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Gerald R. Ford School of Public Policy, University of Michigan
www.npc.umich.edu

"Consumption, Income, and the Well-Being of Families and Children"

Preliminary and incomplete

From Micro to Macro, from Poor to Rich: Consumption and Income in the UK and the US*.

Orazio P. Attanasio♣, Erich Battistin♥ and Andrew Leicester♠

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♣ UCL, IFS and NBER
♥ Universitá di Padova and IFS
♠ IFS

1. Introduction

In this paper, we try to characterize the consumption behaviour of poor households in the US and in the UK. In particular, we want to characterize the relationship between overall consumption and income and between the components of consumption and income among these households. We want to compare the observed behaviour between the two countries and between poor households and households that are better off. We believe that this analysis can be informative about the evolution of relative poverty and about the coping mechanisms individuals have to deal with adverse shocks in the two countries.

In what follows we use data on the distribution of both consumption expenditure and income, in a sense cutting across the debate of whether consumption or income are better measures of individual well-being. The advantages and disadvantages of the two alternatives are well understood and will not be discussed extensively here. For instance, consumption is likely to affect well-being directly and is likely to be less affected by year-to-year fluctuations in income. On the other hand, expenditure is not always strictly linked to consumption, whose measure is ridden with problems, some of which we discuss below. A striking feature of the debate so far is that it takes the existing data and their quality as a given. One aim of this paper is to stress that data quality is not invariant to different methods to construct the data and that there is ample scope for improving the quality of currently available data both in the UK and in the US.

Micro data are always affected by measurement error. A useful benchmark that has been often used for micro data is their ability to mirror, once aggregated, the movements in NIPA data. NIPA data are not exempt from problems of various nature, and this is particularly so for consumption. However, once one takes into account definitional differences (both in terms of the population covered and items that compose consumption), such comparisons are useful benchmarks. The experience of the UK, where the Family Expenditure Survey has been available since the late 1960s and the US has been very different. The FES data account for a very large fraction (over 90%) of NIPA consumption and their movements are remarkably close to those of the NIPA aggregates. The worrying trend that emerges in recent years, however, is a marked worsening of the ability of the aggregated micro data to replicate the behaviour of National Account data. For the CEX the picture is much worse. In the paper, we document the difference in the performance in the two countries both for total consumption and several items. We then discuss in detail the methodological differences between the two surveys and try to take a stand on ‘best practice’.

In the second part of the paper, we effectively ignore these issues and bravely use the available micro data to study the evolution of consumption and income for the poorest sector of the US and UK households. Once again, we cut across the debate of whether poverty should be measured as a relative or absolute concept and define as poor a households that consumes or earns less than 60% of median consumption or income[1]. Consumption poor households do not coincide with income poor households. We therefore look, in both countries, to the consumption of the income poor and the income of the consumption poor. Remarkable differences between the two countries emerge. we document and explore in depth the differences in the relationship between income and consumption poverty in the two countries and try to explain it.

To take a stab at this, we estimate behavioural equations that take into account explicitly the presence of measurement error. In particular, we estimate Engel curves for low-income individuals in both countries. If we find that the relationship between consumption shares and total consumption is different between the two countries, especially for poor households, this might be an indication of important behavioral differences. Instead, if we find that it is similar, then the observed differences in the relationship between consumption and income might be attributed to measurement error.

To estimate Engel curves, we pay attention to a number of methodological issues, ranging from the functional forms used in estimation, to theory consistency, to the endogeneity of total consumption, to measurement error. We will focus on the share equations for two sets of commodities: the first is a necessity, food. The second is a luxury: expenditure on entertainment. This share has been recently used by Costa (199?) as a good approximation of wellbeing and growth.

[1] This is the standard relative poverty threshold used in the UK and European poverty debate. See, for example, Brewer *et al* (2006b).

2. Data sources for Consumption and Income in the US and in the UK.

The collection of reliable and comprehensive data on consumption is a costly and complex exercise. For this reason, good quality data sets that include comprehensive measures on consumption in developed countries are few and far between. Often these data sources are collected with the official purpose to compute the weights of the Consumer Price Index. This is true for both the US and the UK. In this section we start with a brief history of the two data sources, which also includes a summary description of the data collection methodology. We then move on to aggregate several measures of consumption from the micro data and compare them to data from NIPA.

2.1 THE FES

The UK Family Expenditure Survey has a long history as a continuous and consistent survey. It is an annual cross-sectional survey, with sampling carried out throughout the year to take account of seasonal fluctuations in expenditures. The original data FES survey goes back to the 1957, but it is not until the late 1960s or better the early 1970s that has been collected in a reasonably homogeneous and consistent fashion. Until 1992 the survey was collected on a calendar year basis; since 1993/4 it has been collected on a financial year basis (i.e. April to March). This paper makes use of data from 1974 to 2002/3 giving us 29 years of data. In 2001/2, the FES was merged with the UK National Food Survey to create the Expenditure and Food Survey (EFS); for simplicity the rest of this paper will use FES as shorthand for Family Expenditure Survey / Expenditure and Food Survey.

Each year, a representative sample of approximately 7,000 households from across the UK is taken. Each member of the household aged 16 or more is asked to keep a 2-week diary of all their spending[2]. In addition, household members are interviewed to obtain demographic and financial information; as part of that interview, a series of 'recall' questions are asked for some spending categories where it is known items are purchased infrequently[3] (typically this includes large durables like furniture and cars, and also expensive service items like holidays), and also for items where payments are frequent and regular, such as rent, mortgage payments and fuel bills. Spending from the diary and recall sources are calculated as weekly averages at the household level.

[2] Since 1995/6, children aged 7 to 15 have been asked to keep a simplified diary. We do not use this information in this paper.

[3] These recall questions for durable and expensive items were introduced at various points in the late 1980s for different items. We use them as they become available.

Spending is disaggregated into several hundred small categories which allows considerable flexibility in aggregation. Typically, spending is aggregated to match the categories of expenditure in the two main inflation measures in the UK, the CPI (Consumer Price Index) and RPI (Retail Prices Index). Our measures match the categories of the RPI; there are around 70 separate spending categories in this definition (e.g. bread, electrical appliances, electricity) though we focus mostly on non-durable expenditure as our measure of spending. This also excludes spending on housing costs.

We exclude households from Northern Ireland and households headed by people aged under 20 or over 70 from the analysis below. This leaves us with a typical sample size in each year of 5,000 to 6,000 households and a total sample over the full range of years of 165,723 households.

2.2 THE CEX

In the US there are mainly two household level databases that contain information on consumption. The first is the PSID, whose big advantage rests on being a longitudinal data base that has been collected since 1967 and has been proven of very high quality in a variety of dimensions. In terms of the consumption data, the main problem with this dataset is the fact that the information contained in it is far from being exhaustive. The PSID contains information on food consumption (at home and outside the home) and on a few additional items. In addition to providing very synthetic and incomplete information, the questions asked to gather this information are somewhat ambiguous, especially in terms of the time horizon to which they refer.

The other large data set that contains consumption information is the Consumer Expenditure Survey (CEX). The CEX has a long history, going back to the beginning of the 20th century. However, only in 1980 did the survey become a continuous and consistent survey. The CEX is made of two independent samples. The first, and largest, sample is referred to as the Interview sample and is a rotating panel. Around 5,000 households are interviewed four times per year and in each of these interview they report information on a the expenditure in the previous three months on a long list of commodities, which should almost exhaust the items that make Personal Consumption Expenditure in the NIPA accounts (after 1998, the sample size of this survey was increased by about 30%). While the information on most commodities is very detailed, the one on food is not. There is basically a catch all question on ‘total food in the home’. Food is particularly problematic in the Interview Survey as it is the one question on which there are two important changes in the methodology used to collect the information, one in 1982 and one in 1987 (see Battistin, 2003, for the effects of this change on the reporting of expenditure on food).

The second component of the CEX is the so called Diary Survey. This is a somewhat smaller independent sample of 5,000 households. Households in this sample are observed for two weeks, and during this time they keep detailed diaries of all their expenditures. From 1980 to 1985 the Diary Survey only collected information on 'frequently purchased items'. These include very detailed information on food and on a number of other items. Since 1986, the Diary Survey includes all commodities, including retrospective information on durables (see Battistin, 2003, for further details). Interestingly, in addition to the detailed diary information, for food at home the Diary Survey also contains the same retrospective questions asked in the Interview Survey.

Both surveys, but especially the Interview Survey, contain a large set of additional variables ranging from income and labour supply variables, to detailed demographic information, to some information on assets. The Interview Survey also contains a number of extremely detailed modules on a variety of themes, ranging from vehicles and vehicle loans to education, housing and so on.

As mentioned above, the main purpose of these data sets is the computations of the weights for the CPI. The BLS typically uses information from the Diary Survey for frequently purchased items and from the Interview Survey for the remaining items. This procedure implicitly recognizes the plausible fact that the information on frequently purchased items in the Diary Survey is more accurate than in the Interview Survey, while the information on other commodities is more reliable in the Interview Survey.

Partly because the CEX was only started in 1980, until relatively recently the survey has not been used extensively, especially in comparison to other data sources, such as the PSID, the CPS, and the NLSs. An important question, therefore, is the reliability of the data. In this respect, one can check whether the information one extracts from the CEX is consistent with the information from other data sources. As is often the case, there are good news and bad news. The good news is that information on wages and on pre-tax income is remarkably consistent with the information from other data sources such as the CPS. If one studies the pattern of inequality using hourly wages measures from the CEX, one gets, with a little bit additional noise (explained by the smaller sample size) the same general picture that one gets out of the CPS. This is particularly comforting as it signals that the CEX should not be affected by particularly nasty composition problems and the like. The bad news is that when one looks at consumption, the picture is not very comforting, as we will discuss in the next section.

In our analysis, we used micro data between 1980 and 2003 as published by the BLS. As for the Interview survey, we obtained quarterly expenditure data for this period by considering all households in the sample.[4] For households who did not complete their interview, very pragmatically we decided to inflate their expenditure depending on the number of monthly observations in the quarter. As for the Diary Survey, we constructed expenditure figures for the two weeks covered by the interview, and we inflated expenditures of those households who did not complete the diary in the second week. We considered the measure of total expenditure as published by the BLS after excluding "cash contributions" and "personal insurance and pensions", thus using a definition that includes expenditures for food, alcohol, housing, transportation, apparel, medical care, entertainment, and other miscellaneous items (such as personal care services, reading, education and tobacco products). The measure of non-durable spending was defined considering only non-durable items, as in Attanasio and Weber (1995). As for income, we only considered (before tax) figures as reported in the fifth interview by households who were classified as complete income reporters (though our results proved robust with respect to considering figures from the second interview). Real income and expenditure figures were obtained throughout by deflating using the CPI.[5]

[4] We used quarterly data from the *Summary Expenditure Data* section available in the public use data files.

[5] Price indexes for different expenditure groups were obtained from Table 2.5.4 at www.bea.org.

3. Comparison with NIPA data

In this section we perform a parallel exercise for the UK and the US. For each of these two countries we aggregate up the micro consumption data and compare it to National Income and Product Account (NIPA) data[6]. This exercise should not be interpreted as setting the NIPA data as a gold standard to be matched by the aggregated micro data. The NIPA data have a well known set of issues and problems that make them not strictly comparable with the micro data. The population of reference, for instance, is different, because micro data typically do not include institutionalized populations and NIPA data do. The definitions of many items are different and not strictly comparable. The most obvious (and sizeable) example here is the imputed services for owner occupied housing, which is typically included in NIPA data and is not in most micro surveys. But even going down the list of individual small items, the conventions are remarkably dissimilar. The NIPA consumption data are obtained, for many categories, as a residual from several items, so that they are bound to contain a substantial amount of measurement error. Those who use aggregate NIPA data are all too used to the frequent and sometimes substantial revisions through which the aggregate data undergo.

Having said all this, however, it is clear that a comparison between the two data sources is interesting, especially if conducted over several years. In the absence of changes in definitions and methodologies, one would expect the differences between the macro and micro data to be relatively constant. Moreover the comparison of different surveys (either within a country or in different countries) can be informative about the importance that methodological differences can have on the data.

In this section we present the results of our comparison between aggregated micro data and NIPA data for the UK FES and the US CEX (Interview and Diary Survey). In both cases we first focus on the expenditure on total non-durable and services. We then move on to consider expenditure on finer components of this total. For a number of different reasons (add which) we have excluded from our analysis the expenditure on durables.

3.1 THE FES

Our comparison of the consumption data from the FES with the UK National Account data constitutes an up-date of the exercise presented in Tanner (1998). In that exercise, it was found that

[6] In the UK this series is known as the 'National Accounts' (NA).

the FES does a remarkable job in matching aggregate time series data. Tanner (1998) also argues that the observed differences in the total can be easily explained by definitional differences. Her analysis used data up to and including the 1992 survey.

This finding is confirmed, for data up to the mid-1990s, in the time series data plotted in Figure 1a[7]. The figure plots the dynamics of total non-durable consumption as estimated from the FES and from the NA data, and the ratio of FES spending to NA spending across time. Spending in the FES is weighted using grossing factors that give higher weights to household types less well-represented in the FES than in the population at large. This ought to give a national total for expenditures in the micro dataset. Values for each year for both FES and NA are uprated to 2002 values.

Until the mid 1990s the FES accounted for at least 95% of the NA consumption. Since then, however, the ratio of FES to NA consumption has been declining dramatically. Between 1992 and 1995, spending as recorded in the FES fell in real terms whilst continuing to rise in the NA data; thus over this period the percentage of NA non-durable spending captured by the FES declined from around 98% to 85%. Since then, FES non-durable spending has risen, but less quickly than NA spending such that by 2002, the ratio captured by the FES had fallen below 80%. Evidence of this decline was first seen in Blow *et al* (2004) for data up to 1999 using total non-housing expenditure (including durables); our findings extend and confirm the trend. Figure 1b illustrates clearly the deviation between FES and NA in the early 1990s by plotting the growth rates of the two series between 1975 and 2002. 1987/1988, 1998, 2000 and 2002 also stand out as years when growth in the FES lagged behind growth in the NA.

If we look at several components, we see that the pattern is repeated for many of them, and most evidently for food, alcohol, tobacco, and clothing (see figures 3, 5, 7, 9 and 11 for UK data).[8] As is well known and should be expected, the ratio of FES to NA expenditure changes dramatically from commodity to commodity. The pattern for food is particularly interesting (see figure 3) given our focus on the poorest individuals, for whom food is a larger share of total consumption. Commodities for which social stigma is high, such as alcohol and tobacco, are characterized by a substantial amount of under-reporting (see figures 5 and 7). Interestingly, even for these commodities, the underestimation from individual level data has worsened since the mid 1990s. By

[7] Here we analyse data on a calendar year basis – thus, for example, we combine information from the 1994/5 and 1995/6 FES to look at the calendar year comparison for 1995. This is because NA data is produced at a calendar year level.

[8] Figures on additional commodities are available upon request.

contrast, household fuel expenditures (gas, electricity etc) in the survey tend to overestimate those in NA data (see figure 11).

It is worth speculating for a moment why the relationship between FES and NA appears to have worsened, though a fuller analysis of the reasons is best left to future research. It is clear that the decline began in 1992; as such it is tempting to attribute it to the move from a calendar to fiscal year basis of calculation for the FES. However it is hard to see why this should affect the results at all – data is still collected over the entire year and in any case we would anticipate such an effect coming through as a step change rather than what appears to be a pretty continuous decline since 1992. Another possibility is that the coverage of the FES has changed and that more people are living in households now excluded from FES coverage but included in NA coverage such as students, however this would not explain the large divergence over time by itself. It may be tempting to think that puchases over the internet are not well recorded in the FES but the decline begain in 1992, well before the advent of online shopping. At the moment, the period 1992 – 5 in particular remains a puzzle[9].

3.2 THE CEX

As with the FES, the comparison of aggregate figures obtained from micro data from the CEX with NIPA consumption data is not new. Since the beginning of the "new" CEX in the early 1980s, the aggregates derived from summing up the household level data have been routinely compared to NIPA aggregates. Examples of this can be found, amongst others, in Triplett (1997) and Slesnick (2001), as well as in very many BLS internal publications.

The general finding is that, if the performance of the FES in terms of its ability to match aggregate data has worsened over the last 10 years, that of the CEX has started from the very beginning from a much lower level. In what follows, we will make use of aggregate CEX data as derived by the BLS and compare them to NIPA figures for the period 1984-2003.[10] By publishing tables of data

[9] Since 2001/2, when the FES changed to the EFS, the spending categories available have been more easily mapped to the categories of spending in the CPI than the RPI, and as such it is possible to match the EFS data to the NA data at a very fine level of aggregation much more simply and accurately. To make a longer historical comparison we have had to match the FES and NA more broadly and so have lost some of this finer comparison. An analysis of the 2001/2 and 2002/3 EFS compared to the 2002 NA figures suggests that the EFS is particularly poor at capturing financial services, water services, insurance, hospital services and transport services. One possible explanation therefore seems to be that the more spending switches away from goods and towards services, the worse a micro level study will perform relative to national accounts data. Full details of this comparison are available on request.

[10] To this end, we will use on-line aggregate data from the CEX for that period available at www.bls.gov/cex/home.htm and NIPA data from Table 2.5.5 available at www.bea.org.

integrated from the two survey components of the CEX, the BLS claims that a more complete accounting of expenditures is obtained. As we have pointed out earlier in this paper, the Diary Survey is explicitly designed to collect information of frequently purchased items, while the Interview Survey is designed to collect data on major items of expense, such as those that occur on a regular basis that respondents can easily recall.

In Figure 2a we report the dynamics of total consumption as estimated from the CEX and from NIPA data, and the ratio of CEX spending to NIPA spending over time. The general picture painted by this graph, though referred to a different time period, is in line with that from other studies (see, for example, Figure 3.2 in Slesnick, 2001). Over the period considered, the weighted sum of individual consumption is only able to match, on average, about 70% of total consumption expenditure. The CEX to NIPA ratio has been declining almost continuously since 1984, though it seems to have stabilized starting from 2000. Its values range from about 80% in 1984 to just above 60% in the final part of the time series. It is worth stressing again that, over the same time period, the same exercise performed on FES data provides values of this ratio ranging between 80% and 95%.

Figure 2b plots growth rates of the two series over time. Compared to the FES series in figure 1b, there appear to be fewer instances where the gap between survey data and NIPA data is very large; rather, the CEX growth rate appears to fairly consistently be below the NIPA growth rate leading to the gradual decline observed in figure 2a of the ability of CEX data to pick up NIPA totals. In more recent years the two series seem more closely aligned.

We replicated the same exercise for a variety of expenditure categories, and results are reported in Figures 3-16. As it should be expected, the ratio of CEX to NIPA expenditures changes dramatically from commodity to commodity. An interesting comparison worth looking at is that for total food, as the bulk of the elementary expenditures (i.e. UCC codes) used to compute such commodity is taken from the Diary Survey. Given that diaries are explicitly designed to collect expenditures on frequently purchased items (like food), the comparison of CEX aggregates to NIPA aggregates for this commodity is somehow informative of the quality of the Diary Survey. The decline in the CEX to NIPA ratio reported in Figure 4 is not as steep as that documented for total expenditure, but values of this ratio are, on average, just below 75%. Overall, the same declining pattern can be found for several other commodities (with the exception of expenditure on alcohol,

which seems to present a u-shaped profile, and public transportation and household utilities, for which a roughly stable relationship emerges).

4. The prevalence and dynamics of poverty

In this section, we start by discussing the dynamic of poverty in the US and in the UK looking both at income and expenditure definitions. In both countries we arbitrarily define as poor a household whose income (expenditure) is below 60% of the median, though as we noted earlier this is the standard relative poverty line used in British and European literature. On the other hand, our choice contrasts with much of the US literature where an absolute poverty line is typically used. It is not the purpose of this paper to enter in the controversy about the most appropriate way to define poverty. From our point of view, an important advantage of looking at a relative concept is that it avoids the necessity of a poverty line. The readers who think that poverty should be measured in absolute terms, may re-read the analysis below as an analysis of inequality rather than poverty.

We focus on a very specific population: that of married couples, that is a group that excludes the most vulnerable households that have been the focus of much of the analysis, such as single mothers. Our motivation for this choice are two. First, Meyer and Sullivan (2003, 2006) have looked at the relationship between expenditure and income for this group. Second, one of our focus being on the ability of individual consumers to smooth income shocks, we wanted to study this phenomenon among a well defined group that is probably better equipped to buffer negative income shocks.

After presenting the evolution of these different measures of poverty, for each of the two countries we consider, we look at the level of consumption and income along the income distribution and the the consumption distribution. This analysis can be informative about the nature of income shocks individuals face. Finally, we present descriptive evidence on the expenditure shares of two commodities, food, that is a necessity, and entertainment, a luxury. The latter has been used by Costa (1999) as an approximation of economic welfare. The former, as we argue, is of considerable interest for the poorest segment of the population.

4.1 The evolution of 'poverty' in the US

We start our analysis by plotting, in Figures 17 and 18, how the proportion of poor in the US has changed over time according to the income and expenditure definition, first with the Interview and then with the Diary survey. Several features emerge from these pictures. First, in either survey income poverty rates are higher than consumption poverty rates. The figures obtained from the two surveys in terms of the incidence of income poverty are roughly comparable, ranging between 26%

and 30% for the period considered. This result is perhaps not surprising, as household in the two surveys are asked the same income questions with the same methodology. Note, however, that the time series obtained from diary data appears to be more noisy than the one from the Interview Survey, most likely reflecting the difference in the sample size.

Both surveys paint a picture of stable or slightly increasing poverty rates during the 1990s. In particular, for the Interview Survey the percentage of households that are poor according to the income definition starts at about 25% in the early 1980s to increase to almost 30% and subsequently decline before the end of the decade. After that the proportion starts to increase again to reach almost 30% again just before the end of the 1990s.

The picture that emerges from the expenditure definition is quite different, depending on the survey component considered. As far as the Interview Survey is concerned, a few points are worth mentioning. First of all, the proportion of households that are "spending poor" is substantially lower than the proportion obtained considering income. Having a lower proportion of poor households is a direct consequence of the fact that the distribution of consumption is less unequal than that of income (see, for example, Krueger and Perri, 2005). Our relative definition of poverty, therefore, causes this effect. Second, the path over time is much more stable (except for very high frequency fluctuations probably induced by noise) and the increase and decrease during the 1980s is much less pronounced. This second fact is a reflection of the fact that the level of inequality in consumption is much more stable, especially in the 1990s than the level of inequality in income.

On the other hand, the level of consumption poverty rates is considerable larger when we look at the Diary Survey. Two dramatic differences between the Diary and Interview Survey are worth mentioning. First the percentage of households below 60% of median expenditure is substantially higher in the Diary Survey than in the Interview Survey. The proportion is almost as high as the proportion of poor households derived using the income definition. Second, this proportion increases substantially during the sample period (particularly during the 1990s). These facts are a direct consequence of the level and evolution of consumption inequality in the Diary Survey. As discussed in Attanasion, Battistin and Ichimura (2005) the Diary Survey indicates a much higher and increasing level of inequality.

Having looked at the evidence on the evolution of the prevalence of poverty using different definitions, we now consider who the poor are according to the different definitions. In Table 1, we

report the results of estimating two probit models where the dependent variable is the poverty indicator (either using the income or the consumption definition), separately for the two survey components of the CEX.

We include amongst controls the survey year, region, household size, household type, number of children and household composition, ethnicity, a polynomial in age and education of the head of the household (which we set to the male for husband and wife households). In the case of education, the excluded group is high-school dropouts.

All the coefficients have the expected sign. The results in the table show that similar factors appear to drive both consumption and income poverty. However, in some cases, the results are remarkably different across specifications. For instance, age and education effects seem to be quite different in the income and consumption specification. The same applies to family composition variables. Instead, there is a remarkable similarity between the interview and diary survey, especially for the income poverty.

We now move on to study the average level of income and consumption along the income distribution. These figures are plotted for four representative years and for both the Interview and Diary survey in Figures 20 and 21. In both surveys and for all years considered we see that while the level of income obviously increases as we consider increasing percentiles, the level of consumption is remarkably flat. This implies that for the lowest income percentiles, consumption is above income. These figures, if taken at face value, imply substantial amount of dis-saving a fact that has been noted before, for instance by Sabelhaus (1998). For completeness, in Figures 22 and 23, we also report average and consumption along the consumption distribution. In this case, consumption is always below income and both variables increase monotonically.

In section 6 we will present the results we obtain estimating Engel curves for food and entertainment, which, as we discussed above, can be informative of how the behaviour of individual households changes with poverty. Here we start presenting some descriptive statistics on the share of food and entertainment in total non durable consumption for the whole CEX sample and various sub-samples. In Figure 24, we start reporting, for the whole sample, the sample of income poor, the sample of spending poor and for the sample of high school dropouts, the share of food in total non durable consumption. The first feature to explain is the large jump in 1988. This is explained by the change in the food question implemented in the CEX Interview sample in 1988. Unfortunately, such

a large change swamps the pattern over time. If one translates the pre-1987 data upward to align them to the post change data, one observes a slight but monotonic decline in the share for the whole sample. However, for spending poor, this declines is reversed in the second part of the sample, while for the income poor and the high school dropouts it stops.

In Figure 25 we repeat the same exercise with data from the Diary survey. In this case, there are no definitional changes, so that we observed a marked decline from 1986 to 1996 followed by a flattening of the four profiles. As for the Interview survey, the spending poor have the highest shares.

In Figures 26 and 27 we look at the share of entertainment in total non durable consumption. In this case, we see a monotonic increase over time, although such an increase slows down in the last part of the sample. The share of entertainment is higher for the whole sample and lowest for the spending poor. The other two groups (the income poor and the high school dropouts), are somewhat in the middle. For the spending poor and to an extent for the income poor and the high school dropouts, the path of this share seems to be flatter, with a less pronounced increase in the early part of the sample.

4.2 *The evolution of 'poverty' in the UK*

We repeat a similar analysis for UK FES data between 1974 and 2002/3[11]. Figure 15 shows income and non-durable expenditure poverty rates. We show both net income poverty, since this is the typical income poverty measure in the UK, and gross income poverty for comparability to the CEX measure. In addition, poverty is measured as a headcount – it shows the number of individuals living in households that are below the poverty line as a proportion of all the individuals in the data. For consistency with the CEX results, we exclude households headed by people aged under 20 or over 70 both in calculating the relative poverty line and proportion of people in poverty.

All three measures have risen since 1974: gross income poverty rose from around 22% to 29% in 2002, net income poverty from 19% to 26% and non-durable spending poverty from 15% to 21%. Net income poverty is typically around 2 percentage points below gross income poverty – this is not surprising since the tax and benefits system will typically increase the incomes of the poorest household and reduce the incomes of those in the middle of the income distribution who determine

[11] FES data is analysed at an annual rather than quarterly level though the survey is nationally representative quarter-on-quarter. Note that we switch our analysis to fiscal year from 1993/4 in line with the definition of the survey, thus points on the graph marked 1993, 1994 etc should be read as 1993/4, 1994/5 and so on from this period.

the poverty line. Note, though, that the gap between gross and net income poverty rates has narrowed over time.

The trends across measures are not the same over the whole time period. Income poverty rates rose very strongly in the 1980s and more gradually in the early 1990s, such that both gross and net income poverty peaked in around 1993 – 1996. Since then, income poverty rates have declined (particularly net income). By contrast, spending poverty rates rose more slowly in the 1980s but have continued to rise through the 1990s, remaining virtually unchanged since the turn of the century. These figures reinforce the findings of Brewer *et al* (2006a) who looked at total spending poverty (including durables but excluding housing) and found that spending poverty in Britain overtook net income poverty in 2002. Non-durable spending poverty is still some way below income poverty for the UK which suggests the growth in spending poverty has been even stronger amongst durable goods. Since 1998, spending poverty on our measure has been flat; in the Brewer paper it rose further. This may be due to the exclusion of particularly elderly households from our sample, who are much more likely to be in spending poverty.

These different trends, particularly since the mid-1990s, may reflect the fact that the current UK Government has an explicit target to reduce poverty as measured by income, particularly amongst vulnerable households such as those with children or elderly people, but no target to reduce spending poverty. This is of course a direct function of that fact that it is much easier to influence household incomes than it is household expenditure decisions through Government assistance policies. Brewer *et al* (2006a) suggest tentative but far from conclusive reasons as to the different trends. First, they show that very different types of households are in poverty when measured using income and spending (we investigate this further below) – only just under 60% of those poor on one measure are also poor on the other. Second, they suggest that higher spending poverty may reflect growth in permanent income poverty whereas falling income poverty reflects transitory changes. Third, they suggest there may be long-run trends in spending and borrowing behaviour – if low income households are starting to save more, it is consistent with rising spending poverty at the same time as falling income poverty.

Analysis of which household types are poor on the income and spending measures uses the same probit analysis as discussed above for the CEX. We show net income and non-durable spending results in table 2; gross income results are available on request. Unlike the CEX, the FES contains no available measure of ethnicity so we exclude that variable from our analysis. Our model of

poverty controls for year (base is 1974), region (base is London), household size, household type (single, couple, other), number of children, whether the household head is over pension age, a polynomial in age, and whether the head has above compulsory education.

The results in table 2 show that similar factors appear to drive both consumption and income poverty. People living in the North of England, Wales or Scotland have higher poverty rates whilst those in the East or South East have lower rates, relative to those in London. Those in the East Midlands have a higher spending poverty but lower income poverty rate than those in London. Household size has a non-linear effect on both measures – at high values, large households increase poverty rates. Both single adult households (lone parent, lone pensioner and lone non-pensioner) and multiple adult households (extended family and other household types) have higher poverty rates than couple households (with or without children). However the presence of children significantly increases the risk of being in poverty. Perhaps surprisingly, having a pensioner-headed household decreases the risk of poverty, particularly income poverty. Recent UK evidence has shown that the average pensioner is now less at risk than the average non-pensioner of income poverty (Brewer *et al*, 2006b) and it must be borne in mind that this sample is restricted to those age 70 or less so the pensioner population in our sample is the youngest part of the pensioner population. Older households will tend to have a slightly lower risk of income or spending poverty.

As with the CEX analysis, we can also look at the spending of low-income households and the income of low-spending households. As with the CEX, we smooth non-durable spending and net income for the poorest 35% of households measured by each indicator in each year and plot the smoothed spending and income level at each percentile of income and spending in four years: 1980, 1985, 1990 and 2000 (see figures 28 and 29). We find similar results to the US data: low-income households will typically spend well above their 'means' even on non-durables, suggesting that either very low incomes are mis-measured or that people are temporarily running down savings or accumulating debt to maintain expenditures. This compares to similar results found in Brewer *et al* (2006a) where this phenomenon was dubbed the expenditure 'tick' owing to the shape of the spending line in figure 28. The fact that this also holds for non-durable spending alone (in their paper, Brewer *et al* looked at total non-housing expenditures) suggests that durable spending is not sufficient to explain the presence of the tick (i.e. low income households spending a lot on durables during the survey period, pushing up measured spending).

There is no evidence of this holding in reverse – low spending households are also typically also low income households. Thus we do not see any income 'tick' in figure 29.

Finally, in Figures 30, 31 and 32 we look at the evolution of food and entertainment shares in the UK over time. Unlike in the US, we present results for both total food (in and out, in Figure 30) and for food in only (Figure 31). As with the CEX and as expected, the share of food is lower for the whole sample than for the other (relatively poorer) group considered. As with the CEX, the spending poor is the one with the highest share of food. The income poor follow closely, while the share of food for individuals that drop out of school after compulsory education, is closer to the entire sample.

The share of entertainment, which raises throughout the period for all groups, is higher and increasing faster for the whole sample than for the low income or low education groups.

5. Estimating Engel curves for food: methodological issues

In most of this section, we will be discussing the estimation of Engel curves, that is the relationship between the shares of total expenditures devoted to various commodities and total consumption. Such a relationship can be derived within a standard demand system. If one assumes that individual households (conceived as a single decision unit) maximize utility subject to a budget constraint, one can obtain demand curves where expenditure (shares) on individual commodities depend on total expenditure, prices and preference shifters that might include demographic and other variables. The tension in an exercise of this type is between equations that are flexible enough to fit the data and yet are consistent with the restrictions implied by the theory. In what follows we discuss three important issues in the estimation of Engel curves which are still debated in the relevant literature. The first deals with the type of functional form used to fit the data and on the importance of allowing non linearities in total consumption. For our analysis of poverty this aspect is crucial as we want to allow for flexibility in thet tail of the distribution where non-linearities can play an important role. Second we discuss whether total consumption should be instrumented or not. Third we discuss the issue of how to deal with measurement error.

Deaton and Muellbauer's (1980) Almost Ideal Demand System has been widely used and, for a given level of prices, implies a linear relationship between expenditure shares and the log of total expenditure. A quadratic generalization of such a system has been proposed and studied by Banks,

Blundell and Lewbel (1997) (BBL from now on). It as been argued that the AIDS and its quadratic generalization constitute one of the most flexible theory consistent functional forms available in the literature. Therefore, in our discussion, we use the BBL specification as a starting point.

5.1. Functional forms and price effects

As detailed in BBL, a Q-AIDS demand system can be derived from the following Indirect Utility function V:

$$(1)\quad \ln V = \left\{ \left[\frac{\ln m - \ln(a(\mathbf{p}))}{b(\mathbf{p})} \right]^{-1} + \lambda(\mathbf{p}) \right\}$$

where m is total expenditure, $\mathbf{p}$ the vector of prices and the functions $a(\mathbf{p}), b(\mathbf{p})$ and $\lambda(\mathbf{p})$ are defined as follows:

$$\ln a(\mathbf{p}) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + 0.5 \sum_{j=1}^{n} \sum_{i=1}^{n} \gamma_{ij} \ln p_i \ln p_j$$

$$b(\mathbf{p}) = \prod_{i=1}^{n} p_i^{\beta_i}$$

$$\lambda(\mathbf{p}) = \sum_{i=1}^{n} \lambda_i \ln p_i; \qquad \sum_{i=1}^{n} \lambda_i = 0$$

By applying Shephard's lemma to this indirect utility one can get the following share equations:

$$(2)\qquad w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i (\ln m - \ln a(\mathbf{p})) + \frac{\lambda_i}{b(\mathbf{p})} \left[\ln m - \ln a(\mathbf{p}) \right]^2$$

To these equations one can add demographics (either as affecting the intercept α_i or the price coefficients or even with the coefficients on total expenditure). As discussed in BBL, the demand system in (2) combines functional form flexibility with consistency with theory, in that it is integrable. The last term in (2) makes the demand system of rank 3, the highest admissible rank for a theory-consistent demand system that is exactly aggregable, in that is linear in function of total expenditure.

BBL discuss extensively the importance of a quadratic term in the demand system, as such a term allows some commodities to be necessities at certain levels of total expenditure and luxuries at others. This aspect is potentially very important in our context. We will be particularly interested in the expenditure elasticity of food and other groups of commodities. We will therefore want to avoid

imposing ex-ante the linearity implied by a standard AIDS system and allow for the additional flexibility afforded by the quadratic term in (2).

BBL show that any theory-consistent system is of rank 3 (and therefore allows some commodities to have quadratic terms and some not) only if the coefficient on the quadratic term is a function of prices, as is the case in equation (2). If one uses data from a single cross section and is willing to assume that prices faced by the consumers in that cross section are uniform, one does not need to worry about the issue of unobservable prices. It should be remembered, however, that in such a situation, the size of the coefficient on the quadratic term cannot be extrapolated to different contexts, as it would depend on the level of prices prevalent in the cross section used for estimation and would vary in different situations.

In what follows we explicitly allow for the variability of prices, as we use data from several years. However, we do not estimate all the parameters that determine the price indexes that enter equation (2). Blundell, Browning and Meghir (1994) and Attanasio and Weber (1993, 1995) have argued that $a(\boldsymbol{p})$ can be well approximated by a Stone price indexed obtained as the average of individual price indexed weighted by expenditure shares. In our empirical application we use such an approximation and do not impose the non linear restrictions that the structure in (1) and (2) would involve. In particular, we do not restrict the coefficients on log prices. Morever, we approximate the price index $b(\boldsymbol{p})$ by interacting the square of log real expenditure $\ln(m/a(\boldsymbol{p}))$ with individual log prices.

In equation (2) we have not entered any variables, such as family composition, that might affect either the price indexes or tastes. We decide to enter demographic variables as determinants of the intercept shift α_i.

To sum up, the equation we will be estimating is the following:

$$w_i = \alpha_i' \mathbf{z}_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i (\ln x) + \lambda_i \left[\ln x\right]^2 + \psi_i' \ln(\tilde{\mathbf{p}}) \left[\ln x\right]^2 + \varepsilon_i \quad (3)$$

where $\mathbf{z}$ is a vector of demographic variables, $\ln(\tilde{\mathbf{p}})$ a vector of prices expressed in terms of deviations from the mean. The vector coefficients ψ_i will reflect the parameters of the price index $b(\boldsymbol{p})$ as well as apprximation constants. From equation (2), it is clear that if the coefficient on the quadratic term λ_i is zero, equation (3) simplifies to:

$$w_i = \alpha_i' \mathbf{z}_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i (\ln x) + \varepsilon_i \quad (4)$$

because the interactions of squared expenditure with prices enter only through the quadratic term.
In addition to the approach discussed above, we also tried a specification where demographic variables are assumed to enter the price index $a(\boldsymbol{p})$ and where this is not approximated by the Stone price index, In that case the specification that allows for quadratic terms is considerably more complicated as it includes interactions of prices and demographic variables with both linear and quadratic expenditure terms. This can be verified by considering equation (2) and expanding the square term. The results we obtained where not significantly different from those reported here.

5.2. Endogeneity of expenditure

There are several reasons why the terms in log total expenditure might be correlated with the residuals of the demand system. The usual interpretation of a static system is as the second step of a two stage budgeting, where the first step determines the allocation of total expenditure across time periods, and the second determines the allocation within the period. If heterogeneity in intertemporal preferences are correlated with (unobserved) taste shifters in the demand system, one would obtain that the residuals of the latter are correlated, across individuals, with the allocation of resources over time and therefore with log expenditure.[12] It is possible, for instance, that individuals that have a relatively stronger preference for food are also relatively impatient and therefore have a higher level of current consumption as well as a high share of food expenditure.

A valid instrument in such a context, therefore, is a variable that explains the cross sectional variability of log expenditure but is unlikely to be correlated with taste variables. In the literature, income is often used for such a purpose. However, if labour supply enters the utility function in a non-separable manner, income might be correlated with taste shifters in the same way as total expenditure is. Moreover, in the presence of large transitory shocks, current income can constitute an inefficient instrument for total expenditure even if it is uncorrelated with taste shifters. A possible alternative to the use of income is the use of wages, which may be considered as price that the individual household takes as given. An even more conservative stance would be to use average wages for certain groups (such as cohort and education groups).

The presence of quadratic terms in equation (2) introduces additional problems to the instrumenting approach. Once one has established which the instruments that one wants to use are, one can use powers in this instruments to take into account the presence of non linear terms. Such an approach,

[12] Another reasons for the possible correlation between residuals and log expenditure is the presence of measurement error. We discuss at length this issue below.

however, often yields very imprecise estimates. An alternative strategy, which has been tried in the literature is the so-called control function approach as proposed, for instance, by Blundell, Duncan and Pendakur (1998). According to such an approach, one uses the residuals of the first step regression for total expenditure to control for the endogeneity of this variable in equation (2). This is done introducing a polynomial in the residuals as additional regressors.

5.3. Measurement error

In a demand system that expresses shares as a function of log total expenditure, the presence of measurement error introduces a complicated set of problems. Lewbel (1996) shows that the standard instrumental variable approach does not yield consistent estimates in the presence of measurement error in a system like (2). The reason is that measurement error in individual commodities induces measurement error in total expenditure which is the sum of the individual components. This implies that the measurement error in log total expenditure is not independent of the measurement error in individual commodities and is far from being of the classical type, even if the measurement error for the individual commodities is classical. Lewbel (1996) proposes a procedure that takes this problem into account. The idea is relatively simple. For the sake of exposition, let's consider a linear system in which there are no additional taste shifters and in which total expenditure is uncorrelated with the residuals of the expenditure shares equation except, possibly, for the presence of measurement error. Suppose also that prices are constant and equal to 1. For commodity *i* ,we will then have:

$$w_i = \alpha_i + \beta_i \ln(x) + \varepsilon_i \tag{4}$$

In the presence of measurement error in the single components of total expenditure, Lewbel shows that IV estimation of equation (4) does not identify the coefficients of interest. On the other hand, by multiplying equation (4) by the level of total expenditure one gets:

$$xw_i = \alpha_i x + \beta_i x \ln(x) + x\varepsilon_i \tag{5}$$

Lewbel shows that IV applied to such an equation allows one to recover directly the parameter β_i and, indirectly, the parameter α_i. Such an approach can be generalized to the case in which the Engel curve is quadratic, in which one uses a Control Function approach to take into account the endogeneity of *ln(x)* with the residual term, and can be used, with the appropriate modifications, when the system is quadratic, when there is endogeneity of total expenditure and when additional variables enter in the demand system. In what follows, we have generalized Lewbel's approach to our context.

6. Estimating Engel curves for food and entertainment: results for the UK and the US

As we discussed in Section 4, by estimating Engel curves we want to model the consumption behaviour of consumers and focus on the behaviour of those with the lowest level of income and total consumption. For this purpose, we estimate the Engel curve for a necessity (food) and a luxury (entertainment) for both countries. We first estimate the equation for the whole sample and then, given the focus, on sub-samples of 'poor' consumers. We identify 'poor' consumers using two alternative definitions. The first is based on reported income, the second on the educational attainment of the household head. In particular, we first use the income threshold used above (60% of the median) and then define as poor all the high school drop-outs. We avoided the temptation of defining poor on the basis of total consumption as the latter is a variable we have argued to be endogenous.

Much of the focus of the discussion of the results we present will be on three issues. First, we want to assess the importance of using different methodologies for the estimates of the Engel curve we obtain. Given the discussion on the presence of measurement error, we will be particularly interested in the results obtained from methodologies that allow explicitly for it. Second, we want to establish the quantitative importance of non linearities in Engel curves. For food, in particular, we want to establish whether the declines in the share of food with total expenditure accelerate with total expenditure. This would indicate that for very poor families, food consumption is a disproportionately important component of total consumption. Finally, we would focus on the comparison across the two countries. We already identified differences in saving (or more precisely dissaving) behaviour of poor consumers. We want to see if these are reflected also in differences in the allocation of resources across commodities (which could be an indication of differences in economic environment and/or tastes) or not, in which case this would be an indication that the differences across countries might be due to differences in measurement error.

In what follows, we report our estimates of the Engel curves for food and entertainment in the US and in the UK. As mentioned above, we estimate several versions of equation (3): in particular, we report the results obtained estimating one version where the coeffients on the quadratic expenditure terms are constrained to be zero and one where they are not. For each of these two specifications, we report the results obtained by a control function approach that ignores the issue of measurement error and one where this approach is modified using the methodology in Lewbell (1996) discused above. The former will be labeled CF, while the others, ME. We should note that in the case of the

Lewbell estimator for the quadratic specification, to recover coefficients different from that on the quadratic term, one has to omp0ute moments that are not always defined in small samples. It is therefoere possible, that some of the coefficients are not reported.[13]

In additions to the linear and quadratic term in real total expenditure and the vector of pricesequation (3) includes several demographic variables (such as family size, the number of children, the number of adult equivalents, age of the household head and the square of these variable, the number of adults older than 64, education dummies, seasonal dummies).[14] Rather than reporting the coefficients on all these variables, Tables 6.1 to 6.3 (and subsequent tables) only contain the coefficients on the total expenditure and own price. The latter, which in the theoretical model should be negative, should be interpreted with a grain of salt, as the price effects are approximated via the use of the Stone price index used to deflate total expenditure.

6.1. Engel curves for the US

In Tables 6.1 to 6.3, we start with the results for the Engel curve for food in the US. The two panels of Tables 6.1 to 6.3, refer to the two data sources available. The top panel is derived using data from the Interview Survey, while the bottom panel is obtained using the Diary Survey. Under each Table we plot the slopes of the Engel curves obtained with different methods. In the top panel, the slopes are constant as they refer to the linear specification, while in the bottom panel they refer to the quadratic specification and they vary with total expenditure. In addition to the control function and measurement error corrected control function we also plot the slopes obtained by OLS.

The first thing we notice, looking at the results across specification, is that the methodology used in estimation does seem to make a substantial amount of difference in terms of the results obtained. In the case of the interview survey, both the quadratic and the linear specification obtained with the Control Function approach that neglects measurement error imply a counterintuitive positive slope of the Engel curve for food. This result would imply that food is a luxury rather than a necessity. However, when we control for the presence of measurement error, we obtain a much more sensible result, which implies a steady decline of the share of food with an increase in total expenditure. In the case of the Diary survey, the share of food declines with total expenditure with all

[13] In the current draft, in the specification with quadratic terms, we have not implemented the computation of the standard errors for the coefficients other than the quadratic one.
[14] In the case of the Interview Survey in the US, we also use a dummy for observations before 1988 to take into account the change in the food questions in 1988.

specifications. However, the coefficients change substantially when we move from the CF estimates to the ME. In the linear case in Table 6.1, for instance, the coefficient goes from -0.44 to -0.11.

As for the functional form that best fits the available data, we notice that while the results from the Interview survey point out to significant quadratic effects, the data of the Diary survey yield estimates of the quadratic term that are insignificantly different from zero and of the opposite sign relative to those obtained from the Interview Survey. The coefficient on the quadratic term estimated from the Interview survey is positive and significant in the Interview survey, implying a slope that, while negative throughout the sample, increases with total expenditure.[15] This evidence can therefore be summarized by saying that in the case of the Diary Survey, the data are best fit by a linear specification with a coefficient of -0.11. In the case of the Interview Survey, the slope of the food Engle curve varies from -0.16 and -0.05 over the range of observed expenditure. The two sets of results are, therefore, not dramatically different, on average. If we take the evidence on non-linearity emerging from the Interview survey seriously, we find that the share of food declines more rapidly with increases in total expenditure for the poorest households.

As the focus of this paper is the behaviour of individuals at the bottom of the distribution, in Tables 6.2 and 6.3 we re-estimate the Engel curves in Table 6.1 for two subsamples. The first is that of the 'income poor', as defined in Section 4. The second, instead, consider a time invariant criteria, which is education achievement. In particular, we re-estimate the Engel curve in Table 6.1 on the households headed by a high school dropout. Remarkably, the results are relatively similar across tables. This is re-assuring, as it indicates that the relationships identified on the whole sample are stable and hold even for those subsamples of poorer households considered in Tables 6.2 and 6.3.

In Table 6.4 to 6.6, we repeat the exercise in Tables 6.1 to 6.3, but for the share of entertainment. In particular, in Table 6.4, we report the results for the whole sample, while Table 6.5 and 6.6 report the estimates for the income poor sample and the high school drop-outs. Previous evidence, as well as the figures reported in Section 4, seem to indicate that entertainment is a luxury. And indeed, all our estimates indicate that the slope of the Engel curve for entertainment is positive. However, as for food, the estimation method does make a quantitative difference. For instance, in the linear specification, allowing for measurement error changes the coefficient on ln(x) from 0.04 to 0.14.

[15] In the case of the Diary survey, notice that the coefficient on the linear term is not computable because of the small sample problems with the Lewbell procedure mentioned above. Given that the quadratic term is not sginficantly different from zero, this result does not constitute a major worry.

In the interview survey, we do find some evidence of non-linearity. The specification that allows for measurement error, implies that the slope of the Engel curve is above .2 for very low levels of total expenditure and declines to 0.15 at the highest levels in our sample. Unlike for food, we find differences across samples: the estimates that come out of the two 'poor' samples, imply lower levels of the elasticity and not very strong evidence of quadratic effects. For the linear specifications the ME estimates of the coefficient on ln(x) are 0.09 for the income poor sample and 0.045 for the high school drop-outs.

The evidence from the Diary survey is slightly different, especially for the whole sample. First. We do not find any evidence of non linearities and, for the linear specification, the coefficient on ln(x) is, for all three samples, around 0.04, consistent with the evidence for highs school dropouts from the Interview Survey.

6.2. Engel curves for the UK

We now move to discuss the results we have obtained estimating the Engel curve for food and entertainment on UK data. Starting with food, whose results are reported in Tables 6.7 to 6.9 (along with plots of the first derivatives of the Engel curves) for the whole sample, the income poor and those with compulsory levels of education only, we notice that, unlike for the US, both the CF and the ME approach always give that the share of food declines with total expenditure. However, even for the UK, the coefficients on total expenditure change substantially when we take into account measurement error. For instance, in Table 6.7, for the linear specification, the coefficient on total expenditure goes from -0.31 to -0.15. Moreover, the coefficient on the own price is always negative.

As for the functional form that best fits the data, as for the US, we find significant quadratic terms that tend to increase the slope of the Engel curve as we increase total expenditure. Finally, like in the US, the value of the coefficients does not change dramatically when we estimate the same equations on different samples: that of the income poor and that of individuals who left formal education at the compulsory age.

Moving to the estimates of Engel curve for entertainment, we see that, as for the US and as to be expected, entertainment is consistently estimated to be a luxury. This time, however, taking into account measurement error does not make a huge difference to the estimates. Finally, we find very little evidence of non-linearities in the Engel curve and not much difference across the various

samples over which we estimated our equation. The only sign of a non linearity is in the sample of individuals who left education at the compulsory education age, for whom the quadratic termn of the specification that takes into account measurement error is negative and marginally significant. This result implies that for this group, the slope of the Engel curve declines with total expenditure. The linear specification for the income poor indicate a slightly larger coefficient (0.19 vs 0.11 for the whole sample).

Overall, we can characterize there results by saying that the share of entertainment increases approximately linearly with log expenditure and that if there are deviations from linearity are mainly at the bottom of the distribution, where the increase is slightly faster than for the whole sample.

6.3. Comparisons between the US and the UK

One of the motivations to estimate Engel curves for the US and the UK was to focus on the allocation of resources to various commodities, and in particular a necessity and a luxury, among very poor individuals. The emphasis we gave to non-linearities in total expenditure was justified by the interest in identifying different types of behaviour in certain sectors of the population. Such behaviour could either reflect tastes and preferences or, under certain conditions, mask the access to different market opportunities. The comparison across two different countries is also interesting as a way to identify different types of behaviour that, again, might reflect different insurance opportunities.

The comparison for the two Engel curves we considered is remarkably similar for the two countries. We show evidence of soe non-linearities in food consumption. While a log-linear specification fits the data reasonably well on average, it seems that the share of food declines with total expenditure at faster rates for poorer consumers. For entertainment, we observed again similarities between the two countries. There is some evidence for non linearities but less strong than in the case for food, especially for the UK.

7. Conclusions

In this paper we looked at the inference that can be drawn on consumption behaviour from household level data from the UK and the US. In the first part of the paper, we have assessed indirectly the quality of the data by comparing them to aggregate data. The picture that emerges

from this comparison is not comforting. The US micro data do a very poor job at matching the figures on consumption from the National Income and Product accounts. Moreover, since the early 1990s, the ratio of aggregated micro data to NIPA aggregates has been declining. In the case of the UK, the comparison is much better. Even there, however, recent years have seen a deterioration of the micro data's ability to track national aggregates.

In the second part of the paper we study the dynamics of relative poverty. We focus on a specific group, that of married couples, and define as income (expenditure) poor those households whose income (expenditure) is below 60% of the median. We then focus on the consumption and income behaviour of the poor in the two countries. In both countries we find that income poor families somehow consume much more than they earn. Average consumption is above average income for households up to the 10^{th} percentile of the income distribution. These households, however, have a much larger share of food expenditure and a smaller share of entertainment expenditure.

In the last part of the paper we estimate the Engel curves for food and entertainment for the two countries. The main messages from this part of the paper are two. From a methodological point of view, we stress that the results one gets depend strongly on the type of methods used in estimation. It is therefore crucial to use appropriate methods that take into account both the endogeneity of total consumption and measurement error. From a substantive point of view we find, in both countries, important non linearities, especially in the Engel curve for food. While food is obviously a necessity, the Engel curve is steeper (in that the share of food declines faster) for poor consumers than for better off ones.

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Figures and Tables

Figure 1a: Non-durable expenditure in FES and National Accounts, 1974 to 2002

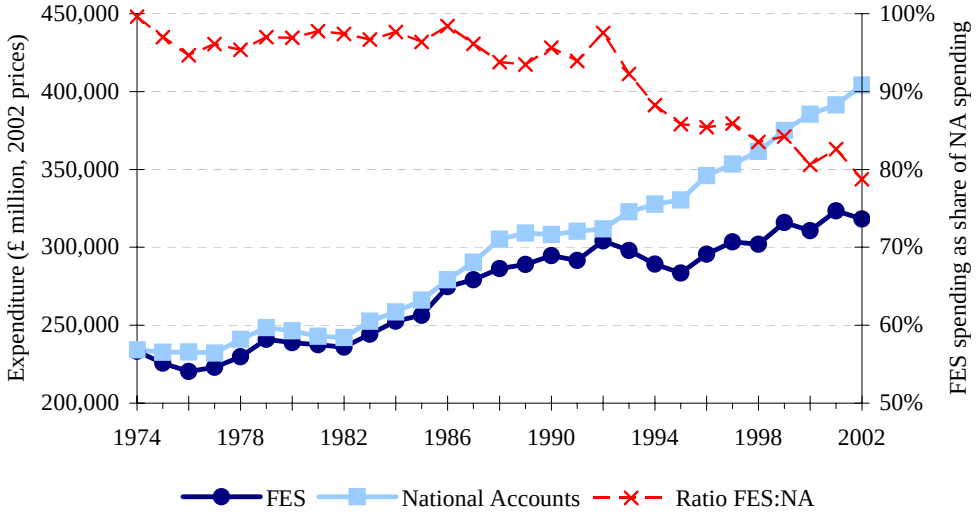


Figure 1b: Growth rates of total non-durable expenditure in the FES and National Accounts, 1975 to 2002

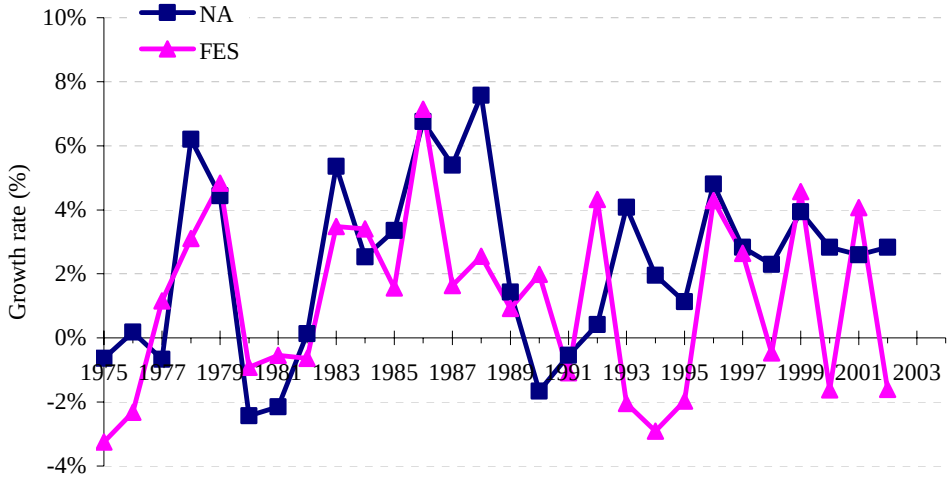


Figure 2: Total expenditure in the CEX and NIPA, 1984 to 2003

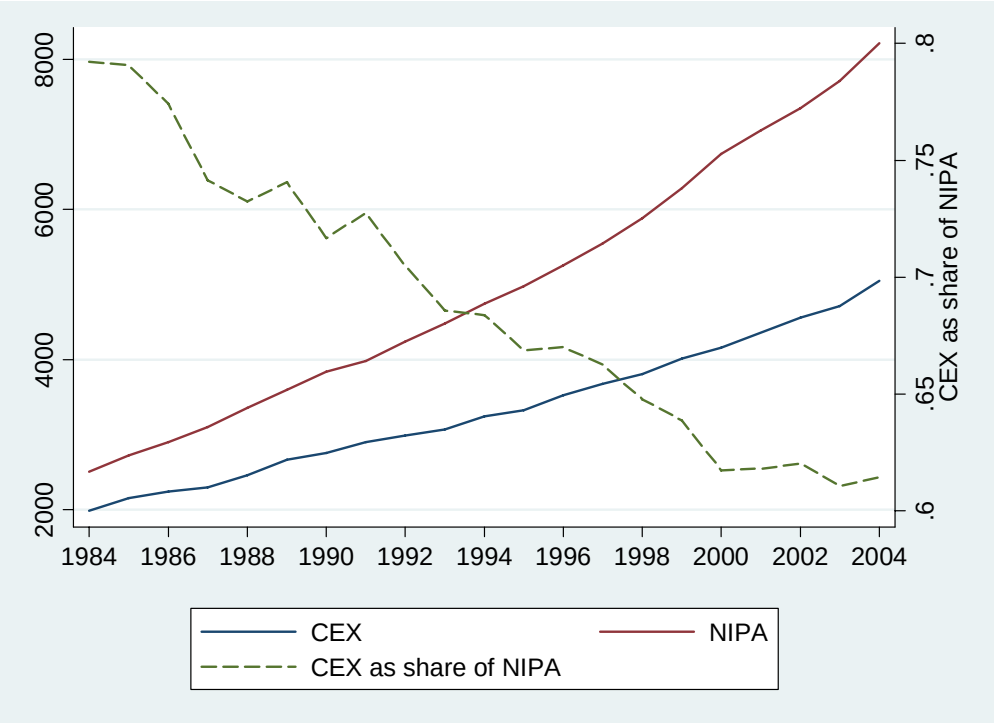


Figure 2b: Growth rates of total expenditure in the CEX and NIPA, 1985 to 2004

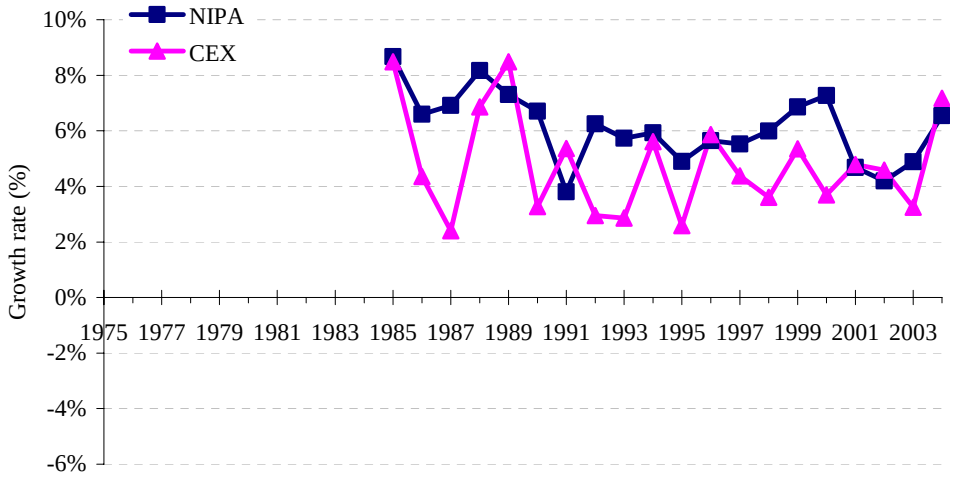


Figure 2b **Ratio of survey data to NIPA / National Accounts data, US CEX / UK FES, 1974 – 2004**

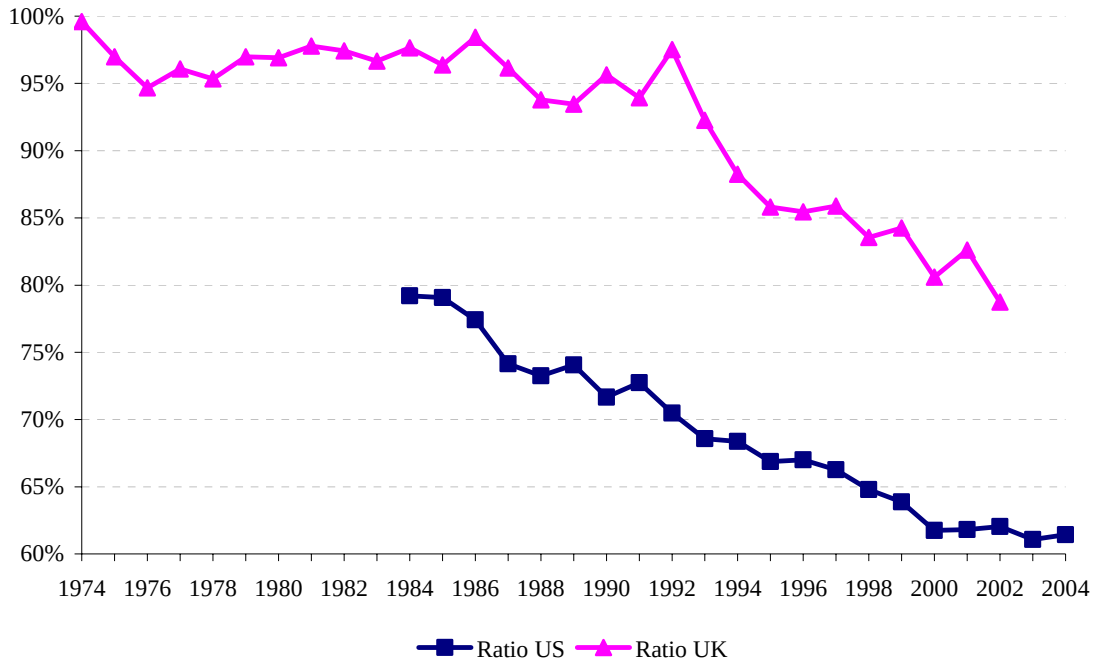


Figure 2c Difference in NIPA growth rate and CEX / FES growth rates, 1975 – 2004

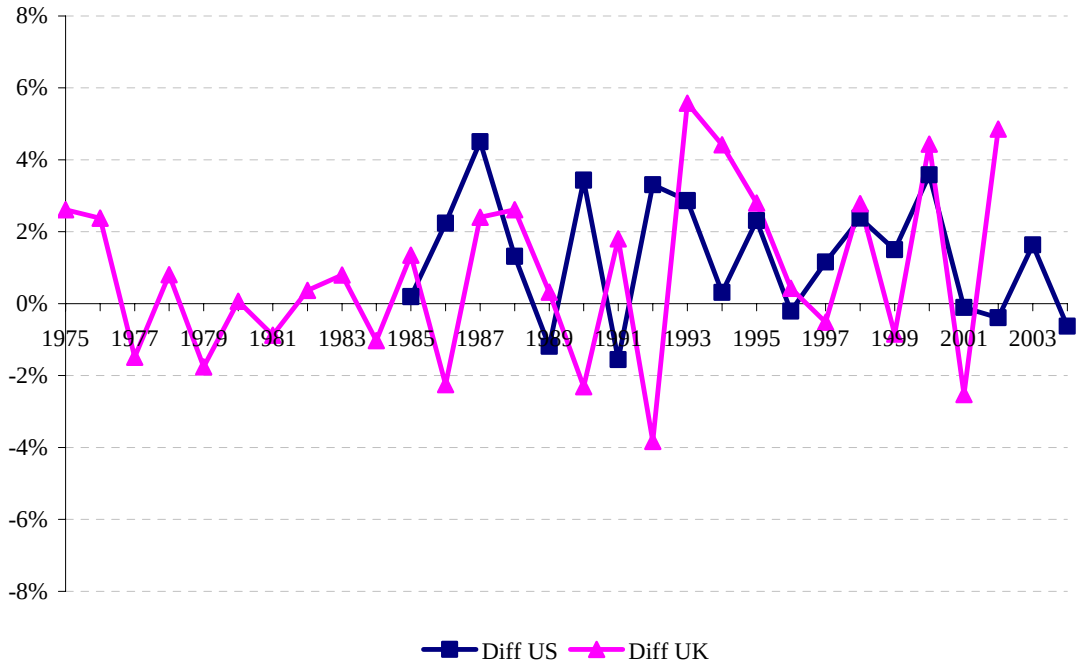


Figure 3: Food expenditure in the FES and National Accounts, 1974 - 2002

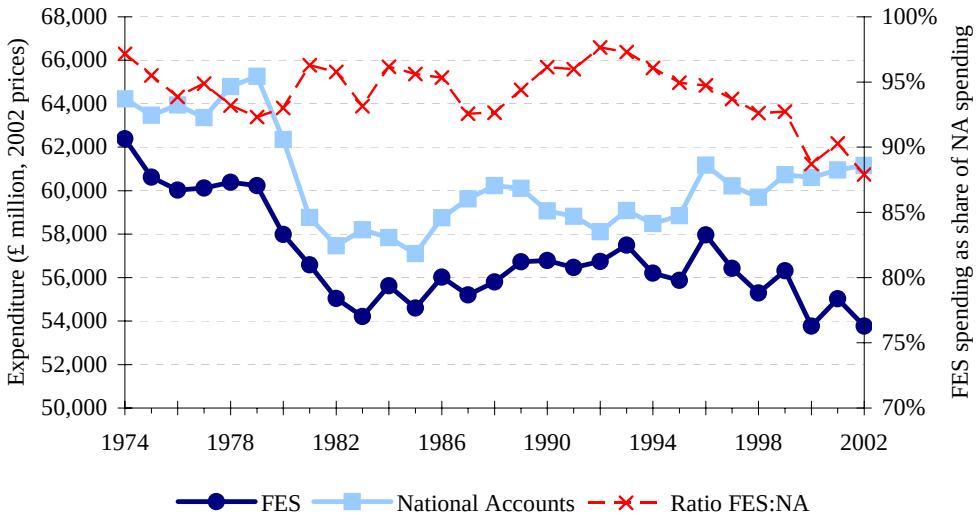


Figure 4: Food expenditure in the CEX and NIPA, 1984 to 2003

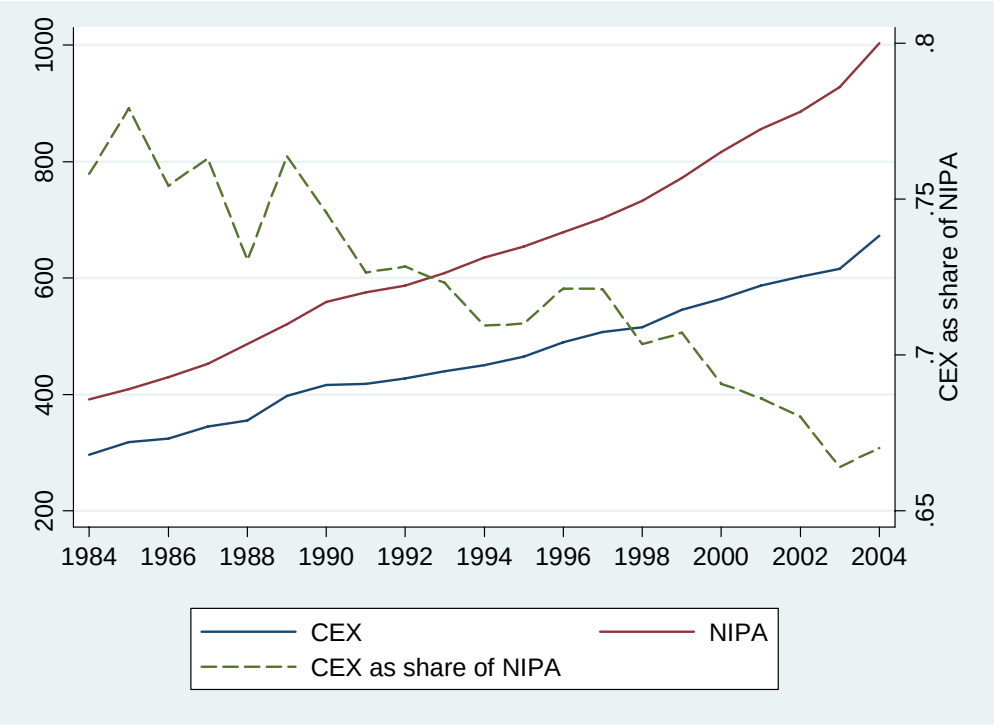


Figure 5: Alcohol expenditure in the FES and National Accounts, 1974 - 2002

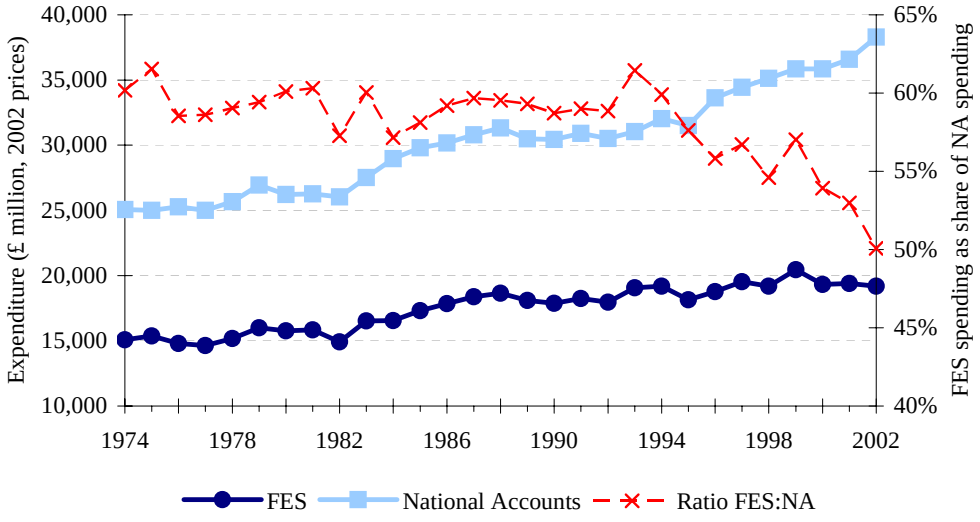


Figure 6: Alcohol expenditure in the CEX and NIPA, 1984 to 2003

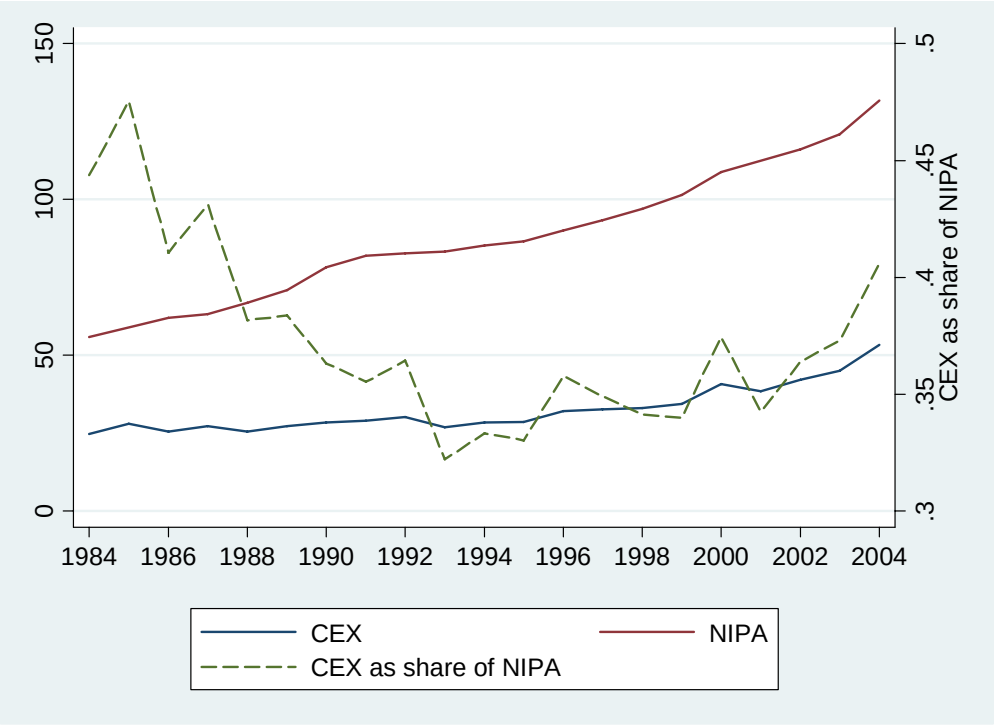


Figure 7: Tobacco expenditure in the FES and National Accounts, 1974 - 2002

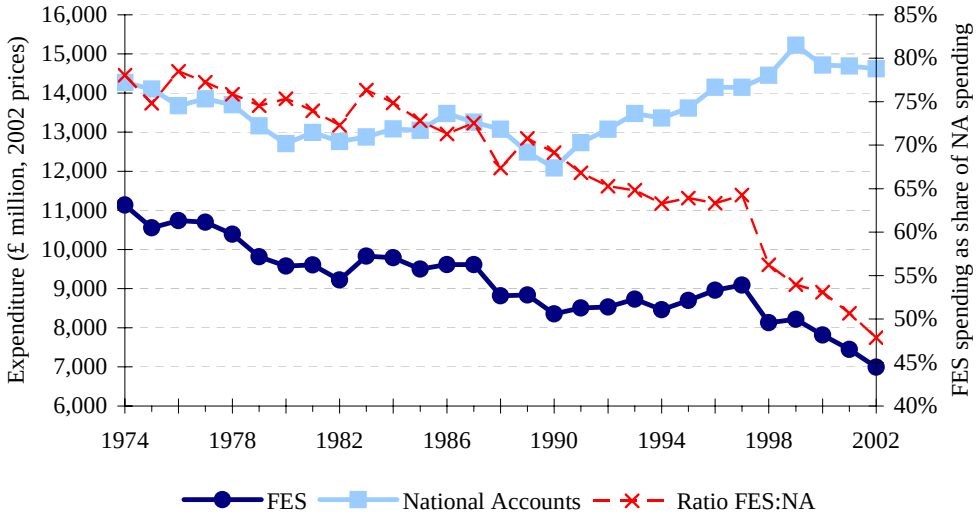


Figure 8: Tobacco expenditure in the CEX and NIPA, 1984 to 2003

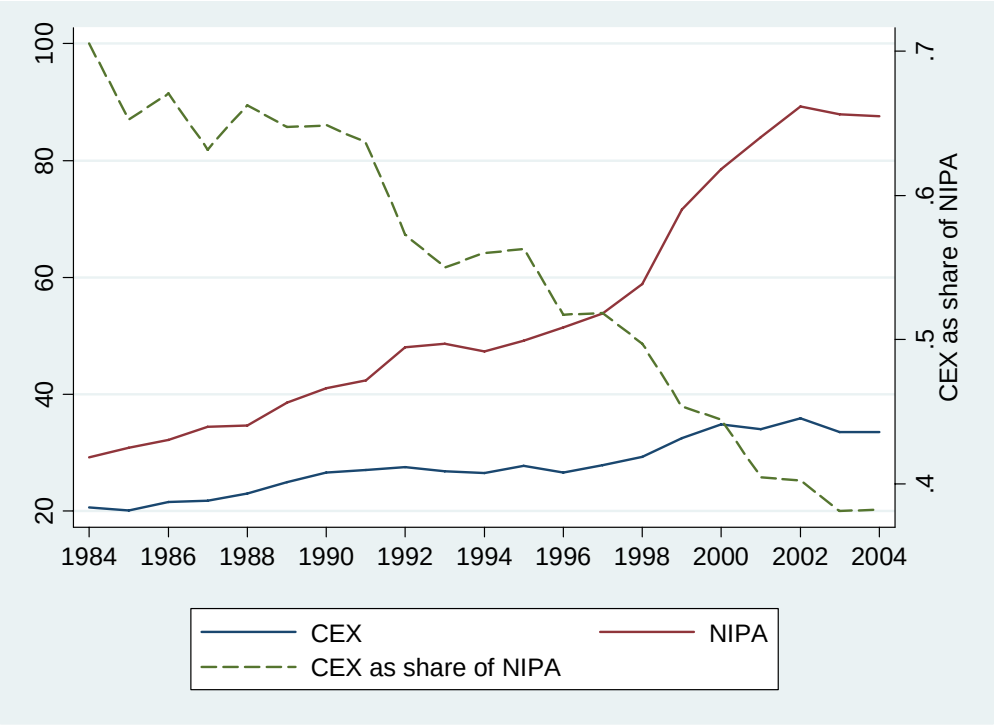


Figure 9: Clothing expenditure in the FES and National Accounts, 1974 - 2002

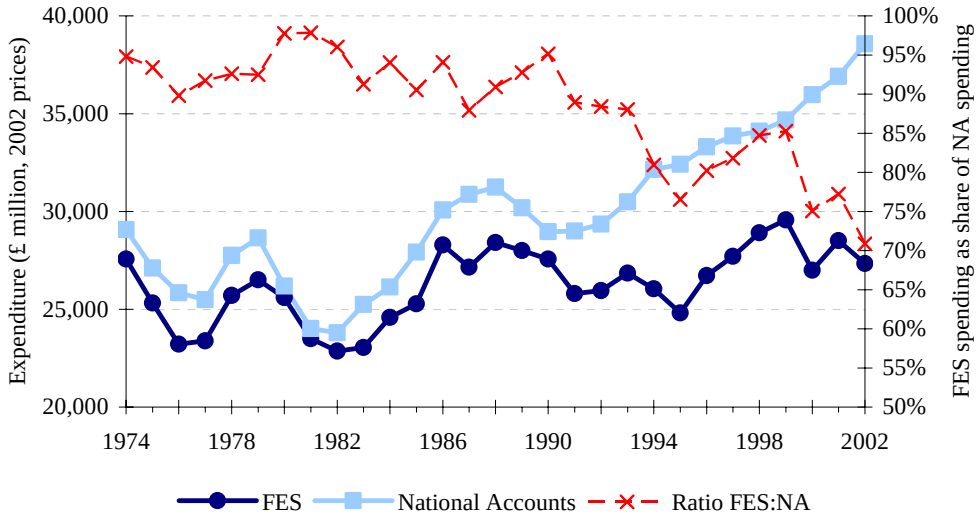


Figure 10: Clothing expenditure in the CEX and NIPA, 1984 to 2003

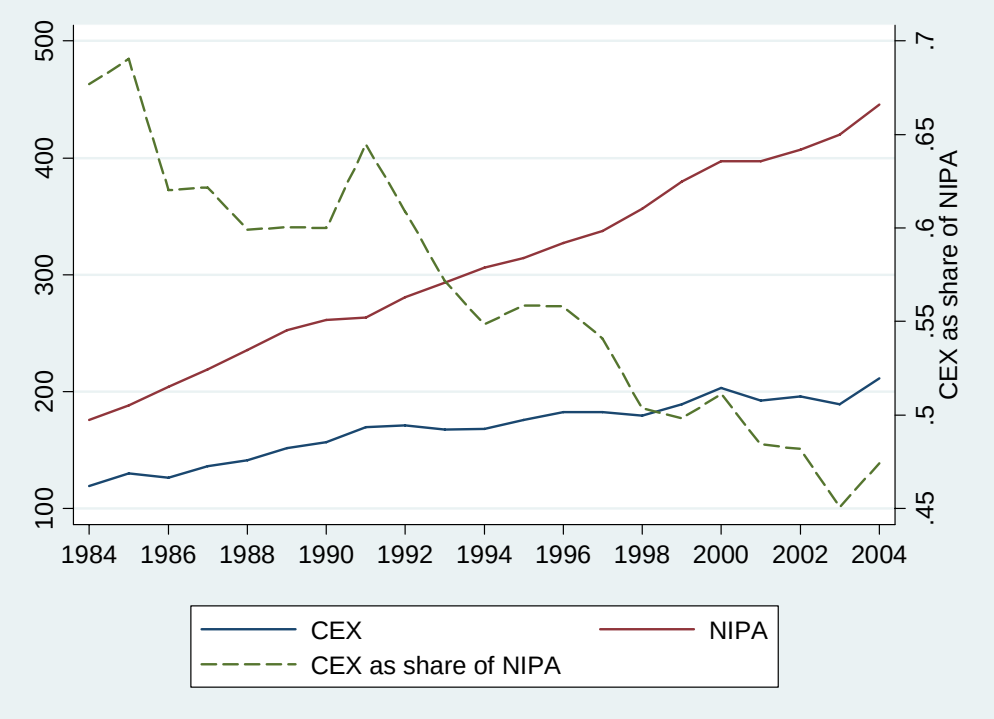


Figure 11: Household fuel expenditure in the FES and National Accounts, 1974 - 2002

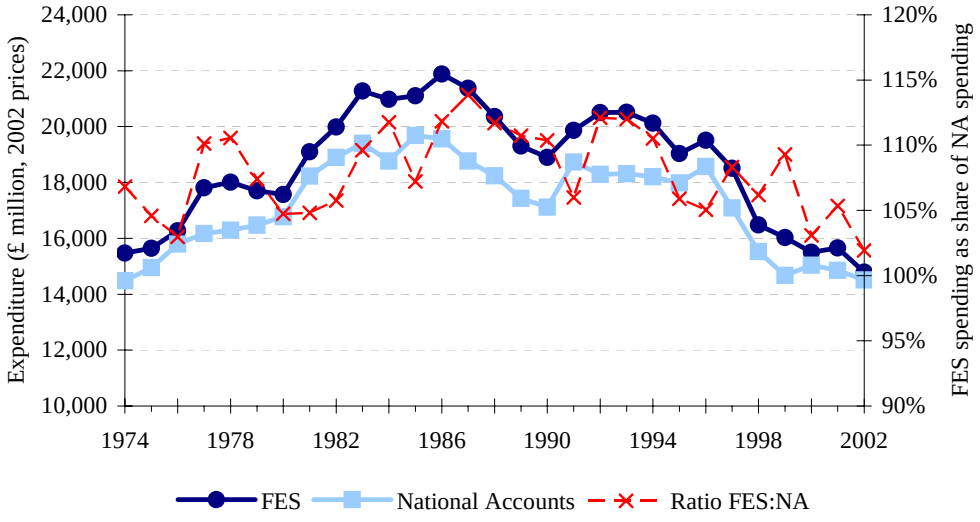


Figure 12: Household utilities expenditure in the CEX and NIPA, 1984 to 2003

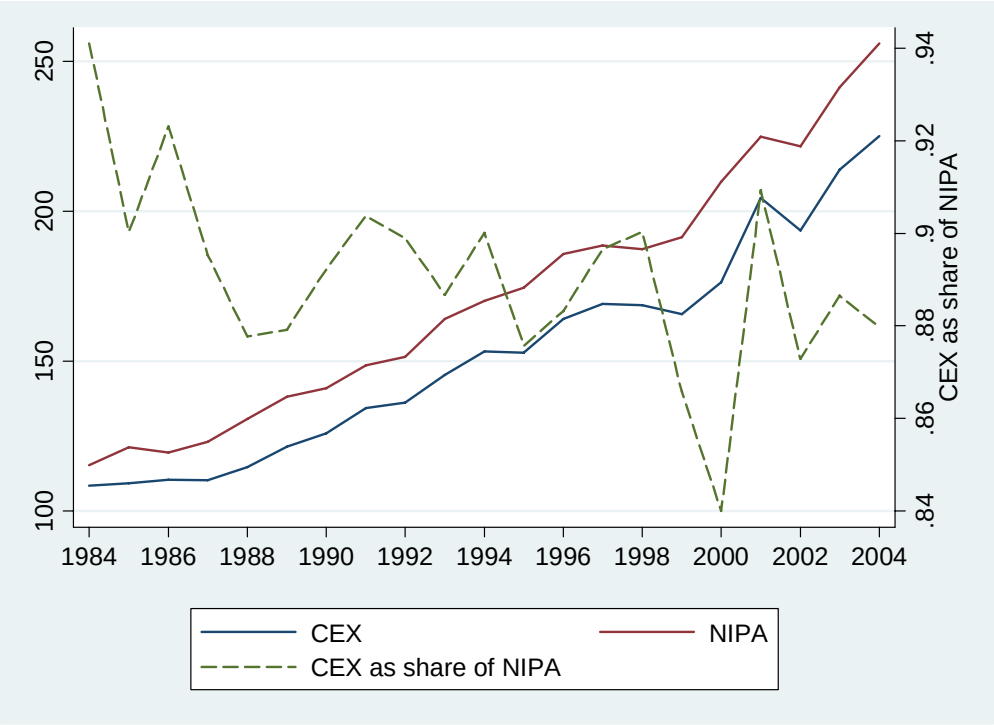


Figure 13: Household expenditure for gasoline and oil in the CEX and NIPA, 1984 to 2003

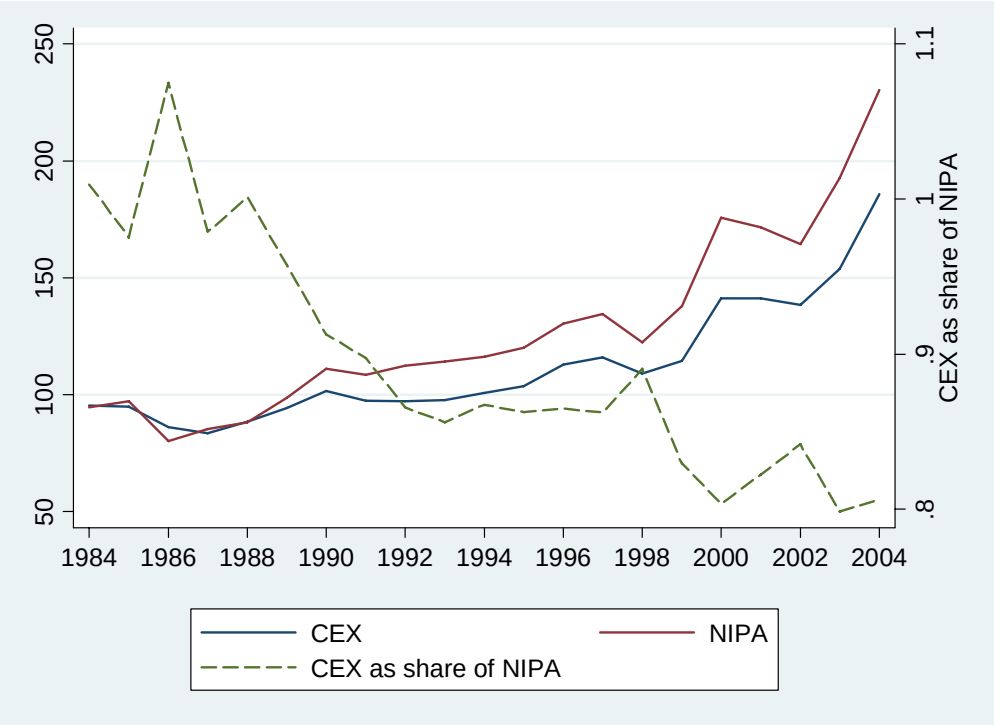


Figure 14: Household personal care expenditure in the CEX and NIPA, 1984 to 2003

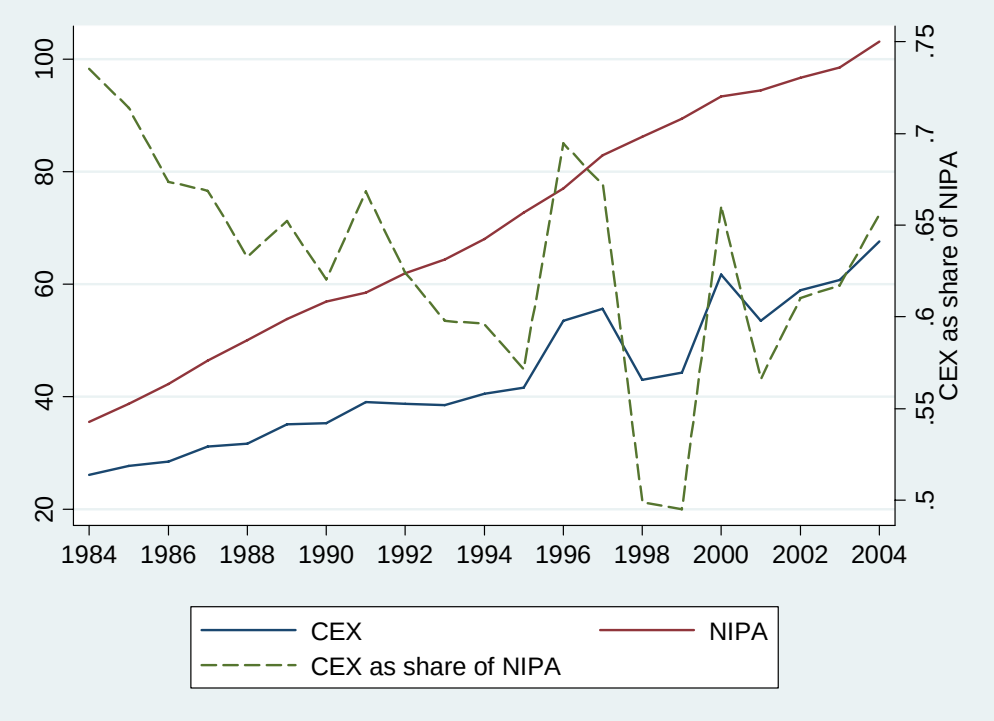


Figure 15: Household telephone expenditure in the CEX and NIPA, 1984 to 2003

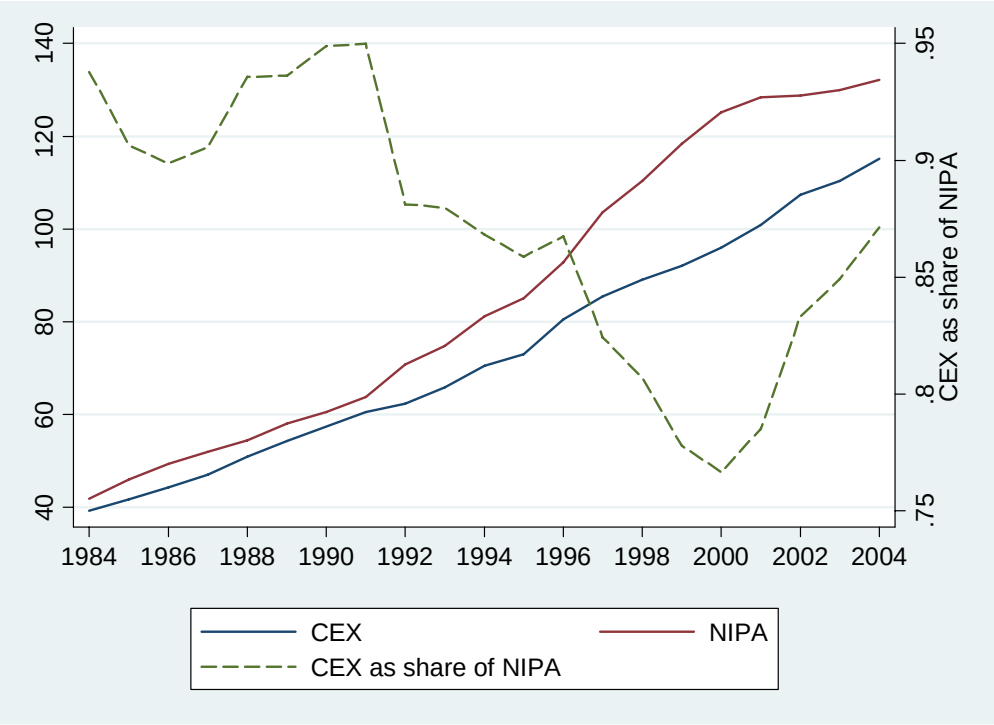


Figure 16: Household transportation expenditure in the CEX and NIPA, 1984 to 2003

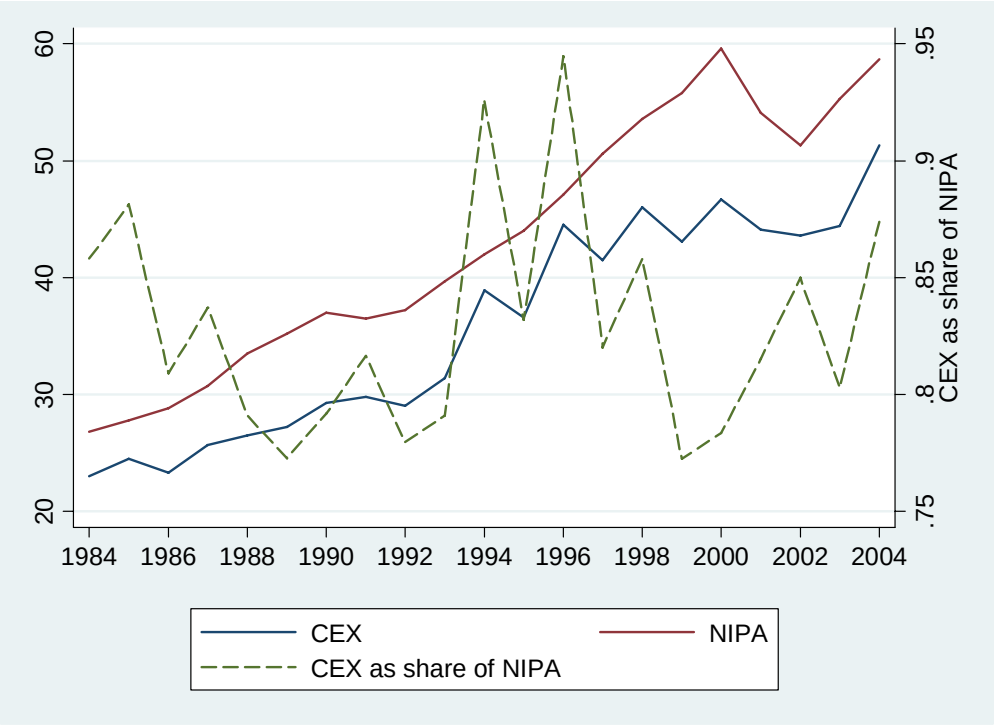


Figure 17: Poverty rates for income and expenditure in US from CEX (interview), 1982q1 – 2004q1

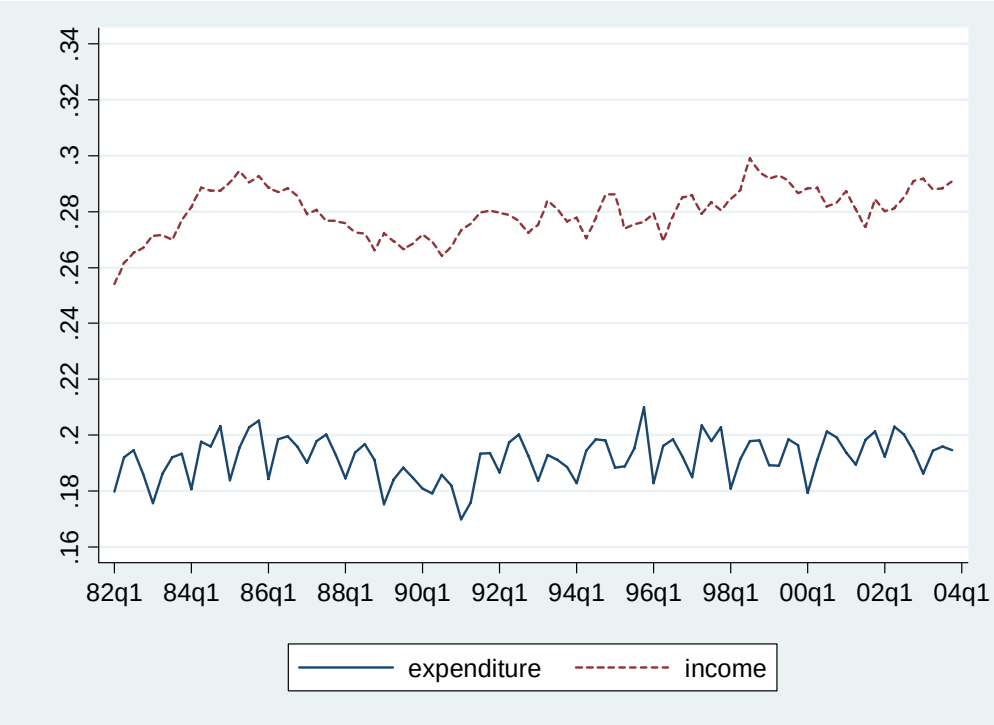


Figure 18: Poverty rates for income and expenditure in US from CEX (diary), 1982q1 – 2004q1

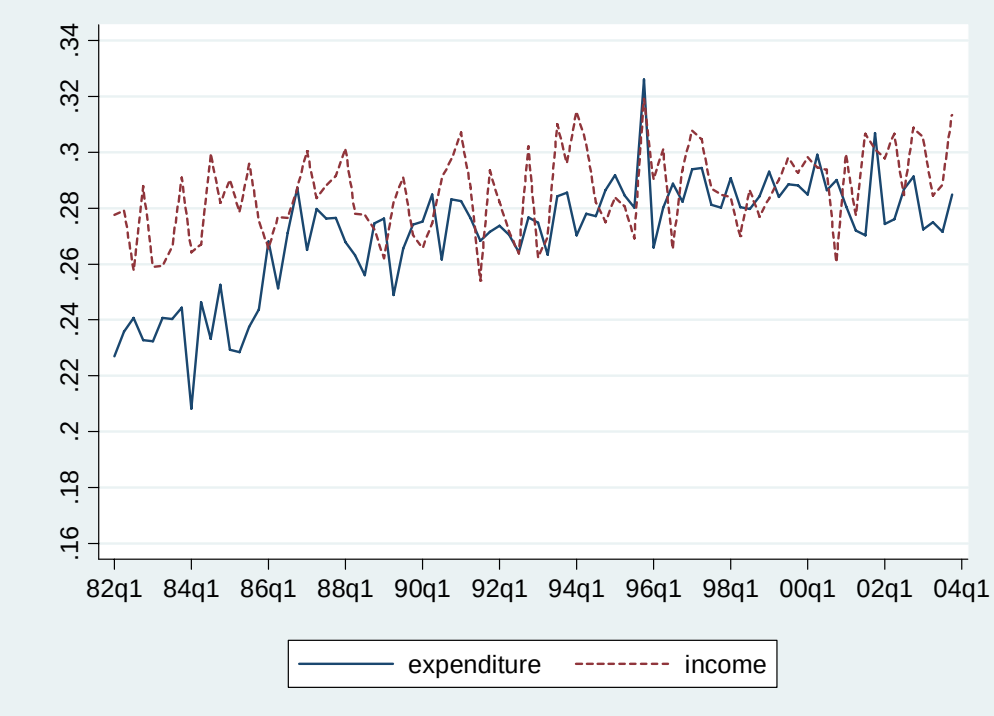


Figure 19: Income (gross and net) and expenditure (non-durable) poverty rates, UK FES, 1974 – 2002

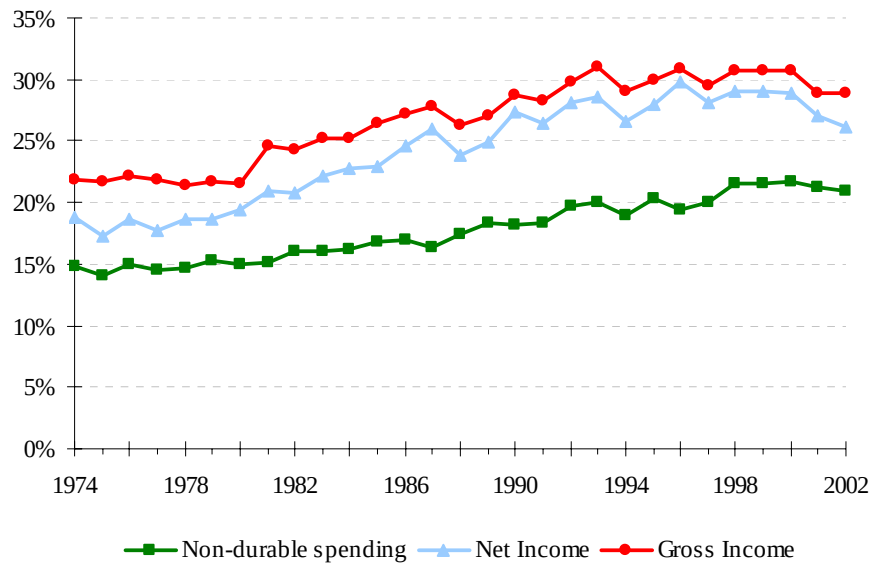
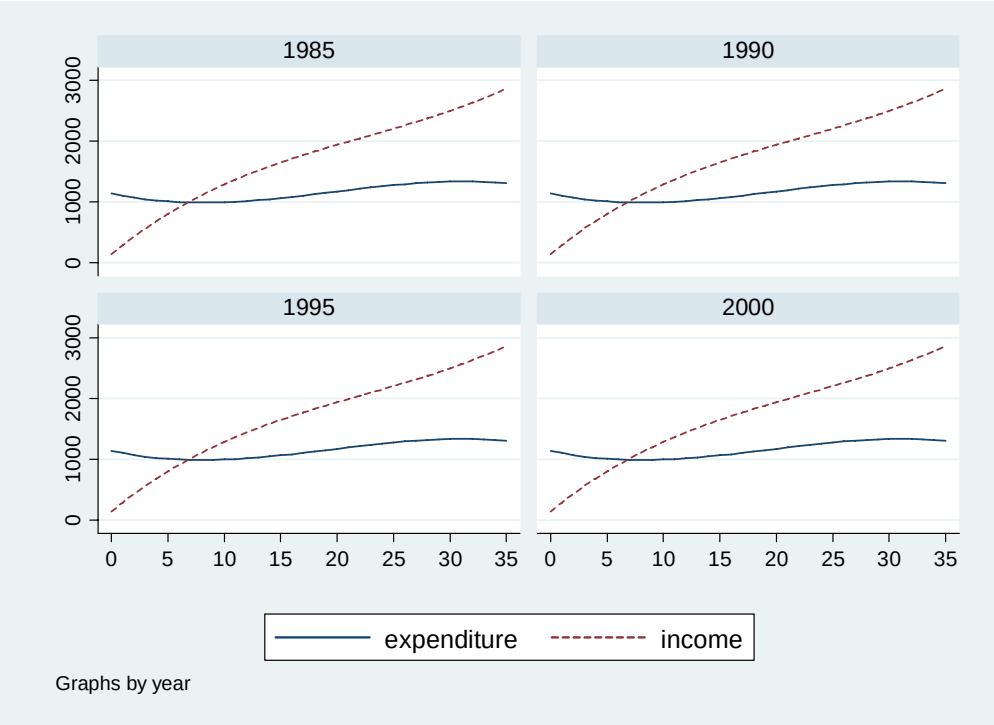


Figure 20

By income percentiles, HW only

Interview



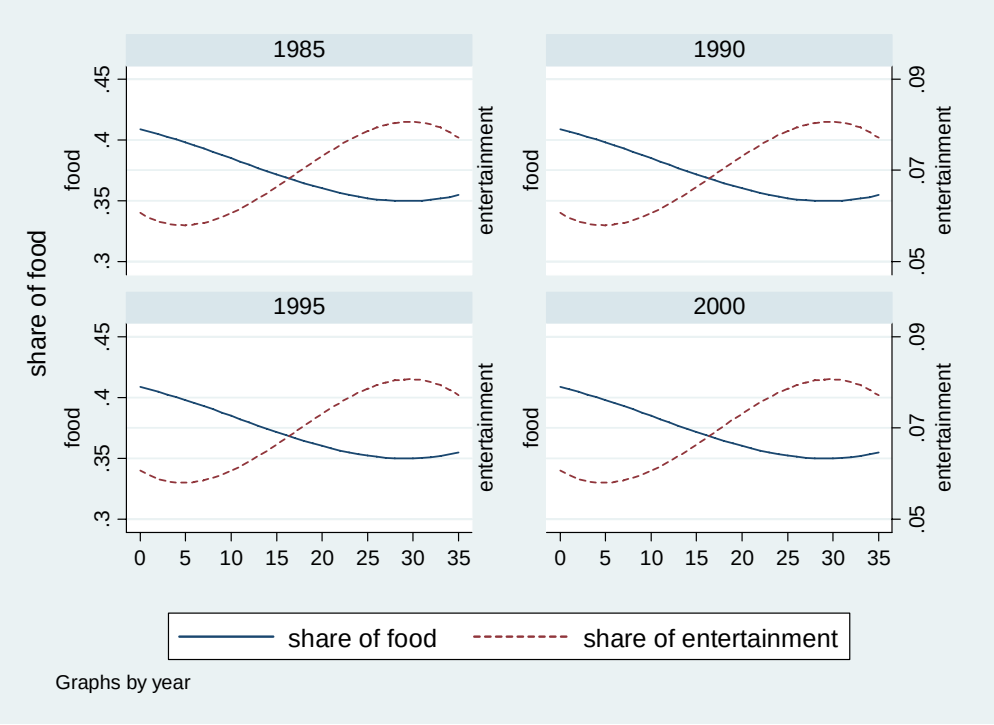
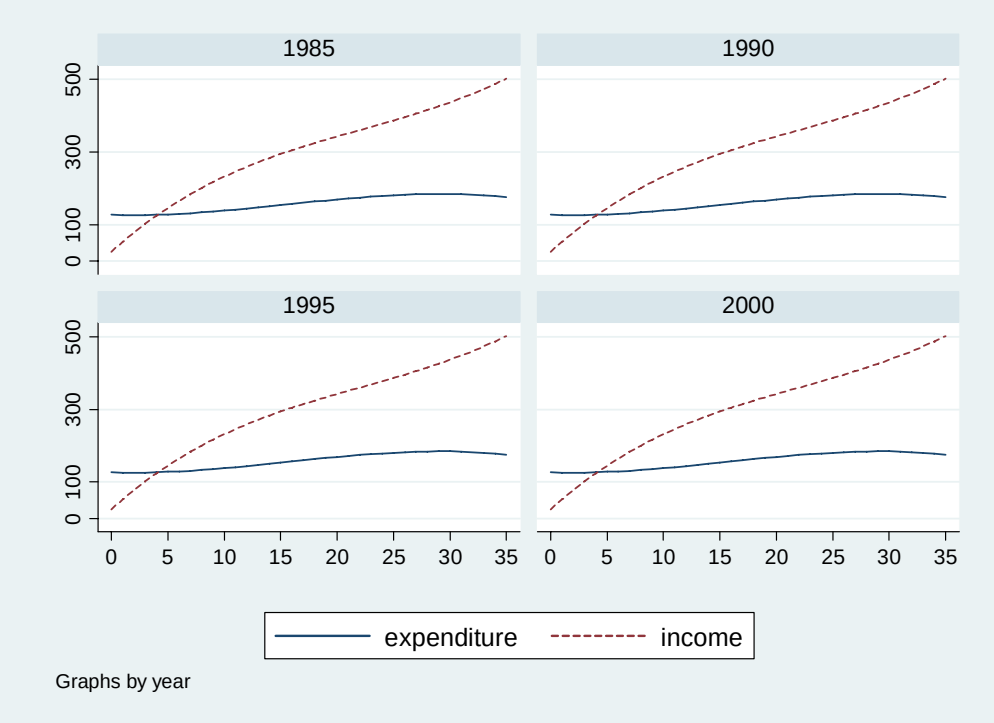


Figure 21
By income percentiles, HW only

Diary



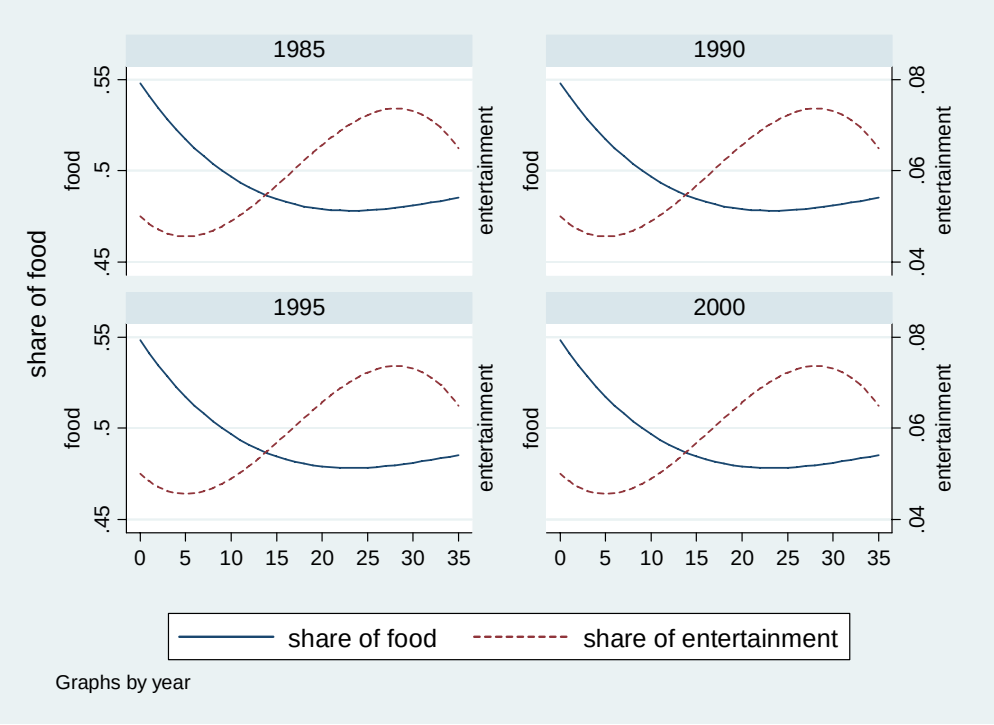
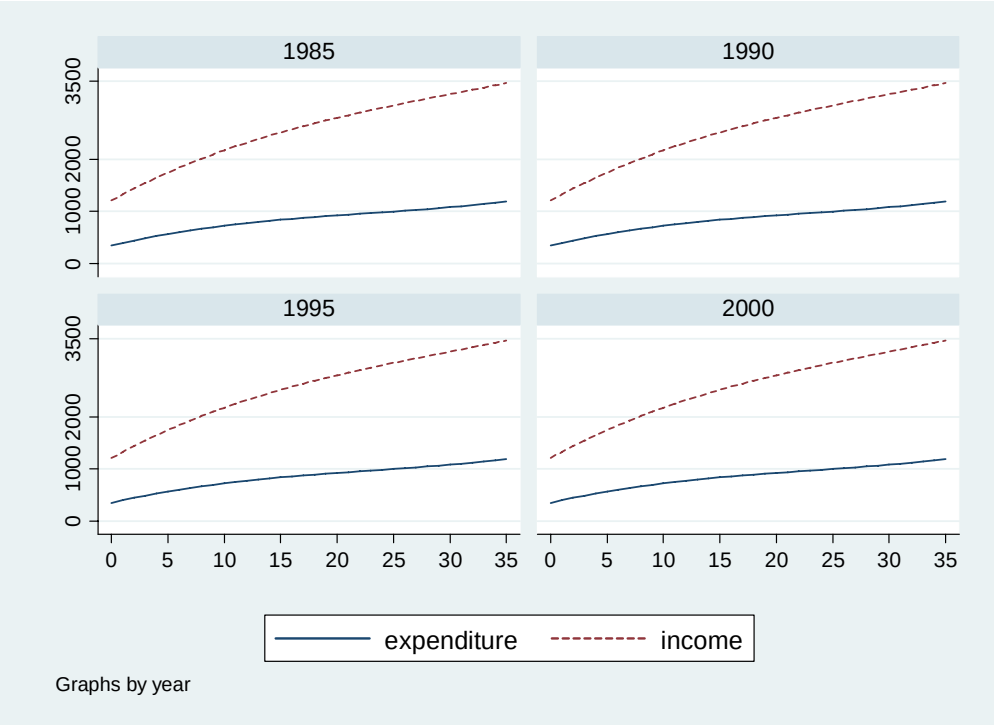


Figure 22
By expenditure percentiles, HW only

Interview



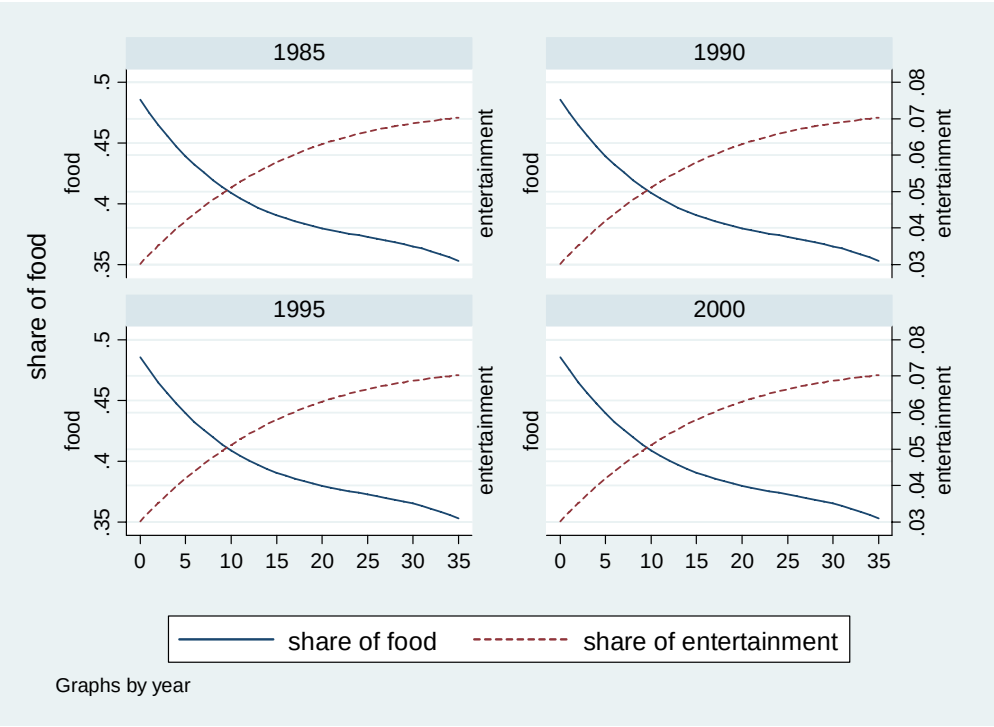
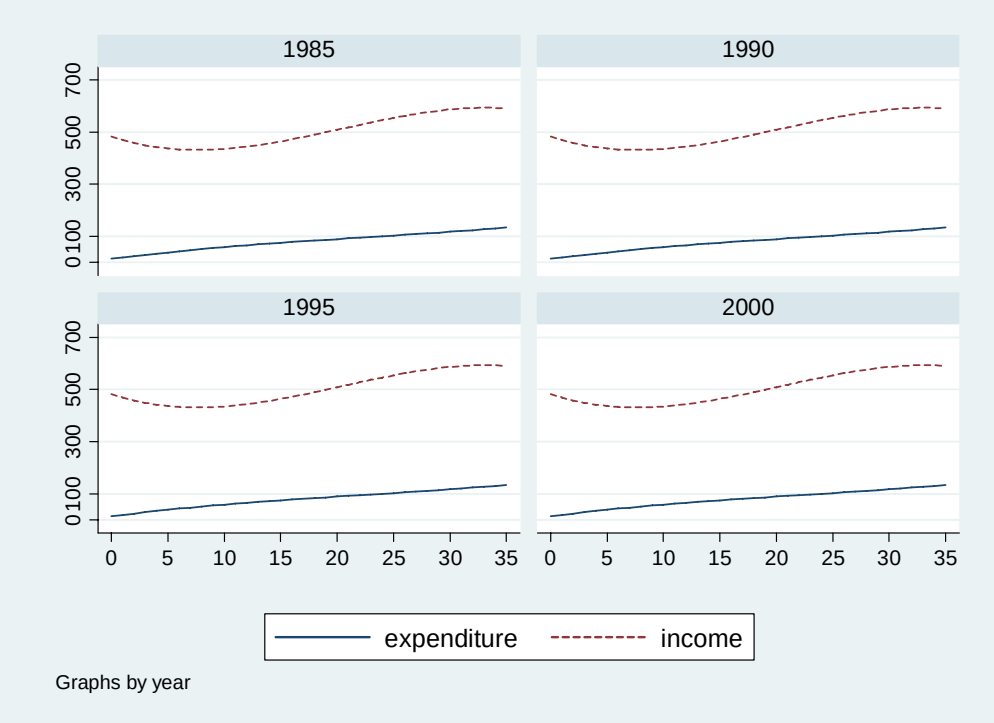
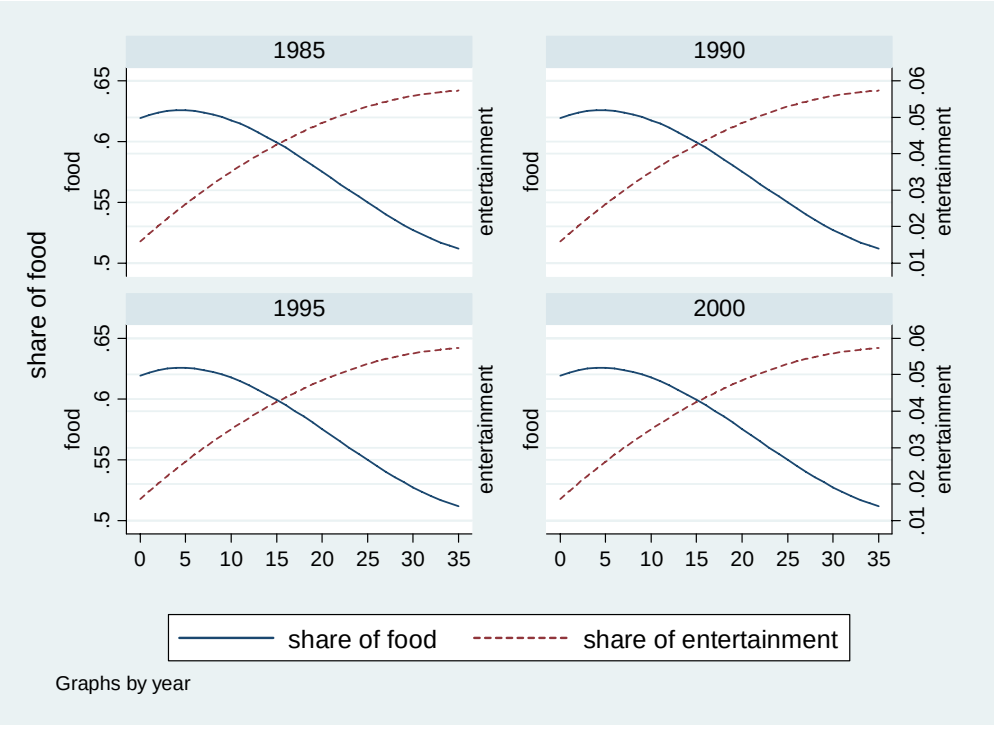


Figure 23
By expenditure percentiles, HW only

Diary





All times series are smoothed by using a 3rd order polynomial in time and quarterly dummies. For food in IS, separate regressions are run before/after1988 (and a quadratic polynomial is used befoe 1988)

Figure 24
Share of total food, Interview Survey

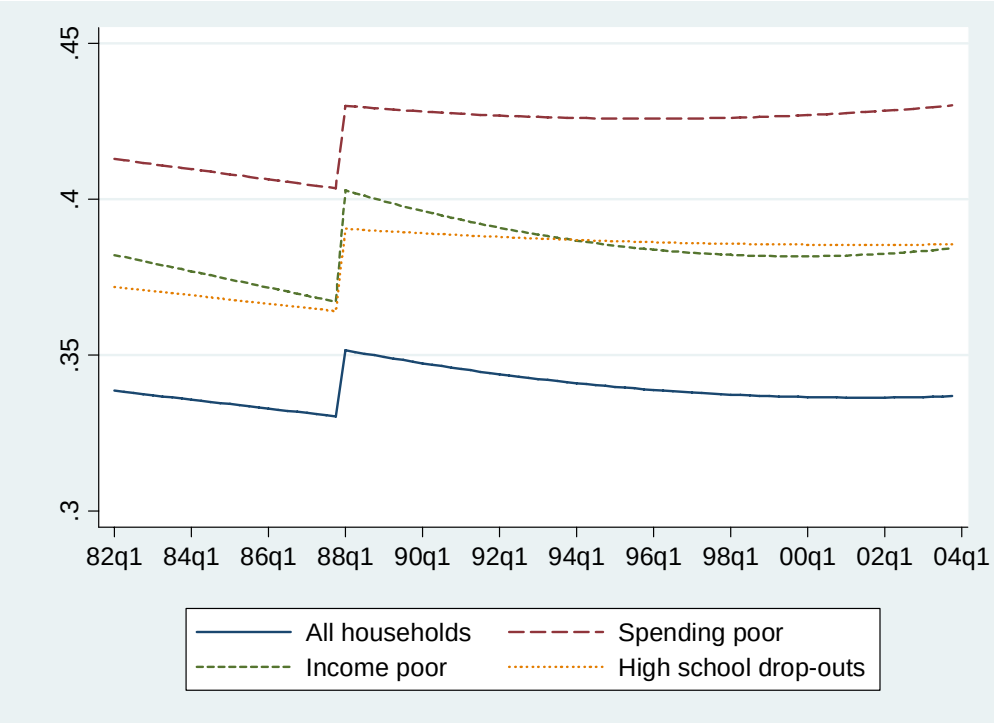


Figure 25
Share of total food, Diary Survey

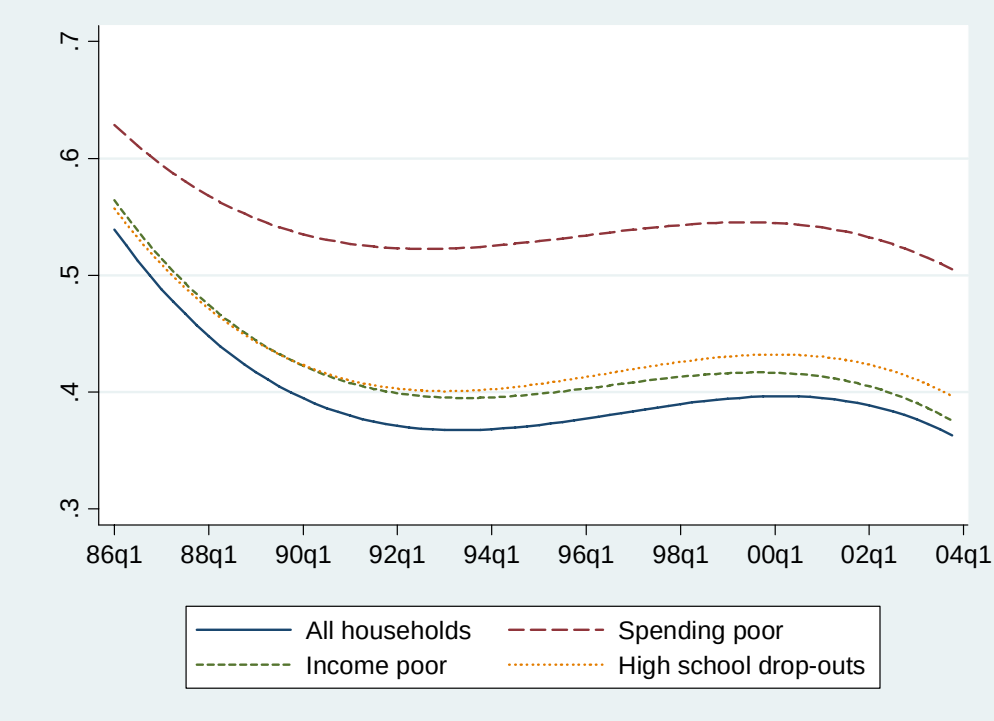


Figure 26
Share of entertainment, Interview Survey

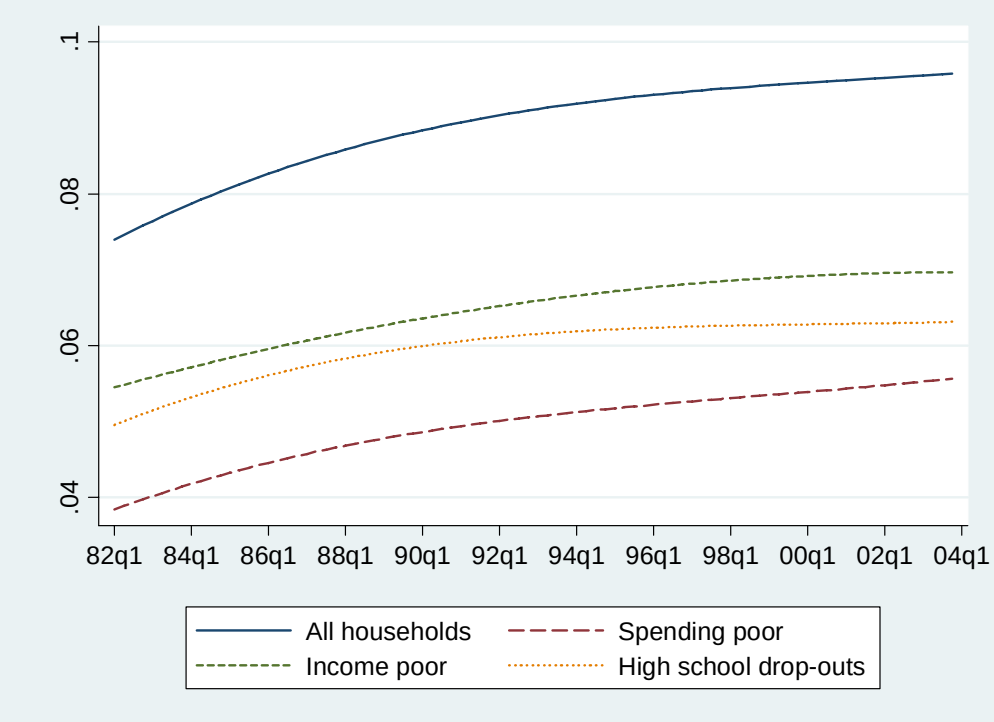


Figure 27
Share of entertainment, Diary Survey

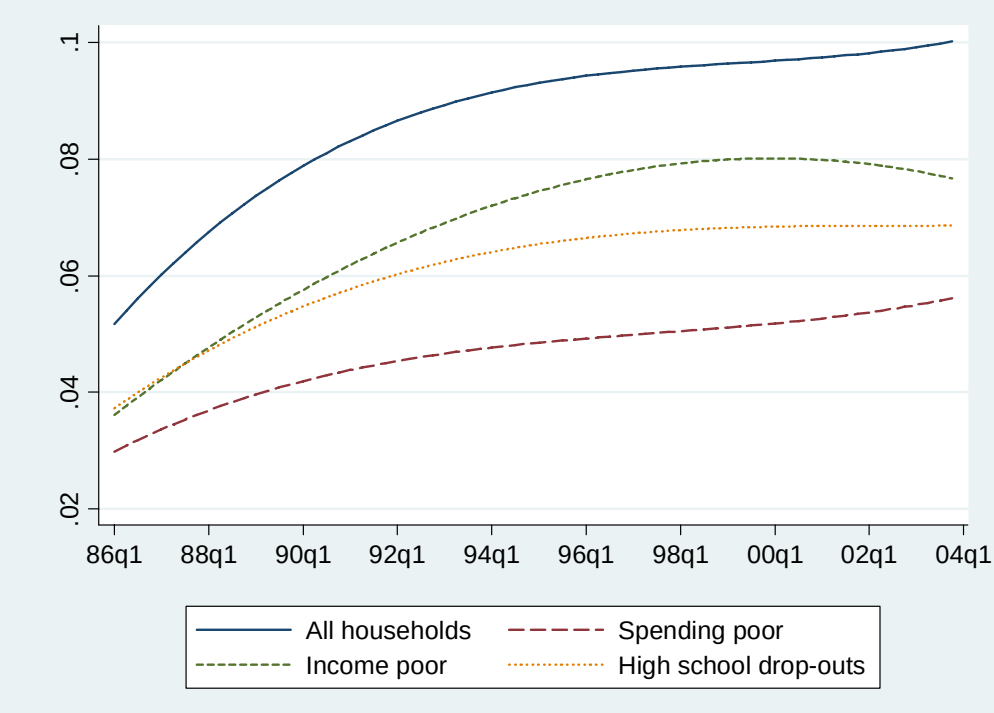


Figure 28a
Spending and income by income percentile, 1985, 1990, 1995, 2000 (couples only)

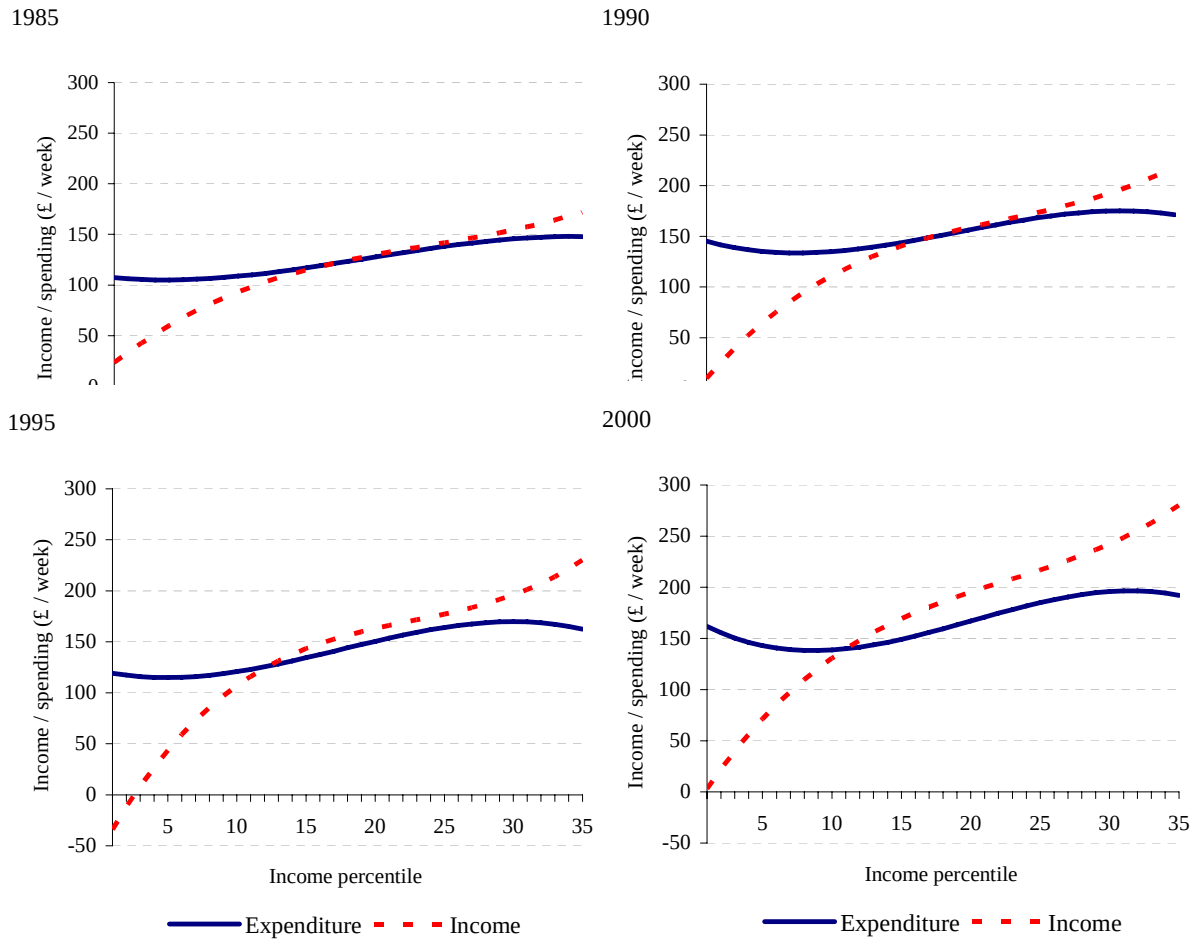
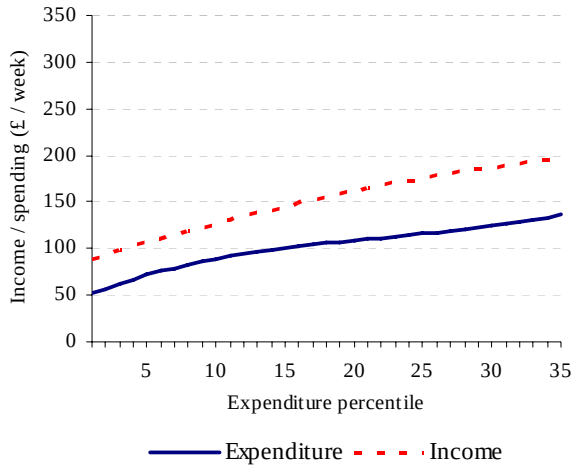
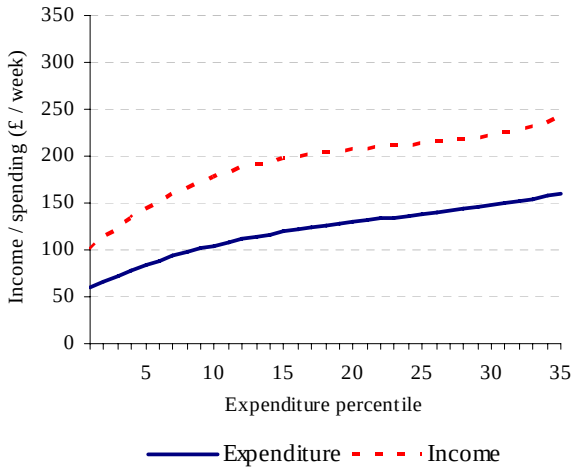


Figure 28b
Spending and income by spending percentile, 1985, 1990, 1995, 2000 (couples only)

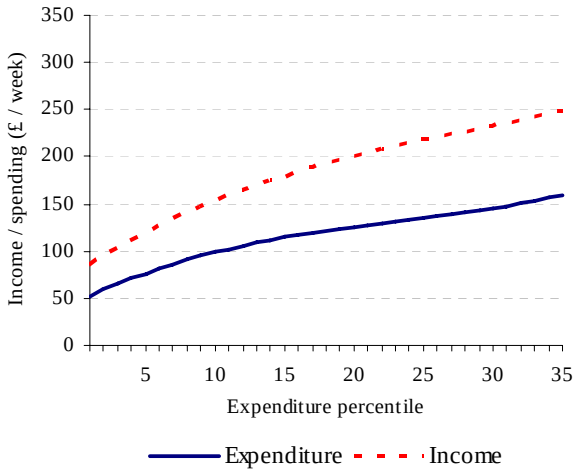
1985



1990



1995



2000

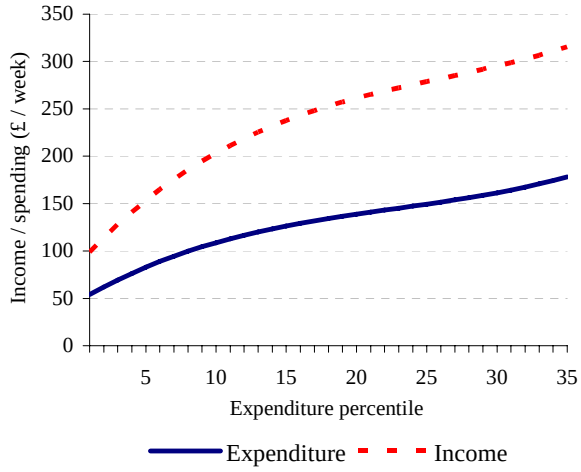


Figure 28c

Total food (food in + food out) shares and entertainment shares by income percentile, 1985, 1990, 1995, 2000 (couples only)

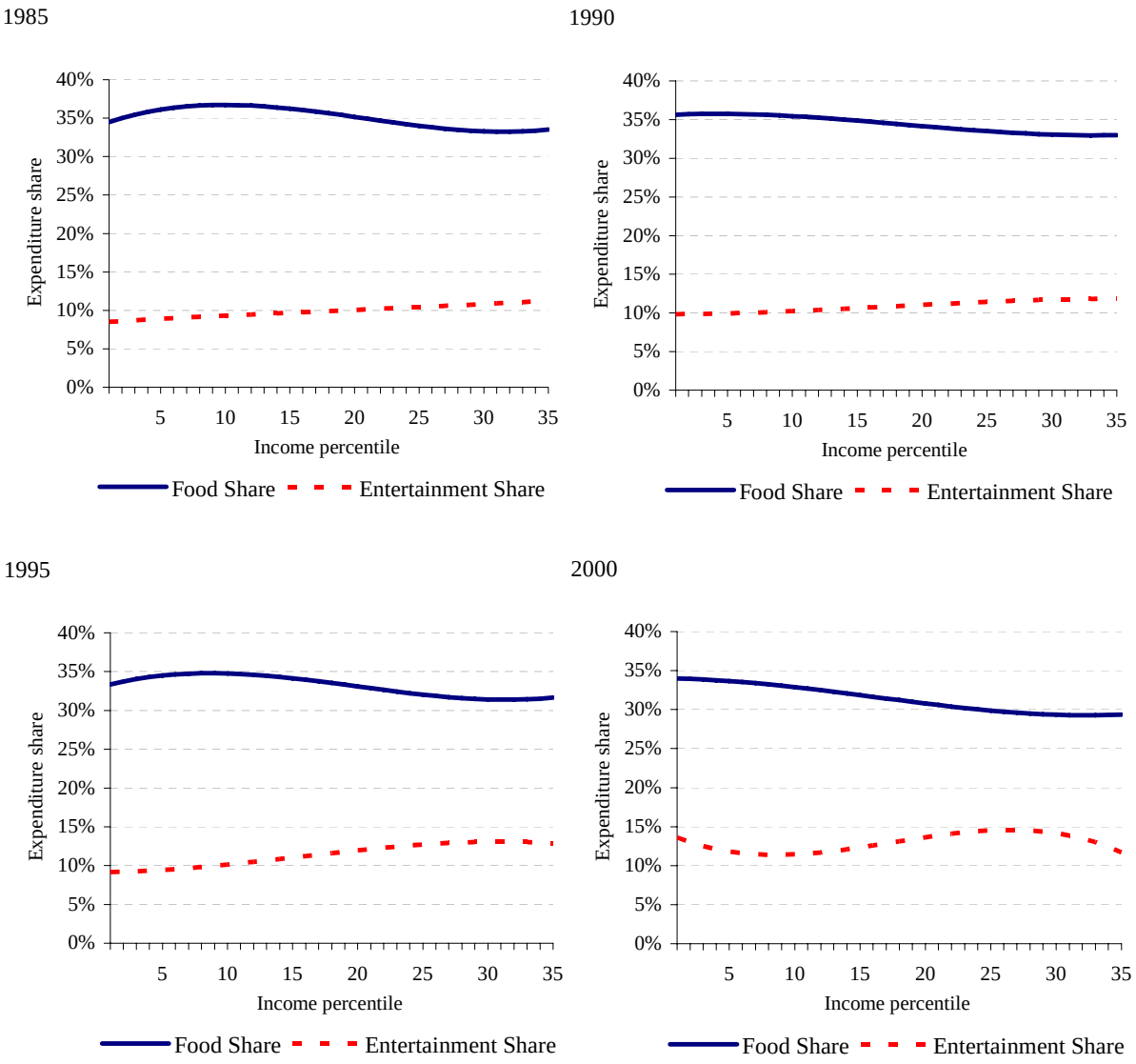


Figure 28d

Total food (food in + food out) shares and entertainment shares by spending percentile, 1985, 1990, 1995, 2000 (couples only)

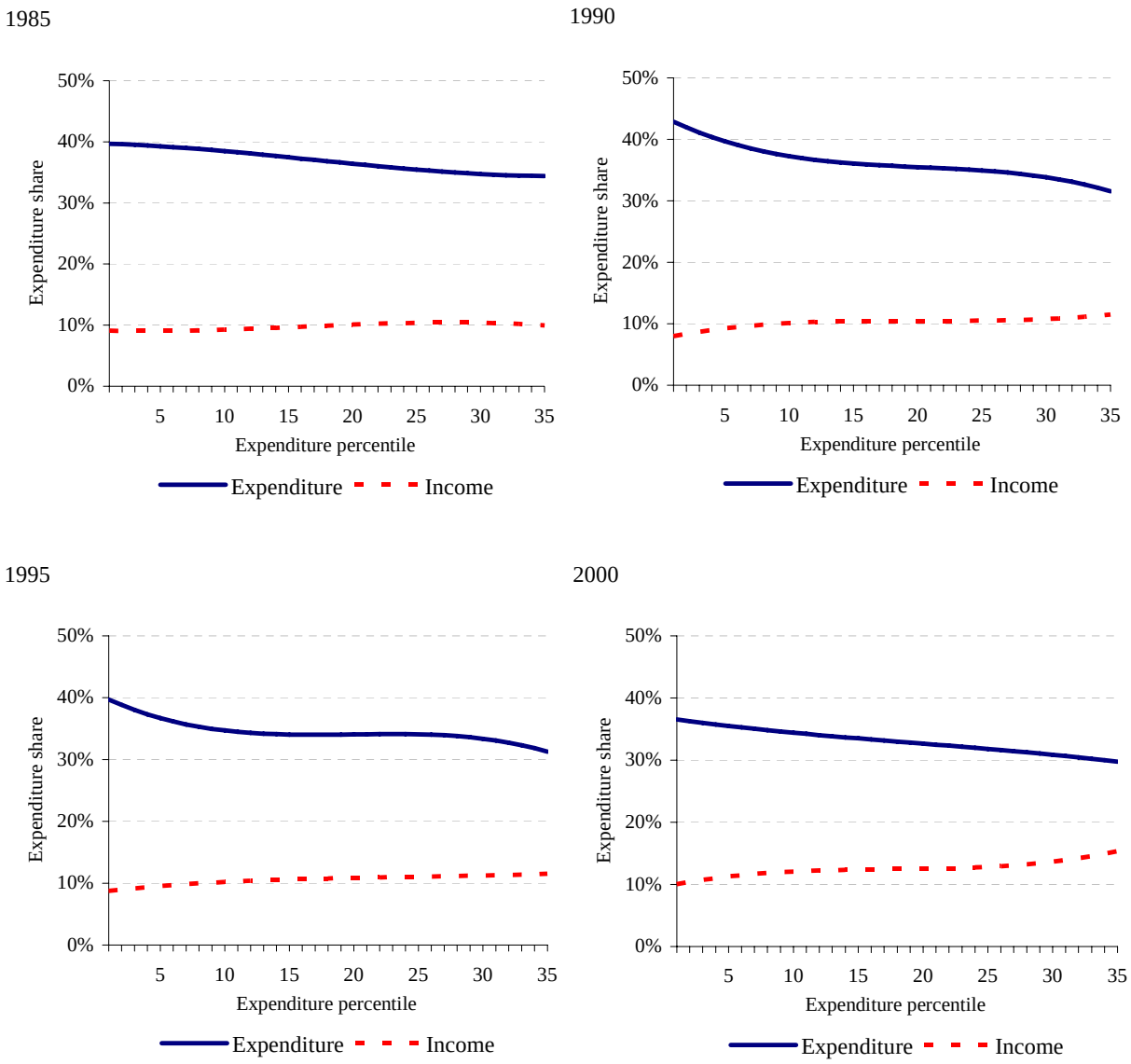
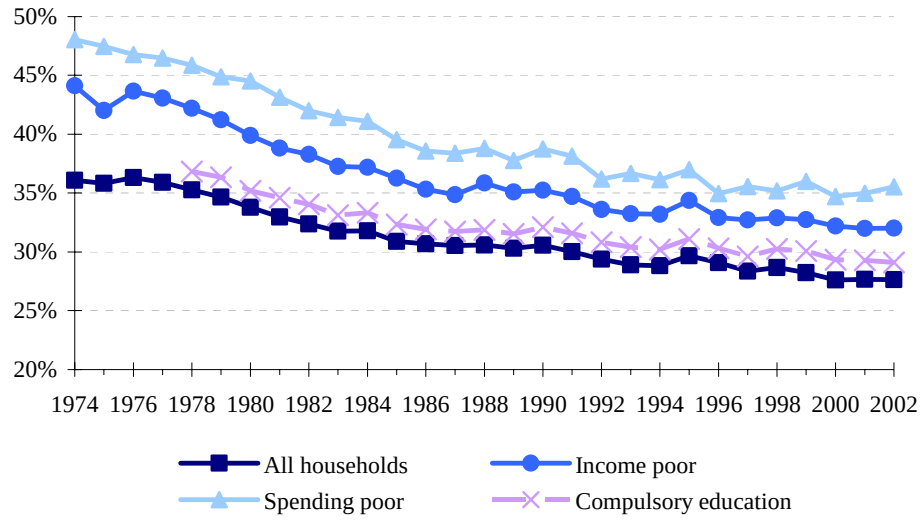


Figure 29

Share of total food (food in + food out), 1974 – 2002



Share of food in only, 1974 – 2002

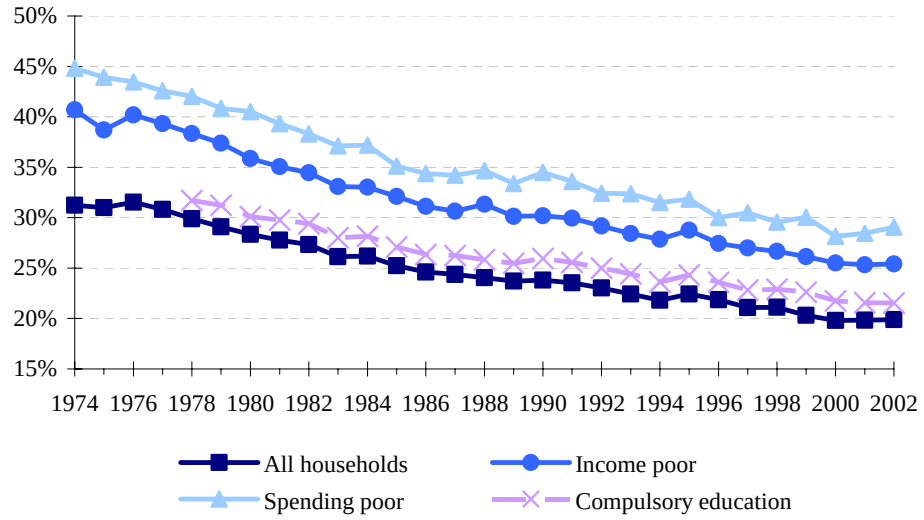


Figure 30
Share of entertainment, 1974 – 2002

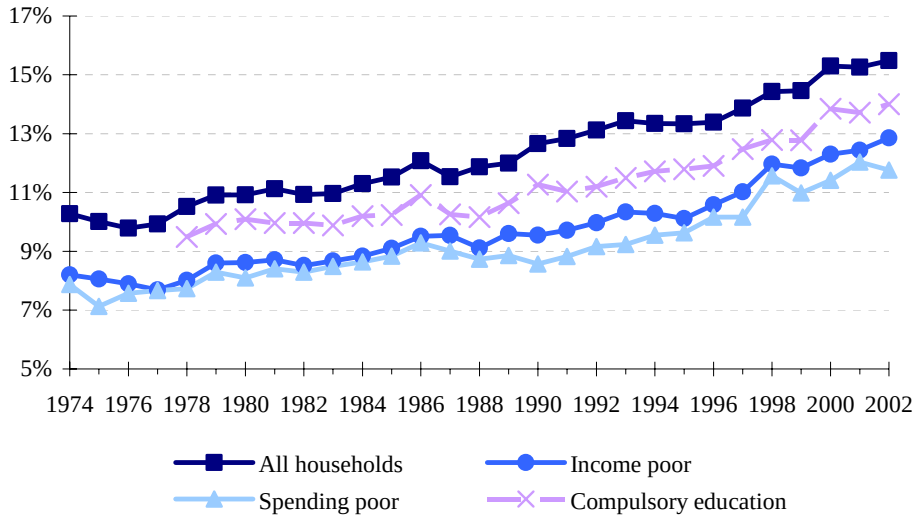


Table 1

	Interview Survey		**Diary Survey**	
	Income	***Non-durable spending***	***Income***	***Non-durable spending***
Midwest	-0.0256***	-0.00925***	-0.0130***	-0.00669*
	(0.0021)	(0.0016)	(0.0048)	(0.0039)
South	0.00471**	0.00779***	0.0202***	0.0137***
	(0.0020)	(0.0016)	(0.0047)	(0.0039)
West	-0.0107***	0.00620***	0.000567	0.00334
	(0.0021)	(0.0017)	(0.0049)	(0.0040)
Household size	0.431***	0.160***	0.465***	0.236***
	(0.036)	(0.026)	(0.080)	(0.066)
Household size^2	-0.0341***	0.0707***	-0.0606**	0.0230
	(0.012)	(0.0084)	(0.027)	(0.022)
H/W, oldest child 6-	-0.0315***	0.0315***	-0.0170*	0.0169**
	(0.0041)	(0.0036)	(0.0095)	(0.0083)
H/W, oldest child 6-17	-0.0699***	-0.0210***	-0.0568***	-0.0183**
	(0.0036)	(0.0028)	(0.0084)	(0.0073)
H/W, oldest child 17+	-0.0231***	-0.00726**	-0.0137	0.00523
	(0.0041)	(0.0031)	(0.0095)	(0.0080)
All other H/W	0.00983**	0.0266***	0.0249**	0.00596
	(0.0049)	(0.0039)	(0.012)	(0.0093)
One parent, male, at least one child 18	0.0780***	0.0460***	0.0662***	0.0488***
	(0.0090)	(0.0075)	(0.021)	(0.017)
One parent, female, at least one child	0.338***	0.155***	0.345***	0.0981***
	(0.0052)	(0.0045)	(0.012)	(0.0093)
Single persons	0.261***	0.148***	0.261***	0.123***
	(0.0078)	(0.0062)	(0.018)	(0.014)
Other households	0.166***	0.110***	0.171***	0.0781***
	(0.0034)	(0.0028)	(0.0077)	(0.0059)
Number of children	-0.0870***	-0.103***	-0.0886***	-0.0963***
	(0.0065)	(0.0047)	(0.015)	(0.012)
Number of children^2	0.117***	0.0367***	0.133***	0.0305***
	(0.0045)	(0.0031)	(0.010)	(0.0082)
Number of 64+	-0.100***	-0.0327***	-0.0871***	-0.0357
	(0.011)	(0.0085)	(0.025)	(0.022)
Number of 64+^{2}	0.0641***	0.0413***	0.0683***	0.0419*
	(0.011)	(0.0087)	(0.025)	(0.022)
Age	-0.0447***	-0.0212***	-0.0464***	-0.0191***
	(0.00041)	(0.00031)	(0.00093)	(0.00079)
Age^2	0.000503***	0.000224***	0.000525***	0.000197***
	(0.0000048)	(0.0000036)	(0.000011)	(0.0000092)
High school graduate	-0.180***	-0.108***	-0.184***	-0.0853***
	(0.0016)	(0.0012)	(0.0035)	(0.0035)
College dropouts	-0.203***	-0.143***	-0.212***	-0.126***
	(0.0015)	(0.0010)	(0.0033)	(0.0034)
At least College graduate	-0.309***	-0.206***	-0.312***	-0.175***
	(0.0014)	(0.0011)	(0.0031)	(0.0033)
black	0.116***	0.114***	0.119***	0.121***

	(0.0024)	(0.0020)	(0.0055)	(0.0046)
other	0.0693***	0.100***	0.0613***	0.0549***
	(0.0036)	(0.0031)	(0.0084)	(0.0069)
Observations	475286	533535	92939	123010

Note: standard errors in parentheses. * = significant at 10%; ** = significant at 5%; *** = significant at 1%. Both models include year dummies. Excluded region is Northeast, excluded household type is H/W. Values show marginal effects – for dummy variables this is effect of switching from zero to one.

Table 2: Probit analysis of income and expenditure poverty, FES

	Net income	Non-durable spending
North	0.033**	0.039**
	(0.004)	(0.004)
Yorkshire	0.025**	0.039**
	(0.005)	(0.004)
East Midlands	-0.012*	0.024**
	(0.005)	(0.004)
West Midlands	0.022**	0.037**
	(0.005)	(0.004)
East / South East	-0.041**	-0.013**
	(0.003)	(0.003)
South West	-0.007	0.019**
	(0.005)	(0.004)
Wales	0.050**	0.041**
	(0.006)	(0.005)
Scotland	0.023**	0.024**
	(0.005)	(0.004)
Household size	-0.065**	-0.050**
	(0.005)	(0.004)
Household size^2	0.009**	0.007**
	(0.001)	(0.000)
One adult	0.239**	0.146**
	(0.005)	(0.004)
Other non-couple household	0.080**	0.064**
	(0.005)	(0.004)
Number of children	0.169**	0.127**
	(0.004)	(0.003)
Number of children^2	-0.012**	-0.012**
	(0.001)	(0.001)
Pensioner head	-0.049**	-0.010*
	(0.004)	(0.004)
Age	-0.039**	-0.022**
	(0.001)	(0.001)
Age^2	0.000**	0.000**
	(0.000)	(0.000)
Post-compulsory education	-0.139**	-0.091**
	(0.002)	(0.002)
n	165,723	165,723
Pseudo-R2	0.173	0.142
Predicted rate	0.184	0.123
Actual rate	0.225	0.156

Note: standard errors in parentheses. ** = significant at 1%; * = significant at 5%. Both models include year dummies. Excluded region is Greater London, excluded household type is couple. Values show marginal effects – for dummy variables this is effect of switching from zero to one.

Tabke 6.1 US FOOD whole sample

	cf	me	cf	me
			Interview survey	
lx	0.1368	-0.0701	-0.0217	-0.2096
	0.0467	0.0052	0.0481	
lx^2	-	-	0.0116	0.0131
			0.0012	0.0047
own price	0.1589	0.0597	-0.0895	-0.1581
	0.0407	0.0393	0.2154	
			DIARY	
lx	-0.4353	-0.1118	-0.5179	na
	0.2447	0.0045	0.2437	
lx^2	-	-	-0.0207	-0.0041
			0.0022	0.0066
own price	0.4269	-1.0159	1.2778	-1.8214
	1.1263	0.1085	1.1273	

Figure 6.1 total sample (Interview survey: (top) and Diary survey (bottom)

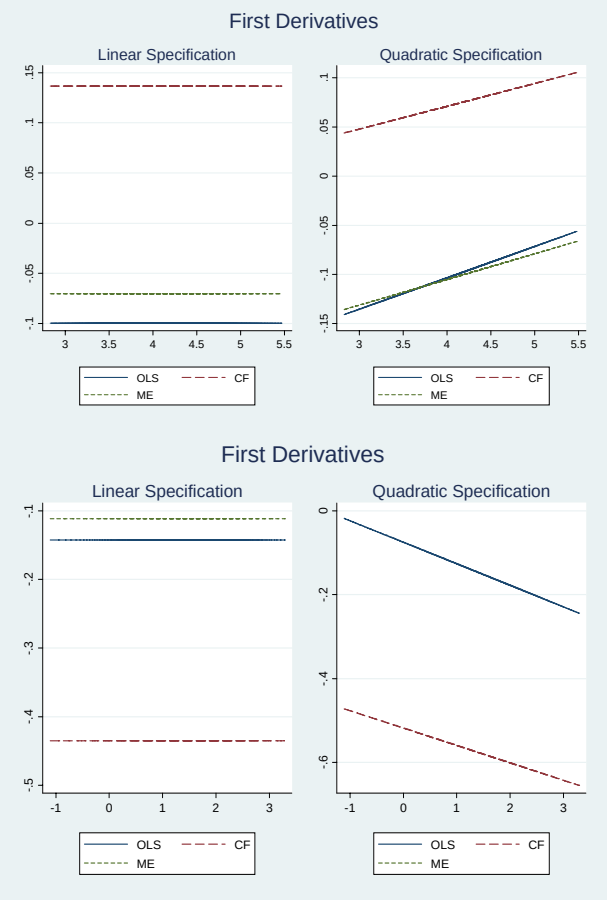


Table 6.2 Food engel curves: income poor sample

	cf	me	cf	me
			Interview survey	
Lx	0.0952	-0.0589	-0.0243	-0.1525
	0.049	0.0077	0.0513	
Lx^2			0.0099	0.0092
			0.0018	0.0069
			Diary	
Lx	0.35	-0.1087	0.458	-0.1347
	0.2943	0.0064	0.2928	
Lx^2			-0.0194	0.0027
			0.0033	0.009
Own price	-3.4716	-1.0898	-3.2984	-0.3214
	1.6112	0.2147	1.612	

Figure 6.2 First derivative of the engel curve
Income poor sample Interview (top) and Diary (bottom)

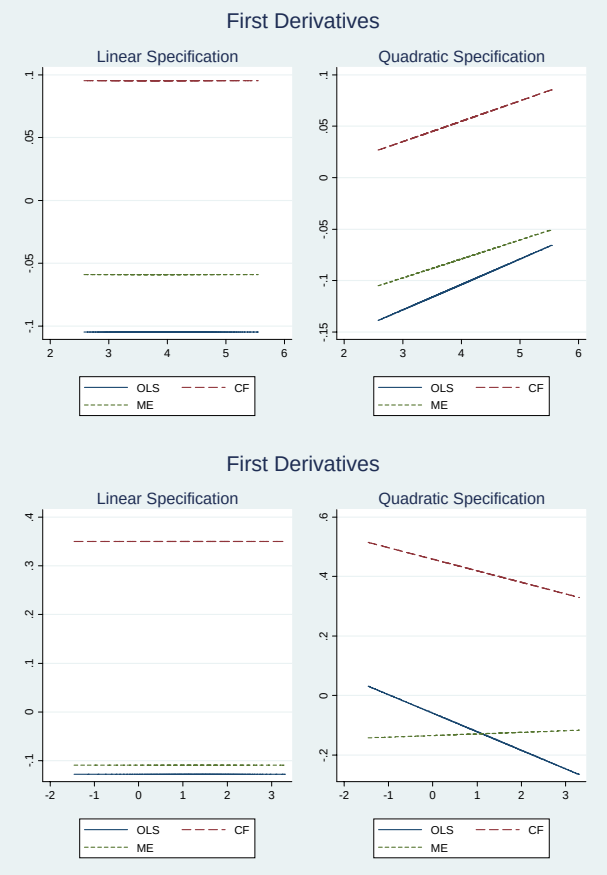


Table 6.3 Food US Interview and Diary high school dropouts

	cf	me	cf	me
		Interview		
Lx	-0.1436	-0.0609	-0.3437	-0.2502
	0.0606	0.0146	0.0701	
Lx2			0.0261	0.0183
			0.0046	0.0177
Own pr	0.1166	0.2788	-1.4222	-6.1848
	0.0799	0.1097	0.7793	
		DIARY		
Lx	-0.056	-0.1238	0.0437	na
	0.1193	0.0147	0.1182	
Lx2			-0.0074	-0.0071
			0.0074	0.0197
Own pr	-1.6923	-1.5933	-1.5154	na
	0.7254	0.3809	0.7973	

Figure 6.3 First derivatives of the Food Engel Curve
Interview survey (top) and diary survey (bottom)

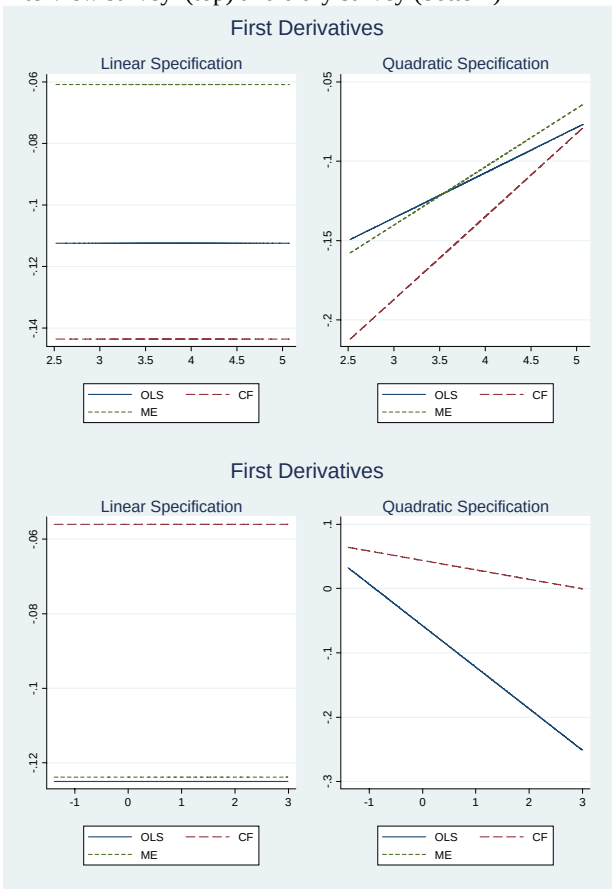


Table 6.4 Entertainment Engel curve: whole sample

	cf	me	cf	me
			interview	
lx	0.0449	0.1372	0.0439	0.284
	0.0342	0.0079	0.0353	
lx^2	-		0.0029	-0.0124
			0.0009	0.0047
own price	0.0824	0.0799	0.4642	1.042
	0.0317	0.0479	0.1741	
			Diary	
lx	0.241	0.0453	0.174	na
	0.1518	0.0066	0.1519	
lx^2			0.0081	0.005
			0.0012	0.0083

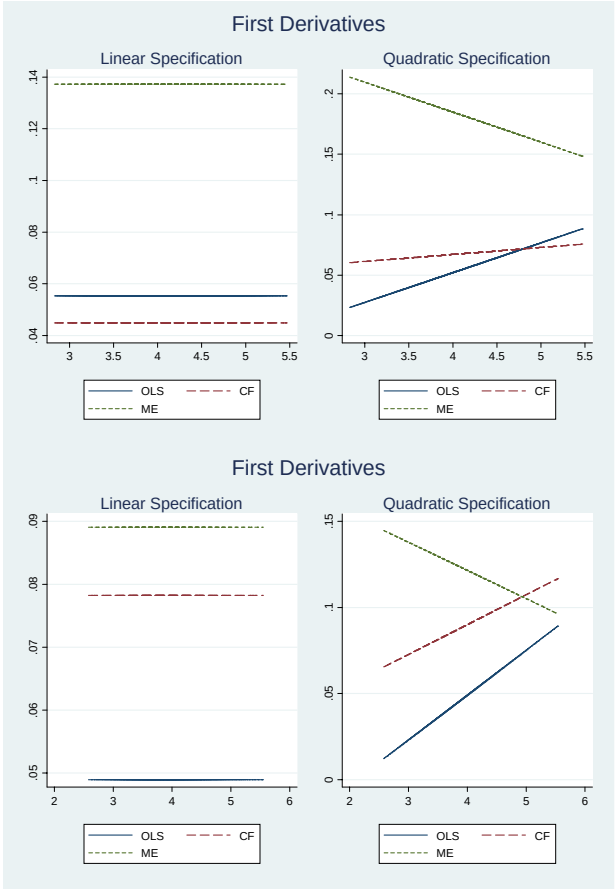


Table 6.5 Entertainment US Income poor sample

	cf	me	cf	me
		Interview survey		
Lx	0.0782	0.089	0.0208	0.1868
	0.0305	0.0106	0.0323	
Lx2			0.0087	-0.0082
			0.0012	0.0067
Ownpri	0.1638	0.2761	0.158	0.2908
	0.0557	0.0953	0.254	
		Diary survey		
Lx	0.2083	0.0469	0.1268	na
	0.1414	0.0088	0.1407	
Lx2			0.0114	0.0028
			0.0015	0.0102
ownprice	-0.0144	0.4191	0.0028	0.2202
	0.1693	0.2109	0.2257	

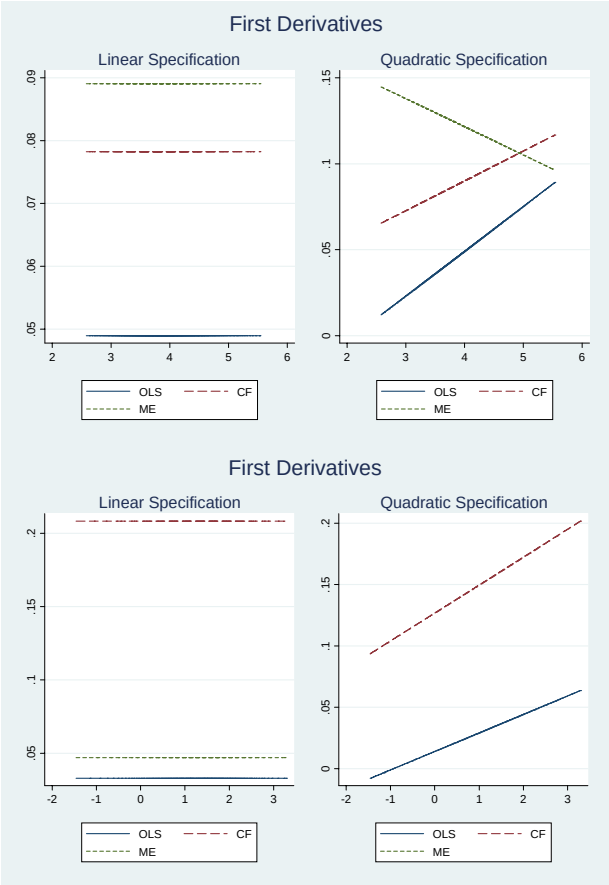


Table 6.6 Entertainment US High school dropouts

cf	me	cf	me
0.241	0.0453	0.174	na
0.1518	0.0066	0.1519	
		0.0081	0.005
		0.0012	0.0083
-0.0996	0.3085	-0.1571	0.1114
0.224	0.1086	0.2567	

cf	me	cf	me
0.0004	0.0397	-0.0134	na
0.057	0.0125	0.0571	
		0.0026	0.0175
		0.0032	0.0207
0.2894	0.2629	0.0654	0.0449
0.1544	0.2333	0.0654	

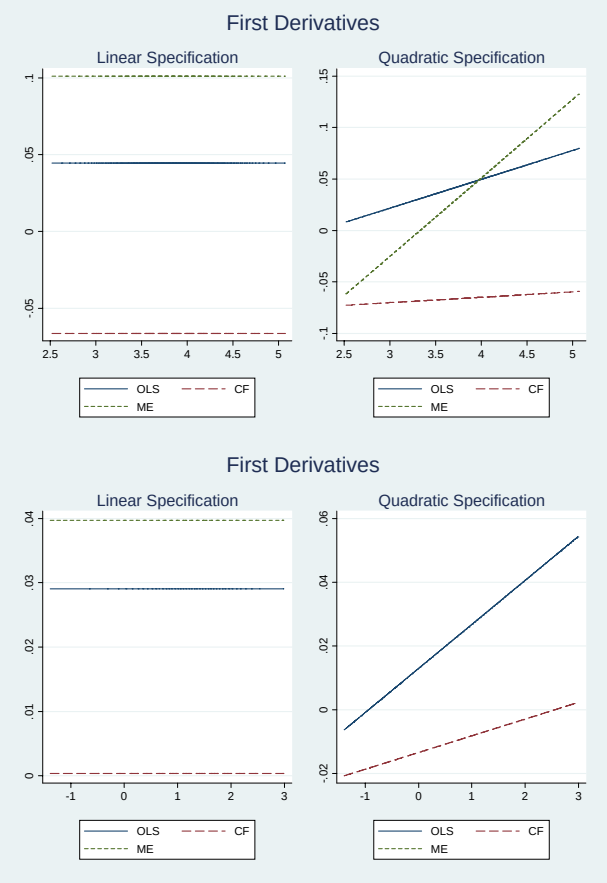


Table 6.7 UK Food Engel curves – whole sample

	cf	me	cf	me
lx	-0.3159	-0.1544	-0.2154	-0.16
	0.0013	0.0012	0.0013	
lx2			0.0818	0.0176
			0.0009	0.0004
own price	-0.1313	-0.0755	0.0108	-0.1145
	0.0053	0.0041	0.0088	

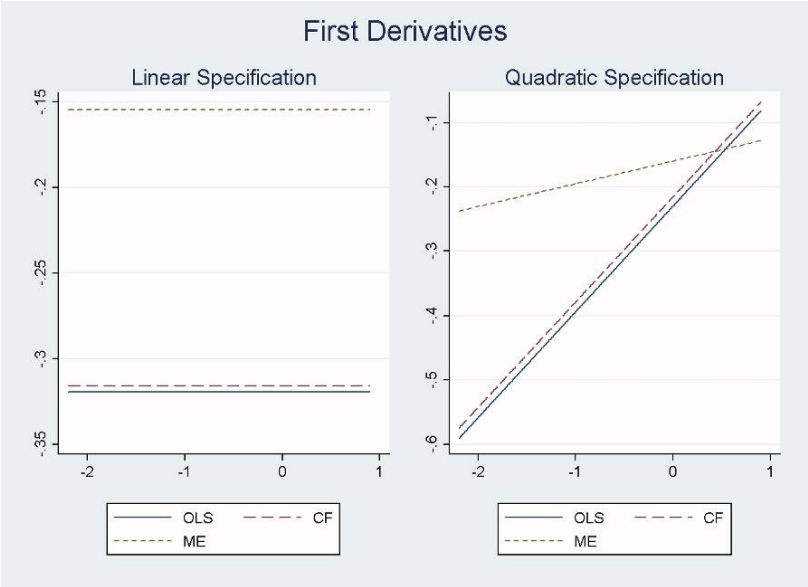


Table 6.8 UK Food Engel curve – income poor

	cf	me	cf	me
lx	-0.4929	-0.196	-0.1478	na
	0.008	0.0041	0.0101	
lx2			0.148	0.0132
			0.0042	0.0019
own price	-0.1895	-0.1965	-0.2225	-0.4499
	0.0141	0.0088	0.0042	

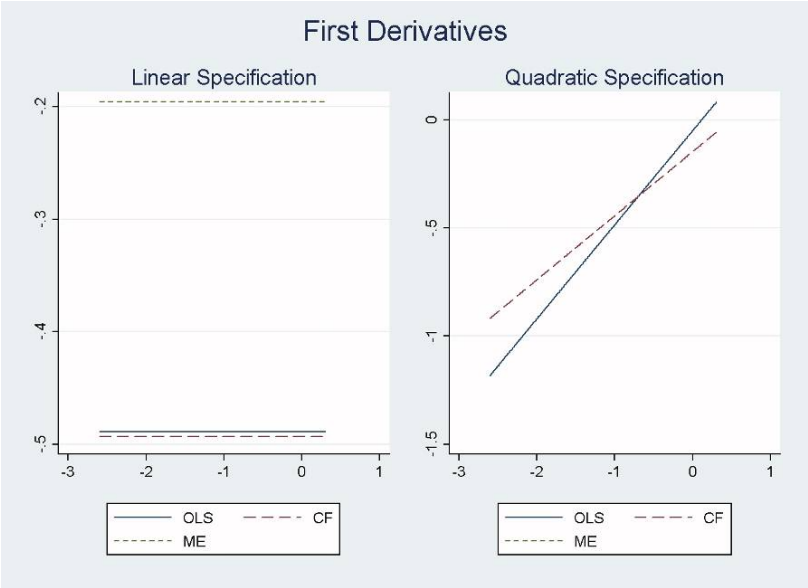


Table 6.9 UK Food Engel curve – compulsory education

	cf	me	cf	me
lx	-0.4423	-0.1035	-0.1537	-0.1023
	0.0165	0.0012	0.0096	
lx2			0.1681	0.0243
			0.0012	0.0015
own price	0.1663	0.0809	0.0347	-0.2182
	0.0122	0.0063	0.018	

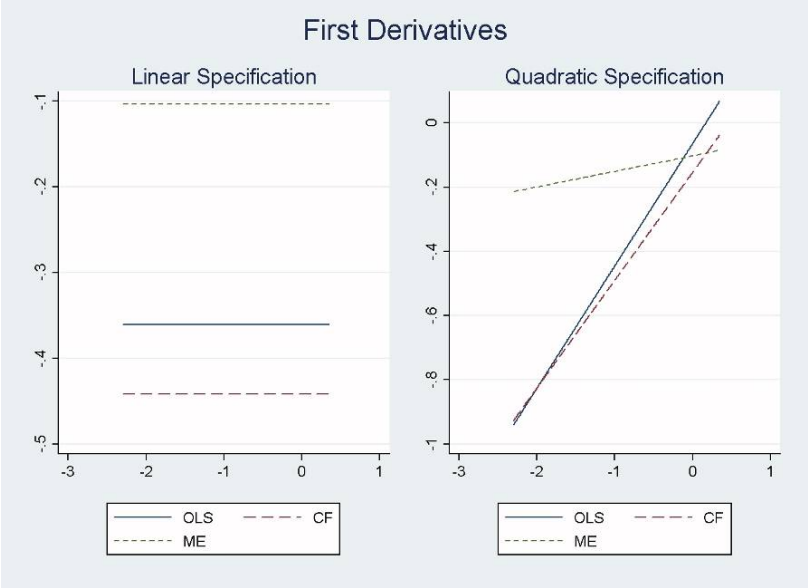


Table 6.10 – UK Entertainment whole sample

	cf	me	cf	me
lx	0.1277	0.1134	0.1303	0.1221
	0.0032	0.0077	0.004	
lx2			0.0021	-0.0065
			0.0013	0.0036
own price	0.0114	0.0454	0.0222	0.0262
	0.008	0.0254	0.0146	

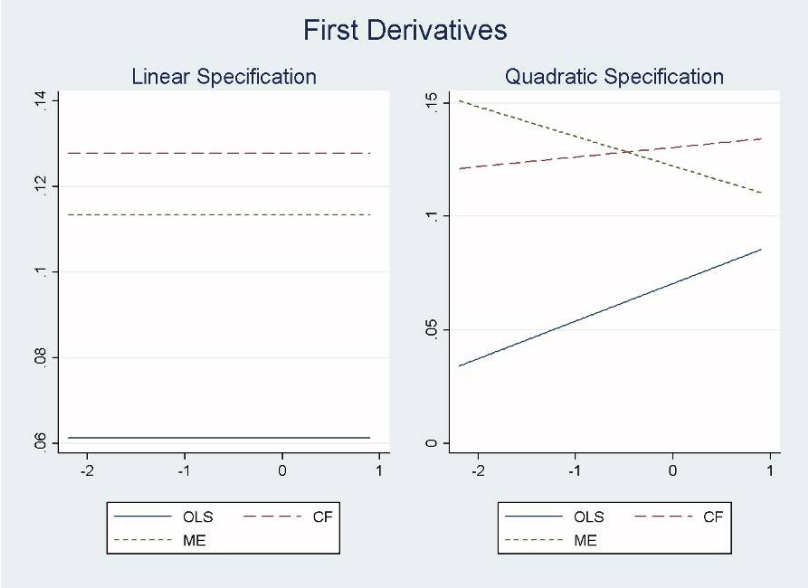


Table 6.11 – UK entertainment income poor

	cf	me	cf	me
lx	0.1228	0.1896	0.1523	0.2031
	0.0163	0.0269	0.0218	
lx2			0.0119	-0.0101
			0.0056	0.0129
own price	-0.0047	0.034	0.0986	0.0648
	0.0162	0.0408	0.0434	

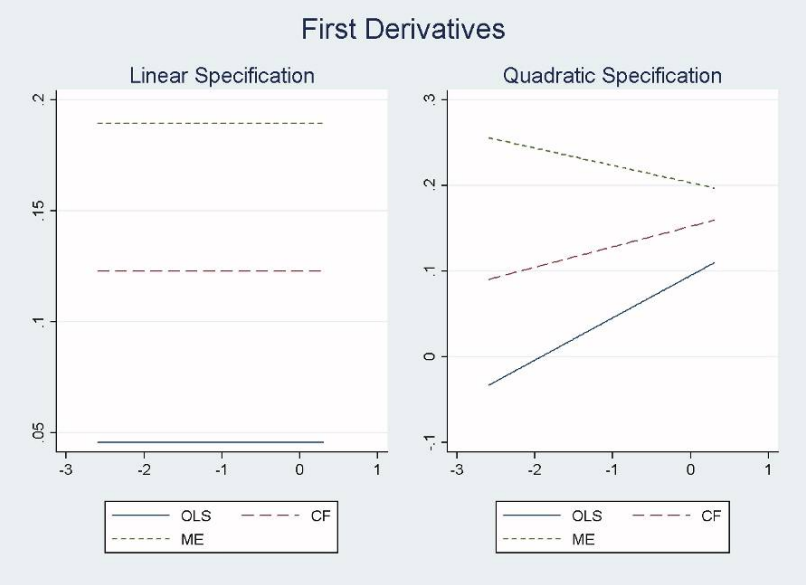


Table 6.12 – UK entertainment compulsory education

	cf	me	cf	me
lx	0.1474	0.1089	0.1143	0.1369
	0.0415	0.0237	0.0428	
lx2			-0.0001	-0.024
			0.0028	0.0104
own price	0.1474	0.036	0.0383	-0.0056
	0.0163	0.0275	0.0275