Out of the Wallet and into the Purse: Using Micro Data to Test Income Pooling

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Abstract:

Unitary models, assuming a single objective function and unified budget constraint, are traditionally used to model household behavior. Most empirical tests of unitary models rely on endogenous regressors. This paper uses an exogenous change in the intrahousehold distribution of income, provided by a change in U.K. Family Allowance policy. Expenditure shares are estimated for a wide range of goods. Shifts in expenditure shares for assignable goods, such as men's clothing, children's clothing, and men's tobacco, suggest that children benefited at the expense of men when this policy change shifted income within households from men to women.

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D12: Household Behavior and Family Economics – Consumer Economics: Empirical Analysis
D19: Household Behavior and Family Economics – Other
D79: Analysis of Collective Decision-Making – Other
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I. Introduction

In the past two decades, there has been much discussion of, and many attempts to test, the "pooling hypothesis" implied by unitary models of household decision-making against the set of alternative collective models.[1] Unitary models assert that a household behaves like an individual, maximizing a single objective function subject to a unified budget constraint. One implication of these models is that household members pool their income, and that who controls what proportion of that income does not affect household demands.

Empirical tests of income pooling are typically plagued by potential biases due to the endogeneity of measures of control over income in the household. In cross section data, the magnitude and distribution of income in the household may be correlated with the preferences of and prices faced by family members. Clearly what is needed for a test of pooling is an experiment generating variation in intra-household income control. In the late 1970s, the U.K. changed the form of its universal child benefit scheme, essentially shifting receipt of transfer income from fathers to mothers in two-parent families. This "natural experiment" provides an exogenous source of variation in the control of resources within the family. Using aggregated data, grouped by household composition and income, Lundberg, Pollak, and Wales (1997) (LPW) find that ratios of children's to men's and of women's to men's clothing expenditures in households with children in the U.K increased after this policy change took effect. This study did not control for changes in relative prices of the three goods, and was limited in the goods examined.

[1] Lundberg and Pollak (1996) provide a comprehensive discussion of both the theoretical and empirical literature.

In this paper, I use household-level data to test for changes in expenditure patterns for a broader range of goods, using a single-difference model in a time series of cross sections.[2] I estimate the effect of the policy change on the share of the budget allocated to each of a comprehensive set of eleven broadly defined goods categories. The hypothesis that expenditure shares for all these goods were unaffected by the shift in income control is strongly rejected. While any significant change in expenditure patterns attributable to this policy change warrants a rejection of income pooling, testing the pooling hypothesis using goods that are assignable to particular household members is comparatively more appealing.

I estimate budget shares for men's, women's, and children's clothing, controlling for prices of each of these goods[3]. Results are consistent with those of LPW. I also estimate budget shares for several narrowly defined goods that may be of greater interest either to men or to women, or of particular relevance to child welfare. I find shifts in expenditures on some quasi-assignable goods that are generally in the direction a collective model would predict, given the direction of change in control over household income. For instance, men's clothing and a men's tobacco category - consisting of cigars, pipe tobacco, and snuff products - decline, while children's clothing, toys, and pocket money, and restaurant and take-away meals increase as a share of total expenditure.

The paper is organized as follows: Section two provides some theoretical and empirical background motivating this research, including a discussion of the change in the Family

[2] It seems appealing to use married couples with no children in the household as a control group, since they were unaffected by this policy change. I explored this possibility for all the goods examined here. I find, for the majority of these goods, that I cannot reject the null hypothesis that the time trends in the four years before the policy change differ between these two groups, and thus conclude that couples with no children are not a good control group. That group contains couples who are childless and will remain so, couples who have not yet had children, and those who have already raised their children. In these data, it is impossible to distinguish these from one another. It is plausible that any of these three groups may behave differently than couples with children, say, with respect to women's labor force participation for example, and thus have different time trends in expenditures.

Allowance policy. Section three discusses the data; and section four, the empirical models. Section five presents results and their implications; and section six concludes.

II. Background

Traditional economic theory avoids the difficult issue of how decisions are made in households by assuming each household maximizes a single objective function subject to a unified budget constraint. Samuelson (1956) suggests that this objective function might be arrived at through consensus among family members. Becker (1981) proposes it may represent the preferences of an altruist (dictator) in the household. The restrictions imposed by the unitary models of Samuelson and Becker are strong ones. The household objective function is assumed to have the properties of a utility function, and to be invariant to who controls resources in the household. One restriction implied by such models is that household members pool their resources. This pooled income is then used to maximize the household objective function. This implies that only total household income, not its distribution, affects household demands.

This has important practical implications for policies targeted at improving the welfare of particular household members, such as women or children. Income pooling results in transfers to targeted household members being neutralized by the household allocation mechanism. The welfare of the targeted member may be improved, but no more or less than if the transfer had been given to another household member. Cash transfers, as well as transfers in kind, may be subject to this reallocation.

The concept of individual rational choice, which lies at the heart of microeconomic theory, compels us to consider the possibility that each person may have distinct preferences, and

[3] LPW used only an aggregate clothing category price index, while this study utilizes separate price indices for each

that there may therefore be competing interests of individuals within a household. Social choice theory has demonstrated that aggregating preferences is no simple matter, and that the aggregate function arrived at may be sensitive to the mechanism of aggregation.

Relatively recent theoretical work allows for the possibility that each adult in the household has distinct preferences, and analyzes how their competing interests are reconciled.[4] Models which do not impose pooling have been introduced, including general collective models (Chiappori 1988, 1992), and both cooperative and non-cooperative bargaining models due to Manser and Brown (1980), McElroy and Horney (1981), Bergstrom (1996), and Lundberg and Pollak (1993, 1994), among others. These models allow income accruing to different family members to affect household demands differently. For instance, in Nash bargained solutions, each person's (potential) income affects his or her reservation level of utility, or threat point, and therefore his or her equilibrium level of utility in the household. Thus, these models allow for more effective targeted transfer policies. In cases where the difference in predictions of and unitary models is important, and if unitary models make poor predictions, then collective household models must be considered.

Endogeneity of the distribution of income within the household creates obstacles to testing the pooling hypothesis. An obvious example is earned income. Its distribution and magnitude depend on hours worked by each spouse, which are determined jointly with household expenditures. Unearned income is also likely to be endogenous with respect to household behavior. For instance, income from assets may be correlated with past labor supply, and thus with current labor supply as well. Transfers, both public and private, are typically conditioned on some set of criteria over which household members exercise some control.

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of the three sub-categories.

Sources of unexpected unearned income that are not subject to these concerns tend to be sporadic and insignificant. Previous attempts to test the pooling hypothesis, including Thomas (1990), Schultz (1990), Phipps and Burton (1998), and Bourguinon, Browning, Chiappori, and Lechene (1993) have used some of these problematic sources of income. These tests have generally rejected pooling, but possible endogeneity biases call those results into question.

Another hurdle in testing for income pooling is that consumption data are typically collected at the household, not the individual, level. Though individual expenditures are collected by some surveys, the purchaser is not necessarily the consumer. We cannot assign consumption of most goods to any one person, and the possibility of interdependent preferences makes it even more problematic to assign utility from consumption. However, complete assignability is not required. Examining goods which are of greater interest to some household members than to others, such as the three clothing categories examined by LPW, provides an intuitive means of testing the pooling hypothesis, and whether any shifts in expenditure patterns are consistent with what we would expect in the context of collective models.

In the United Kingdom in the late 1970s, the child benefit scheme was altered in such a way as to shift income from fathers to mothers in two-parent households. Prior to 1977, the universal child benefit scheme in the U.K. consisted of a small taxable Family Allowance payment to the mother, and a more significant Child Tax Allowance, which reduced the amount of taxes withheld from earned income. The latter generally would have increased the father's take home pay. This two-part program was phased out over the period April 1977 to April 1979 and replaced by the Child Benefit, a non-taxable cash payment to the mother. While the average amount of the total benefit stayed roughly constant, this policy change shifted apparent control

[4] Carolyn Moehling (1997) extends this to include children as household decision-makers.

of a portion of family income from fathers to mothers. The amount of income involved is a significant fraction of the average family's budget. For example, for a family with two children in April 1980, the Child Benefit was approximately 445 British pounds per year[5] (approximately 180 pounds in 1974 currency), or about 8% of male manual earnings in the UK.[6] The real value of that benefit is 7.5% of average total expenditure among families with one to three children in the data used for this study. In April 1974, the Family Allowance paid to the mother in a two-child family was 47 pounds. Since Family Allowance was taxable and Child Benefit was not, the difference of 134 pounds can be viewed as an upper limit of the amount of income shifted to the wife.

Based on this policy shift,[7] which is clearly exogenous with respect to individual household expenditure decisions, LPW present empirical evidence against the pooling hypothesis using grouped data on household expenditures. Using expenditure data from before and after the policy change, they "find strong evidence that a shift towards relatively greater expenditures on women's goods and children's goods coincided with this income redistribution." (p.1) Limitations of the aggregated data dictated some shortcomings, such as a concentration on clothing, and limited demographic controls.[8] Each cell in this data consists of the mean of expenditures on a category of goods for all families in the sample which fall into a particular income–family-size group. The small number of cells in the data make it difficult to distinguish effects of the policy change from time trends. Another potential confounder is the 1979 change in the value-added tax (VAT) rate. This rate rose from 8% to 15%, and at the same time, clothing and footwear for young children gained zero-rated status. This change, occurring

[5] *Social Security Statistics* (1991), Table G1.01, p. 253.
[6] *U.K. House of Commons Hansard*, 14 January 1980, pp. 641-2.
[7] See Lundberg, Pollak, and Wales (1995) for a more detailed discussion of the policy change.
[8] LPW did examine alcohol and tobacco expenditures but did not find significant changes.

around the time of the change in the Child Benefit, likely affected the relative price of adult and children's clothing. LPW use a price index for the aggregate category, clothing and footwear. Thus, the decline they find in the ratio of children's clothing expenditures to men's clothing expenditures may be attributable in part to changes in relative prices for which they are unable to control.

I use separate price indices for the three clothing categories in estimates presented here. Since a change in the relative price of children's clothing is of primary concern in connection with the VAT change, this addresses whether mothers appear to allocate more resources to children than do fathers, as has been suggested by a number of other studies examining intra-household allocation issues.

Using household-level data from the Family Expenditure Survey, I estimate budget shares for some narrow goods categories which may be to some extent assignable to certain members of the household, including men's, women's, and children's clothing and footwear, and some other narrowly defined goods, such as men's tobacco products. Since the policy change gives wives control over a greater proportion of household income, we would expect to see a shift in consumption toward goods which are of relatively greater interest to wives. Such shifts would warrant a rejection of pooling, and thus provide evidence against the unitary model. The nature of these shifts also have important implications for the effectiveness of policies intended to improve welfare for targeted household members.

III. Data and Sample Construction

The Family Expenditure Survey is conducted annually in the U.K. Ten thousand households are randomly selected each year, approximately seventy percent of which complete the survey. One or more face-to-face interviews are conducted with one or more members of each household. In addition to these interviews, each "spender"[9] in the household completes a personal spending diary for a period of two weeks. From the interviews and the diaries, detailed information on household expenditures, income, and household demographics is compiled. Some expenditure items, such as food and clothing, are covered only in the diaries. For other items, such as fuel and housing expenditures, detailed interview questions supplement the information from the diaries. Expenditures are reported as weekly values.

The survey is spread over the entire the year, making it possible to control for seasonal effects on expenditures. The data include the region in which the household is located: Northern Ireland, Scotland, Wales, or one of nine regions in England. The data are collected by the Office of Population Censuses and Surveys Social Survey Division for the Department of Employment. The data archive is maintained by the Economic and Social Research Council Data Archive at the University of Essex.[10]

The primary purpose of the survey is to provide the weights for construction of the Retail Price Index. However, the data are intended to also be useful for research purposes. They include detailed income information by source and by household member. The age and sex of each household member are reported, as well as the number of persons by sex in each of several age categories. I use these categories for children (aged under 2 years, aged 2 but less than 5,

[9] A spender is defined as anyone at least age 15 prior to 1973, or at least age 16 beginning in 1973.

[10] Material from the Family Expenditure Survey is Crown Copyright, has been made available by the Central Statistical Office through the ESRC Data Archive, and has been used by permission. Neither the CSO nor the ESRC Data Archive bear any responsibility for the analysis or interpretation of the data reported here.

aged 5 but less than 16, and aged 16 but less than 18) as a general guide for constructing dummy variables to control for household composition. I create eight categories defined by the number of children in the household and their ages.

Approximately 7,000 households complete the Family Expenditure Survey in any given year. For this analysis, the sample is limited to households with one man, one woman who is recorded as the wife of the household head and less than age 60, and one to three children[11]. This results in a total sample size of 15,810 households for 8 years of data. I use data from 1973 to 1983 but drop the intermediate years, 1977-1979, during which the Child Benefit policy change was phased in. I create three binary variables for the post-policy-change period, one for each family size, allowing for the policy to affect families of different sizes in a general way.

Price indices from the Abstract of National Statistics are used. These indices are available quarterly for 11 broadly defined goods categories, as well as for all goods combined (the Retail Price Index). In estimates of narrowly defined clothing expenditures, I use detailed price indices obtained from the Office for National Statistics in the U.K. These indices are available monthly for a number of narrowly defined goods, including men's clothing, women's clothing, and children's clothing.[12] The two sets of price indices come from the same source, but the latter is aggregated to a lesser degree. Neither set is available separately by region.

[11] Adults are defined as all persons age 18 and over, and married persons irrespective of age.
[12] The children's clothing price index is unavailable prior to 1974.

III. Empirical Models

The basic empirical model is an adaptation of the Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980a,b). The budget share for each good can be estimated equation-by-equation using:

$$w_{ig} = \alpha_g + \gamma \log p_g + \beta \log\left(\frac{C_i}{I_i}\right) + f(D_i, H_i, Q_i, t_i) + u_{ig} \quad (1)$$

where w_{ig} is the budget share for good category g for household i; p_g is the relative price for good category g, computed by dividing the national price index for that category by the Retail Price Index.[13] C_i is total household consumption or expenditure. I_i is the household-specific price index for all goods, approximated by $\log I_i = \sum_g w_{ig} \log p_g$.[14] D is a set of dummy variables representing the policy change, and H is a vector of household demographic variables. Q is the quarter of the year in which the household was surveyed, t measures a time trend, and u_{ig} is an error term with standard properties. This model can be estimated equation-by-equation using ordinary least squares regression.

Given expenditure diary data for a two-week period, many households will record zero expenditures on some goods. The correct empirical model to apply depends on the mechanism generating those zeroes. If a household does not consume a particular good, as may be the case with alcohol or tobacco, then the tobit model can be applied. However, if a good is consumed by the household but not purchased during the period, such as in the case of clothing, then the tobit

[13] While inclusion of all prices is preferred, multicolinearity results if all prices are included due to the short time series and absence of cross-sectional (regional) price variation. Narrowly defined clothing estimates do include all three narrow clothing prices.

[14] According to Deaton and Muellbauer (1980b) this approximation was used by J. R. N. Stone. No particular work is cited. I use broad category expenditures and corresponding price indices to calculate this index.

model is not the correct specification. In this case, OLS is consistent under fairly weak conditions.[15]

I use OLS to estimate the model in (1) for all goods. I also present tobit estimates of the model for goods which a substantial fraction of households may choose to not consume, such as alcohol and tobacco. If both non-consumption and purchase frequency play a role, then the truth is probably somewhere between the results of the two models.

Instrumental Variables Estimation to Correct for Measurement Error

As above, let us assume that expenditure and consumption are equal on average for a sufficiently long time period, in essence that $E(y_{ig}) = E(y_{ig}^*)$ for household i, good g. If we observe expenditure by a household for a random two-week period, we can write the relationship of observed expenditure to unobserved consumption as $y^*_{ig}=y_{ig}+e_{ig}$, where e_{ig} can be thought of as a mean-zero measurement error. This implies that total expenditure will be higher in periods when clothing is purchased than in periods when it is not. Normally, measurement error in the dependent variable is not a concern, but e_{ig} will also enter in total consumption, which is a regressor. For simplicity, suppose only consumption of good 1 is measured with error, so that total consumption equals total expenditure plus e_{i1}:

$$\text{Total Consumption} \equiv C_i \equiv \sum_g y^*_{ig} = \sum_g y_{ig} + e_{i1} \text{ where Total Expenditure } \equiv E_i \equiv \sum_g y_{ig}$$

We can substitute into equation (1) and rearrange terms to obtain:

[15] A purchase infrequency model (see Cragg 1971or Blundell and Meghir 1987) might be used, but there are problems with applying it here. First, it is difficult to find convincing exclusion restrictions – i.e., measured variables that affect consumption but not frequency of purchase, or vice versa. Second, for purchases made on credit, only payments toward the purchase, not the total purchase amount, get recorded in the data. Third, zeroes may be observed for some goods in the data, such as alcohol and tobacco, for both non-consumption and purchase infrequency reasons. A double-hurdle model allows for both, but the two portions of the model cannot be convincingly identified using these data.

$$\frac{y_{i1}}{E_i} = \frac{E_i + e_{i1}}{E_i}\left[\alpha_1 + \gamma \log p_1 + \beta \log\left(\frac{E_i + e_{i1}}{P_i}\right) + f(D_i, H_i, Q_i, t_i)\right] + v_{i1} \quad (2)$$

where $v_{i1} = u_{i1} + \frac{e_{i1}(u_{i1} - 1)}{E_i}$ (3)

This gives us the measured budget share on the left-hand side. Note that the regressor, total consumption, is correlated with the error term through the presence of e_{i1} in both terms. We can instrument for total expenditure where it is used as a regressor intended to measure total consumption, arguably getting closer to a true measure of total consumption and doing away with some of the measurement error. However, some correlation between the regressor and error term will remain because total expenditure appears in the denominator of the latter. Further, estimated coefficients on regressors will be scaled by total consumption over total expenditure. However, as long as these are equal on average, this ratio is unity.

Because the specification of the AIDS model calls for the consumption share and not the level of expenditure to be estimated, elimination of measurement error bias in estimates is not assured by instrumenting for total expenditure. Note that if we estimate consumption levels instead, our equation would be the following:

$$y_{i1} = \alpha_{i1} + \gamma \log p_1 + \beta \log\left(\frac{E_i + e_{i1}}{I_i}\right) + f(D_i, H_i, Q_i, t_i) + \varepsilon_{i1} \quad \text{where} \quad \varepsilon_{i1} = u_{i1} - e_{i1} \quad (4)$$

In this case, instrumenting for total expenditure is sufficient to eliminate the bias, given that instruments used are appropriate.

Keen (1986) uses "normal income" (based on usual rather than current earnings) to instrument for total expenditure in estimating Engel curves using a single year of FES data, and shows that this produces consistent estimates. If macroeconomic conditions are constant, then consumption should be approximately proportional to normal income. However, changes in

macroeconomic conditions may affect saving rates and therefore the proportion of normal income consumed in a given period.

I use normal income and regional quarterly unemployment rates as instruments for total expenditure. Because normal income is zero in some cases, a log specification, to match that for total expenditure, is not feasible. I find that a fifth-order polynomial in normal income and a third-order polynomial in unemployment rate provides the best fit. These variables are used as instruments in two-stage least-squares estimates of both the budget share and the level of expenditure for each of the three clothing categories

If clothing is separable from other goods, and if clothing is the only good for which consumption and expenditure during the survey period may differ, then standard OLS and tobit models will suffice for other goods. These are strong assumptions. Clearly, other goods also suffer from purchase infrequency. These may include durables, haircuts, toys, and books to name a few. Therefore instrumental variables methods will also be used in estimating expenditure shares and levels for eleven broadly defined goods categories and nine additional narrowly defined goods. . In cases where a tobit model should be used, I estimate total expenditure using the instruments discussed above as regressors in an OLS model and enter the estimated total expenditure in the tobit model. I'll refer to this as a two-stage tobit model.[16] OLS estimates of total expenditure using the instruments as regressors (the first stage) is shown in Appendix A. All regressors are significant at the one percent level or better, with the exception of the quadratic normal income term. The adjusted R squared for the model is 0.36.

Recall that in order for the measurement error to be mean zero, we require a sufficiently long time period so that average consumption equals average expenditure. The length of this

[16] Standard errors have not been corrected in two-stage tobit estimates. This is unlikely to affect inference for the

time period may differ for different goods. In particular, I will assume that three months is not a sufficiently long period for clothing, and so will not control for quarter of the year in clothing estimates.[17] Though I do control for quarter in estimates of other goods, I check whether effects of the policy change are affected by inclusion versus exclusion of these variables for goods for which a quarter is arguably too short to assume expenditure equals consumption, such as durables, books, and toys.

An additional method will also be used which allows estimation of the budget share while minimizing concerns about appearance of total expenditure in the denominator of the error term. I subtract clothing and durables expenditures from total expenditure and use the result to proxy for total expenditure, both on the right-hand side and in the share calculation. Standard OLS and tobit models are then used to estimate budget shares. These results are compared to IV results as a check of robustness.

IV. Results

I estimate budget shares and expenditure levels for eleven broadly defined goods categories and twelve narrowly defined goods, including three assignable clothing categories. Table 1 presents summary statistics, including means of total expenditure and income measures, and expenditure shares and levels for the goods of interest. The number of households reporting positive expenditures in each good category is also given. The distribution of families across the three family-size categories is shown. Almost half of families in the sample have two children.

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policy change variables which are the focus of this paper.

[17] Clothing consumption need not be greater in colder months. We may wear more clothes at once in colder months, but may use as many clothing services in warm months due to summer activities and more frequent washing, especially in the case of children's clothes.

Thus, the omitted household composition category in estimates is the most common child-age category among two-child families.

Table 2 presents results for instrumental variable estimates of the eleven broad goods categories. Panels (a) and (c) show budget share estimates while panels (b) and (d) show expenditure level estimates. Because more than five percent of households report zero expenditures on alcohol, clothing, food out and tobacco, both two-stage least squares and two-stage tobit estimates are reported for these two categories (panels c and d). TSLS estimates are reported for the remaining seven categories (panels a and b): durables, food for home preparation (food in), fuel and power (not including fuel for automobiles), housing, services, transportation (including petrol), and miscellaneous goods. The three policy shift variables (for one-, two-, and three-child families) had a positive and significant effect on expenditure shares and levels for clothing, food out, and miscellaneous goods. It had negative and significant effects on expenditure shares and levels for housing. There is also some evidence of decline in alcohol expenditures, particularly in three-child families, although this result is not significant in tobit models, which are theoretically more appealing given that there may be non-consuming households.

Estimates for broadly defined goods are done equation by equation, and no constraint on adding up of shares is imposed.[18] F-tests and likelihood ratio tests were used for each of the broad goods to test the joint hypothesis that the three policy shift dummies had no effect. These tests indicate that the policy shift did significantly affect budget shares for several of the categories, increasing clothing, food out, and miscellaneous goods expenditures and decreasing expenditures on housing and "food in." The durables estimates were also done excluding

[18] The sum of TSLS policy change coefficients for budget shares for a given size family is approximately zero.

controls for quarter of the year and the results on policy variables, which are not statistically different from zero, were virtually unchanged. Table 2 also reports a chi-square statistic based on a seemingly unrelated regressions system of equations (estimated with instruments using three-stage least squares) testing the joint hypothesis that effects of the three policy variables in all eleven equations are zero. This hypothesis is strongly rejected, indicating that the policy shift did significantly change overall expenditure patterns.

Phipps and Burton (1998) and Hoddinott and Haddad (1991) found negative effects of the wife's relative income on tobacco and alcohol. I find marginal negative effects for alcohol. Though I find only slight evidence of negative effects for all tobacco, I do find negative effects for a men's tobacco category, which excludes cigarettes. Phipps and Burton also found positive effects of the wife's income on restaurant meals. This could be interpreted as a price effect since the study uses earned income as the key explanatory variable. The exogeneity of the policy change in the present analysis rules out such an interpretation here of the strong positive effect on "food out," which includes restaurant meals and take-away food.

An alternate method in which total expenditure less clothing and durables expenditures is used as a proxy measure of total consumption in estimating budget shares yields somewhat similar results (shown in Table B1 of Appendix B) to those on broadly-defined goods using IV methods. In general, signs of coefficients on the policy variables are the same, but statistical significance in most cases is stronger. Some differences from the IV models should be highlighted: Here, the negative coefficients for tobacco in one- and two-child families is significant in the OLS model, but not the tobit model. To the extent that purchase infrequency is a more important generator of zeroes than non-consumption, the OLS estimates are preferred to the tobit. Alcohol does decline significantly here for one- and three-child families in the tobit

model, and the negative coefficients in the "food in" equation are significant for all family sizes. Two stark differences emerge – effects on durables here are positive and significant and effects on fuel and power negative and significant. This differs markedly from the IV models, and involves switching signs of coefficients, although they were far from statistically different from zero in the earlier models. Again, a seemingly unrelated regressions system of equations is used to test the joint hypothesis that policy variables in all equations have zero effect, and again the hypothesis is strongly rejected ($p<.001$).

Table 3 reports results from expenditure share equations on nine narrowly defined goods. All of these goods had more than five percent zero expenditures reported, so both OLS and tobit results are presented. For goods which are arguably consumed by most or all households in the sample but which are purchased infrequently, least squares estimates are theoretically more appealing, as discussed earlier. However, it may be that, for some of these goods, there is both non-consumption and infrequent purchase (e.g., pets expenditures). A model which distinguishes these empirically cannot be convincingly identified with this data. I therefore present both two-stage least squares and two-stage tobit estimates.

Cigarettes expenditures do not appear to have been affected by the policy change, but other tobacco expenditures did decline, significantly for two-child families, which comprise almost half of the sample. The joint test of all three policy variables having no effect on other tobacco is rejected in the levels estimates. This category includes cigars and pipe tobacco, almost exclusively consumed by men, whereas cigarettes are a gender-neutral good, widely consumed by both men and women in the UK.

Domestic services, which might be viewed as a substitute for the wife's home production, appear to have increased for one-child families per the tobit results, but declined for two-child

families per the least squares model. There are most certainly non-consumers, but purchase frequency may also play a role. The significant joint test statistics are puzzling and not very informative given that coefficient signs differ for different family sizes. Cosmetics expenditures decline significantly. While these goods are directly consumed mostly by women, one might argue that the husband derives utility from their use, or that their use by the wife may elevate her relative bargaining power by increasing the value of her outside options relative to those of her husband. Hairdressing includes trips to the barber or stylist for all family members, and does not appear to be affected by the policy change.

In panels (c) and (d), we see a positive effect on books, but this is only significant in tobit models. Children's books cannot be distinguished from adult books in the data. The books category also includes some other reading materials, such as periodicals. While it is unlikely there are many households in this sample who don't consume in this category, consumption may be via borrowed library materials, so that expenditure and consumption do not relate to one another in the way I have specified above. There is also most probably an important frequency of purchase element here.

Pets expenditures appear unaffected, while toys are increasing for one- and two-child families. There are likely few non-consumers of toys in this sample, but purchase frequency is likely to be important. Children's pocket money is increasing, significantly for one- and (in one model) two-child families. Results from proxied OLS models for these nine narrowly-defined goods are quite similar to those in instrumented estimates (see Table B2 of Appendix B).

Table 4 reports two-stage least squares shares and levels estimates, and proxied OLS estimates for the three narrow clothing categories. All three models show strong and statistically significant positive effects of the policy change on children's clothing. Policy change

coefficients are consistently negative for men's clothing in all three models, and the effect is statistically significant for three-child families in both instrumented models. The coefficients are consistently positive for women's clothing across all three models, and are statistically significant in two- and three-child families in the proxied OLS model. A test of the joint hypothesis for all three policy variables for women's clothing shows a statistically significant effect in both the instrumented share estimates and the proxied share estimates.

Results found here on men's, women's, and children's clothing are consistent with those found by Lundberg, Pollak, and Wales (1997). They found that the ratio of children's clothing expenditures to men's clothing expenditures increased when the child benefit policy changed. They also found an increase in the ratio of expenditures on women's clothing to that on men's clothing. As discussed earlier, their results on children's relative to men's clothing may be attributable in part to the 1979 change in VAT rates on children's relative to adult clothing.[19] The decline they find in men's clothing relative to women's clothing is unlikely to have been driven by the change in tax rates, since the tax rate change on both goods was the same, but the tax inclusive price of children's clothing relative to adult clothing may have declined significantly. Thus, their result on children's relative to men's clothing expenditures is of particular concern. The results I have presented here are compelling given that narrow price indices with VAT included were used to control for prices of the three separate clothing categories. These results demonstrate that the increase in the relative share of children's goods they find was not solely due to tax rate changes, but is attributable in part to the child benefit policy change, and to the apparent preference of mothers to allocate more of the family budget to children's goods.

[19] VAT rates were 10% in 1973, changing to 8% in 1974, and to 15% in 1979. Young children's clothing and

The magnitudes of changes in budget shares these results suggest are certainly plausible given the amount of income being shifted from men to women. For instance, for the average two-child family, the change in expenditures on the broad category "food out" attributable to the policy change is £26 per year. As a result of the policy change, the same family decreased its annual housing expenditure by £90 and men's tobacco expenditure by £3, and increased children's clothing expenditures by £16 and toys expenditures by £5. These are reasonable magnitudes given that approximately £134 per year was shifted from husband to wife.[20]

V. Conclusion

I use micro data to examine how budget shares changed in two-parent families with children in the U.K. when a change in Family Allowance policy essentially shifted transfer income from fathers to mothers. Shifts in expenditure patterns due to this change are inconsistent with the unitary model of household decisions. I find significant changes in expenditures on broadly defined goods, as well as on some narrowly defined assignable and quasi-assignable goods. Although the broad goods categories do not represent assignable goods, a discrete change in shares in the before versus after period which is not attributable to other factors indicates that there has been a shift of power over decision making in the household, and that a systematic difference in preferences over allocation of household income exists between husbands and wives. Closer examination of expenditures on narrow goods within these broad categories produces further insights. These shifts indicate that women and children benefited at the expense of men when this new policy took effect.

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footwear became zero-rated in 1979. (Prest, 1980)

[20] The quoted magnitudes of change are in 1974 currency, and are based on TSLS budget share estimates.

Results on narrow goods generally point to an increase in the budget share allocated to some women's and children's goods, along with a decline in that for some men's goods. Such changes in consumption patterns resulting from a shift in the control of income in the household adds evidence to the growing case against the unitary model — evidence which is particularly convincing given the exogeneity of this policy shift.

Rejection of the unitary model has important implications for the effectiveness of policies aimed at improving welfare of targeted members of households. The unitary model implies neutralization of targeted transfers. Some alternative collective models allow for more effective transfer policy. As Alderman, et. al. put it, it may be "time to shift the burden of proof." Analyzing the household allocation process within the framework of collective models will allow the development and application of more effective policies in areas of health, education, and welfare.

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Table 1: Summary Statistics

	Share of Budget		Real Level		# positive
Variable	**Mean**[†]	**Std Dev**	**Mean**[†]	**Std Dev**	**observations**
Broadly-defined goods					
Alcohol	0.043	(0.047)	2.041	(2.745)	13474
Clothing	0.078	(0.076)	4.059	(5.205)	14953
Durables	0.063	(0.091)	3.761	(9.932)	15559
Food in	0.231	(0.087)	9.976	(3.759)	16131
Food out	0.034	(0.032)	1.693	(2.035)	15014
Fuel, power, & light	0.062	(0.041)	2.701	(1.991)	16085
Housing	0.150	(0.079)	7.016	(7.173)	16109
Misc	0.085	(0.056)	4.152	(4.458)	16130
Sevices	0.086	(0.082)	4.798	(9.520)	16113
Tobacco	0.036	(0.043)	1.491	(1.675)	10426
Transport	0.132	(0.111)	6.949	(11.530)	15815
Narrowly-defined goods					
Women's clothing	0.027	(0.042)	1.445	(2.740)	11046
Men's clothing	0.018	(0.041)	1.008	(2.695)	5906
Kid's clothing	0.027	(0.039)	1.327	(2.176)	10469
Cigarettes	0.034	(0.043)	1.370	(1.659)	9429
Other tobacco	0.003	(0.010)	0.121	(0.434)	2457
Domestic services	0.004	(0.015)	0.199	(0.899)	2362
Cosmetics	0.005	(0.009)	0.251	(0.509)	9816
Hairdressing	0.005	(0.010)	0.256	(0.519)	5805
Books	0.003	(0.010)	0.185	(0.694)	5676
Toys	0.008	(0.022)	0.391	(1.239)	5954
Pets expenditure	0.008	(0.018)	0.363	(0.978)	8167
Children's pocket money	0.004	(0.009)	0.199	(0.483)	5987
Real total expenditure	48.802	(28.086)			
Log real total exp	3.782	(0.436)			
Predicted log real expenditure	3.782	(0.262)			
Real total expenditure less clothing & durables	20.469	(18.205)			
Real normal income (from earnings)	46.767	(37.864)			

N = 16131

# children in family	Frequency	Percent
1	5513	34.2
2	7721	47.9
3	2897	18.0

[†] Means and standard deviations are for full sample.

Expenditure levels are £ per week in 1974 currency.

Mean shares are computed using total expenditure. Means of shares computed using expenditure excluding clothing and durables are proportionally larger, and are not constrained to be less than or equal to unity.

Table 2: Instrumented Broadly-Defined Goods
(a) Budget Shares, TSLS

	Durables	Food in	Fuel, Power	Housing	Misc.	Services	Transport
Policy dummy	-0.0033	-0.0112**	0.0004	-0.0314***	0.0087***	0.0006	0.0038
1 child family	(0.0058)	(0.0045)	(0.0026)	(0.0058)	(0.0032)	(0.0045)	(0.0061)
Policy dummy	-0.0041	-0.0022	-0.0004	-0.0353***	0.0074**	0.0018	-0.0035
2-child family	(0.0055)	(0.0043)	(0.0026)	(0.0058)	(0.003)	(0.0043)	(0.0058)
Policy dummy	0.0007	-0.0056	0.0021	-0.0354***	0.0082**	0.0031	-0.001
3-child family	(0.0061)	(0.0048)	(0.0027)	(0.006)	(0.0034)	(0.0051)	(0.0065)
Log real	0.0299***	-0.1349***	-0.0375***	-0.004	0.0068***	0.0793***	0.0617***
expenditure	(0.0032)	(0.0024)	(0.0014)	(0.0028)	(0.0019)	(0.0032)	(0.0038)
Log own real	0.0728		0.036***	0.1298***	0.1358***	0.0499	0.0657
price	(0.0444)		(0.0112)	(0.0235)	(0.0318)	(0.0311)	(0.0631)
R^2	0.0738	0.4279	0.1916	0.1056	0.0511	0.0689	0.0610
F statistic	0.68	5.62***	0.85	13.08***	2.64**	0.20	1.17

(b) Expenditure Levels, TSLS

	Durables	Food in	Fuel, Power	Housing	Misc.	Services	Transport
Policy dummy	-0.115	-0.293	-0.02	-1.825***	0.453*	0.125	0.276
1 child family	(0.586)	(0.218)	(0.131)	(0.466)	(0.26)	(0.48)	(0.419)
Policy dummy	0.023	0.018	-0.054	-2.103***	0.205	0.294	-0.229
2-child family	(0.623)	(0.208)	(0.133)	(0.505)	(0.217)	(0.479)	(0.415)
Policy dummy	0.333	-0.187	0.084	-1.971***	0.396*	0.544	0.455
3-child family	(0.666)	(0.243)	(0.14)	(0.537)	(0.235)	(0.601)	(0.84)
Log real	6.265***	3.553***	1.167***	8.035***	4.925***	10.914***	10.87***
expenditure	(0.468)	(0.146)	(0.074)	(0.334)	(0.195)	(0.435)	(0.829)
Log own real	-0.775	4.254**	1.753***	6.157***	9.129***	4.7	4.03
price	(4.74)	(1.913)	(0.552)	(1.846)	(2.388)	(3.17)	(6.815)
R^2	0.1654	0.2751	0.0904	0.1779	0.2288	0.2097	0.1735
F statistic	0.36	2.89**	0.86	5.87***	1.55	0.42	1.09

Table 2: Instrumented Broadly-Defined Goods (continued)
(c) Budget Shares, TSLS and Tobit

	Alcohol		Tobacco		Clothing		Food out	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	-0.0026	-0.0032	-0.0014	-0.0016	0.0089**	0.0108**	0.0121***	0.0137***
1 child	(.0028)	(0.0033)	(0.0028)	(0.0041)	(0.0044)	(0.0047)	(0.0023)	(0.0024)
Policy dummy	-0.0014	-0.0014	0.0001	-0.0009	0.0116***	0.0143***	0.0104***	0.012***
2 children	(0.0026)	(0.0031)	(0.0027)	(0.0039)	(0.0042)	(0.0045)	(0.0022)	(0.0023)
Policy dummy	-0.005*	-0.0052	0.0015	0.0005	0.0111**	0.0145***	0.0047*	0.0061**
3 children	(0.003)	(0.0035)	(0.0029)	(0.0043)	(0.0047)	(0.0052)	(0.0025)	(0.0026)
Log real	0.0035**	0.0102***	-0.0445***	-0.059***	0.0248***	0.0275***	0.0158***	0.0181***
expenditure	(0.0015)	(0.0017)	(0.0014)	(0.002)	(0.0025)	(0.0025)	(0.0011)	(0.001)
Log own real	-0.0165	-0.0154	0.0005	0.0034	-0.042**	-0.0548**	0.0183	0.0185
price	(0.0213)	(0.0262)	(0.0098)	(0.0143)	(0.0206)	(0.0227)	(0.0164)	(0.0168)
R^2 or Log likelihood	0.0335	17847.058	0.0897	10417.399	0.0618	15414.191	0.0166	28990.827
F or χ^2 statistic	1.46	3.44	0.86	0.62	2.69**	10.98**	15.72***	50.87***

(d) Expenditure Levels, TSLS and Tobit

	Alcohol		Tobacco		Clothing		Food out	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	-0.093	-0.061	-0.033	-0.035	0.412	0.734**	0.48***	0.605***
1 child	(0.147)	(0.187)	(0.112)	(0.165)	(0.256)	(0.315)	(0.127)	(0.149)
Policy dummy	-0.06	0.029	0.007	-0.008	0.429*	0.847***	0.379***	0.517***
2 children	(0.131)	(0.178)	(0.109)	(0.159)	(0.251)	(0.302)	(0.122)	(0.145)
Policy dummy	-0.277*	-0.159	0.065	0.081	0.447	0.981***	0.062	0.212
3 children	(0.161)	(0.203)	(0.12)	(0.176)	(0.297)	(0.343)	(0.141)	(0.158)
Log real	2.169***	2.572***	-0.553***	-1.03***	5.232***	5.348***	2.445***	2.566***
expenditure	(0.143)	(0.099)	(0.057)	(0.079)	(0.206)	(0.169)	(0.102)	(0.064)
Log own real	-1.378	-1.381	0.264	0.189	-2.057	-4.084***	1.272	1.620
price	(1.177)	(1.499)	(0.402)	(0.583)	(1.277)	(1.507)	(0.883)	(1.037)
R^2 or Log likelihood	0.1035	-36426.9	0.0078	-28313.502	0.2634	-47207.215	0.1767	-32713.462
F or χ^2 statistic	1.47	2.07	0.53	1.08	1.05	9.29**	9.74***	30.39***

SUR cross-equation joint hypothesis test that all policy variables=0: χ^2 (33) = 135.43***

Estimates include control variables for household composition category, region, and a quadratic trend. All except clothing also include quarter of the year.

Instruments for log real expenditure consist of a 5-order polynomial in "normal" income and 3rd order polynomial in regional unemployment rate. In tobit models, predicted log real expenditure based on these regressors is used in estimates.

***, **, * $p \leq .01, .05, .10$ respectively (standard errors in parentheses)

F or χ^2 statistic is for the joint hypothesis that all three policy variables have no effect.

Table 3: Instrumented Narrowly-Defined Goods
(a) Budget Shares, TSLS and Tobit

	Cigarettes		Other Tobacco		Domestic Services		Cosmetics		Hairdressing	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	-0.0008	-0.0007	-0.0006	-0.0042	0.0002	0.0088*	-0.0016***	-0.0032***	-0.0004	-0.0015
1 child family	(0.0028)	(0.0044)	(0.0006)	(0.0036)	(0.0008)	(0.0045)	(0.0005)	(0.0007)	(0.0006)	(0.0015)
Policy dummy	0.0013	0.0005	-0.0012*	-0.0061*	-0.0017**	-0.0036	-0.0009**	-0.0023***	0.00002	-0.0007
2-child family	(0.0027)	(0.0043)	(0.0006)	(0.0034)	(0.0008)	(0.0043)	(0.0005)	(0.0007)	(0.0006)	(0.0014)
Policy dummy	0.0019	0.0011	-0.0005	-0.0022	-0.0002	0.003	-0.0009*	-0.0021***	-0.0006	-0.0023
3-child family	(0.0029)	(0.0047)	(0.0006)	(0.0038)	(0.0009)	(0.005)	(0.0005)	(0.0008)	(0.0006)	(0.0016)
Log real	-0.0451***	-0.0672***	0.0006*	0.0081***	0.0094***	0.057***	0.002***	0.0046***	0.0034***	0.0125***
expenditure	(0.0014)	(0.0022)	(0.0003)	(0.0017)	(0.0006)	(0.0025)	(0.0003)	(0.0004)	(0.0004)	(0.0008)
Log own real	-0.0008	-0.0035	0.0012	-0.0014	0.0097*	0.0335	0.0109**	0.0183***	0.0016	-0.0032
price	(0.0098)	(0.0157)	(0.0022)	(0.0126)	(0.0058)	(0.0325)	(0.005)	(0.0071)	(0.0041)	(0.0106)
R^2 or Log likelihood	0.0825	7905.0429	0.0026	623.23855	-	107.83656	0.0284	24958.199	0.0043	8686.9832
F or χ^2 statistic	0.96	0.43	1.97	5.05	5.07***	19.80***	3.11**	18.61***	1.04	3.23

(a) Expenditure Levels, TSLS and Tobit

	Cigarettes		Other Tobacco		Domestic Services		Cosmetics		Hairdressing	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	0.006	0.018	-0.039	-0.211	-0.007	0.534**	-0.057*	-0.14***	-0.042	-0.093
1 child family	(0.111)	(0.180)	(0.027)	(0.162)	(0.049)	(0.268)	(0.032)	(0.043)	(0.029)	(0.073)
Policy dummy	0.079	0.076	-0.072**	-0.307**	-0.105**	-0.170	-0.031	-0.099**	-0.014	-0.034
2-child family	(0.108)	(0.173)	(0.028)	(0.155)	(0.046)	(0.256)	(0.026)	(0.041)	(0.028)	(0.069)
Policy dummy	0.095	0.120	-0.031	-0.112	-0.014	0.241	-0.043	-0.104**	-0.05	-0.118
3-child family	(0.12)	(0.191)	(0.029)	(0.173)	(0.058)	(0.292)	(0.029)	(0.047)	(0.032)	(0.079)
Log real	-0.688***	-1.417***	0.135***	0.589***	0.86***	3.993***	0.35***	0.538***	0.44***	0.976***
expenditure	(0.056)	(0.086)	(0.017)	(0.076)	(0.058)	(0.149)	(0.025)	(0.024)	(0.024)	(0.040)
Log own real	0.235	-0.030	0.029	-0.166	0.837**	2.290	0.478	1.004**	0.013	-0.409
price	(0.4)	(0.634)	(0.099)	(0.570)	(0.354)	(1.913)	(0.314)	(0.410)	(0.199)	(0.522)
R^2 or Log likelihood	0.0018	-27098.489	0.0099	-8750.5812	0.019	-9460.3361	0.0887	-14656.428	0.0572	-13845.98
F or χ^2 statistic	0.78	0.91	3.18**	6.28*	4.71***	18.59***	1.2	10.66**	1.70	4.01

Table 3: Instrumented Narrowly-Defined Goods (continued)
(c) Budget Shares, TSLS and Tobit

	Books		Pets		Toys		Kids' pocket money	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	0.0008	0.0026*	0.0011	0.0015	0.0025**	0.0055**	0.0014**	0.0038**
1 child family	(0.0006)	(0.0014)	(0.0013)	(0.0021)	(0.0011)	(0.0027)	(0.0006)	(0.0016)
Policy dummy	0.0008	0.003**	0.0013	0.0012	0.0019*	0.0028	0.0009	0.0028*
2-child family	(0.0005)	(0.0014)	(0.0011)	(0.002)	(0.0011)	(0.0026)	(0.0006)	(0.0015)
Policy dummy	0.0006	0.0027*	0.0016	0.0016	0.0014	0.0004	0.0005	0.0026
3-child family	(0.0006)	(0.0016)	(0.0014)	(0.0022)	(0.0013)	(0.003)	(0.0007)	(0.0016)
Log real	0.004***	0.0139***	-0.003***	-0.0043***	-0.0002	0.0064***	-0.0003	0.0023***
expenditure	(0.0005)	(0.0008)	(0.0006)	(0.001)	(0.0006)	(0.0015)	(0.0003)	(0.0007)
Log own real	-0.0115*	-0.0217	-0.0138	-0.0322*	0.0278**	0.0342		
price	(0.0064)	(0.0135)	(0.0097)	(0.0182)	(0.0141)	(0.0251)		
R^2 or Log likelihood	0.0072	8957.3136	0.0136	12732.881	0.1078	6148.9288	0.1095	11552.691
F or χ^2 statistic	0.79	4.97	0.55	0.58	1.82	7.43*	3.45**	5.73

(d) Expenditure Levels, TSLS and Tobit

	Books		Pets		Toys		Kids' pocket money	
	TSLS	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**	**TSLS**	**Tobit**
Policy dummy	0.032	0.151*	0.054	0.091	0.131*	0.31**	0.054*	0.174**
1 child family	(0.04)	(0.092)	(0.064)	(0.115)	(0.069)	(0.154)	(0.03)	(0.081)
Policy dummy	0.033	0.189**	0.065	0.079	0.107*	0.175	0.027	0.123
2-child family	(0.036)	(0.087)	(0.061)	(0.111)	(0.062)	(0.146)	(0.03)	(0.077)
Policy dummy	0.026	0.172*	0.098	0.133	0.096	0.071	0.002	0.111
3-child family	(0.044)	(0.100)	(0.071)	(0.122)	(0.081)	(0.167)	(0.036)	(0.082)
Log real	0.457***	1.188***	0.27***	0.278***	0.289***	0.795***	0.17***	0.38***
expenditure	(0.044)	(0.050)	(0.044)	(0.053)	(0.038)	(0.085)	(0.017)	(0.033)
Log own real	-0.737*	-1.283	-0.545	-1.466	1.334	1.854		
price	(0.399)	(0.863)	(0.495)	(0.991)	(0.843)	(1.420)		
R^2 or Log likelihood	0.0320	-14412.118	0.0282	-19714.104	0.1119	-17730.041	0.1217	-11800.539
F or χ^2 statistic	0.31	4.79	0.70	1.27	1.27	6.11	3.1	5.16

Estimates include control variables for household composition category, region, a quadratic time trend, and quarter of the year.
Instruments for log real expenditure consist of a 5-order polynomial in "normal" income and 3rd order polynomial in regional unemployment rate. In tobit models, predicted log real expenditure based on these regressors is used in estimates.
***, **, * $p \leq .01, .05, .10$ respectively (standard errors in parentheses)
F or χ^2 statistic is for the joint hypothesis that all three policy variables have no effect.

Table 4: Narrow Clothing, Shares and Expenditure Levels, Instrumented and Proxied Total Expenditure

	Men's Clothing			Women's Clothing			Children's Clothing		
	Share TSLS	**Level TSLS**	**Share Proxy OLS**	**Share TSLS**	**Level TSLS**	**Share Proxy OLS**	**Share TSLS**	**Level TSLS**	**Share Proxy OLS**
Policy dummy 1 child family	-0.0037	-0.136	-0.0015	0.0002	0.016	0.003	0.0078***	0.331**	0.0123***
	(0.0026)	(0.162)	(0.0044)	(0.0025)	(0.144)	(0.0036)	(0.0026)	(0.137)	(0.0036)
Policy dummy 2-child family	-0.004	-0.183	-0.001	0.0036	0.093	0.0078**	0.0063**	0.292**	0.0104***
	(0.0025)	(0.153)	(0.0042)	(0.0023)	(0.137)	(0.0034)	(0.0026)	(0.141)	(0.0038)
Policy dummy 3-child family	-0.0054**	-0.325*	-0.0048	0.0037	0.163	0.0076**	0.007**	0.371**	0.011***
	(0.0027)	(0.176)	(0.0045)	(0.0026)	(0.165)	(0.0037)	(0.003)	(0.162)	(0.0041)
Log real total expenditure	0.0078***	1.468***	-0.0141***	0.0175***	2.349***	-0.0132***	-0.001	1.091***	-0.0105***
	(0.0014)	(0.116)	(0.0012)	(0.0014)	(0.124)	(0.001)	(0.0013)	(0.09)	(0.001)
Log own real price	0.0129	0.657	0.0217	-0.0196**	-1.216**	-0.0249*	-0.0266**	-0.982	-0.0299*
	(0.0127)	(0.791)	(0.0203)	(0.0096)	(0.604)	(0.0142)	(0.0122)	(0.647)	(0.0169)
Trend	0.0068	0.3	0.02	0.0096	0.696*	0.0147	-0.0316***	-1.671***	-0.0357***
	(0.0078)	(0.497)	(0.0141)	(0.0069)	(0.413)	(0.0112)	(0.0093)	(0.504)	(0.0138)
Trend^2	-0.00004	-0.002	-0.0001	-0.0001*	-0.005*	-0.0001	0.0002***	0.01***	0.0002**
	(0.0001)	(0.003)	(0.0001)	(0.00005)	(0.003)	(0.0001)	(0.0001)	(0.003)	(0.0001)
constant	-0.2854	-16.577	-0.7007	-0.3264	-29.905*	-0.3665	1.3423***	65.67***	1.5692***
	(0.2954)	(18.807)	(0.5297)	(0.2664)	(15.808)	(0.4233)	(0.375)	(20.251)	(0.5437)
R^2	0.0281	0.0932	0.1008	0.0527	0.1556	0.1061	0.0342	0.1159	0.1049
F statistic	1.35	1.37	0.89	2.18*	0.61	2.97**	3.07**	2.17*	3.91***

N=16131 for women's and men's clothing; N=14073 for children's clothing due to exclusion of 1973 for which there is no children's clothing price index.
All estimates also include control variables for household composition category, and region.
Instruments for log real expenditure in TSLS and two-stage tobit estimates consist of a 5-order polynomial in "normal income" and 3rd order polynomial in regional unemployment rate. In proxy OLS estimates, log real total expenditure excludes expenditures on clothing and durables.
***, **, * $p \leq .01, .05, .10$ respectively (standard errors in parentheses)
F statistic is for the joint hypothesis that all three policy variables have no effect

Appendix A

Table A1: OLS Estimate of Log Real Total Expenditure Using Instruments as Regressors

Normal income	0.011637***
	(0.000709)
Normal income^2	3.29E-06
	(9.90E-06)
Normal income^3	-2.11E-07***
	(5.40E-08)
Normal income^4	5.53E-10***
	(1.17E-10)
Normal income^5	-4.12E-13***
	(8.41E-14)
Regional quarterly unemployment rate	-0.03113***
	(0.006575)
Unemployment rate^2	0.003034***
	(0.000808)
Unemployment rate^3	-9.4E-05***
	(2.91E-05)
Constant	3.19473***
	(0.022718)
Adj. R^2	0.3613

Standard errors in parentheses.
*** $p \leq .01$

Appendix B: Broad and Narrow Goods Shares Using Proxy for Total Expenditure

Table B1: Broadly-Defined Goods, Budget Shares, Proxy for Total Expenditure
(a) OLS

	Durables	Food in	Fuel, Power	Housing	Misc.	Services	Transport
Policy dummy	0.024***	-0.0294***	-0.0071**	-0.0274***	0.0067*	0.0147***	0.0041
1 child family	(0.0084)	(0.0062)	(0.0033)	(0.0064)	(0.0039)	(0.0053)	(0.0071)
Policy dummy	0.0243***	-0.0227***	-0.009***	-0.0304***	0.0062*	0.0183***	-0.0012
2-child family	(0.0086)	(0.006)	(0.0032)	(0.0063)	(0.0036)	(0.0051)	(0.0068)
Policy dummy	0.023**	-0.0224***	-0.0052	-0.0306***	0.0074*	0.0181***	0.0012
3-child family	(0.009)	(0.0067)	(0.0035)	(0.0067)	(0.0041)	(0.0059)	(0.0076)
Log real	-0.1413***	-0.0119***	-0.0015***	-0.0042***	-0.0026***	0.0079***	0.013***
expenditure	(0.0038)	(0.001)	(0.0003)	(0.0005)	(0.0004)	(0.0007)	(0.001)
Own real price	-0.0965	0.1286**	0.0372***	0.2209***	0.2108***	0.0096	0.1833**
	(0.0599)	(0.0532)	(0.0138)	(0.0269)	(0.0383)	(0.0348)	(0.0722)
Adj. R^2	0.7483	0.1088	0.0654	0.0915	0.0658	0.0346	0.0321
F statistic	2.87**	7.68***	3.54**	7.98***	1.22	4.40***	0.49

(b) OLS and Tobit

	Alcohol		Tobacco		Clothing		Food out	
	OLS	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**
Policy dummy	-0.0053	-0.0071*	-0.0072**	-0.0079	0.018***	0.0179**	0.028***	0.0307***
1 child	(0.0034)	(0.004)	(0.0034)	(0.0051)	(0.0067)	(0.007)	(0.0029)	(0.0031
Policy dummy	-0.0039	-0.005	-0.0066**	-0.0079	0.0225***	0.0233***	0.0265***	0.029***
2 children	(0.0032)	(0.0038)	(0.0033)	(0.0049)	(0.0068)	(0.0067)	(0.0028)	(0.003)
Policy dummy	-0.0074**	-0.009**	-0.0036	-0.0029	0.0189***	0.0197***	0.0195***	0.0212***
3 children	(0.0036)	(0.0043)	(0.0036)	(0.0054)	(0.0072)	(0.0075)	(0.0031)	(0.0032)
Log real	0.0003	0.0007*	0.0001	0.0009**	-0.0398***	-0.0411***	-0.0011***	-0.0011***
expenditure	(0.0003)	(0.0004)	(0.0002)	(0.0004)	(0.0028)	(0.0006)	(0.0002)	(0.0002)
Own real price	-0.0395	-0.0468	0.0019	-0.0023	-0.0391	-0.041	-0.0227	-0.0293
	(0.0249)	(0.0306)	(0.0115)	(0.0171)	(0.0307)	(0.0322)	(0.0197)	(0.0203)
Adj. R^2 or Log likelihood	0.0356	15959.503	0.0348	8690.7554	0.2354	10750.979	0.0419	26544.058
F or χ^2 statistic	1.68	5.37	2.29*	5.03	3.67**	12.43***	37.97***	121.56***

Estimates include control variables for household composition category, region, and a quadratic trend. All except clothing also include quarter of the year.
***, **, * $p \leq .01, .05, .10$ respectively (standard errors in parentheses)
Log real expenditure, not including clothing and durables expenditures, is used as a proxy for log real total expenditure.
F or χ^2 statistic is for the joint hypothesis that all three policy variables have no effect

Table B2: Narrowly-Defined Goods, Budget Shares, Proxy for Total Expenditure

	Cigarettes		Other Tobacco		Domestic Services		Cosmetics		Hairdressing	
	OLS	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**
Policy dummy	-0.0062*	-0.0063	-0.001	-0.0061	0.0026**	0.0156***	-0.0017**	-0.0032***	-0.0003	-0.002
1 child family	(0.0034)	(0.0056)	(0.0007)	(0.0044)	(0.0011)	(0.0056)	(0.0007)	(0.0009)	(0.0007)	(0.0019)
Policy dummy	-0.0051	-0.0059	-0.0015**	-0.008*	0.0007	0.0019	-0.0006	-0.0019**	0.0004	-0.0007
2-child family	(0.0033)	(0.0054)	(0.0008)	(0.0043)	(0.001)	(0.0054)	(0.0006)	(0.0009)	(0.0007)	(0.0018)
Policy dummy	-0.0029	-0.0014	-0.0007	-0.0039	0.0021*	0.0076	-0.0007	-0.0021**	-0.0004	-0.0031
3-child family	(0.0036)	(0.0059)	(0.0008)	(0.0047)	(0.0011)	(0.0061)	(0.0006)	(0.001)	(0.0008)	(0.002)
Log real	0.0003	0.0014***	-0.0002**	-0.0003	0.0004***	0.0034***	-0.0004***	-0.0004***	-0.0004***	-0.0006***
expenditure	(0.0002)	(0.0005)	(0.0001)	(0.0003)	(0.0001)	(0.0006)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Log own real	0.0009	-0.0077	0.001	-0.0043	0.0103	0.0392	0.0152**	0.0232***	-0.0028	-0.0138
price	(0.0114)	(0.0188)	(0.0026)	(0.0148)	(0.0068)	(0.0387)	(0.0063)	(0.0087)	(0.0049)	(0.0129)
Adj. R^2 or Log likelihood	0.0340	6255.3166	0.0058	245.3711	0.0181	-490.78157	0.0331	23067.56	0.0182	7565.9824
F or χ^2 statistic	1.64	3.12	1.95	5.01	4.36***	18.94***	2.78**	12.72***	1.21	4.39

	Books		Pets		Toys		Kids' pocket money	
	OLS	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**	**OLS**	**Tobit**
Policy dummy	0.0015**	0.0042**	0.0007	0.0005	0.0015	0.0051	0.0013*	0.0026
1 child family	(0.0007)	(0.0018)	(0.0014)	(0.0025)	(0.0014)	(0.0034)	(0.0007)	(0.002)
Policy dummy	0.0016**	0.0051***	0.001	0.0003	0.0009	0.0022	0.0006	0.0014
2-child family	(0.0007)	(0.0017)	(0.0013)	(0.0024)	(0.0014)	(0.0033)	(0.0008)	(0.0019)
Policy dummy	0.0013*	0.004**	0.0014	0.001	0.0003	-0.0011	0.0001	0.0011
3-child family	(0.0007)	(0.0019)	(0.0016)	(0.0026)	(0.0016)	(0.0037)	(0.0009)	(0.002)
Log real	0.000008	0.0003**	-0.0001	0.0002	-0.0002*	-0.0003	-0.0002***	-0.0002
expenditure	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0003)	(0.0001)	(0.0001)
Log own real	-0.0111	-0.0213	-0.015	-0.0339	0.0466***	0.0592*		
price	(0.0075)	(0.0162)	(0.0108)	(0.021)	(0.0176)	(0.0306)		
Adj. R^2 or Log likelihood	0.0125	7904.1474	0.0102	11596.07	.01115	5089.7417	0.1135	10662.361
F or χ^2 statistic	1.97	9.12**	0.36	0.27	0.66	6.55*	3.30**	2.92

SUR cross-equation joint hypothesis test that all policy variables=0: χ^2 (33) = 275.94***

Estimates include control variables for household composition category, region, a quadratic time trend, and quarter of the year.

Log real expenditure, not including clothing and durables expenditures, is used as a proxy for log real total expenditure.

***, **, * $p \leq .01, .05, .10$ respectively (standard errors in parentheses)

F or χ^2 statistic is for the joint hypothesis that all three policy variables have no effect