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An empirical analysis of sales tax shifting

Ernest Mantz Hutchinson
The University of Montana

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AN EMPIRICAL ANALYSIS OF
SALES TAX SHIFTING

by

Ernest Mantz Hutchinson
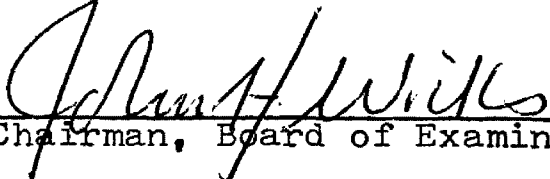
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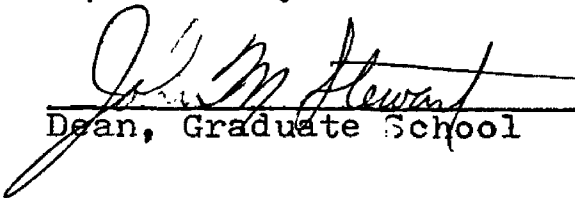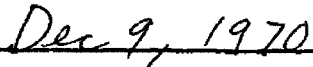
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CHAPTER I

INTRODUCTION

Tax incidence has been a major topic of discussion among political economists since Adam Smith developed his canons of taxation. The subject of retail sales tax shifting in the form of commodity price increases and the effect of those increases on tax incidence have been areas of controversy among economic theorists for the past four decades.

Although the traditional conclusion, that the incidence of retail sales taxation rests on consumers, is still widely accepted as the basis for policy formation, it has been challenged on theoretical grounds since the 1930's. Empirical investigation of price changes resulting from tax shifting has been infrequently attempted. Even the few attempts that have been made were limited to one, or at most several, geographic regions. In addition, the methodology used in these studies was inadequate in dealing with the difficult problem of isolating the effect of sales tax rate changes on commodity prices.

In this study a cross-section analysis of the effect of state and local sales tax changes, both newly imposed

and increased taxes, on the price levels of two commodity groups in a number of cities throughout the nation is developed. Bureau of Labor statistics data for consumer price indexes of home furnishings and apparel from 1935 to 1970 are used. The model constructed herein attempts to isolate the effect of tax changes on retail prices by subtracting out the effect of national changes in demand and supply conditions and the effect of federal monetary policy.

The study hypothesizes that state and local sales tax increases are forward shifted to the consumer in the form of price increases equal to the amount of the sales tax increase. Acceptance of the hypothesis would greatly simplify economic analysis concerning the incidence, revenue raising power, and economic effects of state and local sales taxes. Rejection of the hypothesis has implications for both economic theory and fiscal policy. The assumption of forward shifting through commodity price increases commonly used when estimating burden distribution and tax revenues would no longer be a valid one if the hypothesis were rejected.

CHAPTER II

THEORETICAL DEVELOPMENT AND
EMPIRICAL INVESTIGATION

This chapter will not attempt a complete survey of the theory concerning sales tax shifting and incidence. The area is too broad, and scant purpose would be served in an attempt to cover it all. Instead, the theory which pertains to the validity of the full forward shifting assumption will be developed. Initial justification for this assumption is found in the partial equilibrium analysis of selective excise taxes. General equilibrium analysis of a general tax refutes the conclusions developed through the use of partial equilibrium analysis when applied to general taxes. Examples showing the manner in which the full shifting assumption has been used apply for the most part to limited state sales taxes which function in open economies. Before developing the theory pertaining to limited sales taxes in open economies, it is essential that a simplified model of sales tax shifting with rigid assumptions be developed. After this model has been constructed, the rigid assumptions will be relaxed in order to better approximate the real world of limited sales taxes operating in open economies.

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The traditional conclusion concerning sales tax inci-
dence has been that consumers bear the full burden of the
tax. Although the impact of the tax is on the retailer,
the burden is supposedly shifted to the consumer in the
form of price increase equal to the amount of the tax.
Behind this conclusion lie implicit assumptions of an
expansionary monetary policy and a legal requirement that
the tax be stated separately from the price of each pur-
chase.

Typically, economists have employed partial equilibrium
analysis of selective excise taxes and expanded the conclu-
sions to include more general taxes.

FIGURE 1

PARTIAL EQUILIBRIUM ANALYSIS
OF EXCISE TAX SHIFTING
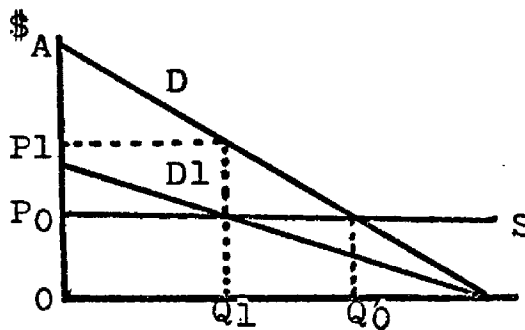
Figure 1 depicts the partial equilibrium analysis used to conclude that the consumer bears the burden of sales taxes in the form of higher prices. The tax is viewed as reducing demand from D to D_1 where $P_1 A/OA$ is the percentage rate of the tax. Price increases from P_0 to P_1 while the quantity supplied falls from Q_0 to Q_1. The price increase, $P_1 - P_0$, is equal to the amount of the sales tax. The naive conclusion follows that a general sales tax is no more than a system of selective taxes, all of which are passed on to the consumer in the form of higher prices. In the partial equilibrium analysis of a selective excise tax, price increases occur because there is a reduction in the output of taxed items. The factors released by the output reduction find employment in other industries at a wage equal to that earned previously in the taxed industry.

General equilibrium analysis of a general sales tax does not support the conclusion that general taxes are merely a system of partial excises. If a tax is general, there will be no untaxed industries into which factors can move. If the factors wish to remain employed, they must accept wage reductions equal to the amount of the tax, unless there is an increase in the money supply. With no money increase there will be no output reductions, no price increases, and factor owners will bear the tax. With an increase in the money supply, demand curves for all goods

tend to shift to the right (contrary to the ceteris paribus assumption of partial equilibrium analysis) and prices will increase.

State retail sales tax laws, for the most part, have legal provisions designed to shift the burden of the tax to the consumer. The retail sales tax is an indirect tax whose initial impact falls on the retailer. Legislative intent that the final incidence of the tax should rest with the purchaser of taxed commodities is demonstrated by the typical legal requirement that the tax be stated separately from the purchase price of the commodity. Legislators commonly make the assumption that the tax burden can and will be fully shifted to the purchaser of the taxed commodity.

Economic advisers and investigators have also made use of the full shifting assumption.[1] State tax studies, upon

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[1]Examples of economic studies which make use of the full shifting assumption include: "Allocation of Tax Burden by Income Class," Project Note No. 45, Tax Foundation, Inc., 30 Rockefeller Plaza, New York 20, New York, p. 4. "Sales taxes fall on the consumer who purchases the goods and services subject to tax." The study uses the distribution of consumption expenditures as the basis for distributing the tax burden. Eugene T. Halas, et al., Financing Government In Colorado, 1959, p. 182. "In the case of the sales tax it is generally assumed that the bulk of the burden falls on the consumer of the finished product or service." William H. Hickman, William K. Schmelzle, Donald R. Travis, "General Fund Consumption Taxes, Part 2," Report of the Senate Fact Finding Committee On Revenue And Taxation, January, 1965, p. 14. "One alternative, which immediately presents itself, is to increase the basic rate from 3 per cent to rates of

which tax policies are occasionally based, generally employ this assumption when attempting to determine the burden distribution resulting from new sales tax legislation or a change in existing sales tax laws. Although factors which may prevent full forward shifting are occasionally noted, the burden analysis in these state tax investigations generally ignores the exceptions and makes use of the full shifting assumption.

State tax investigators also make use of the full shifting assumption when predicting the revenue raising power of the tax. The predictions are usually made by multiplying the amount of each taxed item sold before the tax is imposed by the before-tax price of each item. The sales tax rate is applied to the product and the result is the revenue the tax is predicted to raise. If either the quantity of the taxed items sold decreases because of the

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$3\frac{1}{2}$ of 4 per cent were adopted, sufficient accuracy in predicting revenue is achieved by assuming the resulting increase in price of goods to the final consumer would not reduce the physical volume of purchases which would have been made in the absence of such a sales tax increase." On page 15 of this study, "Over time, after price adjustments it is believed that the entire tax would be shifted forward to the final consumer." Clinton V. Oster, State Retail Sales Taxation, Bureau of Business Research, College of Commerce and Administration, The Ohio State University, Columbus, Ohio, 1957, pp. 61-62. "Despite many qualifications, the consensus of most theorists is that sales taxes are generally shifted to the consumer."

tax caused price increase or the price net of tax declines after the tax is imposed, the revenue predictions will be overstated.

Empirical investigators making contributions to the literature concerning the vertical burden distribution of retail sales taxes have also accepted the assumption of full forward shifting. David G. Davies in attempting to determine the degree of regressivity of sales taxation makes the statement, "I shall assume that the entire tax is passed forward to the consumer and shall calculate the amount of tax collected on the basis of this assumption."[1]

Theoretical justification for the assumption of full forward shifting has been provided by John F. Due.[2] The opposing theory, that sales taxes are back shifted to factor owners rather than forward shifted to consumers received its main impetus from the work of H. G. Brown.[3]

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[1]David G. Davies, "An Empirical Test of Sales Tax Regressivity," Journal of Political Economy, (LXVII, Frebruary, 1959), pp. 72-78.

[2]John F. Due, "Sales Taxation and the Consumer," American Economic Review, (LIII, December, 1963), pp. 1078-1084; The Theory of Incidence of Sales Taxation, (New York: King's Crown Press, 1942); Government Finance, (Homewood, Ill.: Richard D. Irwin, Inc.), 1963.

[3]H. G. Brown, "The Incidence of a General Output or a General Sales Tax," Journal of Political Economy, (XLVII, April, 1939), pp. 254-262.

More recently Earl Rolph has made important contributions to theory supporting the backward shifting argument.[1]

The absence of a common definition of tax incidence has been a major source of conflict between those who advocate full forward shifting and those who envision the burden as falling on factor owners. Much of this conflict has arisen because tax burden is not confined to the collection of the tax itself. Although the burden caused by revenue collection is a real one to those members of society who must forfeit part of their incomes, or savings, this burden is of a redistributional nature. The expenditure of the tax revenue also imposes a burden on society. Society as a whole must give up some of the resources it commands in order to receive the services provided by government, provided the economy is operating under full employment. The burden connected with the expenditure of tax revenues is a feature of all tax systems, including the sales tax, unless the revenues obtained by government are not spent.

Richard Musgrave developed the concept of differential incidence in an attempt to separate the burden arising from the collection of a tax from that involved when government spends tax revenue.[2] This method of burden analysis

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[1]E. R. Rolph, "A Proposed Revision Of Excise Tax Theory," Journal of Political Economy, (LV, April, 1952), pp. 102-117; The Theory of Fiscal Economics, (Berkeley: University of California Press, 1954); G. F. Break, Public Finance, (New York: Ronald Press Co., 1961).

[2]R. A. Musgrave, Theory of Public Finance, (New York: McGraw-Hill Book Co., Inc., 1959), p. 212.

compares the incidence of two or more forms of taxation
which provide the same amount of revenue to be spent for
exactly the same real amount and combination of goods and
services. By maintaining the same real burden distribution
arising from the expenditure of tax revenues, the differen-
tial incidence approach permits the analysis to focus on the
varying patterns of burden distribution which are a conse-
quence of different tax collection systems.

In a simple two sector, one factor, all consumption,
competitive economy, differential incidence analysis of an
income tax and a general sales tax demonstrates that the
burden distribution is identical for both types of taxation.
The single productive factor in the economy, labor, is fully
employed under both systems of taxation. Purchases by firms
and by government are for resources only and expenditures
are not made by them for private products.

In the three situations used as examples--an income
tax, a sales tax with a stable money supply, and a sales
tax with an expansionary monetary policy--the government
collects just enough revenue to command ten per cent of the
economy's resources. The opportunity cost of the labor
employed by the government is the real burden to society
since this resource could have been used to produce goods
in the private sector.

If aggregate before-tax income is $100 and government requires one-tenth of the economy's resources, a 10 per cent income tax withheld at the source would provide $10 in revenue. As shown in Figure 2 after-tax income would be divided $81 for private employees and $9 for government employees. The $90 of after-tax income is paid to the firms for the products they produce. The firms in turn pay their employees $81 and withhold $9 for income tax. The $9 collected income tax is paid by the government to its employees. In the income tax situation, the government uses 10 per cent of the economy's resources and the firms use 90 per cent. Private employees obtain 90 per cent of the private goods produced and pay 90 per cent of the taxes. Government employees command 10 per cent of the private goods and pay 10 per cent of the taxes. The total transactions demand for money is $189 with a source withheld income tax.

If the government replaced the income tax with an ad valorem sales tax, the impact of the tax changes from the source of each individual's income to the object of his expenditures. The amount received by the firms in the form of product payments must differ from the amount they pay out as factor wages by the amount of the tax. This difference between product payments and factor wages may bring about either reductions in the factor wages or increases in the product prices.

SIMPLE ECONOMY

Government ——— factor wages $9 ———→ Government Employees

income taxes withheld $9   product payments $9

Private Employees ←—— factor wages $81 ——— Firms
                   ——— product payments $81 ——→
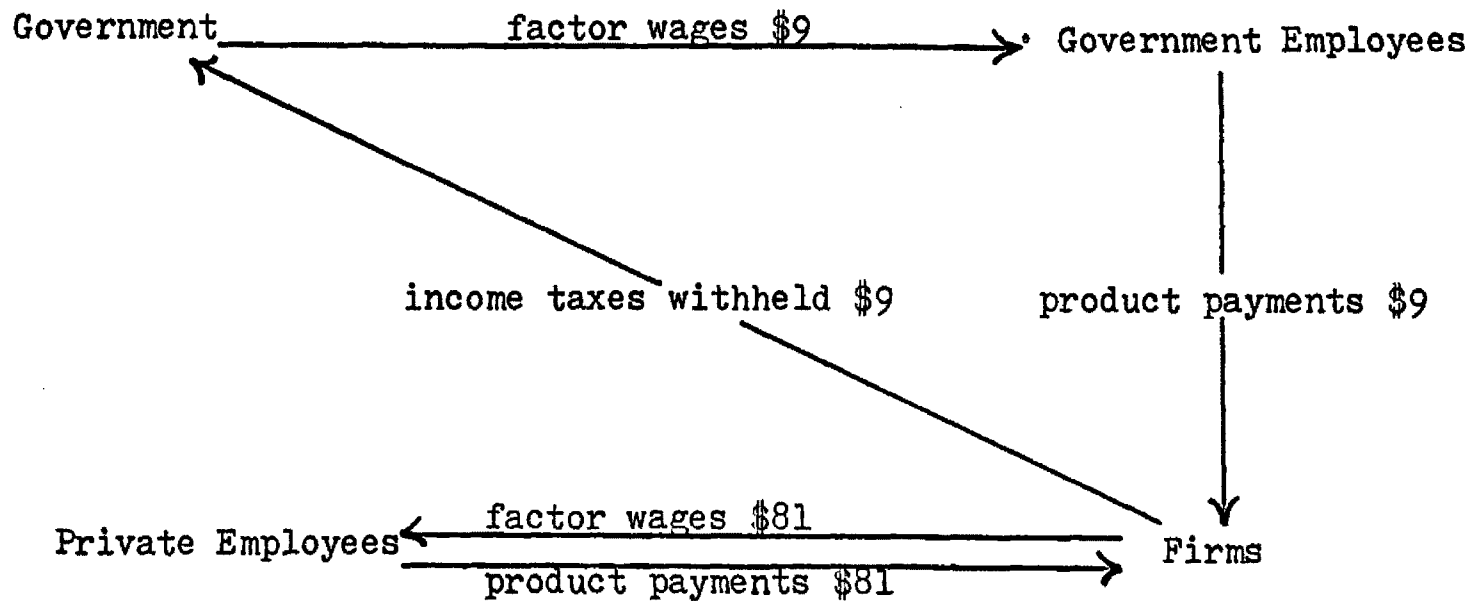
TRANSACTIONS DEMAND FOR MONEY: income taxes withheld from
                                 private employees———————————— $9

                                 factor wages
                                   private   81
                                   public   9

                                 product payments
                                   private   81
                                   public   9

                                 total demand $189

FIGURE 2

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Given a stable monetary policy, factor wages would be
forced down by the amount of the tax, as shown in Figure 3.
Product payments by individuals to firms must include the
amount of the tax and firms must pay the tax to the govern-
ment. If the money supply is not expanded and the velocity
of money does not increase, then commodity prices cannot
rise. In this event factor wages must fall by the amount
of the tax so that transactions demand will remain the same
as under an income tax. Product payments by both private and
public employees remain the same as under an income tax
system, $90. Since government now takes ten per cent of the
purchase price of each commodity, firms receive only $81 with
which to pay their factor costs. Government reduces the
before-tax wage paid to its employees. Aggregate factor
wages before-tax are reduced to $90. In real terms, however,
the division of resources between government and the firms
and the division of products between private and public em-
ployees remains the same as under the income tax. The rela-
tive tax burden for public and private employees also remains
the same.

If an increase in the money supply is permitted,
factor wages may remain constant. In Figure 4, an increase
in the money supply causes an increase in product prices and
stable factor wages. Product payments increase from $90
under the income tax to $100. The transactions demand is

SIMPLE ECONOMY
GENERAL SALES TAX
REDUCED FACTOR WAGES

Government ⎯⎯⎯⎯⎯ factor wages $9 ⎯⎯⎯⎯⎯⟶ Government Employees

sales tax revenue $9   product payments $9

Private Employees ⎯⎯ product payments $81 ⎯⟶ Firms
                  ⟵⎯⎯ factor wages $81 ⎯⎯

TRANSACTIONS DEMAND FOR MONEY: sales tax revenue
                                collected by firms⎯⎯⎯⎯⎯⎯ $9

                                factor wages
                                  private   81
                                  public   9
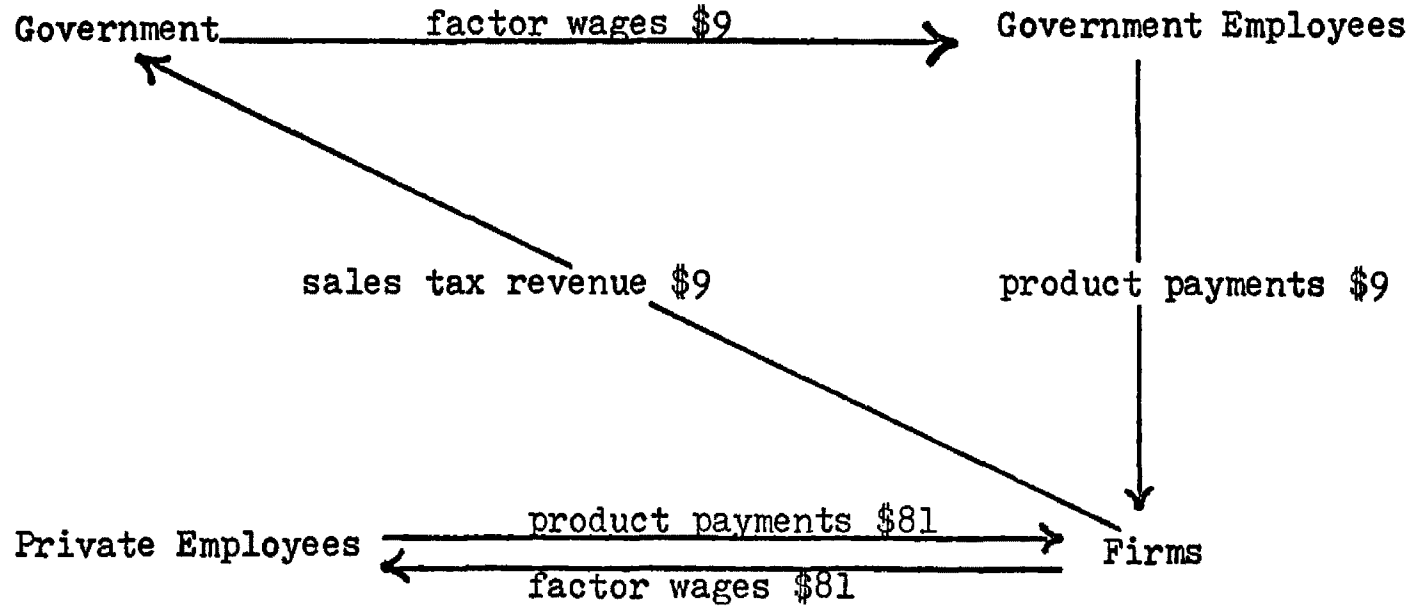
                                product payments
                                  private   81
                                  public   _9_

                                total $189

FIGURE 3

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SIMPLE ECONOMY
GENERAL SALES TAX
INCREASE COMMODITY PRICES

Government ———————— factor wages $10 ——————→ Government Employees

sales tax revenue $10   product payments $10

Private Employees ⇄ product payments $90 / factor wages $90 Firms

TRANSACTIONS DEMAND FOR MONEY: sales tax revenue
                                 collected by firms———— $10

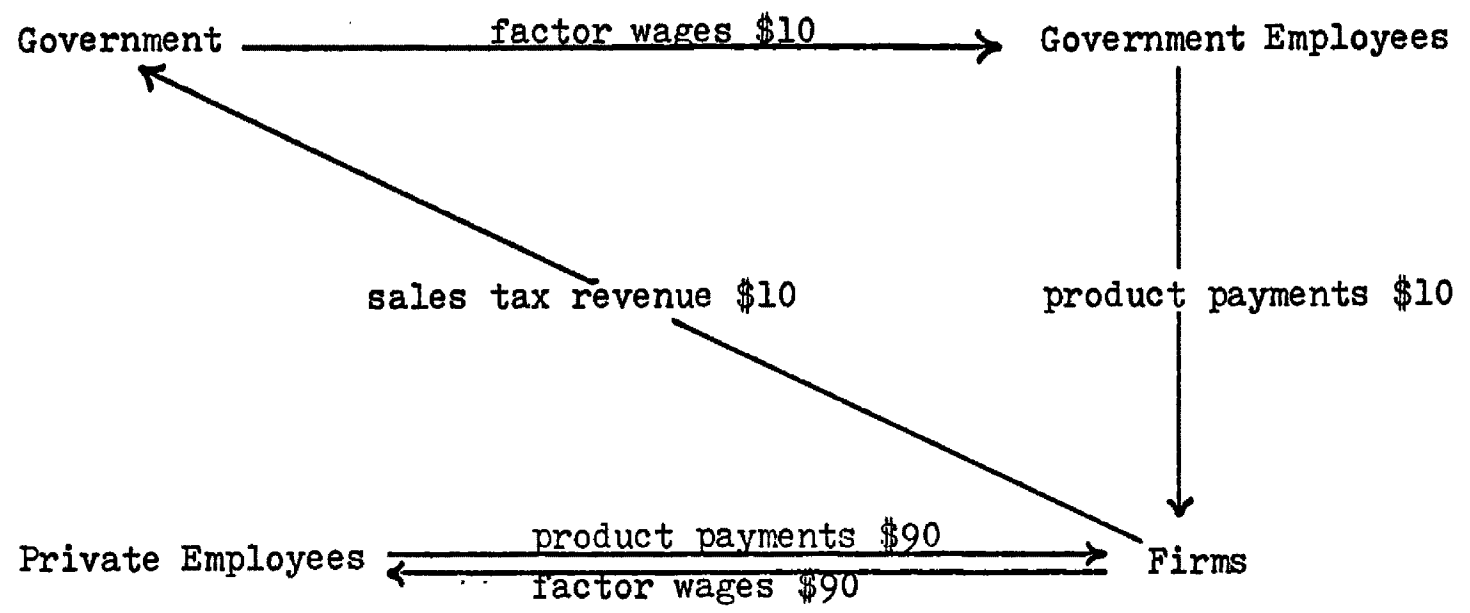   factor wages
                                   private   90
                                   public   10

                                 product payments
                                   private   90
                                   public   <u>10</u>

                                 total $210

FIGURE 4

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now $210 and is supported by the increased money supply.
Government and firms maintain the same division of re-
sources and private and public employees share both
products and tax burdens in the same proportion.

With this highly simplified model of the economy,
burden distributions are identical under both an income
tax and a sales tax. When a sales tax system is used, the
difference between product payments and factor wages can
bring about either reduced factor incomes or higher product
prices, depending on the monetary policy pursued. If pro-
duct prices increase, tax burden is determined by consumption
expenditures. If factor wages are reduced, the burden is
allocated according to income. In this simple model the
question of forward or backward shifting is immaterial
because individuals cannot avoid the tax by changing either
their sector of employment or their expenditure patterns.

The use of more complex models of the economy and
taxes which are less general in their coverage will have a
significant effect on the pattern of sales tax burden dis-
tribution. When a change is made from an income tax to a
general sales tax, wage rigidity in one of the sectors may
disrupt the pattern of burden distribution established in
the simple economy model where the money supply was assumed
constant. For instance, if government employees maintain their
former wage levels and there is full employment and no

increase in the size of the public sector, private employees will face falling factor wages accompanied by stable product prices. Government wages will no longer be reduced by an income tax and, with stable commodity prices, government employees will be able to command a greater amount of the commodities produced by the private sector. In effect, the tax burden which formerly rested with government employees will be shifted to private employees.

Burden distribution will also vary from the simple economy model if the sales tax is less than general in its coverage of goods and services. Product payments for the taxed commodites must exceed factor wages by the amount of the tax. If the level and composition of production and employment are constant and factor and product prices change only for taxed commodities, the tax burden will be distributed according to the purchases of the taxed commodities. Alternately, if all product prices remain constant and if the factor prices for untaxed commodities do not vary, then factor prices will decline in the taxed industries and those factors will bear the burden.

In the final analysis demand and supply elasticities are the determining factors in the horizontal distribution of the burden of a limited sales tax among consumers and factor owners. Additionally, knowledge of these elasticities would allow calculation of the relative burden on

consumers compared with factor owners. Completely inelastic demand for a taxed product will result in consumers buying the same amount of the taxed item no matter what the price. Although this situation is highly unlikely, the burden distribution in this case is clear. Consumers will absorb the tax-caused price increase and will bear the full tax burden. In the opposite situation, completely elastic demand will prevent the producer from selling any of the taxed commodity if the price rises above the pre-tax level. If any of the taxed commodity is produced, the tax cannot be shifted to the consumer and the firms producing the commodity must absorb the full amount of the tax. The burden of the tax, in this case, will fall on factors of production.

Situations in which demand elasticities fall between the two extreme cases will result in a pattern of burden distribution characterized by burden sharing between consumers and factor owners.

Factor mobility will determine the amount of shifting when examining the supply side of the taxed commodity. Once again there are two extreme cases which are unlikely to be typical of supply conditions in the real world. These extreme cases may, however, be useful in pointing out the alternative shifting patterns. If an industry hires unique factors which cannot be used in the production of other good, in other words completely immobile factors,

these factors must absorb the full burden of the tax unless
the factor owners are willing to accept unemployment.
Consumers will bear none of the burden and the price of
the taxed commodites will remain stable if demand elasti-
city is greater than zero.

The other extreme involves completely mobile resources.
A tax on one industry's product will cause output to fall
while the price rises by the full amount of the tax. The
factors released by the fall in production will find employ-
ment in other industries at a wage comparable to that earned
before the sales tax was levied. In this situation the
consumer will bear the full burden of the tax through price
increases equal to the amount of the tax. In the real world
factor mobility somewhere between these extremes is likely
to result in factor owners and consumers sharing the tax
burden.

Although the pattern of general sales tax burden dis-
tribution is straight forward under the assumptions of the
simple economy model, relaxing the assumptions to fit the
real world greatly increases the complexity of the distri-
bution of burden. Constant costs and the high mobility of
factors associated with the competitive model are the ex-
ception rather than the rule in the real economy. The
fixed assets necessary for much of the productive activity
in the economy and the high degree of labor specialization

prevent the rapid shift of resources following the disruption caused by the imposition of a sales tax. Firms which depend on specialized products, production techniques and management skills are forced to bear at least part of the tax in the form of reduced profits and returns to the immobile productive factors."

The full employment assumption of the simple model is not valid for the analysis of the limited sales tax because it requires inelastic factor supplies, or demand elasticity equal to zero, if tax burdens are to be backshifted and factor wages reduced. Factor supply, especially for labor, is not completely inelastic and increasing amounts of factors will be removed from the market as the return to their productive employment falls.

In the real world there are savers as well as consumers. Sales taxes are typically not levied on capital goods. Tax avoidance is therefore possible by saving income and investing in capital items. Consumers as compared to savers would tend to bear more of the tax than they would under an income tax system.

Most sales taxes apply to at least part of the intermediate goods purchased by firms. Determining the tax incidence under these conditions is thus further complicated by the problem of determining the extent of shifting in two areas. First, will the firm producing the intermediate

goods be able to shift the tax forward in the form of price increases? Second, will the firms buying the intermediate goods shift the increased cost forward to the consumers of their products or back to their factor owners?

Finally, the simple model is one of a closed economy, while state and local sales taxes apply in open economies. Mobile factors may seek employment outside of the local economy if their factor wages are reduced. In addition, goods produced within the taxing district may be exported to areas which have lower sales taxes or no sales taxes at all. Producers may be able to avoid at least part of the tax by selling outside of the taxing district if the transportation and marketing costs are less than the tax. In this case, firms will refrain from selling products within the taxing unit unless the price is at least equal to the factor cost plus the cost of shipping and marketing the goods in areas where a lower tax rate applies. Sales taxes may inhibit economic growth in local economies by driving out mobile factors and by reducing the production and sale of taxed products within the taxing area. The tendency in all of these cases would be more forward shifting than with a closed economy. A minor exception to this pattern of shifting would be retail trade diversion into lower or non-tax areas.

Economic theory can say little about the actual burden distribution of sales taxes in the economic structure of the real world. With limited sales taxes operating in open economies and applying to commodites produced with factors whose supply elasticites vary widely and sold in markets with a wide range of economic conditions, finding a price increase equal to the tax does not shed much light on the pattern of burden distribution. Consumers bear part of the tax due to the price increase, factor owners may bear part if they are immobile and unable to find employment in other industries at a wage equal to that prior to the tax increase, savers may even have their earnings reduced through decreased returns to capital. If, however, the price increase due to a sales tax is not equal to the full amount of the tax, the conclusion follows that consumers do not bear the full burden of the tax. In this case firms have failed to reduce production to the point at which the price increase would equal the amount of the tax. The firms have backshifted part of the tax burden to immobile resources which have accepted the lower wage rather than move elsewhere.

CHAPTER III

METHODOLOGY

This study estimates the percentage of each sales tax change which is shifted to the consumer in the form of higher prices. The model attempts to isolate the effect of tax changes on prices by removing error sources which may also cause price changes. Nationwide changes in demand and supply together with expansions of the money supply are sources of error in isolating the effect of state and local sales tax changes on regional price levels. The model removes these sources of error by subtracting the change in the national price level for the commodity under consideration from the change in the local price level. The start of the time period used in calculating both the local and national price change is the first month prior to the tax change for which Bureau of Labor Statistics data are available for both local and national prices. The end of the period is from one to twelve months following the tax change. Shifting estimates are calculated for time periods of varying lengths, once again dependent upon the availability of Bureau of Labor Statistics data during the twelve month interval.

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Once the effect of national price trends and policies
is removed from the shifting estimate, the major remaining
sources of error are local changes in demand and supply
which diverge from the nationwide trend over the time period.

The possibility was considered that the rates of
price changes from causes other than sales taxes differed
between the cities in which tax rate changes occured and
the nation in general. Factors such as an influx in popu-
lation or new industry reducing the rate of unemployment
could cause both commodity price increases and an increased
demand for public service. Since a response to this
increased demand could take the form of increased local
sales tax rates and conceivably state sales tax rates,
the possibility existed that local variations in demand and
supply conditions may not have been random in those cities
which experienced sales tax rate changes. Difference between
the local and national rates of price change due to causes
other than sales tax rate changes would distort the calcu-
lations of shifting percentages. In order to test this
proposition, the percentage changes in the price indexes
for the two years immediately prior to the tax change were
calculated for each city in which a tax change occured and
for the nation as a whole. The difference between the city
percentage changes and the national percentage changes was
insignificant at the ninety per cent level for both commodity

groups used in the study. This indicates that there was no systematic difference in the economic conditions in cities where sales taxes were increased and cities where there was no such increase. Any significant difference between the two groups must be random and will not invalidate the results of the study.

In this study, the one best estimate of retail sales tax shifting was calculated for each city in a sample of cities. The cities were those in which a state or local tax rate change occured and for which Bureau of Labor Statistics data were available. A mean of these estimates was calculated for each of the two commodity groups considered. Specifically, the model used to estimate the shifting percentage for a tax change applying to one city was as follows.

$$\frac{P_t - P_0}{P_0} = \frac{\sum_{n=1}^{x} W_n P_{t,n} - \sum_{n=1}^{x} W_n P_{0,n}}{\sum_{n=1}^{x} W_n P_{0,n}} \quad \frac{1}{V (\Delta T)}$$

where

P_t = price index for the commodity group in the city where the tax change occured (city A) in the month following the tax change

P_0 = price index for the commodity in city A in the first month prior to the tax change for which data were available

$P_{t,n}$ = price index, in a month following the tax change in city A for the commodity, in city n where there was no tax change during the period from one year prior to the tax change to one year after the tax change

$P_{0,n}$ = price index, in the first month prior to the tax change in city A for which data were available, for the commodity in city n during the period defined above

x = the number of cities for which data were available in which no tax change occured during the period defined above

W_n = the population weight (based on number of wage earners and clerical workers) used for city n by the BLS in calculating the nationwide consumer price index

V = the percentage of the BLS commodity group included in the base of the sales tax in city A

T = change in the sales tax rate in city A

The first ratio within the brackets expresses the price movement in the city where the tax rate changed. The second ratio subtracts the effect of changes in the national average price of the commodity. In calculating the national average, not only the city in question but all other cities in which there were contemporary rate changes had to be excluded to eliminate any influence of tax shifting. The V term was necessary to adjust for the fact that sales tax laws treated specific items included in the BLS commodity groups differently.

CHAPTER IV

THE DATA

The Consumer Price Index (CPI) published by the BLS measures the effect of price change on living costs that apply to urban wage earner and salaried clerical worker families. The CPI is based on the price of a fixed quantity and quality of goods measured and compared from one time period to the next. While indexes are computed on an individual basis for major metropolitan areas throughout the nation, the period between data collections varies; in the largest areas it is currently collected on a monthly basis and in the smaller areas on a quarterly basis. In the past there have been other collection frequencies. A weighted national average index is prepared using the individual city indexes and a weighting factor for each city index based on the number of wage and clerical workers in that city.

The indexes are computed for five specific commodity groups. Sales tax treatment of various items within the commodity groups varies from state to state. Only those items contained in the home furnishing and apparel commodity

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groups are generally included in retail sales tax bases. Because many of the items included in the food, rent, and fuels indexes are excluded from state retail sales tax bases and because the degree of exclusion varies among the states, these three commodity groups were not considered in this study.

Payments to government included in the CPI are from three sources: (1) payments for goods and services received from government, (2) license fees paid for the use and ownership of goods, and (3) taxes levied on the purchase of goods and services.[1] The effect of retail sales taxation on commodity prices is included in the CPI through the last of the above items.

The data used in this study are local and national price indexes from 1935 to 1970. Although the study is confined to the home furnishing and apparels indexes, variations in both BLS data collecting procedures and state tax laws during the thiry-five year period require further refinement in the data. Most of this variation arose from the treatment of services. Periodically, the BLS has revised its procedures for calculating the CPI and in doing

[1]"Taxes and the Consumer's Price Index," Monthly Labor Review, (LXVI, January, 1953), pp. 53-7.

so has changed the quantity and identity of the services
included within the commodity groups. Since state and
local tax laws differ in their treatment of services, an
adjustment in the model was necessary to reflect these
differences in the treatment of services. The quantity
of the taxed items comprising the individual city home
furnishing and apparel indexes has ranged from 100 down to
81.2 per cent over the years. The calculated shifting per-
centage was divided by the respective inclusion percentage
to compensate for the inclusion of untaxed items in the
indexes.

The BLS determines the relative importance of each
item within the commodity groups through periodic budget
studies of urban wage and clerical workers and assigns
a weight to each item based on its relative importance.
The individual commodity indexes for each city are deter-
mined by multiplying the item's weight by its price and
summing the weighted prices for all the items in the com-
modity group. The procedure used to compensate for nontaxed
items in the indexes assumes that the BLS's weighting factors
for the various items making up a commodity group apply
uniformly to each of the cities.

In addition to the adjustment necessitated by vary-
ing amounts of services included within the CPI and the

differences in the state and local tax treatment of these services, several other situations required data adjustments. Several of the state tax laws, notably Pennsylvania's, have excluded many clothing items from the sales tax base. Consequently, it was impossible to calculate the percentage of tax shifting on apparel prices in these states. The cities in these states were deleted from the sample of cities used in estimating the tax shifting occuring in the apparel index; although they remained in the home furnishing sample.

During World War II and the immediate postwar years, exogenous variables such as wage and price controls and the adjustments to their removal prevented the CPI from accurately reflecting price changes due to sales tax changes. For this reason all sales tax rate changes from 1941 through 1949 were removed from consideration in this study.

A change in the BLS definition of city areas in 1953 required that price indexes from several cities located near state borders be excluded from this study. Prior to 1953 the data for constructing the CPI had been gathered within the limits of each city. However, from 1953 to the present Standard Metropolitan Statistical Areas (SMSA) have been used as the CPI units. For those SMSA's which cross state lines (New York, Chicago, Washington, Philadelphia,

Cincinnati, St. Louis, and Kansas City) price indexes are computed using data from more than one taxing district. Since it is impossible to determine the effect a sales tax change in one taxing district has on price indexes based on data obtained from several taxing districts, these cities were eliminated from the analysis after 1953. In addition, municipal sales taxes were also eliminated after 1953.

The BLS published separate commodity indexes for each of the cities comprising the national index before 1953. Subsequently, separate indexes have been published for a smaller number of cities, although the total number of cities in the national index has been expanded. Somewhat different methods are necessary in calculating adjusted monthly national average price indexes before and after 1953. Before 1953 the adjusted national index could be calculated by simply subtracting the weighted sum of the indexes for cities with tax rate changes from the national average index published by the BLS. After 1953 the adjusted index was constructed by finding the weighted average of the published city indexes where no tax rate change occured. In both cases published BLS city weights based on the number of urban wage and clerical workers were used in the weighting process.

Shifting percentages were calculated only for sales
tax changes of one percentage point or greater. It appears
unlikely that the exclusion of small tax changes biased the
result, since there was no discernible pattern of difference
in shifting of one, two, and three percentage point rate
changes.

The BLS has published price index data monthly for
some cities and every third month for others. For each
city in which a tax change was analyzed, separate shifting
percentages were estimated for the one month prior to the
change when an index was published, and every month within
one year following the change for which there was data.
The shifting estimates were then grouped by month from one
to twelve following a tax change for the two commodity
groups. An analysis of variance of the means of the groups
produced an F ratio of less than one for both groups. This
indicates that within one year of the tax change, the
passage of time does not effect the degree of shifting.
The results further suggest no reason to expect any differ-
ent amount of shifting to occur in subsequent years.

There was considerable month-to-month variation in
the shifting estimates for each city. The variance in the
price index data probably was largely responsible for fluc-
tuating shifting estimates. There was no clear criterion

identifying the month following the tax change which would provide the best estimate of the effect of this change on price levels within a city. In view of these considerations, the median of the monthly shifting estimates for a city was used as the best estimate of shifting. Using the median reduces the effects of random error in the price index data. The means of these best city estimates were then used as the data in the cross-section analysis to obtain tax shifting estimates in the apparel and home furnishing commodity groups. Twenty-two data points were available for analysis in the apparel category and 36 were available for analysis in the apparel category and 36 were available in the home furnishing group.

CHAPTER V

RESULTS AND CONCLUSIONS

The results of the study indicate that the percentage increases in price following sales tax increases differed between the two commodity groups studied. Although the price increase for the apparel group was equal to the amount of the tax, the price increase for the home furnishings groups was less than half the amount of the tax.

The mean of the price increases for the apparel commodity group was 101.4 per cent; at the 95 per cent confidence level the interval of the mean ranged from 56.3 to 146.5 per cent. For the home furnishings group, the mean was only 45.9 per cent, and the 95 per cent confidence interval ranged from 14.9 to 77.9 per cent. The difference between the means of the two commodity groups was significant at the 95 per cent confidence level with $t = 2.151$. The mean for the home furnishings group, 45.9 per cent, was significantly different from 100 per cent at the 99 per cent confidence level. The results indicate price increases equal to the amount of the tax for the apparel group, but the increases for the home furnishings group was less than 100 per cent

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of the tax. The amounts of price increase for the two commodity groups were significantly different.

It must be noted that the price increase following the tax change may have been influenced by variables other than the tax change. The study attempted to eliminate national trends which could have affected local commodity prices by subtracting out the change in the nation commodity price index. In addition, an analysis of local price changes compared to national price changes in the two year period prior to the tax changes demonstrated that there was no significant difference between local and national price changes. Nevertheless, error sources in the data prevent labeling the price increases determined by the study as the _actual_ shifting percentages due to sales tax increases.

Using the results of the study as estimates of shifting, three factors are apparent which have a direct bearing on the full shifting assumption. First, the price of apparel commodities increased by the amount of the tax. This, taken alone, tends to support the standard assumption. Second, the shifting estimate for home furnishings is not equal to the amount of the tax. And third, the two shifting estimates are significantly different from each other. Incomplete shifting for home furnishings and the difference between this shifting estimate and the one for apparel contradict the full shifting assumption.

Economists have made use of the full shifting assumption in order to predict the revenue raising power of increased sales taxes and to determine the pattern of burden distribution resulting from these increases. Economic theory casts doubt on the validity of using the standard assumption for these purposes while this study questions the validity of the assumption itself.

In the real world of unemployment, open economies, and less than general sales taxes, price increases equal to the amount of the tax do not ensure that the burden of the tax is restricted to consumers. The price increase may cause output reductions resulting in factor unemployment. The tax may be avoided by purchasing items which are not covered by the tax. Increased saving will also tend to remove tax liability. Although economic theory cannot predict the pattern of burden distribution resulting from a sales tax increase in the real world, it can state that an increase in the price of taxed goods equal to the amount of the tax is not a sufficient condition for assigning the full burden to the consumer.

The standard assumption of full tax shifting is disputed by the results of this study. The one best estimate of 45.9 per cent shifting for home furnishings is incompatible with the standard assumption. Economic theory

demonstrates that full shifting is a necessary condition for the consumer to bear the full burden of the tax. If the price of taxed items does not increase by the full amount of the tax, factor owners are absorbing part of the tax burden. The shifting estimate for home furnishings indicates that factor owners are bearing part of the tax and the standard assumption of full tax shifting is not valid.

The difference between the shifting estimates for the two commodity groups indicates that sales taxes may distort price ratios among taxed goods. Full price shifting for all taxed goods would maintain the same relative prices for taxed commodities that existed before the tax. In this event relative prices would change only between taxed and untaxed commodities. With different amounts of shifting among taxed commodites, distortions of relative price ratios will occur and consumption patterns will be altered, not only between taxed and untaxed commodities, but also among taxed commodities themselves.

Fiscal policy makers and their economic advisors should beware of the implications of relying too heavily on the standard assumption. If consumers do not bear the full amount of the tax, revenue predictions may be inaccurate. More important, tax induced factor unemployment

may be detrimental to economic growth within the taxing
area. If factors are mobile, they may emmigrate to other
areas as a result of the tax increase. Firms may also sell
their products outside the taxing area rather than absorb
the cost of the tax. Altered consumption patterns will
result in patterns of burden distribution which are different
from those indicated by the full shifting assumption.
Economic behavior effects resulting from the altered consump-
tion patterns of taxed goods will remove much of the
neutrality with which the sales tax is credited in the
treatment of taxed goods when the full shifting assumption
is used.

Further work in the area of sales tax burden distri-
bution is definitely indicated by this study. The development
of a model of an open economy in which the other assumptions
of the simple economy model can also be relaxed would
greatly increase knowledge of sales tax burden distribution
in the real world.

These empirical results have implications for tax
policy which differ considerably from those which logically
follow from a hypothesis of full forward shifting. A levy
with differential effects on the prices of various taxed
commodities will tend to alter consumption patterns for
taxed items. This alteration indicates that the tax is
less neutral with respect to consumption than would be

concluded if there were uniform price rises equal to the tax. Even increasing the generality of the tax will not necessarily eliminate these consumption effects.

Another supposition following from the full shifting assumption has been that the tax falls on individuals addording to their consumption expenditures. Since significantly less than 100 per cent forward shifting occurs for some commodities, the burden cannot all be on consumers; some must fall on factor owners. Finally, the differential effects on the prices of taxed commodities indicates horizontal inequity with respect to consumption preferences for those products on which forward shifting is greatest. To the extent that neutrality, taxation according to consumption expenditure, and/or horizontal equality with respect to consumption preferences are policy goals, the retail sales tax appears less desirable than has been traditionally concluded.

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