to their consequence for current policy, that the bulk of the rest of this paper will be devoted.

## THE CONTENTS OF "CONSUMER EDUCATION IN SCHOOLS"

Consumer Education in Schools (1981) is a particularly important document in relation to the development of consumer education activities, both by the Commission itself and by the appropriate Authorities and other concerned bodies in the various EEC countries. This is not only because it draws attention to the need for appropriate action and what consumer education might include. More important still, are its statements on the overall approach to consumer education in schools and on how it can be incorporated into obligatory education. Of special interest in this respect are its statements relating to the definition of consumer education, to the prospects for its inclusion in school curricula on a multi-disciplinary basis, and to its emphasis on teaching methods which go beyond the transmission of factual content in order to take account of the transmission of skills and the development of critical awareness.

A particular feature of the document is its insistence on the importance of developing consumer education not only in a strict sense - ie, "to enable the consumer to act in a discriminating way and make informed choices between goods and services" - but also in the broader sense of fostering the education of "children to become responsible adult citizens" with a "critical and analytical attitude to consumption and to its place in society", as well as "by increasing their awareness of the consumer's responsibilities" to general societal problems, eg, the environment, energy and the exploitation of natural resources. In all these respects the document goes much further than the 1971 Council of Europe document, seeing consumer education as an essential ingredient not only of consumer protection but also of the responsible exercise of the related rights and responsibilities of citizenship.

## THE PILOT SCHOOLS PROJECT

If the communication on Consumer Education in Schools has been particularly important and influential in setting the base for the development of consumer education in European countries since 1981, the work of the Commission's various initiatives has also been of relevance. The first of these in time was the now well-known Pilot Schools Project (JENSEN, 1984). In this project, some 30 schools were selected in the different Community countries and given support to develop whatever consumer education curricula experience they believed to be valuable.

A particular characteristic of the project was that no restrictions whatever were placed upon the schools, but that the teachers involved were gathered together regularly in Brussels to discuss their progress. The result of this approach was the development of a fascinating range of materials and teaching methods across the whole age range of elementary and secondary education. Moreover, these took account of every aspect of consumer education ranging from issues of health and the environment through to home management, safety and economics. Taken together, therefore, the activities of the Pilot School not only illustrated that consumer education could be integrated into the curricula of the different countries concerned throughout the school age range, but also provided valuable case examples, in each of those countries, of how it might be done. Moreover, in addition to its rich contribution of individual classroom experience, often based on the elaboration of innovative materials and approaches, the Pilot Schools Project also offered important insights of a more general character into the development of consumer education principles. Refreshingly, it did so inductively, starting from the basis of actual experience in classrooms and a consideration of their more general implications. Naturally, some of these were very specific to the particular classroom situations and to the schools and countries in which they arose. Others, however, were clearly of more general application; and, importantly, they added a directly practice-based dimension of insight into general principles to the more usual theory-based ones. At the same time certain of the pilot school experiences provided vivid illustrations of those principles: a feature of particular value in the context of further development.

## THE TEACHER TRAINING PROGRAMME

The next programme, the Teacher Training programme, began with the work of an "expert working party" which carried out surveys of existing teacher training for consumer education in individual Community countries and then set about trying to establish common guidelines. However, from 1981 onwards, a new phase of work began, under my direction, on the basis of an "action programme" of teacher training (Ryba, 1983). This came to be called the European Commission Consumer Education Teacher Training (ECCETT) Programme (Ryba, 1986). What it has developed is a teacher training programme in a not dissimilar way from that adopted for the Pilot School Project. Like the Pilot School Project, the ECCETT Programme has already resulted in a large number of innovative national case studies in the countries which have been involved. In addition it has provided a valuable trigger to further consumer education activities in the individual states. Much as expected by the European Commission, this initiative, having identified the key importance of appropriate pre-service and in-service teacher training in the management of necessary changes in the schools, has been particularly influential in changing attitudes in individual countries and in priming the pump for further consumer education development.

## THE "ECONOMIC COMPONENT OF CONSUMER EDUCATION" PROGRAMME[6]

Alongside the teacher training initiative, again from 1981 onwards, the European Commission also sponsored initiatives on appropriate curriculum development. The most ambitious of these, was the development programme of work on the "Economic Component of Consumer Education", carried out under my direction at Manchester University between 1981 and 1984. This provided a case illustration of what might be done in other components of consumer education, as well as in other countries, not only to create appropriate learning materials but also to develop strategies for their use both in classrooms and in the process of the professional training of teachers. The materials themselves, together with a comprehensive "teacher guidance handbook", were published in 1985. They have already led to further initiatives related to their replication and adaption in other EEC countries[7]. More recently, the Commission has supported the creation for computer assisted learning materials (Trading Standards Department, Mid-Glamogren 1986) and of an important safety pack (William, Alma & Ulrich J, 1989). However, it is clear that much more work of this kind needs to be done in the future.

## THE "CHILDREN'S CONSUMPTION IMAGES" PROGRAMME[8]

Finally, again in the period between 1981 and 1985, the Commission sponsored an innovative international fundamental investigation into "Children's Consumption Images in the EEC". This was carried out in four countries under the direction of the CNRS Laboratory in Lyon[9]. On the surface, these investigations appear to be of a highly theoretical kind, remote from the practical business of consumer education provision in the schools and in teacher training. Yet, in the event, they threw a fascinating light on the development of children's consumer education ideas and on the growth of related patterns of pupil conceptualisation (Albertini, J M, et al, 1985). These are proving to be of particular importance to teachers' understanding of what can reasonably be done in schools.

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[6] This curriculum development project was directed by the author on the basis of funds provided by the European Commission and the Schools Council of the UK from 1981 to 1984.
[7] eg work currently being undertaken by the Curriculum Development Working Group of the European Commission - sponsored Working Committee on Economic Education in EEC Countries.
[8] This programme was conducted under the direction of J M Albertini, Director of the CNRS Laboratory at Lyon, France.
[9] The countries involved were Belgium, France, Germany and the UK. The general outcomes of the research are available in Albertini J M, et al, Les Jeunes, l'Economie et la Consommation, Labor, Brussels, 1985. National reports were prepared by Leclercq D, et al, for Belgium Silem A, et al, for France, Koppen E, et al, for Germany, and Ryba R, et al, for the UK.

## DEVELOPMENTS SINCE 1986

By 1986 work by the European Commission on these programmes had proved to be sufficiently encouraging to enable the Council to accept an historic Resolution on "Consumer Education in Primary and Secondary Schools". This went a great deal further than had previously been possible, laying the foundation for measures to be taken at "Member State" level as well as at the "Community" level.

At the Member State level, the "Competent Authorities" were invited:

> to promote, within the bounds of what is constitutionally possible and in the framework of national legislation and regulations, consumer education in school curricula, at primary and secondary level, as appropriate, so that consumer education is provided during the period of compulsory education. (op.cit., Section I, para 1)

It went on to indicate ways in which this might be done, to suggest appropriate content, and to state five basic rights regarding which teaching should take place:

- the right to protection of health and safety (particularly concerning nutrition and the avoidance of health hazards associated with the use of consumer products),

- the right to protection of economic interests, (particularly with regard to rights and obligations deriving from a signing of contracts, the comparison of prices and qualities of products and services),

- the right of redress (including methods of settling claims),

- the right of information and education (including information supplied by producers and providers of services in addition to that supplied by the public authorities on the laws, regulations and administrative provisions currently in force),

- the right of representation (including consultation and representation facilities offered by consumer associations, as well as their structure and mode of operation) (op.cit., Section I, para 3).

In addition the competent authorities in the Member States were also invited to promote:

- Consumer education in the initial training of teachers and further training of those already in service,

- the development of appropriate teaching materials (op.cit., Section I, para 5).

At the Community level, the European Commission was asked to continue its own programme of activities, with particular reference to the exchange of views "on previous and current experiments at Community level, so as to take account of new needs revealed by the introduction of Consumer Education in primary and secondary schools with respect to teacher training and teaching materials" (op.cit., Section II, para 1). It was also enjoined to organise a continuation of pilot teacher training schemes and the preparation of appropriate training material as well as to encourage the inclusion of consumer affairs questions in higher education (op.cit., Section II, para 2).

## OUTCOMES AND CONCLUSIONS

Today, as a result of the further development of the European Commission's action programmes in the context of this Resolution, culminating in the important European conference on Consumer Education which took place in Madrid last year, it is clear that consumer education action at the Community level has become firmly established and can only be expected to further increase in importance. Currently, preparations are being made by the Commission for a further approach to the Council to ask it to extend its programme of work beyond the areas of schools and teacher training and into that of adult education.

For all that, however, the work that can be done at Community level remains strictly limited by the limited funds made available. It also continues to be restricted to measures which can go no further than influencing and supporting what is done in individual states. So, in assessing the impact of the Commission's work it is more pertinent to try to assess how far it has proved to be "pump-priming" for programmes in those individual states.

In this respect, it is very clear that is has been surprisingly successful. Important national programmes of Consumer Education development have been begun in the last few years, in the wake of the European Commission activities, in almost all of the European Community countries[10]. New materials have been created[11], teacher training programmes put into place (eg in Belgium, France, Ireland, Portugal, Spain and the UK.), guidelines developed, and, in some countries, the beginning of enabling legislation has been laid (eg in France, Portugal and Spain).

Moreover, important links have been created, which previously did not exist to any extent, between specialists in consumer affairs on the one hand and educationists on the other, in the pursuit of further consumer education development. Without doubt, the innovative actions carried out within the context of the European Commission have been a significant factor in this development.

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[10] eg in Belguim, France, Federal Republic of Germany, Ireland, Netherlands, Portugal, Spain, and the UK.
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# USE OF CONSUMER EXPENDITURE DATA TO STUDY THE INCIDENCE OF A STATE SALES TAX: A CASE STUDY OF OHIO.

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## ABSTRACT

The 1984 Consumer Expenditure Survey was used to determine the incidence of the State of Ohio sales tax. The results indicate that even though such basic necessities as food purchased at grocery stores, prescription drugs and rent are exempt from a state sales tax, this tax still falls more heavily on lower income groups; the tax is regressive.

## Executive Summary

The State of Ohio's five per cent sales tax is the second largest source of revenue for Ohio, raising almost three billion dollars in fiscal 1987. This study examines the incidence of the tax, i.e., the relationship between the level of tax paid and the level of income for different groups. The 1984 Consumer Expenditure Survey is used to gather information on the spending patterns of consumers in different income categories. Each expenditure is then classified as taxable or exempt from the State of Ohio's sales tax based upon the Ohio Revised Code. The tax paid by each group is then compared to their level of income.

Five levels of income groups were used. The lowest group paid 5.0 % of their income in sales tax and the next four groups 1.9 %, 1.5 %, 1.3 % and 1.1 % respectively. Our results show that even though such basic necessities as food purchased at a grocery store, prescription drugs and rent are free from the sales tax, the tax still falls more heavily on the lower income groups. Despite the exemption from taxation for some necessities there is only a slight difference between the proportion of expenditures subject to sales tax between the lowest income group (29.3 %) and the highest group (33.0 %.) There is, however, a large difference between the share of income that is spent among the groups. The lowest income group spends substantially more than their income and the result is a large amount of taxable expenditures in relation to their income. The highest income groups save a substantial portion of their income. Income which is not spent is not subject to the sales tax and hence a lower share of their income is devoted to taxable expenditures. Our conclusion is that the sales tax in Ohio is a regressive one, i.e., lower income consumers pay a greater share of their income in sales tax than higher income consumers.

Our conclusion, however, must contain several caveats. The regressive nature of the tax is due to the fact that low-income consuming units spend more than their income and hence pay a great deal of sales tax in relation to their income. The ratio of income to spending would be less if we used a measure of income over a greater period of time where temporary variations in income tend to average out. Our lowest income group also includes students living away from home. An argument could be presented that they should be combined with their families, but that cannot be done with this data set. Finally, although our study shows the sales tax to be a regressive one, it would be prudent to examine the incidence of the other taxes used in Ohio before making any policy recommendations.

There are a number of factors that can be used to evaluate the merits of a specific tax. Among the factors that might be considered are how the tax will affect various economic decisions to produce, consume or invest (economic efficiency), the ease with which the tax can be administered and the equity of the tax. Equity, or fairness, may be viewed either horizontally, do people with similar incomes pay similar amounts of tax, or vertically, the relationship between the tax paid and the level of income for different

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people. The most common method used to examine the vertical equity of a tax is the incidence of the tax, i.e., a comparison of the relationship of the tax paid and the level of income for different groups. This study presents an analysis of the vertical incidence of the State of Ohio's sales tax.

The State of Ohio currently has a five per cent sales tax with an option that allows local governments and transit authorities to add up to an additional three percentage point sales tax of their own. The tax raised almost three billion dollars for the State of Ohio in fiscal 1987 and was the second largest source of revenue behind the personal income tax [4]. In general all consumer purchases are subject to taxation with the exception of food for consumption off the premises where sold, motor fuel, natural gas, electricity, water, prescription drugs and property directly used in manufacturing, mining or agriculture. Some selected services are also subject to the tax. (A detailed listing of sales subject to taxation is presented in Appendix A.)

In this study, information on spending patterns for different income groups is analyzed in light of Ohio's current sales tax legislation, determining whether each expenditure is subject to the sales tax or not. The methodology is a standard one and can be found in works such as Pechman and Okner's 1974 study Who Bears the Tax Burden? [6]. In their study the authors used data from the federal government's 1967 Survey of Economic Opportunity and the Bureau of Labor Statistics' Survey of Consumer Expenditures (CES) to calculate the combined incidence of sales and excise taxes for the United States. Their results show that the combination of sales and excise taxes are regressive for the nation as a whole, i.e., those with higher levels of income tend to pay a smaller percentage of their income in sales tax than those with lower levels of income. In the Pechman and Okner study, the share of income going to pay sales and excise taxes ranged from approximately nine percent for those in the bottom tenth of the income distribution to one percent for those in the top income category. Although this study is a landmark, it does not separate out the incidence of the sales tax from the excise tax and the information is not specific to Ohio.

A study conducted by Phares using 1975 data is more similar in nature to this one [7]. Phares gathered information on the spending patterns of consumers from the United States Bureau of Labor Statistics Consumer Expenditure Survey (CES.) He then determined whether each expenditure was taxable and compared the tax level to income for Ohio and all other states with a state sales tax. His results showed that the incidence ranged from 2.40 % for Ohio taxpayers with income under $3,000 to 1.17 % for those with income over $35,000. In general, the incidence declined as the level of income increased over 14 income classes.

This study uses 1984 data on the Consumer Expenditure Survey supplied to us by the United States Department of Labor to examine expenditure patterns. The data are more detailed than those presented in the published CES reports. The data in this study contain the detailed information that is aggregated to form the statistics found in the published form. After determining whether each expenditure category is subject to sales taxation under the laws of the State of Ohio, the sales tax paid is compared to the level of income to determine the incidence of the tax. Our results are consistent with the more general findings of Pechman and Okner and Phares, showing that the sales tax is a regressive tax. This conclusion, however, must be tempered with the fact that the sales tax accounts for only one third of the revenue of the State of Ohio [4]. To determine the overall incidence of taxes in the State of Ohio one would also have to examine the incidence of the personal income, corporate franchise, public utility, excise and other taxes. This study is more limited in nature, conducting a detailed analysis of the incidence of the sales tax, only.

Description of the Data

The source of data on consumer expenditures is the 1984 Consumer Expenditure Survey (CES) published by the United States Department of Labor's Bureau of Labor Statistics. The 1984 CES is the most recently available survey as of 1987. The primary purpose of the CES is to collect information on direct expenditures for various goods and services. The sample is composed of

90,223 total and 74,884 urban consuming units, representing a national probability sample of the United States civilian population.[1] The survey also provides information of various other characteristics of the sample. Table 1 presents characteristics of both the total and urban samples used in this analysis. Although our analysis primarily uses the total sample figures, we report the results for the urban sample as well.[2]

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[1] The Consumer Expenditure Survey began in 1980 and consists of an Interview Survey asked of consuming units every three months for a 12 month period called, and a Diary Survey in which consuming units are asked to record their purchases for two consecutive one week periods. Data for this study were taken from the Interview Survey. The Bureau of Labor Statistics defines a consuming unit as: "(1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangement; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who pool their income to make joint expenditure decisions." (Bulletin 2267, p. 46)

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[2] The profiles of both these groups are almost identical in terms of the size of the consuming unit, the age of the person reporting the consuming unit's expenditure patterns, the number of earners within the unit, the number of vehicles within the unit and the number of persons either under age 18 or over age 65. There is approximately a $1,000 difference in both the average before tax and after tax income of the total and urban sample, the latter group having the higher income. In addition, 46 percent of the urban respondents had post-secondary education whereas only 43 percent of the total respondents had done so. The majority of the total group were evenly distributed between renters and home owners with mortgages. Some of these variations will be discussed later in the report in a comparison of the incidence of the state sales tax on urban and total consuming units.

It should also be noted that the survey is for the nation as a whole and is not confined exclusively to the residents of Ohio. No other survey has such detailed reporting of expenditure by income class, so the decision was made to use this survey. We assume that national expenditure patterns do not differ markedly from those found in Ohio.

The income data compiled by the CES represents quintiles of income before taxes. This refers to total money income before taxes for the entire consuming unit during the 12 month period preceding the interview date of the survey. It includes wages and salaries, self-employment income, social security and any other type of pension or government retirement income, interest, dividends, rental income, and other property income, unemployment and worker's compensation, veteran's benefits, public assistance or welfare income of any sort, regular contributions of alimony and child support, and any other income such as pay or stipends.

Table 1. Characteristics of the Samples Used in The Consumer Expenditure Survey

| CHARACTERISTICS | TOTAL | URBAN |
|---|---|---|
| Income before taxes | $23,457 | $24,578 |
| Income after taxes | $20,959 | $21,908 |
| Number of persons in unit | 2.6 | 2.6 |
| Age of respondent | 46.7 | 46.2 |
| Numbers of earners in unit | 1.4 | 1.4 |
| Number of vehicles in unit | 1.9 | 1.9 |
| Persons under age 18 | .7 | .7 |
| Persons age 65 and over | .3 | .3 |
| Respondents high school education (9-12) | 43% | 42% |
| Respondents post-high school attendance | 43% | 46% |
| Homeowners with mortgages | 38% | 39% |
| Homeowners without mortgages | 25% | 22% |
| Renters | 38% | 40% |

The consuming units were ranked according to income and divided into quintiles (fifths). Consuming units with incomplete income records were omitted from the analysis by the Bureau of Labor Statistics, reducing the sample to 81,178 total and 67,438 urban consuming units.[3]

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[3] Some biases in the data may exist given the removal of the incomplete income reporters. Incomplete income reporters are typically either at the extreme low or high end of the income scale. Those at the lower end are often recipients of mean income tested support programs and may fear the loss of benefits. Those at the high end of the scale are often concerned with issues of confidentiality and taxes.

Expenditures refer to the amount paid for various goods and services purchased during the interview period including the purchase price and all excise and sales taxes. Excluded from consideration are purchases made for business purposes or any installment credit payment on purchases made prior to the interview period. The categories of expenditures analyzed here are presented in summary form in Table 2. The subcategories from which these general categories were derived are presented in Appendix B.

As noted above, these expenditure data reflect purchases that were made during the interview period. Specifically, they represent mean expenditures for a particular item calculated over the entire sample "regardless of whether or not a particular consuming unit reported an expenditure for that item" [8]. Hence, these data represent the mean expenditure of those who purchased as well as those who did not purchase a particular item during the period [8].

## Analysis of Expenditures

Categories of consumer expenditures were classified as either taxable or tax exempt based upon State Sales Tax Sections of the Ohio Revised Code. The mean expenditures on taxable items, within each income quintile were then summed. This mean expenditure was then divided by mean before tax income to determine the percentage of income each quintile spent on taxable goods and services. This mean expenditure was also multiplied by the state sales tax rate and the result divided by income to determine the percentage of income spent on sales tax. A description of the rational used in categorizing items as either taxable or tax exempt is presented in Appendix A, along with any assumptions made where the law could not easily be applied to the category description. The words "taxable" or "exempt" refer to whether an item is subject to or exempt from the Ohio State Sales Tax. The results of this analysis are presented in Table 2.

Table 2. The Relationship of Income, Taxable Expenditure and Sales Tax by Income Class

|  | Lowest 20% | Second 20% | Third 20% | Fourth 20% | Highest 20% |
|---|---|---|---|---|---|
| Income Before Tax (IBT)* | $3,162 | $10,235 | $18,333 | $29,005 | $56,424 |
| Income After Tax (IAT)* | 3,129 | 9,700 | 16,632 | 26,053 | 46,169 |
| Total Expenditures: | 10,832 | 13,512 | 18,077 | 24,471 | 39,246 |
| Exempt | 7,524 | 9,427 | 12,344 | 16,671 | 25,976 |
| Taxable | 3,308 | 4,085 | 5,733 | 7,800 | 13,270 |
| Taxable Exp as % of Total Exp | 30.5% | 30.2% | 31.7% | 31.8% | 33.8% |
| Sales Tax | $165 | $204 | $287 | $390 | $664 |
| Sales Tax as % of IBT | 5.2% | 2.0% | 1.6% | 1.3% | 1.2% |
| Sales Tax as % of IAT | 5.3% | 2.1% | 1.7% | 1.5% | 1.4% |

* - Taxes here refer to all federal, state and local taxes.

Before discussing the incidence of the tax, we must note that (1) the level of expenditures exceeds the level of income for the lowest two income quintiles and (2) the distribution of income by quintile is more dispersed than in other data sources. These phenomena are due to the nature of the data employed. No survey offers as much detailed description of expenditure by income category as the Consumer Expenditure Survey. The survey, however, has as its unit of observation the consumption unit rather than the family, household or individual. The population surveyed includes:

the civilian non-institutionalized population of the United States as well as that portion of the institutionalized population living in the following group quarters: Boarding houses, housing facilities for students and workers, staff units in hospitals and homes for the aged, infirm, or needy, permanent living quarters in hotels and motels and mobile parks.[8].

The result is that those individuals living in group quarters are treated as separate consuming units. In other surveys they would either not be included in the population analyzed or would be grouped with others in determining expenditures. Hence, this more broadly defined population with a greater proportion of low income individuals leads to a more dispersed distribution of income. The large number of people in group quarters, many of whom have low incomes and spend more than they earn, helps account for the fact that the bottom two quintiles consume a quantity greater than their income.

The CES also counts the purchase of big-ticket items in the year of purchase. Hence, the total purchase price of an item bought on credit would fall in one year's expenditure even though the credit payments would be made over several years. This also helps explain the fact that expenditures exceed income for the bottom forty percent of the population.

Two other factors must be considered. Individuals whose incomes fluctuate a great deal from year to year tend to spend in relation to their permanent or average income more than in relation to their income in any given year. In years when these people have low income (or show business losses) they will tend to spend much greater amounts than people who consistently have little or no earnings. The greatest degree of business losses is found in the bottom income group. Hence, many of these people spend in relation to their more normal earnings and consume an amount greater than their income. Finally, there is a suspicion by many of the survey respondents that any income included in the survey will be reported to the Internal Revenue Service. Although the Bureau of Labor Statistics assures people that this is not the case, some people will still hesitate to accurately report income. Expenditures, however, tend to be more accurately recorded.

With these considerations in mind we may now turn to the question of incidence. We see that the level of income is inversely related to the share of the income that is paid out in sales tax, i.e., the State of Ohio's sales tax is regressive. At first glance this may appear to be somewhat surprising, as such basic necessities as food bought at a grocery store, medicine and rent are free from taxation. These items make up a greater share of the expenditures by low income consuming units and would lead one to believe that they would pay a smaller share of their income in tax.

Table 2 shows part of the reason why the tax is not progressive. We see that there is only a small difference between the share of expenditures subject to sales taxation between the lowest income quintile (30.5%) and the highest income group (33.8%.)

There is a vast difference between the share of _income_ that is spent between these quintiles. As the table shows, the lowest two quintiles have expenditures much greater than their income and hence find the state sales tax is a much larger share of their income.[4]

## Summary and Conclusion

In this study we have attempted to determine the incidence of the State of Ohio's Sales tax. We used detailed information on consumer spending patterns from the Consumer Expenditure Survey to examine how spending patterns varied with the level of income. These expenditures were classified as either taxable or tax exempt according to the Ohio revised codes. The tax paid was compared to the level of income and the results show that those consumer units in the bottom fifth in terms of income pay approximately 5.2% of their income in sales tax. The remaining four groups, from lowest to highest, pay 2.0%, 1.6% 1.3% and 1.2% of their gross income in taxes. Our conclusion is that the sales tax in Ohio is regressive.

Our conclusion, however, must contain several caveats. The regressive nature of the tax is due to the fact that low-income consuming units spend more than their income and hence pay a great deal of sales tax in relation to their income. The ratio of income to spending would be less if we used a measure of income over a greater period of time. The income of those with business losses would rise as those years showing losses would be averaged in with years of increased income and they would move up in the income distribution rather than fall in the bottom group. Our lowest income group also includes students living away from home. An argument could be presented that they should be combined with their families, but that cannot be done with this data set. Finally, although our study shows the sales tax to be a regressive one, it would be prudent to examine the incidence of the other taxes used in Ohio before making any policy recommendations.

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[4] The analysis was performed again with the urban sample and the results were basically the same. The tax appears to be regressive using either survey.

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   Washington, D.C.: United States
   Government Printing Office, 1986.

## SUMMARY

| | Lowest 20% | Second 20% | Third 20% | Fourth 20% | Highest 20% |
|---|---|---|---|---|---|
| Income before taxes | $3,162 | $10,235 | $18,333 | $29,005 | $56,424 |
| Income after taxes | $3,129 | $9,700 | $16,632 | $26,053 | $46,169 |
| Expenditures: | | | | | |
| Exempt | $7,524 | $9,427 | $12,344 | $16,671 | $25,976 |
| Taxable | $3,308 | $4,085 | $5,733 | $7,800 | $13,270 |
| Total Expenditures | $10,831 | $13,512 | $18,077 | $24,471 | $39,246 |

## CALCULATIONS

| | Lowest 20% | Second 20% | Third 20% | Fourth 20% | Highest 20% |
|---|---|---|---|---|---|
| Sales Tax (5% of Taxable Expenditures) | $165 | $204 | $287 | $390 | $664 |
| Sales Tax as % of IBT | 5.23% | 2.00% | 1.56% | 1.34% | 1.18% |
| Sales Tax as % of IAT | 5.29% | 2.11% | 1.72% | 1.50% | 1.44% |
| Taxable Exp. as % Total Exp. | 30.54% | 30.23% | 31.72% | 31.86% | 33.81% |
| Taxable Exp. as % IBT | 104.61% | 39.91% | 31.27% | 26.89% | 23.52% |
| Total Exp. as % of IBT | 342.53% | 132.02% | 98.60% | 84.37% | 69.56% |
| Total Exp. as % of IAT | 346.16% | 139.30% | 108.69% | 93.93% | 85.01% |

## SUMMARY

| | Lowest 20% | Second 20% | Third 20% | Fourth 20% | Highest 20% |
|---|---|---|---|---|---|
| Income before taxes | $3,162 | $10,235 | $18,333 | $29,005 | $56,424 |
| Income after taxes | $3,129 | $9,700 | $16,632 | $26,053 | $46,169 |
| Expenditures: | | | | | |
| Exempt | $7,981 | $9,784 | $13,017 | $17,505 | $27,083 |
| Taxable | $3,367 | $4,080 | $5,964 | $8,019 | $13,852 |
| Total Expenditures | $11,347 | $13,864 | $18,981 | $25,525 | $40,935 |

## CALCULATIONS

| | Lowest 20% | Second 20% | Third 20% | Fourth 20% | Highest 20% |
|---|---|---|---|---|---|
| Sales Tax (5% of Taxable Expenditures) | $168 | $204 | $298 | $401 | $693 |
| Sales Tax as % of IBT | 5.32% | 1.99% | 1.63% | 1.38% | 1.23% |
| Sales Tax as % of IAT | 5.38% | 2.10% | 1.79% | 1.54% | 1.50% |
| Taxable Exp. as % Total Exp. | 29.67% | 29.43% | 31.42% | 31.42% | 33.84% |
| Taxable Exp. as % IBT | 106.47% | 39.86% | 32.53% | 27.65% | 24.55% |
| Total Exp. as % IBT | 358.86% | 135.46% | 103.54% | 88.00% | 72.55% |
| Total Exp. as % IAT | 362.64% | 142.93% | 114.12% | 97.97% | 88.66% |

DETERMINANTS OF HOUSEHOLD EXPENDITURES FOR SERVICES

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## Abstract

The objectives of this research were to inves-
tigate factors influencing household expen-
ditures for services in the United States
including the opportunity cost of time and time
spent in the labor force by two-earner families.
Quarterly data from the 1984-85 BLS Consumer
Expenditure Survey, Interview Panel Surveys were
used in the analysis and yielded a sample size
of 700. Tobit analysis was used since not all
households had expenditures for child care,
clothing care or domestic services. The results
of the analysis provide strong support for the
household production model and the need to con-
sider both time and budget constraints in ser-
vice expenditure decisions.

## INTRODUCTION

Increased labor force participation by married
women has been one of the major social and eco-
nomic changes in the United States in the past
two decades. Labor force participation rates by
married women have increased from 31 percent in
1960 to 56 percent in 1987 (U.S. Department of
Commerce, 1987, p. 374). For married women aged
25-34 with husband present these rates have
increased from 28 percent in 1960 to 68 percent
in 1987. The corresponding figures for women
aged 35-44 are 36 percent and 72 percent respec-
tively. Increases have also been obtained for
married women with child under six. Labor force
participation rates for these women have in-
creased from 19 percent in 1960 to 57 percent in
1987 (U.S. Department of Commerce, 1987, p.
374). According to some analysts the percentage
of women in the labor force suggests that by
1995, over 80 percent of all mothers with chil-
dren at home will be working (Bureau of National
Affairs, 1986).

The increase in labor force participation rates
for women has been identified by Senauer (1983)
as one of the four major changes affecting con-
sumer expenditures. The other changes were
changing age structure, greater diversity in
family buying patterns and increased economic

uncertainty. It has led to the recognition that
time is a major resource constraint and the
identification of major strategies that might be
used by working wives to reduce time pressures
(Strober and Weinberg, 1980; Nichols and Fox,
1983). These strategies include substituting
capital equipment for household labor, and sub-
stituting paid labor for household labor.

The objective of this research were to inves-
tigate factors influencing household expendi-
tures for services in the United States includ-
ing the opportunity cost of time and time spent
in the labor force by household members. The
analysis was confined to two-earner households
in which both husband and wife worked since data
on the opportunity cost of time were needed for
both family members. Thus, the separate impact
of all work related variables on service expen-
ditures could be investigated.

## WIFE'S EMPLOYMENT STATUS AND MAJOR FAMILY EXPENDITURES

One of the first major studies in this area was
by Strober and Weinberg (1977). The authors
examined working wife and non-working wife fami-
lies with respect to purchases of time-saving
durables and other durables. Data were obtained
from the 1968 Michigan Survey Research Center
Panel Survey of Consumer Finances. The sample
was confined to husband-wife families in which
the husband was under the age of 65. The
results indicated that employment status of wife
was not significant in explaining purchase
decisions for time-saving durables once total
family income, which was significant, was held
constant.

A later study by Weinberg and Winer (1983) was
designed to update and replicate the study by
Strober and Weinberg. Data were obtained from
the 1977 Michigan Survey Research Center Survey
of Consumer Credit. Again the sample was con-
fined to husband-wife families in which the
husband was under the age of 65. The dependent
variables were the purchase decisions and expen-
ditures for time-saving durables and other dur-
ables. The results were in agreement with the
earlier study. Thus, working wife households
did not differ significantly from non-working
wife households with respect to purchase
decisions or expenditures once the impact of
family income was taken into account.

Strober and Weinberg (1980) used data from a
1977 survey of 2,000 married women who were
members of a Market Facts Mail Panel to inves-
tigate the use of Strategy 1. The authors

concluded that neither wife's employment status nor recent entry into the labor force were significant determinants of the purchase or ownership of labor-saving durables once income and family life cycle were held constant. Nichols and Fox (1983) used data from a study of household production activities conducted in eleven states from 1977 to 1979 for husband-wife families. They also found that employed wives did not substitute capital equipment for household labor. However, the use of purchased services and labor substitutes varied by wife's employment status with child care emerging as a major strategy for many working-wife families.

A more recent study by Bryant (1988) investigated expenditures on consumer durables and wife's employment status using data from 1977-78 Survey of Consumer Credit. Time spent in the labor force by wives was treated as an endogenous variable necessitating an instrumental variable approach. Bryant found that the impact of wife's employment status on durable goods expenditures was negative and significant in contrast to the findings of earlier studies. However, Bryant's sample of durable goods was extensive and included many durables which were more related to leisure activities than to time-buying or time-saving activities. It is thus, not surprising that his results differed from those of other researchers.

Bellante and Foster (1984) focused on the relationship between wife's employment status and expenditures on time-saving services using data from the 1972-73 BLS Consumer Expenditure Survey. The dependent variables were expenditures on food away from home, child care, clothing care, domestic services, personal care and total services. The results of the OLS regression analysis indicated that education and labor force participation of wife were significant in determining expenditures for many service categories in addition to family income and family life cycle.

## PROCEDURE

The theoretical model is first discussed followed by the selection of dependent and independent variables and analysis. Data used in the analysis and sample characteristics are given in the last section.

### Theoretical Model

The household production function model was used to identify the major explanatory variables for services expenditures (Becker 1965, Michael and Becker 1973). The characteristics of the model are as follows:

(1) Utility Function : $U = h(Z_1, Z_2, \cdots, Z_n)$

(2) Production Function : $Z_i = z_i(x_i, t_i, E)$

(3) Market Goods Constraint : $\sum p_i x_i = w t_w + V$

(4) Time Constraint : $T_k = t_{wk} + \sum t_{ik}$,
$$k = 1, 2, \ldots, m$$

where

$Z_i$ = commodity produced in the household

$x_i$ = vector of market goods used in the production of $Z_i$

$t_i$ = vector of time inputs used in the production of $Z_i$

$t_{ik}$ = time spent in the production of $Z_i$ by individual k

$t_w$ = vector of time inputs used in market production

$t_{wk}$ = time spent in market production by individual k

$T_k$ = total time available to each household member for household and market product

$P_i$ = price vector for $x_i$

$w$ = wage rate vector

$V$ = unearned income

and $E$ = technology of household production.

The market goods and time constraints may be combined into one resource constraint as follows:

(5) $\sum (p_i x_i + w t_i) = wT + V = S$

where T is a vector of total time available to the household and S is the "full income" of the household if all time is devoted to market production.

Maximization of the utility function subject to the constraints of the production function and "full income" yields the first order conditions that the ratio of the marginal utilities of any two commodities $Z_i$ and $Z_j$ must equal the ratio of their marginal costs. In addition we obtain

(6) $\dfrac{MU_i MP_{ik}}{MU_j MP_{jv}} = \dfrac{P_{fik}}{P_{fjv}}$

where fik is the factor k (either goods or time) used in the production of $Z_i$ and fjv is the factor v (either goods or time) used in the production of $Z_j$. This household production function model provides a rationale for the substitution of paid labor for household labor as follows:

1. An increase in w, other factors constant, will increase the opportunity cost of time spent in household production and encourage

the substitution of $x_i$ for $t_i$ in household production.

2. An increase in $t_w$, other factors constant, will decrease the amount of time available for household production and encourage the substitution of $x_i$ for $t_i$ in household production.

3. An increase in V will increase the demand for $Z_i$ assuming $Z_i$ is a normal good. Since the total time available for market and household production is limited, an increase in V will encourage the substitution of $x_i$ for $t_i$ in household production.

### Selection of Dependent Variables

The dependent variables were household expenditures on total services as well as expenditures on major service categories such as child care, clothing care, domestic services, food away from home and personal care. These were the same service categories that had been used by Bellante and Foster (1984).

### Selection of Independent Variables

The following independent variables were selected based on Becker's model of household production (Becker 1965) and previous research.

Household Production Variables  These variables included the opportunity cost of time which is measured by the wage rate, time spent in market production, and unearned income. They were hypothesized to have a positive impact on service expenditures based on the household production model.

Family Life Cycle and Family Composition Variables  These variables included age of wife, the number of children aged 0 to 2 and 3 to 5 and the number of persons in the household excluding children under six. Age and the number of children under six were used to represent stages in the family life cycle while the number of children and the number of persons in the household were used to represent the demand for household services.

Education of Wife  This variable was included to allow for variations in tastes and preferences. In addition, educational achievement is expected to increase efficiency in non-market production and the household's real income which in turn should increase expenditures on services (Michael and Becker 1973).

Race of Husband  This variable was included to determine the impact of race on expenditures on services. It was hypothesized that white families would spend more on services than black families with the exception of clothing care.

Location  Urbanization was the location variable. It was hypothesized that families in urban areas would be more likely to substitute paid labor for household labor than families living in rural areas.

Home Ownership  This variable is also related to the demand for household services and was expected to increase the demand for services.

### Analysis

Two assumptions were made for the empirical analysis. First, it was assumed that hours spent in the labor force in a given year were exogenous. This assumption is keeping with the emergence of two-earner households in the United States so that the wives' earnings are treated as a permanent income rather than as transitory or secondary income. The treatment of hours worked as exogenous variables for both husbands and wives reflects the fact that many workers face constraints on hours of work and cannot change jobs readily due to imperfect mobility or imperfect information (Killingsworth 1983, pp. 46-66).

Tobit analysis was used to examine the impact of explanatory variables on household expenditures on services. Tobit analysis is required in the case of a censored sample, i.e. complete data are available for the independent variables while missing or zero observations exist for the dependent variable (Maddala 1983). This is likely to occur in the case of specific service categories such as domestic services or child care. In addition separate analyses were performed for families with full-time and part-time working wives. The equality between the sets of coefficients in the two groups was tested using the likelihood ratio test (Kinsey 1983).

### Data Used in the Analysis

Quarterly data from the 1984-1985 BLS Consumer Expenditure Survey, Interview Panel Surveys were used in the analysis. Approximately 5,000 households are interviewed each quarter for five quarters. The household is replaced by a new unit after the fifth and final quarter. According to Garner (1988) the data are the most comprehensive source of information on household expenditures and income at the national level. Survey households selected for the study were two-earner households where both husband and wife worked. In this manner it was possible to investigate the impact of household production variables on service expenditures. Complete earnings and expenditure data for four successive quarters were available for 700 households. The percentage of households reporting expenditures on services and annual expenditures for these households are given in Table 1. Domestic services (38 percent) and child care services (42 percent) accounted for the fewest number of households while personal care (95 percent) and food away from home (99 percent) accounted for the largest number of households. Annual expenditures for purchasing households ranged from

$118 for clothing care to $1,000 for child care.

TABLE 1.  Annual Service Expenditures by Service Category:  1984-85, N=700

| Service Category | Households with Service Expenditures | | Annual Expenditures |
|---|---|---|---|
| | Number | Percentage | Mean ($) |
| Child Care | 294 | 42 | 1,000 |
| Clothing Care | 548 | 78 | 118 |
| Domestic Services | 264 | 38 | 322 |
| Food Away From Home | 692 | 99 | 872 |
| Personal Care | 663 | 95 | 253 |
| Total Services | 700 | 100 | 1,735 |

Characteristics of the sample are given in Table 2.  The mean annual earnings for wives amounted to $12,666 compared to $26,322 for husbands. Unearned income accounted for only 4 percent of total household income.  The average number of children under six years was 0.47 while the average number of persons in the household, excluding children under six, was 2.73.

The dominant age group for wives was 25 to 34 years (46 percent) followed by 35 to 44 years (27 percent).  The dominant education category for wives was high school graduate (39 percent) followed by some college (25 percent).  These two highest levels of education accounted for 27 percent of the sample.

Race was based on the race of husband following the procedure used by Bellante and Foster (1984).  The race of wife was identical to that of the husband 99 percent of the time.  The dominant race was white (87 percent) while black families accounted for less than 10 percent of the sample.  The great majority of families resided in urban areas and owned their own homes.

## RESULTS

The results of the Tobit analysis for all six expenditure categories are given in Table 3. The coefficients, asymptotic t-ratios, and likelihood ratio statistics are given for each of the six dependent variables.  The likelihood ratio statistics are significant in all instances indicating that the model is significant in explaining variations in service expenditures.

The results for the household production variables are of interest in several respects. First, unearned income is significant in five out of six instances where its coefficient is positive as hypothesized.  The exception is child care which is somewhat surprising.

TABLE 2.  Sample Characteristics, N=700

| Variable | Definition | Mean or Percentage |
|---|---|---|
| **Household Production** | | |
| UNINC | Annual Unearned Income ($) | 1,736.00 |
| WAGEW | Hourly Wage Rate of Wife ($) | 8.38 |
| HOURW | Number of Hours Worked per Year by Wife | 1,511.49 |
| WAGEH | Hourly Wage Rate of Husband ($) | 12.32 |
| HOURH | Number of Hours Worked Year by Husband | 2,136.51 |
| **Family Composition** | | |
| CHLD1 | Number of Children Aged 0-2 Years | 0.24 |
| CHLD2 | Number of Children Aged 3-5 Years | 0.23 |
| FSIZE | Number of Persons in Household minus the Number of Children under Six Years | 2.73 |
| **Age of Wife** | | |
| AGEW1 | Less Than 25 | 8.0% |
| AGEW2 | 25 to 34 Years Old | 46.3% |
| AGEW3 | 35 to 44 Years Old | 27.3% |
| AGEW4 | 45 to 54 Years Old | 10.6% |
| AGEW5 | Greater Than 54 | 7.9% |
| **Education of Wife** | | |
| EDUW1 | Never Attended School or Elementary or Some High School | 8.9% |
| EDUW2 | High School Graduate | 39.3% |
| EDUW3 | Some College | 25.3% |
| EDUW4 | College Graduate | 13.9% |
| EDUW5 | Some Graduate Education | 12.7% |
| **Race of Husband** | | |
| RACE1 | White | 87.4% |
| RACE2 | Black | 8.6% |
| RACE3 | Others (Asian, Pacific Islander, Aleut, American Indian, Eskimo, etc.) | 4.0% |
| **Location of Household** | | |
| URBAN | Urban | 88.6% |
| RURAL | Rural | 11.4% |
| **Home Ownership** | | |
| OWNER | Own Throughout Year | 77.3% |
| RNTER | Rent Part or All of Year | 22.7% |

Second, the number of hours worked each year by husband and wife and the wage rate of the husband are all significant for clothing care, food away from home, personal care and total services where the coefficients are again positive as hypothesized.  The wife's wage rate is significant for child care, domestic services and total services.  Only the wage rate and hours worked by the wife are significant in the case of child care.  This result is in keeping with the fact that child care is a primary responsibility of the female parent so that working wives must

TABLE 3.  Results of Tobit Analysis for Service Expenditures[a]

| Independent Variable | Dependent Variable | | | | | |
|---|---|---|---|---|---|---|
| (Reference Group in Parenthesis) | Child Care | Clothing Care | Domestic Services | Food Away From Home | Personal Care | Total Services |
| INTERCEPT | -2471.75 (-6.27)*** | -47.12 (-1.03) | -899.49 (-2.59)*** | 88.48 (0.51) | -36.27 (-0.68) | -531.72 (-1.61) |
| UNINC | 0.02 (1.09) | 0.00 (2.91)*** | 0.03 (2.70)*** | 0.02 (3.60)*** | 0.00 (2.40)** | 0.04 (3.80)*** |
| WAGEW | 5.30 (1.77)* | 0.37 (0.82) | 5.91 (1.78)* | 1.10 (0.61) | 0.62 (1.12) | 10.62 (3.08)*** |
| HOURW | 0.43 (5.84)*** | 0.02 (1.91)* | 0.03 (0.40) | 0.12 (3.51)*** | 0.02 (1.76)* | 0.38 (5.86)*** |
| WAGEH | -0.64 (-0.13) | 1.12 (2.52)** | 5.96 (1.83)* | 3.83 (2.21)** | 1.54 (2.88)*** | 9.60 (2.89)*** |
| HOURH | 0.14 (1.53) | 0.06 (5.42)*** | 0.11 (1.39) | 0.19 (4.79)*** | 0.06 (5.08)*** | 0.41 (5.35)*** |
| CHILD1 | 1229.65 (10.83)*** | -26.22 (-1.68)* | -87.64 (-0.72) | -59.34 (-1.00) | -22.80 (-1.24) | 454.12 (4.01)*** |
| CHILD2 | 1508.86 (13.85)*** | -37.91 (-2.49)** | -74.29 (-0.62) | -90.85 (-1.57) | 3.53 (0.20) | 646.19 (5.84)*** |
| FSIZE | 223.42 (3.43)*** | -21.02 (-2.61)*** | -10.25 (-0.17) | 81.10 (2.67)*** | 26.24 (2.79)*** | 120.04 (2.07)** |
| Age (35-44) | | | | | | |
| AGEW1 | -273.25 (-1.21) | -28.05 (-0.98) | -393.39 (-1.68)* | -256.05 (-2.33)** | 4.92 (0.15) | -596.32 (-2.84)*** |
| AGEW2 | 77.66 (0.62) | -25.94 (-1.55) | -258.86 (-2.00)** | -175.41 (-2.74)*** | -27.17 (-1.37) | -326.03 (-2.66)*** |
| AGEW4 | -768.71 (-2.93)*** | -28.19 (-1.15) | 67.88 (0.37) | -104.56 (-1.11) | 64.31 (2.22)** | -35.24 (-0.20) |
| AGEW5 | -3629.16 (-0.34) | -29.79 (-1.00) | -126.95 (-0.57) | -322.61 (-2.82)*** | 89.70 (2.54)** | -399.39 (-1.82)* |
| Education (High School Graduate) | | | | | | |
| EDUW1 | -647.63 (-2.68)*** | -3.08 (-0.13) | -138.90 (0.00) | -17.85 (-1.51) | -192.07 (-0.63) | -192.07 (-1.09) |
| EDUW3 | 60.57 (0.47) | 30.83 (1.89)* | 118.38 (0.93) | 196.70 (3.15)*** | 19.55 (1.01) | 369.51 (3.09)*** |
| EDUW4 | 423.98 (2.80)*** | 53.29 (2.66)*** | 126.65 (0.83) | 173.95 (2.26)** | 40.36 (1.70)* | 506.64 (3.44)*** |
| EDUW5 | 239.52 (1.48) | 70.14 (3.32)** | 662.62 (4.33)*** | 295.97 (3.63)*** | 111.83 (4.43)*** | 831.83 (5.31)*** |
| Race (White) | | | | | | |
| RACE2 | -185.18 (1.00) | 71.55 (3.20)*** | -350.85 (-1.84)* | -289.35 (-3.27)*** | 44.45 (1.64) | -266.45 (-1.59) |
| RACE3 | -107.11 (-0.44) | -47.44 (-1.43) | -246.35 (-0.99) | -21.91 (-0.18) | -44.78 (-1.15) | -247.35 (-1.03) |
| Urbanization (Urban) | | | | | | |
| RURAL | -396.16 (-2.27)** | -62.47 (2.97)*** | -177.39 (-1.05) | -123.35 (-1.59) | -73.11 (-3.03)*** | -320.82 (-2.16)** |
| Home Ownership (Owner) | | | | | | |
| RNTER | -111.42 (-0.85) | 45.99 (2.85)*** | 77.97 (0.63) | -130.12 (-2.10)** | -47.15 (-2.46)** | -99.85 (-0.84) |
| Likelihood Ratio Statistics | 424.40*** | 124.20*** | 68.00*** | 151.40*** | 129.60*** | 210.20*** |

*Significant at 0.10 level
**Significant at 0.05 level
***Significant at 0.01 level
[a]Asymptotic t-ratios are given in parentheses.

118

substitute paid labor for their own labor in child care activities (Peskin 1982). Finally, expenditures on domestic services were affected by unearned income and wage rates though not by hours worked. This suggests that income constraint are more important than time constraint for this service category.

The number of children aged 0 to 2 and 3 to 5 had a significant impact on service expenditures in three out of six instances. Families with young children spent more on child care which is expected and less on clothing care suggesting that these families may sacrifice expenditures in one service category for another. However, families with young children spent more on total services than other families indicating the need for purchased services in families with greater demands on their time. Similarly, family size had a positive impact on service expenditures in the case of child care, food away from home, personal care, and total services. The negative impact of family size on clothing care is in keeping with the results obtained for families with young children.

The results for age also indicate the effect of family life cycle on service expenditures. Families with women in the two youngest age groups spent less on domestic services than other families while the highest expenditures for food away from home and total services were associated with families in which the wife's age was 35-44 or 45-54. Personal care also increased with age with families in the two oldest age groups spending more than other families.

Higher levels of education were positively associated with expenditures on most services. This was particularly true for families in which the wife was a college graduate or had some graduate education. Families of women with the lowest level of education did not differ in their expenditures on services from the reference group (high school graduate) with the exception of child care where their expenditures were lower.

Race did not prove to be a major explanatory variable and was significant in only three out of twelve instances. Black families spent more on clothing care and less on domestic services and food away from home than other families.

The two remaining variables were urbanization and home ownership. Rural households spent significantly less than urban households for child care, clothing care, personal care and total services. This may reflect price differences or differences in life styles or service availability in rural and urban areas. However, there was no difference in expenditures for domestic services and food away from home. Renters spent more on clothing care than owners though less on food away from home and personal care.

The significance of sets of variables was also examined in view of possible multicollinearity for household production, family life cycle and education variables. All three sets of variables were significant with the exception of domestic services for family life cycle.

In a further test of the household production model separate analyses were performed for household with part-time and full-time working wives. The results of the Chi-Square test indicated that there was a significant difference between the two groups with respect to all service categories.

## DISCUSSION

The results of this analysis provide strong support for the household production model and the need to consider both time and budget constraints in service expenditure decisions. The set of household production variables had a significant impact on service expenditures in all instances. In addition, many of the individual variables were significant. The number of hours worked each year had a significant impact on service expenditures in five out of six instances for wives and in four out of six instances for husbands. However, higher wage rates for men meant higher opportunity time costs for men so that it was not surprising that the husband's wage rate proved more important than the wife's wage rate for many services. The exception was child care where only the wife's hours and wage rate were significant. This is in keeping with the fact that child care is the primary responsibility of women. Unearned income had a positive and significant impact on service expenditures in five out of six instances.

Families with part-time and full-time working wives were also compared and the results indicated that there was a significant difference between the two kinds of households with respect to all service categories. This provides additional support for the household production model.

Family life cycle proved significant when it was tested as a single set of variables and when the individual effects of age of wife and the number of children under six were examined. Age of wife was important for all service categories except clothing care while the number of children under six had a positive effect on child care and total services.

The results for education indicate that education has a positive impact on service expenditures in most instances. They also provide support for greater efficiency in consumption by families in which wives have higher levels of education (Michael and Becker 1973). Racial differences in consumption were also obtained with higher expenditures for clothing care and lower expenditures for food away from home and

domestic services for black families than for other families. However, there were no differences with respect to the other service categories. Location, proved significant in four out of six instances with rural households spending less on services than urban households in the case of child care, clothing care, personal care and total services.

Finally, it should be noted that service price and availability could not be investigated in this study though it undoubtedly plays a role particularly in the case of domestic services.

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# COMPLETE DEMAND SYSTEMS OF NONDURABLE GOODS AND SERVICES

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The objective of this study is to estimate a linear expenditure system (LES) and a quadratic expenditure system (QES) using the time-series and cross-section data from the continuing consumer expenditure surveys conducted by the Bureau of Labor Statistics. Specifically, the study addresses the question of whether or not the data on means of subsamples can be effectively used to estimate such demand systems. The empirical model deals with eight expenditure categories of nondurable goods and services. The study shows surprisingly plausible results. The estimated income and price elasticities are indeed very reasonable from these summary statistical data.

## INTRODUCTION

Understanding consumer demand is very important for consumer organizations, businesses and corporations, politicians and public policy makers. Basically, for one reason or another, these entities would like to know what the consumer wants, how consumers allocate their limited budget, and what the factors are affecting their consumption decisions. Complete demand systems provide one of the most effective frameworks for summarizing the consumer's numerous buying decisions by a set of key parameters (in form of elasticities) estimated in these models. Such estimated elasticities have proved to be very useful. For example, an estimated income elasticity for food provides important information for evaluating the effectiveness of various food assistance programs. An estimate of price elasticity for medical care can be used to explain the skyrocketing of medical costs in recent years.

The previous studies of consumer demand and consumer expenditure patterns have relied on either time-series data for aggregate expenditure categories from national income account or the cross-sectional household level data which were available only for selected years. The household expenditures studies such as those of Prais and Houthakker (1955), Bellante and Foster (1984), and Blaylock and Smallwood (1986) were constrained to a narrow focus of finding the income-consumption relationships and the additional impacts of demographic factors. The study of Bellante and Foster is a typical example of using the consumer expenditure survey data collected by the U.S. Bureau of Labor statistics (BLS). They fitted a set of expenditure equations (in this case, for time-saving services) which were expressed as functions of family income, education, race, home ownerships, and stage of the family life cycle. In addition, they included several variables

related to the wife's labor participation to investigate the hypothesis on the value of time. While this type of study has its own right for analyzing an interesting aspect of consumer behavior, the specification remains rather ad hoc in that the model usually merely expands the Engel curve to include whatever the demographic and household characteristics variables available in the survey. It is true that this type of models provides a great detail about the impacts of demographic variables on consumption. Furthermore, in almost all cases, a low $R^2$ was justified on the ground that the estimated equations were not for the purpose of prediction (and therefore, a low $R^2$ does not have a fatal consequence). We note, however, that this modeling strategy while being widely adopted, lacks a strong theoretical foundation. That is, the demand equation could not be derived directly from any well specified utility function. As shown by Pollak and Wales (1978), one needs such methods of translating or scaling to incorporate demographic variables in order to preserve the plausibility of the demand system. As pointed out by Chern and Horacio (1987), one can appropriately include the demographic variables linearly in a linear Engel function (with the expenditure as the dependent variable) only if the corresponding demand system is either the linear expenditure system (LES) or the CES.

The primary objective in this study is to estimate a complete demand system using consumer expenditure survey data. The BLS's continuing surveys have enabled us to include the price variables in the fundamental demand system. This study attempts to explore the use of aggregate group data published by the BLS. The study is motivated by the earlier works of Pollak and Wales (1978) who demonstrated a successful use of the summary statistics for estimating a complete demand system. As a parallel study to this one, Chern et al. (1988) compared the estimates of demand parameters obtained from both aggregate group data and household level data and found a great deal of similarities. This latest study motivated us to investigate further the use of aggregate group data. This paper presents the most recent results of this investigation.

One may ask why bother with the aggregate data when the detailed household level data are available. There are at least two reasons. First, the use of household level data requires a great deal of time and resources to handle the large data base. With the availability of the BLS's continuing survey data, we can no longer conduct a study once 10 years like before when the survey was conducted in a 10-year interval. It is a major task to incorporate new data and update your estimate every year. The use of aggregate data would make this updating much easier. Second, the price data are available only on a

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national or regional basis. We do not have household level prices to match household expenditure data. If the main objective is to estimate the income and price elasticity matrix with only selected demographic variables, we may achieve this objective with consistent aggregate data for both prices and expenditure. Of course, with the aggregate group data, we can not include as many demographic variables as with the household level data. For one thing, such variables as aggregate (or average) education or race do not exist. Nevertheless, we also consider the fact that it is not practical to include many demographic variables with translating or scaling. Therefore, we consider meeting the theoretical plausibility of the model as our first priority in selecting the methodology to use for this study. In order to further justify the use of aggregate data, we also carefully evaluated the validity and consistency of data using the nonparametric tests.

For the remainder of this paper, the methodology will be discussed first. The empirical model specification and data sources are next presented. The estimated results from two alternative demand systems are then compared. Important income and price elasticities are also computed and compared. Lastly, the paper presents an analysis of the estimated elasticities and the assessments of models and the use of aggregate data.

## METHODOLOGY

For the purpose of this study, we selected the LES developed by Stone (1954) and the quadratic expenditure system (QES) developed by Pollak and Wales (1978, 1981) and Howe, et al. (1979). As indicated earlier, the summary statistical data at the group level are used for estimation in this study. Specifically, we use the average consumer expenditure data for five selected income groups in the sample. These average expenditure data are available for six years from 1980 to 1985. Therefore we have a total of 30 observations. In this study, we group the nondurable goods and services into 8 categories. Thus, we are dealing with a relatively large demand system.

Pollak and Wales (1978) showed that the QES is particularly suited to the situation of using a small number of summary statistics from the household surveys. Both LES and QES incorporated the theoretical restrictions of the adding-up, homogeneity and symmetry in their specification. Therefore, these models require the data used for estimation to be consistent with these theoretical restrictions. As such, the LES and QES are more restrictive than the Almost Ideal Demand System (AIDS) or translog because we can not test the validity of these restrictions with the data on hand in the LES and QES. However, both LES and QES have performed very well in several previous studies. In fact, Pollak and Wales (1980) estimated the QES, a basic translog and a generalized translog demand system using U.K. household budget data from 1968-1972. Based on the likelihood function criterion, they showed that QES was superior to the translogs in all cases which are compatible.

In order to validate the aggregate data, we employed the nonparametric tests developed by Varian (1983). As documented elsewhere in Chern and Lee (1989), the results of the nonparametric tests showed that this set of aggregate group data satisfied the Generalized Axiom of Revealed Preference (GARP). Therefore, the data used in this study are consistent with the utility maximization hypothesis. These nonparametric results are thus supportive of the uses of the LES and QES which satisfy all demand properties.

The QES is a generalization of the LES in which the demand functions are quadratic in total expenditure. The QES is less restrictive than LES. For example, unlike LES, the proportionality between own-price and income elasticities is not imposed. In the QES, the expenditure and price elasticities are nonlinear functions of total expenditure and demographic translating variables. Even though the QES does not have these undesirable properties associated with the LES, it is a highly nonlinear system and, therefore, much more difficult to estimate. In this study, we estimate both LES and QES for comparison.

The LES can be specified in the expenditure share form as

$$(1) \quad w_i = \alpha_i(P_i/x) + \beta_i(1-(\textstyle\sum_k \alpha_k P_k)/x) + u_i$$

$$\textstyle\sum \beta_i = 1$$

where $w_i$ = expenditure share of ith good or service (or commodity),

$\quad P_i$ = price of ith good or service,
$\quad x$ = total expenditure,
$\quad u_i$ = disturbance term,
$\alpha_i, \beta_i$ = parameters to be estimated.

In the LES, $\beta_i > 0$ so that inferiority does not occur. Note that $w_i = \dfrac{p_i q_i}{x}$ where $q_i$ is the quantity of the ith good or service. BLS's consumer expenditure surveys did not provide data on quantity. However, $q_i$ may be approximated by dividing expenditure by price or a price index. In the LES, the following elasticities can be computed:

Income Elasticities:
$$e_i = \beta_i/w_i$$

Own-price elasticities:
$$e_{ii} = -1 + (1-\beta_i)(\alpha_i/q_i)$$
$$= -e_i(x - \textstyle\sum \alpha_k p_k + \alpha_i P_i)/x$$

Cross-price elasticities:
$$e_{ij} = -\beta_i(p_j \alpha_j/P_i q_i), \quad i \neq j$$

In order to incorporate the impacts of demographic variable in the LES, we adopt the procedure of demographic translating developed by Pollak and Wales (1978). Accordingly, we further assume

(2) $\alpha_i = \alpha_i^* + \delta_i D$

where D is a demographic variable. Household size is the demographic variable used in this study.

There are alternative versions of QES. The one used in this study follows that developed by Howe, et al. (1979). Specifically, the expenditure share is expressed as

(3) $w_i = \alpha_i(P_i/x) + \beta_i[1-\sum \alpha_k(P_k/x)]$

$\qquad + [\gamma_i(P_i/x) - \beta_i \sum \gamma_k(P_k/x)] \Pi$

$\qquad (P_k/x)^{-2\beta_k} [1-\sum \alpha_k(P_k/x)]^2 + u_i$

$\sum \beta_i = 1$

Note that all variables were defined previously. An additional set of parameters, $\gamma_i$ needs to be estimated in the QES. This version of QES was previously applied by Barnes and Gillinghan (1984) and Kokoski (1986). With the QES, the formulas for demand elasticities are much more complicated than those in the LES. For example, the income elasticity is expressed as

$$e_i = \frac{1}{W_i} MBS_i$$

where $MBS_i$ = marginal budget share and

$$MBS_i = \frac{\partial P_i q_i}{\partial x} = \beta_i + 2(\gamma_i P_i - \beta_i \sum P_k \gamma_k) \Pi$$
$$P_k^{-2\beta_k} (x - \sum P_k \alpha_k)$$

Own-price and cross-price elasticities can also be obtained analytically. In order to incorporate the demographic effect, we adopt the same demographic translating specified in Equation (2). With eight expenditure groups in the system, the number of parameters needed to be estimated in an expenditure share equation under the QES is 25.

MODEL SPECIFICATION AND DATA SOURCES

In the previous section, the general models of the LES and QES were specified. In this section, we will discuss the development of the empirical model. As noted earlier, the study uses the data obtained from BLS's interview survey of consumer expenditures. The BLS has been publishing many different sets of aggregate data in the form of sample averages across different stratifications. One such stratification is by income level. Average expenditures were computed by the BLS for five income quantiles (lowest 20%, second 20%, third 20%, fourth 20% and highest 20%). Therefore we have five observations for each year. The data on expenditures and household size were taken from the BLS (1985, 1986a, 1986b, and 1988).

There are several hundreds of expenditure categories collected by the BLS. Of course, it is impossible to deal with these many expenditure components. For this study, we aggregate the components of nondurable goods and services into eight categories. These components are shown in Table 1. Excluding the durable goods component, the housing expenditures, for example, include only (1) utilities, fuels, and public service and (2) house operations. The durable good components of transportation and entertainment are also excluded. The reason for this separation is

Table 1. Expenditure Components of Nondurable Goods and Services

| | | Average Expenditures ($P_i q_i$) in dollars | | | | |
|---|---|---|---|---|---|---|
| | | 1980 | | 1985 | | 1980-1985 |
| Number (i) | Expenditure Components Defined by BLS | BLS Weighted Average[a] | Sample Mean[b] | BLS Weighted Average[a] | Sample Mean[b] | Sample Mean |
| 1 | Food at home | $ 2,398 | $ 2,384 | $ 2,318 | $ 2,293 | $ 2,290 |
| 2 | Food away from home | 787 | 785 | 1,076 | 1,068 | 927 |
| 3 | Housing[c] | 1,458 | 1,444 | 1,994 | 1,991 | 1,740 |
| 4 | Apparel | 895 | 892 | 1,161 | 1,203 | 1,052 |
| 5 | Transportation[d] | 2,002 | 2,040 | 2,261 | 2,163 | 2,084 |
| 6 | Health Care | 730 | 709 | 1,037 | 1,022 | 842 |
| 7 | Entertainment[e] | 516 | 515 | 666 | 739 | 624 |
| 8 | Other goods and services[f] | 1,924 | 1,944 | 2,561 | 2,503 | 2,258 |
| | Total expenditures | $ 10,710 | $ 10,713 | $ 13,074 | $ 13,062 | $ 11,817 |

[a] Weighted average for entire sample in the survey as published by BLS.
[b] Simple average over the average expenditures from five income groups used in this study.
[c] Includes only (1) utilities, fuels and public service and (2) house operations.
[d] Includes only (1) gasoline and motor oil, (2) maintenance and repairs, (3) vehicle insurance, and (4) public transportation.
[e] Excludes television, radios and sound equipments.
[f] Includes (1) personal care, (2) reading, (3) education, (4) tobacco and smoking supplies, (5) cash contributions, (6) alcoholic beverages, (7) life and other personal insurance, and (8) miscellaneous services.

because the purchases of durable goods such as household appliances are much less frequent than the nondurables. Due to durability of durable goods, the demand model for durable goods may be dynamic in structure and therefore the time element should be incorporated. As documented elsewhere in Chern and Lee (1989), the non-parametric tests showed that the durable good expenditures were weakly separable from the expenditures for nondurable goods and services.

Table 1 also shows that average expenditures for each of the eight categories of nondurable goods and services for 1980 and 1985. Two data series are compared with. One being the BLS weighted averages published in its bulletins. These averages are for the entire sample from the survey. The other series is a sample mean which is obtained from a simple averaging over the five income groups, i.e., data or observations used in this study. It is noted that the data from the two series are very close. For example, the average expenditure for food at home for the entire sample as published by the BLS is $2,398 in 1980 while the simple average of the average expenditures for five income groups is $2,384 in the same year. The last column in Table 1 shows the sample means for the 1980-1985 period (i.e., averaging over 30 observations).

Another criterion for grouping the aggregate expenditures is the availability of the corresponding price components in the series of consumer price indexes (CPI). We attempt to match the expenditure definitions to those used as components of CPI. For housing and transportation, we computed the weighted averages using the CPI series for subgroups published by BLS. In general, the expenditure and price series are very consistent.

## ESTIMATION OF LES AND QES

Since both LES and QES are nonlinear systems, we have to use procedures for solving nonlinear systems of equations. The most appropriate estimation procedure is the iterative nonlinear least squares for a seemingly unrelated regression (INLSUR). Since the dependent variable is expenditure share, the variance and covariance matrix is singular due to the adding-up condition. Consequently, we drop one share equation from the system. With the INLSUR, the estimates are invariant with what equation being dropped. The SAS computer software is used to implement this estimation procedure.

Table 2 shows the results of this nonlinear regression estimation. Consider first the results for the LES. The theoretical restrictions, $\beta_i > 0$ are all satisfied. All $\beta_i$'s are statistically significant at the 1% level except that for health care ($\beta_6$). With respect to the price coefficient, only $\alpha_5$ (transportation), is statistically significant at the 1% level. However, the coefficient of the household size which is a component of the price effect is statistically significant at the 5% level for food at home ($\delta_1$), housing ($\delta_3$), transportation ($\delta_5$), and health care ($\delta_6$).

Table 2. Regression Results

| Parameters[a] | LES Estimated Coefficient | LES Asymptotic Standard Error | QES Estimated Coefficient | QES Asymptotic Standard Error |
|---|---|---|---|---|
| $\alpha_1$ | 0.183 | 1.072 | 0.742 | 1.217 |
| $\alpha_2$ | 0.571 | 0.839 | 0.279 | 0.674 |
| $\alpha_3$ | 0.677 | 0.688 | 0.385 | 0.520 |
| $\alpha_4$ | 0.312 | 1.488 | -0.728 | 0.921 |
| $\alpha_5$ | -2.795 | 0.767 | -2.481 | 0.913 |
| $\alpha_6$ | 0.105 | 0.336 | -0.069 | 0.342 |
| $\alpha_7$ | -0.208 | 0.972 | -0.594 | 0.740 |
| $\alpha_8$ | 2.446 | 3.595 | 0.261 | 1.635 |
| $\beta_1$ | 0.082 | 0.025 | 0.181 | 0.061 |
| $\beta_2$ | 0.121 | 0.007 | 0.114 | 0.018 |
| $\beta_3$ | 0.104 | 0.008 | 0.088 | 0.020 |
| $\beta_4$ | 0.139 | 0.008 | 0.081 | 0.022 |
| $\beta_5$ | 0.125 | 0.011 | 0.225 | 0.022 |
| $\beta_6$ | 0.015 | 0.011 | -0.0004 | 0.027 |
| $\beta_7$ | 0.106 | 0.006 | 0.092 | 0.015 |
| $\beta_8$ | 0.308 | b | 0.219 | b |
| $\delta_1$ | 2.539 | 0.553 | 2.284 | 0.594 |
| $\delta_2$ | 0.195 | 0.369 | 0.531 | 0.307 |
| $\delta_3$ | 1.111 | 0.309 | 1.413 | 0.242 |
| $\delta_4$ | 0.621 | 0.652 | 1.571 | 0.439 |
| $\delta_5$ | 2.638 | 0.349 | 2.554 | 0.400 |
| $\delta_6$ | 0.828 | 0.181 | 0.950 | 0.183 |
| $\delta_7$ | 0.252 | 0.430 | 0.674 | 0.341 |
| $\delta_8$ | 0.519 | 1.530 | 1.828 | 0.748 |
| $\gamma_1$ | | | -0.0022 | 0.0024 |
| $\gamma_2$ | | | 0.0004 | 0.0009 |
| $\gamma_3$ | | | 0.0004 | 0.0007 |
| $\gamma_4$ | | | 0.0024 | 0.0010 |
| $\gamma_5$ | | | -0.0017 | 0.0017 |
| $\gamma_6$ | | | 0.0003 | 0.0005 |
| $\gamma_7$ | | | 0.0007 | 0.0009 |
| $\gamma_8$ | | | 0.0028 | 0.0019 |

a   $\alpha_i$ is the $\alpha_i^*$ in Eq. (2). $\gamma_i$'s are additional parameters in the QES.
b   The asymptotic standard error is not yet computed.

Note that $\beta_i$ measures the marginal budget share. One may be surprised to find that the estimated marginal budget share for food at home ($\beta_1$) is smaller than that for food away from home ($\beta_2$). These results may appear to be inconsistent with the actual expenditures between these two food categories. This is, however, not the case because the coefficient of household size ($\delta_1$) is highly significant. Since $\delta_1$ constitutes a budget component for the subsistence, $\sum P_i(\alpha_i^* + \delta_1 D)$ in the LES, a large coefficient $\delta_1$ would imply that the food at home makes up a substantial portion of this subsistence expenditure. Therefore, after this subsistence expenditure is subtracted from the total expenditure, the household no longer need to allocate much budget for food at home.

The QES results are generally satisfactory. Even though the estimated asymptotic standard errors for a few coefficients are lower under the LES than QES, the overall regression results of the QES appear to be superior. In particular, the household size variable performed much better in the QES than in LES. The QES does not require $\beta_i > 0$. All estimated $\beta_i$'s are significant at the 1% level except $\beta_6$ for health care. Note that if $\gamma_i$'s are all equal to zero then the QES reduces to the LES. The results show that the hypothesis of all estimated $\gamma_i$'s being zero is rejected. Therefore, the QES is statistically different from the LES.

## ESTIMATED TOTAL EXPENDITURE & PRICE ELASTICITIES

Table 3 presents the estimated total expenditure

(income) elasticities from the LES and QES. For the LES, the marginal budget shares are constant. However, the expenditure elasticities can still be computed by income group. An important feature of the QES is that the marginal budget shares are not constant and therefore, the expenditure elasticity depends upon income level and other parameters in the model. Table 3 shows the expenditure elasticities for the five income groups.

The expenditure elasticities computed at the mean value appear to be similar between the LES and QES. However, a comparison of the two sets of estimates across different income groups shows some important differences. Specifically, in the LES, the expenditure elasticities are inversely related to expenditure shares. Consequently, for those with expenditure elasticities less than unity, the elasticities are larger for higher income households. The opposite pattern of changes holds for those expenditure groups with the estimated expenditure elasticities greater than unity. Therefore, under the LES, the expenditure elasticity for food at home increases from 0.35 for the first 20% income quantile to 0.51 for the fifth 20% income quantile. This result would be at odds with the Engel Law and our usual expectation that the income elasticity for food should decrease as income increases.

The estimated expenditure elasticities from the QES do not exhibit this restriction. The results show that the estimated expenditure elasticities for food decrease from 0.74 in the lowest income group to 0.13 in the highest income group. Another sharp difference occurs for apparel. The LES results show a decreasing pattern of expenditure elasticities as income increases while the QES results show the opposite. Since the QES does not have the restriction of constant marginal budget shares, its estimates appears to be more reasonable.

The results also show that the health care has the smallest expenditure elasticity and the entertainment has the largest elasticity in both LES and QES. Food at home, housing, and health care are found to be necessities as their expenditure elasticities are all smaller than unity. Food away from home, apparel, entertainment and others are found to be luxuries. Transportation is a luxury for low income households but a necessity for high income households.

In all cases, the estimated expenditure elasticities for health care are very low. These low income effects may be due to the fact that many households do not pay their medical costs out of their pockets. Employers usually pay a larger portion of the medical costs than employees (households).

Table 4 presents the own-price elasticities estimated from the two models. Since the price

Table 3. Estimated Total Expenditure Elasticities

| | LES by Income Group | | | | | | QES by Income Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Expenditure Group | 1st 20% | 2nd 20% | 3rd 20% | 4th 20% | 5th 20% | Sample Mean | 1st 20% | 2nd 20% | 3rd 20% | 4th 20% | 5th 20% | Sample Mean |
| Food at home | 0.35 | 0.36 | 0.40 | 0.42 | 0.51 | 0.40 | 0.74 | 0.73 | 0.69 | 0.59 | 0.13 | 0.64 |
| Food away from home | 1.69 | 1.78 | 1.64 | 1.59 | 1.39 | 1.60 | 1.60 | 1.70 | 1.59 | 1.56 | 1.45 | 1.52 |
| Housing | 0.60 | 0.63 | 0.70 | 0.73 | 0.78 | 0.68 | 0.52 | 0.55 | 0.64 | 0.69 | 0.87 | 0.66 |
| Apparel | 1.84 | 1.85 | 1.67 | 1.60 | 1.35 | 1.64 | 1.13 | 1.21 | 1.27 | 1.39 | 1.74 | 1.30 |
| Transportation | 0.88 | 0.71 | 0.66 | 0.67 | 0.72 | 0.72 | 1.51 | 1.18 | 0.97 | 0.84 | 0.31 | 0.93 |
| Health Care | 0.17 | 0.17 | 0.20 | 0.23 | 0.27 | 0.20 | 0.01 | 0.02 | 0.07 | 0.14 | 0.40 | 0.11 |
| Entertainment | 3.26 | 3.06 | 2.27 | 1.93 | 1.59 | 2.24 | 2.86 | 2.72 | 2.10 | 1.86 | 1.76 | 1.91 |
| Others | 1.75 | 1.92 | 1.77 | 1.65 | 1.42 | 1.68 | 1.29 | 1.46 | 1.47 | 1.49 | 1.67 | 1.41 |

Table 4. Estimated Own-Price Elasticities

| | LES by Household Size | | | | | QES by Household Size | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Expenditure Group | D=1 | D=2 | D=3 | D=4 | Sample Mean D=2.62 | D=1 | D=2 | D=3 | D=4 | Sample Mean D=2.62 |
| Food at home | -0.70 | -0.41 | -0.13 | 0.15 | -0.24 | -0.77 | -0.83 | -0.89 | -0.96 | -0.87 |
| Food away from home | -0.77 | -0.72 | -0.66 | -0.60 | -0.68 | -1.48 | -1.47 | -1.46 | -1.46 | -1.47 |
| Housing | -0.68 | -0.49 | -0.29 | -0.09 | -0.36 | -0.62 | -0.61 | -0.60 | -0.59 | -0.61 |
| Apparel | -0.85 | -0.75 | -0.66 | -0.56 | -0.69 | -0.99 | -0.96 | -0.93 | -0.89 | -0.94 |
| Transportation | -1.02 | -0.63 | -0.23 | 0.17 | -0.38 | -1.12 | -1.17 | -1.27 | -1.30 | -1.21 |
| Health Care | -0.63 | -0.31 | -0.02 | 0.35 | -0.10 | -0.002 | -0.004 | 0.0002 | 0.0109 | -0.002 |
| Entertainment | -0.98 | -0.90 | -0.81 | -0.73 | -0.85 | -1.78 | -1.76 | -1.75 | -1.74 | -1.75 |
| Others | -0.76 | -0.72 | -0.68 | -0.63 | -0.69 | -1.30 | -1.21 | -1.17 | -1.13 | -1.19 |

effects are depend upon household size, we can compute own-price elasticities for different values of household size (D = 1,2,3,4 and the sample mean D = 2.62). These price elasticities as shown in Table 4 indicate substantial demographic impacts on price responses. In the LES, the estimated coefficients of household size all have a positive sign. Therefore, as household size increases, the computed price elasticities (in absolute value) decrease in all expenditure groups. Note also that under the specification of LES, the proportionality between the income and price elasticities hold. Furthermore, the estimated own-price elasticities are positive for larger household sizes for food at home, transportation and health care. These positive elasticities are not reasonable. These results may suggest that the estimated price elasticities are not as reliable for large households under the LES.

The estimated price elasticities from the QES do not have a fixed pattern of changes among different household sizes. For example, the estimated own-price elasticities in absolute value for food at home increases as household size increases. But for apparel, the own-price elasticities decreases as household size increases. Overall, the differences among different household sizes are not very substantial. Note however, that the QES estimates of the own-price elasticities show a wider variation among expenditure groups than the LES estimates. Specifically, the demand is found to be price elastic for food away from home, transportation, entertainment, and others. The price elasticity is about unitary for apparel. On the other hand, the demand is price inelastic for food at home, housing, and health care. The price elasticity is especially small for health care, implying its insensitivity to price changes. Given the limited amount of price data available, these results must be considered as remarkable.

## CONCLUSIONS

From the BLS's continuing consumer expenditures surveys, we are able to obtain time-series data of detailed consumer expenditures from 1980-1985. In this study, we attempt to use the sample mean statistics (for five income quantiles) for estimating the LES and QES for eight nondurable good and service groups. The regression results for both LES and QES are, in general, plausible.

The results show that there are substantial differences in the estimated expenditure and own-price elasticities among the eight expenditure groups. For example, comparing the two food groups, the demand for food at home is fairly inelastic with respect to income as the estimated expenditure elasticities computed at sample mean range from 0.31 in the LES to 0.65 in the QES. On the other hand, the demand for food away from home is very elastic with respect to income.

The QES model provides important insights on the differences of income effects among different income groups. For example, the results show that

the expenditure elasticities for food at home decrease from low income groups to high income groups. These findings confirm that the QES is a much more flexible functional form than the LES.

The results also show that the estimated expenditure elasticities are high for food away from home, apparel, entertainment and others. However, as income increases, the estimated expenditure elasticities increase for housing, apparel, health care and others. Therefore, if income increases in the future, one can expect that households would allocate more of their budget for these four expenditure groups. One interesting result is that the expenditure elasticity is very small for health care. This may be explained by the small portion of medical costs paid directly by households.

We are pleased with the plausible estimates of price elasticities with limited amount of price data available for estimation. The results show that the demographic effects can be incorporated into the model as part of the price coefficient. Therefore the estimated price elasticities vary depending upon household size. The results further show that food away from home, transportation, entertainment, and others all have elastic demand with respect to own-price. On the other hand, the demands for food at home and health care have the lowest price responses. The cross-price elasticities are not presented and discussed in this paper.

The study shows that we can successfully use the aggregate group data for estimating a complete system of aggregate expenditures. Furthermore, the QES produced more plausible estimates of demand elasticities and was more satisfactory in incorporating the demographic variable than the LES.

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# CONSUMER EXPENDITURES: DISCUSSION OF THREE STUDIES

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The three studies covered in this session had one thing in common: they each used data from the BLS Consumer Expenditure Survey. Beyond that, these studies reflected very diverse purposes and approaches in the way they used this rich data source. One study used the data to address whether the sales tax in a particular state was regressive; another study used the data to explain the consumer demand for services; the other used the data to address a methodological question. The studies reflected both disaggregated and aggregated use of the data. These studies collectively were testimony to the diverse ways this national data can be used. At the same time they identified some deficiencies in the data set for consumer research.

## Gitter, Cook, Harvey, and Simon: "Use of Expenditure Data to Study the Incidence of a State Sales Tax: A Case of Ohio"

This study addresses an important public policy question about the differential impact of a state's sales tax code on households of varying income levels. While it is generally recognized that a sales tax is a regressive form of generating revenues, what is interesting about this study is the use of the state of Ohio's tax code in the analysis. Ohio has attempted to eliminate the regressiveness of the sales tax by exempting from taxation those expenditures which are for the basic necessities of life. The authors of this paper have included in an appendix how each expenditure category is treated by Ohio's tax code. They are to be commended for providing such thorough information, enabling the reader to clearing see how each expenditure was treated in the study.

Using national data from the 1984 Consumer Expenditure Survey, the Ohio tax code was used to determine whether sales tax exemptions were enough to eliminate the regressiveness of a sales tax. This application of one state's tax policy to national data is based on the assumption that consumers in Ohio do not spend differently as a result of the state's tax policy or any other factor, such as climate, which is unique to Ohio consumers. This is a necessary assumption as BLS Consumer Expenditure Survey data cannot be obtained for Ohio consumers only.

The authors identify several caveats to their conclusions. First, students living away from home were included in the low income group. The authors note that they should have been combined with their families, but it was not possible with the data set. Clearly, the inclusion of students does distort the expenditure averages, as students will spend very differently than will other low income households. The effect of this bias should be discussed in the paper, if they cannot be excluded from the sample. Secondly, the ratio of sales tax to income is high for the low income because they spend more than their income for the measured period (which was a year). This was true for the lowest two quintile income groups, with the lowest quintile group spending almost 3 1/2 times their before-tax income. Alternatively, the highest income quintile was only spending 70 percent of their before-tax income. When these

conditions exist, the tax is bound to be regressive, no matter what the differential treatment of various categories of expenditures. Even though the tax is still regressive, I would like to know what proportion of total expenditures are subject to sales tax for each income quintile group. Have the exemptions benefited the poor due to the fact that a higher percentage of their total expenditures are tax exempt? If you do these calculations you find that about 70 percent of all expenditures in the lowest two income quintile groups are exempt from sales tax while 66 percent of the total expenditures for the highest income group are exempt from sales tax. Also, 1.5 percent of the lowest income quintile group's total expenditures are for sales tax, with this ranging up to 1.7 percent for the highest income quintile group. Even by these calculations, the poor, relative to the rich, are not given real breaks by the exemptions currently allowed in the tax code.

Perusing the expenditure data by each commodity/service category, it is apparent that there are still taxable areas for living necessities where the poor spend disproportionately more of their income than do the nonpoor, such as expenditures for wood and coal for home heating purposes. This information can be useful to public policy makers, if they wish to eliminate more of the regressiveness of the sales tax.

In short, this study addressed an important question. It was relatively simple and straight forward in methodology and the writeup was well documented.

## Dardis, Soberon-Ferrer, and Tsay: "Determinants of Household Expenditures for Services"

The research question in this study pertained to the identification of factors which explain the consumption of services by families who have two earners in the labor market. It is a study which significantly contributes to an important line of research in consumer economics. It moves us a step forward as it uses a more sophisticated measure of labor force participation, opportunity cost of time, than the nominal measure (full or part-time employment) used in prior research on the topic. However, the limited nature of the sample used in the study leaves several unanswered questions. Namely, would the findings hold for single earner traditional families and for single parent families? While the limited nature of the study sample avoided the very-tricky problem of estimating the opportunity cost of time for the nonemployed, it also limits the generalizability of the findings.

The household production function model served as the theoretical basis for the study. The study report is well versed in economic terminology. However, it is a study which addresses important issues in family resource management, as well as consumer economics. There is an opportunity for this study to bridge the gap between these two areas of study. I would encourage the authors of this study to look to the family resource management literature, which views the family from a systems perspective, and incorporate some terminology and insight to family functioning that this perspective provides. For example, this perspective views personal and family values as relatively enduring and important factors in

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