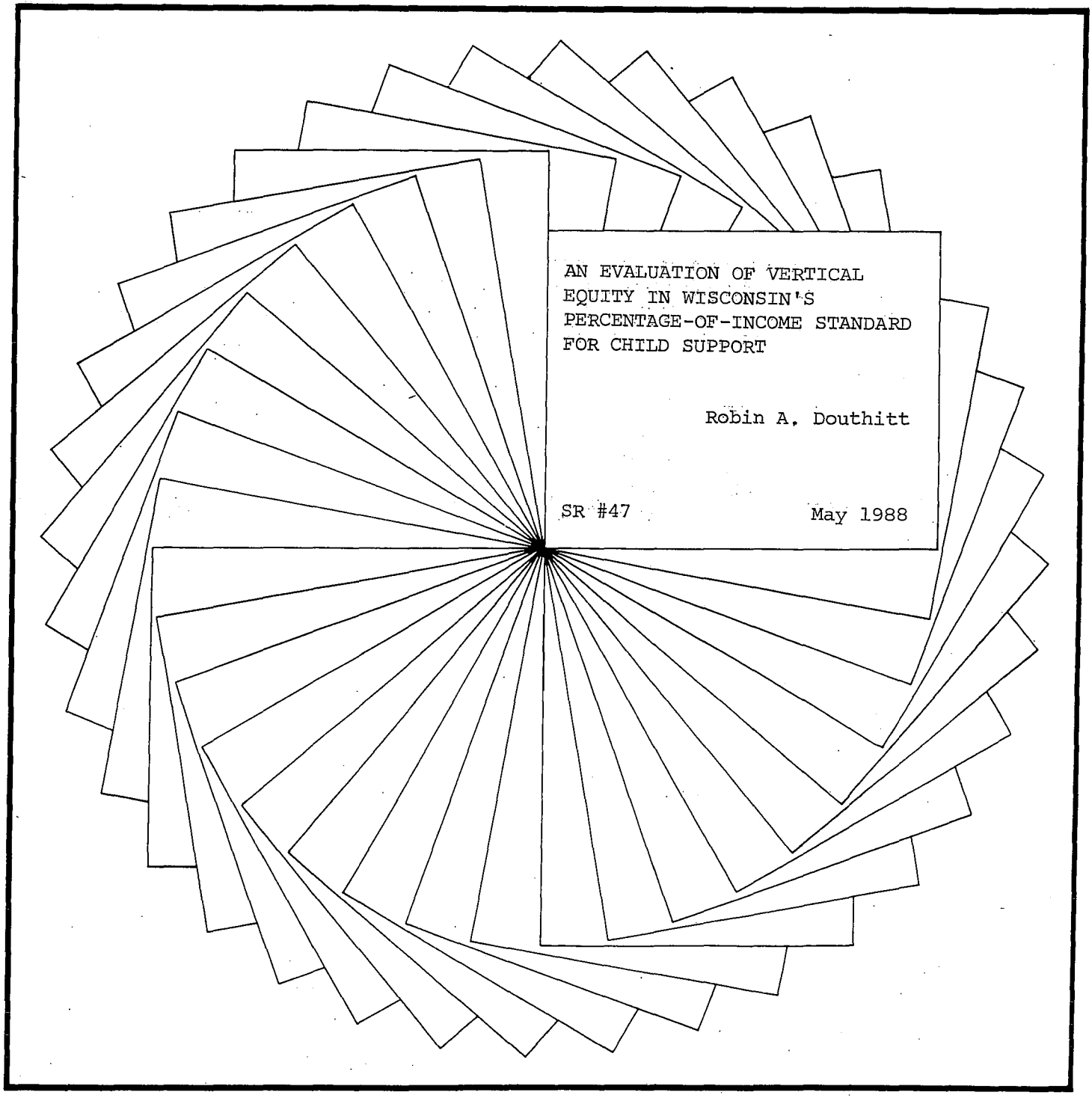
University of Wisconsin-Madison

Institute for Research on Poverty

Special Report Series



Special Report no. 47

An Evaluation of Vertical Equity in Wisconsin's Percentage-of-Income Standard for Child Support

Robin A. Douthitt
School of Family Resources and Consumer Sciences
and
Institute for Research on Poverty
University of Wisconsin-Madison

May 1988

The research reported here was supported in part by a grant from the Wisconsin Department of Health and Social Services to the Institute for Research on Poverty. Any opinions expressed are solely those of the author.

Executive Summary

This report addresses the question of whether high-income families allocate a smaller proportion of income to current consumption than do low-income families. The question bears on the fairness of Wisconsin's percentage-of-income standard for child support awards, since that standard requires larger payment amounts by high-income absent parents than by their low-income counterparts. Canadian data on families in similar economic circumstances to families in Wisconsin are used. A number of measurement issues are involved in a study of this nature, in particular use of gross versus net income and the choice of expenditure items to be included in defining consumption.

The results of this study can be summarized as follows:

1. The share of total expenditures allocated by Canadian families to current consumption is negatively related to both net and gross income--the larger the income, the smaller is the expenditure share allocated to current consumption.
2. The strength of the relationship between current consumption and income depends on the choice among specific current consumption measures. As more expenditures for durable goods are included in measures of consumption, the smaller is the measured difference between lower- and upper-income households in propensities to consume out of gross income.
3. Only small differences are noted in the relationship of current consumption share to net versus gross income.
4. The issue of whether implementation of a percentage-of-income standard will result in payment by high-income absent parents of an unfair share of child-rearing costs depends on the percentage

levels established. Using Williams' estimates of child-rearing costs as a benchmark, analysis indicates that application of the Wisconsin percentage-of-income standard to establish child support payments results in awards very close to actual child-rearing costs.

Several qualifications should be added:

1. Because Canadian families face a more progressive tax structure than American families, these results may overstate the negative relationship between consumption and income of U.S. families.
2. Methodological differences between this study and Espenshade's study, on which Williams bases his conclusions, will yield differences in results.

Implications of these results are as follows:

1. Further study using U.S. expenditure data is needed to determine whether the negative relationship between income and share of total expenditures allocated to current consumption can be replicated.
2. In Wisconsin the guiding principle in establishing child support awards is that parents should share a percentage of their income with their children whether or not they reside with them. This approach has both conceptual and practical appeal. Conceptually, it underscores the obligation of all parents, regardless of income, to share resources with their children. Practically, it provides flexible guidelines that are less costly to administer through avoidance of methodological debates surrounding the estimation and updating of child-rearing costs. However, a benchmark is needed to assess equity issues surrounding the percentages of

income absent parents share with their children. Estimates of child-rearing costs provide one comparative standard for evaluating questions of "reasonableness" and "fairness." In this report, child-rearing cost estimates are used to evaluate vertical equity issues surrounding implementation of Wisconsin's child support award guidelines; e.g., the issue of how the percentage-of-income standard affects higher- versus lower-income absent parents in regard to support awards compared to awards based directly on child-rearing cost estimates. The choice of child-rearing costs as such a benchmark for impact evaluation requires closer scrutiny of related measurement issues in future work.

3. From a policy perspective, consideration should be given to the extent to which expenditures on durables should be included in child-rearing costs. This will have implications for whether actual vertical inequities arise from application of Wisconsin's percentage-of-income standard, since high-income families allocate a larger share of total expenditures to durables.
4. The current levels of gross income percentages established by Wisconsin result in support awards that are comparable to the levels of net income percentage guidelines suggested by Espenshade/Williams. Thus, high-income absent parents under the current guidelines are paying support consistent with actual child-rearing costs. However, the finding that a negative relationship exists between consumption and income for Canadian families could imply that low-income absent parents are not paying their full share of child-rearing costs.

An Evaluation of Vertical Equity in Wisconsin's Percentage-of-Income Standard for Child Support

In 1982 Van der Gaag completed a comprehensive review of the economics literature on the costs of raising children. Conclusions drawn from his study were used as the starting point for constructing the percentage-of-income standard used in Wisconsin for establishing child support awards. A conclusion of his study that "the share of income devoted to children is roughly proportional up to very high income levels" provided one justification for recommending that child support awards be based on a constant percentage of the absent parent's gross income (Van der Gaag, 1982).

Subsequently, this premise was challenged by Williams (1986), who used findings by Espenshade (1984) to argue that the proportion of income parents spend on their children declines as income increases. Espenshade found that expenditures for children (1) increase with income and (2) represent a constant proportion of families' current consumption. However, Espenshade did not provide direct evidence regarding the relationship between consumption and income. Thus, Williams extrapolates by augmenting Espenshade's findings and concludes that "As income increases, total family current consumption declines as a proportion of net (after-tax) income because non-current consumption increases with level of household income.... Moreover, family current consumption declines as a proportion of gross (before-tax) income because of the progressive federal and state income tax structure" (p. 24).

From these conclusions, Williams expresses concern that Wisconsin's percentage-of-income standard child support formula is inequitable in

that high-income noncustodial parents would be required to pay a greater proportion of net income in child support than their low-income counterparts (p. 36). He recommends that the child support obligation of high-income noncustodial parents be calculated by applying a lower percentage of gross income than that applied in determining the obligation of low-income parents.

In response to Williams' charges of vertical income inequities arising from implementation of Wisconsin's percentage-of-income standard, Garfinkel (1987) concedes that, although the weight of economic evidence is not on Williams' side, the literature lacks any studies designed specifically to examine the proportionality issue and calls for additional study of the question.

This paper is an initial study of the relationship between child-related expenditures and family income. For present purposes we accept the Espenshade finding that expenditures for child-related goods and services represent a constant proportion of total current consumption by families with children and focus on, first, disentangling taxes from measures of consumption and income and, second, examining the relationship between net income and current consumption of families with children. We want to begin to answer the question, Do high-income families allocate a smaller proportion of net income to current consumption than their low-income counterparts?

Finally, we question and examine implications of the implicit assumption of Williams that children only benefit from family expenditures for

current consumption. That is, Williams' argument that child support awards should be based only on a percentage of current consumption implies that family expenditures for housing principal, vacation homes, deposits for purchase of consumer durables, plus other types of investments that fall under the general heading of savings, do not influence the standard of living enjoyed by children. This assumption is not in accord with the theoretical literature regarding the costs of raising a child (van der Gaag, 1982; Deaton and Muellbauer, 1986).

The addition of children to a family often induces increased investment in durable goods in order to more efficiently meet increased household production demands. Further, children are often consumers of the durable service flow; witness their influence on the depreciation rate of many home appliances. Such an assumption is particularly problematic if high-income families do allocate a smaller share of income to current consumption. In fact, including only expenditures for current consumption could seriously underestimate the true cost of providing enough support for children with high-income absent parents to sustain the standard of living that they would have enjoyed had the parent remained in the home. In this analysis we will examine the specific effects of how durable measurement influences the observed consumption/income relationship.

The findings reported here are an extension of a Canadian study (in progress) regarding the influence of children on family budget allocations. We examine whether consumption is proportional to income after netting away taxes; if true, given Espenshade's finding of proportionality between child-related expenditures and current consumption, this would imply that child expenditures are also proportional to income.

I. DATA AND THE MEASUREMENT OF TAXES

A major obstacle that has stood in the way of microeconomists' analysis of the consumption function has been identifying a data set that contains not only income, but also tax and consumption variables. In theory, one would like to net away both consumption and income taxes paid by the family prior to examining their relationship. Unfortunately, few data sets include measures of all three.

The data employed in this study were collected as part of Statistics Canada's 1982 Family Expenditure Survey. The survey contained questions regarding income, expenditure, demographic and tax information from a random sample of over 10,000 Canadian households. Unfortunately it was primarily income taxes and not consumption taxes that were explicitly identified. Table 1 presents a list of taxes and how they were measured in the FES.

Income, gift, and other personal taxes, net tax credits and refunds are measured independently of either consumption or income. In addition, measures of contributions to the Canada Pension Plan (the Canadian equivalent to FICA deductions) and unemployment insurance are included in the FES data. However, measures of both current consumption and income are gross of sales and property taxes.

In order to minimize the effects of regional price differences, we restricted our sample to families living in a single region of Canada. Families living in the Western region (provinces of British Columbia, Alberta, Saskatchewan and Manitoba) of Canada were chosen because of the similarities between their economic circumstances (unemployment rates and savings rates) and those of families living in the state of Wisconsin in

Table 1

Taxes and Their Measurement in the FES Data

Type of Tax	Coded as a Separate Variable	Value Included as Part of Consumption and Income
Income	X	
Gift	X	
Other Personal	X	
Canada Pension Plan	X	
Unemployment Insurance	X	
(Tax Refunds)	X	
(Tax Credits)	X	
Sales		X
Property		X

1982. A limitation in using this sample is that a family's specific province of residence cannot be established from the data. Families living in the prairie provinces of Alberta, Saskatchewan, and Manitoba are simply given the geographic code "prairies." Since provinces imposed widely divergent sales tax policies,[1] regional aggregation precludes us from imputing sales tax paid by each family.

Our final sample consisted of 1630 husband-wife families (1) with neither spouse older than 65 years of age, (2) not living on a farm, (3) with all members present the entire year, and (4) whose income-tested government assistance constituted no more than one-third of total income in 1982. Mean sample characteristics are given in Table 2.

II. ANALYSIS OF THE INCOME-CONSUMPTION RELATIONSHIP

As noted in the introduction to this report, Williams regards both a progressive tax system and the propensity for high-income families to consume less of total income than their lower-income counterparts as contributing to inequities arising from enforcement of the percentage-of-income standard. In this section we present an analysis of children's influence on Canadian families' propensities to consume, net of the effects of taxes.

Although it is arguable that Canadian families face a myriad of market factors and have tastes that are different from those of similarly situated families in the United States, many similarities in consumption patterns in the two countries can be documented. Of special note are the results of a pilot study to this project, where strikingly similar

Table 2

Mean Sample Characteristics

Mean ages:		
Head[a]	41.2 years	
Spouse	38.0 years	
First child[b]	10.3 years	
Second child[b]	8.1 years	
Mean family size	3.3	
Mean number of children[c]	2.1	
Median gross family income	$37,180	
Median total expenditures	$34,757	
Mean expenditures on:		Percentage of total income
Food at home	$3861	10.2
Food away from home	1190	3.1
Shelter	6231	16.4
Clothing	2381	6.3
Transportation	4343	11.4

[a]Head is male in 90 percent of families.

[b]Where present.

[c]Families with children present.

results were found in replicating the analysis of 1972-73 expenditure data[2] for the northeastern United States, using 1982 Canadian Family Expenditure Survey data (Fedyk, 1986).

Of perhaps more concern are the differences in tax policies of the two countries. The tax incidence in Canada, particularly as it applies to families with children, is more progressive than that faced by families in the United States.[3] More specific differences will be enumerated as we proceed to describe our analysis and apply its lessons to Wisconsin.

A. Methodology

In order to examine the relationship between family consumption and income, we employ a multinomial logit budget share model (MLBAM) (from Tyrrell, 1979) and twice estimate a simple consumption/saving system using two different measures of income. First we estimate consumption as a function of gross income--that is, the measure of income used is gross of sales, property, income and other personal taxes. Next we reestimate the system netting all taxes noted in Table 1 as having been coded separately by Statistics Canada from gross income. Because of data restrictions, measures of consumption and income in both estimates are gross of property and sales taxes.

Contributions of this work include (1) the unique characteristics of the chosen empirical model, (2) analysis of more recent expenditure data than have previously been used, and (3) analysis of the model's sensitivity to specific consumption (savings) definitions.

Findings are based on results from an empirical model that incorporates both continuous measures of adult equivalence and a flexible

functional form. In the study a revealed-preference approach using continuous household size and structure variables is adopted. Although revealed preference is a common approach for deriving equivalence measures in the consumer demand literature,[4] few studies also incorporate a continuous (versus stepwise discrete) approach to measure the effects of family size and structure on spending behavior.[5] Friedman (1957) first developed the concept of a continuous equivalence-scale measure. Its strengths include continuity over size or age-range measures (i.e., scales do not "jump" between adjacent age categories) and fewer required parameters for estimation. No studies in the consumer demand literature whose purpose is to explicitly measure the costs of raising children have used continuous scales.

The literature regarding the costs of raising children is replete with examples of studies which incorporate econometric models that a priori restrict estimated parameter values to be consistent with postulates of economic theory. For example, many expenditure allocation models assume functions homogeneous of degree one in income and family size (Prais and Houthakker, 1955). However, it can be demonstrated that the assumption of homogeneity can generate nonsensical results when applied to actual behavior and that homogeneity, coupled with an equivalence-scale specification, implies constant returns to scale. Numerous illustrations can be cited to refute the restriction that household composition changes yield constant returns to scale. The purchase of food in larger quantities sold at lower per unit prices and the reuse of clothing are standard examples of economies of scale which often occur upon the addition of a family member.

The present study incorporates a model which assures the theoretical restrictions of adding-up while allowing for nonhomogeneous demand functions and economies of scale. Thus, the model provides an effective balance between the concern for theoretical plausibility and the practical need to explain variance in the data.[6]

An additional contribution of this work is that it uses more recent expenditure data than have previous studies. The data are taken from the 1982 Canadian Family Expenditure Survey (FES). Lazear and Michael (1980) use the 1960-61 Survey of Consumer Expenditures, while Olson (1983), Espenshade (1984), and van der Gaag and Smolensky (1982) all use the 1972-73 Consumer Expenditure Survey. Although Espenshade applies the CPI to update expenditures to 1981 dollars, this approach can potentially bias the results. For instance, if a change in relative prices occurs over a period, causing families to substitute away from consumption of goods that become relatively more costly, studies relying on dated expenditure survey results will overstate (understate) the importance of commodities whose prices have exceeded (fallen short of) the average inflationary trend. This study's use of more recent expenditure data enhances external validity of the empirical findings.

The final contribution of this study is its particular attention to the model's sensitivity to definitions of consumption. As discussed in the introduction, the treatment (measurement) of durable expenditures can influence the consumption/income relationship. Most researchers in previous studies simply adopt the collection agency's (Bureau of Labor Statistics or Statistics Canada) definition of current consumption. The problem with this approach concerns consistent treatment of durable

expenditures. For example, expenditures for outlays on such durable goods as automobiles are included as an element of current consumption, while others such as expenditures for mortgage principal are not. Thus, to the extent that high-income families with children are more likely to own their own home, estimates of their consumption will be lower than that of their lower-income counterparts, who are more likely to be renters.

In order to examine the sensitivity of results to definitions of consumption, we estimated the multinomial logit budget share model using four definitions of consumption. In our strictest definition of current consumption (EXCLCONS), we netted as many measures of durable purchases from current consumption as possible. To identify elements for exclusion from current consumption, we applied three different definitions of durables to each Statistics Canada expenditure category: (1) the expenditure must be one for which the family could have secured a consumer loan by using equity in the good as collateral, (2) the expenditure must be for a good from which the family could expect to derive a flow of service for at least two years, and (3) the expenditure must either defray future liability or increase future consumption. Expenditure categories meeting all three of these definitions were netted from the measure of total current consumption and added to net change in assets (savings). Expenditure categories influenced by this decision were transportation (netting away the purchase price of an automobile), recreation (netting away expenditures for recreational vehicles), purchase of securities, and household operation (netting away the purchase of major home appliances).

The second definition adds back into current consumption (EXCLCONS) payments to mortgage principal (PRINCONS). This definition allows one to examine whether excluding mortgage principal from consumption biases measures of marginal propensity to consume across income groups.

The third definition of current consumption is as close to that used by Espenshade (ESPCONS) as possible. We add back to current consumption (EXCLCONS) purchase of securities and purchase of durables (automobiles, recreational vehicles, household furnishings, etc.). This definition is the one used by both Statistics Canada and the Bureau of Labor Statistics and includes mortgage principal in savings (net change in assets) rather than consumption.

The last definition of current consumption (BROADCONS) adds housing principal payments to ESPCONS. Of all four definitions used, BROADCONS represents the most comprehensive. Estimates using this measure provide a limit of the maximum propensity to consume from which we can compare EXCLCONS results (the minimum propensity to consume).

Although parameter estimates from our multinomial logit model will be presented in this report, their interpretation from a policy point of view is less than straightforward. For that reason we have used parameter estimates to simulate predicted values of consumption behavior by an average family. The average family we have chosen is a two-parent family with two children, the first being born when the husband is 29 and the wife 26 years of age and the second two years later. The ages of the parents and spacing of the children are based on information regarding the marriage and fertility behavior of Canadian families.

The life-cycle income stream of the family is derived by estimating a simple age-earnings profile using cross-sectional data and predicting

values from those parameter estimates. A table presenting the family characteristics used in the simulations is presented in Appendix B.

B. Results

1. Evaluation of tax incidence

For comparative purposes, we will first present the results using the ESPCONS measure of current consumption and compare the propensities to consume out of net versus after-tax income. This definition represents the one that Williams would likely have used had he reestimated the Espenshade findings to assess equity issues surrounding the use of net versus gross income in establishing child support awards.

Table 3 provides a comparison of the average sample family's gross and net income along with an estimate of the average taxes paid. These figures are expressed in 1982 Canadian dollars. Over the lowest-income ranges there is evidence of a certain amount of progressivity in the effective tax rate. However, over the middle- to upper-income ranges, taxes are nearly proportional.

Appendices C and D present parameter estimates of the consumption saving systems where the dependent variable, ESPCONS, is defined in a fashion similar to that used by Espenshade. The former results include gross income as an independent variable while the latter includes net income. Both results indicate that the current consumption share is negatively and significantly related to income. A 1 percent change in net income appears to result in a slightly larger decline in share of total expenditures allocated to current consumption than that caused by a small change in gross income.

Table 3

Net Versus Gross Income and Average Tax Rates Faced by Western Canadian Families, 1982 and 1977

Gross Income, 1982	Net Income, 1982	Average Tax Rate, 1982	Reported Average Tax Rate, 1977[a]
$15,000	$13,500	.10	.10
20,000	17,600	.12	.13
25,000	21,311	.15	.15
30,000	24,900	.17	.16
35,000	28,210	.19	.17
40,000	32,000	.20	.21[b]
45,000	35,685	.21	
50,000	39,250	.22	
55,000	42,900	.22	

Source: 1982 Canadian Family Expenditure Survey.

[a]From Ross (1980), p. 55.

[b]Effective average tax rate for families with annual incomes $35,000 and over.

Figure 1 presents results of simulations using the respective parameter estimates reported in Appendices C and D for our average family in the year of the life cycle when the father is 41, the mother is 38, and the two children are 11 and 13 years of age. Holding family characteristics constant, we repeat the simulation at various levels of income. The two lines are virtually on top of one another, reflecting the negligible difference in consumption share when comparing net versus gross income results at various income levels.

Table 4 presents income elasticity results using various levels of net and gross income. Only at the uppermost levels of income are any differences apparent in the responsiveness of consumption to changes in net versus gross income. A comparison of elasticities across income groups confirms the result that the change in consumption share and the change in income are negatively related, i.e., that as income increases by 1 percent, higher-income families are apt to respond by increasing consumption at a rate less than that of their lower-income counterparts, ceteris paribus.

To summarize, our results indicate that (1) as a share of total expenditures, there are no significant differences between families' share allocation to current consumption out of net and gross income. However, (2) there is a negative relationship between both gross and net income in budget shares allocated to current consumption.

The first result seems to contradict findings reported by Williams (p. 26) indicating an increasing difference between current consumption out of gross and net income.[7] The second result tends to support Williams' finding that higher-income families allocate a smaller share of

Figure 1

Simulations of Consumption Shares Using
Net Versus Gross Income

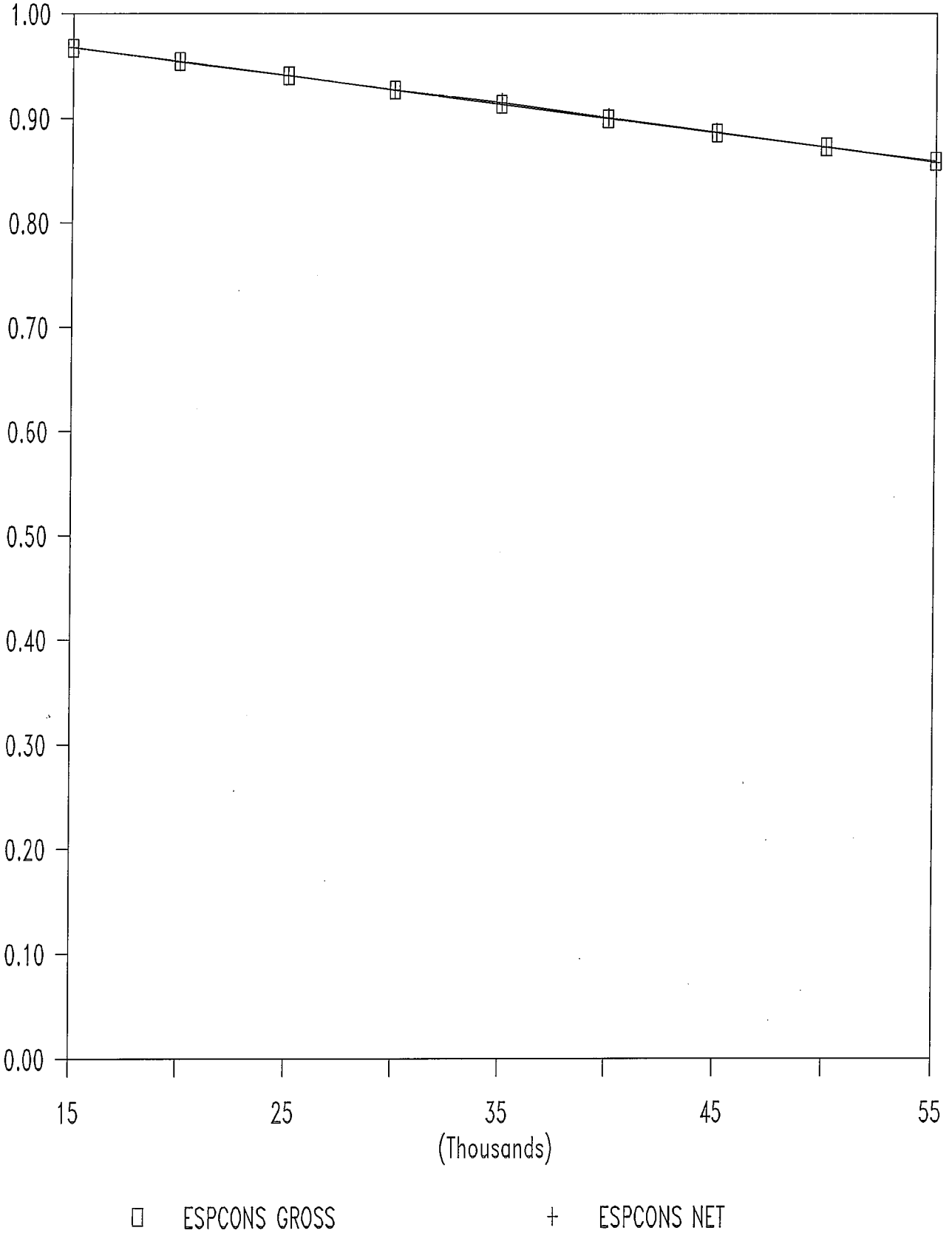


Table 4

Comparison of Income Elasticities by Net Versus Gross Income and Level of Income

Income Level Used in Simulation: Gross/Net	Income Elasticity	
	Simulation Using Gross Income Parameters	Simulation Using Net Income Parameters
$15,000/$13,500	.96	.96
$20,000/$17,600	.94	.94
$25,000/$21,311	.93	.93
$30,000/$24,900	.91	.90
$35,000/$28,210	.89	.88
$40,000/$32,000	.88	.86
$45,000/$35,685	.86	.84
$50,000/$39,250	.84	.82
$55,000/$42,900	.83	.80

both net and gross income to current consumption. Yet, any conclusions drawn from these results must be tempered by warnings regarding differences between this analysis and previous studies that may result from this particular methodology and sample.

One methodological difference that may produce disparate findings across studies is the interaction between variable measurement error and the choice of model used in the analysis. In this study, as previously mentioned, both consumption and income are gross of sales tax and property tax. Espenshade's study suffers from similar measurement error. However, the resulting bias will be influenced by the model chosen for estimating the income-consumption relationship. For example, Espenshade and Williams estimate family consumption as a linear function of husbands' and wives' earnings and a product of each. In this study we estimate consumption shares as a nonlinear function of total family income from all sources. Thus

$$n_e > n_d > n_t,$$

where n_t is the true income elasticity with respect to current consumption as compared to those estimates by e, Espenshade, and d, Douthitt. That is, the Espenshade results will yield an upward-biased income elasticity as compared to both the actual and Douthitt elasticity estimates. This implies that Espenshade's results would overestimate the extent to which the consumption behavior of high-income families would respond to changes in income.

Potential differences in findings attributable to the sample are twofold. The first relates to the fact that the Canadian sample was drawn

using different selection criteria from that used to draw the Espenshade/Williams U.S. sample. Perhaps the major difference is the fact that Canadian households were excluded if over one third of their total family income was from income-tested government programs. The only households deleted from Espenshade's study based on income were those with incomplete reporting.

If families in the United States face a progressive incidence of taxation, as claimed by Williams, the Canadian estimates of the relationship between consumption and gross income will be understated. If, however, U.S. policies, as reported by Pechman (1987), are slightly regressive or at best proportional at the lower end of the income distribution, the fact that many of these households have been eliminated in the Canadian study should introduce little or no bias with regard to the true relationship for the upper quartiles of the population, but possibly underestimate the relationship between consumption and gross income for U.S. families at the lower end of the income distribution.

Second, different types of tax policies are applied to household income in the American and Canadian samples, resulting in potential differences in tax incidence. One of the biggest differences between the Canadian and U.S. federal tax policies is that mortgage interest is deductible from taxable income in the United States, but not in Canada. This may explain in part why analysis of Canadian tax incidence (Gillespie, 1980) indicates that theirs is more progressive at the lower end of the income distribution than is that of the United States. However, given that we have restricted the Canadian sample to exclude certain low-income families, this difference is not particularly germane to our analysis.

The remaining bias depends on whether sales and property tax incidence (the two unaccounted-for tax policies) varies between the two countries. There is little evidence to suggest these are significantly different (as a percentage of current consumption) in the Canadian regions analyzed and the state of Wisconsin in 1982.

2. Evaluation of current consumption measurement and its relationship across income levels

As discussed in the introduction, the measurement of current consumption in the analysis of child-rearing costs is less straightforward than some might like to believe. In this section we examine how sensitive the relationship between income and current consumption across income levels is to the measurement of the dependent variable.

Appendices E, F, and G present parameters of the MLBAM model using alternative definitions of current consumption. Since results appear relatively invariant to specification of net or gross income as the independent variable, we will present only the results using gross income, consistent with Wisconsin's specification of the income base.

Definitionally, average consumption shares increase as the consumption share definition varies from EXCLCONS to BROADCONS. Further, the larger the defined current consumption share, the less responsive it is to changes in income. Figure 2 compares the predicted consumption shares for our average family at various levels of income. This responsiveness is reflected in the relative slope of each function. The slope of BROADCONS is less steep than that of EXCLCONS.

Table 5 presents a comparison of income elasticities at various income levels for each definition of current consumption. The income

Figure 2

Predicted Consumption Shares for Average Canadian Family at Various Income Levels

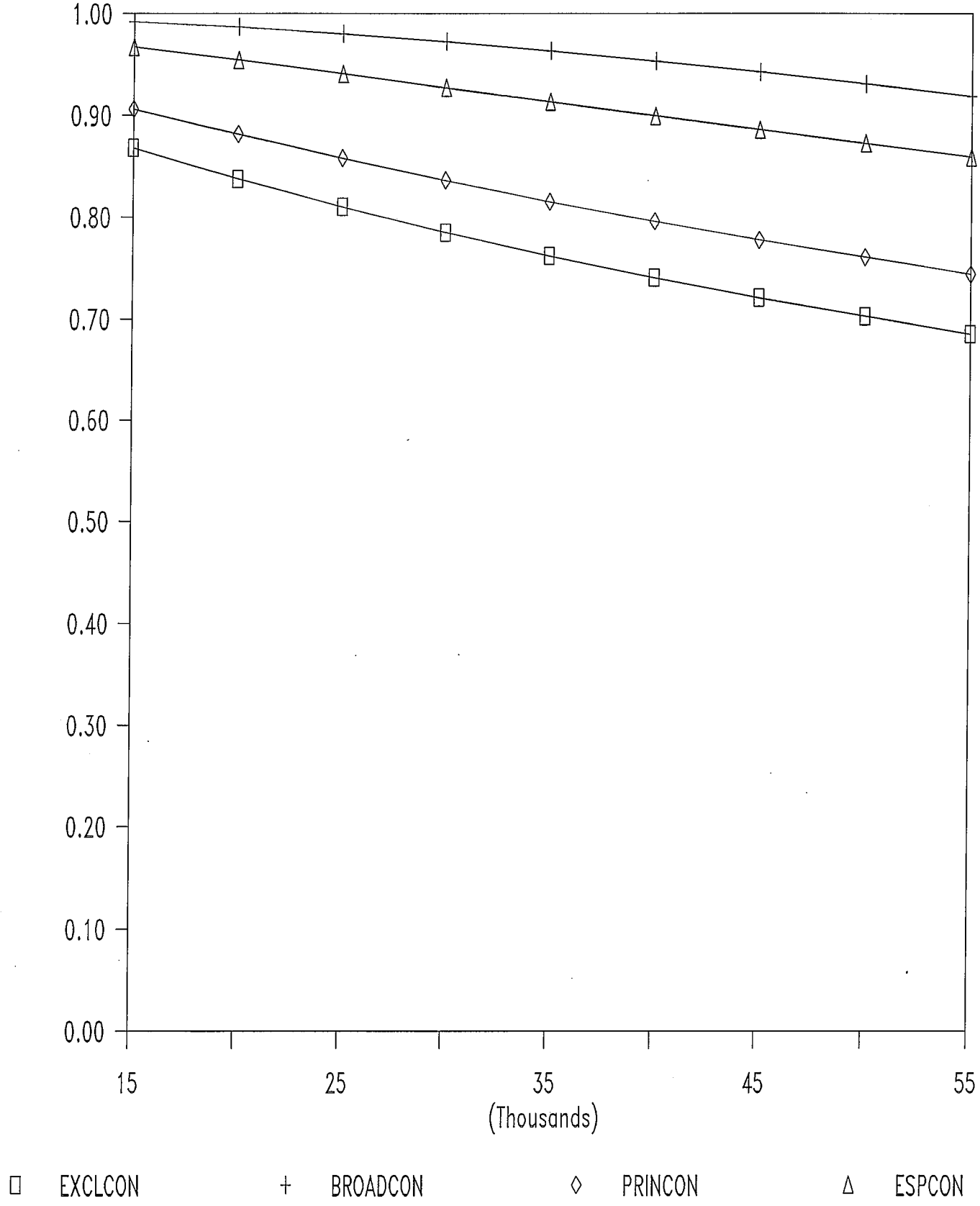


Table 5

Comparison of Income Elasticities
Using Various Definitions of Current Consumption
as the Dependent Variable, by Gross Income Level

Gross Income Simulation	Income Elasticity			
	BROADCONS Simulation Results	ESPCONS Simulation Results	PRINCONS Simulation Results	EXCLCONS Simulation Results
$15,000	.99	.96	.91	.89
$20,000	.98	.94	.89	.86
$25,000	.96	.93	.87	.84
$30,000	.95	.91	.85	.82
$35,000	.93	.89	.83	.80
$40,000	.91	.88	.81	.78
$45,000	.89	.86	.79	.76
$50,000	.87	.84	.78	.75
$55,000	.85	.83	.76	.73

elasticity corresponding to the BROADCONS parameter estimate is nearly unitary, implying that as gross income increases by 1 percent, the share of current consumption will increase by the same amount.

The major implication of this analysis for evaluation of equity issues surrounding implementation of the percentage-of-income standard relates to the philosophical question of what expenditures should be considered when assessing children's entitlement to their absent parent's income. If the guiding principle is that children are entitled to a level of support such that their standard of living does not vary from what it would have been had the parents chosen to live together, then it would be misguided to define consumption exclusive of all expenditures for durables (EXCLCONS) that would have contributed to the child's standard of living.

The implicit assumption in applying Espenshade's child-rearing cost estimates to establish child support awards is that children are not entitled to be compensated for housing expenditures applied to the principal of an owned home. This may be an equitable solution if, in addition to a child support award, the absent parent is ordered to share mortgage principal payments with the custodial parent residing in the matrimonial home. In the absence of such an order, support orders based on Espenshade's cost figures will tend to underestimate child-rearing costs, particularly for those high-income families who are more likely to be homeowners. Figure 2 and Appendix F support this conclusion by demonstrating that smaller differences in shares of income allocated to consumption across income groups are noted when durable goods purchases are included in the consumption measure.

Thus, the definition of current consumption used to evaluate child-rearing costs has direct implications for assessing whether gross or net income should be used as the income base in setting child support awards. When expenditures for durable goods are included in consumption, there appears to be less potential disparity in applying a single percentage-of-income standard across all income classes of absent parents.

III. DISCUSSION AND SUMMARY

The purpose of this analysis is to examine the relationship between child-related expenditures and family income. The objective is to evaluate whether Wisconsin's percentage-of-income standard to set child support awards results in vertical income inequities between high- and low-income absent parents--i.e., are high-income absent parents required to pay a greater proportion of their net income in child support than their low-income counterparts?

Analysis of Canadian expenditure data regarding family consumption behavior provides mixed evidence regarding the equity issue. Like Williams, we note that when the Espenshade definition of current consumption is used, families do tend to allocate a smaller share of their expenditures to consumption as income increases. However, contrary to Williams, we find no difference in allocations out of gross versus net income.

Further analysis considered what, if any, influence a different definition of current consumption from that used by Espenshade and others--one including durable goods--had on the differences in observed

propensities to consume across income groups. Results indicate that this definition does influence the relationship between consumption and income. Specifically, if we include in our measure of consumption expenditures for durable goods that contribute to child welfare and that are more likely to be purchased by upper-income families, then smaller differences across income groups are noted in the share of expenditures allocated to consumption.

In the final analysis, however, what really matters is whether the percentage-of-income standard set by the state of Wisconsin unfairly burdens high-income absent parents. Contrary to Williams' assertion that this standard will a priori be unfair to high-income parents, what is key from an equity standpoint is the percentage standard level set by the state. With knowledge of the tax rate faced by families at different income levels, we could set Wisconsin's percentage-of-income standard so that it yields a monthly child support payment equal to what it would have been had net income been the income base. A simple formula for this calculation is

$$r_g * Y = (Y\ (1-t)) * r_n, \qquad (1)$$

where r_g equals the percentage support applied to gross income, Y equals gross income, t equals the tax rate faced by a family at that level of gross income, and r_n equals the percentage support of net income applied to the absent parent's income.

Since what is largely at issue in this whole evaluation is our inability to accurately measure t, rigorous analysis of Wisconsin's percentage-of-income standard cannot yet be accomplished. However, we do

have estimates of tax rates from the Canadian analysis and guidelines of Williams (p. 26) regarding what both r_g and r_n should be for different income groups to make a "ballpark" assessment of the equity of Wisconsin's percentage-of-income standard.

First, consider what the equivalent r_g should be if r_n equals 33.9 percent for an absent parent with two children and a net income of $40,000 per year, as proposed by Williams (p. 26). Using the upper-income tax rate of 22 percent, as found in the Canadian study, and applying our formula (1), we see that an equivalent support payment based on gross income would be 26 percent. The Wisconsin percentage-of-income standard (r_g) stands at 25 percent.

If one believes that the weight of evidence regarding the relationship between consumption and income lies with the Williams study, i.e., that there are significant differences across income categories in propensities to consume out of gross income, then the implication of the previous exercise is that the Wisconsin standard is a reasonable approximation of actual child-rearing costs. If, however, one believes that the Williams evaluation of tax incidence is flawed in favor of the high-income absent parent, then application of the Wisconsin standard yields support levels below actual child-rearing costs for high-income absent parents. Conversely, if one concurs with the Williams findings, then low-income parents are not being ordered to make child support payments sufficient to cover direct costs.

We can also assess the fairness of the percentage-of-income standard by simply comparing it to the percentages of gross income that Williams estimates as direct child-rearing costs (p. 26). Consistent with our

previous example of a parent whose net income is $40,000, we will now consider support payments of a parent whose gross income is $50,000 (the approximate income equivalent as calculated by both Williams in Table 5 and the author in Table 3). Williams finds that the parent of one, two, or three children would allocate 17.6, 27.3 and 34.1 percent of gross income, respectively, in support of their children. The Wisconsin standard for one, two, and three children is 17, 25 and 29 percent, respectively. Thus, by Williams' own findings, the present percentage-of-income standard levels do not appear unduly to burden the high-income absent parent.

This evaluation is but a first step in examining the relationship of consumption to income, and ultimately of child-rearing costs to income. Some of its shortcomings can be addressed in part through analysis of recent U.S. Bureau of Labor Statistics expenditure data. The next stage of this evaluation is to replicate the Canadian study using these data.

Appendix A

METHODOLOGY

The "new home economics" (see Becker, 1981; Michael and Becker, 1973; and Pollak and Wachter, 1975) serves as the theoretical framework on which we build. We assume that households derive utility from the consumption of home-produced commodities (Q), one of which is child services. The inputs to the production process are time (t) and market goods (x), which the household purchases with either unearned income (V) or earnings (w) obtained from selling their labor (h) in the market. Utility is maximized subject to time, income, and home production technology constraints. Input demand (expenditure) equations are derived by solving the cost function dual problem for the household's expenditure function.

The functional form of our expenditure equations are based on work by Tyrrell (1979). Budget shares in Tyrrell's multinomial logit budget allocation model are expressed in the logistic form as

$$wi = \frac{e^{f_i(M,\ P_1,\ldots P_n, Z_1,\ldots Z_r)}}{\sum_{j=1}^{n} e^{f_j(M,\ P_1,\ldots P_n, Z_1,\ldots Z_r)}}, \quad (i,j=1,\ldots n) \qquad (A1)$$

where:

w_i is the budget share of good i (and represents the probability that a given proportion of the budget is allocated to good i),

M is income,

P_i is the price of the ith good,

Z_k is the kth element of family composition,

$f_i()$ is a function assumed to be linear in the unknown parameters.

Since the model is specified in terms of budget shares, the adding-up property is assured; when a complete system is estimated, the budget shares will sum to one. Data used in this study are cross-sectional, and thus prices are assumed constant and drop out of equation (A1):

$$w_i = \frac{e^{f_i(M,Z)}}{\sum_{j=1}^{n} e^{f_j(M,Z)}} \qquad \text{(A2)}$$

This model was chosen for several reasons. First, while many models represent the addition of a child as having the same effect across all family types, the MLBAM specification allows the addition of a child to influence expenditures in different ways depending on the composition of the family to which the child is added. Thus, it is not only possible to examine the effect of marginal children on family expenditures, but also to examine those marginal effects dependent upon spacing of children. Further, it is possible to examine what, if any, effects the age of parents at child's birth and parental age gap have on expenditure patterns.

The Tyrrell model also incorporates a continuous equivalence scale which varies with age in order to capture the effects of family composition (Z) on household expenditures. Tyrrell's specification of family composition includes family size and composition (age and sex of family members). Departing from the usual method of specifying a

separate equivalence coefficient for each age-sex group and adding these together to get the equivalence scale, the MLBAM follows Forsyth (1960) and specifies equivalent family size as the product of household size and a composition term for each good:

$$S_i = S\Theta_i, \tag{A3}$$

where:

S_i is equivalent family size with respect to good i,

S is actual family size, and

Θ_i represents a household composition term specific to good i.

The standard household is then defined by $\Theta_i = 1$ and $S_i = S$.

Tyrrell distinguished between size effects--the effects on consumption due to the addition of a family member regardless of the type of person (such as the increase in the demand for necessities like food and clothing)--and composition effects--the effects on consumption due to the addition of a specific type of family member (like the purchase of a crib for an infant). His model was formulated to examine these effects separately by taking the logarithm of (A3). The function f_i in (A2) is then written as

$$f_i(M,Z) = B_{i0} + B_{i1}\ln M + B_{i2}\ln S + B_{i3}\ln\Theta_i. \tag{A4}$$

The family composition function Θ_i is specified so that $\ln\Theta_i$ is linear in parameters:

$$\Theta_i = \sum_{s=1}^{S} g_{is}, \tag{A5}$$

where g_{is} is a transformation of each family member's age.

Following Buse and Salathe (1978) and Blokland (1976), Tyrrell specified the gis functions to be continuous, in the form of cubic polynomials in age:

$$g_{is} = a_{i0} + a_{i1}AGE_s + a_{i2}(AGE_s)^2 + a_{i3}(AGE_s)^3, \tag{A6}$$

with separate functions for males and females. The definition of a standard consumer or family requires that for a certain age (6) is normalized at zero, which, Tyrrell stated (p. 108), "is not possible to do directly." Instead, equation (A6) is approximated using Lagrangian interpolation polynomials (LIP) first suggested by Almon (1965). This technique transforms equation (A6) into a linear combination of LIPs whose coefficients will approximate the values of equation (A6). The LIPs are specified in terms of four reference points, in this case four ages.

All the ages are expressed in terms of deviations around the four reference ages. The LIPs have the form:

$$L1(a_s) = \frac{(a_s - a_2)(a_s - a_3)(a_s - a_4)}{(a_1 - a_2)(a_1 - a_3)(a_1 - a_4)}, \tag{A7}$$

$$L2(a_s) = \frac{(a_s - a_1)(a_s - a_3)(a_s - a_4)}{(a_2 - a_1)(a_2 - a_3)(a_2 - a_4)}, \tag{A8}$$

$$L3(a_s) = \frac{(a_s - a_1)(a_s - a_2)(a_s - a_4)}{(a_3 - a_1)(a_3 - a_2)(a_3 - a_4)}, \tag{A9}$$

$$L4(a_s) = \frac{(a_s - a_1)(a_s - a_2)(a_s - a_3)}{(a_4 - a_1)(a_4 - a_2)(a_4 - a_3)}, \qquad \text{(A10)}$$

where:

a_s = ln(age of person s + 1.75)

a_1 = ln(-.75 + 1.75),

a_2 = ln(14 + 1.75),

a_3 = ln(20 + 1.75),

a_4 = ln(100 + 1.75), and

L_i = the ith LIP.

These functions have the feature that if one of the reference ages is the person's actual age, the LIP corresponding to that reference age is equal to one while all the other LIPs equal zero.

Incorporating equations (A7) to (A10) into (A6) yields

$$g_{is} = \sum_{r=1}^{4} L_r(a_s) \qquad \text{(A11)}$$

Incorporating (A5) and (A11) for θ_i into equation (A4) gives a complete specification for the function f_i:

$$f_i(M,S_i) = B_{i0} + B_{i1}\ln M + B_{i2}\ln S + \sum_{r=1}^{4} B_{i2r} \sum_{s=1}^{S_m} L_r(a_s)$$

$$+ \sum_{r=1}^{4} B_{i2(r+4)} \sum_{s=1}^{S_f} L_r(a_s), \qquad \text{(A12)}$$

where S_m is the number of males in the family and S_f is the number of females.

Next the expenditure function (A12) must be normalized by specifying the standard consumer or household. Tyrrell chose households composed of 20-year-olds for his standard household. This normalization is obtained by the restriction

$$B_{i23} = B_{i27} = 0 \quad (\forall\ i). \tag{A13}$$

In adapting the Tyrrell model to this study, several modifications were necessary. For example, Tyrrell separates the effects of males and females by specifying a separate function for each sex. Since data regarding gender of children are unavailable in the Canadian data and the sample selected contained only two-parent households (with no other adults present), no variation in gender exists in the data. Consequently, Tyrrell's age specification is altered to separate adults and children rather than males and females. Thus, equation (A12) becomes

$$\begin{aligned} f_i(M,S_i) = {} & B_{i0} + B_{i1}\ln(M) + B_{i2}\ln(S) + B_{i21}[L1(AGE_m) + L1(AGE_f)] \\ & + B_{i22}[L2(AGE_m) + L2(AGE_f)] + B_{i23}[L3(AGE_m) + L3(AGE_f)] + \\ & B_{i24}[L4(AGE_m) + L4(AGE_f)] + B_{i25}\sum_{k=1}^{K} L1(AGE_k) + B_{i26}\sum_{k=1}^{K} L2(AGE_k) \\ & + B_{i27}\sum_{k=1}^{K} L3(AGE_k) + B_{28}\sum_{k=1}^{K} L4(AGE_k), \end{aligned} \tag{14}$$

where:

AGE_m = age of the adult male,

AGE_f = age of the adult female,

AGE_k = age of child k,

K = total number of children in the family,

and other variables are as previously defined. The reference ages of the LIP functions are similar to those used by Tyrrell, but are altered to reflect the characteristics of the specific subsample. In this study families with part-year members were not included in the final sample, implying that the youngest individual in the sample is one year old. Correspondingly, the reference age for L1 is one rather than Tyrrell's -.75. However, the results are the same, since Tyrrell added 1.75 to all ages to allow for the logarithmic transformation: ln(-.75+1.75) = ln(1) = 0. Further, since the oldest person in our sample is constrained to be 64, the reference age for L4 is 64. The reference ages for L2 and L3 are unchanged from Tyrrell's specification at 14 and 20 respectively.

The standard consumer in this study is defined to be a couple aged twenty. Thus, the constraint is

$$B_{i23} = 0. \tag{A15}$$

The estimating equation is

$$wi = \frac{e^{f_i(M,S_i)}}{\sum_{j=1}^{n} e^{fj(M,S_i)}}, \tag{A16}$$

with the f_i function specified in the form of equation (A14). The model is estimated using an iterative Newton-Raphson (maximum likelihood) procedure. Identification of the system is achieved by setting the parameters of one equation equal to zero. Results are thus interpreted as being compared to the omitted category. In this study "savings" (net change in assets) is the excluded equation.

Appendix B

Family Characteristics Used in Life-Cycle Simulations

Year of Life Cycle	Father's Age	Mother's Age	First Child's Age	Second Child's Age	Gross Family Income	Net Family Income
1	28	25			$32,255	$27,644
2	29	26	1		27,167	22,466
3	30	27	2		30,679	25,027
4	31	28	3	1	30,377	25,019
5	32	29	4	2	33,759	27,489
6	33	30	5	3	36,316	29,352
7	34	31	6	4	38,390	30,863
8	35	32	7	5	40,135	32,133
9	36	33	8	6	41,633	33,224
10	37	34	9	7	42,934	34,171
11	38	35	10	8	44,068	34,997
12	39	36	11	9	45,057	35,719
13	40	37	12	10	45,916	36,347
14	41	38	13	11	46,657	36,889
15	42	39	14	12	47,289	37,353
16	43	40	15	13	47,817	37,743
17	44	41	16	14	48,248	38,063
18	45	42	17	15	48,585	38,316
19	46	43	18	16	48,833	38,505
20	47	44		17	47,497	37,295
21	48	45		18	47,572	37,361
22	49	46			47,647	37,427

Appendix C

Parameter Estimates of the Multinomial Logit Budget Allocation Model Defining Current Consumption in Similar Fashion as Espenshade (ESPCONS), with Gross Income as an Independent Variable

Variable	Parameter	Standard Error	t-value
CONSTANT	14.19	2.00	7.09
ln GROSS INCOME	-1.23	.19	-6.50
ln FAMILY SIZE	1.01	.54	1.88
LIP1	21.03	82.59	.25
LIP2	.12	1.16	.11
LIP4	-.58	.37	-1.60
LIP5	-.52	.64	-.82
LIP6	-.11	.16	-.69
LIP7	.02	.05	.36
LIP8	.85	1.84	.46
Average consumption share:	.87		
ln likelihood:	-604.91		
n:	1630		

Appendix D

Parameter Estimates of the Multinomial Logit Budget Allocation Model Defining Current Consumption in Similar Fashion as Espenshade (ESPCONS), with Net Income as an Independent Variable

Variable	Parameter	Standard Error	t-value
CONSTANT	15.61	2.13	7.33
ln NET INCOME	-1.39	.20	-6.77
ln FAMILY SIZE	1.09	.54	2.03
LIP1	20.85	82.66	.25
LIP2	.13	1.16	11.31
LIP4	-.59	.37	-1.61
LIP5	-.56	.64	-.88
LIP6	-.12	.16	-.76
LIP7	.02	.05	.42
LIP8	.97	1.85	.52
Average consumption share:	.87		
ln likelihood:	-603.12		
n:	1630		

Appendix E

Parameter Estimates of the Multinomial Logit Budget Allocation Model Defining Current Consumption as EXCLCONS, with Gross Income as an Independent Variable

Variable	Parameter	Standard Error	t-value
CONSTANT	9.41	1.45	6.48
ln GROSS INCOME	-.85	.14	6.16
ln FAMILY SIZE	.49	.40	1.23
LIP1	1.51	59.75	.03
LIP2	-.14	.81	-.17
LIP4	-.19	.26	-.75
LIP5	-.22	.45	-.49
LIP6	-.06	.11	-.50
LIP7	.00	.02	.48
LIP8	.39	1.31	.30
Average consumption share:	.72		
ln likelihood:	-947.61		
n:	1630		

Appendix F

Parameter Estimates of the Multinomial Logit Budget Allocation Model Defining Current Consumption as PRINCONS, with Gross Income as an Independent Variable

Variable	Parameter	Standard Error	t-value
CONSTANT	10.13	1.57	6.45
ln GROSS INCOME	-.93	.15	-6.17
ln FAMILY SIZE	.37	.43	.86
LIP1	-12.22	62.85	-.19
LIP2	-.65	.85	-.77
LIP4	-.10	.26	-.38
LIP5	-.39	.49	-.79
LIP6	-.11	.12	-.87
LIP7	.01	.03	.18
LIP8	1.39	1.43	.98
Average consumption share:	.77		
ln likelihood:	-843.48		
n:	1630		

Appendix G

Parameter Estimates of the Multinomial Logit Budget Allocation Model Defining Current Consumption as BROADCONS, with Gross Income as an Independent Variable

Variable	Parameter	Standard Error	t-value
CONSTANT	20.38	2.68	7.60
ln GROSS INCOME	-1.88	.25	-7.40
ln FAMILY SIZE	1.30	.70	1.86
LIP1	-57.88	99.62	-5.81
LIP2	-1.80	1.39	-1.30
LIP4	-.30	.41	-.73
LIP5	-1.63	.90	-1.81
LIP6	.36	.22	-1.63
LIP7	4.67	.08	.58
LIP8	5.59	2.76	2.02
Average consumption share:	.92		
ln likelihood:	-379.74		
n:	1630		

Notes

[1]In 1982 there was no sales tax in Alberta and a 5 percent sales tax in the provinces of Saskatchewan and Manitoba. And to complicate matters further, although taxed at the same rate, different types of Saskatchewan and Manitoba family expenditures were taxed.

[2]The same data set used in the Espenshade analysis.

[3]For a more complete discussion of the differences between family tax policies in the United States and Canada, the interested reader is referred to Douthitt (1986) and Douthitt and Zick (1988).

[4]See Barten, 1964; Blokland, 1976; Buse and Salathe, 1978; Espenshade, 1984; Henderson, 1950; Lazear and Michael, 1980; Muellbauer, 1980; Olson, 1983; Prais and Houthakker, 1955; Price, 1971; Singh and Nagar, 1973; Sydenstricker and King, 1921; Tedford, Capps, and Havlicek, 1986; Tyrrell, 1979; and Van der Gaag and Smolensky, 1982.

[5]See Blokland, 1976; Buse and Salathe, 1978; Tedford, Capps and Havlicek, 1986; Tyrrell, 1979.

[6]A more complete exposition of the model is presented in Appendix A.

[7]In Williams' Tables 5 and 6, he reports the proportion of gross and net income spent on children by level of income. Estimates were derived using Espenshade's result that the cost of raising children is a constant function of current consumption across income levels. Thus, the proportions reported in those tables should bear a direct correspondence with current consumption as measured in our analysis.

References

Almon, S. (1965). "The Distributed Lag between Capital Appropriations and Expenditures." Econometrica, 33: 178-196.

Barten, A.P. (1964). "Family Composition, Prices and Expenditure Patterns." In P.E. Hart, G. Mills, & J.K. Whitaker (eds.), Econometric Analysis for National Economic Planning. London: Butterworths.

Becker, G.S. (1981). A Treatise on the Family. Cambridge: Harvard University Press.

Blokland, J. (1976). Continuous Consumer Equivalence Scales. Leiden: Stenfert Kroese.

Buse, R.C., Salathe, L.F. (1978). "Adult Equivalent Scales: An Alternative Approach." American Journal of Agricultural Economics, 60: 460-468.

Capps, O., Jr., Tedford, J.R., and Havlicek, J., Jr. (1983). "Impacts of Household Composition on Convenience and Nonconvenience Food Expenditures in the South." Southern Journal of Agricultural Economics, 15: 111-118.

Deaton, A. and Muellbauer, J. (1980). Economics and Consumer Behavior. Cambridge: Cambridge University Press.

Deaton, A. and Muellbauer, J. (1986). "On Measuring Child Costs: with Applications to Poor Countries." Journal of Political Economy, 94: 720-744.

Douthitt, R.A. (1986). "Canadian Family Tax Law and Its Implications for Household Time Allocation." Institute for Research on Poverty, Discussion Paper no. 826-86.

Douthitt, R.A. and Zick, C.D. (1988). "Taxes and Time Allocation Patterns of Married Women with Children: Cross-Cultural Comparisons between the United States and Canada." Journal of Consumer Studies and Home Economics, 10, forthcoming.

Engel, E. (1895). "Die Lebenskosten Belgischer Arbeiter-Familien fruher and jetzt." International Statistical Institute Bulletin, 9: 1-74.

Espenshade, T.J. (1984). Investing in Children. Washington, D.C.: The Urban Institute.

Fedyk, J.M. (1986). "An Application of the Multinomial Logit Budget Allocation Model to the Costs of Raising Children on the Prairies." Master's Thesis, University of Saskatchewan.

Forsyth, F.G. (1960). "The Relationship between Family Size and Family Expenditure." Royal Statistical Society Journal, Series A, 123: 367-393.

Friedman, M. (1957). A Theory of the Consumption Function. Princeton: Princeton University Press.

Garfinkel, I. (1987). "The Basis of the Wisconsin Percent of Income Standard." Institute for Research on Poverty, University of Wisconsin-Madison, February 1987. Mimeo.

Gillespie, W. I. (1980). The Redistribution of Income in Canada. Ottawa: Gage Publishing Limited.

Henderson, A.M. (1950). "The Cost of Children, Parts II and III." Population Studies, 4: 267-298.

Lazear, F.P., Michael, R.T. (1980). "Family Size and the Distribution of Real per Capita Income." American Economic Review, 70: 91-107.

Michael, R.T. and Becker, G.S. (1973). "On the New Theory of Consumer Behavior." Swedish Journal of Economics, 75 (4), 378-396.

Muellbauer, J. (1977). "Testing the Barten Model of Household Composition Effects and the Cost of Children." Economic Journal, 87: 460-487.

Muellbauer, J. (1980). "The Estimation of the Prais-Houthakker Model of Equivalence Scales." Econometrica, 48: 153-176.

Olson, L. (1983). Costs of Children. Toronto: Lexington Books.

Pechman, J.A. (1987). Federal Tax Policy, Fifth Edition. Washington, D.C.: The Brookings Institution.

Pollak, R.A. and Wachter, M.L. (1975). "The Relevance of the Household Production Function and Its Implications for the Allocation of Time." Journal of Political Economy, 83 (2), 255-277.

Prais, S.J., and Houthakker, H.S. (1955). The Analysis of Family Budgets. Cambridge: Cambridge University Press.

Price, D. W. (1971). "Unit Equivalence Scales for Specific Food Commodities." American Journal of Agricultural Economics, 52: 224-233.

Ross, D.P. (1980). The Canadian Fact Book on Income Distribution. Ottawa: Council on Social Development.

Rothbarth, E. (1943). "Note on a Method of Determining Equivalent Income for Families of Different Composition." In C. Madge (ed.), War-Time Pattern of Saving and Spending. Cambridge: National Institute of Economic and Social Research.

Singh, B. (1972). "On the Determination of Economies of Scale in Household Consumption." International Economic Review, 13: 257-270.

Singh, B., and Nagar, A.L. (1973). "Determination of Consumer Unit Scales." Econometrica, 41: 347-355.

Sydenstricker, F., and King, W.I. (1921). "The Measurement of the Relative Economic Status of Families." Quarterly Publication of the American Statistical Association, 17: 842-857.

Tedford, J.R., Capps, O. and Havlicek, J. (1986). "Adult Equivalence Scales Once More--A Developmental Approach." American Journal of Agricultural Economics, 68 (2), 321-333.

Theil, H. (1969). "A Multinomial Extension of the Linear Logit Model." International Economic Review, 10: 251-258.

Tyrrell, T.J. (1979). "An Application of the Multinomial Logit Model to Predicting the Pattern of Food and Other Household Expenditures in the Northeastern United States." Doctoral dissertation, Cornell University.

Van der Gaag, J. (1982). "On Measuring the Cost of Children." Children and Youth Services Review, 4: 77-109.

Van der Gaag, J., and Smolensky, E. (1982). "True Household Equivalence Scales and Characteristics of the Poor in the United States." Review of Income and Wealth, 28: 17-28.

Williams, R. G. (1986). "Development of Guidelines for Child Support Orders." Washington, D.C.: Office of Child Support Enforcement, U.S. Department of Health and Human Services.