growth and variation of total personal income for Iowa has in the past been the result or summation of economic circumstances and prospects in the several sources of income within the state.

**Manufacturing**

A major source of growth in personal income in Iowa has been the development of manufacturing and other heavy industry within its borders. Increases in employment and wages indicate that Iowa is only beginning to fulfill its potential as a location for industry. Diversification of manufacturing away from agriculture and agricultural related industries is increasing. Reports have indicated (25) that industries in the machinery, food products, printing and publishing, chemicals, fabrication metals, and transportation equipment are beginning to locate in the state. In 1965 extension of branch plants representing food products and fabricated metals plants located in Waterloo; electrical machinery and fabricated metals in Burlington; non-electrical machinery, food, printing and publishing and transportation in Des Moines; non-electrical machinery in Dubuque; chemicals in Fort Madison; and printing and publishing in Mason City (25).

A notable part of this expansion has occurred in the smaller communities rather than the metropolitan areas of the state. Of the 14 new major industries to locate in Iowa in 1965, 13 were dispersed throughout Iowa in the smaller
communities. Of the 52 expansions which occurred, only half were located in metropolitan areas like Des Moines. Of the 51 new branch plants only five located in major metropolitan cities in the state (25).

The causes of this phenomenon are not certain, but its implications are significant for the growth of industry and income in Iowa. One explanation for this trend which is becoming increasingly prevalent is that in general throughout the United States, there is occurring a decentralization of industry away from crowded urban centers into the more manageable rural areas of states. With increasing frequency, it seems metropolitan areas offer more difficulties than benefit of central location. Problems of crime, pollution, incessant strikes, transportation traumas and high operating costs seem increasingly evident to the metropolitan center. Studies show that turnover rates for personnel are four times as great in cities as they are in smaller communities. It was estimated that men working in a small town have a 17 percent better chance of surviving from age 65 to 85. Cost of living for a middle income individual is as much as 50 percent higher in New York City as in the South or Southwest areas of the United States (10).

These observations have a very definite implication for Iowa. Iowa is rural by tradition yet it contains or is relatively near markets for skilled labor inputs which can meet
the technical and labor needs of various industrial concerns. It provides central location to lucrative markets in Chicago, St. Louis, Kansas City, Omaha, and Minneapolis. Iowa offers excellent transportation facilities. It is bounded on two borders by water routes for low cost transportation. It has an adequate railroad system and two primary interstate highway systems leading to major market areas.

Some indication of what effect the increased growth in Iowa's share of total manufacturing might have on the state's economy may be previewed by examining past trends. For example, the rate of growth of wages and salaries in Iowa have fluctuated from 5.5 percent in the early 60's to a rate as high as 9.2 percent in the middle and later 60's (see Chart 5.2A (35). Wages and salaries from the manufacturing component of personal income have increased from 14.03 percent to 17.76 percent of total personal income for the state between 1954 and 1969 (see Table 5.1 (35)). Depending first on the general economic circumstances for the nation it is reasonable to expect that movements in wages and salaries from manufacturing over the next decade will continue to become a more significant figure for the state's level of personal income.

On considering the possibility of a rising level of wages and salaries in the state, note that the total level of wages and salaries is determined not only by wage and salary rates
Chart 5.2A Iowa personal income and personal income by sources per year from 1955 to 1970 (35)
Chart 5.2B Iowa personal income and personal income by sources per year from 1955 to 1970 (35)
Table 5.1 Farm income and manufacturing income in Iowa and the percentage share of total income for each from 1954 to 1970. (Millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Farm Income</th>
<th>Share of Total</th>
<th>Manufacturing Income</th>
<th>Share of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>1174</td>
<td>25.9</td>
<td>635</td>
<td>14.03</td>
</tr>
<tr>
<td>1955</td>
<td>686</td>
<td>15.7</td>
<td>700</td>
<td>16.28</td>
</tr>
<tr>
<td>1956</td>
<td>714</td>
<td>15.5</td>
<td>750</td>
<td>15.37</td>
</tr>
<tr>
<td>1957</td>
<td>1076</td>
<td>21.1</td>
<td>776</td>
<td>15.28</td>
</tr>
<tr>
<td>1958</td>
<td>1039</td>
<td>19.9</td>
<td>789</td>
<td>15.16</td>
</tr>
<tr>
<td>1959</td>
<td>795</td>
<td>14.9</td>
<td>912</td>
<td>17.20</td>
</tr>
<tr>
<td>1960</td>
<td>743</td>
<td>13.5</td>
<td>915</td>
<td>16.65</td>
</tr>
<tr>
<td>1961</td>
<td>866</td>
<td>15.0</td>
<td>919</td>
<td>16.00</td>
</tr>
<tr>
<td>1962</td>
<td>909</td>
<td>15.1</td>
<td>962</td>
<td>16.02</td>
</tr>
<tr>
<td>1963</td>
<td>937</td>
<td>14.7</td>
<td>1029</td>
<td>16.19</td>
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<tr>
<td>1964</td>
<td>825</td>
<td>12.4</td>
<td>1143</td>
<td>17.19</td>
</tr>
<tr>
<td>1965</td>
<td>1173</td>
<td>15.5</td>
<td>1233</td>
<td>16.29</td>
</tr>
<tr>
<td>1966</td>
<td>1330</td>
<td>15.9</td>
<td>1409</td>
<td>16.92</td>
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<td>1967</td>
<td>1020</td>
<td>11.9</td>
<td>1507</td>
<td>17.68</td>
</tr>
<tr>
<td>1968</td>
<td>1024</td>
<td>11.2</td>
<td>1630</td>
<td>17.86</td>
</tr>
<tr>
<td>1969</td>
<td>1270</td>
<td>12.8</td>
<td>1753</td>
<td>17.76</td>
</tr>
<tr>
<td>1970</td>
<td>1200</td>
<td>11.5</td>
<td>1807</td>
<td>17.33</td>
</tr>
</tbody>
</table>

Source: (34), (35)

but also by the number of persons receiving a wage or salary. Thus, if wage rates are rising at 5 percent per year, total wages may be rising by 6 percent reflecting a net increase of 1 percent in the number of persons employed or redeployed into higher paying jobs. For Iowa, related to its increasing growth in manufacturing will be the increase of personal income determined by higher wages and salaries and an increase in the number of people employed in the manufacturing industry. The exact rate will depend on how well Iowa does in fact develop its potential for manufacturing in the next decade.
Agriculture

There remains for Iowa a real concern for the influence of farm income on the total personal income figure for the state. On balance even during the 60's when the Iowa economy was considered to be expanding, with incomes rising by relatively significant amounts, farm income grew slowly or was constant (see Chart 5.2A (35)). Farm income as a percentage of total personal income in Iowa has also been declining in importance falling from a high of 25.5 percent of personal income in 1954 to a low of 11.5 percent in 1970 (see Table 5.1 (35)).

Movements in farm income do have an influence on personal income, but it is no longer itself sufficient to cause direct corresponding movement in personal income of a proportional magnitude. For example, the fall in farm income of 42 percent from 1154 million dollars in 1954 to 635 million dollars in 1955, corresponded to a drop in state personal income of 6 percent from 4575 million dollars to 4307 million dollars for the same period. However, the fall in farm income of 25 percent from 1313 million dollars in 1966 to 1083 million dollars in 1967 corresponded to an increase in state personal income of 2 percent, from 8327 million dollars to 8523 million dollars (see Chart 5.2A (35)). The point to be made is that in the latter instance even with a significant decline in farm income for the state, personal income
increased. This does not mean to imply that agriculture is of minor importance in the determination of income in the state. Even though income increased in 1967 while farm income declined, it did so by a much smaller amount than might have been expected. The increase in personal income for the previous year 1966 and the following year 1968 both revealed substantial increases of 8 and 6 percent respectively, corresponding to the fact that farm income also increased during these years by 9 and 3 percent, respectively.

As with manufacturing, total farm income is determined by the number of farms being operated as well as the income produced by each farm. During the period 1960-1969 the number of farming units declined 24 percent. This represents 4,200 less farms each year. Also during this period the size of farms, in acres, increased 29 percent. These structural changes are reflected in the fact that both income and expenses have more than doubled for the farmer. Net farm income in Iowa averaged 8331 dollars per farm in 1969, an increase of 115 percent above 1960 (15). Projections are that the number of farms in Iowa will continue to decline rapidly over the next decade, while individual farm income will increase. However, this decline in number should easily outpace any rise in income, making farm income increasingly less important as a direct determinant of personal income for the state.
Tertiary activities

The growth of income from other sources resembles closely that of the manufacturing components (see Chart 5.2A (35), 5.2B (35)). This is not surprising if one considers that retail trade, wholesale trade, and selective services, for example, generally develop as a result of industrial expansion in any economically defined area. This is supported in Iowa by the fact that, like manufacturing, much of the new retail and wholesale trade establishments, for instance, were situated in non-metropolitan areas. In 1963, of the new retail trade establishments set up throughout Iowa, less than 42 percent were in metropolitan areas (25). If this is any indication of future trends, it may be assumed that income from trade and selective services will indeed expand at rates dependent on and comparable to wages and salaries from manufacturing.

One exception to this is income from non-farm proprietorships. Past data demonstrates that this source of income has grown at rates often below that of total personal income. The fact is that much of the income from this source is dependent on the sale of farm-related items. For example, sales of farm implements and fertilizer are very definitely tied to previous levels of income to farms. As income from the farm section may fluctuate, so also may non-farm proprietors' incomes. However, like farm income, the effect of these
fluctuations is not of a sufficient magnitude to cause a corresponding downturn in the economy of the state.

Iowa Projections and National Income

In discussing projections of income for Iowa, it is useful and important to realize that state movements in income are tied to national economic circumstances.

In the United States, with its basic free market structure and mobility of factors of production, there should be a tendency for personal income to equalize between states and regions and to assume similar patterns of growth over time. If, for example, high prices exist for goods in one region as opposed to another, goods from the region in which prices are lower should tend to flow to the area in which prices are higher, placing downward pressure on prices in the latter area and upward pressure on prices for the former area. This will consequently have an equalizing effect on price levels in general. Theoretically, the only differential between the return to the selling parties would be the cost of shipping the goods from one market to another.

Similarly, there should be a tendency toward equalization of wages and interest rates due to the mobility of these factor inputs. For example, if demand for factors in Iowa increased to where it was greater than supply, the wages and income, which might have been below the rest of the nation,
must increase in order to retain what labor it has and further it must rise to draw labor input from other markets to meet its increasing demand.

There are, of course, numerous obstacles that prevent complete equalization of prices and wages and income throughout the United States. Cost of transfer, degree of specialization, capital mobility in real terms, education, and a host of other considerations may make impossible a sufficient transfer of factors and goods to insure price and income equalization. However, in general, conditions are such in the United States that they allow for the necessary mobility to establish a considerable degree of price and income equalization among states and regions. Iowa has, it seems, followed a pattern over the last twenty years which is in line with this theoretical base. Through the 50's and early 60's per capita income for Iowa rose at the rather slow but consistent average rate of 2.7 percent, while at the same time the level of per capita income was consistently below the national average (see Chart 5.3 (35)). However, after 1963 as a change in the economic structure of Iowa become increasingly apparent, per capita income rose sharply to an average rate of growth of 6.2 percent, approaching the national level of per capita income and even exceeding it in 1964.

Also, comparing variations of personal income in Iowa with those of the United States, it can be observed that Iowa
Chart 5.3 Per capita income per year for the United States and Iowa from 1955 to 1970 (35)
displays a pattern of movement in income over time which is quite similar to that of the United States (see Chart 5.1 (35)). Movements of income for the nation ranged between +7.8 percent and -5.95 percent as compared to Iowa where it ranged between +18.9 percent and -7.4 percent. Though the cyclical movements are similar, there are differences in degree of variation. These differences can be explained in part by the relative importance of agriculture in Iowa as compared to the rest of the nation. The agriculture sector does on occasion accent declines or increases in income for the state and also on occasion stifles increases in income.

The major implication is that the Iowa economy does assume a similarity in movement to the national economy over time. Since income does fluctuate in a cyclical pattern similar to national movements, state projections for income may be based on more detailed projections concerning national income provided by federal agencies.

A further note is that today social pressures demand that government pursue policies which will maintain a full employment rate of growth in the economy. By administration of the correct policy, the government may both minimize unwanted fluctuations in the economy and insure a desired secular trend of growth. For Iowa an immediate effect of such a policy should be to also guide it into a consistently stable and desired growth rate. If the federal government
continues to assume the role of economic supervisor, even in a limited sense, this will imply that the United States economy and the economy of Iowa as well might itself assume an ever more predictable path of income levels. The actual rate the path will take is uncertain since numerous factors will interplay to determine what the actual level will be. Even so, government efforts for stabilizing the economy should play a significant part in seeing that a stated growth rate is at least approached.

Alternative Methods to Estimating Income for Iowa

It remains to determine what value the income variable might assume for any given future year. Whatever method for determining income that might be chosen, the present state of knowledge makes inevitable the fact that such forecasts will be subject to some error. Data used in determining the income variable are often inaccurate. For example, stocks of capital and the degree of confidence in the economy cannot at present be precisely measured. Before any model is chosen, therefore, whether linked directly to national income or not, the alternatives available for selecting the appropriate estimates of income should be discussed.

Averaging or extrapolating income

Two methods often used for forecasting are to average income changes over time or to extrapolate a trend of past
data into the future. In the former instance it requires a simple procedure of adding some average of previous year's levels of income to the most recent year's level and thus derive an estimate.

To extrapolate an income trend one might use a time series regression to determine an optimum path through the known income values and then simply extend this path to determine estimates for years in which forecast data is required.

Methods such as these, in their simplest form, cannot directly account for or adjust for unexpected or unwanted cyclical variations around the trend or average. For reasonably accurate estimates, adjustments for such variations may be required and without some means to allow for future circumstances, the adjustments would in fact be arbitrary.

Sales or use tax receipts as indicators

For Iowa, with its comprehensive sales tax structure, one method for forecasting income might be to employ either the sales or use tax, or some component of one of them to be used as a leading indicator of how income should behave in the future.

However, when such a model was implemented, for instance, using a lagged motor use tax variable, the results were not accurate enough to use as a means to project levels of income for a period of over one year. For instance, though the $R^2$
coefficient accounted for better than 86 percent of the variation and the coefficients to the appropriate equation were determined to be significant at the 5 percent level, there was in fact a number of years when the estimate was as much as 15 percent in error. Also, the model on three separate occasions anticipated a significant decline of income when in fact, income rose. On another occasion, it predicted an increase of income when there was actually a fall of income in the state.

It is not difficult to understand why such a method is unsuited for the task of predicting income. Consumption is not dependent alone on current income, and it is also obvious that movements in income are not strictly determined by trends in consumption. Certainly income is far more dependent on the interrelationships of expectation concerning future levels of economic activity and investment levels than on current levels of consumption for its projected value for any given year. Certainly consumption habits cannot adequately anticipate movements in all related variables.

Even if a method such as this were adequate for a one-year estimate, it falls far short of the needed three- to four-year estimate required for forecasting revenues to be received by the state for a period as long as a biennium.

To digress from the topic of three- to four-year estimates, it might be suggested that a model similar to the one
discussed here, using instead quarterly sales or use tax data, might indeed give a quick reliable estimate for the level of income to the state for the current year. That is, an estimate for income in Iowa during 1971 could be obtained as early as December of 1971. If, in fact, the relationship of current spending to state income is a relatively constant proportion over time, then income should be able to be estimated from tax reports for the current year. For example, on December 31, 1971, sales and use tax receipts are released by the state for the third quarter of 1971. If then the fourth quarter receipts are estimated with the appropriate seasonal adjustments made, and knowing taxable sales to be approximately 70 percent of personal income for the state, a reliable income estimate can be determined as much as eight months prior to most estimates provided by national agencies.

**Personal income determined by sector**

A method that might be used to forecast income, though no empirical work is done, would be to estimate the level of income or aggregate output in Iowa by sector.

This would be formulated into an econometric model or system of equations from which total output is determined and from which state personal income can be derived. The model might be designed such that all variables are endogeneous to the system. That is, a model where, for instance, present
levels of investment are dependent on past levels plus levels of consumption; or, farm income is determined by past income plus trends in state exports of farm commodities. From such a model an aggregate state output or income figure might be determined by solving simultaneously the set of equations or model. From this estimate a state personal income figure may be determined without having to assume directly that some exogenous variable is given or without having to simply extrapolate past trends in income with no account taken of how changes in particular sectors of the state's economic structure might effect the income variable.

However, this particular procedure is appropriate more for national income estimates where specified variables and interrelationships between variables can be more easily approximated than could be for state estimates. Though general movements in economic activity over time are similar for Iowa and the nation, the interrelationships between state economic variables and the rest of the nation are difficult to define. For example, it is no simple matter to determine how much the level of investment in Iowa is determined by past investment in Iowa itself and how much is determined by present and past levels for the nation as a whole.

Though such a model if it could be designed would be of significant value in determining accurately future levels of income for the state, constructing such a model is a complete
study in itself and is not feasible to design in a study of this nature.

Income Model For This Study

There are on occasion independent detailed econometric studies conducted at the state level which attempt to derive reliable income forecasts. If one obtains such an estimate, and it is employed as the independent variable in each of the tax models, it is reasonable to conclude that these results are the best available at that time.

However, for Iowa there have been no recent forecast models developed to determine levels of income in the state. As a result, it is necessary to use an extrapolative procedure described in the preceding section for estimating income. Extrapolating past trends of income into the future while anticipating changes in the trend by relying on national forecasts of income, it is possible to determine future estimates of Iowa personal income. This implies a model of the following type:

\[ Y = a + t^c \]

(5.1)

where

\( Y \) = personal income
\( t \) = time
\( a \) = intercept coefficient
\( c \) = exponent measuring percentage change of income
In developing the appropriate equation for the model, specific alternative structures were analyzed in an effort to account for cyclical variation from trend in the income variable. Trigonometric and cubic functions were estimated but they did not adequately anticipate when changes would occur. Often times these forms of the equation estimated changes of income in the wrong direction to what actually occurred.

Finally, a log linear model was estimated in which a dummy variable was introduced to allow for shifts in the function caused by changing patterns of cyclical variations (see Chart 5.4 (35)). The results of this analysis using Iowa data rendered an $R^2$ term of .9439. Each coefficient was determined to be significantly different from zero at the 5 percent level and each dummy variable representing a change of direction for the trend was also significant at the 5 percent level.

The observations noted concerning the similarity of movements in state and national income is important to this particular model. Without it, the results from the model would have less significance for future estimates since it is unable on its own to predict directly where turns in trends might occur. With the observed similarity of movement in income for the nation and the state of Iowa, then predictions of turns in the economy made for the nation may be anticipated in the state estimate as well, either as a
Chart 5.4 Estimated personal income for Iowa determined from log linear regression analysis with actual income for comparison for years 1949 to 1969 (35)
percentage decline or increase from predicted trend.

Based on these considerations the value of the income variable used throughout this study was determined by the following equation:

\[ Y = 3.537 + 3.498D_1 + 3.548D_2 + 0.0205 \]  
\[ (.0070) (.0150) (.0151) (.0012) \]  

where

- \( Y \) = personal income
- \( t \) = time
- \( D_1 \) = dummy variable estimating average deviation from trend for 1955-1964
- \( D_2 \) = dummy variable estimating average deviation from trend for 1965-1969

and where estimates for future years assumed the coefficient \( D_2 \) as the appropriate intercept coefficient.

There is, of course, no way to be certain of how valid this equation will in fact be in the future, but certainly knowing more of the expected movements for national income in general gives an improved basis for accepting the result obtained from the model.

Estimates for personal income for years 1970-1973 are consistent with past trends of income (see Table 5.2 and Chart 5.5 (35)). Indications are that the growth of income in Iowa should continue to increase at a rate much less than the 8 or 9 percent experienced in 1967-1969. The growth rate of nearly 5 percent is more closely aligned with the observation that government will implement and regulated stated
Chart 5.5 Personal income for Iowa from 1954 to 1969 with estimates given through 1973 (35)
Table 5.2 Estimated personal income and percent change of income assumed by extrapolation of past growth trends from 1948 to 1969. (millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>9986</td>
<td>-</td>
</tr>
<tr>
<td>1971</td>
<td>10450</td>
<td>4.6</td>
</tr>
<tr>
<td>1972</td>
<td>10950</td>
<td>4.7</td>
</tr>
<tr>
<td>1973</td>
<td>11500</td>
<td>4.8</td>
</tr>
</tbody>
</table>

policy to achieve this rate of growth.

As the discussion has indicated, difficulties in obtaining reliable income variables are indeed extensive. No one particular method or model can in any complete sense look into the future and forecast what income will be. There are far too many uncertain and unaccountable factors with which to deal. The best that can be done is to look at the available data and make the best judgment possible.
CHAPTER VI. SUMMARY AND CONCLUSIONS

Final Observations and Implications

The purpose of this study has been to examine and explain the trends in selected sources of revenue received by the state and to develop models and procedures for estimating future revenues from these sources. It has been the primary hypothesis throughout this study that personal income and the tax rate are the dominant variables in determining revenue from most state tax sources. This hypothesis was examined for three types of revenue and except for revenues from the taxation of cigarettes, income was found to play a highly significant role in the determination of revenue. Thus, if personal income is known and the appropriate tax rates are assumed, revenue for future years can be anticipated within 3 percent with up to 95 percent confidence in the estimate.

With respect to estimating income, however, there exists many influences or determinants of its level. It is, therefore, unreasonable to formulate single valued expectations. As attempted in Chapter V, it is possible to determine "most likely" estimates of income, but there is just no way to be certain of what the level of personal income should be for each year an estimate is required.

If past trends in Iowa continue and if government intervention to stabilize and direct the economy is reasonably
successful, the most likely rate of growth of Iowa personal
income is about 5 percent. But there is no guarantee that
income will grow at exactly this explicit rate. It is nearly
as likely that income will grow at 4 or 6 percent. If, for
example, the government was unable to contain inflationary
pressures completely, the level of personal income in ab-
solute terms could rise at an average rate of about 5 per-
cent, perhaps 6 percent. If government price and credit
constraints become too severe, economic activity could slow,
unemployment rise and the level of growth of income could
actually be less than 5 percent, perhaps 4 percent. Though
any rate of growth in income is possible, a 5 percent rate is
more likely. Also, as the range of deviation from the esti-
mate of 5 percent widens, the probability of having rates of
about 3 or 7 percent falls. The federal government's policy
commitment to price stability and full employment should lim-
it the observed rates to values of nearly 5 percent which is
the established trend. For instance, it is fairly certain
that the government would not passively allow a situation of
hyper-inflation or deflation to develop in the economy.

If Iowa continues to develop in the future as it has in
the past, then its rate of growth of personal income should
also move at rates comparable to those for the nation as a
whole. Thus, the comments made above pertaining to the po-
tential growth of personal income are valid for Iowa as well
as for the entire nation.

Because of the uncertainty of the income variable, the models developed in this study were used to estimate alternative revenues to be received by the state assuming different values for the income variable for years 1970-1973 (see Tables 6.1, 6.2, 6.3, and 6.4). The first series of

Table 6.1 Estimated state revenue for Iowa for 1970-1973
based on estimated personal income assumed by extrapolation of past growth trends from 1948 to 1969. (millions of dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Income</td>
<td>9966</td>
<td>10450</td>
<td>10950</td>
<td>11500</td>
</tr>
<tr>
<td>Income Tax</td>
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<td>Sales and Use Tax</td>
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<td>Beer Tax</td>
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<td>6.91</td>
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<td>7.75</td>
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<td>30.25</td>
<td>36.19</td>
<td>37.88</td>
<td>36.58</td>
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<td>394.74</td>
<td>435.35</td>
<td>460.01</td>
<td>481.21</td>
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Table 6.2 Estimated state revenue for Iowa for 1970-1973
based on estimated personal income assuming a 4 percent growth per year after 1969. (millions of dollars)

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<td>156.09</td>
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<td>Sales and Use Tax</td>
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<td>239.63</td>
<td>249.48</td>
<td>259.25</td>
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<td>37.88</td>
<td>36.58</td>
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<td>Total</td>
<td>403.72</td>
<td>445.42</td>
<td>467.04</td>
<td>485.83</td>
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Table 6.3 Estimated state revenue for Iowa for 1970-1973 based on estimated personal income assuming a 5 percent growth per year after 1969. (millions of dollars)

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<td>143.12</td>
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<td>24.64</td>
<td>25.85</td>
<td>27.12</td>
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<td>7.12</td>
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<td>Total</td>
<td>406.90</td>
<td>453.20</td>
<td>480.09</td>
<td>503.82</td>
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Table 6.4 Estimated state revenue for Iowa for 1970-1973 based on estimated personal income assuming a 6 percent growth per year after 1969. (millions of dollars)

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<td>Sales and Use Tax</td>
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<td>244.60</td>
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<td>273.57</td>
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<td>Liquor Profit and Tax</td>
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<td>Beer Tax</td>
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<td>7.95</td>
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<tr>
<td>Cigarette Tax</td>
<td>30.24</td>
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<td>36.58</td>
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<tr>
<td>Total</td>
<td>409.99</td>
<td>460.93</td>
<td>493.39</td>
<td>524.46</td>
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</table>

of estimates used income determined from equation 5.1 of Chapter V. The remaining series of estimates used values of income assuming growth rates of 4, 5 and 6 percent after 1969. As an example of the possible divergence of estimates when they are dependent on alternative levels of income, note that for 1970 differences in total revenue from all sources range
between 394.56 million dollars for the lowest income figure (Table 6.1) to 409.82 million dollars for the highest income figure (Table 6.4), a difference of about 3.8 percent.

The primary cause of the differences in revenue is the influence the different levels of personal income have on the personal income tax and sales tax revenues. These two sources of revenue provide the state government with greater than 70 percent of its non-property tax revenues. In fact, of the 3.9 percentage difference in revenues in the example above, 3.6 percent were directly attributable to the differences in revenues received from sales and income taxes. The remaining .3 percent was attributable to alcoholic beverages including beer. Of course, none is dependent on revenues from cigarettes since personal income was not considered a dominant variable in determining demand for cigarettes.

Finally, it should be realized that the importance of the income and sales taxes is not only because of their elasticity with respect to income, which is close to one, but also because of the volume of dollars and breadth of coverage involved with collection of the taxes. The income and sales taxes are universal taxes, not taxes confined to only those individuals who choose to consume a specific product. The sales tax effects over 70 percent of income earned in Iowa. For the income tax, this coverage applies to adjusted gross income which is over 70 percent of personal income in Iowa.
As stated then, perhaps to the point of monotony, it is not possible to forecast income three or four years into the future with certainty. In Chapters II through IV, estimates of revenues were given for levels of income determined by an extrapolative procedure. In this concluding section, the uncertainty of revenue forecasting has been more explicitly recognized and alternative income and revenue estimates have been anticipated and presented in Tables 6.1, 6.2, 6.3 and 6.4.

The estimates in each case represent what might be expected if income grew at any one of the various rates. The alternatives as presented, therefore, give the policy maker representable figures on which to base his decision and, further, various alternatives from which contingency plans may be designed. At the moment, this is the best that can be done and should be used as a step forward toward becoming more completely able to specifically estimate revenues for the state government.

Sources of Revenue Not Considered in Study

The income tax, sales and use tax, and other selective sales taxes and revenue sources discussed in this study contributed over 70 percent of revenue in the Iowa General Fund. Nevertheless, other taxes of significant magnitude were omitted and should be noted. They include, for example, the
corporation income tax, insurance premium tax, inheritance tax, and the motor fuel tax. Revenue from these sources, excluding the motor fuel tax, contributed 11.5 percent of total revenue collected by the state in 1970. By itself, motor fuel taxes amount to about 25 percent of state total revenues.

The majority of these sources have not been discussed primarily because they do not fit easily the basic relationship to income that has been hypothesized throughout the text of this work. For example, if one were to attempt to design a revenue-estimating technique for the corporation income tax, one would discover that an essential requirement for doing so would be to develop some method of projecting the distribution of the sales of corporations to be taxed between sales made within the state and those made outside its boundaries. Further, it would be necessary to examine the structure of the various corporations in Iowa and their respective growth in terms of future returns. Neither of these two aspects for establishing some means of estimating revenue from this source is of a simple nature and to date no approach has been adequately designed to cope with these problems.

The other taxes mentioned, though not as difficult as the corporation tax to deal with, are not required as further evidence of the usefulness of the approach to revenue
estimation set forth here. Omitted, they restrict the study from detailing a total revenue estimate to the state, but this does not inhibit the study from its purpose of demonstrating that with further research such a procedure might be detailed and estimates derived for all sources of revenue to the state.

Value of the Analysis

Judgments concerning whether revenues will meet future expenditure requirements for the state must be made on estimates from models exemplified by those listed in Tables 6.1, 6.2, 6.3 and 6.4. Because of the uncertainty of the income variable and the limits to the confidence bands for the models themselves, errors may indeed result. The fact is that in dealing with models of this type, it has often been observed that difficulties with actually determining accurate forecasts are sufficient to make one wonder that any such method is useful at all. Only a few econometric models have been used for forecasting purposes over any extended period (6). Problems in anticipating base changes in the tax structure or changes in the structure of demand for various goods make difficult the task of constructing meaningful econometric models. Also, judgment concerning the degree of aggregation or disaggregation regarding any such model is difficult to determine. If in determining the income variable, a model is developed using each sector of the Iowa economy, one could
disaggregate these sectors down to the manufacturing industry level. However, this very fine disaggregation poses problems where, for instance, a systematic influence which affects the behavior of all firms may be of considerable importance in the aggregate, yet the individual firm may be so swamped by other factors that it cannot be detected.

In spite of these difficulties, the fact is that in general, such methods are better than simple naive forecast or departmental averaging alone. Naive forecasting methods are by definition nearly incapable of being improved, whereas, econometric models can and are being improved for better and more detailed analysis. It is, therefore, with this final note that it may be said that the estimates and techniques presented in this study are of considerable value in determining useful data on which policy and budget decisions for the state government may be based.
BIBLIOGRAPHY


Table 7.1 Iowa income tax and related figures for 1958 to 1970.\textsuperscript{a}

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Income</th>
<th>Adjusted Gross Income</th>
<th>Fed. Ded.</th>
<th>State Ded.</th>
<th>Effective Rate</th>
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\textsuperscript{a} Source: (17), (20)

\textsuperscript{b} Not available
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Source: (16), (19)
Table 7.3 Cigarette consumption and cigarette tax revenue for Iowa from 1954 to 1969.\textsuperscript{a}

<table>
<thead>
<tr>
<th>Year</th>
<th>Cigarette Sales (millions of packs)</th>
<th>Per Capita Sales (units of packs)</th>
<th>Revenue (thousands of dollars)</th>
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\textsuperscript{a} Source: (8)
Table 7.4 Liquor sales, net income and tax receipts from operations of the Iowa liquor commission for fiscal years 1955 to 1971. *(millions of dollars)*

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<th>Fiscal Year</th>
<th>Liquor Sales</th>
<th>Net Income</th>
<th>Tax Receipts</th>
<th>Total Revenue</th>
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*Source: (18)*
Table 7.5  Beer consumption and beer tax revenue for Iowa for 1954 to 1969. a

<table>
<thead>
<tr>
<th>Year</th>
<th>Beer Sales (thousands of gallons)</th>
<th>Per Capita Sales (units of gallons)</th>
<th>Revenue (millions of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>38250</td>
<td>14.19</td>
<td>3.060</td>
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<tr>
<td>1955</td>
<td>39200</td>
<td>14.06</td>
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<td>1956</td>
<td>38600</td>
<td>14.21</td>
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<td>1957</td>
<td>37690</td>
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<td>38390</td>
<td>14.57</td>
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<td>39580</td>
<td>14.64</td>
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<td>1960</td>
<td>40153</td>
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<td>1961</td>
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<td>1962</td>
<td>40278</td>
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<td>3.222</td>
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<td>42512</td>
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<td>46683</td>
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<td>1970</td>
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</table>

a  Source: (31)