



## **Working Paper No. 667**

---

### **The Levy Institute Measure of Economic Well-Being, Great Britain, 1995 and 2005**

by

**Selçuk Eren  
Thomas Masterson  
Edward Wolff  
Ajit Zacharias\***

Levy Economics Institute of Bard College

**April 2011**

---

\* The Levy Institute Measure of Economic Well-Being for Great Britain was developed as part of the Levy Institute's research project on International Comparisons of Economic Well-Being. Edward Wolff and Ajit Zacharias directed the project. We are grateful to the Alfred P. Sloan Foundation for their generous support.

---

The Levy Economics Institute Working Paper Collection presents research in progress by Levy Institute scholars and conference participants. The purpose of the series is to disseminate ideas to and elicit comments from academics and professionals.

Levy Economics Institute of Bard College, founded in 1986, is a nonprofit, nonpartisan, independently funded research organization devoted to public service. Through scholarship and economic research it generates viable, effective public policy responses to important economic problems that profoundly affect the quality of life in the United States and abroad.

Levy Economics Institute  
P.O. Box 5000  
Annandale-on-Hudson, NY 12504-5000  
<http://www.levyinstitute.org>

## **ABSTRACT**

We construct estimates of the Levy Institute Measure of Economic Well-Being for Great Britain for the years 1995 and 2005. We also produce estimates of the official British measures HBAI (from the Department for Work and Pensions annual report titled “Households below Average Income”) and ROI (from the Office of National Statistics Redistribution of Income analysis). We analyze overall trends in the level and distribution of household well-being using all three measures for Great Britain as a whole and for subgroups of the British population. Gains in household economic well-being between 1995 and 2005 vary by the measure used, from 23 percent (HBAI) to 32 percent (LIMEW) and 35 percent (ROI). LIMEW shows that much of the middle class’s gain in well-being was as a result of increases in government expenditures. LIMEW also marks a greater increase in economic well-being among elderly households due to the increase in their net worth. The redistributive effect of net government expenditures decreased notably between 1995 and 2005 according to the official measures, primarily due to the change in the distributive impact of government expenditures.

**Keywords:** Levy Institute Measure of Economic Well-being (LIMEW); Great Britain; Economic Well-Being; Economic Inequality; Household Income Measures

**JEL Classifications:** D31, D63, P17

## 1 INTRODUCTION

This paper describes the construction of the Levy Institute Measure of Economic Well-Being (LIMEW) for Great Britain. We will also analyze the level and distribution of economic well-being using the LIMEW, as well as the conventional measures used in the United Kingdom. This is particularly interesting because the LIMEW is a more comprehensive measure of households' command over resources than the conventional measures of disposable income. LIMEW includes estimates of public consumption and household production, components that are excluded in most available measures of economic well-being. It also includes estimates of long-run benefits from the ownership of wealth (other than homes) in the form of an imputed lifetime annuity, a procedure that, in our view, is superior to considering only current income from assets.

No single survey on households provides the information required to construct the LIMEW. As a result, our approach was to use the Family Resources Survey as the basic sample and supplement it with data from a variety of sources.<sup>1</sup> An overview of the estimation process is provided in table 1. The details are discussed in the subsequent sections and the appendices.

## 2 COMPONENTS OF LIMEW

The LIMEW is constructed as the sum of the following components (see table 1): base income (line 10); income from wealth (lines 12 through 18); net government expenditures (both cash and noncash transfers and public consumption, net of taxes, lines 20 through 27); and household production (line 29).

Base money income is defined as gross money income (MI) *less* the sum of property income (interest, dividends, and rents) and government cash transfers (e.g., basic state pension). The rationale for deducting these two items at this stage is to avoid double-counting because we do include our own estimates of government transfers and income from wealth (as discussed below). Earnings make up the overwhelming portion of base money income. The remainder consists of occupational pensions and other small items. The imputed value of health insurance premiums paid by employers is added to base money income to obtain base income. In Britain,

---

<sup>1</sup> The 1995 round of the survey did not include Northern Ireland. To maintain comparability, we have excluded Northern Ireland from all estimates for both years of the study.

such payments take the form of a payroll tax paid by the employers that go toward funding the National Health Service—government-run universal healthcare services.<sup>2</sup>

The second component is imputed income from the household's wealth holdings. MI includes property income, the sum of interest, dividends, and rent. From our perspective, this is an incomplete measure of the economic well-being derived from the ownership of assets. Owner-occupied housing yields services to their owners over many years, thereby freeing up resources otherwise spent on housing. Financial assets can, under normal conditions, be a source of economic security in addition to property-type income.

In measuring the economic well-being from wealth holdings, it is useful to distinguish between owner-occupied homes and other forms of wealth (Wolff and Zacharias 2009). Housing is a universal need and homeownership frees the owner from the obligation of paying rent, leaving an equivalent amount of resources for consumption and asset accumulation. Hence, benefits from owner-occupied housing are reckoned in terms of the replacement cost of the services derived from it (i.e., a rental equivalent).<sup>3</sup> We estimate the benefits from nonhome assets (real estate excluding homes, liquid assets, and financial assets) using a lifetime annuity method.<sup>4</sup> We calculate an annuity based on a given amount of wealth, an interest rate, and life expectancy. The annuity is the same for the remaining life of the wealth holder and the terminal wealth is assumed to be zero (in the case of households with multiple adults, we use the maximum of the life expectancy of the head of household and spouse in the annuity formula). Moreover, in our method, we account for differences in portfolio composition across households. Instead of using a single interest rate for all assets, we use a weighted average of asset-specific and historic real rates of return,<sup>5</sup> where the weights are the proportions of the different assets in a household's total nonhome assets. The burden of liabilities is also captured by an analogous procedure that

---

<sup>2</sup> Most of the expenditure for the National Health Services is funded via general taxation and not payroll taxes.

<sup>3</sup> This is consistent with the approach adopted in the US national accounts.

<sup>4</sup> This method gives a better indication of resource availability on a sustainable basis over the expected lifetime than the standard bond-coupon method. The latter simply applies a uniform interest rate to the value of nonhome wealth. It thereby assumes away differences in overall rates of return for individual households ascribable to differences in household portfolios. It also assumes that the amount of wealth remains unchanged over the expected (conditional) lifetime of the wealth holder.

<sup>5</sup> The rate of return used in our procedure is real total return (the sum of the change in capital value and income from the asset, adjusted for inflation). For example, for stocks, the total real return would be the inflation-adjusted sum of the change in stock prices plus dividend yields.

annuitizes the value of debt, with the rate of inflation playing the role of the interest rate in the procedure.

The third component is net government expenditures—the difference between government expenditures incurred on behalf of households and taxes paid by households (Wolff and Zacharias 2007). Our approach to determine expenditures and taxes is based on the social-accounting approach (Hicks 1946; Lakin 2002: 4346). Government expenditures included in the LIMEW are cash transfers, noncash transfers, and public consumption. These expenditures, in general, are derived from the National Income and Product Accounts (NIPA). Government cash transfers are treated as part of the money income of the recipients. In the case of government noncash transfers, our approach is to distribute the appropriate actual cost incurred by the government among recipients of the benefit.<sup>6</sup> A potential alternative method of valuation is the so-called fungible-value method that is based on the argument that the income value for the recipient of a given noncash transfer is, on average, less than the actual cost incurred by the government in providing that benefit (see, for example, Canberra Group [2001: 24, 65]). This valuation method involves estimating how much the household could have paid for the medical benefit, after meeting its expenditures on basic items such as food and clothing, with the maximum payment for the medical benefit set equal to the average cost incurred by the government.

We do not use the fungible-value approach because of its implication that recipients with income below the minimum threshold receive no benefit from the service (like healthcare). This implication is inconsistent with our goal of measuring the household's access to or command over products. Further, unlike the social-accounting method, the fungible-value method would not yield the actual total government expenditure when aggregated across recipients. Such a feature is incompatible with our goal of estimating net government expenditures using a consistent methodology.

The other type of government expenditure that we include in the LIMEW is public consumption. We begin with a detailed functional classification of government expenditures. We then exclude certain items because they fail to satisfy the general criterion of increasing the household's access to goods or services. These items generally form part of the social overhead

---

<sup>6</sup> In the case of medical benefits, the relevant cost is the “insurance value” differentiated by risk classes.

(e.g., national defense) and do not lend themselves to a market substitute. Other expenditures, such as transportation, are allocated only in part to households because part of the expenditure is also incurred on behalf of the business sector. The household sector's share in such expenditures can be estimated on the basis of information regarding its utilization (for example, miles driven by households and businesses). The remaining expenditures (such as health) are allocated fully to households.

In the second stage, the expenditures for each functional category are distributed among households. The distribution procedures followed by us build on earlier studies employing the government-cost approach (e.g., Ruggles and Higgins [1981]; Wolff and Zacharias [2007]). Some expenditures, such as education, highways, and water and sewerage, are distributed on the basis of estimated patterns of utilization or consumption, while others such as public health, fire, and police are distributed equally among the relevant population.

The third part of net government expenditures is taxes. Our objective is to determine the actual tax payments made by households, consistent with the government-cost approach. In general, therefore, we do not consider tax incidence in our analysis.<sup>7</sup> We align the aggregate taxes in the microdata with their NIPA counterparts, as we did for government expenditures. Taxes consist of personal income taxes, property taxes on owner-occupied housing, payroll taxes, and consumption taxes. Taxes on corporate profits, on business-owned property, and on other businesses, as well as nontax payments, are not allocated to the household sector because they are paid directly by the business sector.

The fourth component of LIMEW is the imputed value of household production. Three broad categories of unpaid activities are included in the definition of household production: (1) core production activities, such as cooking and cleaning; (2) procurement activities, such as shopping for groceries and for clothing; and (3) care activities, such as caring for babies and reading to children. These activities are considered as "production," since they can be assigned, generally, to third parties apart from the person who performs them, although third parties are *not* always a perfect substitute for the person, especially for the third activity.

---

<sup>7</sup> It may appear that our inclusion of the employer-paid payroll taxes for the National Health Service (NHS) in the household tax burden is based on the assumption that the incidence of the employer-paid tax falls on labor income. In fact, this treatment was necessitated by the fact that we include the government expenditures on NHS, partly financed by NHS payroll tax, in LIMEW; therefore, if we did not deduct it from LIMEW, we will be double-counting part of the benefits from NHS.

Our strategy for imputing the value of household production is to value the amount of time spent by individuals on the basis of its replacement cost as indicated by the average earnings of domestic servants or household employees (Kuznets, Epstein, and Jenks 1941: 432433; Landefeld and McCulla 2000). Research suggests that there are significant differences among households in the quality and composition of the “outputs” of household production, as well as the efficiency of housework (National Research Council 2005: ch. 3). The differentials are correlated with household-level characteristics (such as wealth) and characteristics of household members (such as the influence of parental education on childrearing practices). Therefore, we modify the replacement-cost procedure and apply to the average replacement cost a discount or premium that depends on how the individual (whose time is being valued) ranks in terms of a performance index. Ideally, the performance index should account for all the factors relevant in determining differentials in household production and the weights of the factors should be derived from a full-fledged multivariate analysis. Given the absence of such research findings, we incorporated three key factors that affect efficiency and quality differentials—household income, educational attainment, and time availability—with equal weights attached to each.

### **3 ESTIMATING LIMIEW**

The estimation procedure consists of two main steps. In the first step, a core synthetic microdata file is created that contains the various sources of money income, various components of household wealth, and time spent on household production activities. This step involves the statistical matching of an income and demographic survey with a wealth survey and a time use survey. In the next step, information from a variety of sources (administrative data, national accounts, etc.) are utilized, in conjunction with the variables contained in the income survey to create estimates of government transfers, taxes, public consumption, and household production.

#### **3.1 Statistical Matching**

The surveys are combined to create the core synthetic file using constrained statistical matching. The basic idea behind the technique is to transfer information from one survey (the “donor file”) to another (the “recipient file”). Such information is not contained in the recipient file but is

necessary for research purposes. Each individual record in the recipient file is matched with a record in the donor file, where a match represents a similar record, based on several common variables in both files. The variables are hierarchically organized to create matching cells for the matching procedure. Some of these variables are used as strata variables, i.e., categorical variables that we consider to be of the greatest importance in designing the match and which we therefore use to restrict the records that can be matched between the two files. For example, if we use sex and employment status as strata variables, this would mean that we would match only individuals of the same sex and employment status. Within the strata, we use a number of common variables of secondary importance as match variables.

The matching is performed on the basis of the estimated propensity scores derived from the strata and match variables. For every recipient in the recipient file, an observation in the donor file is matched with the same or nearest neighbor values of propensity scores. In this match, a penalty weight is assigned to the distance function according to the size and ranking of the coefficients of strata variables. The quality of match is evaluated by comparing the marginal and joint distributions of the variable of interest in the donor file and the statistically matched file (Kum and Masterson 2010).

### *3.1.1 Matching wealth surveys*

The matching unit for the wealth match (and the unit of analysis for the LIMEW) is the household. The basic sample for the 1995 and 2005 LIMEW estimates are the public-use files for 1995–96 and 2005–06 rounds of the Family Resources Survey (FRS), published by the Department for Work and Pensions of the National Center for Social Research and the Office for National Statistics (2005 and 2007). The FRS files have records for 26,435 and 28,029 households, respectively, in 1995 and 2005. The source data for household wealth are the 1995 and 2005 waves of the British Household Panel Survey (BHPS) published by University of Essex (2010). The public-use version of the files contained, respectively, 4,990 and 4,592 households (after removing records representing institutionalized residents) in 1995 and 2005. The weights in the BHPS are proportional weights that provide accurate demographic proportions, but do not give a total population estimate. The data in the BHPS was processed before matching to convert categorical wealth variables into continuous values and to replace missing values.



The BHPS wealth surveys contain information on individually held and household assets and liabilities. Ideally, the survey would be comprised of detailed questions about each asset and liability type. For the most part, however, the BHPS includes a limited set of questions for each asset/liability type. For example, for debts, a series of questions asks whether or not individual types of debt are held, then another series of questions asks the total amount of debt, and, if no amount is given, whether the total amount of debt exceeds a series of amounts.<sup>8</sup> Further questions ask whether any of the debt is held jointly with another individual and what amount this applies to.

We estimated amounts for each individual or household using the following method. In those cases for which the total amount was not given, we first converted the series of questions regarding the amount into a categorical variable. We then assigned values to records within a categorical range (£0 to £100, for example) by randomly selecting an amount from a uniform distribution and for the top category by selecting from a Pareto distribution:

$$y = \frac{y_{min}}{U^{\frac{1}{k}}}$$

Where  $y_{min}$  is the minimum of the top category (in the debt example, £5,000),  $U$  is the uniform distribution on the unit interval  $(0,1)$ , and  $k$  is the so-called shape parameter (equal to 2 in all cases in this estimation). Completion of this step yields an amount for all records without missing values (for details of handling missing values, see the appropriate sections below). This amount was adjusted in the cases where some of the total was held jointly. The new amount was then divided up equally between all types of asset or liability that the respondent indicated that they held.

Missing values in the 1995 BHPS data<sup>9</sup> were replaced in two stages: in the first, missing values in individual records were replaced by hot-decking; in the second, missing values in the household records were replaced using the method of multiple imputation with chained equations. The 2005 BHPS has been multiply imputed to replace missing values using the same

---

<sup>8</sup> In the case of 1995, the amounts are “500 or more,” “1,500 or more,” “5,000 or more,” and “10,000 or more.”

<sup>9</sup> Variables with missing values were: educational attainment, employment status, and marital status, as well as wealth and income variables. 877 of 9,203 individual records were missing education, employment, savings, investment, or debt data. 541 of 4990 household records were missing mortgage, home-value, or income data.

two-step procedure.<sup>10</sup> In each case the resulting data set contained five replicates for each original household record.

In order to perform a successful match, the candidate data sets must be well-aligned in the strata variables used in the match procedure. For the wealth match, strata variables are homeownership, age, educational attainment, family type, and household income. Since in both years both surveys are regionally representative samples for the same year, we can expect them to be well-aligned. However, the BHPS is drawn from a more complicated sampling frame, since the BHPS is a panel survey. We encountered some misalignment, especially for education and income, as a result of this important difference in sampling frame between the two surveys (see appendix A for details).

Overall, the quality of the matches was good. It has its limitations, especially in terms of the education categories (due, once again, to the mismatch of variable definitions in the two surveys). But the overall distribution is transferred with remarkable accuracy, and the distributions within even small subgroups, such as young married homeowners, is transferred with good precision (see appendix A for details).

### *3.1.2 Matching time use surveys*

The source data for time spent on household production activities was the 1995 Office of Population Censuses and Surveys Omnibus Survey (OPCS) published by Office of Population Censuses and Surveys (1998) and the 2000 United Kingdom Time Use Survey (UKTUS) published by Ipsos-RSL and Office for National Statistics (2003).<sup>11</sup> While for the wealth match the matching unit is the household, for the time use match we use individuals. We use individual records from the public-use files for both surveys, excluding those living in group quarters or in the armed forces. The 1995 OPCS has a number of missing values, which we replaced by the method of multiple imputation with hot-decking.<sup>12</sup> This results in five replicates for each original

---

<sup>10</sup> Variables in the 2005 BHPS with missing values included: at the individual level, employment status, self-employment status, earner, education, savings, investments, and debts; and at the household level, homeownership, region, home value, other real estate, mortgage, and income variables. 1,544 of 8,407 individual records and 790 of 4,592 household records had one or more missing values.

<sup>11</sup> There was no available survey for a year closer to 2005 during the time in which this research was conducted.

<sup>12</sup> The variables with missing values were: marital status, family type, relationship to household head, homeownership, educational achievement, personal income category, and age. 123 of 2,005 records had missing values for one or more of these variables.

record, for a total of 10,025. Missing values in the 2000 UKTUS were multiply imputed using chained equations, producing five replicates for each original record.<sup>13</sup> The records from the time use surveys were matched to 48,263 FRS individual records in 1995 and 50,885 in 2005.

For the time use match, the strata variables are sex, parental status, employment status, marital status, and spouse's employment status. The alignment between the two sources of data (i.e., FRS and time use survey) were generally very good in both years, except for parental status: the proportion of individuals who are parents appears to be somewhat lower (by about 6 percentage points) in the FRS. Just as we found in the case of matches with wealth data, the quality of the matches with time use data was good. And, in a similar vein, some limitations also should be noted, especially in terms of the marital and employment status categories. But the overall distribution is carried over from the donor to the recipient file with a great deal of accuracy, and the distributions within even small subgroups, such as female parent employees, are transferred fairly precisely (see appendix B for details).

### **3.2 Income from Wealth**

The second component of the LIMEW is income from wealth. Income from wealth is divided into two components, which are estimated using different methods. The income from home wealth component is calculated by taking the share of imputed rent (from the national accounts)<sup>14</sup> proportional to the household's share of national holdings of primary residential housing and subtracting the annuitized value of mortgages on the primary residence. The income from nonhome wealth component is calculated by annuitizing the household's nonhome wealth holdings with separate rates of return for each asset type and other debt. An important difference in the British data as compared to the US wealth data is the lack of information about business equity or any other forms of nonfinancial wealth other than real estate.

---

<sup>13</sup> 778 of 8,490 records had missing values for personal income class.

<sup>14</sup> The amount of imputed rent for 1995 (£36.629 billion) is taken from the United Kingdom National Accounts 2001, table 6.4, "Individual consumption expenditure at current market prices by households, nonprofit institutions serving households and general government," line 04.2, p.228. The amount of imputed rent for 2005 (£77.339 billion) is taken from the United Kingdom National Accounts 2010, table 6.4, "Individual consumption expenditure at current market prices by households, nonprofit institutions serving households and general government," line 04.2, p.220.

Table 2 shows the mean values for each asset and debt type, as well as the estimated income from each for the UK for 1995 and 2005 (values are in 2010 pounds).<sup>15</sup> We can see that the value of primary residences grew by 133 percent in the decade between 1995 and 2005, while debt on primary residences grew by only 72 percent. We can guess that things have changed quite a lot since then on the asset side of this equation, but this certainly shows the growth of the housing bubble in the UK. In stark contrast to the trend in home values, the imputed rent from primary residences had only increased by 54 percent in the same decade. The annuitized debt on primary residences has grown almost as much as the amount of debt. As a result, income from home wealth has grown by less than a third. The other categories of household wealth show much less divergence between the stock and flow variables. This is in part due to the difference in the method of estimation for income from primary residences. Note that while household net worth has increased by 109 percent between 1995 and 2005, a growth entirely due to the bubble in housing, our estimation of income from wealth has increased by less than a fifth of that increase.

### **3.3 Government Transfers**

Government transfers are categorized into cash benefits and in-kind benefits. The Family Resources Survey contains individual level data on more than forty different cash transfers. We group these cash transfer categories into fifteen transfer items according to the eligibility rules of the programs.<sup>16</sup> We align weighted sums for transfer items with national accounts from Public Expenditure Statistical Analyses (PESA), the official source of information on government spending published by HM Treasury (2005 and 2008).<sup>17</sup> Table 3 presents total government transfer expenditures in 1995 and 2005 calculated from the FRS data and the amounts reported in the national accounts.<sup>18</sup> Expenditures on cash transfers calculated from the FRS data suggest underreporting of total cash transfers in the microdata compared to national accounts, especially for smaller programs. The largest cash benefit program is retirement pension. Retirement pension

---

<sup>15</sup> We use All Items Retail Prices Index published by Office for National Statistics.

<sup>16</sup> We adopted the fifteen transfer categories from EUROMOD studies, a tax-benefit microsimulation model for the European Union. See <http://www.iser.essex.ac.uk/research/euromod> for further information and papers using the model.

<sup>17</sup> The corresponding tables in PESA publications are table 5.2 for 2005 and table 4.5 for 1995. See [http://www.hm-treasury.gov.uk/pespub\\_index.htm](http://www.hm-treasury.gov.uk/pespub_index.htm) for additional tables on government spending in the United Kingdom.

<sup>18</sup> Expenditures reported from national accounts are adjusted for the exclusion of Northern Ireland (see note 1).

expenditures calculated from the microdata are 8 and 16 percent less than the amount from national accounts in 1995 and 2005, respectively. Other major programs, such as income support, which included the minimum income guarantee program in 1995 and pension, family, and tax credits in 2005, are also underreported in the microdata by between 12 and 22 percent. Minor programs such as maternity allowance are underreported to an even greater extent, due to the smaller number of beneficiaries of these programs in the microdata. We aligned the microdata with national accounts by distributing the PESA amount of each cash transfer among recipient households in the FRS according to their respective shares in the FRS aggregate of each transfer.<sup>19</sup>

In-kind benefits are split up into two categories: health expenditures (which include National Health Service) and personal social services. Health expenditures are, by far, the largest transfer program, costing nearly £37 billion in 1995 and more than doubling to £84 billion in 2005. Its share in government transfers increased from 28 percent of total in 1995 to 35 percent in 2005. We assign health expenditures to individuals in the microdata using risk classes defined by sex and age. The average cost to the government in each risk class is assigned to each individual in the risk class.<sup>20</sup> The total health expenditures for the household are scaled in such a manner so that when aggregated across all households, the resulting sum will be identical to the total health expenditures in the PESA.

National accounts do not provide much detail on the expenditures on personal social services beyond four broad categories: sickness and disability, old age, family and children, and unemployment. We distribute each of these on an equal per capita basis to the beneficiaries of relevant cash benefits. The beneficiaries of sickness and disability expenditures are assumed to be recipients of any one or more of the following benefits: incapacity benefit, attendance allowance, disability living allowance, severe disablement allowance, invalid care allowance, industrial injuries disablement allowance, and war pension. Expenditures on old age are distributed among recipients of retirement pension and/or widow's benefits. Personal social

---

<sup>19</sup> One exception is the Maternity Allowance (MA). We distributed MA expenditures from PESA to all women who had a child within the last year, as recipients of MA are significantly underrepresented in the microdata.

<sup>20</sup> Average weekly costs of health service were provided by Office of National Statistics. The estimates are identical to those used in the annual publication of Office for National Statistics "The Effects of Taxes and Benefits on Household Income." Average weekly costs of risk classes are defined by age groups for each sex respectively and an additional cost for females for maternity. Age ranges for risk classes are as follows: 0, 1, 2-4, 5-15, 16-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, and 84+.

services expenditures grouped under family and children are assumed to benefit the recipients of any one or more of the following benefits: child benefit, income support, and housing benefit. Unemployment expenditures are distributed among recipients of job seeker's allowance. We then aligned these amounts to the PESA totals using the method described above.

### **3.4 Taxes**

The source data for taxes paid by the households in Great Britain in 1995 is the Annual Abstract of Statistics, 2004 edition, table 18.5, and in 2005 is Annual Abstract of Statistics, 2010 edition, table 18.6, both published by the Office for National Statistics (ONS).<sup>21</sup> Tax burden on households is categorized as direct taxes and indirect taxes. Direct taxes include individual income taxes, council tax, and employees' compulsory contributions to National Insurance (NI). Indirect taxes include employers' compulsory contributions to NI, value-added taxes (VAT), duty on hydrocarbon oils, vehicle excise duty, and other indirect taxes.

Both income taxes as well as employees' contributions to NI are usually deducted at the source from paychecks or cash benefits. We first calculate the taxable income and then simulate the tax burden of each individual in the FRS using the tax rules for each year. Table 4 summarizes the income and NI tax rates and allowances used for the simulation. There were both married couple and personal allowances in 1995, but married couple allowances were abolished in 2005 with the exception of older-aged households. The lowest income tax rate in the UK was 20 percent in 1995 and was levied on the first £3,200 of an individual's income above the taxable threshold. The middle rate was 25 percent and was levied on income above £3,200 and below £24,300. The highest tax rate was 40 percent and levied on incomes above £24,300. Income from dividends was taxed at a flat rate of 20 percent. In 2005, the lower rate was reduced to 10 percent and was levied on the first £2,090. The middle rate was also reduced to 22 percent and the band was enlarged to between £2,090 and £32,400. The higher rate remained intact. Moreover, a separate rate of 20 percent on all savings income was introduced. Lastly, taxes on income from dividends became subject to two rates with the higher rate of 32.5 percent and the lower rate of 10 percent.

---

<sup>21</sup> Annual Abstract of Statistics contains taxes collected by type for the United Kingdom. While total taxes collected in Northern Ireland are available, we do not have information by type. We deduct the same percentage, 3.2 percent, from each type of tax to reach total taxes for Great Britain.

Employees' contribution to NI is also collected at the source in the Great Britain. Most employees are classified as class 1 and pay the corresponding NI rates. The first £58 of weekly earnings was taxed at a 2 percent and the amount between £58 and £440 was taxed at a 10 percent in 1995. Any earnings above £440 were not taxed for NI contributions, indicating the regressive nature of NI taxes. Both rates and allowances were changed to make the system less regressive in 2005. The first £82 of weekly earnings became exempt from NI taxes, the main rate was increased to 11 percent, and a 1 percent tax was levied on earnings exceeding £630. Employees who opt out of employer-provided or private pensions were eligible to receive a rebate of 1.8 percent in 1995 and 1.6 percent in 2005. Approximately 20 percent of NI contributions are allocated to the NHS while the rest goes to Job Seeker's Allowance and retirement pension funds. Self-employed individuals pay a different rate, as noted in table 4.

We first simulate the total income and payroll tax burden for each household using these tax rates and then align the total tax amounts to the corresponding values reported in the ONS. The other direct tax, i.e., council tax, is a form of property tax and collected throughout the United Kingdom with the exception of Northern Ireland. FRS data contain council tax amounts paid by households and we aligned the FRS total with the total council tax amount reported in the ONS. Indirect taxes include consumption taxes as well as employers' contribution to NI. Employers' contributions to NI are simulated using the rates shown at table 4. We impute consumption taxes paid by households by multiplying household disposable income by the share of indirect taxes in disposable income by household income decile using estimated shares in Harris (1997) for 1995 and Jones (2007) for 2005. In order to avoid negative consumption taxes, we use the median amount of consumption taxes in the lowest decile of taxable income for households with negative taxable income.

Table 5 presents total taxes simulated using FRS data and the values from ONS data.<sup>22</sup> They match exceptionally well with the exception of self-employed NI contributions in 2005. This is due to the relatively low (and sometimes negative) values of reported self-employed income in 2005. Total direct taxes increased by nearly 85 percent in the ten-year period from just above £102 billion to £187 billion. Similarly indirect taxes went up by more than 50 percent

---

<sup>22</sup> ONS data is only available for the United Kingdom and does not contain country breakdown. We make adjustments to exclude Northern Ireland by reducing the values according to the overall population.

from £58 billion to £88 billion. Total tax burden increased almost 74 percent in the ten-year period, compared to an increase of 86 percent in government transfers.

### **3.5 Public Consumption**

Our valuation of public consumption is based on the government cost method which equates the amount of income associated with a given public consumption expenditure to the average expenditure that the government incurs for the beneficiary. We construct the estimates of public consumption by households in three steps: (1) we obtain total expenditures by function and region using data from PESA,<sup>23</sup> (2) we allocate total expenditures between the household sector and other sectors of the economy using allocators from several sources of data that are explained in appendix 3; and (3) we distribute expenditures allocated to the household sector among households. We describe the functional schema that we have utilized for our estimates and the assumptions for the allocation and distribution of expenditures in appendix 3.

The expenditure concept we use for public consumption is the same as that used for government expenditures on the product side of the GDP. We use the United Nations Classification of Government Functions (COFOG) reported by PESA. We distribute the national aggregate of local expenditures for each function among three countries (England, Wales, Scotland) and nine regions of England (North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, Eastern, Greater London, South East, and South West).

We first allocate government expenditures between the household and nonhousehold sectors. We allocate some types of expenditures, such as education and recreation, entirely to households whereas some, such as police services, are split between the household and nonhousehold sector. Some expenditure items (e.g., defense and prisons) are not allocated at all

---

<sup>23</sup> The relevant tables are table 3.6 in 1995 (HM Treasury 2005) and 5.2 in 2005 (HM Treasury 2008). PESA table 3.6 presents total government expenditures in a COFOG consistent subfunction level for the United Kingdom for 1995. We exclude the amounts for Northern Ireland using country-level information available in table 8.4a which is presented at functional level. In order to allocate the remaining amounts to subfunction level, we assume the distribution is the same with year 2002 and use distributions from PESA table 8.16 which has regional distribution (nine regions plus the countries) of identifiable expenditures (expenditures that can be traced to the destination it is spent) at subfunction level. Most unidentifiable expenditures (e.g., national defense) are not allocated by us to households. Remaining unidentifiable expenditures are geographically distributed according to proportions calculated using identifiable expenditures. Similarly, PESA table 5.2 presents total government expenditures in a COFOG consistent subfunction level for the United Kingdom for 2005. We subtract amounts for Northern Ireland using country-level information available in table 10.1-10.4 on subfunction level for identifiable expenditures. Once again, remaining unidentifiable expenditures are distributed among countries according to proportions calculated using identifiable expenditures and the calculated amounts for Northern Ireland are excluded.



to households because we assume that they do not deliver products that can be used directly by them. Next, we distribute the total government expenditures allocated to the household sector among individual households. In this step, we follow, as much as possible, the same principles of direct usage and cost responsibility that were used to divide total government expenditures between the household and nonhousehold sectors. Expenditures are distributed among households equally in some cases (e.g., cultural services), while others are distributed according to household- or person-level characteristics (such as elementary education). Information on a significant number of characteristics relevant to distribution is available in the FRS and other surveys and is discussed in detail in appendix 3.

Overall, £57.3 billion out of a total of £126.7 billion of government consumption and gross investment expenditures are distributed among households in 1995. Total government consumption and gross investment expenditures nearly doubled to £241 billion in 2005 and the household sector's share increased to £88 billion corresponding to 37 percent of total public consumption expenditures, compared to 45 percent in 1995.

### **3.6 Valuation of Household Production**

The fourth component of LIMEW is the imputed value of household production. As discussed in section 2, we use three broad categories of unpaid activities in the definition of household production: (1) core production activities; (2) procurement activities; and (3) care activities (care of household members). After matching the time use surveys to the FRS in the two benchmark years, we calculate the performance index, an average of normalized years of education, household income, and time available for each person. We multiply this index by the mean wage for domestic workers in each benchmark year and use the greater of that result and the tenth percentile wage as the effective wage for household production.<sup>24</sup> We then multiply the effective

---

<sup>24</sup> We derived the wage rates from the UK Labour Force Survey for 1995 and 2005. The mean wages (in nominal terms) were £3.80 and £5.66 in 1995 and 2005, respectively, while the wages of the tenth percentile were £2.44 and £4.00, respectively. They were calculated from the Quarterly Labor Force Surveys of 1995 and 2005 (Office of National Statistics n.d.). Microdata from all the quarters in a year were combined to calculate an annual average. The variable used was "HOURLY PAY" and the estimates were weighted using the income weight variable "PIWT07." Note that the hourly pay was calculated by dividing gross weekly pay by usual weekly hours (including overtime). In 1995, workers in the following occupations were considered as "domestic workers": cleaners and domestics, and other childcare and related occupations (SOCMAIN values 958 and 659); in 2005, the occupations were cleaners and domestics, and childminders and related occupations (SOC2KM values 9223 and 6122). There was no category that is equivalent to private household workers in the survey. In 1995, there is the

wage by the hours of household production to produce the value of household production for each person in the household, and then add up the total for each household.

Table 6 shows the average household hours of work in the market (for pay) and household, total work hours, and value of household production for 1995 and 2005. Both household and market hours increased for British households by a bit under 200 hours per year, adding up to an increase in household work hours of 9 percent between 1995 and 2005. The value of household production, though, increased by 60 percent. The difference is explained by the 49 percent increase in wages for workers in the household sector over the period.

## 4 RESULTS

We now compare LIMEW with two official measures of economic well-being used in Great Britain. The Office for National Statistics annually publishes a report titled “The Effects of Taxes and Benefits on Household Income,” which is also known as the Redistribution of Income (ROI) analysis. We refer to the income measure used in the ROI analysis as “ROI.” The Department for Work and Pensions produces an annual report titled “Households Below Average Income” (HBAI). This measure is referred to as “HBAI” in the discussion below. The LIMEW differs from the official measures in terms of its scope (i.e., items that are included or excluded) and method (i.e., the manner in which an item is included in the measure).

Table 7 lists the components of the three measures. All three measures include base money income, which is equal to gross (money) income less government cash transfers and property income. It consists mostly of income from employment. We included employers’ contribution to National Health Insurance (NHI) as a part of pretax LIMEW, while simultaneously including the same amount in taxes (see note 7 and the related discussion). As discussed before, LIMEW includes imputed income from the household’s wealth holdings whereas HBAI and ROI include current property income. Cash transfers are included in all three

---

category of “domestic housekeepers and related occupations,” but there were only 18 observations with valid values of hourly pay (i.e., positive hourly pay and income weight). In 2005, there were 116 valid observations for the category of “housekeepers,” but this consists mainly of housekeepers in hotels and hospitals. The absence of a uniformly defined occupational category of private household workers for the two years was the motivation behind approximating the notional wage for such a category by the average of the two occupations that may be considered as closest to it (i.e., cleaners, domestics, and unskilled childcare workers).

measures, but we aligned them to PESA totals in the LIMEW. The treatment of direct taxes is the same in all three measures, with the exception that in LIMEW, they are aligned to independent estimates of aggregate taxes. We estimate direct taxes for the three measures using tax rates presented in table 4 and reduce incomes to reflect income taxes, council (property) taxes, and employees' contributions to NI. HBAI deducts several items from household income, including payments of education loans, own contributions to private pension plans, payments to children living outside the household, and maintenance and alimony payments. Finally, HBAI adds the cash value of certain in-kind benefits (free school meals, free welfare milk and free school milk, and free TV license for those aged 75 and over) to household income. These adjustments yield the HBAI definition of "disposable income."

Unlike the HBAI measure, ROI and LIMEW do not deduct payments of education loans, own contributions to private pension plans, payments to children living outside the household, and maintenance and alimony payments. The in-kind benefits included in HBAI are also in ROI and LIMEW. However, these items cannot be separately identified in LIMEW due to PESA alignment, which does not specify these items separately. However, LIMEW includes in-kind benefits derived from the PESA aggregates and categorized under personal services that consist of personal social services for old age, disabled, family and children, and unemployed. It is quite likely that the in-kind benefits included in HBAI falls in this group. Additionally, ROI and LIMEW measures include the cash value of government-provided healthcare under in-kind benefits (noncash transfers).

Both the LIMEW and ROI measures deduct consumption taxes paid by households. Consumption taxes include VAT, duties on tobacco, beer and cider, wines and spirits, and hydrocarbon oils as well as vehicle excise duty, television licenses, stamp duty on house purchase, customs duties, betting taxes, insurance premium tax, air passenger duty, Camelot National Lottery Fund, and others. In fact, the estimates of consumption taxes included in the LIMEW are derived from the ROI estimates reported in Harris (1997) and Jones (2007). The treatment of the employer portion of payroll taxes is different between the two measures. The LIMEW includes the portion of employers' contribution to NI that goes to the NHS, whereas ROI includes all of employers' contribution to NI. Our rationale for not including the employer-portion of NI taxes is based on our assumption that they are paid directly out of the gross income of the business sector rather than directly out of household income. The assumption behind the

ROI approach is that the tax is paid indirectly by households because the prices of commodities bought by them include the tax. Based on the same logic, the ROI measure also deducts commercial industrial rates as a part of indirect taxes which is not included in LIMEW definition.

The ROI measure includes the value of government-provided education and housing. In our schema, they are elements of public consumption. The addition of these types of public consumption results in the ROI measure named “final income.” The scope of LIMEW, however, is broader. We include additional types of public consumption (i.e., in addition to education and housing) such as public transportation. Furthermore, the value of household production is also included in the LIMEW. As we shall see in the subsequent sections, the differences in scope and method between LIMEW and the other measures lead to considerably different assessments of the level and distribution of economic well-being in Britain.

#### 4.1 Overall Population

We start by comparing LIMEW to ROI and HBAI for the overall population (table 8). All monetary values were converted to 2010 pounds by using the retail prices index. The median household LIMEW was £36,470 in 1995 and increased to £48,145 in 2005. HBAI increased from £18,518 to £22,822 over the same period, while ROI increased from £19,077 to £25,794. The estimates show that the median value of LIMEW was higher than HBAI and ROI—the latter values were about 50–60 percent of LIMEW. This is mostly a reflection of the inclusion of household production in the LIMEW. In terms of the rate of growth in measured well-being between 1995 and 2005, ROI was the leader with an annual growth rate of 3.1 percent, followed by LIMEW (2.8 percent), and HBAI (2.1 percent). The values adjusted for the differences among households in size and composition are also reported in table 8 (appendix B).<sup>25</sup> The annual rates of change in the median values of the adjusted measures are higher than the unadjusted values, but the ranking of the measures with respect to rates of change were unaffected by the

---

<sup>25</sup> We used the OECD equivalence scale. The scale takes an adult couple without children as the reference unit, with an equivalence value of one. Incomes of single-person households are scaled upward by dividing their incomes with an equivalence value of less than one and incomes of households with three or more persons are scaled downward by dividing their incomes with an equivalence value of greater than one. The formula is as follows:

$$\text{scale} = 0.67 + 0.33(A - 1) + 0.20C$$
, where

**A = number of individuals of age 14 and over** and **C = number of individuals under 14**.

equivalence scale adjustment. Comparisons of the mean values of per capita LIMEW, HBAI, and ROI (appendix C) also show that their annual rates of change were quite similar to the changes in the median household values, except for the HBAI measure which showed a higher rate of change on a per capita basis (2.5 percent). It is also notable that the per capita values of all three measures of personal well-being showed a higher rate of growth than per capita GDP.

The growth in well-being was accompanied by an increase in the median values of time spent on work. The median value of weekly hours spent on market work (i.e., employment) per household increased from 37 to 40 hours between 1995 and 2005 (appendix A). This is a reflection of the much better employment picture in 2005 as compared to 1995. The unemployment rate was substantially lower in 2005 relative to 1995 (4.8 versus 8.7 percent).<sup>26</sup> The median hours of market work reported by working individuals (over 18 years of age) in the FRS increased from 38 to 40 hours over the same period; at the same time, the percentage of individuals who engaged in market work also increased from 55.3 to 59.6 percent. Similar to market work, the time spent on housework by the average household also grew during the period, as indicated by the increase in the median weekly hours of household production per household from 37 to 42 hours. The median hours of housework by individuals who engaged in household production actually declined from 23 to 22 hours between 1995 and 2005. However, the percentage of individuals (over 18 years of age) who engaged in housework increased from 84 to 96 percent over the same period and the increased participation accounts for the rise in the median hours of household production per household. The rise in the median total (i.e., market work plus housework) weekly hours of work per household from 75 to 80 hours over the period (i.e., a rate of 0.6 percent per annum) is thus the combined result of the increases in market and household work.

Table 9 presents the composition of LIMEW, HBAI, and ROI. Panel A presents mean values of each component. Mean household base money income was £29,827 in 1995 and it increased to £38,442 in 2005, an increase of 26 percent. The income from wealth in LIMEW was £2,864 in 1995. It increased by 16 percent to £3,309 in 2005. The income from wealth in LIMEW was almost three times more than the reported property income included in the HBAI and ROI measures and the rate of increase in the latter was also much smaller at only 1 percent

---

<sup>26</sup> The unemployment rate data is taken from the *International Financial Statistics* data CD of the International Monetary Fund (2010).

against the 16 percent increase in the LIMEW counterpart. Taxes and transfers were aligned to the national accounts benchmarks in LIMEW whereas no alignment was done for the other two measures. Cash transfers in HBAI and ROI increased by 13 percent from £4,733 in 1995 to £5,343 in 2005, while those included in LIMEW increased at a higher rate of 17 percent, from £5,572 to £6,537. These increases were offset by even a larger increase in direct taxes—26 percent in the official measures (from £6,565 to £8,296) and 31 percent (from £6,590 to £8,626) in LIMEW. Indirect taxes also went up, but at a relatively lower rate of 10 percent in ROI (from £4,811 to £5,281) and 8 percent in LIMEW (from £4,058 to £4,370). One reason for such a large increase in direct taxes may be to offset the increase in government expenditures, driven by health (an increase of 66 percent, from £2,373 to £3,939) and education (an increase of 50 percent, from £1,987 to £2,991). Government subsidies for housing and subsidies for public transportation (included in ROI as other public services) also increased notably over the decade, but these increases had little effect on overall public expenditure because their share in public expenditure was quite small. Other public services that are included in LIMEW, including expenditures on local and national roads, communication, recreation, energy, etc. stayed rather flat going up by only 11 percent (from £1,378 to £1,522) over the decade.

The composition of the three measures is also shown in table 9 (panel B). Both the official measures displayed a very high share of base money income—its share was never below 100 percent—although it declined slightly over the period. In contrast, the share of base money income in LIMEW was much lower and stayed stable at around 57 percent. Value of household production was the second largest component of LIMEW and its share stayed steady around 31 percent. Government expenditures for households (the sum of cash transfers, noncash transfers, and public consumption) increased its share in LIMEW from 28 to 30 percent over the period, mainly due to the faster increase (relative to LIMEW) in healthcare spending and housing subsidy. On the other side of the ledger, tax payments by households (the sum of direct and indirect taxes) lost some of its share in LIMEW with a decline from 26 to 24 percent, mainly due to the slower increase in indirect taxes (relative to LIMEW). As a result, net government expenditures doubled as a share of LIMEW over the period from 3 to 6 percent. While the same trend was also evident for net government expenditures in ROI, driven mainly by the same underlying factors (trends in health expenditures and indirect taxes), it is noteworthy that net government expenditures were negative in both years, according to the ROI measure, i.e., on the

average, households appear to pay more to the government than what they receive as benefits. The balance appeared to be even worse in the HBAI measure because net government expenditures were negative 10 percent of HBAI in 2005, up from negative 8 percent in 1995, reflecting the fact that the growth in cash transfers were only half as much as that in overall HBAI (13 versus 26 percent) over the decade. Another notable difference in the composition of the measures was evident in the much higher share of income from wealth in LIMEW than in the official measures (6 versus 3 percent in 2005).

The ranking of the three measures in terms of the percent change in mean values is similar to what we observed for the change in median values. The ROI measure registered the fastest growth (33 percent), followed by LIMEW (29 percent), and then HBAI (26 percent). (table 9, panel C). Base money income contributed nearly half of the growth of LIMEW while more than one-quarter of the growth of LIMEW is explained by the increase in value of household production, which is a result of increased wages and hours spent on housework. Net government expenditures and, to a much smaller extent, income from wealth accounted for the remainder of the growth in LIMEW. Base money income accounted for almost all the growth in the official measures. Its contribution to the growth of HBAI exceeded the overall growth in HBAI. The lower rate of growth of HBAI reflects the fact that the contribution of in-kind benefits was not large enough to offset the subtraction to growth due to direct taxes. In the ROI measure, base money income accounted for 27 percentage points of the 32 percent growth and the remainder was accounted for by net government expenditures. Unlike the HBAI, which includes only a very limited set of publicly provided benefits, the ROI includes benefits from publicly provided health and education, the functions on which government expenditures happened to grow quite rapidly over the period under consideration. While the ROI also includes indirect taxes, unlike the HBAI, their contribution to the growth in ROI actually declined over the period.

#### **4.2 “Middle-Class” Economic Well-Being**

We now turn to a closer look at the third quintile of the LIMEW distribution and compare it to its counterparts in the ROI and HBAI distributions. The change in the mean value of the third quintile’s well-being is a reasonable approximation of the change in the overall median well-

being that we discussed earlier. The middle quintile is often defined as the “middle class,” and we follow that convention here.<sup>27</sup>

The estimates in table 10 (panel C) for the change in the mean values of the three measures for their respective third quintiles show growth rates that are identical to what was observed earlier for the change in the median values for the overall population: Between 1995 and 2005, the change in middle-class well-being was highest according to the ROI measure (35 percent), followed by the LIMEW (32 percent), and then HBAI (23 percent). Base money income and net government expenditures each accounted for about one-third of the total growth in middle-class LIMEW, while the contribution of household production was somewhat smaller (29 percent). Income from wealth accounted for almost the entire remaining portion of the growth in LIMEW. A comparison of panel C in tables 9 and 10 shows that net government expenditures accounted for a much larger portion of the growth in middle-class LIMEW than the growth in LIMEW for the overall population. The main reason for the difference was the higher share of net government expenditures in middle-class LIMEW than overall LIMEW (8 versus 3 percent in 1995 and 14 versus 6 percent in 2005). In turn, the higher share was due to the greater share of transfers (both cash and noncash) and the lower share of taxes in middle-class LIMEW compared to overall LIMEW (panel B in tables 9 and 10); public consumption, on the other hand, had a similar share of middle-class and overall LIMEW.

Turning to the broad official measure, ROI, we see that base income accounted for 78 percent of the growth in middle-class ROI and net government expenditures accounted for the remainder (panel C, table 10). Compared to its contribution to the growth in overall ROI, the contribution of net government expenditures to middle-class ROI was much higher—similar to what we found with regard to LIMEW. As in the case of LIMEW, the responsible factor was the higher share of net government expenditures in ROI for the middle class than the overall population (7 versus 3 percent in 1995 and 11 versus 6 percent in 2005). Once again, similar to what we found for LIMEW, the higher share of transfers and the lower share of taxes in middle-class ROI relative to the ROI of the overall population explained the higher share of net government expenditures (panel B in tables 9 and 10).

---

<sup>27</sup> In general, the household’s rank in the distribution will not be the same across the three measures and hence the households classified as middle class will not be the same across the measures.



In contrast to LIMEW and ROI, net government expenditures did not contribute at all to the growth in middle-class HBAI (panel C, table 10) and base income accounted for the entire growth. The contribution to growth from cash transfers and taxes offset each other. This pattern is quite different from what we found regarding the sources of growth in HBAI for the overall population. In that case, the contribution to growth from cash transfers was smaller than taxes, and therefore net government expenditures exerted a retarding influence on the growth of average HBAI (panel C, table 9). The difference is accounted for by the higher share of cash transfers and the lower share of direct taxes in middle-class HBAI than overall HBAI (panel B in tables 9 and 10).

### 4.3 Subgroup Disparities

We divide households into distinct subgroups using the economic status and family type categories employed by Department of Work and Pensions in their annual HBAI reports (2010). Households are grouped according to their economic status as follows (note that full-time [FT] work is defined as 31 or more hours a week and part-time [PT] is defined as less than 31 hours): (1) One or more FT self-employed adults; (2) single or couple, all in FT work; (3) couple, one in FT work, one in PT work; (4) couple, one in FT work, one not working; (5) no one in FT work, one or more in PT work; (6) workless, one or more aged 60 or over; (7) workless, one or more unemployed; and, (8) workless, other inactive households not classified above (this group includes the long-term sick, disabled people, and nonworking single parents).

In table 11, panels A and B present mean and median values of the three measures and their equivalence-scale adjusted versions according to the economic status of households. Rankings of highest to the lowest mean LIMEW in 2005 of these groups are as follows: (1) couple, one in FT work, one not working; (2) couple, one in FT work, one in PT work; (3) one or more FT self-employed adults; (4) single or couple, all in FT work; (5) single or couple, no one in FT work, one or more in PT work; (6) workless, one or more aged 60 or over; (7) workless, other inactive; and (8) workless, one or more unemployed.<sup>28</sup> LIMEW rankings changed only slightly from 1995 and 2005. Couples with one spouse in FT work and one spouse not working moved from second ranking to top spot between the two periods. Workless, one or more

---

<sup>28</sup> The rankings were exactly the same for median values in 2005.

unemployed dropped from seventh to bottom ranking between periods.<sup>29</sup> As we have discussed before, HBAI and ROI are less comprehensive measures of economic well-being. ROI does not include expenditures on personal social services, public consumption expenditures (except for education and housing), and value of household production. Rankings of the households according their economic status change dramatically when we look at mean ROI. Rankings of highest mean ROI to the lowest mean ROI in 2005 of these groups are as follows: (1) couple, one in FT work, one in PT work; (2) one or more FT self-employed adults; (3) couple, one in FT work, one not working; (4) single or couple, all in FT work; (5) single or couple, no one in FT work, one or more in PT work; (6) workless, other inactive; (7) workless, one or more aged 60 or over, and (8) workless, one or more unemployed.<sup>30</sup> HBAI, on the other hand, is even a less comprehensive measure as it further omits health and education expenditures, housing subsidies, and expenditures on other public services, as well as all indirect taxes. Rankings of the households according their economic status change slightly when we look at mean HBAI pushing households with one or more FT self-employed adults to second as the main component of HBAI is earnings hence favoring households where all households work in 2005.<sup>31</sup> A comparison of the subgroups by the three measures in 2005 is shown in figure 1.

Economic status categories combine single and married households under same groups. Therefore, household sizes in the same economic status categories are not homogenous. To address this potential issue we also present results adjusted by the equivalence scale (table 11, part B). The rankings of households according to the economic status change once the measures are adjusted with the equivalence scale. Mean adjusted LIMEW for workless, head or spouse aged 60 or over ranked second in 2005 compared to its unadjusted ranking at sixth pushing the order of other groups down.<sup>32</sup> On the other hand, adjusting mean LIMEW for equivalence scale shifted the order of workless, other inactive and workless, head or spouse unemployed dropping

---

<sup>29</sup> Median LIMEW for workless, one or more unemployed was higher than median LIMEW for workless, other inactive in 1995.

<sup>30</sup> There is some change in rankings when we look at median ROI. Median ROI for couple, one FT work, and one not working was ranked second in 2005 and median ROI for workless, one or more aged 60 or over was ranked sixth. Mean ROI in 1995 followed a similar ranking with 2005 with the exception of couple, one in FT work, one not working and single or couple, all in FT work switching order.

<sup>31</sup> Median HBAI follows the same order as mean HBAI in 2005. Rankings for mean HBAI in 1995 is slightly different than ranking in 2005 and are identical to rankings for mean ROI in 1995.

<sup>32</sup> Rankings for median adjusted LIMEW for one or more FT self-employed adults and single or couple, all in FT work switch places compared to mean adjusted LIMEW in 2005.

the former to the bottom in 1995.<sup>33</sup> Rankings for mean adjusted ROI and mean adjusted HBAI are identical in 1995 and 2005 and as follows:<sup>34</sup> (1) single or couple, all in FT work; (2) couple, one in FT work, one in PT work; (3) one or more FT self-employed adults; (4) Couple, one in FT work, one not working; (5) single or couple, no one in FT work, one or more in PT work; (6) workless, other inactive; (7) workless, one or more aged 60 or over; and (8) workless, one or more unemployed.

Given the heterogeneous household sizes within economic status categories, equivalence adjusted measures describe a clearer picture of differences in rankings between measures. As previously noted, rankings are identical for adjusted HBAI and adjusted ROI measures suggesting that accounting for health and education expenditures, housing subsidies and expenditures on other public services and indirect taxes paid by households do not change the rankings of households according to their economic status.

We next look at family type categories as defined by Department of Work and Pensions in their annual HBAI reports (2010). Households are grouped according to family type as follows: (1) pensioner couple—a couple where one or more of the adults are age 60 or over; (2) single male pensioner—single male adult of state pension age or over; (3) single female pensioner—single female adult of state pension age or over; (4) couple with children—a nonpensioner couple with dependent children; (5) single with children—a nonpensioner single adult with dependent children; (6) couple without children—a nonpensioner couple with no dependent children; (7) single male without children—a nonpensioner single adult male with no dependent children; and (8) single female without children—a nonpensioner single adult female with no dependent children.

In table 12, panels A and B present mean and median values of the three measures and their equivalence-scale adjusted versions by family type. Rankings for mean LIMEW from the highest to the lowest in 2005 of these groups are as follows:<sup>35</sup> (1) couple with children; (2) pensioner couple; (3) working-age couple without children; (4) single male pensioner; (5) single female pensioner; (6) single with children; (7) single female without children; and (8) single

---

<sup>33</sup> Median adjusted LIMEW follows the same order as mean adjusted LIMEW in 1995.

<sup>34</sup> Median adjusted ROI and median adjusted HBAI follow the same rankings in both years.

<sup>35</sup> Rankings for mean LIMEW in 1995 follows the same order as in 2005 with the exception of switching order of single female pensioner and single with children. Rankings for median LIMEW in 2005 follows the same order in 2005 whereas rankings for median LIMEW in 1995 is slightly different than rankings for mean LIMEW. Median value for pensioner couple drops to third and median value for single male pensioner drops to sixth in rankings.

male without children. Given households within family type categories are very homogenous, adjusting for equivalence scale changes rankings minimally and only drops mean LIMEW for couple with children to the second in rankings in 2005.<sup>36</sup>

Rankings for mean ROI from the highest to the lowest in 2005 of these groups are significantly different than rankings for mean LIMEW and are as follows:<sup>37</sup> (1) couple with children; (2) working-age couple without children; (3) single with children; (4) pensioner couple; (5) single male pensioner; (6) single female pensioner; (7) single male without children; and (8) single female without children. Equivalence-scale adjustment does not change rankings for ROI. Rankings for mean HBAI from the highest to the lowest in 2005 of these groups are also significantly different than rankings for mean LIMEW and rankings for mean ROI and are as follows:<sup>38</sup> (1) couple with children; (2) couple without children; (3) pensioner couple; (4) single male pensioner; (5) single female pensioner; (6) single with children; (7) single male without children; and (8) single female without children. Equivalence-scale adjustment does not change rankings for HBAI. A comparison of the subgroups by the three measures in 2005 is shown in figure 2.

#### **4.4 Inequality**

We present the shares of the quintiles in the three measures for 1995 and 2005 in table 13. The bottom 20 percent of households in the LIMEW distribution received 7 percent of total LIMEW in 2005 whereas households in the next quintile received 12.6 percent. The middle, fourth, and the top quintiles received respectively, 17.6, 23.6, and 39.1 percent. Between 1995 and 2005, the share of the bottom quintile in LIMEW stayed the same while the shares of the second, third, and fourth quintiles increased by, respectively, 0.3, 0.4, and 0.1 percentage points. The gains for the lower quintiles were accompanied by decline in the share of the top quintile by 0.9 percentage

---

<sup>36</sup> Rankings for mean adjusted LIMEW in 1995 follows the same order as rankings for mean adjusted LIMEW in 2005.

<sup>37</sup> Rankings for mean ROI in 1995 are very similar to 2005 with the exception of mean ROI for pensioner couple dropping from fourth to sixth in rankings. Rankings for median ROI in 2005 is similar to rankings for mean ROI in the same year with the exception single female pensioner moving to fourth and mean ROI for single male without children dropping to last. Rankings for median ROI in 1995 and 2005 is similar to rankings for mean ROI in the same year with the exception single female pensioner switching spots with single male pensioner.

<sup>38</sup> Rankings for mean HBAI in 1995 are very similar to 2005 with the exception of mean HBAI for couple with children dropping from first to second and pensioner couple dropping from third to fifth in rankings. Rankings for median HBAI in 1995 and 2005 follow the same order as rankings for mean HBAI in 1995.

points between 1995 and 2005 (figure 3). Trends in quintile shares of LIMEW between 1995 and 2005 tell a different story compared to the other two measures of well-being. Whereas the top quintile lost some of its share of total LIMEW in the period, the top quintile of the ROI distribution did not lose any of its share of total ROI (41.5 percent for both years) and the top quintile of the HBAI distribution actually gained in share of HBAI by 1.2 percentage points (42.7 to 43.9 percent). The share of the second quintile and the fourth quintile in the ROI measure increased by 0.1 percentage points while the share of middle quintile went up by 0.3 percentage points. In contrast, the share of the bottom quintile of ROI declined by 0.4 percentage points. Both the bottom, third, and fourth quintiles suffered losses in their shares of HBAI while the second quintile experienced no change in its share.

The composition of LIMEW by quintiles in 1995 and 2005 are shown, respectively, in figure 4 and 5. Base income was the largest item in both years for all income groups representing 60 percent for the bottom quintile, 47 for the second quintile, 50 for the middle quintile, 53 for the fourth quintile, and 66 for the top quintile in 2005 (figure 5). This represented a large increase from 1995 for the bottom quintile when the share of base income in LIMEW was 49 percent. This change was in contrast to the middle three quintiles where share of base income declined between two years. Very little changed in the top quintile where the share of base income in LIMEW went up by 1 percentage points.

Income from wealth represented a larger share of LIMEW for households in higher quintiles. In fact, the share of income from wealth was negative (-3 percent) for bottom quintile in 2005 suggesting that households on average had negative net worth within the bottom quintile.<sup>39</sup> Share of income from wealth in LIMEW declined for the middle three quintiles (from 5 percent to 4 percent for second quintile and from 6 percent to 5 percent for third and fourth quintiles) between 1995 and 2005. Only the top quintile had a stable share in LIMEW as 9 percent of LIMEW came from income from wealth in both years for this group.

From 1995 to 2005, share of cash benefits in LIMEW declined for the bottom quintile by a drastic 10 percentage points (35 to 25 percent). In fact, cash benefits fell in absolute terms for this group, perhaps reflecting the strong growth in their earnings, as reflected in base income. The decline was much more moderate for the next two quintiles: 3 percentage points for the

---

<sup>39</sup> Income from wealth represented a very small share of LIMEW for bottom quintile in 1995 as well, albeit a positive one at 2 percent.

second quintile (23 to 20 percent) and 1 percentage point for the third quintile (16 to 15 percent). Unlike the bottom quintile, this was not due to any absolute decline in cash benefits but due to their relatively slower growth. For the top quintiles the share remained constant at 11 and 6 percent, respectively, for the fourth and top quintile.

The share of taxes, unlike cash benefits, stayed stable for the bottom quintile at -29 percent of LIMEW. For the top quintile, the share remained constant at -26 percent, while for the three middle quintiles it declined between the two periods (-24 to -21 percent for all three middle quintiles). It is interesting to note that the decline in the share of taxes for the middle quintiles occurred in conjunction with the decline in the share of base income in LIMEW.

Share of in-kind benefits, like cash benefits, declined as a share of LIMEW for the bottom quintile (18 to 15 percent). However, unlike cash benefits, this was the result of relatively slower growth than absolute decline. None of the other quintiles experienced any such decline as the growth in noncash benefits was on par with the growth in LIMEW for the second quintile while it exceeded the growth in LIMEW for the top three quintiles. As a result, the share of noncash benefits stayed the same for second quintile (13 percent), and went up for middle quintile (8 to 11 percent), fourth quintile (5 to 9 percent), and top quintile (3 to 6 percent) between 1995 and 2005. Share of public consumption expenditures in LIMEW showed no noticeable variation across the quintiles, unlike cash and in-kind benefits. The shares ranged from 7 to 9 percent in 1995 and 7 to 10 percent in 2005.

The value of household production was also not found to shown much variation across the quintiles, except for the bottom quintile. However, the gap between the bottom and the other quintiles in terms of the relative weight of household production in their respective LIMEW declined between 1995 and 2005 because the share of household production in the LIMEW increased substantially for the bottom quintile (from 18 to 25 percent). The share of household production remained fairly stable for the other quintiles between the two years.

Estimates of economic inequality by the three measures are shown in table 13. Overall inequality in LIMEW declined as the Gini for all households went down by 0.7 points (from 33 to 32.3) between 1995 and 2005. In contrast, the inequality in ROI and HBAI increased by 0.5 and 1.5 points, respectively. These changes are consistent with the changes in quintile shares that we discussed above (see figure 3). Equivalence-scale adjustments did not change the picture of declining inequality in LIMEW and increasing inequality in HBAI. However, the inequality in

equivalent ROI declined, though the decline was smaller than the decline in the inequality of equivalent LIMEW (-0.4 versus -1.0 points). The switch in the direction of the change in inequality of ROI caused by the equivalence-scale adjustment is perhaps indicative of the impact of education and health expenditures on inequality. They tend to be correlated with household size and once household income measures are adjusted for size, the larger households do not appear to be as well-off as before. As we noted before, both education and health expenditures increased considerably over the period under consideration.

We report the estimates of inequality among family households (defined as households with at least one family) in table 13, panel B. Inequality in LIMEW declined among family households by 0.9 points (26.6 to 25.7) and inequality in equivalent LIMEW fell by 1.3 points (23.7 to 22.4). These declines in LIMEW inequality among family households were larger than the declines for all households. The broad official measure, ROI, also indicated falling inequality among family households, unlike the case of the ROI for all households which showed a modest increase. However, inequality in equivalent ROI declined for all households and family households. Contrary to the trends in LIMEW and ROI, the inequality in HBAI increased for family households as it did for all households. Equivalence-scale adjustment to the HBAI did not result in any change in the pattern of increasing inequality.

To better understand the differences in the level of inequality in LIMEW and the official measures, we also conducted a decomposition analysis. In the decomposition, the Gini coefficient is expressed as the weighted sum of the concentration coefficients of each component

(e.g., base income) and the weights are the income shares:  $G = \sum_{i=1}^n k_i s_i$ , where  $G$  is the Gini coefficient of the measure (say LIMEW),  $k_i$  is the concentration coefficient of an individual component of LIMEW (say income from wealth), and  $s_i$  is the share of the individual component in aggregate LIMEW (see, Kakwani 1977). The results of the decomposition are shown in table 15.

The level of inequality in HBAI and ROI can be seen as resulting from two counteracting influences: the positive and large contribution to inequality stemming from base income (primarily consisting of earnings), which exceeded the total amount of inequality in both years, and the negative contribution to inequality due to net government expenditures. In contrast, base income accounts only for roughly two-thirds of the total inequality in LIMEW, primarily because

of the inclusion of household production, which accounts for roughly 33–38 percent of total inequality in LIMEW. The share of base income in total inequality tends to be lower in LIMEW because income from wealth is reckoned as imputed rent plus annuitized value of nonhome wealth in LIMEW rather than as actual property income in the official measures. Our approach entailed a much larger share of income from wealth in total economic well-being as well as in total inequality. The overall level of inequality is thus the result of the counteracting influences of the positive contributions made by base income, income from wealth, and household production on the one hand, and the negative contribution made by net government expenditures on the other.

It is worthwhile to examine the role of net government expenditures in the inequality in the three measures a little closer because of the usual importance attached to it as an index of the redistributive effect of government social expenditures and taxation. In all three measures, net government expenditures contribute toward reducing the level of inequality as its contribution is negative. However, the inequality-reducing effect was lower in 2005 than 1995, especially according to ROI and LIMEW (figure 6). Most of the reduction appeared to have been due to the change in the distributional impact of expenditures (sum of cash benefits, in-kind benefits, and public consumption). Government expenditures as a whole made a positive contribution to total inequality in ROI and LIMEW, and, the amount of such contribution was notably higher in 2005 than 1995. The change in the distributional effect of taxes was also regressive because taxes also took a lower bite out of inequality in 2005 than 1995.

Our estimates also show that the inequality-reducing effect of net government expenditures was much lower in LIMEW than in the official measures. Since the overwhelming portion of the inequality reduction associated with net government expenditures was due to taxes, particularly direct taxes, it stands to reason that a major part of the difference is attributable to the variation across measures in the distributional impact of taxes. The lower redistributive impact of taxes in LIMEW was due to the fact the latter includes household production and, to a lesser extent, imputed rent and the annuitized value of nonhome wealth. Both household production and imputed income from wealth are, obviously, not subject to taxation. Their inclusion in LIMEW therefore tends to lower the concentration coefficient of taxes in LIMEW relative to ROI and HBAI (e.g., the concentration coefficient of direct taxes in HBAI, ROI, and LIMEW were, respectively, 0.56, 0.51, and 0.41 in 2005). The inclusion also



has the effect of lowering the share of taxes in the overall measure (e.g., the share of direct taxes in HBAI, ROI, and LIMEW were, respectively, 0.29, 0.27, and 0.16 in 2005).

## 5 CONCLUSION

In this paper, we constructed and analyzed the level and distribution of economic well-being using the LIMEW, as well as two official measures, HBAI and ROI, used in the United Kingdom. The LIMEW is a more comprehensive measure of households' command over resources than the official measures. Our measure includes a broader estimate of government benefits because we went beyond the ROI definition and incorporated, *inter alia*, public expenditures on infrastructure, public safety, and personal social services. We also estimate a value of hours spent on household production, a component that is excluded in both HBAI and ROI. Further, we include estimates of long-run benefits from the ownership of wealth (other than homes) in the form of an imputed lifetime annuity, a procedure that, in our view, is superior to considering only current income from assets. We constructed LIMEW, HBAI, and ROI, and compared and contrasted these three measures for the overall population as well as several subpopulations and income groups for 1995 and 2005. Our findings, in general, suggest that the three measures differ considerably regarding the picture they offer regarding the level and distribution of well-being in Britain.

Between 1995 and 2005, the gain in economic well-being enjoyed by the average British household was only 23 percent according to the HBAI measure, while it was 35 percent according to the ROI measure. The LIMEW indicated a change of 32 percent. Apart from the differing rates of change, the sources of change in the economic well-being of the middle quintile appeared to be quite different across the measures. Base money income (consisting mainly of earnings) and net government expenditures each accounted for about one-third of the total growth in middle-class LIMEW, while most of the growth in the middle quintile of the official measures was due to the growth in base money income. The LIMEW thus suggests that the government played a greater role in promoting middle-class well-being. Several important aspects of disparities among population subgroups were also sensitive to the yardstick. Most notable among these was the much improved relative well-being of the elderly according LIMEW compared to the official measures. The difference is due to the fact that the official

measures do not adequately reflect the advantages from wealth ownership, while LIMEW attempts to account for it in the form of an imputed rent and the annuitized value of nonhome wealth. We also found that the Gini coefficient of the HBAI measure was considerably higher than that of ROI and LIMEW. This reflects the equalizing effects of public consumption, health expenditures, and household production. Our estimates also indicated that the redistributive effect of net government expenditures decreased notably between 1995 and 2005 according to the broader measures, primarily due to the change in the distributive impact of government expenditures.

Several of the findings reported here deserve further scrutiny, a task that we expect to undertake in future work. For example, it would be instructive to examine the relative importance of the different components of LIMEW in shaping subgroup disparities. An unavoidable part of constructing measures of economic well-being is that one needs to choose among assumptions that are arguably equally tenable. For example, it could be argued that the imputed return on home equity is a better measure of the advantage of homeownership than the imputed rent, our chosen assumption. Indeed, whether alternative assumptions would make any substantive difference in terms of the major findings regarding the level and distribution of economic well-being can only be ascertained via sensitivity analysis. Given the additively decomposable nature of LIMEW, such sensitivity analyses are relatively easier to conduct within our framework.

## REFERENCES

- Canberra Group. 2001. *Expert Group on Household Income Statistics: Final Report and Recommendations*. Ottawa: Canberra Group.
- Department for Work and Pensions. 2010. *Households Below Average Income, 1994/95–2008/09* [computer file], 4th edition. Colchester, UK: UK Data Archive.
- Department for Work and Pensions, National Centre for Social Research, and Office for National Statistics. 2007. *Social and Vital Statistics Division, Family Resources Survey, 2005–2006* [computer file]. Colchester, UK: UK Data Archive.
- Department for Work and Pensions, National Centre for Social Research, and Office for National Statistics. 2005. *Social and Vital Statistics Division, Family Resources Survey, 1995—2006* Colchester, Essex: UK Data Archive.
- Harris, T. 1997. “The effects of taxes and benefits upon household income, 1995–96.” *Economic Trends* 520: 26–59.
- Hicks, Ursula K. 1946. “The Terminology of Tax Analysis.” *The Economic Journal* 56(221): 38–50.
- HM Treasury. 2008. “Public expenditure statistical analyses 2008.” London: The Stationery Office.
- HM Treasury. 2005. “Public expenditure statistical analyses 2005.” London: The Stationery Office.
- International Monetary Fund. 2010. “International Financial Statistics.” ESDS International, University of Manchester.
- Ipsos-RSL and Office for National Statistics. 2003. *United Kingdom Time Use Survey, 2000* [computer file], 3rd edition. Colchester, Essex: UK Data Archive.
- Jones, Fred. 2007. *The Effects of Taxes and Benefits on Household Income, 2005/06*. Social Analysis and Reporting Division Office, Office of National Statistics (United Kingdom). Available at: [www.ons.gov.uk](http://www.ons.gov.uk).
- Kakwani, Nanak C. 1977. “Applications of Lorenz Curves in Economic Analysis.” *Econometrica* 45(3): 719–727.
- Kum, Hyunsub, and Thomas Neal Masterson. 2010. “Statistical matching using propensity scores: Theory and application to the analysis of the distribution of income and wealth.” *Journal of Economic and Social Measurement* 35(3): 177–196.
- Kuznets, Simon, Lillian Epstein, and Elizabeth Jenks. 1941. *National Income and Its Composition, 1919–1938*. New York: National Bureau of Economic Research.

- Lakin, Caroline. 2002. "The Effects of Taxes and Benefits on Household Income, 2000–01." Social Analysis and Reporting Division, Office for National Statistics, UK Available at: <http://www.statistics.gov.uk/>.
- Landefeld, J Steven, and Stephanie H McCulla. 2000. "Accounting for Nonmarket Household Production within a National Accounts Framework." *Review of Income and Wealth* 46(3): 289–307.
- National Research Council. 2005. *Beyond the Market: Designing Nonmarket Accounts for the United States. Panel to Study the Design of Nonmarket Accounts*. K.G. Abraham and C. Mackie (eds.), Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- Office for National Statistics. 2010. *Annual Abstract of Statistics, 2010* [computer file]. London: Office for National Statistics.
- Office for National Statistics. 2004. *Annual Abstract of Statistics, 2004* [computer file]. London: Office for National Statistics.
- Office for National Statistics. n.d. *Social and Vital Statistics Division and Northern Ireland Statistics and Research Agency*. Central Survey Unit, Labour Force Survey 1995 and 2005 Colchester, Essex: UK Data Archive [distributor]
- Office of Population Censuses and Surveys. 1998. *Social Survey Division, OPCS Omnibus Survey, Time Use Module, May 1995* [computer file]. Colchester, Essex: UK Data Archive.
- Ruggles, P., and M. O'Higgins. 1981. "The distribution of public expenditure among households in the United States." *Review of Income and Wealth* 27(2): 137.
- University of Essex. 2010. *Institute for Social and Economic Research, British Household Panel Survey: Waves 1–18, 1991–2009* [computer file], 7th edition. Colchester, Essex: UK Data Archive.
- Wolff, Edward N., and Ajit Zacharias. 2009. "Household wealth and the measurement of economic well-being in the United States." *Journal of Economic Inequality* 7(2): 83–115.
- Wolff, Edward N., and Ajit Zacharias. 2007. "The Distributional Consequences of Government Spending and Taxation in the US, 1989 and 2000." *Review of Income and Wealth* 53(4): 692–715.
- Yeung, W. Jean, and Frank Stafford. 2003. "Intra-family Child Care Time Allocation: Stalled Revolution or Road to Equality." mimeo. New York: New York University.

## TABLES AND FIGURES

**Table 1: Estimation Of LIMEW For Britain: An Overview**

Line no.	Item	Source
1	Gross money income (MI)	FRS
2	<i>Less:</i>	
3	Government cash transfers	FRS
4	Property income	FRS
5	<i>Equals:</i>	
6	Base money income	FRS
7	<i>Plus:</i>	
8	Employer contributions for NHS	FRS and supplementary information
9	<i>Equals:</i>	
10	Base income	
11	<i>Plus:</i>	
12	Imputed rent on homes	Statistical matching of FRS and BHPS; and, national accounts
13	Annuitized value of:	
14	Equity in real estate (other than homes)	Statistical matching of FRS and BHPS; and, supplementary information on life expectancy and rates of return
15	Liquid assets	
16	Financial assets	
17	<i>Less:</i>	
18	Annuitized value of debt	
19	<i>Plus:</i>	
20	Government transfers	FRS and national accounts
21	Public consumption	FRS, national accounts and supplementary information
22	<i>Less:</i>	
23	Income taxes	FRS, national accounts and supplementary information
24	Employee portion of payroll taxes	
25	Employer contributions for NHS	
26	Property taxes on homes	
27	Consumption taxes	FRS and FES
28	<i>Plus:</i>	
29	Value of household production	Statistical matching of FRS and time-use surveys
30	<i>Equals:</i>	
31	LIMEW	

**Key:** FRS = Family Resources Survey; BHPS = British Household Panel Survey; FES = Family Expenditure Survey

**Table 2: Mean Values of Components of Net Worth and Income from Wealth in 2010 Pounds, 1995 and 2005**

	1995		2005		Change 1995 - 2005	
	Stocks	Annuities	Stocks	Annuities	Stocks	Annuities
<b>Primary residence</b>	£ 74,773	£ 2,351	£ 174,149	£ 3,629	132.9%	54.3%
<b>Debt on primary residence</b>	£ 22,928	£ 1,579	£ 39,333	£ 2,640	71.5%	67.2%
<b>Income from home wealth</b>		£ 772		£ 988		27.9%
<b>Other real estate</b>	£ 5,240	£ 378	£ 11,791	£ 786	125.0%	108.0%
<b>Liquid assets</b>	£ 12,162	£ 823	£ 14,553	£ 872	19.7%	5.9%
<b>Financial assets</b>	£ 14,035	£ 1,029	£ 13,068	£ 965	-6.9%	-6.2%
<b>Other debt</b>	£ 2,035	£ 138	£ 4,637	£ 302	127.9%	118.6%
<b>Income from nonhome wealth</b>		£ 2,092		£ 2,321		10.9%
<b>Income from wealth</b>		£ 2,864		£ 3,310		15.5%
<b>Net worth</b>	£ 81,247		£ 169,591		108.7%	

**Table 3: Expenditures on Government Transfers in Great Britain in Current Million Pounds, 1995 and 2005**

	1995-96		2005-06		1995-96	2005-06
	FRS Total	PESA Total	FRS Total	PESA Total	FRS/PESA	FRS/PESA
<b>Cash Benefits</b>	73,665	86,784	113,626	139,371	85%	82%
<i>Contributory benefits</i>	37,123	40,721	56,733	69,010	91%	82%
Job Seeker's Allowance *	1,338	1,536	2,238	2,516	87%	89%
Incapacity Benefit	6,817	6,870	6,102	7,078	99%	86%
Retirement Pension (basic)	27,576	30,067	47,439	56,747	92%	84%
Widow's Benefits	856	1,016	737	1,092	84%	68%
Maternity Allowance #	536	1,231	216	1,577	44%	14%
<i>Non-contributory, non-means-tested benefits</i>	13,344	16,636	31,872	40,668	80%	78%
Child Benefit **	6,501	7,190	17,889	22,304	90%	80%
Attendance Allowance	1,686	2,948	2,395	3,919	57%	61%
Disability Living Allowance	2,937	3,124	6,488	8,604	94%	75%
Severe Disablement Allowance	595	672	433	894	88%	48%
Invalid Care Allowance	499	782	896	1,149	64%	78%
Industrial Injuries Disablement Benefit	558	703	402	828	79%	49%
War Pension	568	1,216	640	983	47%	65%
Winter Fuel Payment			2,727	1,988		137%
<i>Non-contributory, means-tested benefits</i>	23,198	29,427	25,021	29,693	79%	84%
Income Support ***	14,104	18,064	13,722	15,644	78%	88%
Housing Benefit	9,094	11,363	11,299	14,049	80%	80%
<b>Non Cash Benefits (Benefits in Kind)</b>		44,310		104,846		
<i>Personal social services</i>		7,351		20,891		
Sickness and Disability		1,796		5,227		
Old Age		3,075		8,630		
Family and Children		2,448		6,199		
Unemployment		33		835		
<i>Health Expenditures</i>		36,959		83,956		

\* includes unemployment and training

\*\* includes child tax credit in 2005

\*\*\* includes Minimum Income Guarantee, Pension Credit, Family Credit, and Tax Credit

# Maternity Allowance expenditures calculated from FRS are not used for alignment

**Table 4: Tax Rates and Allowances in the United Kingdom**

	1995	2005
<b>Income Tax</b>		
<i>Bands (in Pounds)</i>		
Lower Band	1-3,200	1-2,090
Middle Band	3,201-24,300	2,091-32,400
Higher Band	Over 24,300	Over 32,400
<i>Rates (except Dividend and Savings Income)</i>		
Lower Rate	20%	10%
Middle Rate	25%	22%
Higher Rate	40%	40%
<i>Dividend Income</i>		
Lower Rate	20%	10%
Higher Rate	20%	32.50%
<i>Savings Income</i>	No separate rate	20%
<b>Allowances</b>		
Personal	3,525	4,895
Married Couple	1,720	-
Blind Persons	1,200	1,610
65-74	4,630	7,090
75+	4,800	7,220
65-74 (Married Couple)	2,995	5,905
75+ (Married Couple)	3,035	5,975
Income Limit	14,600	19500

Note 1: Married couple allowance is 15% up to the amount noted in 95-96 and 10% up to the amount in 05-06.

Note 2: Allowance is reduced by 1 pound for each 2 pounds over the income limit



**Table 4 (Continued): Tax Rates and Allowances in the United Kingdom**

<b>National Insurance</b>	<b>1995</b>	<b>2005</b>
Lower earnings limit	58	82
Upper earnings limit	440	630
Primary threshold (employees) (£ per week)	-	94
Secondary threshold (employers) (£ per week)	-	94
<i>Class 1 employee contracted in</i>		
Rate at LEL (%)	2%	0%
Main rate(s)b (%)	10%	11%
Rate above UEL (%)	0%	1%
<i>Class 1 employer contracted in</i>		
Rate at LEL (%)	3%	0%
Main rate(s) (%)	10.20%	12.80%
Rate above UEL (%)	10.20%	12.80%
<i>Class 1 contracted out rebate</i>		
Employee (% pts.)	1.80%	1.60%
Employer(% pts.)	3.00%	3.50%
<b>National Insurance (self employed)</b>		
Lower profit limit (£ per annum)	6,640	4,895
Upper profit limit (£ per annum)	22,880	32,760
Class 2 rate (£ per week)	5.75	2.1
<i>Class 4 rates</i>		
Between LPL and UPL	7.30%	8%
Above UPL	0%	1%

**Table 5: Total Taxes Collected by the United Kingdom Government in Current Million Pounds, 1995 and 2005**

Tax Type	1995-96		2005-06		1995-96	2005-06
	FRS Total	ONS Total	FRS Total	ONS Total	FRS/ONS	FRS/ONS
Income Tax	73,081	73,474	121,963	128,098	99%	95%
Council Tax	9,225	9,107	21,564	21,114	101%	102%
NI (Employee's Contribution)	18,558	18,511	34,005	34,810	100%	98%
NI (Self Employed)	1,779	1,553	406	3,150	115%	13%
NI (Employer's Contribution)	27,789	24,042	42,594	46,824	116%	91%
Total Direct Taxes	102,643	102,644	177,939	187,172	100%	95%
Total Indirect Taxes		58,319		88,465		
Total Taxes (direct+indirect+employers' ni)		185,006		322,461		

**Table 6: Value of Household Production in 2010 Pounds and Work Hours, 1995 and 2005 (Mean values per household)**

	1995	2005 Change	
Value of Household Production	9,030	14,403	60%
Annual Total Work Hours	4,158	4,525	9%
Annual Market Work Hours	1,964	2,155	10%
Annual Household Production Hours	2,189	2,369	8%

**Table 7: Alternative Measures of Economic Well-Being, Great Britain**

	HBAI	ROI	LIMEW
Base money income	✓	✓	✓
Employers' NH contributions	✗	✗	✓
Income from wealth	Property income	Property income	Imputed rent and annuities
Cash benefits (transfers)	Cash benefits	Cash benefits	Cash transfers (PESA aligned)
Direct taxes <sup>1</sup>	✓	✓	✓
Other deductions <sup>2</sup>	✓	✗	✗
In-kind benefits (noncash transfers)			
Food, nutrition etc. <sup>3</sup>	✓	✓	✓
Health	✗	✓	✓
Other <sup>4</sup>	✗	✗	✓
Indirect taxes			
VAT, duties etc. <sup>5</sup>	✗	✓	✓
Other <sup>6</sup>	✗	✓	✓
Public consumption			
Education	✗	✓	✓
Housing subsidy	✗	✓	✓
Other public services	✗	✗	✓
Household production	✗	✗	✓
<b>Total</b>	Disposable income	Final income	LIMEW

1. Direct taxes is the sum of income tax, council tax and employee's portion of NI tax.

2. Includes payments of education loans, own' contributions to private pension plan, payments to children living outside the household, and maintenance and alimony payments.

3. Cash value of free school meals, free welfare milk and free school milk and free TV license for those aged 75 and over.

4. Personal social services include non-cash benefits to families and children, disabled, old-aged, and unemployed.

5. Other items included in this line are TV licenses, betting taxes, insurance premium taxes, and Camelot National Lottery Fund.

6. This item consists of employer's NH contributions in LIMEW. In ROI, this item consists of employer's NI contributions and commercial and industrial rates as a form of intermediate taxes.

**Table 8: Economic Well-Being and Work, 1995–2005**

**Median values in 2010 constant pounds**

<b>Alternative Measures</b>	<b>1995</b>	<b>2005</b>	<b>1995-2005</b>
LIMEW	£ 36,470	£ 48,145	2.82%
HBAI	£ 18,518	£ 22,822	2.11%
ROI	£ 19,077	£ 25,794	3.06%
<i>Addendum A: Weekly hours of work (median values)</i>			
Market work	37	40	0.78%
Housework	37	42	1.38%
Total	75	80	0.59%
<i>Addendum B: Equivalence scale adjustment</i>			
Equivalent LIMEW	£ 35,164	£ 47,013	2.95%
Equivalent HBAI	£ 17,748	£ 22,537	2.42%
Equivalent ROI	£ 19,000	£ 25,893	3.14%
<i>Addendum C: Real per capita amounts</i>			
GDP	£ 18,951	£ 24,245	2.49%
LIMEW (mean value)	£ 17,103	£ 22,577	2.82%
HBAI (mean value)	£ 9,212	£ 11,753	2.47%
ROI (mean value)	£ 9,467	£ 12,841	3.10%

Source: Authors' calculations

**Table 9: Components of Economic Well-Being, 1995–2005**

Mean values	1995			2005		
	HBAI	ROI	LIMEW	HBAI	ROI	LIMEW
Base money income	£ 24,724	£ 24,724	£ 24,724	£ 31,122	£ 31,122	£ 31,122
Employers' NH contributions			£ 136			£ 319
Income from wealth	£ 879	£ 879	£ 2,864	£ 892	£ 892	£ 3,309
Cash benefits (transfers)	£ 4,733	£ 4,733	£ 5,572	£ 5,343	£ 5,343	£ 6,537
Direct taxes <sup>1</sup>	-£ 6,565	-£ 6,565	-£ 6,590	-£ 8,296	-£ 8,296	-£ 8,626
Other deductions <sup>2</sup>	-£ 912			-£ 554		
In-kind benefits (noncash transfers)	£ 23	£ 2,396	£ 2,844	£ 16	£ 3,955	£ 4,919
Food, nutrition etc. <sup>3</sup>	£ 23	£ 23		£ 16	£ 16	
Health		£ 2,373	£ 2,373		£ 3,939	£ 3,939
Other <sup>4</sup>			£ 471			£ 979
Indirect taxes		-£ 4,811	-£ 4,058		-£ 5,281	-£ 4,370
VAT, duties etc. <sup>5</sup>		-£ 3,894	-£ 3,922		-£ 4,284	-£ 4,051
Other <sup>6</sup>		-£ 917	-£ 136		-£ 997	-£ 319
Public consumption		£ 2,158	£ 3,449		£ 3,426	£ 4,795
Education		£ 1,987	£ 1,987		£ 2,991	£ 2,991
Housing subsidy		£ 84	£ 84		£ 282	£ 282
Other public services		£ 87	£ 1,378		£ 153	£ 1,522
Household production			£ 13,542			£ 16,774
<b>Total</b>	£ 22,883	£ 23,515	£ 42,483	£ 28,523	£ 31,161	£ 54,780

1. Direct taxes is the sum of income tax, council tax and employee's portion of NI tax.

2. Includes payments of education loans, own' contributions to private pension plan, payments to children living outside the household, and maintenance and alimony payments.

3. Cash value of free school meals, free welfare milk and free school milk and free TV licence for those aged 75 and over.

4. Personal social services include non-cash benefits to families and children, disabled, old-aged, and unemployed.

5. Other items included in this line are TV licences, betting taxes, insurance premium taxes, and Cemlot National Lottery Fund.

6. This item consists of employer's NH contributions in LIMEW. In ROI, this item consists of employer's NI contributions and commercial and industrial rates as a form of intermediate taxes.

**B. Percent share**

	HBAI	ROI	LIMEW	HBAI	ROI	LIMEW
Base money income	108%	105%	58%	109%	100%	57%
Employers' NH contributions	0%	0%	0%	0%	0%	1%
Income from wealth	4%	4%	7%	3%	3%	6%
Cash benefits (transfers)	21%	20%	13%	19%	17%	12%
Direct taxes <sup>1</sup>	29%	28%	16%	29%	27%	16%
Other deductions <sup>2</sup>	4%			2%		
In-kind benefits (noncash transfers)	0%	10%	7%	0%	13%	9%
Food, nutrition etc. <sup>3</sup>	0%	0%		0%	0%	
Health		10%	6%		13%	7%
Other <sup>4</sup>			1%			2%
Indirect taxes		20%	10%		17%	8%
VAT, duties etc. <sup>5</sup>		17%	9%		14%	7%
Other <sup>6</sup>		4%	0%		3%	1%
Public consumption		9%	8%		11%	9%
Education		8%	5%		10%	5%
Housing subsidy		0%	0%		1%	1%
Other public services		0%	3%		0%	3%
Household production			32%			31%
<b>Total</b>	100%	100%	100%	100%	100%	100%

C. Contribution to Growth in LIMEW mean value by component (in percentage points)			
	1995-2005		
	HBAI	ROI	LIMEW
Base money income	28%	27%	15%
Employers' NH contributions			0%
Income from wealth	0%	0%	1%
Cash benefits (transfers)	3%	3%	2%
Direct taxes <sup>1</sup>	8%	7%	5%
Other deductions <sup>2</sup>	-2%		
In-kind benefits (noncash transfers)	0%	7%	5%
Food, nutrition etc. <sup>3</sup>	0%	0%	
Health		7%	4%
Other <sup>4</sup>			1%
Indirect taxes		2%	1%
VAT, duties etc. <sup>5</sup>		2%	0%
Other <sup>6</sup>		0%	0%
Public consumption		5%	3%
Education		4%	2%
Housing subsidy		1%	0%
Other public services		0%	0%
Household production			8%
<b>Total</b>	<b>25%</b>	<b>33%</b>	<b>29%</b>

**Table 10: Components of Measures of Economic Well-Being for Middle-Class Households, Great Britain, 1995–2005**

A. Mean values

	1995			2005		
	HBAI	ROI	LIMEW	HBAI	ROI	LIMEW
Base money income	£ 16,950	£ 17,100	£ 19,767	£ 21,062	£ 22,340	£ 23,683
Employers' NH contributions			£ 105			£ 226
Income from wealth	£ 637	£ 694	£ 2,051	£ 607	£ 695	£ 2,443
Cash benefits (transfers)	£ 5,525	£ 5,503	£ 5,959	£ 6,455	£ 6,237	£ 7,439
Direct taxes <sup>1</sup>	-£ 3,992	-£ 4,071	-£ 4,842	-£ 4,966	-£ 5,326	-£ 5,989
Other deductions <sup>2</sup>	-£ 556			-£ 291		
In-kind benefits (noncash transfers)	£ 46	£ 2,830	£ 2,985	£ 29	£ 4,453	£ 5,221
Food, nutrition etc. <sup>3</sup>	£ 46	£ 35		£ 29	£ 16	
Health		£ 2,796	£ 2,471		£ 4,436	£ 4,122
Other <sup>4</sup>			£ 514			£ 1,099
Indirect taxes		-£ 4,468	-£ 3,910		-£ 4,906	-£ 4,031
VAT, duties etc. <sup>5</sup>		-£ 3,911	-£ 3,806		-£ 4,285	-£ 3,805
Other <sup>6</sup>		-£ 557	-£ 105		-£ 621	-£ 226
Public consumption		£ 1,604	£ 2,818		£ 2,415	£ 4,203
Education		£ 1,420	£ 1,546		£ 1,993	£ 2,442
Housing subsidy		£ 104	£ 85		£ 283	£ 297
Other public services		£ 79	£ 1,187		£ 139	£ 1,464
Household production			£ 11,645			£ 15,037
<b>Total</b>	£ 18,610	£ 19,192	£ 36,577	£ 22,895	£ 25,909	£ 48,232

1. Direct taxes is the sum of income tax, council tax and employee's portion of NI tax.
2. Includes payments of education loans, own' contributions to private pension plan, payments to children living outside the household, and maintenance and alimony payments.
3. Cash value of free school meals, free welfare milk and free school milk and free TV licence for those aged 75 and over.
4. Personal social services include non-cash benefits to families and children, disabled, old-aged, and unemployed.
5. Other items included in this line are TV licences, betting taxes, insurance premium taxes, and Camelot National Lottery Fund.
6. This item consists of employer's NH contributions in LIMEW. In ROI, this item consists of employer's NI contributions and commercial and industrial rates as a form of intermediate taxes.

B. Percent share

	HBAI	ROI	LIMEW	HBAI	ROI	LIMEW
Base money income	91%	89%	54%	92%	86%	49%
Employers' NH contributions	0%	0%	0%	0%	0%	0%
Income from wealth	3%	4%	6%	3%	3%	5%
Cash benefits (transfers)	30%	29%	16%	28%	24%	15%
Direct taxes <sup>1</sup>	21%	21%	13%	22%	21%	12%
Other deductions <sup>2</sup>	3%			1%		
In-kind benefits (noncash transfers)	0%	15%	8%	0%	17%	11%
Food, nutrition etc. <sup>3</sup>	0%	0%		0%	0%	
Health		15%	7%		17%	9%
Other <sup>4</sup>			1%			2%
Indirect taxes		23%	11%		19%	8%
VAT, duties etc. <sup>5</sup>		20%	10%		17%	8%
Other <sup>6</sup>		3%	0%		2%	0%
Public consumption		8%	8%		9%	9%
Education		7%	4%		8%	5%
Housing subsidy		1%	0%		1%	1%
Other public services		0%	3%		1%	3%
Household production			32%			31%
<b>Total</b>	100%	100%	100%	100%	100%	100%

C. Contribution to Growth in LIMEW mean value by component (in percentage points)  
1995-2005

	HBAI	ROI	LIMEW
Base money income	22%	27%	11%
Employers' NH contributions			0%
Income from wealth	0%	0%	1%
Cash benefits (transfers)	5%	4%	4%
Direct taxes <sup>1</sup>	5%	7%	3%
Other deductions <sup>2</sup>	-1%		
In-kind benefits (noncash transfers)	0%	8%	6%
Food, nutrition etc. <sup>3</sup>	0%	0%	
Health		9%	5%
Other <sup>4</sup>			2%
Indirect taxes		2%	0%
VAT, duties etc. <sup>5</sup>		2%	0%
Other <sup>6</sup>		0%	0%
Public consumption		4%	4%
Education		3%	2%
Housing subsidy		1%	1%
Other public services		0%	1%
Household production			9%
<b>Total</b>	<b>23%</b>	<b>35%</b>	<b>32%</b>



**Table 11: Measures of Economic Well-Being by Economic Status of Household in 2010 Pounds, Great Britain, 1995–2005**

	1995 (mean)						2005 (mean)					
	HBAI	ROI	limew	eqhbai	eqroi	eqlimew	HBAI	ROI	limew	eqhbai	eqroi	eqlimew
<b>A. Mean Values</b>												
Single/couple one or more FT self-employed	£ 30,780	£ 31,270	£ 52,452	£ 25,961	£ 25,970	£ 42,734	£ 36,763	£ 39,677	£ 64,632	£ 31,469	£ 33,085	£ 53,137
Single/couple all in FT work	£ 31,185	£ 29,782	£ 41,652	£ 30,942	£ 29,188	£ 39,942	£ 38,137	£ 37,492	£ 53,519	£ 38,313	£ 36,969	£ 51,978
Couple, one FT, one PT work	£ 33,210	£ 34,080	£ 57,616	£ 25,523	£ 25,898	£ 43,552	£ 40,715	£ 44,327	£ 69,698	£ 31,755	£ 34,013	£ 53,318
Couple, one FT work, one not working	£ 28,265	£ 28,751	£ 54,550	£ 22,715	£ 22,768	£ 42,948	£ 34,434	£ 38,056	£ 72,097	£ 27,882	£ 30,164	£ 57,092
Single/couple no FT, one or more PT work	£ 19,900	£ 20,485	£ 40,912	£ 18,778	£ 19,038	£ 37,463	£ 24,316	£ 28,193	£ 50,744	£ 23,288	£ 26,156	£ 46,525
Workless, head or spouse aged 60 or over	£ 13,259	£ 14,912	£ 33,951	£ 15,328	£ 17,731	£ 39,173	£ 16,523	£ 19,775	£ 45,895	£ 19,493	£ 23,406	£ 53,323
Workless, head or spouse unemployed	£ 11,447	£ 13,173	£ 33,632	£ 10,821	£ 11,822	£ 29,670	£ 11,564	£ 16,840	£ 40,159	£ 10,861	£ 14,906	£ 36,669
Workless, other inactive	£ 14,081	£ 15,948	£ 33,473	£ 13,879	£ 15,115	£ 31,099	£ 15,356	£ 20,818	£ 43,529	£ 15,275	£ 19,564	£ 41,236
All	£ 22,883	£ 23,515	£ 42,483	£ 21,392	£ 21,886	£ 39,191	£ 28,523	£ 31,161	£ 54,780	£ 27,103	£ 29,123	£ 51,331
	1995 (median)						2005 (median)					
<b>B. Median Values</b>												
Single/couple one or more FT self-employed	£ 25,044	£ 25,657	£ 44,301	£ 21,035	£ 21,152	£ 36,394	£ 28,966	£ 32,954	£ 56,790	£ 25,075	£ 27,306	£ 45,938
Single/couple all in FT work	£ 28,643	£ 26,831	£ 36,434	£ 28,219	£ 26,466	£ 35,987	£ 33,766	£ 32,475	£ 46,817	£ 34,120	£ 33,065	£ 47,543
Couple, one FT, one PT work	£ 29,308	£ 31,109	£ 51,951	£ 22,555	£ 23,183	£ 39,230	£ 35,542	£ 40,917	£ 64,051	£ 27,805	£ 30,539	£ 48,742
Couple, one FT work, one not working	£ 23,948	£ 25,036	£ 48,664	£ 19,879	£ 20,122	£ 38,529	£ 28,352	£ 33,174	£ 64,632	£ 23,191	£ 26,438	£ 51,356
Single/couple no FT, one or more PT work	£ 15,842	£ 17,068	£ 35,714	£ 15,025	£ 16,343	£ 32,785	£ 19,708	£ 24,288	£ 44,547	£ 18,710	£ 23,384	£ 41,746
Workless, head or spouse aged 60 or over	£ 10,626	£ 13,240	£ 28,571	£ 13,134	£ 16,120	£ 34,972	£ 13,998	£ 17,827	£ 39,105	£ 17,401	£ 22,057	£ 48,956
Workless, head or spouse unemployed	£ 10,402	£ 10,739	£ 27,928	£ 10,350	£ 11,195	£ 28,708	£ 9,992	£ 13,202	£ 34,780	£ 10,879	£ 14,009	£ 36,871
Workless, other inactive	£ 12,235	£ 13,668	£ 28,057	£ 12,254	£ 13,841	£ 29,081	£ 13,323	£ 16,409	£ 38,268	£ 14,010	£ 18,707	£ 41,146
All	£ 18,518	£ 19,077	£ 36,470	£ 17,748	£ 19,000	£ 35,164	£ 22,822	£ 25,794	£ 48,145	£ 22,537	£ 25,893	£ 47,013
	1995 (mean ratios)						2005 (mean ratios)					
<b>C. Mean Ratios</b>												
Single/couple one or more FT self-employed	1.345	1.330	1.235	1.214	1.187	1.090	1.289	1.273	1.180	1.161	1.136	1.035
Single/couple all in FT work	1.363	1.267	0.980	1.446	1.334	1.019	1.337	1.203	0.977	1.414	1.269	1.013
Couple, one FT, one PT work	1.451	1.449	1.356	1.193	1.183	1.111	1.427	1.423	1.272	1.172	1.168	1.039
Couple, one FT work, one not working	1.235	1.223	1.284	1.062	1.040	1.096	1.207	1.221	1.316	1.029	1.036	1.112
Single/couple no FT, one or more PT work	0.870	0.871	0.963	0.878	0.870	0.956	0.853	0.905	0.926	0.859	0.898	0.906
Workless, head or spouse aged 60 or over	0.579	0.634	0.799	0.717	0.810	1.000	0.579	0.635	0.838	0.719	0.804	1.039
Workless, head or spouse unemployed	0.500	0.560	0.792	0.506	0.540	0.757	0.405	0.540	0.733	0.401	0.512	0.714
Workless, other inactive	0.615	0.678	0.788	0.649	0.691	0.794	0.538	0.668	0.795	0.564	0.672	0.803
	1995 (median ratios)						2005 (median ratios)					
<b>D. Median Ratios</b>												
Single/couple one or more FT self-employed	1.352	1.345	1.215	1.185	1.113	1.035	1.269	1.278	1.180	1.113	1.055	0.977
Single/couple all in FT work	1.547	1.406	0.999	1.590	1.393	1.023	1.480	1.259	0.972	1.514	1.277	1.011
Couple, one FT, one PT work	1.583	1.631	1.425	1.271	1.220	1.116	1.557	1.586	1.330	1.234	1.179	1.037
Couple, one FT work, one not working	1.293	1.312	1.334	1.120	1.059	1.096	1.242	1.286	1.342	1.029	1.021	1.092
Single/couple no FT, one or more PT work	0.856	0.895	0.979	0.847	0.860	0.932	0.864	0.942	0.925	0.830	0.903	0.888
Workless, head or spouse aged 60 or over	0.574	0.694	0.783	0.740	0.848	0.995	0.613	0.691	0.812	0.772	0.852	1.041
Workless, head or spouse unemployed	0.562	0.563	0.766	0.583	0.589	0.816	0.438	0.512	0.722	0.483	0.541	0.784
Workless, other inactive	0.661	0.716	0.769	0.690	0.728	0.827	0.584	0.636	0.795	0.622	0.723	0.875

**Table 12: Measures of Economic Well-Being by Family Type of Household in 2010 Pounds, Great Britain, 1995–2005**

	1995 (mean)						2005 (mean)					
	HBAI	ROI	limew	eqhbai	eqroi	eqlimew	HBAI	ROI	limew	eqhbai	eqroi	eqlimew
<b>A. Mean Values</b>												
Pensioner couple	£ 20,306	£ 20,108	£ 47,822	£ 18,849	£ 18,676	£ 44,376	£ 25,934	£ 28,422	£ 63,943	£ 24,310	£ 26,671	£ 60,267
Single male pensioner	£ 20,500	£ 21,531	£ 43,539	£ 19,337	£ 20,351	£ 41,416	£ 24,783	£ 27,908	£ 58,101	£ 22,450	£ 25,134	£ 52,703
Single female pensioner	£ 20,315	£ 21,349	£ 43,207	£ 18,709	£ 19,730	£ 39,875	£ 24,697	£ 27,515	£ 52,815	£ 23,071	£ 25,734	£ 49,314
Couple with children	£ 30,958	£ 34,196	£ 61,725	£ 21,967	£ 24,059	£ 43,255	£ 39,834	£ 47,763	£ 80,991	£ 28,355	£ 33,600	£ 56,955
Single with children	£ 20,178	£ 23,873	£ 43,495	£ 16,532	£ 19,402	£ 34,854	£ 20,230	£ 29,410	£ 49,223	£ 18,823	£ 26,804	£ 45,181
Working-age couple no children	£ 31,392	£ 28,899	£ 47,410	£ 28,323	£ 26,025	£ 42,330	£ 39,343	£ 37,384	£ 60,247	£ 35,630	£ 33,710	£ 53,957
Single male working-age no children	£ 15,235	£ 15,260	£ 23,275	£ 20,787	£ 20,653	£ 31,095	£ 18,742	£ 18,490	£ 29,254	£ 26,249	£ 25,720	£ 40,467
Single female working-age no children	£ 11,927	£ 14,000	£ 25,120	£ 15,767	£ 18,319	£ 33,176	£ 15,291	£ 16,597	£ 31,525	£ 21,777	£ 23,571	£ 44,915
All	£ 22,883	£ 23,515	£ 42,483	£ 21,392	£ 21,886	£ 39,191	£ 28,523	£ 31,161	£ 54,780	£ 27,103	£ 29,123	£ 51,331
<b>B. Median Values</b>												
Pensioner couple	£ 16,492	£ 16,548	£ 40,862	£ 15,698	£ 15,878	£ 38,621	£ 20,988	£ 24,599	£ 56,072	£ 20,370	£ 23,774	£ 54,166
Single male pensioner	£ 17,609	£ 19,593	£ 35,138	£ 17,394	£ 17,748	£ 34,251	£ 21,457	£ 24,595	£ 51,485	£ 21,024	£ 23,276	£ 48,310
Single female pensioner	£ 17,622	£ 19,743	£ 37,821	£ 16,932	£ 18,514	£ 36,125	£ 21,343	£ 25,167	£ 50,532	£ 20,632	£ 24,540	£ 48,718
Couple with children	£ 26,873	£ 30,616	£ 55,090	£ 19,152	£ 21,321	£ 38,758	£ 33,979	£ 42,804	£ 73,461	£ 24,228	£ 30,028	£ 51,213
Single with children	£ 17,825	£ 21,874	£ 40,321	£ 14,768	£ 18,231	£ 33,183	£ 18,263	£ 27,987	£ 46,335	£ 16,724	£ 26,614	£ 44,224
Working-age couple no children	£ 28,376	£ 25,428	£ 41,164	£ 25,656	£ 22,981	£ 37,630	£ 34,336	£ 32,206	£ 53,283	£ 31,321	£ 29,435	£ 48,589
Single male working-age no children	£ 11,609	£ 12,211	£ 18,529	£ 16,488	£ 17,664	£ 26,787	£ 14,254	£ 14,708	£ 23,995	£ 20,770	£ 21,742	£ 35,138
Single female working-age no children	£ 10,055	£ 12,355	£ 22,578	£ 13,098	£ 16,977	£ 30,366	£ 12,414	£ 14,816	£ 28,950	£ 18,335	£ 21,978	£ 42,785
All	£ 18,518	£ 19,077	£ 36,470	£ 17,748	£ 19,000	£ 35,164	£ 22,822	£ 25,794	£ 48,145	£ 22,537	£ 25,893	£ 47,013
<b>C. Mean Ratios</b>												
Pensioner couple	0.887	0.855	1.126	0.881	0.853	1.132	0.909	0.912	1.167	0.897	0.916	1.174
Single male pensioner	0.896	0.916	1.025	0.904	0.930	1.057	0.869	0.896	1.061	0.828	0.863	1.027
Single female pensioner	0.888	0.908	1.017	0.875	0.901	1.017	0.866	0.883	0.964	0.851	0.884	0.961
Couple with children	1.353	1.454	1.453	1.027	1.099	1.104	1.397	1.533	1.478	1.046	1.154	1.110
Single with children	0.882	1.015	1.024	0.773	0.886	0.889	0.709	0.944	0.899	0.694	0.920	0.880
Working-age couple no children	1.372	1.229	1.116	1.324	1.189	1.080	1.379	1.200	1.100	1.315	1.158	1.051
Single male working-age no children	0.666	0.649	0.548	0.972	0.944	0.793	0.657	0.593	0.534	0.968	0.883	0.788
Single female working-age no children	0.521	0.595	0.591	0.737	0.837	0.847	0.536	0.533	0.575	0.803	0.809	0.875
<b>D. Median Ratios</b>												
Pensioner couple	0.891	0.867	1.120	0.884	0.836	1.098	0.920	0.954	1.165	0.904	0.918	1.152
Single male pensioner	0.951	1.027	0.963	0.980	0.934	0.974	0.940	0.953	1.069	0.933	0.899	1.028
Single female pensioner	0.952	1.035	1.037	0.954	0.974	1.027	0.935	0.976	1.050	0.915	0.948	1.036
Couple with children	1.451	1.605	1.511	1.079	1.122	1.102	1.489	1.659	1.526	1.075	1.160	1.089
Single with children	0.963	1.147	1.106	0.832	0.960	0.944	0.800	1.085	0.962	0.742	1.028	0.941
Working-age couple no children	1.532	1.333	1.129	1.446	1.210	1.070	1.505	1.249	1.107	1.390	1.137	1.034
Single male working-age no children	0.627	0.640	0.508	0.929	0.930	0.762	0.625	0.570	0.498	0.922	0.840	0.747
Single female working-age no children	0.543	0.648	0.619	0.738	0.894	0.864	0.544	0.574	0.601	0.814	0.849	0.910

**Table 13: Share of Income Measures by Quintiles, Great Britain, 1995–2005**

	Quintile				
	1	2	3	4	5
<b>1995</b>					
HBAI	6.3	10.9	16.3	23.9	42.7
ROI	7.1	11.6	16.3	23.4	41.5
LIMEW	7.0	12.3	17.2	23.5	40.0
<b>2005</b>					
HBAI	5.8	10.9	16.1	23.4	43.9
ROI	6.7	11.7	16.6	23.5	41.5
LIMEW	7.0	12.6	17.6	23.6	39.1

Note: Quintiles for each income measure are defined with respect to that income measure.

**Table 14: Gini Coefficients, Great Britain, 1995–2005**

<b>A. All Households</b>	1995	2005	1995-2005
HBAI	36.7	38.2	1.5
ROI	34.4	34.9	0.5
LIMEW	33.0	32.3	-0.7
<i>Equivalence scale adjusted measures</i>			
Equivalent HBAI	31.7	33.5	1.8
Equivalent ROI	28.0	27.6	-0.4
Equivalent LIMEW	25.4	24.4	-1.0
<b>B. Family Households</b>			
HBAI	31.2	33.8	2.5
ROI	30.3	29.4	-0.9
LIMEW	26.6	25.7	-0.9
<i>Equivalence scale adjusted measures</i>			
Equivalent HBAI	30.4	32.5	2.1
Equivalent ROI	28.1	26.1	-2.0
Equivalent LIMEW	23.7	22.4	-1.3

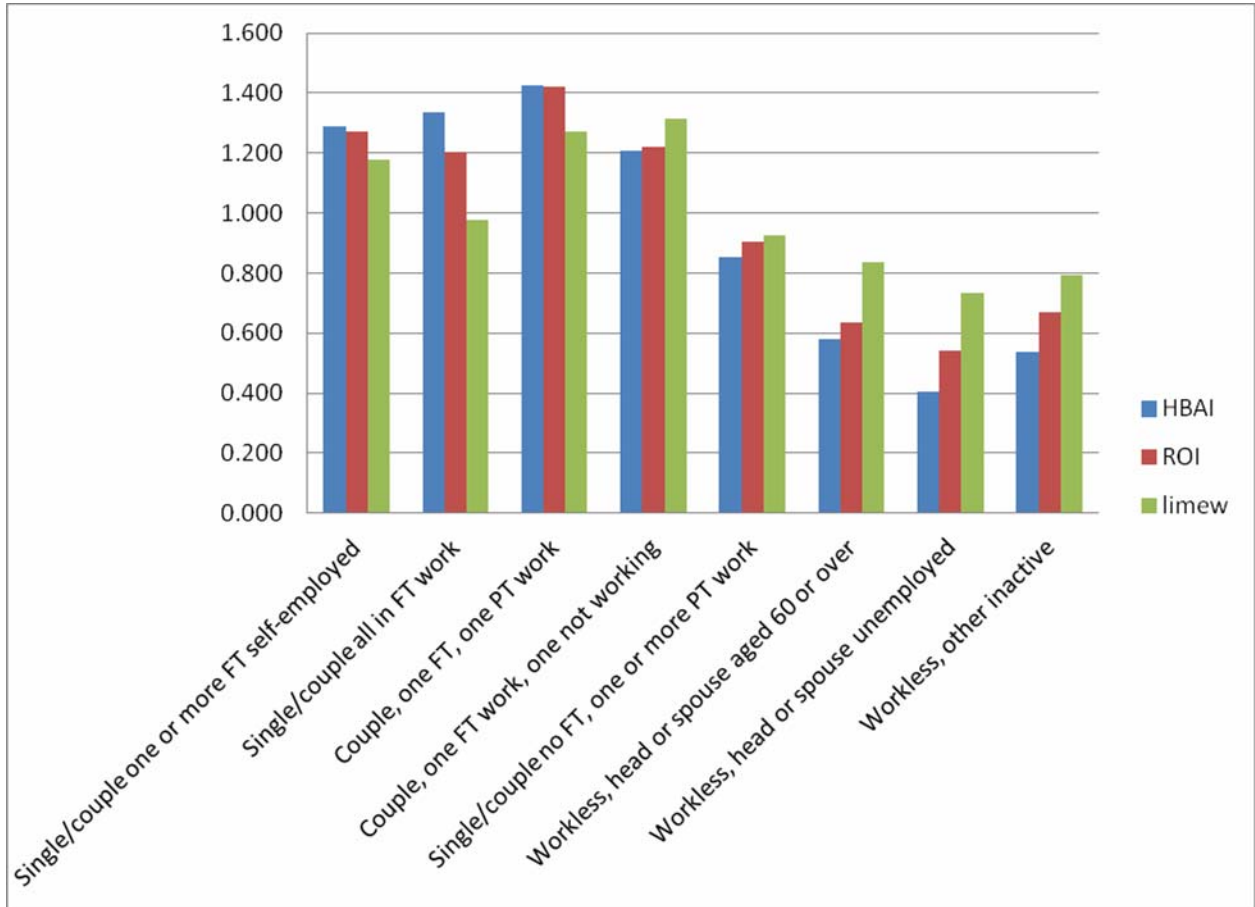
**Table 15: Decomposition of Inequality by Source and Measure**

	1995			2005		
	Concentration coefficient	Income share	Contribution to inequality	Concentration coefficient	Income share	Contribution to inequality
<b>HBAI</b>						
Base income	0.529	1.041	0.551	0.524	1.072	0.562
Income from wealth	0.440	0.038	0.017	0.466	0.031	0.015
Net government expenditures		-0.079	-0.201		-0.103	-0.195
Cash benefits	-0.193	0.208	-0.040	-0.176	0.188	-0.033
Direct taxes	0.559	-0.287	-0.160	0.556	-0.291	-0.162
Total		1.000	0.367		1.000	0.382
<b>ROI</b>						
Base income	0.500	1.051	0.526	0.477	0.999	0.476
Income from wealth	0.413	0.037	0.015	0.419	0.029	0.012
Net government expenditures		-0.089	-0.197		-0.027	-0.139
Cash benefits	-0.156	0.201	-0.031	-0.092	0.171	-0.016
Direct taxes	0.533	-0.279	-0.149	0.514	-0.266	-0.137
Indirect taxes	0.245	-0.205	-0.050	0.253	-0.169	-0.043
In-kind benefits	-0.072	0.102	-0.007	0.080	0.127	0.010
Public consumption	0.438	0.092	0.040	0.421	0.110	0.046
Total		1.000	0.344		1.000	0.349
<b>LIMEW</b>						
Base income	0.388	0.585	0.227	0.376	0.574	0.216
Income from wealth	0.487	0.067	0.033	0.617	0.060	0.037
Net government expenditures		0.029	-0.057		0.059	-0.037
Cash benefits	-0.010	0.131	-0.001	0.040	0.119	0.005
Direct taxes	0.418	-0.155	-0.065	0.412	-0.157	-0.065
Indirect taxes	0.195	-0.096	-0.019	0.218	-0.080	-0.017
In-kind benefits	-0.020	0.067	-0.001	0.124	0.090	0.011
Public consumption	0.364	0.081	0.030	0.336	0.088	0.029
Household production	0.395	0.319	0.126	0.347	0.306	0.106
Total		1.000	0.330		1.000	0.323

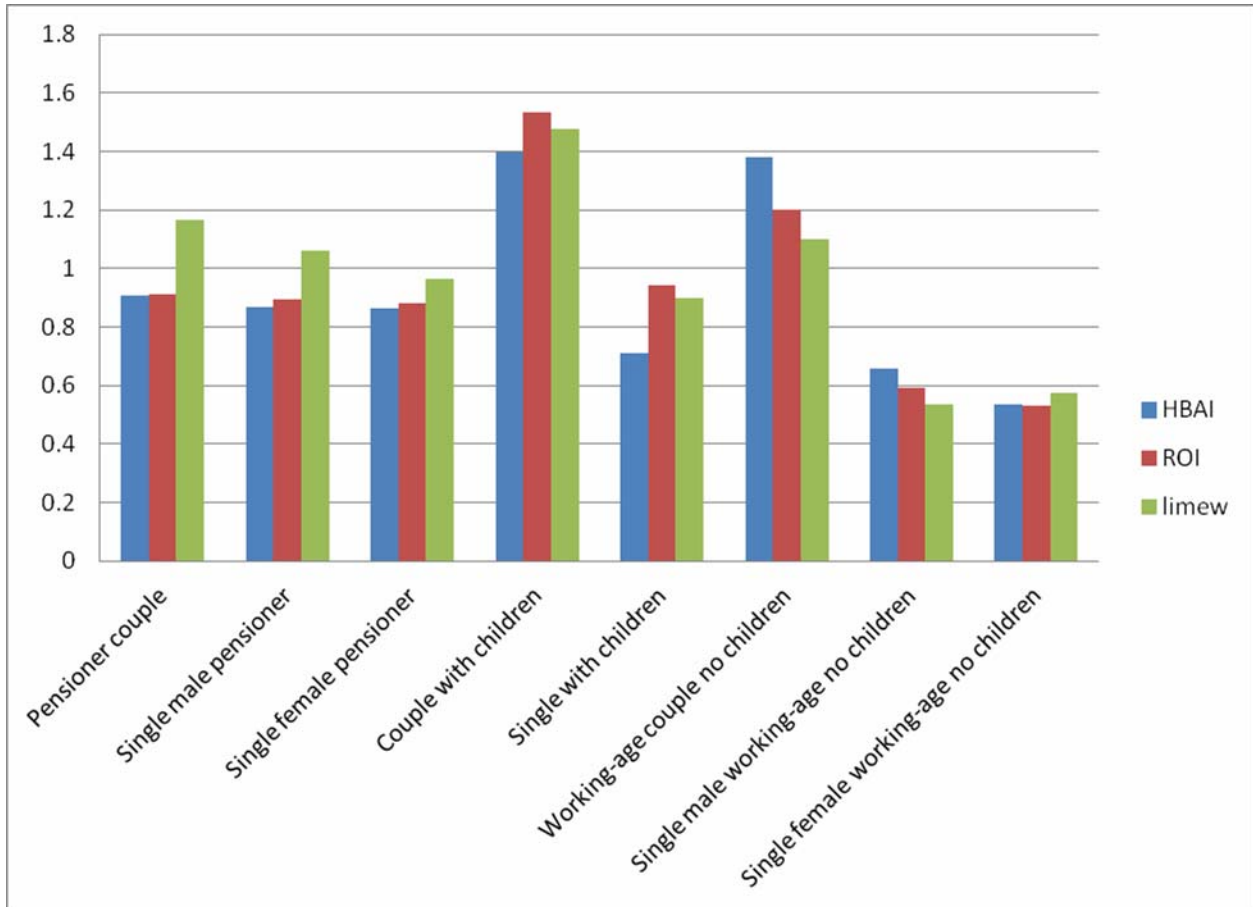
**Symbols:**

$c$  = concentration coefficient,  $s$  = share in measure, and,  $k$  =  $cs$  = contribution to inequality.

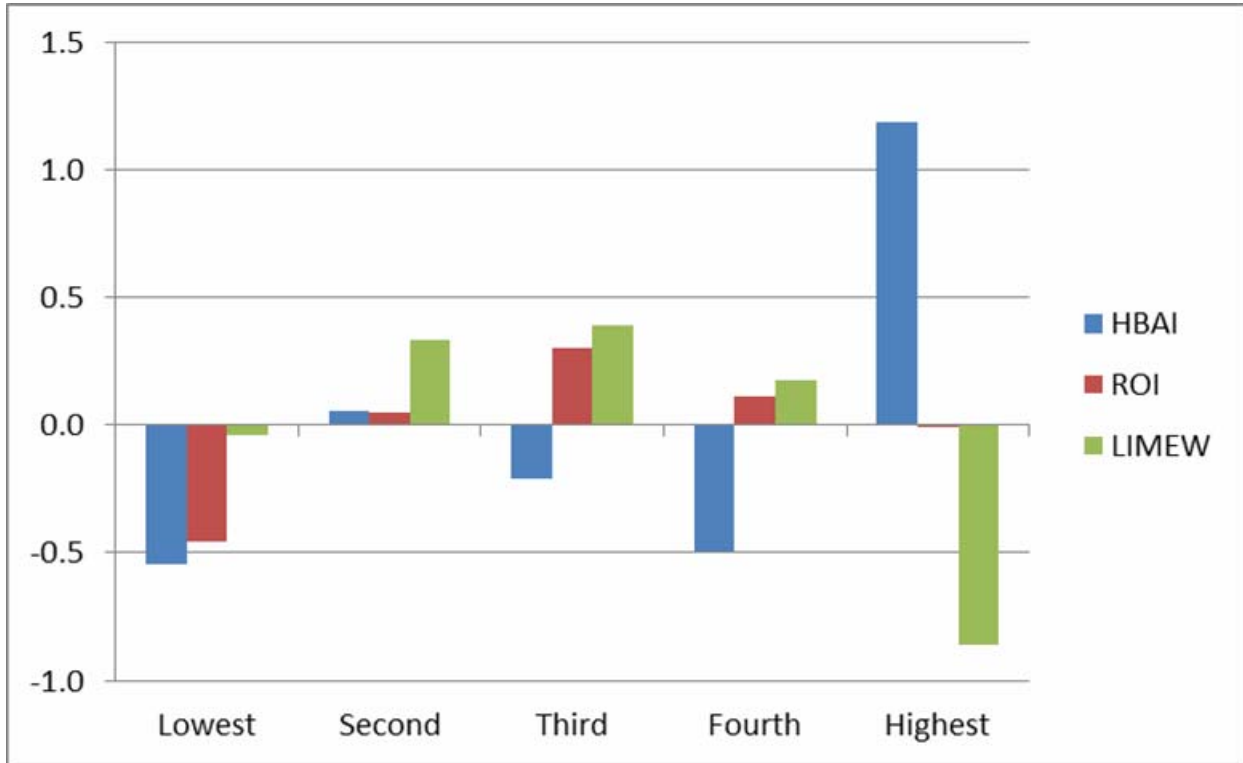
**Figure 1: Ratio of Subgroup Mean to Overall Mean by Status and Measure, 2005**



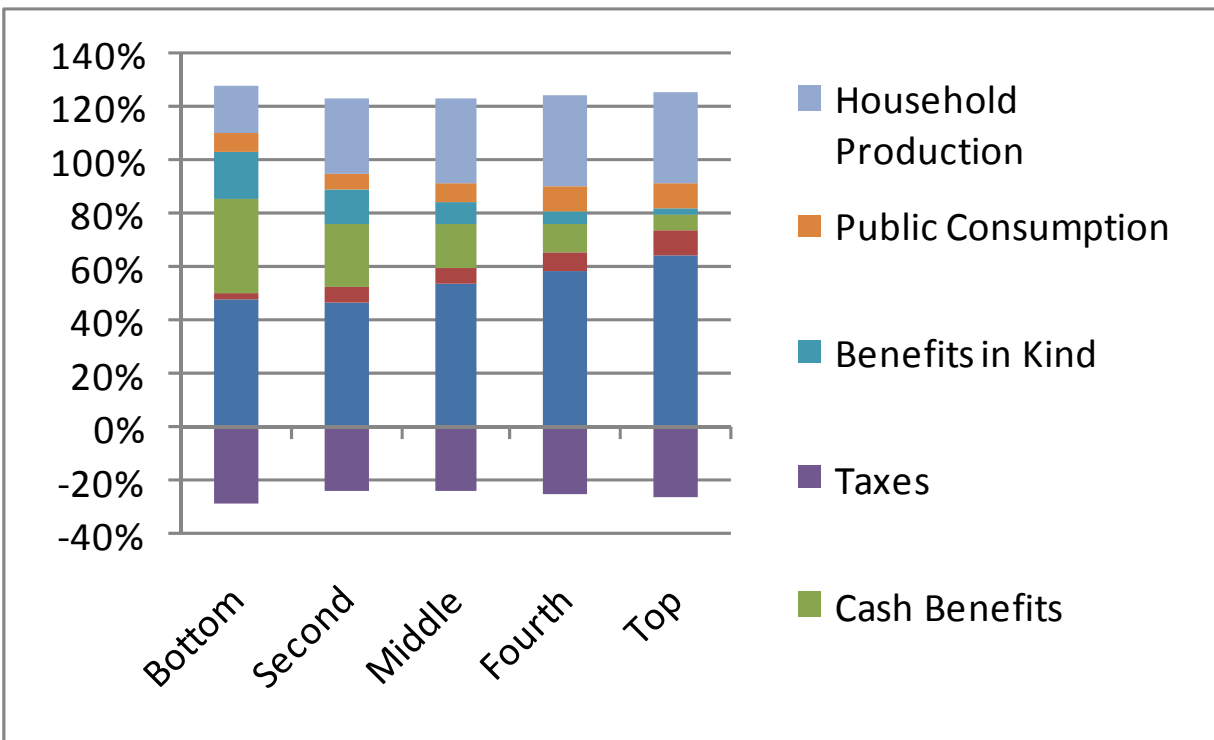
**Figure 2: Ratio of Subgroup Mean to Overall Mean by Economic Status and Measure, 2005**



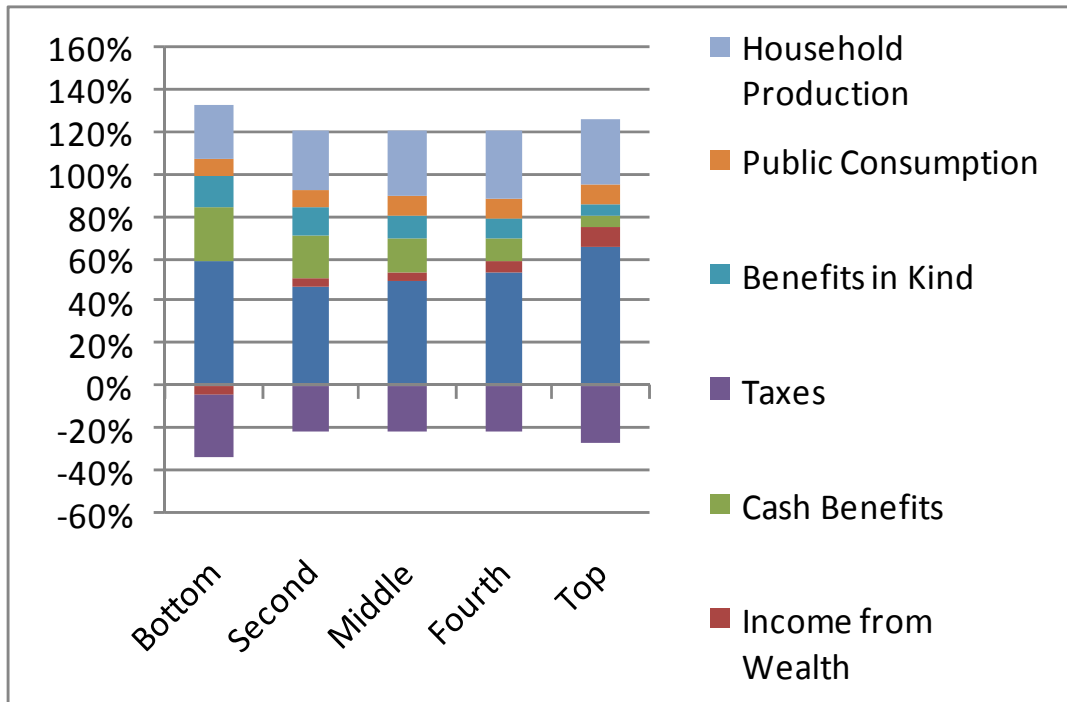
**Figure 3: Percentage Change in Measures by Quintiles, Great Britain, 1995–2005**



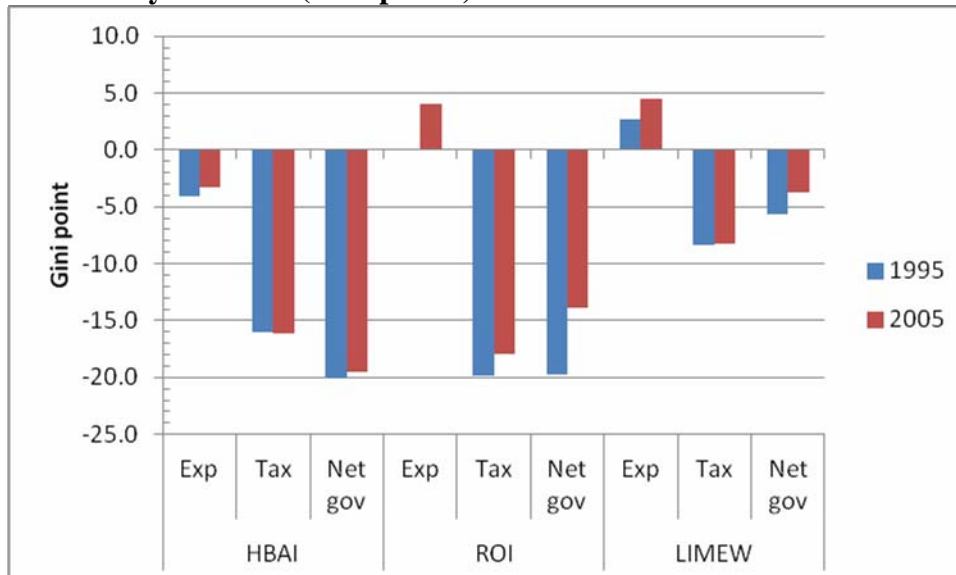
**Figure 4: Share of Components of LIMEW by LIMEW Quintiles, 1995**



**Figure 5: Share of Components of LIMEW by LIMEW Quintiles, 2005**



**Figure 6: Contributions to Inequality by Expenditures, Taxes, and Net Government Expenditures by Measure (Gini points)**



**Key:** Exp = Expenditures, Tax = Taxes, Net gov = Net government expenditures



## APPENDIX A: STATISTICAL MATCHES WITH WEALTH DATA

### A.1 1995

#### *Data and alignment*

The matching unit for the wealth match (and the unit of analysis for the LIMEW) is the household. The source data sets for the wealth match for the 1995 UK LIMEW estimates are the 1995–96 FRS and the 1995 wave of the BHPS. The 1995–96 FRS is used since it has income data for 1995. The 1995–96 FRS file has records for 26,435 households. These records represent 23,359,418 UK households after weighting. The 1995 British Household Panel Survey contains information for 5,024 respondents. After removing records representing institutional residents, we are left with 4,990 households. The weights in the BHPS are proportional weights that provide accurate demographic proportions, but do not give a total population estimate. Missing values in the BHPS data<sup>40</sup> were replaced in two stages: in the first, missing values in individual records were replaced by hot-decking; in the second, missing values in the household records were replaced using the method of multiple imputation with chained equations. This resulted in a data set with five replicates (generated in the first stage) for each original record, or 24,950 household records. In order to perform a successful match, the candidate data sets must be well-aligned in the strata variables used in the match procedure.<sup>41</sup> For the wealth match, strata variables are homeownership, age, educational attainment, family type, and household income. Table A.1 compares the distribution of households by these five variables in the two data sets. Since both surveys are regionally representative samples carried out the same year, we can expect them to be well-aligned. However, the BHPS is drawn from a more complicated sampling frame, since the BHPS is a panel survey. We expect some misalignment as a result of this important difference in sampling frame between the two surveys.

The distribution of homeownership is closely aligned in the two surveys. The distribution of family types is slightly different in the two surveys, with married couples and male-headed households slightly more common in the FRS than in the BHPS. Age categories differ more

---

<sup>40</sup> Variables with missing values were: educational attainment, employment status, and marital status, as well as wealth and income variables. 877 of 9,203 individual records were missing education, employment, savings, investment, or debt data. 541 of 4990 household records were missing mortgage, home value, or income data.

<sup>41</sup> Statistical matching is done first within subsets of the two data sets defined by key variables, which are referred to as strata variables.

greatly, with elderly being more prevalent in the BHPS (3.80 percent). The largest difference is by education category, with those completing their O levels making up a much greater percentage of FRS household heads (5.86 percent), while those with less than O level are more common in the BHPS (3.40 percent). This is due to differing questions about educational achievement in the two surveys.<sup>42</sup> The lower end of the household income distribution makes up a larger proportion of the BHPS sample than of the FRS (1.45 percent), while the top tier make up a larger portion of the FRS households (1.60 percent). These misalignments can make matching a challenge, because it ensures that, for example, some households with less than £10K annual income in the BHPS will be matched with households in the middle-income categories in the FRS, thereby slightly depressing the wealth profile of the lower middle of the income distribution (corresponding effects can be expected at the upper end of the income distribution). Based on these observations of the alignment, we can expect that the worst misallocation of wealth variables will be by education.

### *Match QC*

Turning to the results of the match, we first look to the distribution of matched records by matching round in table A.2. Earlier rounds occur in the most detailed cells (round 1 occurs within cells that incorporate all five strata variables). The bulk of the matches occur in the earliest rounds, in fact 94.5 percent in the first four rounds alone. This fact means that most of the wealth records will be assigned to records that are similar in age, education, family type, homeownership, and income to their donor records. This bodes well for the quality of the match. Indeed, we can see in figure 1 that the overall distribution of net worth is well carried over into the match file. In fact, it is impossible to see differences at all at this level of detail. Table A.3 provides a more detailed comparison of the distribution of net worth in the BHPS and the matched file. The percentile ratios are all quite close, with the exception of p75/p25 and p50/p25. The middle of the wealth distribution in the matched file is somewhat less wealthy than in the BHPS. The twenty-fifth percentile, for example is £1,109 in the BHPS and only £760 in the matched file. The Gini coefficient is quite close, 0.686 in the matched file, compared to 0.690 in the BHPS. Table A.4 breaks down the mean and median of the four assets and two debt classes

---

<sup>42</sup> Age left full-time education in the FRS, as opposed to highest level completed in the BHPS.

that make up net worth in the wealth match.<sup>43</sup> We can see that for all seven variables the difference in the matched and the source file's mean is small, 4.5 percent or less in all cases. For median values, most asset and debt classes are zero. There is a larger percentage difference for asset 3 than for average values, but this difference is small in absolute terms (£335). The most important asset, asset 1, is precisely matched, and the median net worth is off by 2 percent, but again, this represents a small absolute difference of just over £600.

Examination of the quality of the match within population subgroups shows generally good results. Figure A.1 displays ratios of mean net worth between the matched file and the BHPS for the five strata variables. With one exception, the ratios of mean net worth within subcategories of the five strata variables are all within 10 percent of unity. The second educational attainment group (which attempts to match those with their O level in the BHPS with those with twelve years of education in the FRS) has 89.8 percent the net worth in the matched file as in the BHPS. Table A.4 has the actual numbers, and we can see that this represents a substantial difference of about £6,400. The median net worth for this group in the matched file is 42.3 percent that of the BHPS. The degree to which this is a problem depends on the degree to which these categories actually overlap in real life. The second group in the household income panel of figure A.1 is those households with greater than £5,000 but less than £15,000 per year. We can see that they have just under 10 percent smaller net worth in the matched file than in the BHPS. We see in table A.4 that this translates to £5,300 smaller average net worth. The difference in medians is much larger, at 89 percent, which translates to a £34,300 difference in median net worth. The overall pattern in household income is that the lowest income group (less than £5,000) has higher net worth in the matched file, while all the other groups have lower net worth than in the BHPS. For judging the accuracy of the match in preserving the distribution of wealth by subgroups, table A.4 displays the ratios of mean and median values for the strata variables' categories. The ratios' values in the BHPS are very well-reproduced in the match file, given the variation in the means and medians described above. The extent to which the match file reproduces the distribution of net worth within matching cells is demonstrated in figure

---

<sup>43</sup> The four asset classes are primary residence, other real estate net of debt and business equity, liquid assets, and financial and other assets (a fifth asset class used in the LIMEW estimates for the United States and other countries, retirement assets, is not available for the UK). The two debt classes are mortgages and equity loans, and lines of credit on the primary residence and other debt (exclusive of mortgages on other property, which are subtracted from the value of that property in asset 2).

A.2.<sup>44</sup> We can see that the distribution is well-preserved in the matching process, even at this level of detail.

Overall, the quality of the match is good. It has its limitations, especially in terms of the education categories (due, once again, to the mismatch of variable definitions in the two surveys). But the overall distribution is transferred with remarkable accuracy, and the distributions within even small subgroups, such as young nonwhite homeowners, is transferred with good precision.

## **A.2 2005**

### *Data and Alignment*

The source data sets for the wealth match for the 2005 UK LIMEW estimates are the 2005–06 FRS and the 2005 BHPS. The 2005–06 FRS is used since it has income data for 2005. The 2005–06 FRS file contains records for 64,733 individuals in 28,029 households. After dropping those living in Northern Ireland we have records for individuals in 26,134 households. When weighted this gives us data representing 24,821,549 UK households. The 2005 BHPS has been multiply imputed to replace missing values.<sup>45</sup> There are five replicates for each of the 4,592 original records, making 22,960 household records in the full file. We use all the records. When the weights are appropriately adjusted, the records in the BHPS represent 25,482,600 households. As mentioned above, for the wealth match, the strata variables are homeownership, age, educational achievement, family type, and household income. Table A.5 shows the distribution of households by these five variables plus region in the two data sets. Since both surveys are regionally representative samples carried out in roughly the same year, we can expect them to be well-aligned. However, the 2005 BHPS is drawn using the same complicated sampling frame as the 1995 BHPS. Thus we again expect some misalignment as a result of this important difference in sampling framed between the two surveys.

---

<sup>44</sup> Household income and educational attainment are excluded for the sake of clarity of the plot.

<sup>45</sup> Variables in the BHPS with missing values included: at the individual level, employment status, self-employment status, earner, education, savings, investments, and debts; and at the household level, homeownership, region, home value, other real estate, mortgage, and income variables. 1,544 of 8,407 individual records and 790 of 4,592 household records had one or more missing values.

Homeownership is more widely prevalent in the BHPS than in the FRS (by 3.3 percent). The distribution of family types is slightly different in the two surveys, with married couples once again being almost exactly the same but, male headed and female headed off (by 2.3 to 2.6 percent). Educational categories are off again (by 2.9 to 6.0 percent) due to the difference in survey questions. The differences by income category are small as in 1995, with those at the lower end of the household income distribution making up a slightly larger proportion of the BHPS sample than of the FRS, while those at the higher end of the household income scale are a smaller share of the BHPS. Age categories are further off at the low and the high end (by 3.3 and 4.7 percent, respectively). Based on these observations of the alignment, we can expect that the worst misallocation of wealth variables will be by education and age.

### *Match QC*

The match itself, although requiring twenty-three rounds of matching to complete, was 83 percent done after the first round (see table A.6). This is a good sign, as so many records were matched within one of 208 very detailed matching cells (formed by combining all of the strata variables). This indicates that the quality of the match should be quite good. Table A.7 shows that this is in fact the case. The distribution of net worth has been well-preserved. Percentile ratios are quite closely carried over. The one exception is the p75/p25 ratio, which is considerably larger in the matched file. This is another example of the denominator problem, although the difference here is substantial: p25 is £3,400 in the matched file, compared to £7,500 in the BHPS. The components of net worth are well carried over into the matched file (see table A.8). The largest difference is for asset 1, primary residence, although the actual difference is only £7,200.

Figure A.3 shows the ratio of mean net worth by strata variable categories. As we can see, net worth has been well-reproduced in the match file, with generally small variations between the matched file and the BHPS. The largest difference is among renters (43.4 percent), but this amounts to only £2,400 in absolute terms (see table A.8). The comparison by family type looks good for married couples but less so for female-headed, and especially male-headed households (again the numerically smallest category is the worst). The distribution of wealth by age seems to have been well-preserved by the matching, with only small variations between the BHPS and the match file. The differences by education are fairly large, exceeding 14 percent for

the most highly educated, which will tend to reduce stated inequality. The transfer within household income categories looks good except that the higher income categories look less wealthy in the match file than in the BHPS. This is due to the misalignment between the two files. Figure A.4 shows the distribution of log net worth within collapsed matching cells (again by family type, homeownership, and age). The distributions have been carried over very well.

Finally, the comparison of mean and median net worth by strata variable categories is found in table A.8. The ratios of mean net worth by category are very similar between the BHPS and the matched file. The most notable differences are the ratios by household income categories. The first two categories seem to have been leveled a bit in the course of the matching. The ratios of median values are somewhat more concerning, with the same pattern appearing in the household income category.

Overall, however, the match has provided us with a fair representation of the original distribution of wealth in the BHPS. The differences we observe are small enough not to affect the outcome of the final analysis of the LIMEW greatly.

## A.3 Tables

**Table A.1: Alignment of Strata Variables for 1995 Wealth Match**

	<b>FRS95</b>	<b>BHP95</b>	<b>Difference</b>
<i># Households</i>	23,359,418	26,130	N/A
<b>Homeownership</b>			
<i>Renter</i>	33.37%	32.50%	-0.87%
<i>Owner</i>	66.63%	67.50%	0.87%
<b>Family Type</b>			
<i>Married Couple</i>	59.64%	58.91%	-0.73%
<i>Female Headed</i>	25.75%	27.75%	2.00%
<i>Male Headed</i>	14.61%	13.33%	-1.28%
<b>Age Category</b>			
<i>&lt;35</i>	23.80%	20.94%	-2.86%
<i>35-44</i>	18.01%	18.19%	0.18%
<i>45-54</i>	17.49%	17.40%	-0.09%
<i>55-64</i>	14.54%	13.52%	-1.02%
<i>&gt;=65</i>	26.16%	29.96%	3.80%
<b>Education Category</b>			
<i>LT O Level</i>	44.60%	48.00%	-3.40%
<i>O Level</i>	27.08%	21.22%	5.86%
<i>A Level/Cert.</i>	17.39%	20.20%	-2.81%
<i>Degree</i>	10.93%	10.58%	0.35%
<b>HH Income</b>			
<i>LT £10,000</i>	33.31%	34.76%	1.45%
<i>£10,000 - £19,999</i>	28.14%	27.56%	-0.58%
<i>£20,000 - £29,999</i>	18.51%	19.25%	0.74%
<i>£30,000 - £39,999</i>	9.91%	9.91%	0.00%
<i>GE £40,000</i>	10.13%	8.53%	-1.60%

**Table A.2: Distribution of Matched Records by Matching Round, 1995 Wealth Match**

Matching Round	Records Matched	Percent	Cumulative Percent
1	20,010,011	85.7	85.7
2	766,140	3.3	88.9
3	539,771	2.3	91.3
4	755,261	3.2	94.5
5	90,147	0.4	94.9
6	103,112	0.4	95.3
7	116,494	0.5	95.8
8	8,394	0.0	95.9
9	50,216	0.2	96.1
10	5,857	0.0	96.1
11	23,299	0.1	96.2
12	138,295	0.6	96.78
13	166,953	0.7	97.49
14	8,241	0.0	97.53
15	200,806	0.9	98.39
16	26,271	0.1	98.5
17	350,150	1.5	100
<b>Total</b>	<b>23,359,418</b>	<b>100</b>	

**Table A.3: Distribution of Net Worth in 1995 BHPS and Matched File**

	p90/p10	p90/p50	p50/p10	p75/p25	p75/p50	p50/p25	Gini
<b>BHP 1995</b>	-1263.455	4.542	-278.200	64.919	2.353	27.594	0.686
<b>Matched</b>	-1354.150	4.514	-300.000	92.895	2.353	39.474	0.690



**Table A.4: Mean and Median Net Worth by Strata Variable, 1995 BHPS and Matched File**

**Average Net Worth**

	<b>BHP1995</b>	<b>Match</b>	<b>Ratio</b>		<b>BHP1995</b>	<b>Match</b>
<b>Asset1</b>	50,678	49,844	98.35%			
<b>Asset2</b>	4,237	4,169	98.40%			
<b>Asset3</b>	7,966	7,686	96.48%			
<b>Asset4</b>	10,868	10,543	97.01%			
<b>Debt1</b>	15,265	15,083	98.81%			
<b>Debt2</b>	1,391	1,366	98.21%			
<b>Networth</b>	57,094	55,793	97.72%			
<b>Renter</b>	6,529	6,030	92.36%	<b>ren/own</b>	0.080	0.075
<b>Owner</b>	81,443	80,717	99.11%			
<b>Non-elder</b>	53,226	52,296	98.25%	<b>non/eld</b>	0.805	0.796
<b>Elder</b>	66,138	65,663	99.28%			
<b>Married Couple</b>	71,165	69,321	97.41%			
<b>Female Headed</b>	35,418	35,399	99.95%	<b>fh/mc</b>	0.498	0.511
<b>Male Headed</b>	40,039	36,514	91.19%	<b>mh/mc</b>	0.563	0.527
<b>LT O Level</b>	42,299	44,955	106.28%	<b>ltOlvl/deg</b>	0.446	0.509
<b>O Level</b>	62,751	56,384	89.85%	<b>Olvl/deg</b>	0.661	0.638
<b>A Level/Cert.</b>	66,497	62,171	93.49%	<b>Alvl/deg</b>	0.700	0.703
<b>Degree</b>	94,934	88,406	93.12%			
<b>LT £10,000</b>	29,477	30,993	105.14%	<b>LT £10,000</b>	0.227	0.246
<b>£10,000 - £19,999</b>	52,982	47,733	90.09%	<b>£10,000 - £19,999</b>	0.408	0.380
<b>£20,000 - £29,999</b>	68,711	63,580	92.53%	<b>£20,000 - £29,999</b>	0.529	0.506
<b>£30,000 - £39,999</b>	80,176	76,012	94.81%	<b>£30,000 - £39,999</b>	0.617	0.604
<b>GE £40,000</b>	129,879	125,745	96.82%			

Median Net Worth

	BHP1995	Match	Ratio		BHP1995	Match
Asset1	35,202	45,000	127.83%			
Asset2	0	0				
Asset3	945	1,280	135.50%			
Asset4	0	0				
Debt1	0	0				
Debt2	0	0				
Networth	22,869	30,602	133.81%			
Renter	21	108	502.84%	ren/own	0.000	0.002
Owner	45,000	54,030	120.07%			
Non-elder	18,952	27,250	143.78%	non/eld	0.518	0.634
Elder	36,569	43,000	117.59%			
Married Couple	24,741	22,500	90.94%			
Female Headed	30,703	32,670	106.41%	fh/mc	1.241	1.452
Male Headed	41,842	39,020	93.26%	mh/mc	1.691	1.734
LT O Level	19,810	30,008	151.48%	ltOlvl/deg	0.610	1.000
O Level	38,000	16,080	42.32%	Olvl/deg	1.169	0.536
A Level/Cert.	34,220	25,000	73.06%	Alvl/deg	1.053	0.833
Degree	32,500	30,000	92.31%			
LT £10,000	33,500	73,700	220.00%	LT £10,000	0.698	2.388
£10,000 - £19,999	38,630	4,297	11.12%	£10,000 - £19,999	0.805	0.139
£20,000 - £29,999	33,787	19,932	58.99%	£20,000 - £29,999	0.704	0.646
£30,000 - £39999	41,604	28,884	69.43%	£30,000 - £39999	0.867	0.936
GE £40,000	48,000	30,866	64.30%			

**Table A.5: Alignment of Strata Variables for 2005 Wealth Match**

	<b>FRS 2005-6</b>	<b>BHPS 2005</b>	<b>Diff</b>
Number	24,821,549	9,261,750	-62.7%
<b>Homeownership</b>			
<i>Renter</i>	29.79%	26.52%	3.27%
<i>Owner</i>	70.21%	73.48%	-3.27%
<b>Family Type</b>			
<i>Married Couple</i>	57.18%	57.49%	-0.31%
<i>Female Headed</i>	26.04%	28.30%	-2.26%
<i>Male Headed</i>	16.78%	14.21%	2.57%
<b>Education Category</b>			
<i>LT O Level</i>	32.04%	36.88%	-4.84%
<i>O Level</i>	29.23%	23.20%	6.03%
<i>A Level</i>	21.42%	25.49%	-4.07%
<i>More than A Level</i>	17.31%	14.42%	2.89%
<b>Age Category</b>			
<i>LT 35</i>	19.21%	15.95%	3.26%
<i>35 to 44</i>	20.59%	18.78%	1.81%
<i>45 to 54</i>	17.78%	18.60%	-0.82%
<i>55 to 64</i>	16.67%	16.23%	0.44%
<i>GE 65</i>	25.75%	30.44%	-4.69%
<b>Household Income</b>			
<i>LT £5,000</i>	2.43%	3.18%	-0.75%
<i>£5,000 to £15,000</i>	27.23%	28.09%	-0.86%
<i>£15,000 to £25,000</i>	22.06%	20.92%	1.14%
<i>£25,000 to £40,000</i>	22.26%	22.96%	-0.70%
<i>GE £40,000</i>	26.02%	24.86%	1.16%

**Table A.6: Distribution of Matched Records by Matching Round, 2005 Wealth Match**

Matching Round	Records Matched	Percent	Cumulative Percent
1	20,634,119	83.1	83.1
2	767,690	3.1	86.2
3	209,100	0.8	87.1
4	1,298,089	5.2	92.3
5	87,380	0.4	92.7
6	78,516	0.3	93.0
7	232,964	0.9	93.9
8	66,838	0.3	94.2
9	27,635	0.1	94.3
10	7,453	0.0	94.3
11	312,065	1.3	95.6
12	16,524	0.1	95.6
13	41,190	0.2	95.8
14	32,736	0.1	95.9
15	18,602	0.1	96.0
16	75,137	0.3	96.3
17	89,246	0.4	96.7
18	116,292	0.5	97.1
19	58,007	0.2	97.4
20	104,925	0.4	97.8
21	28,514	0.1	97.9
22	14,144	0.1	98.0
23	504,383	2.0	100.0
<b>Total</b>	<b>24,821,549</b>	<b>100.0</b>	

**Table A.7: Distribution of Net Worth in 2005 BHPS and Matched File**

	p90/p10	p90/p50	p50/p10	p75/p25	p75/p50	p50/p25	gini
<b>BHPS 2005</b>	-1827.240	3.322	-550.000	27.933	1.905	14.667	0.630
<b>Match</b>	-2109.412	3.516	-599.888	59.268	1.985	29.863	0.648

**Table A.8: Mean and Median Net Worth by Strata Variable, 2005 BHPS and Matched File**

**Average Net Worth**

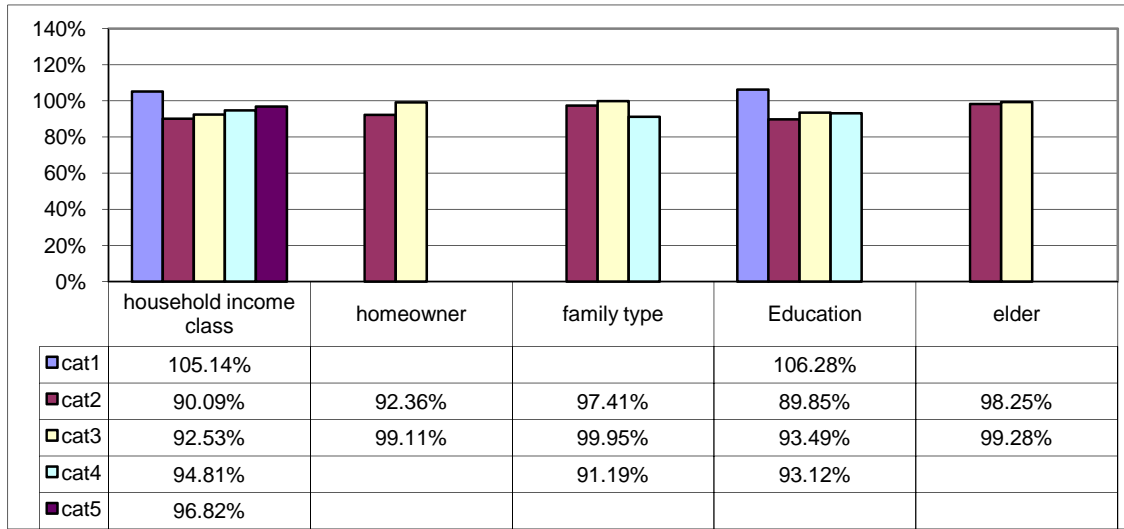
	<b>BHPS 2005</b>	<b>Match</b>	<b>Ratio</b>		<b>BHPS 2005</b>	<b>Match</b>
<b>Asset1</b>	156,853	149,575	95.36%			
<b>Asset2</b>	10,207	9,956	97.54%			
<b>Asset3</b>	12,909	12,697	98.36%			
<b>Asset4</b>	12,650	12,336	97.52%			
<b>Debt1</b>	35,233	34,460	97.81%			
<b>Debt2</b>	3,999	3,974	99.38%			
<b>Networth</b>	153,388	146,130	95.27%			
<b>Renter</b>	5,484	7,862	143.36%	<b>ren/own</b>	0.027	0.038
<b>Owner</b>	206,780	204,792	99.04%			
<b>Non-elder</b>	142,764	132,582	92.87%	<b>non/eld</b>	0.804	0.716
<b>Elder</b>	177,669	185,198	104.24%			
<b>Married Couple</b>	193,551	187,986	97.12%			
<b>Female Headed</b>	94,248	88,466	93.86%	<b>fh/mc</b>	0.487	0.471
<b>Male Headed</b>	108,689	92,998	85.56%	<b>mh/mc</b>	0.562	0.495
<b>Less than O lvl</b>	114,072	123,447	108.22%	<b>ltO/mtA</b>	0.524	0.665
<b>O lvl</b>	149,217	135,358	90.71%	<b>Olvl/mtA</b>	0.685	0.729
<b>A lvl</b>	177,586	162,727	91.63%	<b>Alvl/mtA</b>	0.815	0.876
<b>More than A lvl</b>	217,879	185,761	85.26%			
<b>&lt;£5000</b>	80,825	91,078	112.68%	<b>lt £5k</b>	0.350	0.410
<b>£5000&gt;=hhinc&lt;£14999</b>	101,635	91,324	89.85%	<b>£5-15k</b>	0.441	0.411
<b>£15000&gt;=hhinc&lt;£24999</b>	129,285	122,414	94.69%	<b>£15-25k</b>	0.561	0.551
<b>£25000&gt;=hhinc&lt;£39999</b>	165,057	153,832	93.20%	<b>£25-40k</b>	0.716	0.692
<b>&gt;=£40000</b>	230,651	222,156	96.32%			

Median Net Worth

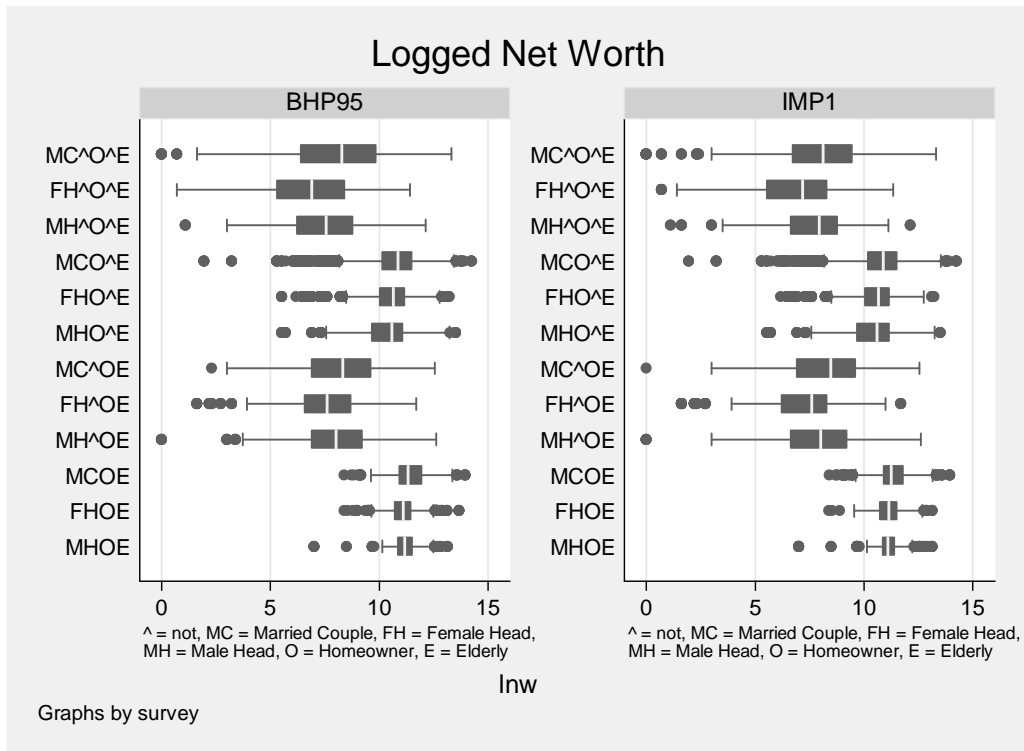
	BHPS 2005	Match	Ratio		BHPS 2005	Match
Asset1	102,517	140,000	136.56%			
Asset2	0	0				
Asset3	1,366	2,000	146.44%			
Asset4	0	0				
Debt1	0	0				
Debt2	0	0				
Networth	78,595	110,000	139.96%			
Renter	0	0		ren/own	0.000	0.000
Owner	126,815	157,500	124.20%			
Non-elder	65,408	100,000	152.89%	non/eld	0.541	0.752
Elder	120,926	133,000	109.98%			
Married Couple	83,451	84,900	101.74%			
Female Headed	91,613	107,543	117.39%	fh/mc	1.098	1.267
Male Headed	139,811	129,630	92.72%	mh/mc	1.675	1.527
Less than O lvl	69,790	92,200	132.11%	ltO/mtA	0.590	0.981
O lvl	110,000	56,000	50.91%	Olvl/mtA	0.930	0.596
A lvl	121,295	78,129	64.41%	Alvl/mtA	1.025	0.831
More than A lvl	118,300	94,000	79.46%			
<£5000	103,400	157,677	152.49%	lt £5k	0.689	2.039
£5000>=hhinc<£14999	125,474	6,147	4.90%	£5-15k	0.836	0.079
£15000>=hhinc<£24999	162,003	32,171	19.86%	£15-25k	1.080	0.416
£25000>=hhinc<£39999	158,000	71,558	45.29%	£25-40k	1.053	0.925
>=£40000	150,050	77,335	51.54%			

## A.4 Figures

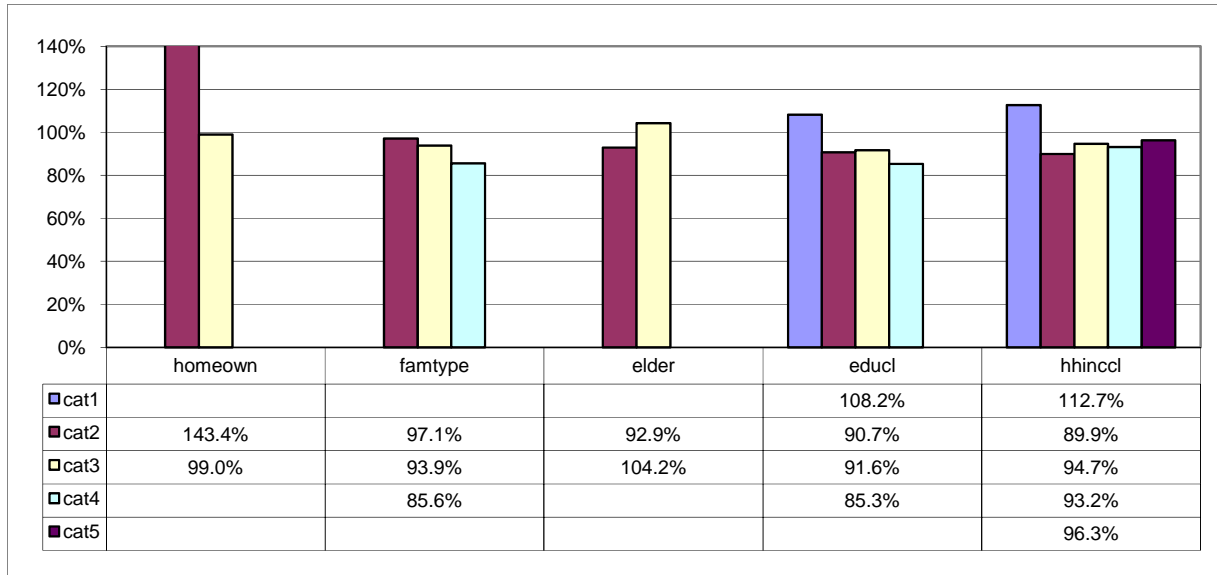
**Figure A.1: Ratio of Mean Net Worth by Category (Match/BHPS 1995)**



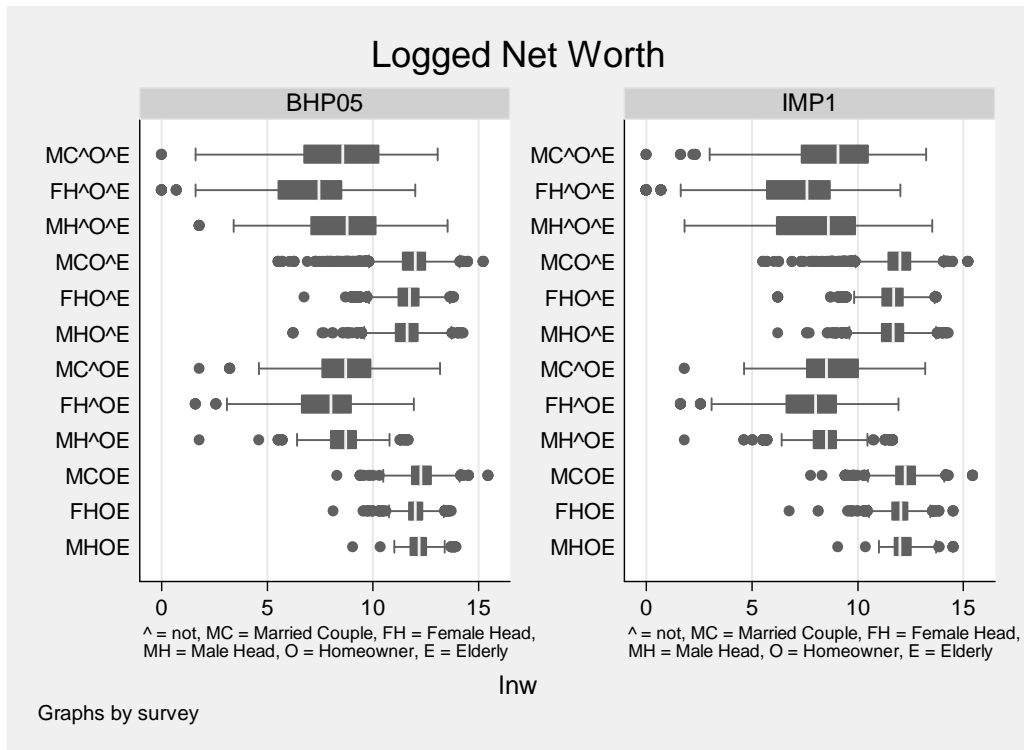
**Figure A.2: Net Worth by Matching Cells, 1995 BHPS and Matched File**



**Figure A.3: Ratio of Mean Net Worth by Category (Match/BHPS 2005)**



**Figure A.4: Net Worth by Matching Cells, 2005 BHPS and Matched File**





## APPENDIX B: STATISTICAL MATCHES WITH TIME USE DATA

### B.1 1995

#### *Data and Alignment*

The source data sets for the time use match for the 1995 LIMEW estimates are the 1995–06 FRS and the 1995 OPCS. We use individual records from the 1995–06 FRS file, excluding those living in group quarters or in the armed forces. The OPCS has a number of missing values, which we replaced by the method of multiple imputation with hot-decking.<sup>46</sup> This results in five replicates for each original record, for a total of 10,025. The weights in the OPCS are meant to give population proportions not estimates of population size, so no weighted count is available. Since the OPCS covers individuals 16 years old and above, we discard younger individuals from the FRS file. This leaves 48,263 records, which represents 43,882,909 individuals when weighted.

For the time use match, the strata variables are sex, parental status, employment status, and marital status. While for the wealth match the matching unit is the household, for the time use match we use individuals. Table B.1 compares the distribution of individuals by these variables and personal income in the two data sets. Since the two surveys were carried out at roughly the same time, we can expect them to be well-aligned. We see that the distribution of individuals by sex is quite close in the two surveys, with females slightly less common in the OPCS than in the FRS. Parents are present in greater portions in the OPCS (4 percent). The not employed are underrepresented in the OPCS relative to the FRS (5 percent). The portion of married individuals is also higher in the OPCS (2.3 percent). The differences by income category are largest, with those in the lowest income class making up a significantly larger proportion of the OPCS sample than of the FRS (5.7 percent), while the middle-income classes are relatively overrepresented in the FRS (1.3–2.4 percent). The differences must be due to the differing sampling frame and this will certainly impact the quality of the match.

---

<sup>46</sup> The variables with missing values were: marital status, family type, relationship to household head, homeownership, educational achievement, personal income category, and age. 123 of 2,005 records had missing values for one or more of these variables.

### *Match QC*

Turning to the results of the match, we first look to the distribution of matched records by matching round in table B.2. The bulk of the matches, 92 percent, occur in the first round, ensuring as high quality a match as possible. The rest of the records are matched over an additional eleven rounds, with one-tenth of 1 percent receiving no match at all.<sup>47</sup> Table B.3 provides a comparison of the distribution of weekly hours of household production in the OPCS and the matched file. The percentile ratios are all equivalent. The Gini coefficient is extremely close, 0.5145 in the matched file, compared to 0.5148 in the OPCS. Table B.4 breaks down the mean and median of the three classes that make up total household production in the time use match.<sup>48</sup> We can see that for all four variables the difference in the matched and the source file's mean and median is zero, with the one exception of average weekly hours of care, which is 6.45 percent (or twelve minutes) higher in the matched file than the OPCS.

Examination of the quality of the match within population subgroups shows generally good results. Figure B.1 displays ratios of mean weekly hours of household production between the matched file and the OPCS for the four strata variables, as well as for personal income categories. As we can see, the best-aligned variable, sex, is the best-matched as well. Nonparents have 5 percent higher, while parents have 6 percent lower, average weekly hours of household production compared to the OPCS. The full-time employed have 7 percent higher average weekly hours in the matched file than in the OPCS, while the part-time employed have 10 percent higher, and the not employed have 3.4 percent lower. Unmarried individuals have 5.3 percent lower weekly hours in the matched file than in the OPCS. There are also large differences by income group, ranging from 11 percent higher in the matched file (for the middle personal-income group) to 7.4 percent lower average weekly hours in the matched file.

Table B.4 has the actual numbers, and we can see that these large percentage differences represent relatively small differences in hours per week. For example, the large differences for the lowest and middle-income classes represent differences of three and two hours per week, respectively. Notice that the ratios by category are well-reproduced in the matched file. The

---

<sup>47</sup> The unmatched records are assigned the average values for their original matching cells.

<sup>48</sup> The three classes are care (child care, education, etc.), procurement (shopping, etc.), and core (cooking, cleaning, laundry, etc.).

extent to which the match file reproduces the distribution of weekly hours of household production within matching cells is demonstrated in figure B.2.<sup>49</sup> We can see very little difference between the matched file and the OPCS. Thus the distribution of household production is well-preserved in the matching process, even at this level of detail.

Overall, the quality of the match is very good. It has its limitations, especially in terms of the marital and employment status categories. But the overall distribution is transferred with remarkable accuracy, and the distributions within even small subgroups, such as female parent employees, is transferred with good precision.

## **B.2 2005**

### *Data and Alignment*

The source data sets for the time use match for the 2005 UK LIMEW estimates are the 2005–06 FRS and the 2000 UKTUS. We use individual records from the 2005–06 FRS file, excluding those living in group quarters or in the armed forces. Since the UKTUS covers individuals 16 years old and above, we discard younger individuals from the FRS file. This leaves 50,885 records, which represents 47,643,205 individuals when weighted. The UKTUS file includes time use data for 8,490 individuals. Missing values in the UKTUS were multiply imputed using chained equations, producing five replicates for each original record.<sup>50</sup> The records in the UKTUS correspond to 38,555,900 individuals when weighted. For the time use match, the strata variables are sex, parental status, employment status, marital status, and spouse's employment status. While for the wealth match the matching unit is the household, for the time use match we use individuals. Table B.5 compares the distribution of individuals by these variables and household income in the two data sets. Since the two surveys were carried out five years apart, we can expect them to be somewhat misaligned. We see that the distribution of individuals by sex and marital status is only slightly different in the two surveys, though. Parents are much less prevalent in the FRS than in the UKTUS (5.5 percent). The not employed are slightly underrepresented in the UKTUS relative to the FRS (2.4 percent), with the difference mostly made up by those working part time (2.2 percent). The portion of married individuals is lower in the UKTUS, by 2.23 percent. The difference in spouse's labor force status is very small (less

---

<sup>49</sup> Marital status is excluded for the sake of clarity of the plot.

<sup>50</sup> 778 of 8,490 records had missing values for personal income class.

than 1 percent in all cases). The difference in parental status, reflecting different sampling frames, is the greatest cause for concern in terms of the potential match quality, but the alignment overall is quite good.

### *Match QC*

Table B.6 shows the distribution of matched records by matching round. The fact that 93 percent of records were matched in the first round of matching is a promising sign for the quality of the match. The overall distribution of weekly hours of household production looks nearly perfect, based on the percentile ratios and Gini coefficient displayed in table B.7. All but the p90/p10 ratio are within two decimal points, while this ratio is off by only 0.02. The Gini coefficient is off by less than 0.1 Gini points. The mean and median weekly hours of household production and its three components are exactly carried over to the matched file from the UKTUS (see table B.8), with the exception of mean care hours, which is off by six minutes (3.4 percent). Figure B.3 displays ratios of mean weekly hours of household production by the strata variables, as well as personal income. In terms of the strata variables, the match looks good for each one. Nonparents have 5 percent greater average weekly hours of household production in the match file, parents have 3 percent greater, and the not employed have 3 percent fewer household production hours. Personal income categories show a worse situation, but as it is not one of the strata variables, nothing could be done.

Table B.8 gives us a closer look at the numbers behind figure B.3, showing the mean and median weekly hours of household production by the strata variables, plus personal income. While the average weekly hours of household production for most categories in the matched file are exactly the same as in the UKTUS, the differences in the other strata variables are all one hour, which works out to between 3 and 5 percent. The ratios by strata variables are correspondingly well-reproduced in the matched file. The differences for personal income are unsurprisingly larger, both in terms of percentage and hours. For example, those in the lowest income category, but working, have four hours more in the matched file than in the UKTUS, amounting to 16 percent. As we can see, the ratios of matched to UKTUS medians are unity or close to it for all the strata variables. The difference between the matched file and the UKTUS for parents, married people, unmarried people, and those not working is one hour per week. The

differences for personal income are again larger, with those with the lowest income registering seven hours less per week at the median in the matched file.

Overall match quality is good. The LIMEW should do as good a job portraying the distribution of household production and wealth as is possible under the circumstances.

## B.3 Tables

**Table B.1: Alignment of Strata Variables for 1995 Time Use Match**

	<b>FRS 1995</b>	<b>OPCS 1995</b>	<b>Difference</b>
<i>Individuals</i>	42,527,589	11,690	N/A
<b>Personal Income Class</b>			
<i>Less than £4K</i>	25.11%	30.78%	-5.67%
<i>£4K to £8K</i>	26.14%	24.81%	1.33%
<i>£8K to £15K</i>	25.92%	23.48%	2.44%
<i>£15K to £30K</i>	18.47%	16.91%	1.56%
<i>£30K or more</i>	4.36%	4.02%	0.34%
<b>Sex</b>			
<i>Male</i>	48.10%	48.85%	-0.75%
<i>Female</i>	51.90%	51.15%	0.75%
<b>Parent</b>			
<i>No</i>	76.91%	72.91%	4.00%
<i>Yes</i>	23.09%	27.09%	-4.00%
<b>Employed</b>			
<i>Full-time</i>	42.06%	42.85%	-0.79%
<i>Part-time</i>	10.80%	14.98%	-4.18%
<i>Not working</i>	47.14%	42.17%	4.97%
<b>Married</b>			
<i>No</i>	36.15%	33.82%	2.33%
<i>Yes</i>	63.85%	66.18%	-2.33%

**Table B.2: Distribution of Matched Records by Matching Round, 1995 Time Use Match**

<b>Matching Round</b>	<b>Records Matched</b>	<b>Percent</b>	<b>Cumulative Percent</b>
1	40,362,628	92.0	92.0
2	455,492	1.0	93.0
3	144,754	0.3	93.4
4	41,200	0.1	93.4
5	504,149	1.2	94.6
6	113,848	0.3	94.9
7	69,917	0.2	95.0
8	929,343	2.1	97.1
9	107,836	0.3	97.4
10	64,144	0.2	97.5
11	706,088	1.6	99.1
12	327,259	0.8	99.9
13	56,251	0.1	100
<b>Total</b>	<b>43,882,909</b>	<b>100</b>	

**Table B.3: Distribution of Weekly Hours of Household Production in 1995 OPCS and Matched File**

	<b>p90/p10</b>	<b>p90/p50</b>	<b>p10/p50</b>	<b>p75/p25</b>	<b>p75/p50</b>	<b>p25/p50</b>	<b>Gini</b>
<b>OPCS 1995</b>	16.50	2.54	6.50	3.83	1.77	2.17	0.5148
<b>Match</b>	16.50	2.54	6.50	3.83	1.77	2.17	0.5145

**Table B.4: Mean and Median Household Production Weekly Hours, 1995 OPCS and Matched File**

<b>Mean values of HH Production (Weekly Hours)</b>			
	<b>OPCS</b>	<b>Match</b>	<b>Ratio</b>
HH Production	23.00	23.00	100.0%
Care	3.10	3.30	106.5%
Procurement	4.20	4.20	100.0%
Core	16.00	16.00	100.0%
<b>Distribution among population subgroups</b>			
<b>Personal Income</b>			
<i>Less than £4K</i>	28.00	31.00	110.7%
<i>£4K to £8K</i>	27.00	25.00	92.6%
<i>£8K to £15K</i>	18.00	20.00	111.1%
<i>£15K to £30K</i>	16.00	16.00	100.0%
<i>£30K or more</i>	17.00	16.00	94.1%
<b>Sex</b>			
<i>Male</i>	16.00	16.00	100.0%
<i>Female</i>	29.00	29.00	100.0%
<b>Parent</b>			
<i>No</i>	20.00	21.00	105.0%
<i>Yes</i>	33.00	31.00	93.9%
<b>Employed</b>			
<i>Working FT</i>	14.00	15.00	107.1%
<i>Working PT</i>	30.00	33.00	110.0%
<i>Not Working</i>	29.00	28.00	96.6%
<b>Married</b>			
<i>No</i>	19.00	18.00	94.7%
<i>Yes</i>	26.00	26.00	100.0%

		<b>Ratio of Mean Values</b>	
		<b>OPCS</b>	<b>Match</b>
<b>Personal Income</b>		<b>Over All</b>	
<i>Less than £4K</i>		1.22	1.35
<i>£4K to £8K</i>		1.17	1.09
<i>£8K to £15K</i>		0.78	0.87
<i>£15K to £30K</i>		0.70	0.70
<i>£30K or more</i>		0.74	0.70
<b>Sex</b>			
<i>Female/Male</i>		1.81	1.81
<b>Parent</b>			
<i>No/Yes</i>		0.61	0.68
<b>Employed</b>			
<i>No/FT</i>		2.07	1.87
<i>No/PT</i>		0.97	0.85
<b>Married</b>			
<i>No/Yes</i>		0.73	0.69



<b>Median values of HH Production (Weekly Hours)</b>			
	<b>OPCS</b>	<b>Match</b>	<b>Ratio</b>
HH Production	18.00	18.00	100.0%
Care	-	-	
Procurement	-	-	
Core	11.00	11.00	100.0%
<b>Distribution among population subgroups</b>			
<b>Ratio of Median Values</b>			
<b>Personal Income</b>			
<i>Less than £4K</i>	26.00	30.00	115.4%
<i>£4K to £8K</i>	23.00	21.00	91.3%
<i>£8K to £15K</i>	12.00	14.00	116.7%
<i>£15K to £30K</i>	11.00	8.80	80.0%
<i>£30K or more</i>	11.00	8.80	80.0%
<b>Sex</b>			
<i>Male</i>	11.00	8.80	80.0%
<i>Female</i>	26.00	26.00	100.0%
<b>Parent</b>			
<i>No</i>	14.00	14.00	100.0%
<i>Yes</i>	30.00	26.00	86.7%
<b>Employed</b>			
<i>Working FT</i>	8.80	8.80	100.0%
<i>Working PT</i>	28.00	32.00	114.3%
<i>Not Working</i>	26.00	26.00	100.0%
<b>Married</b>			
<i>No</i>	14.00	11.00	78.6%
<i>Yes</i>	21.00	21.00	100.0%

**Table B.5: Alignment of Strata Variables for 2005 Time Use Match**

	<b>FRS</b>	<b>UKTUS</b>	<b>Diff.</b>
<i>Number</i>	47,643,205	38,555,900	23.6%
<b>Sex</b>			
<i>Female</i>	51.58%	52.57%	-0.99%
<i>Male</i>	48.42%	47.43%	0.99%
<b>Spouse</b>			
<i>No</i>	38.19%	38.75%	-0.56%
<i>Yes</i>	61.81%	61.25%	0.56%
<b>Parent</b>			
<i>No</i>	73.88%	68.40%	5.48%
<i>Yes</i>	26.12%	31.60%	-5.48%
<b>Labor Force Status</b>			
<i>Full-time</i>	43.39%	43.64%	-0.25%
<i>Part-time</i>	13.89%	16.05%	-2.16%
<i>Not working</i>	42.72%	40.31%	2.41%
<b>Spouse's Labor Force Status</b>			
<i>No Spouse</i>	38.19%	38.75%	-0.56%
<i>Full-time</i>	29.85%	29.07%	0.78%
<i>Part-time</i>	9.66%	10.48%	-0.82%
<i>Not working</i>	22.29%	21.70%	0.59%

**Table B.6: Distribution of Matched Records by Matching Round, 2005 Time Use Match**

<b>Matching Round</b>	<b>Number</b>	<b>Percent</b>	<b>Cumulative Percent</b>
1	44,304,621	93.0%	93.0%
2	247,735	0.5%	93.5%
3	42,321	0.1%	93.6%
4	55,837	0.1%	93.7%
5	373,240	0.8%	94.5%
7	1,425,374	3.0%	97.5%
8	38,409	0.1%	97.6%
9	492,267	1.0%	98.6%
10	258,044	0.5%	99.1%
11	121,321	0.3%	99.4%
12	66,936	0.1%	99.5%
13	190,052	0.4%	99.9%
14	27,048	0.1%	100.0%
<b>Total</b>	<b>47,643,205</b>	<b>100.0%</b>	

**Table B.7: Distribution of Weekly Hours of Household Production in 2000 UKTUS and Matched File**

	<b>p90/p10</b>	<b>p90/p50</b>	<b>p50/p10</b>	<b>p75/p25</b>	<b>p75/p50</b>	<b>p50/p25</b>	<b>Gini</b>
<b>UKTUS 2000</b>	12.953	2.402	5.393	3.872	1.732	2.236	0.4326
<b>Match</b>	12.932	2.401	5.387	3.869	1.731	2.236	0.4322

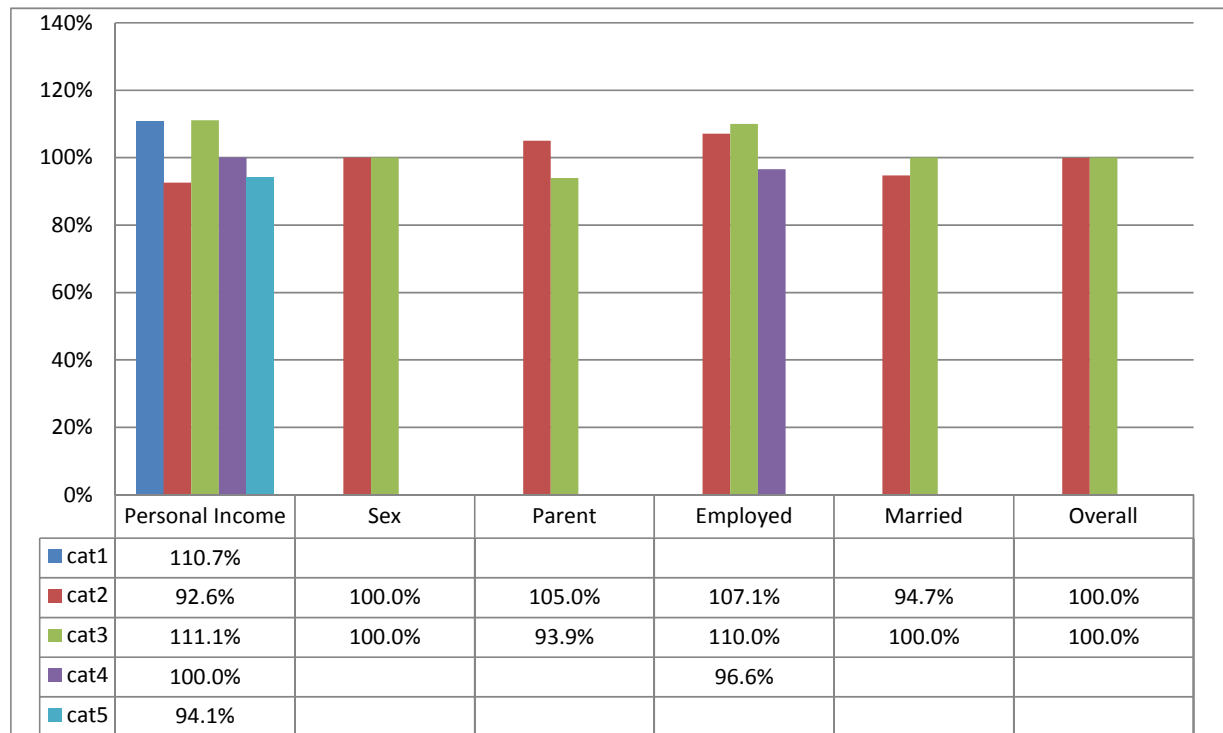
**Table B.8: Mean and Median Household Production Weekly Hours, 2000 UKTUS and Matched File**

Average HH Production Weekly Hours						
	UKTUS 2000	Match	ratio			
HH Production	25.00	25.00	100%			
Care	2.90	3.00	103%			
Procurement	5.70	5.70	100%			
Core	17.00	17.00	100%			
				Ratios		
					UKTUS 2000	Match
Female	32.00	32.00	100%	fem/male	1.778	1.778
Male	18.00	18.00	100%			
Unmarried	22.00	22.00	100%	sing/marr	0.815	0.815
Married	27.00	27.00	100%			
No kid	22.00	23.00	105%	no kid/kid	0.710	0.719
Kid	31.00	32.00	103%			
Not working	33.00	32.00	97%	nw/w	1.650	1.600
Working	20.00	20.00	100%			
Spouse not working	24.00	24.00	100%	spw/spnw	0.889	0.889
Spouse working	27.00	27.00	100%			
Not Working	33.00	32.00	97%			
less than £5,607	28.00	24.00	86%	less than £5,607	0.875	0.774
£5,607 to £11,213	21.00	24.00	114%	£5,607 to £11,213	0.656	0.774
£11,214 to £16,820	18.00	20.00	111%	£11,214 to £16,820	0.563	0.645
£16,821 to £36,347	16.00	19.00	119%	£16,821 to £36,347	0.500	0.613
£36,348 or more	14.00	17.00	121%	£36,348 or more	0.438	0.548

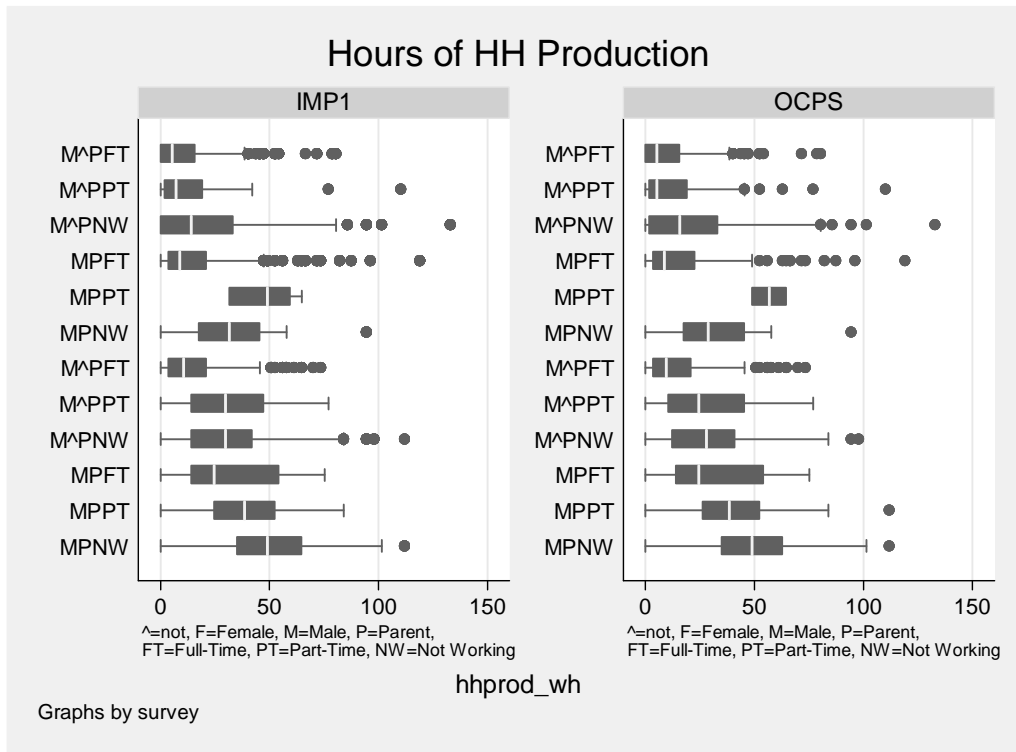
<b>Median HH Production Weekly Hours</b>						
	<b>UKTUS 2000</b>	<b>Match</b>	<b>ratio</b>			
<b>HH Production</b>	17.00	17.00	100%			
<b>Care</b>	0.00	0.00				
<b>Procurement</b>	2.90	2.90	100%			
<b>Core</b>	13.00	13.00	100%			
				<b>Ratios</b>		
					<b>UKTUS 2000</b>	<b>Match</b>
<b>Female</b>	30.00	30.00	100%	<b>fem/male</b>	2.308	2.308
<b>Male</b>	13.00	13.00	100%			
<b>Unmarried</b>	17.00	18.00	106%	<b>sing/marr</b>	0.708	0.783
<b>Married</b>	24.00	23.00	96%			
<b>No kid</b>	19.00	19.00	100%	<b>no kid/kid</b>	0.704	0.679
<b>Kid</b>	27.00	28.00	104%			
<b>Not working</b>	32.00	31.00	97%	<b>nw/w</b>	2.133	2.067
<b>Working</b>	15.00	15.00	100%			
<b>Spouse not working</b>	21.00	21.00	100%	<b>spw/spnw</b>	0.955	0.955
<b>Spouse working</b>	22.00	22.00	100%			
<b>Not Working</b>	32.00	31.00	97%			
<b>less than £5,607</b>	26.00	19.00	73%	<b>less than £5,607</b>	0.813	0.613
<b>£5,607 to £11,213</b>	18.00	21.00	117%	<b>£5,607 to £11,213</b>	0.563	0.677
<b>£11,214 to £16,820</b>	14.00	16.00	114%	<b>£11,214 to £16,820</b>	0.438	0.516
<b>£16,821 to £36,347</b>	12.00	14.00	117%	<b>£16,821 to £36,347</b>	0.375	0.452
<b>£36,348 or more</b>	10.00	12.00	120%	<b>£36,348 or more</b>	0.313	0.387

## B.4 Figures

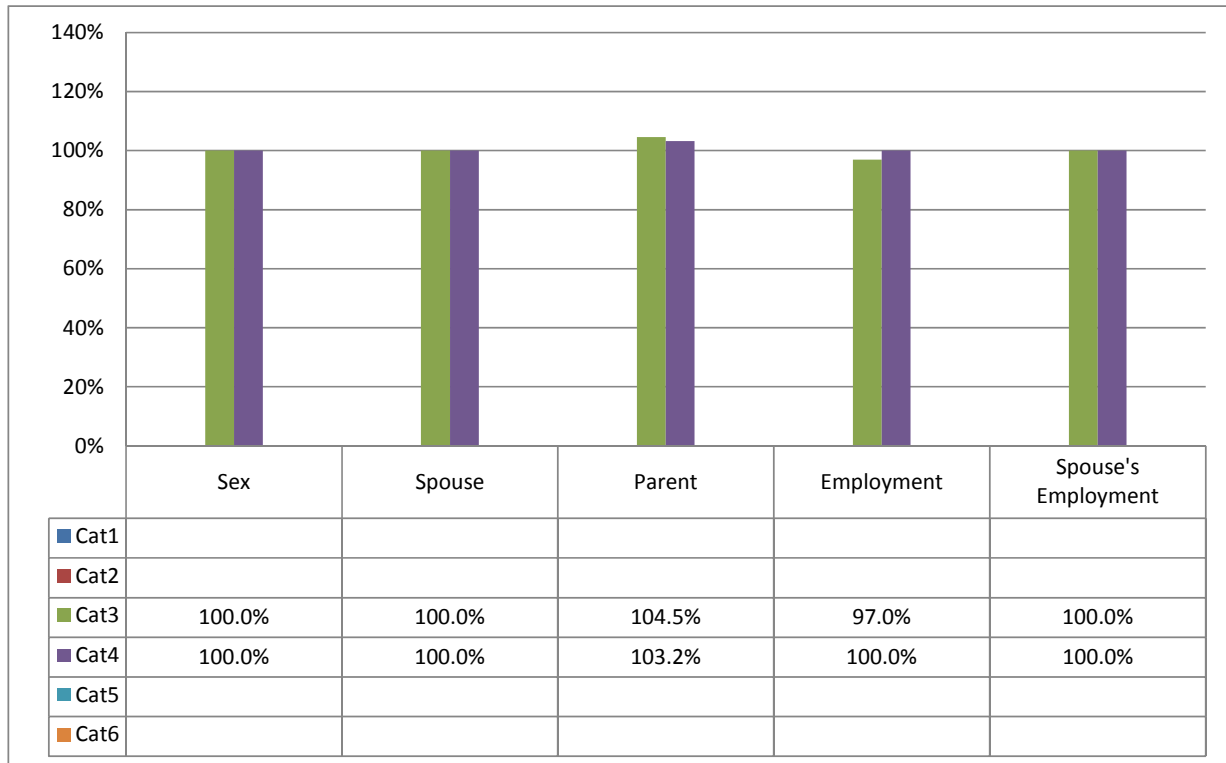
**Figure B.1: Ratio of Mean HH Production by Category (Match/OPCS 1995)**



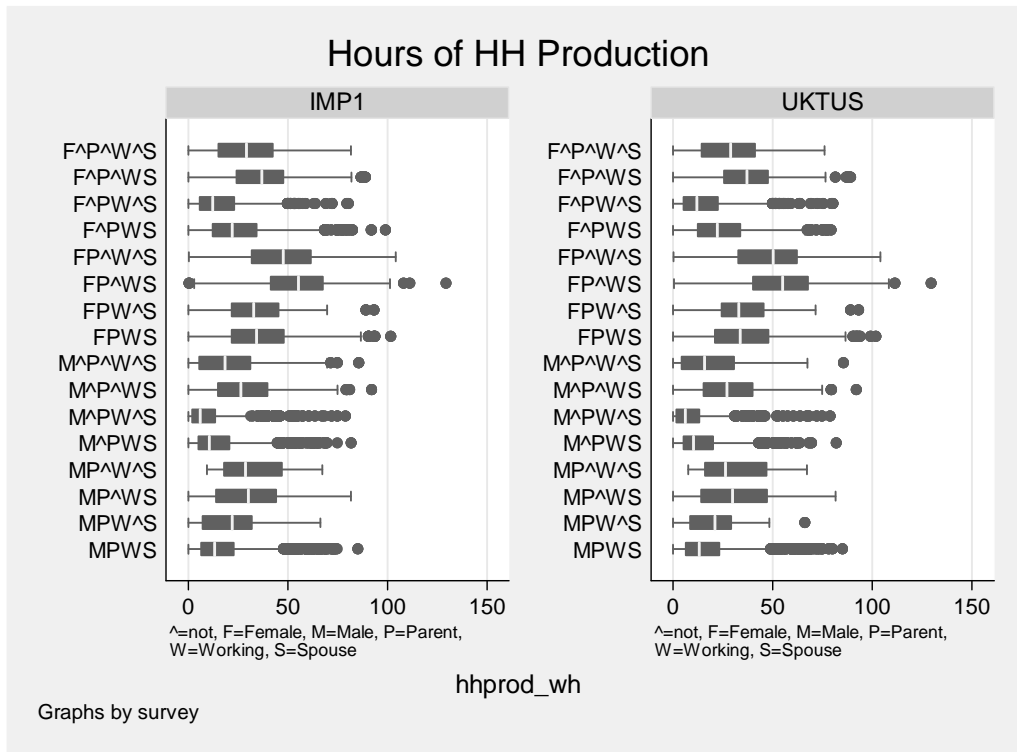
**Figure B.2: Household Production by Matching Cells, 1995 OPCS and Matched File**



**Figure B.3: Ratio of Mean HH Production by Category (Match/UKTUS 2000)**



**Figure B.4: Household Production by Matching Cells, 2000 UKTUS and Matched File**



## APPENDIX C: ESTIMATION OF INCOME FROM WEALTH

We divide net worth into two components. The first is the gross value of owner-occupied housing and its corresponding liability—mortgage debt on owner-occupied housing. The remainder, “nonhome wealth,” equals the sum of: (1) equity in real estate (other than the principal residence); (2) cash and demand deposits, time and savings deposits, TESSA and ISA accounts; (3) government bonds, corporate bonds, foreign bonds, and other financial securities, corporate stock and mutual funds, personal equity plans (PEPs), and equity in trust funds; and (4) less other (nonhome) debt such as auto and credit card loans.

The total real rate of return of each nonhome wealth component is the average of annual rates over a relatively long period of time, varying from 14 to 40 years, depending on the asset (see table C1). The total rates of return data we use are inclusive of both the capital gains and the income generated by the assets. The average rates of return by asset type were estimated from the data on asset holdings published by the Office of National Statistics for the United Kingdom and various other sources.<sup>51</sup> The calculation for income from wealth is:

$$\begin{aligned} p &\equiv m + a \\ m &= \left( M \frac{h}{H} \right) - \left( d \frac{r_d}{1 - (1 + r_d)^{-t}} \right) \\ a &= \sum_j w_j \frac{r_j}{1 - (1 + r_j)^{-t}} \\ t &= f(\text{age, sex}) \end{aligned}$$

In which  $p$  is income from wealth,  $m$  is imputed rent,  $d$  is mortgage debt,  $a$  is annuity,  $M$  is aggregate imputed rent,  $h$  is gross value of home,  $H$  is aggregate value of homes,  $w$  is nonhome net worth component,  $r$  is rate of return, and  $t$  is remaining years of life. The data for the remaining years of life were derived from the *National Vital Statistics Reports*, Vol. 56, No. 9,

---

<sup>51</sup> See the notes to table C1. Details on the data used, including series identifiers, are available from the authors upon request.



December 28, 2007, Interim Life Tables, Wales, 1980–82 to 2006–08, Interim Life Tables, Scotland, 1980–82 to 2006–08, and Interim Life Tables, England, 1980–82 to 2006–08.

**Table C1: Long-term Average Rates of Return (in percent)**

	Nominal	Real	Period
Real estate and business	10.86	4.95	1975–2007
Liquid assets	4.67	1.83	1994–2007
Financial assets	9.76	3.39	1960–2007
Mortgage debt	0.00	-5.80	1960–2007
Other debt	0.00	-5.80	1960–2007
<i>Inflation rate (RPI average)</i>	6.16		1960–2007
	2.78		1994–2007

Notes: **Real rate of return** =  $(1 + \text{Nominal rate}) / (1 + \text{Inflation rate}) - 1$

**Real estate and business:** Estimated as return on house prices (<http://www.nationwide.co.uk/hpi/historical.htm>) in the UK plus difference between return on business plus real estate and house prices in the US.

**Liquid assets:** Unweighted average of monthly interest rates of: (1) fixed-rate bond deposits; (2) ISA deposits; and (3) time deposits (Source: <http://www.bankofengland.co.uk/mfsd/iadb/index.asp?Travel=NIxIRx&levels=1&XNotes=Y&B40727XNode40727.x=3&B40727XNode40727.y=5&Nodes=X3688X3691X3694X3716X3738X3757X3764X3771X3774X3739X4052X40727&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM>).

**Financial assets:** Weighted average of rate of return on (1) stocks; (2) UK government bonds; and (3) bank fixed-rate bonds. Weights are based on historical shares of each type of asset in total of all three, from ONS Financial Statistics Consistent (from <http://www.statistics.gov.uk/statbase/tsdtables1.asp?vlnk=fsc>). The rate of return on stocks is derived from the FTSE All-Share Index, originally known as the FTSE Actuaries All-Share Index, is a capitalization-weighted index, comprising around 600 of more stocks. Representing 98–99 percent of UK market capitalization, FTSE All-Share is the aggregation of the FTSE 100, FTSE 250, and FTSE Small Cap Indices. The FTSE UK Index Series is designed to represent the performance of UK companies, providing investors with a comprehensive and complementary set of indices that measure the performance of all capital and industry segments of the UK equity market (from [http://www.ftse.com/Indices/UK\\_Indices/index.jsp](http://www.ftse.com/Indices/UK_Indices/index.jsp)). The rate of return on UK government bonds is the average of annual average yields from British government securities, 20-year, 10-year, and 5-year nominal par yields (from <http://www.bankofengland.co.uk/mfsd/iadb/index.asp?Travel=NIxIRx&levels=1&XNotes=Y&B40727XNode40727.x=3&B40727XNode40727.y=5&Nodes=X3688X3691X3694X3716X3738X3757X3764X3771X3774X3739X4052X40727&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM>). The rate of return on bank fixed rate bonds is the unweighted average of monthly interest rates of fixed rate bonds from (1) banks and (2) building societies (from <http://www.bankofengland.co.uk/mfsd/iadb/index.asp?Travel=NIxIRx&levels=1&XNotes=Y&B40727XNode40727.x=3&B40727XNode40727.y=5&Nodes=X3688X3691X3694X3716X3738X3757X3764X3771X3774X3739X4052X40727&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM>).

**Inflation rate:** Calculated from the RPI published by Office of National Statistics (from [http://www.statistics.gov.uk/downloads/theme\\_economy/rp02.pdf](http://www.statistics.gov.uk/downloads/theme_economy/rp02.pdf)).

## APPENDIX D: ESTIMATING PUBLIC CONSUMPTION

We use data from UK Public Expenditure Statistical Analyses (PESA) on Total Expenditures on Services by subfunction provided by Her Majesty's (HM) Treasury department.<sup>52</sup> UK consists of four countries: England, Wales, Scotland, and Northern Ireland. Our estimates did not include Northern Ireland (corresponding to less than 3 percent of the population) because our microdata do not include households from that country for both the years. Our estimates were developed by disaggregating England into nine regions (North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, Eastern, Greater London, South East, and South West). In sum, the geographical groupings for our estimates included the nine regions of England, Wales, and Scotland.

Total government expenditures classified by the United Nations' Classification of the Functions of Government (COFOG) schema are reported in table 3.6 in 1995 (HM Treasury 2005) and table 5.2 in 2005 (HM Treasury 2008).<sup>53</sup> Functions consist of general public services, defense, public order and safety, economic affairs, environmental protection, housing and community amenities, health, recreation, culture and religion, education, and social protection.<sup>54</sup> These functions are further disaggregated to subfunctions according to the activities funded by the expenditures. For instance, the education function contains preprimary education, primary education, secondary education, post-secondary education, and tertiary education as subfunctions (see table D.1 and D.2 for list of subfunctions for Great Britain in 1995 and 2005, respectively).

Since PESA tables are available only for the United Kingdom as a whole and our microdata are only available for Great Britain, we need to subtract the public expenditures allocated to Northern Ireland. Unfortunately, country-level expenditures by subfunction are not available for 1995. We do, however, have country-level expenditures by function for 1995 (table 8.4a in HM Treasury [2005]). The earliest year that we have this information is 2002 (table 10 in HM Treasury [2005]). Information on expenditures are available by country and COFOG-consistent subfunctions. In order to allocate the amounts from functions to subfunction level, we

---

<sup>52</sup> The relevant tables are table 3.6 in 1995 (HM Treasury 2005) and 5.2 in 2005 (HM Treasury 2008). Source: <http://www.hm-treasury.gov.uk/>

<sup>53</sup> The details regarding the COFOG can be found at: <http://unstats.un.org/unsd/class/family/family2.asp?Cl=4>

<sup>54</sup> We classify expenditures on health and social protection as government transfers. Therefore, they are not included in public consumption.

assumed that there was no change in within-function distribution from 1995 to 2002, i.e., we calculated proportions of each subfunction within functions in 2002 and used these proportions to divide expenditures in each function to subfunctions in 1995. The resulting expenditure amounts by subfunction are presented in table D.3 in column 3. Next, we disaggregated the remaining amounts to nine divisions of England as well as Scotland and Wales. Once again, this information is not available for 1995 forcing us to use data from 2002 (table 8.12 in HM Treasury [2005]) which contain function-level expenditures by region (and country) for identifiable expenditures, i.e., expenditures that can be traced to the (geographical) destination it is spent.<sup>55</sup> We made the same assumption about the regional distribution in 1995 as we did to subtract expenditures on Northern Ireland, i.e., there was no change in the regional distribution of expenditures between 1995 and 2002. We calculated the proportions of each subfunction amount within functions in 2002 and used these proportions to divide expenditures by subfunctions between regions in 1995.

COFOG-consistent, subfunction-level public expenditures are available for both the United Kingdom (table 5.2 in HM Treasury [2008]) as well as for Northern Ireland (table 10.4 in HM Treasury [2008]) in 2005. We subtracted the latter from the former to get subfunction-level public expenditures for Great Britain. The expenditure amounts used in the calculation of LIMEW are presented in table D.4 in column 3. Amounts for Scotland and Wales are available for 2005 (table 10.2 and 10.3 in HM Treasury [2008]) and no further adjustment was necessary for these countries. We still needed to allocate amounts for England (table 10.1 in HM Treasury [2008]) to the regions. Once again, we only have information on identifiable expenditures by function and region (tables 9.7 through 9.14 in HM Treasury [2008]) that we employed to allocate subfunction level public expenditures for England to nine regions using the same methodology as described for 1995.

Once we constructed the total expenditures for subfunctions in each region and country, the next step was to determine the allocation of the amounts between the household and nonhousehold sectors and the distribution of the allocated amounts among households. We used past available research in order to determine the extent to which expenditures benefit the

---

<sup>55</sup> Most unidentifiable expenditures are not allocated to households in our analysis such as national defense, so their omission should not bias regional distributions. The remaining unidentifiable expenditures are small in size. We assume that they have the same geographical distribution as identifiable expenditures.

households versus other entities and the extent to which different households benefit from the expenditures. Table D.1 and D.2 outline the allocation procedures between household and nonhousehold sector (column 2) and the distribution procedure among the households (column 3).

Central administration and associated expenditures, international services, defense, law courts, prisons, and public safety, as well as regional and industrial support were not allocated to households. We divided police and fire expenditures as well as communication expenditures equally between households and nonhouseholds. We distributed police and fire expenditures as well as communication expenditures equally to all persons. Protection of biodiversity and landscape, some housing and community amenities items (such as street lighting), and all recreation, culture, and religion subfunctions were allocated fully to households and were distributed equally to all persons.

In order to determine households' share of expenditures on spending on local and national roads, we employed cost responsibility estimates that were produced using national data on kilometers traveled by vehicle category obtained from "Transport Statistics Great Britain" (TSGB table 7.2) and the study "1998 Surface Transport Cost and Charges—Great Britain."<sup>56</sup> We assumed that the households' share was equal to the share of total costs attributed to cars, SUVs, and buses. The next step was to divide the expenditures between regions. We used *Transport Consumption Statistics* that contained information on fuel consumption by region and combined this information with fuel consumption per kilometers by vehicle type and imputed kilometers traveled by households for each region. In the final step, we distributed the allocated expenditures among households according to the usage of roads (as measured by kilometers traveled) by households in different groups. Usage was estimated with data from the National Travel Survey (NTS). We estimated usage for five income categories (quintiles) and twelve regions and employed this information to distribute expenditures on local and national roads among households in region and income cells.<sup>57</sup>

---

<sup>56</sup> Source: <http://www.dft.gov.uk/pgr/statistics/datatablespublications/tsgb/>

<sup>57</sup> National Travel Survey data is available for 1995–2006 time periods. It has a relatively small sample size for any given year and is not representative of each year. We followed recommendations by Olivia Christophersen from Department of Transport and employed data from 1995–2001 time period for 1995 distributors and data from 2001–2006 time period for 2005 estimators.

Unfortunately, we did not have any ready estimates for railway usage of households compared to nonhouseholds. We calculated households' share of rail usage as the ratio of passenger ton-kms to total ton-kms. The former was calculated by multiplying the number of passenger-kilometers moved by the average weight of British persons (70 kg) and converting the resulting amount into tons. The latter was calculated by adding passenger ton-kilometers and freight ton-kilometers lifted by rail. Information on freight ton-kilometers lifted and passenger-kilometer moved was taken from the *National Rail Trend Statistics* published by the Office of Rail Regulation.<sup>58</sup> We distributed the allocated expenditures among households according to the usage of rail by households in five income categories (quintiles) estimated with the data from NTS. Local transport (public transit) was fully allocated to households and distribution was formulated using estimates of kilometers traveled via public transport by income category and region using NTS.

We fully allocated general labor affairs to households and distributed expenditures equally among recipients of government employment training. We allocated agriculture market support to the nonhousehold sector whereas other agriculture, fisheries, and food were allocated to both households and nonhouseholds. We used the share of family farms in total sales of farm products to determine allocators for other agriculture, food, and fisheries policy expenditures<sup>59</sup> and distributed these among households who receive farm income according to the share of their farm income in total farm income of all households. We allocated fuel and energy according to the domestic (household) share of total energy consumption. Regional energy consumption statistics were obtained from the Department of Energy and Climate Change.<sup>60</sup> We used the 2006 data for 2005 and the 2003 data for 1995.<sup>61</sup> We divided energy consumption into three categories: industry and commercial, domestic, and transport. Transport was divided into commercial and residential transport using the road transport fuel energy consumption table published by the Department of Transport based on statistics from NTS. The formula is as follows:

---

<sup>58</sup> <http://www.rail-reg.gov.uk/server/show/nav.1863>

<sup>59</sup> Source: <http://epp.eurostat.ec.europa.eu/portal/page/portal/agriculture/data>  
[http://www.defra.gov.uk/esg/work\\_htm/publications/cs/farmstats\\_web/1\\_ABOUT\\_THE\\_SURVEY/FAQs\\_ABOUT\\_THE\\_DATA\\_AND\\_SURVEY/Introduction.htm](http://www.defra.gov.uk/esg/work_htm/publications/cs/farmstats_web/1_ABOUT_THE_SURVEY/FAQs_ABOUT_THE_DATA_AND_SURVEY/Introduction.htm) for definition of ESU: SGM

<sup>60</sup> Source: [http://www.decc.gov.uk/en/content/cms/statistics/regional/total\\_final/total\\_final.aspx](http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx)

<sup>61</sup> 2003 was the earliest year for which we were able to locate information.

Imputed household energy consumption for each region =  
residential energy consumption + (transportation energy  
consumption x share of personal fuel consumption in total fuel  
consumption) / total energy consumption

Allocators for solid-waste management were calculated from the data published by the Department for Environment, Food, and Rural Affairs (Defra). We used a table titled “Waste Arisings by Disposal and Sector by Rgion”<sup>62</sup> and calculated the share of the household sector in waste arisings. This information is only available for regions of England, so we assumed that the English average prevailed also in Wales and Scotland. Allocated expenditures were distributed among households classified by five income categories (quintiles) and eleven regions according to their share of expenditures on water and other public services among all households using data from the 1995–96 and 2005–06 rounds of the Family Expenditure Survey (FRS). We utilized detailed information on household expenditures on energy, water and sewerage, pollution items (nondurables plus entertainment), and recreation. For waste-water management, we used the share of the household sector in the estimated abstractions from groundwater, estimated using the data available from the Department for Environment, Food, and Rural Affairs. This information was available for the regions of England and Wales so we used the English estimates for Scotland.<sup>63</sup> These expenditures are distributed using the same methodology as above using data from FRS.

In order to allocate pollution abatement, we used four measures of pollution: air, water, greenhouse gases, and municipal solid waste and employed the average of these four as allocator for each region.

(1) household share of GHG = total domestic CO<sub>2</sub> emission/total CO<sub>2</sub> emission<sup>64</sup>

(2) Household share of water pollution = household share of estimated abstractions from groundwater

(3) household share of municipal waste = waste arising by households/total waste arising

(4) household share of air pollution = residential + passenger cars + motorcycles air

---

<sup>62</sup> Source: <http://www.defra.gov.uk/environment/statistics/inlwater/alltables.htm>

<sup>63</sup> Source: <http://defraweb/evidence/statistics/environment/index.htm>

<sup>64</sup> Source: <http://www.defra.gov.uk/environment/statistics/index.htm>

pollution/total air pollution

air pollution = sum of emission inventories of air quality pollutants: CO, NH<sub>3</sub>, NO<sub>x</sub>, SO<sub>2</sub>, PM<sub>10</sub>, VOC, and lead.<sup>65</sup>

We calculated the household share of water use from the table “Household Abstractions from Nontidal Surface Waters and Ground Waters/Total Abstractions” published in *Regional Sustainable Development*.<sup>66</sup> We imputed the average share of Great Britain to Scotland.

The following functions were fully allocated to the household sector: housing development and community development; protection of biodiversity and landscape; recreation and culture; and education. Housing development and community development is equally distributed among those who were in social housing. Protection of biodiversity and landscape and recreation and culture were distributed equally among households.

We calculated the total number of state (public) school students at each level of schooling (preprimary, primary, and secondary) by geographical region (nine regions of England, plus Wales and Scotland). Total expenditures on schooling were distributed equally among individuals of school-attending age by level of schooling and geographical region. For higher education, we combined the number of students per institution<sup>67</sup> with the regions these institutions are located.<sup>68</sup> Using this information, we computed the total number of students in higher education institutions by region and country, and divided the total higher education expenditures by the number of students to obtain per-pupil expenditures. We assigned households expenditures according to the number of higher education students in the household. For further education, enrollment numbers per institution come from the Department of Business Innovation and Skills.<sup>69</sup> We followed the same procedure as we described above for higher education, i.e., we calculated per-pupil expenditure by dividing regional expenditures with regional enrollment.

---

<sup>65</sup> Source: [http://www.airquality.co.uk/archive/reports/cat07/1001071213\\_AQI\\_Summary\\_Table.xls](http://www.airquality.co.uk/archive/reports/cat07/1001071213_AQI_Summary_Table.xls)

<sup>66</sup> Source: Regional Sustainable Development Indicators Report, 2008. Report can be found at <http://www.defra.gov.uk/sustainable/government/progress/data-resources/regional.htm>.

<sup>67</sup> Source: Higher Education Statistics Agency  
[http://www.hesa.ac.uk/index.php/component/option,com\\_datatables/Itemid,121/](http://www.hesa.ac.uk/index.php/component/option,com_datatables/Itemid,121/)

<sup>68</sup> Source: <http://www.scit.wlv.ac.uk/ukinfo/>

<sup>69</sup> Source: <http://www.dcsf.gov.uk/rsgateway/DB/SFR/>



In 1995, only a small portion of individuals who attended a further or higher education institution responded to the type of institution question so we could not observe the type of institution for all individuals that may actually be attending these institutions. For this reason, we had to impute institution types by estimating the likelihood of each individual being in further or higher education institution. We do this imputation by age first. If the individual is below age 18 and responded to be attending an institution of further or higher education, we assumed that they attended an institution of further education. For individuals above 18 who did not answer the type of institution question, we calculated a likelihood function by first running a probit regression among the individuals who answered the question. The dependent variable was a dummy for attending an institution of higher education (1 if the person is in higher education and 0 if the person was in further education). We used age, age squared, sex, and marital status as the independent variables. The estimated parameters of the regression were then used to impute the type of institution for individuals with missing information.

**Table D.1: UK Region-wise Distributor, Allocation, and Distribution of Government Consumption Expenditures and Gross Investment by Function, 1995**

Function	Allocation	Distribution
<b>Central administration and associated expenditure</b>		
Other public services	Nonhousehold	
Common services	Nonhousehold	
EC Net Payments	Nonhousehold	
Finance for public corporations	Nonhousehold	
Northern Ireland Regional Rates (Payments)	Nonhousehold	
Northern Ireland Regional Rates (Receipts)	Nonhousehold	
<b>International development assistance and other international services</b>		
International development assistance and other international services	Nonhousehold	
Other international services	Nonhousehold	
<b>Defense</b>		
Defense budget	Nonhousehold	
Receipts for sale of married quarters	Nonhousehold	
Civil defense	Nonhousehold	
<b>Public Order and Safety</b>		
Police Services		
of which: Police	50-50	Population
of which: Immigration and citizenship	Nonhousehold	
Fire Protection Services	50-50	Population
Law Courts	Nonhousehold	
Prisons	Nonhousehold	
R&D Public Order and Safety	Nonhousehold	
Public Order and Safety n.e.c.	Nonhousehold	
<b>Economics Affairs</b>		
General economic, commercial and labor affairs		
of which: General labor affairs	Household	Recipients of government employment training
of which: Regional and other industrial support	Nonhousehold	
Agriculture, fisheries, food and forestry		
of which: Market support under CAP	Nonhousehold	
of which: Other agriculture, fisheries and food	Share of family farms in total sales of farm products	Farm Income
of which: Forestry	Household	Population
Fuel and energy	Domestic share of total energy consumption	Energy expenditures
Mining, manufacturing and construction	Nonhousehold	
Transport		
of which: National roads	Share of automobiles and buses in total cost	KMs driven by region and income quintile
of which: Local roads	Share of automobiles and buses in total cost	KMs driven by region and income quintile

	Household	KMs used by region and income quintile
if which: Local transport		
of which: Ports	Nonhousehold	
	Nonhousehold	
of which: Marine, coastguard, shipping and civil aviation services		
of which: Driver and vehicle licensing	Share of automobiles and buses in total cost	KMs driven by region and income quintile
of which: National rail services	Share of passenger rail KM-tons in total rail KM-tons	KMs used by region and income quintile
of which: UK Maritime Agency	Nonhousehold	
of which: Other transport services	Nonhousehold	
Communication	50–50	
Other industries	Nonhousehold	
R&D economic affairs	Nonhousehold	
Economic affairs n.e.c.	Nonhousehold	
<b>Environmental protection</b>		
Waste management	Residential share of total municipal solid waste	Expenditures on water and other public services by households receiving public water supply
Waste water management	Domestic share of total water discharges from all sectors	Expenditures on water and other public services by households using public sewerage
Pollution abatement	Domestic share of total pollution in four categories	Expenditures on nondurables and entertainment (less fees and admissions)
Protection of biodiversity and landscape	Household	Population
R&D environment protection	Nonhousehold	
Environment protection n.e.c.	Domestic share of total pollution in four categories	Expenditures on nondurables and entertainment (less fees and admissions)
<b>Housing and community amenities</b>		
Housing Development		
of which: local authority housing	Household	Recipients of housing assistance
of which: other Social Housing	Household	Recipients of housing assistance
Community development	Household	Population
Water supply	Domestic-use share of total deliveries from the public water supply	Expenditures on water and other public services by households using public sewerage
Street lighting	Household	Population
R&D housing and community amenities	Nonhousehold	
<b>Recreation, culture, and religion</b>		
Recreational and sporting services	Household	Population
Cultural services	Household	Population
Broadcasting and publishing services	Household	Population
Religious and other community services	Household	Population
R&D recreation, culture and religion	Nonhousehold	
Recreation, culture and religion n.e.c.	Household	Population
<b>Education</b>		

Pre-primary education	Household	Pre-primary students in public schools
Primary education	Household	Primary students in public schools
Secondary education	Household	Secondary students in public schools
Post-secondary education	Household	Post-secondary students in public schools
Tertiary education	Household	College students in public schools
Education not definable by level	Household	All Students
Subsidiary services to education	Household	All Students
R&D Education	Nonhousehold	
Education n.e.c	Household	All Students

**Table D.2: UK Region-wise Distributor, Allocation, and Distribution of Government Consumption Expenditures and Gross Investment by Function, 2005**

<b>Function</b>	<b>Allocation</b>	<b>Distribution</b>
<b>General public services</b>		
Executive and legislative organs, financial and fiscal affairs, external affairs	Nonhousehold	
Foreign economic aid	Nonhousehold	
General services	Nonhousehold	
Basic research	Nonhousehold	
R&D general public services	Nonhousehold	
General public services n.e.c.	Nonhousehold	
Public debt transactions(1)	Nonhousehold	
<i>of which: central government debt interest</i>	Nonhousehold	
<i>of which: local government debt interest</i>	Nonhousehold	
<i>of which: public corporation debt interest</i>	Nonhousehold	
<b>Defense</b>	Nonhousehold	
Military defense	Nonhousehold	
Civil defense	Nonhousehold	
Foreign military aid	Nonhousehold	
R&D defense	Nonhousehold	
Defense n.e.c.	Nonhousehold	
<b>Public order and safety</b>		
Police services		
<i>of which: immigration and citizenship</i>	Nonhousehold	
<i>of which: other police services</i>	50–50	Population
Fire-protection services	50–50	Population
Law courts	Nonhousehold	
Prisons	Nonhousehold	
R&D public order and safety	Nonhousehold	
Public order and safety n.e.c.	Nonhousehold	
<b>Economic affairs</b>		
General economic, commercial and labor affairs	Share of labor affairs	Recipients of Government Employment Training
Agriculture, forestry, fishing and hunting		
<i>of which: market support under CAP</i>	Nonhousehold	
<i>of which: other agriculture, food and fisheries policy</i>	Share of family farms in total sales of farm products	Farm Income
<i>of which: forestry</i>	Household	Population
Fuel and energy	Domestic share of total energy consumption	Energy expenditures
Mining, manufacturing and construction	Nonhousehold	

Transport		
<i>of which: national roads</i>	Share of automobiles and buses in total cost	KMs driven by region and income quintile
<i>of which: local roads</i>	Share of automobiles and buses in total cost	KMs driven by region and income quintile
<i>of which: local public transport</i>	Household	KMs used by region and income quintile
<i>of which: railway</i>	Share of passenger rail KM-tons in total rail KM-tons	KMs used by region and income quintile
<i>of which: other transport</i>	Nonhousehold	
Communication	50–50	
Other industries	Nonhousehold	
R&D economic affairs	Nonhousehold	
Economic affairs n.e.c.	Nonhousehold	
<b>Environment protection</b>		
Waste management	Residential share of total municipal solid waste	Expenditures on water and other public services by households receiving public water supply
Waste water management	Domestic share of total water discharges from all sectors	Expenditures on water and other public services by households using public sewerage
Pollution abatement	Domestic share of total pollution in four categories	Expenditures on nondurables and entertainment (less fees and admissions)
Protection of biodiversity and landscape	Household	Population
R&D environment protection	Nonhousehold	
Environment protection n.e.c.	Nonhousehold	
<b>Housing and community amenities</b>		
Housing development		
<i>of which: local authority housing</i>	Household	Recipients of Government Housing Assistance
<i>of which: other social housing</i>	Household	Recipients of Government Housing Assistance
Community development	Household	Population
Water supply	Domestic-use share of total deliveries from the public water supply	Expenditures on water and other public services by households using public sewerage
Street lighting	Household	Population
R&D housing and community amenities	Nonhousehold	
Housing and community amenities n.e.c.	Household	Population
<b>Recreation, culture and religion</b>		
Recreational and sporting services	Household	Population
Cultural services	Household	Population
Broadcasting and publishing services	Household	Population
Religious and other community services	Household	Population
R&D recreation, culture and religion	Nonhousehold	
Recreation, culture and religion n.e.c.	Household	Population
<b>Education</b>		
Pre-primary and primary education		
<i>of which: under fives</i>	Household	Pre-primary students in public schools
<i>of which: primary education</i>	Household	Primary students in public schools
Secondary education	Household	Secondary students in public schools

Post-secondary non-tertiary education(3)	Household	Per pupil expenditures on further education by region
Tertiary education	Household	Per pupil expenditures on higher education by region
Education not definable by level	Household	All Students
Subsidiary services to education	Household	All Students
R&D education	Nonhousehold	
Education n.e.c.	Household	All Students

**Table D.3: UK Government Consumption and Gross Investment Expenditures by Function (in millions of current pounds): Total Expenditure and the Amount and Share (in percent) Allocated to the Household Sector, 1995**

Function	PESA Total	Allocated Amount	Household share
<b>Total central administration and associated expenditure</b>	<b>8,110</b>	na	
Other public services	4,432	na	
Common services	278	na	
EC Net Payments	3,370	na	
Finance for public corporations	(52)	na	
Northern Ireland Regional Rates (Payments)	205	na	
Northern Ireland Regional Rates (Receipts)	(124)	na	
<b>International development assistance and other international services</b>			
International development assistance and other international services	2,216	na	
Other international services	1,333	na	
Total international development assistance and other services	3,549	na	
Defense			
Defense budget	21,528	na	
Receipts for sale of married quarters			
Total defense	21,528		
Civil defense	37	na	
<b>Public Order and Safety</b>			
Police Services	7,447		
of which: Police	7,239	3,619	50
of which: Immigration and citizenship	208	na	na
Fire Protection Services	1,537	769	50
Law Courts	2,921	na	na
Prisons	2,247	na	na
R&D Public Order and Safety		na	na



	28		
Public Order and Safety n.e.c.	425	na	na
<b>Total law, order and protective services</b>	22,739	4,388	19
<b>Economics Affairs</b>			
General economic, commercial and labor affairs	4,758	2,572	54
of which: General labor affairs	2,572	2,572	100
of which: Regional and other industrial support	2,186	na	na
Agriculture, fisheries, food and forestry	3,785	na	na
of which: Market support under CAP	2,159	-	-
of which: Other agriculture, fisheries and food	1,570	1,247	79
of which: Forestry	55	55	100
Fuel and energy	628	327	52
Mining, manufacturing and construction	63	na	na
Transport	8,578	na	na
of which: National roads	2,406	1,657	69
of which: Local roads	3,472	2,400	69
if which: Local transport	1,077	1,077	100
of which: Ports	5	na	na
of which: Marine, coastguard, shipping and civil aviation services	21	na	na
of which: Driver and vehicle licensing	139	94	67
of which: National rail services	2,004	282	14
of which: UK Maritime Agency	82	na	na
of which: Other transport services	(627)	na	na
Communication	197	98	50
Other industries	136	na	na
R&D economic affairs	1,351	na	na
Economic affairs n.e.c.	352	na	na
<b>Total Economic Affairs</b>	19,847	9,809	49

<b>Environmental protection</b>			
Waste management	5,604	786	14
Waste water management	77	22	28
Pollution abatement	251	72	29
Protection of biodiversity and landscape	384	384	100
R&D environment protection	366	na	na
Environment protection n.e.c.	2,650	561	21
Total environmental services	9,332	1,825	20
<b>Housing and community amenities</b>			
Housing Development	1,315	1,315	100
of which: local authority housing	1,021	na	na
of which: other Social Housing	294	na	na
Community development	1,809	1,809	100
Water supply	922	234	25
Street lighting	478	478	100
R&D housing and community amenities	27	na	na
<b>Total housing and community services</b>	4,729	3,836	81
<b>Recreation, culture, and religion</b>			
Recreation and culture	2,791	2,837	102
Recreational and sporting services	732	na	na
Cultural services	2,059	na	na
Broadcasting and publishing services	71	71	100
Religious and other community services	54	53	98
R&D recreation, culture and religion	42	na	na
Recreation, culture and religion n.e.c.	42	na	na
<b>Total recreation, culture and religion</b>	3,000	2,961	99
<b>Education</b>			
Pre-primary education	1,589	1,588	100
Primary education	9,414	9,414	100

Secondary education	10,089	10,089	100
Post-secondary education	4,876	3,038	na
Tertiary education	4,795	4,057	na
Other Education	3,040	2,755	91
Education not definable by level	1,518	na	na
Subsidiary services to education	823	na	na
R&D Education	31	na	na
Education n.e.c	699	na	na
<b>Total education</b>	33,834	30,941	91
<b>Total Public Expenditures (excluding Social Protection and Health)</b>	126,669	53,760	42

**Table D.4: UK Government Consumption and Gross Investment Expenditures by Function (in millions of current pounds): Total Expenditure and the Amount and Share (in percent) Allocated to the Household Sector, 2005**

Function	PESA Total	Allocated Amount	Household share
<b>General public services</b>			
Executive and legislative organs, financial and fiscal affairs, external affairs	11,447	-	
Foreign economic aid	4,227	-	
General services	1,060	-	
Basic research	127	-	
R&D general public services	30	-	
General public services n.e.c.	2,413	-	
Public debt transactions(1)	26,752	-	
of which: central government debt interest	25,807	-	
of which: local government debt interest	440	-	
of which: public corporation debt interest	505	-	
<b>Total general public services</b>	46,056	-	
<b>Defense</b>			
Military defense	26,411	-	
Civil defense	77	-	
Foreign military aid	1,155	-	
R&D defense	566	-	
Defense n.e.c.	2,710	-	
<b>Total defense</b>	30,918	-	
<b>Public order and safety</b>			
Police services	16,186	7,287	45
of which: immigration and citizenship	1,649	-	
of which: other police services	14,537	7,288	50
Fire protection services	2,675	1,337	50
Law courts			0

	6,111	-	
Prisons	3,577	-	0
R&D public order and safety	23	-	0
Public order and safety n.e.c.	421	-	0
<b>Total public order and safety</b>	28,993	-	0
<b>Economic affairs</b>			
General economic, commercial and labor affairs	6,971	3,095	44
Agriculture, forestry, fishing and hunting	5,586	1,104	20
of which: market support under CAP	3,950	-	0
of which: other agriculture, food and fisheries policy	1,481	988	67
of which: forestry	156	116	74
Fuel and energy	1,359	711	52
Mining, manufacturing and construction	136	-	0
Transport	17,039	8,461	50
of which: national roads	2,705	1,796	66
of which: local roads	4,963	3,320	67
of which: local public transport	2,567	2,568	100
of which: railway	5,921	777	13
of which: other transport	882	-	0
Communication	426	213	50
Other industries	295	-	0
R&D economic affairs	2,925	-	0
Economic affairs n.e.c.	762	-	0
<b>Total economic affairs</b>	35,499	13,583	38
<b>Environment protection</b>			
Waste management	5,077	799	16
Waste water management	70	11	16
Pollution abatement	227	43	19
Protection of biodiversity and landscape			100

	348	349	
R&D environment protection	332	-	0
Environment protection n.e.c.	2,401	450	19
Total environment protection	8,456	1,651	20
Housing and community amenities	.		
Housing development	6,017	6,012	97
of which: local authority housing	3,783	-	-
of which: other social housing	2,235	-	-
Community development	2,983	2,984	100
Water supply	880	250	28
Street lighting	482	482	100
R&D housing and community amenities	14	-	0
Housing and community amenities n.e.c.	175	-	-
<b>Total housing and community amenities</b>	10,552	9,728	92
<b>Recreation, Culture, and Religion</b>			
Recreation and culture	7,196	6,982	97
Recreational and sporting services	3,130	-	-
Cultural services	3,984	-	-
Broadcasting and publishing services	3,431	3,433	100
Religious and other community services	105	106	100
R&D recreation, culture and religion	81	-	0
Recreation, culture and religion n.e.c.	82	-	-
<b>Total recreation, culture and religion</b>	10,813	10,521	97
<b>Education</b>			
Pre primary and primary education	23,448	23,447	100
of which: under fives	4,305	4,305	100
of which: primary education	19,143	19,142	100
Secondary education	21,144	21,144	100
Post secondary non tertiary education	7,669	5,607	73

Tertiary education	9,793	8,215	84
Other Education	7,624	7,626	100
Education not definable by level	2,229	-	-
Subsidiary services to education	3,360	-	-
R&D education	33	-	-
Education n.e.c.	2,035	-	-
<b>Total education</b>	69,710	66,039	95
<b>Total UK Expenditures (excluding health and social protection)</b>	240,997	101,522	42