Modelling Small Business Behavior in Michigan

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MODELLING SMALL BUSINESS BEHAVIOR IN MICHIGAN

A PROJECT OF THE INDEPENDENT BUSINESS RESEARCH INSTITUTE OF MICHIGAN

BY MARK P. HAAS

I. Introduction

Economic growth and stability within the State of Michigan are increasingly reliant upon independent and smaller businesses within the market economy. Studies sponsored by the Michigan Department of Commerce indicate that job preservation and future expansion in Michigan will have to occur in enterprises other than heavy industry, a point the Blumenthal Commission repeatedly underscored in its 1976 report on Michigan's economic future. The report's recommendation that Michigan look to the development of smaller businesses in the service sector for the new jobs it must have was further reinforced by a Massachusetts Institute of Technology study published this year revealing that 66 percent of the new jobs created in the U.S. now come from firms with fewer than 20 employees.

Given the basic thrust of the Blumenthal Report and subsequent studies, it is clear that public policymakers in Michigan must begin giving careful consideration to the impact of public policy issues upon those enterprises which will provide the stability and growth to the State's economy in the remaining years of this century. Unfortunately, at present, little is understood concerning the impact of state taxation, regulation, insurance, and capital availability policies upon independent and small businesses within the market economy.
Research in these areas is limited at this time because there are glaring deficiencies in both the data available and tools developed to analyze information which relates to the operation of the small business sector in our economy. It follows that the primary concerns of any meaningful research effort to study the effect of economic and political forces on the small business community must be with the creation and maintenance of a useful information system and the techniques needed to study it.

The cost to Michigan of this information gap is substantial. Public policymakers in both the legislative and executive branches make decisions based on available information. If a segment of the economy (such as the small business sector) is not represented in that information stream upon which public policymakers draw for their decisions, those decisions will not reflect the interests and concerns of that segment of the economy. The dearth of information about the impact of public policy on independent business has resulted in Michigan being forced to make critical economic decisions without benefit of the knowledge of how these decisions will affect that part of the economy with the greatest growth potential.
II. Overview

This project is intended to help remedy the existing situation by taking
the initial steps in creating micro data sources and computer based
econometric, simulation and forecasting models of small business behavior
in Michigan.

The major tasks undertaken by this project in the design of the modelling of
small business behavior in Michigan are as follows: 1. The identification
of the types of information desired by public policy decision makers and
owners of small businesses; 2. The identification of the types of model(s)
required to answer the questions raised by interested groups; 3. The
identification and description of the types of micro and macroeconomic data
describing the behavior of small businesses necessary as input into the
model(s); 4. The identification of data interface and meshing points and
the costs involved in merging data, and 5. The evaluation of the utility
of the data sources for estimating model parameters and simulating and/or
forecasting the impact of existing and proposed policies.

This list of tasks outlines the course taken to expand the area of
research on small business. As time goes on and research continues,
additional items of interest may make themselves known. Thus, the areas
identified above represent but a lower bound of the material that may be
investigated in the realm of small business research in Michigan.

Section III sets the stage by identifying some of the information that
policy decision makers and small business persons may desire to provide

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adequate background upon which to base opinions and positions. Section IV describes some of the modelling techniques that may be used to derive an accurate description of the present situation and provide systematic estimates of the impact upon small businesses of proposed changes in public policy. Section V details the data sources to be used as input into the models described in part IV; Section VI indicates how the data sources may be merged. The usefulness of each of the data sources in providing answers to public policy decision makers and owners of small business concerns is discussed in Section VII. A summary of the report is provided in the final section, VIII.
III. Research Questions

Work Task #1: Identification of information desired by public policy decision makers and owners of small businesses.

The questions of most general concern to businessmen and policy makers are how changes in economic conditions and public policy affect the labor force, employment, unemployment, wage and salary earnings, business income or profits, investment, sales receipts and tax liabilities. Because of severe limitations on the amount and quality of microeconomic data available, the research in this area has focused mainly on the macroeconomic aspects of national and regional economics. The issues of concern have been on how dramatic shifts in relative energy costs and availability will affect overall employment, for instance.

Objects of particular interest to small businessmen and public policy decision makers are in determining the distributional effects of public policy and a changing economic environment on businesses of various sizes. Specific questions include: 1. What are the effects of alternative taxes on small business such as value added taxes; and 2. how do factor proportions vary by size of firms and by industry type.

In order to answer these types of questions, the appropriate micro data on businesses by firm size is required. To undertake meaningful analysis of these issues it is necessary to apply the proper methods of study. Both of these areas are discussed next.
IV. Modelling

Work Task #2: Identification of the types of model(s) required to answer the questions raised by interested groups.

A. Introduction

By making use of a variety of types of modelling techniques, it will be possible to develop a system that combines both quantitative and qualitative informational sources to forecast the impact of public policy changes on small businesses. The behavioral relationships between economic variables can be quantitatively estimated and a qualitative assessment of both input and output data is necessary in order to finalize forecasts.

Three distinct but interrelated types of models can be utilized to analyze the micro and macroeconomic data available. These can be used to assess the impact of public policy proposals for change on small business in Michigan. Each model is designed to make use of the specific data sources it utilizes and together the models can provide useful information on a range of public policy questions concerning employment and small businesses.

The three types of models to be discussed in this section are: 1. The Michigan Single Business Tax Simulation Model; 2. An Econometric Model of Employment and Earnings; and 3. A Small Business Simulation Model. The procedures for designing each of these three models will be outlined and the basic structure of each described.

B. Single Business Tax Simulation Model

The model is a computer-based algorithm that reproduces the calculations
used in determining Michigan's Single Business Tax. The computer will mimic the C8000 tax forms packet by creating a program to prepare the primary tax form and subroutines to represent the various auxiliary forms that compute credits and deductions, for example. Using this scheme, the logic of the SBT calculations is reproduced so that the effect of proposed changes in the current tax laws and/or expected changing conditions in the economy can be simulated. Thus, parameters such as the tax rate, exemption amounts and maximum limits can be respecified, and the model contains a vector of weighting factors that can be used to represent various changes in the economy. Since all lines of C8000 will be computed, any interest in variables not tabulated at this time can be easily added. This model is similar to the type of model used by the Office of Tax Analysis, U.S. Department of Treasury, to simulate changes in the tax laws. Subroutines can categorize the results by various size and type (SIC classifications).

This provides capabilities for: 1. Analysis of the Single Business Tax; 2. Simulation capability to determine the impact of changes in the current tax statutes on various sizes and types of businesses; and 3. The forecasting of the impact of changing economic conditions on the tax liability of businesses by size and type. This model will also provide a basis for analyzing the use of a Michigan type value added tax at the federal level as it impacts on small business.
A description of the main program and the major subroutines follows. The descriptions are more for reference than for explanation; for more detailed information on each of the tax forms discussed, refer to the attached Michigan Single Business Tax forms booklet.
MICHIGAN SINGLE BUSINESS TAX SIMULATION MODEL

BLOCK DIAGRAM

Main Program C8000

Subsystem of subroutine that simulates C8000 X + I/O

RECEIN
Reads firms data from tape

C8000D

C8000H

C8000P

C8000I

C8000C

C8000S

PAKAM
Reads in tax parameters and weighted factors

TABLE
Prints the final table of firms
SINGLE BUSINESS TAX SIMULATION MODEL

PROGRAM DESCRIPTION

MAIN PROGRAM (C8000)

The main program simulates SBT form C8000 with an array C8000 (71,3). There are 71 lines in the C8000 form with some of the lines having A, B, C suffixes. This program will compute each line of this form calling other subroutines as needed (e.g. C8000H, C8000D, C8000I, C8000P, etc.). The program will loop for each firm on the SBT sample data tape, process the data, and store them in MODEL (11,10). After all firms have been processed it will call subroutine TABLE to print the results.

SUBROUTINE RECIN

This routine will read the returns file and place the data in a labeled common/FIRM/. If it detects an end of file (EOF) on the tape, logical variable DONE will be set to true and the program begins to calculate the tax.

SUBROUTINE C8000D

This routine simulates the SBT form C8000D for computing CAPITAL ACQUISITION DEDUCTION. Firm data will be passed to this routine in /FIRM/ and weighting factors from /WEIGHT/. This routine will put results into /C8000/line 13a.

SUBROUTINE C8000H

This routine simulates SBT form C8000H for computing APPORTIONMENT FACTORS, firm data is from labeled common /FIRM/. Depending on the firm code FIRM (11) will place in /C8000/ line 17 or 20 the appropriate apportionment factor thereby
allocating the portion of business activity attributed to Michigan operations.

SUBROUTINE C8000P

This routine simulates SBT form C8000P and calculates the small business tax credit for "partnerships." Firm data from /FIRM/ is then transmitted into /C8000/. The small business tax credit provides for a reduction of taxes paid by small/low profit businesses to a maximum of one-half of taxes owed before the credit. It is hoped that this will stimulate small business growth. Small Business Credits of some 23 million dollars were claimed by firms in the sample tax year.

SUBROUTINE PARAM

This routine reads the simulation parameters and weighting factors from input, and stores them in labeled common /PARAM/ and /WEIGHT/. By changing the simulation parameters and weighting factors the model is given the capability of mimicking changes in the single business tax and/or economic conditions.

SUBROUTINE C8000I

This routine is the same as C8000P except it computes the small business tax credit for "individuals" claiming the credit.

SUBROUTINE C8000C

This routine is the same as C8000P or C8000I but computes the small business tax credit for "corporations" claiming the credit.

SUBROUTINE C8000S

This routine simulates SBT form C8000S and computes reductions to a firm's adjusted tax base. Data is from /FIRM/ and results go to /C8000/.

SUBROUTINE TABLE

This routine prints the OUTPUT of tabulated results of the SBT simulation from the subroutine MODEL into a tabular form for analysis purposes.
MICHIGAN SINGLE BUSINESS TAX SIMULATION MODEL
MAIN PROGRAM LOGIC  C8000

Initialize constants, set up commons

CALL PARAM

"Load the tax simulation parameters from INPUT and assign weighting factors"

CALL REcin

"Get the firm's information from the data tape (5)."

done = true? Y N

CALL C8000H

"Prepare form C8000H" - APPORTIONMENT.

CALL C8000D

"Prepare form C8000D" - CAPITAL ACQUISITION ADJUSTMENT

FIRM=1 Y N

CALL C8000I

"If individual prepare form C8000I" GROSS RECEIPTS & BUSINESS INCOME

FIRM=3 Y N

CALL C8000P

"If partnership prepare form C8000P" GROSS RECEIPTS & BUSINESS INCOME

N PROCESS CORPORATIONS

"If corporation compute" GROSS RECEIPTS & BUSINESS INCOME
Compute lines 39 - 46

Compute lines 47 - 57

Compute lines 10, 7, 8, 9

Compute lines 58 - 61

Code 2 or 3?

Compute line 12b from C8000H

Compute lines 12a

Compute lines 13a - 14

MAIN PROGRAM LOGIC (continued)

"Compute C8000 (39,1) through C8000 (45,1)"
Compensation

"Compute C8000 (47,1) through C8000 (57,1)"
Additions

"Compute C8000 (i0,i) = \sum_{i=7}^{9} C8000 (61,1)"
Subtotal (Tax Base)

"Compute C8000 (50,1) through C8000 (61,1)"
Subtractions

"If taxable in another state get apportionment factor from C8000H line 17 or 20."

"Compute Tax Base"

"Compute C8000 (14,1) = C8000 (13,A) - C8000 (13,B)"
MAIN PROGRAM LOGIC (continued)

2

Code 2 or 3?
N

Y

C8000(14) < 0?
N

Y

ADD C8000(14) to C8000(12,B)

SUBTRACT C8000(14,1) from C8000(12,B)

ADD C8000(14,1) to C8000(12,A)

"Compute ADJUSTED TAX BASE" BEFORE DEDUCTIONS

SUBTRACT C8000(14,1) from C8000(12,B)

Compute lines 16 - 17

Compute lines 62 - 71

Compute lines 18 - 20

CALL C8000S

"Compute C8000(16,1) through C8000(17,1)"

"Compute lines C8000(62,1) through C8000(71,1)"

"Compute lines C8000(18,1) through C8000(20,1)"

ADJUSTED TAX BASE

"prepare form C8000S" REDUCTIONS TO ADJUSTED TAX BASE

3
"Line C8000(21,1) is from C8000S" Recomputed from C8000(23,1)*.0235

"Compute TAX C8000(22,1) * TAX23" TAX BEFORE CREDITS

"C8000(24,1) from subroutines C8000I or C8000P or C8000L SMALL BUSINESS CREDIT"

"C8000(25,1) from subroutine C8000C CREDIT FOR CORPORATIONS"

"Compute C8000(27,1) from TABLE (3,3) TAX"

"If firm income greater than or equal to MAX set subscript"

"Compute subscript for MODEL (11, 10) based on firm's income"

"Tabulate data in array MODEL (11,10)"
The information produced by this computer based simulation model of Michigan's Single Business Tax can be printed out in a number of ways. This provides analysts with different types of data arranged to best suit their needs.

Each of the 71 pieces of data available on individual firms may be aggregated and printed out (up to a maximum of eight items including the number of firms). For example, these may be arranged and distributed by tax liability as presented on the following page, by gross receipts as provided in Section V.B. or by any other variable as the need arises. The following table shows the distribution of tax liability by amount of liability for Michigan business firms during tax year 1977.12 to 1978.11. The distribution of other items for those firms also appear as an example of how the output may be formulated.

The source listing for the program is attached in Attachment E to aid in the understanding of how the model works and the versatility built into it.
## STATE OF MICHIGAN
### SINGLE BUSINESS TAX SIMULATION MODEL

**RETURN YEAR 1977-12-1978-11**

**10/28/80 00:02:32**

**USING A STRATIFIED RANDOM SAMPLE**

**CURRENT TAX LAWS REFERENCE RUN**

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<th>NUMBER OF FIRMS</th>
<th>TAX 28 LIABILITY</th>
<th>TAX BEFORE CREDITS 23</th>
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<th>GROSS RECEIPTS</th>
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<th>SMALL BUS. CREDIT 24</th>
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**REFERENCE**

896090273.-- 931550128.-- 64543120147.-- 797236605798.-- 239746414326.-- 8516273499.-- 22554274.--

**DIFFERENCE**

74.-- 0.-- 0.-- 0.-- 0.-- 0.-- 0.-- 0.--
### Variables

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C. Econometric Model of Employment and Earnings

There are a number of different aspects of small business behavior that one may wish to model depending upon the nature of the investigation to be undertaken. Economic theory allows the specification of behavioral relationships between many different activities carried out by individual firms. Because of the unusually severe levels of unemployment persisting in Michigan during recent months, the level of employment attributable to firms of various sizes was chosen as the object of interest.

The following discussion describes the methodology utilized to develop a computer-based econometric model which estimates the relationships between employment by standard industrial code classification and size of firm with macroeconomic production data. This type of configuration attempts to capture the impact of changes in economic conditions on employment for firms of different sizes. The model consists of a number of independent equations which may be combined to form the employment portion of a larger model of the Michigan economy.

The sectors of the Michigan economy to be modelled are: durable manufacturing (vehicle and other durables); nondurable manufacturing; construction; transportation, communication and utilities; wholesale and retail trade; finance, real estate and insurance; service industries, and mining. Total employment is the sum of employment in the other sectors plus what will be called residual employment. This latter term is comprised of government,
self-employed, and farming employment plus statistical discrepancy between
the place of residence and place of employment measures of total employment.

The breakdown of each sector by size of employment may be accomplished
by categorizing the firms in each sector by one of the schemes exhibited in
Attachment G (size categories to be used in collapsing data). The specific
number of groups depends upon the distribution of firms in each sector.
Attachment C provides an estimate of the number of employers in nine SIC
classifications broken down by nine size classifications. Depending on the
needs of the research various groupings may be formed. Hence, the equations
described below may be estimated with the employment levels for firms of
various sizes alternatively used as the dependent variables. The result
is an estimation of how employment varies with macroeconomic and industry
trends for different sized firms in each industry.

All of the following are reduced form equations of the labor and product
markets in the respective sectors taken from the quarterly Michigan Employment
Model used by the Michigan Department of Labor to track employment trends
by industry in Michigan. The Michigan Employment Model is part of a larger
model of the Michigan economy. Using these models as a starting point avoids
reinventing the wheel.

Both supply-side and demand-side influences are represented in the
equations. Time trends and shift variables as well as seasonal factors are
included where theory suggests relationships are changing over time or due to
structured changes. Each of these equations is derived from economic theory
where firms maximize profits and workers maximize utility subject to resource
constraints and consumption and production technologies. The equations are
re-estimated quarterly as new data becomes available.

The equations are summarized in the table appearing on the following
page with discussions following thereafter.
Michigan Econometric Employment Model

Functional Relationships

Manufacturing, Durable Vehicles (MDV) = \( f \left[ \text{Average hourly wage in manufacturing in Michigan, Private nonfarm price deflator, real gross auto product, Industrial Production (auto), Michigan's share of car and truck assemblies, MDV(-1), Real GNP, STRIKE, TIME} \right] \)

Manufacturing, Other Durables (MOD) = \( f \left[ \text{Real GNP, Average hourly wage in manufacturing in Michigan, Private nonfarm price deflator, Industrial Production (Durables-Auto), Real Business Fixed Investment, MOD(-1,-2), MDV(-1,-2), TIME} \right] \)

Manufacturing, Nondurables (MND) = \( f \left[ \text{Real GNP, Average hourly wage in manufacturing in Michigan, Private nonfarm price deflator, Industrial Production (nondurables), MND(-1,-2), MDV(-1,-2), TIME} \right] \)

Construction (CON) = \( f \left[ \text{Building Permits, Real Business Fixed Investment, TOT, CON(-1), SEASON, STRIKE, TIME} \right] \)

Transportation, Communications & Utilities (TCU) = \( f \left[ \text{Real Personal Income in Michigan, Average hourly wage in manufacturing in Michigan, Private nonfarm price deflator, TCU(-1), TIME} \right] \)

Wholesale & Retail Trade (WRT) = \( f \left[ \text{Real Personal Income in Michigan, Real Michigan Sales Tax Revenue (current, -1), Dummy variable for Food and Drug exemption from sales tax, WRT(-1)} \right] \)

Finance, Real Estate & Insurance (FRI) = \( f \left[ \text{Real Personal Income in Michigan, TOT(-1,-2), FRI(-1,-2), CON(-1,-2)} \right] \)

Service Industries (SIN) = \( f \left[ \text{Real Personal Income in Michigan (current,-1,-2)} \right] \)

Mining (MIN) = \( f \left[ \text{TOT, Real GNP, Price of Crude, MIN(-1), STRIKE, TIME} \right] \)

Total Employment (TOT) = MDV + MOD + MND + CON + TCU + WRT + FRI + SIN + RES

Residual Employment (RES) = Government + Self Employed + Farming + Discrepancy

Seasonal Factors (SEASON)

Strike Proxies (STRIKE)

Time Trend (TIME)
The level of employment in the durables manufacturing of vehicles sector in Michigan depends in part on the real cost of labor as proxied by the average hourly wage in manufacturing and the private nonfarm price deflator. As costs rise employment is expected to decline. It is also hypothesized that employment depends on the level of real national income which represents a measure of consumer purchase ability and the real gross auto product and level of industrial production in the auto sector which represents auto output. The fraction of car and truck assemblies completed in Michigan suggest the demand for labor in the state while the strike proxy indicates periods of artificial supply shortages. As incomes rise relative to auto output levels, employment should increase but as the fraction of assemblies declines, employment in Michigan should fall.

The level of employment in manufacturing other durables is also hypothesized to depend on the cost of labor and the level of national income with similar types of influences. The industrial production datum used here is that of the production of durables (less auto output) which is thought to exert a positive effect on employment as it rises. As firms increase their expenditures on plant and equipment, the demand for manufacturing of more such products expands causing an upward pressure on employment in this sector. Also, recent trends in this sector and the manufacturing of vehicles affects current employment levels as the pace of economic activity is reflected by the durable goods sectors.

Employment in the nondurables manufacturing sector is similarly affected negatively by real wage rate increase and positively by the level of national
income and industrial production of nondurables. Again the recent patterns of employment in this and the vehicles sector influence current employment in the nondurables manufacturing sector.

Construction activity (and therefore construction employment) is closely tied to the issuance of residential building permits and the level of real business fixed investment of plants and equipment. As these variables grow or decline, so does construction employment. The level of total employment captures the level of economic activity while the seasonal factors track the variations due to weather. Due to the average construction contract lasting about two quarters, the past level of employment helps explain the path of current employment. Again, strike proxies provide for disruptions caused by work stoppages.

Employment in the transportation, communications and utilities sector real labor costs and real personal income in Michigan is due to the non-national nature of the market. As wage rates rise, employment falls and as real income grows it is followed by advances in this sector's employment. Recent employment is thought to exert a positive influence on current levels due to the long term nature of contracts in these industries.

Wholesale and retail trade activity is a function of real Michigan personal income and regional prices which reflect budget constraints imposed on consumers. As prices rise and real incomes fall, wholesale and retail employment waxes and wanes. The current and most recent previous period state sales tax revenues provide an excellent estimate of current activity.
A dummy variable for the exemption of food sold not for immediate consumption and drugs prescribed by a physician is included to reflect that statutory change.

Employment in the finance, real estate and insurance sector depends on ability to pay as reflected by real personal income, the level of activity reflected by total employment and the supply of new structures as related to new construction. As each of these variables grows, so does employment in finance, real estate and insurance.

Service industries employment depends entirely on real Michigan personal income as it represents a regional market and a luxury good.

The level of employment in the mining industry depends on the overall level of employment and real income which reflect the general demand for goods.

As the price of crude materials less food and feedstocks which represents the cost of obtaining substitute materials rises, the feasibility of mining less abundant resources improves indirectly, causing an increase in mining employment. Mining activity is not easily stopped and restarted so recent employment is also used to explain current levels. Again a strike variable is included.

D. Small Business Model

The small business model is a computer based econometric model which attempts to utilize the microeconomic data developed from merging the Single Business Tax micro data file with the MESC ES-202 employment and
earnings data. Taking advantage of these two sources of information allows the construction of a sample set of firms about which information on both employment and business financial operations are available.

This type of model can be estimated for any and all disaggregations the data allows: by SIC classifications, by a variety of size classifications, or by combination.

First, behavioral relationships between employment levels and labor costs, business income or profit, sales or gross receipts, tax liabilities and asset acquisition must be formulated. The following functional relationship is hypothesized:

\[
\text{Employment} = f \left( \text{labor costs represented by compensation, business income, gross receipts, tax liabilities and asset acquisition} \right)
\]

The level of employment is thought to vary indirectly with labor compensation as increases in the cost of an input factor reduces its use, ceteris paribus. As business income expands, so does the ability of the firm to take on additional workers if profitability allows. A similar agreement can be made for growth of gross receipts. Higher tax liabilities suggest less resources available to compensate labor and hence lower levels of employment may result. The acquisition of additional assets may have a positive or negative influence on employment depending on whether the capital was purchased for expanding operations with more labor or to replace labor. It follows that estimation may reveal which effect is stronger on net. Additional variables from the SBT file could be added to the explanatory side of the above equation if desired.
Using the parametric estimates of this model, it would be possible to forecast the impact of changes in public policy and economic conditions which affect the latter set of above variables on the level of employment. As the data are distinctly available for individual firms, cross sectional estimation would reveal the differential impacts on small business.
V. Data Sources Description

Work Task #3: Identification and description of the types of micro and macroeconomic data describing the behavior of small businesses necessary as input into the model.

A. Introduction

A variety of data sources will be useful in determining the impact of public policy on small businesses in Michigan. These data sources will be used in the design and construction of the models discussed earlier. These sources include: 1. Michigan Single Business Tax Data File; 2. Michigan Employment Security Commission Data; 3. State and national macroeconomic data; and 4. a micro data file to be created by merging Michigan Single Business Tax and Michigan Employment Security Commission data.

The discussion that follows outlines the contents of each of the data sources and the sampling techniques that may be used to assure adequate representation of various types of firms. The actual creation of some of the data files described here depends on the resources available for that purpose.

B. Michigan Single Business Tax Data File

In 1976, Michigan enacted legislation which created the Single Business Tax (SBT) to replace seven other taxes on businesses in the state. The SBT is a tax on the "value added" of business entities as defined by business income plus compensation, net interest, and depreciation, with several adjustments and deductions.
Currently, every person who is engaged in business activity in Michigan and whose gross receipts plus recapture of capital acquisition deduction are at least $40,000 for the tax year must file an annual Single Business Tax return. For a person whose tax year is less than 12 months, the minimum gross receipts for filing a return is $40,000 multiplied by a fraction, the numerator of which is the number of months in the tax year and the denominator of which is 12.

"Business activity" means a transfer of legal or equitable title to or rental of property, whether real, personal, or mixed, tangible or intangible, or the performance of services, or a combination thereof, made or engaged in, or caused to be made or engaged in, within the state, whether in intrastate, interstate, or foreign commerce, with the object of gain, benefit, or advantage, whether direct or indirect, to the taxpayer or to others, but shall not include the services rendered by an employee to his employer, services as a director or a corporation, or a casual transaction. Although an activity of a taxpayer may be incidental to another or other of his business activities, each activity shall be considered to be business engaged in within the meaning of this act.

Gross receipts include all receipts derived from a business activity including rental and lease receipts except receipts specifically excluded. "Gross receipts" means the sum of sales (as defined in the gross receipts checklist) and rental or lease receipts.
Gross receipts does not include the losses incurred by an insurance carrier as reported to the Michigan insurance bureau or amounts received in an agency or other representative capacity, solely on behalf of another or others but not including amounts received by persons having the power or authority to expend or otherwise appropriate such amounts in payment for or in consideration of sales or services made or rendered by themselves or by others acting under their direction and control or by such fiduciaries as guardians, executors, administrators, receivers, conservators, or trustees other than trustees of taxes received or collected from others under direction of the laws of the federal government or of any state or local governments.

Receipts to be included in a gross receipt checklist are: receipts from sales of products, receipts from services performed, sales and/or use tax collected on sale of tangible personal property, interest/carrying charges on sales of products or services performed, gross commissions earned, rents and royalties received, receipts from professional services, receipts from sales of scrap and other similar items, service charges to customers, client reimbursed expenses not obtained in a representative capacity, and gross proceeds from intercompany sales.

Hence, except for business concerns with gross receipts less than $40,000 on an annualized basis, most firms conducting business in Michigan must file SBT returns regardless of their resultant tax liability. The number of firms filing returns for calendar year 1978 and for fiscal (tax) years
ending through November 1979 which have cleared processing to date is upwards of 139,000.

This data file provides an excellent source for information on particular aspects of businesses operating in the state of Michigan.

The first step in identifying the extent of information available from Michigan's SBT returns is an examination of the Michigan Department of Treasury Single Business Tax Returns and Instructions for 1978 (a copy is enclosed). Review of the form reveals that particular line numbers are white surrounded by a gray background rather than black on a white background. The former items are the data points entered into the master SBT data file tapes.

The second step in identification of data items is achieved by studying the EDP File Description of the master SBT data file tapes (copy enclosed). This reveals that additional administrative information has been added to each firm's SBT return record. By checking only those data items needed for aggregate analytical purposes, much of the information contained in the master SBT file can be omitted from the sample data file to reduce cost and computational complexity.

The third step involves the cross referencing of the items appearing on the EDP File Description and the line numbers in the SBT return to assist in flowcharting and programming the computer-based algorithm that reproduces the calculations used in determining Michigan's Single Business Tax. This has been performed for items appearing on both the master SBT data file, EDP File Description, and the 1978 SBT Annual Return C8000 (refer to copies enclosed).
The fourth step required is the specification of the appropriate sampling technique to apply to the master SBT data file to create a micro data file of manageable proportions. As the primary objective is to study the impact of changes in the business tax laws on businesses disaggregated by their relative size, the sample should be stratified so as to provide adequate representation of all sizes of firms.

A priori expectations and a review of the data suggest that the variance in the values of specific data items are greater for "larger" firms than for "smaller" firms. (In this case "larger" and "smaller" refer to the size of firms based on either business income, gross receipts, or tax liability). Therefore, it is necessary to stratify the sample by over-representing the number of firms in those groups which have larger variances relative to the average to achieve similar levels of confidence for data on all size groups.

A sample size of approximately ten percent was arbitrarily chosen as fulfilling the criteria of both a manageable size and adequate proportions of returns from which to simulate changes in the SBT laws. The stratification employed selected all firms with Single Business Tax liabilities of $10,000 or more and one of every ten firms with tax liabilities less than $10,000.

This process will result in providing a sample of approximately 20,660 SBT returns out of a population of more than 139,000 representing about 14.8% of the firms whose returns have cleared final processing. The breakdown is estimated as follows:
The stratification by tax liability was used for two reasons. First, a review of the data suggested that tax liability was highly correlated with the size of the firm in terms of compensation and business income in general. Second, computer programs to sort SBT returns by tax liability and statistics describing the characteristics were already available and considerable cost savings could be realized by utilizing these existing commodities.

For a better understanding of the exact definition of specific data items included in the micro data file, consult the Michigan Department of Treasury publication, *Single Business Tax Returns and Information for 1978*.
Another item of interest is the distribution of Gross Receipts among firms of various sizes. To give some indication of this dispersion of gross receipts, the sample data was used to construct four tables that might shed some light on the subject.

The first tabulation simply categorizes firms by tax liability and shows the amount of Gross Receipts reported by businesses in that tax liability class and compares that to the amount reported for the population. The results are self explanatory and appear in the table on the next page.
<table>
<thead>
<tr>
<th>Tax Liability Class</th>
<th>Firms In Population</th>
<th>Firms In Sample</th>
<th>Sample/Population</th>
<th>Population Gross Receipts (thousands of dollars)</th>
<th>Sample/Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 1,000,000</td>
<td>63</td>
<td>70</td>
<td>111%</td>
<td>$15,268,6578</td>
<td></td>
</tr>
<tr>
<td>500,000 - 1,000,000</td>
<td>60</td>
<td>59</td>
<td>98%</td>
<td>$4,551,4831</td>
<td></td>
</tr>
<tr>
<td>100,000 - 499,999</td>
<td>685</td>
<td>639</td>
<td>93%</td>
<td>$1,990,14377</td>
<td></td>
</tr>
<tr>
<td>50,000 - 99,999</td>
<td>890</td>
<td>880</td>
<td>99%</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10,000 - 49,999</td>
<td>6,576</td>
<td>6,225</td>
<td>95%</td>
<td>$15,908,7179</td>
<td></td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>6,349</td>
<td>6,291</td>
<td>99%</td>
<td>$3,451,5275</td>
<td></td>
</tr>
<tr>
<td>1,000 - 4,999</td>
<td>28,003</td>
<td>28,655</td>
<td>102%</td>
<td>$3,495,9119</td>
<td></td>
</tr>
<tr>
<td>500 - 999</td>
<td>11,536</td>
<td>11,826</td>
<td>103%</td>
<td>$1,355,8857</td>
<td></td>
</tr>
<tr>
<td>100 - 499</td>
<td>16,039</td>
<td>14,964</td>
<td>93%</td>
<td>$7,618,449</td>
<td></td>
</tr>
<tr>
<td>10 - 99</td>
<td>5,751</td>
<td>5,703</td>
<td>99%</td>
<td>$1,606,551</td>
<td></td>
</tr>
<tr>
<td>0 - 9</td>
<td>71,646</td>
<td>71,173</td>
<td>99%</td>
<td>$2,393,4034</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL:** 148,324 146,485 99% $868,504,863 $797,238,606 92%
The second table sorts the firms by Gross Receipts categories and reports the number of firms in each group and the amount of Gross Receipts reported.

<table>
<thead>
<tr>
<th>Gross Receipts Class (thousands of dollars)</th>
<th>Number of Firms</th>
<th>Firms in Sample</th>
<th>Sample/Population</th>
<th>Gross Receipts (thousands of $'s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 250,000</td>
<td>459</td>
<td>423</td>
<td>92.2%</td>
<td>$607,583,109</td>
</tr>
<tr>
<td>50,000 - 249,999</td>
<td>828</td>
<td>558</td>
<td>67.4%</td>
<td>89,373,654</td>
</tr>
<tr>
<td>25,000 - 49,999</td>
<td>597</td>
<td>345</td>
<td>57.8%</td>
<td>20,670,895</td>
</tr>
<tr>
<td>10,000 - 24,999</td>
<td>1,513</td>
<td>838</td>
<td>55.4%</td>
<td>22,964,420</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>1,346</td>
<td>1,206</td>
<td>62.0%</td>
<td>13,307,667</td>
</tr>
<tr>
<td>2,500 - 4,999</td>
<td>3,346</td>
<td>1,708</td>
<td>51.0%</td>
<td>11,556,341</td>
</tr>
<tr>
<td>500 - 2,499</td>
<td>17,531</td>
<td>3,518</td>
<td>20.1%</td>
<td>18,452,556</td>
</tr>
<tr>
<td>0 - 499</td>
<td>120,267</td>
<td>13,338</td>
<td>11.1%</td>
<td>13,329,964</td>
</tr>
<tr>
<td>TOTAL</td>
<td>146,485</td>
<td>21,934</td>
<td>15.0%</td>
<td>$797,238,606</td>
</tr>
</tbody>
</table>

The third table provides the output of the SBT Simulation model stratified by Gross Receipts class. It should be noted that 4,219 firms in the sample reported no gross receipts and 5,080 firms reported gross receipts less than $40,000. This represents 30,355 and 39,172 firms, respectively, in the population.
To provide an indication of the relationship of gross receipts to other data on firms by gross receipts class size the following ratios were calculated from the SBT Simulation model output sorted by Gross Receipts Class.

<table>
<thead>
<tr>
<th>Gross Receipts Class (thousands of dollars)</th>
<th>Number of Firms</th>
<th>Gross Receipts/ Tax</th>
<th>Business Income/ Tax</th>
<th>Gross Receipts/ Compensation</th>
<th>Gross Receipts/Net Capital Deduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 250,000</td>
<td>459</td>
<td>1,574</td>
<td>110</td>
<td>4.41</td>
<td>159.8</td>
</tr>
<tr>
<td>50,000 - 249,999</td>
<td>828</td>
<td>1,568</td>
<td>93</td>
<td>4.10</td>
<td>196.4</td>
</tr>
<tr>
<td>25,000 - 49,999</td>
<td>597</td>
<td>669</td>
<td>40</td>
<td>4.32</td>
<td>62.2</td>
</tr>
<tr>
<td>10,000 - 24,999</td>
<td>1,513</td>
<td>490</td>
<td>21</td>
<td>4.53</td>
<td>41.5</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>1,944</td>
<td>301</td>
<td>11</td>
<td>4.55</td>
<td>43.3</td>
</tr>
<tr>
<td>2,500 - 4,999</td>
<td>3,346</td>
<td>277</td>
<td>9</td>
<td>3.82</td>
<td>18.0</td>
</tr>
<tr>
<td>500 - 2,499</td>
<td>17,531</td>
<td>238</td>
<td>6</td>
<td>3.87</td>
<td>5.5</td>
</tr>
<tr>
<td>0 - 499</td>
<td>120,267</td>
<td>63</td>
<td>63</td>
<td>0.22</td>
<td>89.7</td>
</tr>
</tbody>
</table>

The figures suggest that the sample stratification by Tax Liability class may be preferable to that by gross receipts class because of the large number of firms not reporting gross receipts as evidenced by the large difference in the Gross Receipts/Tax ratio beginning with the class including those firms with less than $40,000 in gross receipts who don't report the amount of gross receipts. Analysis of the data only for firms reporting gross receipts may be useful in the future.

A possible use for the SBT data may be to consider these ratios as proxies for output/labor and output/capital relationships and measures of tax burdens.
### Current Tax Laws by Gross Receipts

<table>
<thead>
<tr>
<th>Gross 6 Receipts Class</th>
<th>Number of Firms</th>
<th>Gross 6 Receipts Number of Sample Firms</th>
<th>Gross 6 Receipts Liability</th>
<th>Tax 28% Business 7 Income</th>
<th>Compensation Net-Capt. Deduct 14</th>
<th>Capital Acoustic Deduct 13A</th>
</tr>
</thead>
<tbody>
<tr>
<td>250000000.00 Plus</td>
<td>120267.00</td>
<td>13338.00 13329963544</td>
<td>212336799.00</td>
<td>13440596480.00</td>
<td>59461687492.00</td>
<td>2188221910.00</td>
</tr>
<tr>
<td>500000000.00 - 49999999</td>
<td>3346.00</td>
<td>1708.00 11556341179</td>
<td>41676174.00</td>
<td>380995135.00</td>
<td>3022025244.00</td>
<td>2570196411.00</td>
</tr>
<tr>
<td>250000000.00 - 49999999</td>
<td>17531.00</td>
<td>3518.00 18452555513</td>
<td>77564641.00</td>
<td>500516551.00</td>
<td>4767805070.00</td>
<td>980538841.00</td>
</tr>
<tr>
<td>100000000.00 - 24999999</td>
<td>1513.00</td>
<td>838.00 22964419800</td>
<td>46885424.00</td>
<td>984526889.00</td>
<td>5074063620.00</td>
<td>262190427.00</td>
</tr>
<tr>
<td>50000000.00 - 9999999</td>
<td>1944.00</td>
<td>1206.00 13307666560</td>
<td>44193324.00</td>
<td>46777800.00</td>
<td>2926735372.00</td>
<td>311790367.00</td>
</tr>
<tr>
<td>25000000.00 - 49999999</td>
<td>597.00</td>
<td>345.00 20670895368</td>
<td>30874133.00</td>
<td>1246839843.00</td>
<td>4787851359.00</td>
<td>326915683.00</td>
</tr>
<tr>
<td>50000000.00 - 24999999</td>
<td>828.00</td>
<td>558.00 89373654489</td>
<td>56569221.00</td>
<td>5241115483.00</td>
<td>21008846655.00</td>
<td>443464972.00</td>
</tr>
<tr>
<td>250000000.00 Plus</td>
<td>459.00</td>
<td>423.00 607583109151</td>
<td>385990556.00</td>
<td>137812881514.00</td>
<td>3746131658.00</td>
<td>3802114891.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>146485.00</td>
<td>21934.00 797238605798</td>
<td>896090273.00</td>
<td>64543120147.00</td>
<td>239746414326.00</td>
<td>8516273499.00</td>
</tr>
</tbody>
</table>

Reference: 21934.00 797238605798 896090273.00 64543120147.00 239746414326.00 8516273499.00 8887264777.00

Difference: 0.0 0.0 0.0 0.0 0.0 0.0 0.0

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*STATE of MICHIGAN*

*SINGLE BUSINESS TAX SIMULATION MODEL*

*RETURN YEAR 1977.12-1978.11*

*11/12/80 20.17.39*

*USING A STRATIFIED RANDOM SAMPLE*

---

*CURRENT TAX LAWS BY GROSS RECEIPTS*
C. ES-202 Employment Data

The Michigan Employment Security Commission collects data on the labor force, employment, unemployment, hours worked and earnings, payroll and unemployment insurance contributions for the state of Michigan. The ES-202 form provides monthly data on employment and payroll (wages) for Michigan employers along with information on business location and type of business as classified by the standard industrial code (SIC).

The first step in identifying the exact information available from the ES-202 forms is an examination of the EDP file description forms for the master ES-202 data tapes. By checking those data items needed for analytical purposes, much of the information contained in the master data file can be omitted from the sample data file to reduce expenses and the cost of computation. Two file formats are necessary as the tape formatting was changed after the third quarter in 1978.

There are two types of ES-202 printouts. The first consists of total employment by 2-digit SIC classifications. The second is broken down into private, federal, state, and local employment by 2-digit SIC classifications. The total employment printout may be used for all private sector wage and salary breakdowns except "Transportation, Communications, and Utilities" (TCU) and "Services." The aggregation of SIC codes that makes up TCU includes SIC 43, which is the Post Office. If the total employment printout is used, Post Office employees would be counted twice -- under both TCU and under
"federal government wages and salaries." Thus, the private industry section of the printout, which excludes SIC 43, must be used since it yields the correct wage and salary total for TCU. Similarly, the SIC codes that are included in the category "services" include publicly funded health and education services. Again, the private sector employment totals must be used in order to avoid counting those employees twice.

The 2-digit SIC classification system roughly follows the following categories:

<table>
<thead>
<tr>
<th>SIC CODE</th>
<th>PRIMARY INDUSTRY CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 9</td>
<td>Agriculture</td>
</tr>
<tr>
<td>10 - 14</td>
<td>Mining</td>
</tr>
<tr>
<td>15 - 17</td>
<td>Contract Construction</td>
</tr>
<tr>
<td>20 - 23, 26 - 31</td>
<td>Nondurable Manufacturing</td>
</tr>
<tr>
<td>24 - 25, 32 - 39</td>
<td>Durable Manufacturing</td>
</tr>
<tr>
<td>40 - 49</td>
<td>Transportation, Communication, and Public Utilities</td>
</tr>
<tr>
<td>50 - 51</td>
<td>Wholesale Trade</td>
</tr>
<tr>
<td>52 - 59</td>
<td>Retail Trade</td>
</tr>
<tr>
<td>60 - 67</td>
<td>Finance, Insurance and Real Estate</td>
</tr>
<tr>
<td>70 - 89</td>
<td>Services</td>
</tr>
</tbody>
</table>

This data file provides an excellent source for information on particular aspects of businesses operating in the state of Michigan.
The next step involves the specification of the sampling methodology most suitable for the tasks at hand. As an objective of this undertaking is to study the impact of changes in public policy and economic conditions on employment across various sized business firms, the sample must be stratified to insure adequate representation of all sizes of establishments.

A review of the data reveals that the variance of employment and earnings across business sizes is greater for "larger" firms than for "smaller" firms (here larger refers to the respective deciles by number employed). Therefore, it is necessary to stratify the sample by overrepresenting firms in the largest decile relative to the number of businesses in the lower deciles to account for the skewed distribution.

The Michigan Employment Security Commission data will be an extract of specific information reported on the ES-202 forms constructed to form a random, stratified, ten to fifteen percent sample of the total number of firms from 1974 to the present. The information is coded to a four-digit SIC level which is converted from the 1957 SIC base to the 1972 SIC base in 1974. An example of the ES-202 data by 2-digit is attached.

The information on the master ES-202 tapes does not include railroads as they have their own unemployment insurance system and did not include non-profit businesses or government employment until recently. The coverage of the agricultural sector is limited due to non-reportage by small entrepreneurs. No breakdown of the sampling distribution is yet available.
D. Merged Micro Data File

The Michigan Single Business Tax micro data file does not provide any direct information on the number of workers employed by each firm. The Michigan Employment Security Commission employment and earnings data derived from the ES-202 forms does not contain any information on the taxation of each firm. In order to assess the impact of changes in Michigan's single business tax on employment, it is necessary to combine the information contained in each of these micro data files to form a merged micro data file.

The merged micro data file will be developed by matching Michigan firms filing both Single Business Tax returns and ES-202 forms during the same period. The merged micro data file will contain all of the information described in the Single Business Tax micro data file and employment information from the Michigan Employment Security Commission ES-202 micro data file.

The sampling-stratification used in creating the Single Business Tax micro data file will be invoked to form the merged micro data file. A computer program yet to be written will search the Michigan Employment Security Commission ES-202 master data file to find employment information on the firms in the SBT sample micro data file, then write the monthly employment data for the firm's corresponding tax year onto a file along with the sample SBT micro data file. It will be necessary to insure that employment data from all establishments is aggregated to the single SBT form for the entire firm.
E. Macroeconomic Data

The employment levels of businesses of different sizes are related to a number of macroeconomic variables as described in sections IV.C and D. This information describes income/output levels, price indices and deflators, wage rates, industrial production, tax revenues, employment levels, Michigan's share of business activities and proxies for disruptions caused by worker strikes. These variables are listed below for quick reference followed by a brief discussion of each. In general, these data items are well known and do not require digressions into their peculiarities.

Summary of Macroeconomic Data

1. Average hourly wage in manufacturing in Michigan
2. Private-nonfarm price deflator
3. Real gross national product
4. Real gross auto product
5. Industrial Production (Durables, Durables-Auto, NonDurables)
6. Michigan's share of car and truck assemblies
7. Real business fixed investment
8. Residential building permits issued in Michigan
9. Real Michigan personal income
10. Consumer Price Index, 1967 = 100
11. Michigan Sales Tax Revenues
12. Wholesale Price Index for Crude Materials less raw food and feed stocks, 1967 = 100
13. Proxies for strikes in the Auto, Construction and Mining Industries
14. Total wage and salary employment in Michigan
15. Government employment in Michigan

The average hourly wage earned in manufacturing in Michigan is available from the Michigan Employment Security Commission on a monthly basis. MESC Form 3086 lists the average hourly wage by two digit SIC classification for those groups with four or more employers in manufacturing and for selected nonmanufacturing industries. This serves as a cost of labor measure.

The private nonfarm price deflator for expenditures is reported monthly by the U.S. Department of Commerce, Bureau of Economic Analysis in the Survey of Current Business. This represents a price index for national markets based on 1972 = 100.

The gross national product provides an estimate of the overall level of macroeconomic activity through measuring the income/earnings accruing to factor inputs or by measuring expenditures on goods and services. This is released monthly by the U.S. Department of Commerce. To arrive at real gross national product, the nominal value is adjusted by the implicit private nonfarm price deflator.

Real gross auto product is a measure of the portion of gross national product originating in the automobile industry deflated to represent constant dollars. This data is published annually in the national income accounts appearing in the U.S. Department of Commerce Survey of Current Business. The information is reported on a quarterly basis.
Macroeconomic production data is calculated by the Federal Reserve Board and reported monthly as the Index of Quantity Output. This data is conveniently compiled monthly in the Survey of Current Business published by the U.S. Department of Commerce with historical time series available in the biennial Business Statistics. The series is available since 1947 on a monthly basis in both seasonally adjusted and unadjusted forms, the adjusted version available in a more disaggregated breakdown of market groupings. Again, this series is well known and needs no further discussion.

Michigan's share of car and truck assemblies reveals the fraction of national assemblies performed in Michigan. This measure is calculated from information contained in the publication Ward's Automotive Reports, published by Ward's Communication, Inc. This data is available on a monthly basis.

Real business fixed investment represents the expenditures firms make on new plant and equipment as reported by the U.S. Department of Commerce in the Survey of Current Business and Business Statistics. The data is available on a quarterly basis though published monthly. To arrive at a constant dollar figure, the nominal value is deflated by the implicit price deflator.

The number of residential building permits issued in Michigan provides an estimate of upcoming construction activity in the state. This data is published monthly by the U.S. Department of Commerce in Construction Review.

The U.S. Department of Commerce, Bureau of Economic Analysis provides quarterly estimates of Michigan personal income by source through its
Regional Economics Information System. The data is available at the two digit standard industrial code classification level on a quarterly basis since 1958. Most recent estimates are subject to revision on a periodic basis with revisions of the entire historical series made at irregular intervals as new information becomes utilized. The personal income figures are seasonally adjusted but may be deseasonalized using the X-11 seasonal adjustment program inverse.

The consumer price index for the Detroit Standard Metropolitan Statistical Area and for the United States is published monthly by the Bureau of Labor Statistics. This series is based on a "market basket" of consumer goods and services which is reevaluated periodically to better approximate a generalized price level index. It is used in this model to deflate Michigan Personal Income based on the year 1967 = 100. Due to the great influence of changing interest rates on the CPI, it is often preferable to use the implicit price deflator for national markets.

The Department of Management and Budget, State of Michigan, in conjunction with the Michigan Department of Treasury compile sales tax revenue collections on a monthly basis. This data is published annually in the Michigan Governor's Budget Message and is available upon request from the Office of Revenue and Tax Analysis. This series provides a measure of retail sales activity in Michigan with the exception of expenditures on food not purchased for immediate consumption (restaurants) and drugs purchased under a doctor's prescription.
The wholesale price index for crude materials less raw food and feed stocks is published monthly by the Bureau of Labor Statistics. This information indicates the relative cost of these materials over time based on 1967 = 100.

Proxies for labor strikes in the auto, construction and mining industries allow the investigator to take account of disruptions in the trend of business as usual. This data is available from the Bureau of Labor Statistics in periodic reports from the Office of Information titled "Work Stoppages."

The Michigan Employment Security Commission provides monthly estimates of the total wage and salary employment in Michigan by two-digit standard industrial code. This information is reported on MESC form 3221 which also includes estimates of the number of government employees.
VI. Data Merging

Work Task #4: Identification of data interface and meshing points and the costs involved in merging data.

A. Introduction

The Michigan Single Business Tax micro data file does not provide any direct information on the number of workers employed by each firm. The Michigan Employment Security Commission employment and earnings data derived from the ES-202 forms does not contain any information on the taxation or sales of each firm. In order to assess the impact of changes in Michigan's single business tax on employment, it is necessary to combine the information contained in each of these micro data files to form a merged micro data file.

The potential exists to merge these two data sources together to create a truly robust picture of Michigan businesses from which considerable insight may be gained about the behavior of small business. Each contains information which, when merged with the other, would provide a more comprehensive picture of each business.

Confidentiality restrictions do not permit the SBT or MESC data to leave Michigan computing systems. Hence, the task would have to be performed by State of Michigan employees from the Department of Treasury and the Michigan Employment Security Commission.

The sampling stratification used in creating the Single Business Tax micro data file could be invoked to form the merged micro data file. A computer program yet to be written, would search the Michigan Employment Security Commission ES-202 master data file to find employment information on the firms in the SBT sample micro data file, then write the monthly employment information for the firm's corresponding tax year onto a file along with the sample SBT micro data file. It is necessary to insure that employment data from all establishments is aggregated to the single SBT form for the entire firm.

The following sections identify the data interface and meshing points and the costs involved in merging data.

B. Micro Data File: Employer Matching

There are a number of items that must be addressed when attempting to merge information collected from two or more sources for different purposes. Each of these considerations will be discussed separately as each presents its own special problems.

1. Employer Matching

In order to merge the information contained in the Michigan Single Business Tax data file with the ES-202 employment and earnings data, it is
necessary to have a common identifier for a firm filing a SBT return and an employer reporting employment and earnings information to the Michigan Employment Security Commission. Fortunately common identifiers exist.

Firms filing the Single Business Tax are required to report the federal employer identification number on line 5a of SBT for C8000. In the event that the business does not have a federal employer identification number, the individual's social security number is reported on line 5b of SBT form C8000. This is referred to as the firm's account number.

All firms reporting employment and earnings to the Michigan Employment Security Commission are required to indicate their federal employer identification number. Hence, the ES-202 data series contains the federal identifier.

The Small Business Administration has developed a program to match two data sets when both sets have federal employer identification numbers. This program could be modified and used to help merge the Single Business Tax and ES-202 data sets. Several problems may still exist. For firms that do not file either the SBT or report employment and earnings through ES-202, no match will be possible and the firms may have to be dropped from the file or retained without the merged data. For firms filing the SBT returns that do not possess a federal employer identification number, only the social security number of the principal owner(s) will appear. Again, it will not be possible to match data sets. Thirdly, clerical errors on the part of both reporting firms and state government employees may result in the incorrect employer identification number appearing on the SBT and ES-202 data files with the obvious consequences.
Depending on the frequency of the above problems, it may be necessary to consider merging the data sets through firm name and address (including zip code) for those firms not matched by federal employer identification numbers. This would increase the amount of effort necessary to develop the merged data file.

2. Firms not covered by Unemployment Insurance

All firms conducting business in Michigan are required to file Single Business Tax returns even if their operations are only for a portion of the year. Unfortunately, not all firms are required to be covered by Unemployment Insurance. It is also possible that not all firms will file a SBT return. For firms that do not file a SBT return and are not covered by Unemployment Insurance, no information is available and the firms will not be represented in the data base.

Firms that must report employment and earnings information are those which are required to make payments into the Michigan Unemployment Compensation Fund because they fall into at least one of the following classifications:

a. Number of Workers/Gross Payroll

An employing unit other than an employer of agricultural or domestic services becomes liable to report retroactive to January 1 of the year in which it has or had total payroll of $1,000 or more for covered services, or one or more employees performing covered services in 20 different calendar weeks.

The twenty calendar weeks in which workers are employed need not be consecutive, and the same individuals need not be employed in each such week.
Workers in all establishments operated by the same employing unit must be included in the count. Part-time workers count the same as full-time workers. If an employee works a shift which starts before midnight Saturday and ends on Sunday, such worker is counted only in the week in which the shift began.

A calendar week which begins on Sunday and ends at midnight Saturday is used in making the count. A week which falls in two calendar years is considered to fall entirely within that calendar year which contains the majority of days of such week.

Effective January 1, 1978, an employing unit that pays $1,000 or more in cash for domestic services performed in a calendar quarter in the current or preceding calendar year, is liable to report.

Effective January 1, 1978, an employing unit that pays $20,000 or more in cash for agricultural services performed in a calendar quarter during the current or preceding calendar year, or employs ten or more individuals in at least 20 different calendar weeks during the current or preceding calendar year to perform agricultural services, is an employer liable to report.

Individuals furnished by a registered crew leader are employees of the crew leader if such leader holds a valid certificate of registration under the Farm Labor Contractor Registration Act of 1963, or substantially all members of the crew operate or maintain mechanized equipment which is provided by the crew leader, and if the crew leader is not an employee of the farm operator.

Agricultural services performed before January 1, 1980 by a non-resident alien, who is admitted to the United States for purposes of such services,
are not covered employment, and the employer is not required to report.

b. Successorship

Any individual, legal entity or employing unit becomes a liable employer by acquiring the organization, trade, business or 75% or more of the assets of another liable employer. The acquisition need not necessarily be by purchase, but could be by rental, lease, inheritance, merger, mortgage foreclosure, etc.

c. Elective Coverage

Any employing unit which is not a liable employer may elect with Commission approval, to become a liable employer and cover its workers.

d. Governmental Entities

As of January 1, 1975, all political subdivisions, public school districts, and community college districts became liable under the provisions of the Act. As of January 1, 1978, the above types of employing units and certain other special districts were included in the definition of "governmental entities" and were so renamed.

e. Federal Liability

Employers are liable under the Federal Unemployment Tax Act (FUTA) if they paid wages of $1500 or more in any calendar quarter or had one or more employees at any time in each of 20 calendar weeks.

As a practical matter, this data series covers almost all employers who have two or more employees. Two notable exceptions are the railroads (they are self insured) and agriculture (limited coverage).

It follows that when the sample of firms is drawn from the SBT micro data file and merged with the MESC ES-202 information, the results will leave some firms without employment information. No solution to this problem has yet been determined.
3. Time Period Covered

The Michigan Single Business Tax (SBT) data is only available for tax years, hence the period of observation is necessarily one year. Thus, as various firms have different tax years it is imperative that the employment information for each firm correspond with the same period of time as the reported tax year.

The SBT data file contains the date of the end of each firm's tax year and allows the determination of the twelve month period covered by the return. The sampling routine has provisions for choosing any consecutive twelve month period as a tax year. One could choose the sample to correspond to fiscal year collections to determine the revenue implications of changes in tax policy.

The employment and earnings information the Michigan Employment Security Commission (MESC) ES-202 micro data file is collected each month for all firms covered by Unemployment Insurance in Michigan. Thus, once the time period covered by a firm's SBT return is identified, the merging requires the employment and earnings data for the corresponding months to be written onto a new file along with the SBT data.

This concept is straightforward, but due to the size of the two data files, this part of the matching process will require considerable computer processing time at a great expense.

4. Aggregation of Establishments to Companies

The Single Business Tax return reports all information for a particular company even though it may have branch offices which operate independently throughout the state. Because of interest in the geographic dispersion of employment and earnings, the MESC ES-202 data is reported by each separate establishment location. Therefore, it is necessary to identify each establishment as a part of a particular company and aggregate the establishment employment and earnings information to the company level.

This task may best be accomplished by first summing the employment and earnings
information for each employer using the employer identification number found on the MESC ES-202 micro data file. Thus, the match up of SBT and MESC companies will only require a one to twelve correspondence (one for each month of employment data). As the first step could be accomplished within the present MESC system, considerable cost savings could be realized.

5. **SBT Three-Digit Versus MESC Four-Digit SIC**

The Single Business Tax micro data file contains a three-digit SIC number for the company filing the return and the MESC ES-202 data reports a four-digit SIC for the reporting establishments. On the surface it appears that additional information could be secured from the MESC data on two counts. First, the four digit SIC could be added to the merged data to provide a more specific description of the company's primary business. Second, as it is possible that several of the establishments of a given company are engaged in different activities as defined by the SIC, information on the proportion of the company's total business that is in each SIC may be derived.

The first premise of more detailed four-digit SIC information is rejected because of the multiplicity of establishments involved. The second premise of an apportionment of the SBT and MESC data by weighting according to establishment four-digit SIC is dismissed due to problems in inferring proportionality of financial data based on employment shares. Hence, the SBT three-digit SIC is retained as the only business type indicator.

6. **SBT Compensation Versus MESC Gross Payroll**

Prior to merging the SBT and MESC data sets there is not much information available for determining which of the measures of employee wage is more useful/accurate. Once the merged data set becomes available, this topic
could be examined to shed light on the practicality of substituting SBT compensation for MESC gross payroll or vice versa. The merged data file should thus include both measures to facilitate comparison.

C. Cost of Data Merging

Several types of costs are involved in merging the SBT and MESC data sets. These costs include systems design, programming design, program debugging, computing time, data tape materials cost, data compatibility testing, data editing and final production costs. The costs of some of these items are easy to estimate while others defy all but the most tenuous of guesses, as this merging has not been attempted before for these data sets.

The following provides an estimate of the costs involved to merge the Single Business Tax micro data file with the Michigan Employment Security Commission employment and earnings data.

<table>
<thead>
<tr>
<th>PROJECT ITEM</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Selection of Current SBT Sample to Merge With Employment Data</td>
<td></td>
</tr>
<tr>
<td>A. Senior Personnel</td>
<td></td>
</tr>
<tr>
<td>1. Principal Investigator</td>
<td>$1,250</td>
</tr>
<tr>
<td>1 month X $2,500 per month X .50</td>
<td></td>
</tr>
<tr>
<td>B. Other Personnel</td>
<td></td>
</tr>
<tr>
<td>4. Clerical - 1 person X 40 hours X $6.75 per hour</td>
<td>270</td>
</tr>
<tr>
<td>E. Materials and Supplies</td>
<td></td>
</tr>
<tr>
<td>Paper, pens, notebooks, folders, etc.</td>
<td>50</td>
</tr>
</tbody>
</table>
J. Consultant Costs

3 days @ $200 per day  $ 600

K. Computer Costs

Single Business Tax Micro Data File  $2,400
Programming Funds  500
Staff - 3 days @ $120 per day  360
Magnetic Tape  50

O. Total Costs for #1  5,480
Q. Amount Requested from SBA for #1  5,480

2. Merging SBT and MESC Data Sets

A. Senior Personnel

1. Principal Investigator
   3 mos. X $2,500 per month X .50  $3,750

B. Other Personnel

4. Clerical - 1 person X 160 hours X $6.75 per hr.  1,080

E. Materials and Supplies

   paper, pens, notebooks, folders, etc.  100

F. Domestic Travel

   2 trips to Washington, D.C. @ $400 per trip  800

56
J. Consultant Costs

15 days @ $200 per day $3,000

K. Computer Costs

SBT/MESC Micro Data File $5,000
Programming Funds 5,000
Data Testing and Editing 5,000
Staff - 30 days @ $120 per day 3,600
Magnetic Tapes 50

O. Total Costs for #2. $27,330
Q. Amount Requested from SBA for #2 27,330

Total Costs for #1 and #2 $32,810

Amount Requested from SBA for #1 and #2 32,810
VII. Utility of Data Sources and Models

Work Task #5: Evaluation of the utility of the data sources for estimating model parameters and simulating and/or forecasting the impact of existing and/or proposed policies.

A. Introduction

Our economic research interests are in determining how the incidence of changes in public policy and economic well-being may be distributed among firms of various sizes. Therefore, the usefulness of the data described in this report depends heavily on its ability to capture the differential impact of changing events on the economic position of various sized firms. To accomplish this goal, the data must possess at least three separate but related characteristics. First, the data items must be distinctly available for different sized firms. This enables researchers to study various economic aspects of a firm by a wide range of arbitrary size classifications. Second, the data items must be available over a number of time periods. This condition allows analysts to examine how particular types of firms behaved as the economic environment changed. Third, the data items must retain similar definitions and reporting procedures over the period of investigation.

This helps to insure that the fluctuations in data values reflect a systematic response to some economic and/or institutional stimulus rather than a change in information compilation and recording.

The degree to which these data sources fulfill the above goals and allow for meaningful estimation of model parameters and simulation/forecasting.
the impact of existing and/or proposed policy changes on various sizes of businesses will be discussed in the context of the models presented in this paper.

B. Single Business Tax Model Data

The seventy-one data items from the Single Business Tax micro data file are available for each firm filing a return and the SBT simulation/forecasting model allows for stratification/selection of firms by size of firms by size of any one of the appropriate variables. However, firms meeting certain criteria are not required to report all of the seventy-one data items. This is particularly a problem for missing gross receipts data as discussed in Section VB which notes that more than 30,000 firms do not report gross receipts data. Hence, the SBT data only partially fulfills the first goal of each data item being distinctly available for all different sized firms.

The SBT has only been in existence for five tax years and therefore severely limits the analysis of how similarly situated firms fared over time due to changes in economic conditions and/or public policy. Sufficient degrees of freedom could be obtained by several methods including disaggregating the information into monthly observations and pooling cross-sectional and time series data. The first method suffers from the problem that only a small sample of the firms report monthly as the majority have so little or no tax liability that they are not subject to withholding. The reporting firms are strongly biased to be "large" firms that bear the majority of the tax. The second method does not really provide the researcher with the desired information. Thus, the SBT data fails the test of providing longitudinal
information of a sufficient time range but this problem will solve itself as time goes on.

The SBT data file appears to achieve the third goal of remaining a consistent source for information on business firms as the definitions have not changed significantly since their creation in 1976 either in the courts or through legislative/institutional influence.

Overall, the SBT data should prove to be very useful estimating the short run impacts of changes in Michigan’s business tax structure on small businesses. The ability of the SBT model to simulate the long run effects of changes in the tax laws is uncertain unless the researcher is able to determine how firms will alter their production technologies and/or input and/or output mixes in response to the change in public tax policy. The model's forecasting ability also depends on the analyst's skill in determining how macroeconomic variables affect the various components of each individual firm's balance sheet as reflected in the data reported on the SBT form. The SBT model allows for investigators to be as selective as necessary to weight the future values of each of the appropriate data items for various types of firms.

C. Econometric Model Data

The Econometric Model is a computer-based estimation/forecasting model used to mimic the relationships between employment and earnings by Standard Industrial Code (SIC) classification and size of firm with macroeconomic production data. This type of configuration attempts to capture the impact of changes in economic conditions on the employment and earnings
the impact of existing and/or proposed policy changes on various sizes of businesses will be discussed in the context of the form models presented in this paper.

B. Single Business Tax Model Data

The seventy-one data items from the Single Business Tax micro data file are available for each firm and the SBT simulation/forecasting model allows for stratification: selection of firms by size of firms by size of any one of the appropriate variables. Hence, this data set completely fulfills the first goal of each data item being distinctly available for different sized firms.

The SBT has only been in existence for five tax years and therefore severely limits the analysis of how similarly situated firms fared over time due to changes in economic conditions and/or public policy. Sufficient degrees of freedom could be obtained by several methods including disaggregating the information into monthly observations and pooling cross-sectional and time series data. The first method suffers from the problem that only a small sample of the firms report monthly as the majority have so little or no tax liability that they are not subject to withholding. The reporting firms are strongly biased to be "large" firms that bear the majority of the tax. The second method does not really provide the researcher with the desired information. Hence, the SBT data fails the test of
providing longitudinal information of a sufficient time range but this problem will solve itself as the clocks tick/beep on.

The SBT data file appears to achieve the third goal of remaining a consistent source for information on business firms as the definitions have not changed significantly since their creation in 1976 either in the courts or through legislative/institutional influence.

Overall, the SBT data should prove to be very useful estimating the short run impacts of changes in Michigan's business tax structure on small businesses. The ability of the SBT model to simulate the long run effects of changes in the tax laws are uncertain unless the researcher is able to determine how firms will alter their production technologies and/or input and/or output mixes in response to the change in public tax policy. The model's forecasting ability also depends on the analysts' skill in determining how macroeconomic variables affect the various components of each individual firm's balance sheet as reflected in the data reported on the SBT form. The SBT model allows for investigators to be as selective as necessary to weight the future values of each of the appropriate data items for various types of firms. Some insight on the approximate weighting scheme may be derived from the Small Business Econometric Model.

C. Econometric Model Data

The Econometric Model is a computer-based estimation/forecasting model used to mimic the relationships between employment and earnings by Standard Industrial Code (SIC) classification and size of firm with macroeconomic production data. This type of configuration attempts to capture the impact of changes in economic conditions on the employment and earnings
for firms of different sizes and then forecast these changes into future periods. This model would provide the beginning for the design of a larger model of the Michigan Economy appropriate for the analysis of the impact of public policy issues on small business.

The employment and earnings data from the MESC ES-202 data file are available for each firm and therefore are distinctly available for different sized firms. This fulfills the first goal. The data has been collected monthly since 1947 allowing a sizeable number of time periods to be observed over a wide range of types of economic activity. This characteristic satisfies the second goal. The data is available on computer tapes only from 1974 to the present making earlier investigations somewhat more difficult.

The third goal: that data items must retain similar definitions and reporting procedures over the period of investigation, presents some problems. Both the coverage of which firms are included in the sample and how the firms are classified have been changed during the period of investigation. Knowledge that the coverage of agricultural firms aids the analyst but as industry structure changes, the workers covered may also change thereby distorting trends. The fact that non-profit concerns and governmental units were not covered until recently (1978) may cause some problems in totals and in time series research.

The Standard Industrial Code (SIC) is used to classify firms by the principal type of business in which they are engaged. This code has a 1967 standard and a 1972 standard. The Michigan ES-202 data switched from the 1967 standard to the 1972 standard in 1974 when the data began to be stored on magnetic tape. If research is conducted from 1974 to some later
period, then no problems arise in reclassifying the firms before 1974. Alternatively, when an analysis of the pre-1974 period is desired, changes would complicate the comparison of employment growth of some types of firms whose SIC may have changed.

Thus, achievement of the third goal leaves something to be desired, however adjustments can be made that allow the employment and earnings data from the MESC ES-202 data file to be relatively consistent.

All of the following macroeconomic variables described in Section V.F are by definition not distinctly available for different sizes of firms. This will provide different relationships between the macroeconomic data and the firm size data thereby satisfying the first goal indirectly.

All of the macroeconomic variables from Section V.F. are available at least quarterly if not monthly over a sufficient number of time periods to allow parameter estimation with reasonable degrees of freedom. Thus the second goal of adequate time series evidence is fulfilled for all of the macroeconomic variables.

The third goal, consistency of definition, is fulfilled by all of the macroeconomic variables except those disaggregated by standard industrial code, Michigan sales tax revenues and BLS price indices. The variables classified by SIC are subject to the definitional changes discussed above. The BLS price indices have been subject to revisions based on the BLS Consumer Household Expenditure Survey in 1967 and 1972. Thus, adjustments
can be made to account for these changes. The Michigan sales tax revenues changed their meaning in 1975 when food and prescription drugs became exempt from sales taxation. A dummy variable to account for this change allows the consistency goal to be approximated.

D. Small Business Model Data

The Small Business Model is a computer-based econometric model which will attempt to utilize a microeconomic data base developed from merging several micro data sources. Taking advantage of the data sources used in the above two models can be used to construct a sample set of firms about which information on both employment and business financial operations are available. The model is designed to estimate the interrelationships that exist between employment or earnings and business income or profit, sales or gross receipts, tax liabilities and asset acquisition (for example). Using the parametric estimates of this model, it would be possible to forecast the impact of changes in public policy and economic conditions on small business.

As this model is a hybrid of the Single Business Tax and the Econometric models discussed above and uses the data sets of both models, the usefulness of the data for estimating model parameters and simulating and/or forecasting the impact of existing and/or proposed policies has already been discussed. It is hoped that the merged data set to be used to estimate and run the Small Business Model will provide more utility to policy makers and technicians than the nonmerged sets. A critical evaluation of the utility of this set is only possible after the data set is created and the model parameters estimated.
VIII. Summary

This project completed all five of the tasks outlined in the proposal and SBA contract SBA-80-2310.

It must be kept in mind that this project is but a first step in building tools to analyze the behavior of small businesses in Michigan. The SBT simulation model is already being used to analyze the impact of changes in Michigan's business tax structure on small businesses as legislators and executive office policy makers are attempting to formulate new tax policies to stimulate small business development and expansion in Michigan (interested parties may inquire about Senate Bills 1197, 1160 and 1161 by writing to the Legislative Service Bureau, c/o the State of Michigan, Lansing, Michigan 48909). However, the much desired analysis of the resultant impact of tax changes on employment is still very indirect.

Other topics that are of interest include a thorough examination of the incidence of the Michigan Single Business Tax and the impact of changing the tax structure on small businesses. The SBT simulation/forecasting model is capable of both of these tasks. Once the merged SBT/MESC data file is created, the impact of changes in the business taxes on employment may be undertaken. Much useful information may be derived from such a data source and analytical model.

The severe downturn in the auto industry and Michigan's strong dependence on that and the durable goods industries have caused the State's fiscal
position to deteriorate rapidly in recent months. Significant budgetary
shortfalls have resulted in numerous rounds of program cutbacks and personnel
layoffs with the situation continuing to worsen through October. By mid-
November the Governor had already reduced the state's fiscal year 1981 budget
by one billion dollars. These circumstances have not permitted work on the
development of a merged SBT/Employment micro data file.

This data source would be of enormous help in providing policy decision
makers with information to aid small business development in Michigan.
As the majority of new jobs are attributed to small businesses and state
resources are severely limited, it is of utmost importance that money be
spent (including tax expenditures) so as to create maximum employment.

The economic conditions prevailing in Michigan are not expected to
return to pre-recessionary levels through 1985. Thus, for work on the data
merging project to continue, non-state funding would have to be secured.

In summary, the project was successful in completing the five tasks
and making available some tools for researchers and policymakers in Michigan
to use in analyzing and understanding how small businesses operate and are
affected by and react to State tax policies. This, in conjunction with the
information gleaned from the series of "Conferences on Small Business" in
Michigan, should provide a basis for public policy recommendations.
ATTACHMENTS


B. Michigan Single Business Tax Micro Data File EDP Description


D. Michigan Single Business Tax Operating Instructions

E. Michigan Single Business Tax Compiled Program Listing

F. Michigan Single Business Tax Sample Output

G. Size Categories to be used in Collapsing Data