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The Changing Distribution of Wealth in the pre-crisis US and UK: The Role of Socio-Economic Factors

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Abstract

The US and the UK experienced substantial increases in net wealth in the decade that preceded the financial crisis, largely driven by house price booms in each country. The distribution of these gains across households led to a slight increase in wealth inequality in the US but a substantial fall in inequality in the UK. We use a decomposition technique to examine the extent to which changes in households' socioeconomic characteristics explain changes in wealth holdings and wealth inequality. In both countries we find that changes in household characteristics had an equalizing effect on wealth inequality, moderating the increase in the US and accounting for over one-third of the fall in UK wealth inequality.

JEL codes: C81, D31, D63, I24, I31

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1 Introduction

The UK-US comparison is often used in economic case studies, and for good reason. Apart from the obvious cultural connections between the two countries there are similarities in social and economic policies, systems and outcomes. Both exhibit high levels of earnings and income inequality, both have been characterized as countries with weaker institutions and less generous welfare states than other developed countries. However, in the distribution of wealth and in the recent history of wealth inequality, there are important differences between the two countries.[1] The objective of this paper is to better understand one aspect of the roots of these differences and the contrasting changes in wealth distribution and wealth inequality in the two countries. We do this by focusing on changes in household characteristics during the decade immediately preceding the financial crisis: this period is essential to provide an understanding of both the medium-term determinants of wealth distribution in the two countries and the basis from which the financial crisis subsequently unfolded.

During the pre-crisis decade both the US and the UK experienced substantial increases in net wealth. In the UK increases in net wealth were mainly linked to the general increase in house prices throughout the period. In the US, on the other hand, the increase in wealth between 1995 and 2001 were mainly driven by the increases in stock market prices (continuing a trend that started in 1989) whereas in the period between 2001 and 2005 the main driver of the increase was rising house prices. Despite the fact that stock and housing market prices evolved in a similar fashion over the period, the outcomes in terms of wealth inequality were rather different and clearly an explanation for this must be attributable in part to the fact that households in the two countries typically hold rather different portfolios of personal wealth.

Research comparing housing and financial wealth has highlighted the fact that US households are more likely to hold financial assets than UK households, who are more likely to hold housing assets (Banks et al. 2004). UK households are more likely to enter home-ownership earlier than US households and entry into the housing market leaves UK households with fewer savings to invest in the stock market. Furthermore, institutional differences between the two countries are likely to affect the dynamics of housing assets and associated debt: for example, smaller down-payment ratios in the UK make it easier to enter home-ownership at a young age (the down-payment ratio in the UK was 5% compared to 11% in the US during the period 1991-1995 – see Chiuri and Jappelli 2003). Fixed-rate mortgages accounted for the majority of mortgage loans in the US – at least 70% since 1995 and a higher share since the financial crisis (Green and Wachter 2005). In contrast, in the UK the vast majority of

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[1]Although income inequality is well documented, until recently much less has been known about the distribution of household wealth. For earlier work comparing US and UK wealth see Banks et al. (2004).

mortgages have flexible rates (IMF 2004). But that is, at best, only a partial explanation as recent evidence suggests that younger UK cohorts are entering the housing market later but do not appear to be saving more, in terms of financial asset accumulation, than older cohorts (Hood and Joyce 2013). The widespread diffusion of stock ownership which occurred in the US over the 1990s (Gale and Pence 2006), has not been replicated in the UK; some of this difference appears to be due to historical factors and pension systems (Banks et al. 2000). These pre-crisis trends are likely to have a bearing on differences between the US and the UK in terms of the financial resilience of households as they enter the economic downturn.

In addition to house and stock-market prices evolving in a similar fashion in both countries during the pre-crisis decade, the distribution of characteristics changed in similar ways: educational attainment increased; the prevalence of older-aged households increased; so too did real income levels. However, there were important differences in the way income inequality evolved in the two countries: as measured by the Gini coefficient income inequality increased markedly in the US, but only slightly in the UK (see section 5.1 below). We investigate the different distributional outcomes in the two countries by comparing private wealth holdings of financial and non-financial assets of US and UK households over the period 1994/5 – 2005/6. We examine the relationship between the distribution of economic and demographic factors of households and the distribution of wealth and assess the extent to which changes in these factors explain changes in the distributions of wealth over this period. Since one of our aims is to understand the link between the composition of household wealth (in particular the relative importance of financial and housing assets) and the distribution of household wealth we focus on a period characterized by important developments in both the housing and financial markets. We do not extend the analysis to the subsequent financial crisis and Great Recession period, since this period was accompanied by considerable increases in unemployment and income shocks, which themselves would have serious repercussions on household economic behaviour.

Sections 2 and 3 describe the data and the principal changes in wealth distribution that have occurred during the period. Section 4 explains the methodology for analysing the distributional changes; this methodology is then implemented in Section 5. Section 6 concludes.

2   Data

The principal source for the US is the Luxembourg Wealth Study database (LWS), based on the Survey of Consumer Finances (SCF). International wealth data, drawn from national surveys and in some cases administrative sources, held in this database have been harmonized as much as possible to allow for meaningful comparisons between countries. The analysis for the UK is based on the British Household Panel Survey (BHPS) data: household wealth definitions are comparable to those adopted by LWS while the necessary imputations for

housing and financial wealth are described in detail in Karagiannaki (2011). While the SCF has a good coverage of the upper tail (because of its oversampling of rich households), the coverage of the upper tail by BHPS (as a representative sample survey) is not as good; for further detail see the online Data Appendix.

Wealth holdings are typically computed at the household level by summing assets (net of debt) across all members of a household. Normally, households are described in terms of the characteristics of the household head and no equivalization is made for household size or composition. This contrasts with earnings statistics which are usually presented (as they are paid) on an individual basis and income which is typically expressed at a household level and equivalized using a variety of scales that adjust for 'need' based on household size and composition to facilitate comparison on a like-for-like basis. There is no consensus on whether or how household wealth holdings should be equivalized. In our analysis we use unadjusted measures of household wealth, treating wealth as a common household asset, although we do consider the impact of household composition on our results.

A consequence of using raw household wealth data is that individual wealth holders – the households – are clearly not equal in their ability to accumulate wealth or in their 'need' for wealth holdings. Households with more adult members are likely to have higher wealth than households with fewer adults and, arguably, larger households' needs for wealth are greater. In using household level wealth measures there is an underlying assumption that this provides a good description of the wealth status of household members and against other alternatives this may well be the most realistic. Wealth ownership within a household can take various forms with some assets personally owned by individual members and some jointly owned between household members or with individuals who are not household members. Similarly some debts may be viewed as personal (credit-card debt, personal loans, bank overdrafts) while others are usually treated as joint (mortgage debt). As an example of the complexity of intra-household asset ownership, legal ownership of household assets is frequently contested upon divorce/separation and settlements vary across different jurisdictions.

The main measure of wealth used in this paper is an estimate of net worth. Net worth in any year is defined as the sum of total financial assets less total non-housing debts and total housing assets less housing debt. This measure of net worth excludes estimates of business assets and debts, life insurance and pension assets, and durables or collectibles. See the online Data Appendix for details.

3 Changes in US and UK household wealth

We focus on the decade from the mid 1990s onwards. This is a period characterized by a substantial increase in household net worth in both countries as shown in Table 1. It is also a period that ends in a natural break, the financial crisis of 2007–08. The upheaval in the housing market and the market for

	Mean	P_{10}	P_{25}	P_{50}	P_{75}	P_{90}	Number of households
US							
1994	149.0	-7.0	0	34.7	123.9	296.4	4299
1997	183.8	-9.1	0	41.2	158.4	366.1	4305
2000	241.0	-7.3	0.3	49.4	181.1	487.1	4442
2003	266.1	-8.6	0.2	50.5	201.5	558.1	4519
2006	287.1	-10.9	0.1	58.4	221.1	562.6	4418
UK							
1995	103.8	-0.2	1.6	49.4	131.7	267.9	3915
2000	137.8	-0.1	3.4	75.0	177.1	363.4	3856
2005	253.6	0	14.2	175.0	342.1	598.0	3484

Source: Authors' calculations from SCF (in LWS) and BHPS waves 5, 10, 15.

Note: The number of households in BHPS is for households with non-missing wealth data.

Currency unit: thousands of 2005 dollars (PPP adjusted).

Table 1: Mean and quantiles of net worth in US and the UK

financial assets that took place on both sides of the Atlantic would have clearly changed the wealth dynamics substantially. By focusing on the pre-crisis period we are able to get a clearer view of the medium-term determinants of wealth inequalities in the two countries.

3.1 The US

Mean *net worth* rose by around 62% between 1994 and 2000 (from about $149,000 to $241,000)[2] after which increases in wealth were much smaller: around 10% between 2000 and 2003 and less than 8% between 2003 and 2006. Overall, during the entire period average net worth increased by 93%. Median wealth grew by less (68% over the entire period), indicating a widening inequality of wealth over these years (Wolff 2007). Underlying this, each of the principal components of net worth behaves in interesting and contrasting ways over the period.

Mean *financial wealth* showed a sharp increase from 1994 to 2000 (around 80%), followed by a rather modest decline from 2000 to 2003 and then a slight increase between 2003 and 2006 but not enough to return to the 2000 level (Table 2). Figure 1 shows that these trends follow the trends in share prices,[3] although the strong recovery in share prices 2003-2006 was not matched by a comparable increase in financial wealth which has a number of components that can separately influence trends. Overall, for the entire period mean net financial

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[2]All values are expressed in 2005 dollars.
[3]For further discussion see Wolff (2012).
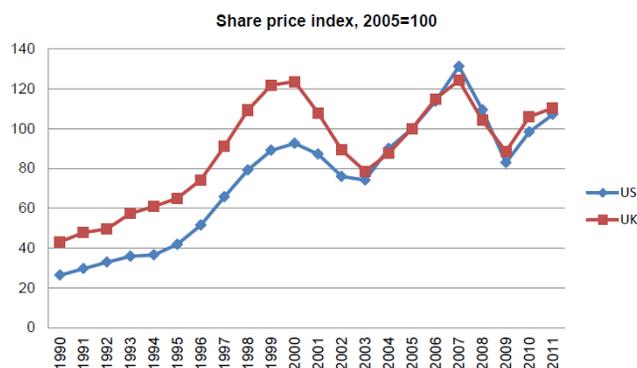
Figure 1: Share price index.

wealth grew by around 68% (a little under the increase in share prices). Over the same period median net financial wealth remained virtually unchanged while net financial wealth at the lower quartile decreased by around 70%, mainly as a result of the large increases in financial debt in the lower tail of the distribution. The stronger growth of net financial wealth at the upper tail of the distribution indicates again increased inequality. The patterns in terms of (gross) financial wealth are similar, showing larger increases at the upper tail of the distribution and small or no increases at the middle and lower tail of the distribution.

Mean (net) *housing equity* held by US households more than doubled over this period. The larger increases occurred between 1994-2000 and 2000-2003 when (net) housing wealth increased by 50% and 26% respectively. Between 2003 and 2007 the growth in (net) housing wealth was much lower (increasing by around 10%).[4] Over the entire period, (net) housing equity increased by 108%. The increase in median housing wealth was slightly smaller than the increase in mean housing wealth (81%) indicating again widening inequality. The growth in gross housing wealth follows a similar pattern, although the difference between median and mean growth is greater, with the median growing by 71% and the mean by 106%.

Over the same period there was also a substantial increase in financial debt and an even larger increase in housing (mortgage) debt (with the means of the former increasing by around 52% and the latter by 100%). Total debt as a proportion of gross (total) assets decreased between 1994 and 2000 (from around 26% to 21%) - as a result of the faster growth in the value of gross assets - but by 2006 the proportion increased again to 26% (reflecting the slowdown of asset-price growth).

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[4]This does not follow the pattern of house prices changes shown in Figure 2 where house prices increased more after 2003 than earlier. This suggests that other changes such as increases in loan-to-value mortgages and owner-occupation rates drove some of these changes.

	Net financial wealth					Total financial assets				Financial debt			
	Mean	P_{25}	P_{50}	P_{90}	% neg	Mean	P_{25}	P_{50}	P_{90}	Mean	P_{25}	P_{50}	P_{90}
US													
1994	58.0	-5.2	0.2	92.2	42	67.3	0.7	3.7	97.6	9.4	0.0	2.0	23.7
1998	79.3	-5.1	0.8	136.2	38	91.4	0.8	6.1	145.3	12.2	0.0	2.0	29.9
2000	104.8	-5.0	1.2	175.4	38	116.3	1.0	6.8	181.6	11.6	0.0	2.1	29.5
2003	94.2	-7.7	0.3	146.8	41	107.8	0.7	5.4	153.9	13.7	0.0	3.3	33.1
2006	97.2	-8.8	0.2	126.9	42	111.5	0.8	5.2	134.6	14.3	0.0	3.1	37.8
UK													
1995	36.8	0.0	3.6	97.0	22	39.0	0.3	5.2	97.0	2.2	0.0	0.0	6.8
2000	28.9	0.0	3.7	82.3	24	32.7	0.3	5.9	84.1	3.8	0.0	0.0	12.6
2005	39.3	0.0	5.2	112.6	24	44.9	0.3	8.1	114.8	5.6	0.0	0.0	15.7

	Net housing equity					Gross housing wealth				Housing debt			
	Mean	P_{25}	P_{50}	P_{90}	% neg	Mean	P_{25}	P_{50}	P_{90}	Mean	P_{25}	P_{50}	P_{90}
US													
1994	91.2	0.0	31.7	208.8	1	133.6	0.0	73.7	263.6	42.5	0.0	0.0	126.5
1998	104.5	0.0	36.6	228.5	1	153.7	0.0	85.2	330.2	49.1	0.0	0.0	141.1
2000	136.3	0.0	40.9	297.8	1	190.5	0.0	90.7	396.9	54.1	0.0	0.0	147.4
2003	171.9	0.0	49.9	371.6	0	248.5	0.0	116.8	530.7	76.6	0.0	0.0	201.7
2006	189.9	0.0	57.2	410.7	1	275.1	0.0	126	581.4	85.2	0.0	0.9	222.8
UK													
1995	67.2	0.0	36.6	164.6	2	92.7	0.0	82.3	210.2	25.5	0.0	0.0	87.8
2000	109.0	0.0	63.9	285.9	0	140	0.0	100.9	336.3	31.1	0.0	0.0	100.9
2005	214.2	0.0	157.3	471.7	0	259	0.0	220.1	550.3	44.9	0.0	0.0	149.4

Source: Authors' calculations from SCF (in LWS) and BHPS waves 5, 10, 15.

Note: In thousands of 2005 US$ (PPP adjusted)

Table 2: Mean and quantiles of household net worth components

3.2 The UK

The rapid growth in wealth occurred after 2000, in contrast to US experience: mean household net worth increased by 33% between 1995 and 2000, but by 84% between 2000 and 2005. Mean net worth was more than twice as high in 2005 as it was in 1995 ($103,800 in 1995 compared to $253,600 in 2005). The growth was stronger in the lower tail and the middle of the distribution, indicating a decrease in net-worth inequality.

The increase in UK household net worth over the period was mostly driven by net housing wealth which, according to the estimates in Table 2, grew from an average of $67,200 in 1995 to $214,200 in 2005. In turn the main drivers of the increase in housing equity were first the growth in house prices (see Figure 2)[5] and, second, the increase in the home ownership rate (up from 65% in

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[5]Sources: UK House Price Index: data downloads October 2017

1995 to 72% in 2005).[6] Mean net financial wealth decreased by around 22% between 1995 and 2000 and increased between 2000 and 2005 to reach a level slightly higher than in 1995. Probably the most noticeable change concerning the distribution of net financial wealth was the increase in the accumulation of debt in the lower tail of the distribution reflected in the two percentage point increase in households with negative financial wealth holding (from 22% to 24% in 2005).
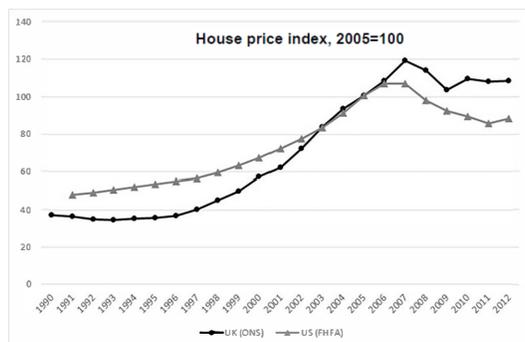
Figure 2: House price index. Source: see footnote 5

As a result of the substantial rise in the value of assets in the UK the proportion of debt fell, from around 21% to 16% of gross assets (from 26% to 19% of equity). Housing debt behaved similarly: falling from 28% to 17% as a proportion of housing assets (from 38% to 20% as a proportion of housing equity). But financial debt *rose* much faster than financial assets: debt as a proportion of gross financial wealth rose from about 6% in 1995 to 12% in 2005.

3.3 Wealth inequality

As a result of the large increase in household net worth, in both countries there were large increases in the absolute differences between quantiles over the period – see columns labelled $P_{10}, \ldots, P_{90}$ in Table 1. In the US this mainly reflected the increase of wealth in the upper tail of the distribution while in the UK this reflected a widening dispersion in the lower part of the distribution as a result of the median pulling away from the bottom of the distribution.

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(http://landregistry.data.gov.uk/id/region/united-kingdom last accessed 12-12-2017); US Federal Housing Finance Agency (FHFA), quarterly Purchase Only Index (weighted, repeat-sales index). (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#qpo last accessed on 12-12-2017). This FHFA HPI is more stable than the Standard and Poor (S&P) index due to differences in coverage and methodology. Quarterly data in both countries are averaged to reflect simple annual average and prices are expressed in Q2 2005 prices.

[6]The BHPS sample records a larger increase from a smaller base in home-ownership rates than other data sources. It would appear that this is partly driven by sample selection as households with missing wealth (excluded from our sample) are more likely to be homeowners.

The differences between P_{50} and P_{90} are substantial and much greater in the US than in the UK: households at P_{90} have net worth around nine times larger than households at the median in the US;[7] in the UK this difference was a factor of five at the beginning of the period falling to a factor of three by the end of the period. The differences between P_{50} and P_{90} for net *financial* wealth are very large indeed, particularly in the US, reflecting the fact that wealthier households are more likely to hold this type of asset.

The relative inequality measures presented in Table 3 show that despite the substantial increase in the level of net worth and the greater increases in the mean relative to the median, the degree of inequality in the distribution of net worth in the US remained fairly stable. Over the entire period the Gini coefficient for total net wealth increased by about one-point (from 0.83 to 0.84). This increase reflected mainly the larger concentration of wealth at the top of the distribution (mainly between P_{96} and P_{99} in the US data). Looking at the components of net worth, there was an increase in the concentration of net housing wealth (the Gini coefficient rose from 0.74 to 0.76), while the concentration of net financial wealth was about the same at the end of the period as it was at the beginning.

By contrast net-worth inequality in the UK *decreased* substantially: the Gini coefficient fell from 0.69 to 0.59. This was driven by the decrease in the inequality of housing equity; inequality in net financial wealth increased over this period. The fall in relative inequality was also accompanied by falls in wealth concentration at the top of the distribution (shares of the top 1%, 5% and 10%), again driven by falls in the concentration of net housing wealth. As shown earlier the large increases in house prices drove up the value of housing equity and this benefited those in moderately wealthy households and consequently led to a fall in inequality. Although financial asset ownership is more skewed towards wealthier households, and inequality in these assets increased over this period, falls in financial asset holdings meant that this had little impact on overall wealth inequality.

In summary, Figure 3 shows the contrasting tale of changes in net worth and its distribution between the US and the UK over this period,[8] highlighting the differences between the two countries both with respect to the timing at which the largest increases in net worth took place (between 1994 and 2000 in the US and between 2000 and 2005 in the UK) as well as to the parts of the distribution where the increase in net worth was concentrated (in the UK large increases were observed from P_{30} upwards whereas in the US the increase was concentrated further up the distribution).

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[7]Because the SCF has better coverage of the top end of the wealth distribution, it is not surprising to find this difference.

[8]In each case the graph is plotted up to P_{99}.

	P_{90}/P_{50}	P_{25}/P_{50}	Gini	Share of top:		
				10%	5%	1%
Net worth US						
1994	8.539	0.000	0.83	68.1	55.2	32.2
1997	8.876	0.001	0.83	68.4	55.6	32.1
2000	9.876	0.006	0.83	70.3	57.3	32.7
2003	11.045	0.005	0.83	70.0	56.5	31.5
2006	9.630	0.002	0.84	70.4	57.8	31.3
Net worth UK						
1995	5.426	0.033	0.69	48.7	33.0	12.0
2000	4.846	0.045	0.66	44.4	28.9	9.2
2005	3.417	0.081	0.59	38.4	24.6	7.6
Net housing wealth US						
1994	6.604	0.000	0.74	56.39	42.68	21.74
1997	6.260	0.000	0.75	58.52	44.79	23.27
2000	7.294	0.000	0.76	61.22	47.81	25.17
2003	7.447	0.000	0.77	61.97	48.03	25.29
2006	7.183	0.000	0.76	61.30	47.83	23.86
Net housing wealth UK						
1995	4.500	0.000	0.66	32.48	27.78	10.14
2000	4.474	0.000	0.64	32.51	28.29	9.51
2005	3.000	0.000	0.57	29.65	23.70	7.54
Net financial wealth US						
1994	472.538	na	1.11	96.92	85.21	58.04
1997	164.691	na	1.06	92.17	79.93	50.81
2000	154.700	na	1.02	91.12	78.83	51.38
2003	461.020	na	1.07	95.30	82.96	52.89
2006	523.990	na	1.10	98.57	88.14	57.54
Net financial wealth UK						
1995	26.500	0.000	0.89	71.28	55.20	23.44
2000	22.236	0.000	0.94	69.03	52.45	21.05
2005	21.730	0.000	0.98	70.15	54.48	21.28

Source: as for Table 2.

Note: 'na' denotes not applicable as denominator is negative.

Table 3: Inequality of net worth

US SCF 1994, 2000, 2006
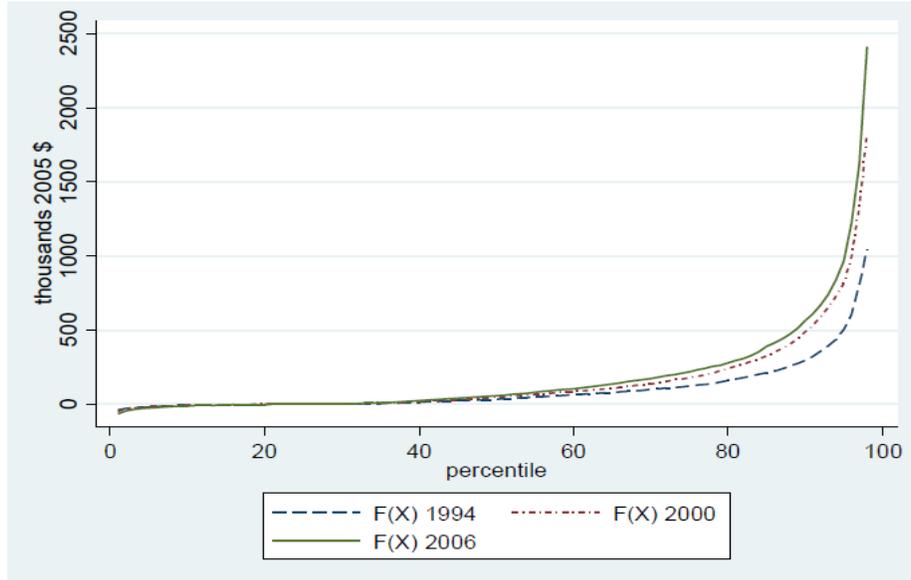
UK BHPS 1995, 2000 and 2005
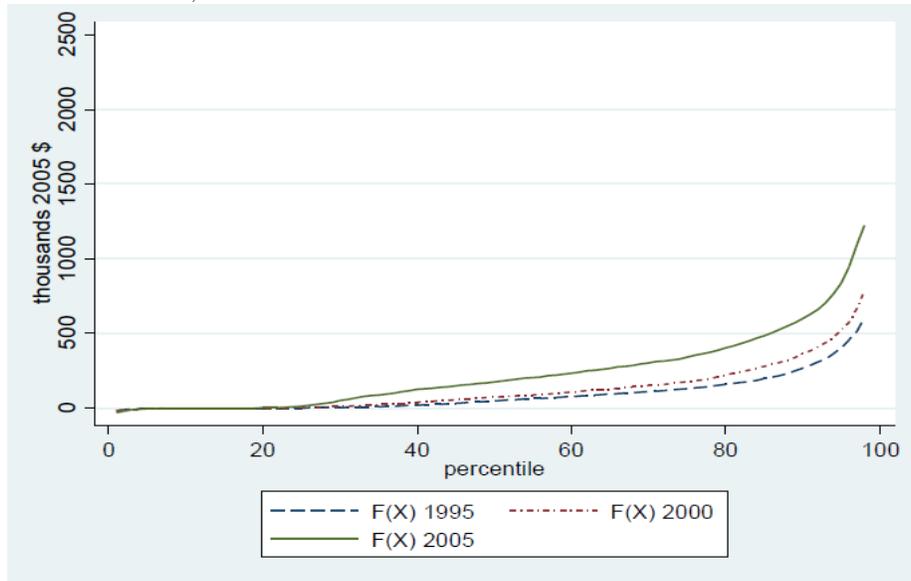
Figure 3: Pen's parades of net worth

	US SCF		UK BHPS	
	1994	2006	1995	2005
Age of household head				
16-24	5.25	5.42	4.47	3.28
25-34	19.53	16.24	17.02	11.91
35-44	23.02	19.59	17.67	18.02
45-54	17.84	20.77	15.23	17.25
55-64	12.5	16.85	12.66	15.86
65-74	12.05	10.52	16.87	13.78
75 or older	9.81	10.62	16.08	19.90
Household type				
Single no children	30.34	29.93	35.51	35.52
Single with children	9.69	9.34	5.57	6.49
Single with other adults no children	1.87	2.85	4.80	4.51
Couples no children	27.97	27.16	26.94	28.06
Couples with children	27.35	27.38	20.85	18.87
Couples with other adults	2.78	3.34	6.33	6.55
Educational attainment of the household head				
Low	50.22	46.36	60.87	45.36
Mid	23.66	23.35	29.34	40.21
High	26.11	30.28	9.79	14.43
Race or ethnicity of the household head				
White (including Middle Eastern/Arab)	77.53	73.87		
Black/African American	12.9	12.66		
Hispanic/Latino	5.67	9.41		
Other	3.9	4.06		
Housing status (% of homeowners)	67.7	70.8	64.6	72.2
Household disposable income (equivalized):				
Median	20,149	22,669	14,029	20,490
Mean (overall)	25,688	35,440	16,785	23,311
Mean of bottom 25%	6,539	8,979	6,490	10,302
Mean of second 25%	15,736	17,880	11,540	17,204
Mean of third 25%	25,065	29,070	17,687	24,276
Mean of top 25%	58,086	92,008	31,845	41,336
Gini	0.47	0.57	0.34	0.30
Number of households	4,299	4,418	3,915	3,484

Source: Authors' calculations from SCF (in LWS) and BHPS waves 5, 10, 15.

Notes: households with non-missing information on wealth and all other variables in our analysis.

Income (in 2005 $) excludes rental income, income from investments and savings. BHPS sample size

precludes analysis on race. In the SCF data on race are recorded for household head only.

Table 4: Changes in the distribution of characteristics 1994/5-2005/6

4 Methodology

We analyse the development over time of the wealth distribution in two stages: (1) the computation of a 'counterfactual' decomposition of the factors contributing to the changes in the distribution; (2) an assessment of the actual and counterfactual changes in terms of inequality and related distributional statistics.

4.1 Decomposition

Following DiNardo et al. (1996) − hereafter DFL − we use semi-parametric decomposition methods to estimate the portion of across-time changes in the distribution of wealth which is attributable to changes in the distribution of household characteristics.[9] The characteristics that we account for here are income, educational attainment, age and household structure (for the US we also take into account race). Let w denote wealth and z a vector of wealth determinants. The distribution of wealth for each year t in country i can be thought of as given by:

$$F(w|t) = \int_z F(w, z|t)\, \mathrm{d}z = \int_z F(w|z, t)\, \mathrm{d}F(z|t). \tag{1}$$

Suppose we want to compare the wealth distributions in two time periods, t_1 and t_2, and to identify the portion of the difference that can be accounted for by the changes in the distribution of characteristics. The basic idea behind the DFL decomposition is to compare the actual distribution of wealth in t_2 with the counterfactual distribution that would have prevailed if the distribution of characteristics in t_2 was the same as in t_1, holding the conditional distribution of wealth in t_2 fixed. The counterfactual distribution of interest can then be thought of as the distribution that mixes the wealth function in t_2 with the distribution of characteristics in t_1, $F(z|t_1)$. The counterfactual distribution function is then given by

$$F_{\mathrm{c}}(w|t_2) = \int_z F(w|z,\, t_2)\, \mathrm{d}F(z|t_1). \tag{2}$$

Following DFL equation (2) can be rewritten as:

$$F_{\mathrm{c}}(w|t_2) = \int_z F(w|z,\, t_2)\psi(z)\, \mathrm{d}F(z|t_2), \tag{3}$$

where

$$\psi(z) := \frac{\mathrm{d}F(z|t_1)}{\mathrm{d}F(z|t_2)}$$

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[9]Similarly to Bover (2010), our main instrument of analysis is the evaluation of counterfactual cumulative distribution functions rather than counterfactual densities. As stressed by Bover (2010), page 259: 'An advantage of relying on conditional distributions is that one avoids having to choose a smoothing method. It is well known that density estimation is sensitive to the smoothing method adopted. This is particularly relevant in the case of wealth distributions, which often have a marked spike at zero because a non-negligible proportion of the population has no wealth. The presence of spikes increases the sensitivity of density estimations to the smoothing method used.'

is a reweighting factor which reweights the distribution of characteristics in t_2 to match the distribution of characteristics in t_1. While in theory the reweighting function is straightforward its empirical implementation is not. It is likely that in finite data the probability mass in the numerator or the denominator is zero for some values of z. As discussed in DiNardo et al. (1996) DFL overcomes this problem by using Bayes rule:

$$\Pr\left(A|B\right) = \frac{\Pr\left(B|A\right) \centerdot \Pr(A)}{\sum_X \Pr\left(B|X\right) \centerdot \Pr(X)}.$$

Recall that $dF\left(z|t_2\right) = \Pr(z|t_2 = 1)$, so applying this method to the DFL we get

$$\Pr\left(z|t_2 = 1\right) = \frac{\Pr(t_2 = 1|z) \cdot dF(z)}{\int_z \Pr(t_2 = 1|z) \cdot dF(z)} = \frac{\Pr\left(t_2 = 1|z\right)}{\Pr\left(t_2 = 1\right)}$$

and a similar expression for $dF\left(z|t_1\right) = \Pr(z|t_1 = 1)$. Therefore, the reweighting factor that keeps all conditioning variables as in period t_1 becomes:

$$\widehat{\psi(z)} = \frac{\Pr\left(z|t_1 = 1\right)}{\Pr\left(z|t_2 = 1\right)} = \frac{\Pr\left(t_1 = 1|z\right)}{\Pr\left(t_2 = 1|z\right)} \centerdot \frac{\Pr\left(z|t_2 = 1\right)}{\Pr\left(z|t_1 = 1\right)}.$$

The reweighting factor can be computed by estimating a probability model for $\Pr\left(t_1 = 1|z\right)$ and using the predicted probabilities to compute a value $\widehat{\psi(z)}$ for each observation. In our implementation of the DFL we use a probit model to predict the probability of $t_1 = 1$. We then use the predicted probabilities to generate the weight for each household: this is done by multiplying the predicted probabilities of each household by their existing sample weight and using standard methods to create the distribution of interest.[10]

In our decompositions we use the earliest year in each country as the baseline t_1 and compare each of the other years to t_1. Each counterfactual distribution is constructed by reweighting the distributions of characteristics in each year t_2 in order to mirror the distributions of characteristics in t_1. The difference in the observed and the counterfactual distribution at each point in time captures the contribution of characteristics to the observed differences in net worth; the unexplained part includes such things as the overall changes in the returns to assets and differences in propensity to hold particular types of assets. We first implement our decompositions for net worth and then for each of its sub-components separately taking into account differences in ownership of different types of assets, the degree of indebtedness and levels of wealth holdings. In addition to considering the aggregate compositional effect to the change in the wealth distribution in each country we also consider the effect of each covariate separately. The difficulty with the DFL approach to decompose the effect of

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[10]In principle the function $\widehat{\psi(z)}$ could also be derived using non-parametric specifications (Barsky et al. 2002, Bover 2010, Sierminska et al. 2010), but in our application z includes five variables (four for the UK) so that non-parametric estimation of the reweighting factor is infeasible.

each covariate is that the effect attributed to each factor would always depend on the sequence in which its effect is evaluated. Using four components to decompose wealth differences leads to 24 relevant sequences while the number of sequence increases to 120 in the case of five covariates. With no particular preference over the relevant sequence we follow Cobb-Clark and Hildebrand (2006) and calculate each in turn and present results of the simple average across all possible sequences.[11]

4.2 Inequality

We use standard graphical and analytical techniques to summarize the distribution of wealth and the counterfactual distributions used in the decomposition analysis. In addition to the Gini coefficient we also compute a number of quantiles and shares (given by points on the inverse of the distribution function and on the Lorenz curve, respectively). The quantiles can be used to derive measures of dispersion – for example P_{25}/P_{50}, the ratio of the lower quartile (25th percentile) to the median (50th percentile) is commonly used as a simple way of characterizing dispersion in the lower tail of the distribution. From the Lorenz ordinates we can infer the share of specific groups at the top of the distribution that may be of particular interest (we will focus on the shares of the top 1%, 5% and 10%).

5   The role of income and demographic changes

5.1 Overview

Table 4 presents summary statistics describing the distribution of various socio-economic characteristics in the US and the UK in 1994/1995 and 2005/2006. In common with most wealth studies the unit of analysis in this paper is the household, these characteristics mainly relate to the household head (household reference person as defined in the SCF and BHPS).[12] In both countries socio-economic characteristics of households changed over this period. For instance there was a rise in the share of middle-aged households in the US and a rise in the proportion of older aged households in the UK. Given what we know about wealth accumulation over the life cycle we would expect this to have an impact on the distribution of wealth. In both countries there was a clear increase in the proportion of household heads with higher educational attainment and a clear upward trend in household income (mean, median and quartiles). In the US this culminated in an increase in income inequality as measured by the Gini coefficient, reflecting the larger relative increases in income in the upper tail

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[11]For more details about the application of this method see Cowell et al. (2018).

[12]There are differences in how household heads are defined in the two surveys. In the UK (BHPS) the household head is the person legally or financially responsible for the accommodation, or the older of the two people equally responsible. In the US (SCF) the household head is the male in a married or couple family or the older individual in the case of a same-sex couple and the single individual where there is not a core couple.

of the distribution. Note that the increase in income inequality in the SCF was substantially larger than the increase suggested by the Census data.[13] In the UK, on the other hand, the increase in income levels was associated with a decrease in income inequality as measured by the Gini coefficient using the BHPS or a slight increase using the UK's official estimates.[14] According to Jenkins (2010) the divergence in the two series reflects the under-recording of net household income at the top of the distribution in the BHPS relative to the official series.[15] In addition, our estimates could be affected by the fact that capital income and realized capital gains are excluded from our measure of income.

5.2 Decomposition: basic

Using Section 4's decomposition methodology Table 5 shows that in both the US and the UK changes in the distribution of characteristics explain a significant proportion of the changing distribution of wealth, especially of changes occurring in the lower tail of the distribution.

In the US, changes in the distribution of characteristics in 2000 and in 2005 had a positive impact on wealth levels relative to 1994, particularly in the lower tail: at P_{10}, where households are in debt, levels of indebtedness would have been larger than the observed levels if the distribution of characteristics had remained unchanged; at P_{25} and P_{50} the changing distribution of characteristics explained most of the increase in wealth levels in both years (100% and 78%); but in 2000 it only explained 25% of changes in wealth at P_{90} and 19% of changes in wealth at P_{95}; in 2006 these figures increased to 39% and 37% respectively. The main reason for the increase in the contribution of characteristics was that the decrease in asset prices had a greater impact in the upper tail of the distribution (see below). To see this, compare the actual and counterfactual net financial and housing wealth distributions in Table 6: the changing distribution of characteristics played a moderate role in explaining the increase in financial wealth levels in 2000; by 2006 it explained *all* of the change in financial wealth. But for housing equity the distribution of characteristics played a more moderate role in explaining the increasing levels of housing wealth in 2006, although there is a fairly strong impact between P_{30} and P_{50}.

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[13]That the SCF data reports higher levels of income inequality than CPS data has been noted by several studies (for example Kenworthy and Smeeding 2013, Wolff 2006). The higher income inequality recorded by SCF can be attributed mainly to two factors: (1) the SCF oversamples the wealthy in contrast to CPS, which is based on a representative sample; (2) differences in the income concepts in the two surveys; for example the SCF income definition includes capital gains whereas the CPS definition does not (although the income definition in the present paper does not include capital gains). For further discussion see Wolff (2006) page 148.

[14]Official estimates are taken from the *Households Below Average Income* series derived from the UK Family Resources Survey.

[15]The Households Below Average Income series makes adjustments to very high incomes using the HM Revenue and Customs' Survey of Personal Incomes – see Department for Work and Pensions (2013) page 267.

	P_{10}	P_{25}	P_{50}	P_{90}	P_{95}	
SCF 1994						
Actual	-7.0	0.0	34.7	296.4	503.3	
SCF 2000						
Actual	-7.3	0.3	49.3	487.1	815.4	
Counterfactual	-8.0	0.0	38.0	439.0	757.3	
Change	-0.3	0.3	14.6	190.6	312.1	
Explained by characteristics	0.6	0.3	11.3	48.1	58.2	
Explained by characteristics (%)	*-180*	*100*	*78*	*25*	*19*	
SCF 2006						
Actual	-11	0.1	58.4	562.7	966.6	
Counterfactual	-11.7	0.0	39.8	458.3	796.5	
Change	-4.0	0.1	23.7	266.2	463.3	
Explained by characteristics	0.7	0.1	18.6	104.3	170.2	
Explained by characteristics (%)	*-18*	*100*	*78*	*39*	*37*	
BHPS 1995						
Actual	-0.2	1.6	49.4	267.9	405.9	
BHPS 2000						
Actual	-0.2	3.4	75	363.5	524.7	
Counterfactual	-0.7	0.8	61.6	325.4	477.6	
Change	0.1	1.7	25.6	95.6	118.7	
Explained by characteristics	0.5	2.5	13.4	38.1	47.1	
Explained by characteristics (%)	*733*	*146*	*52*	*40*	*40*	
BHPS 2005						
Actual	0	14.2	175	598	835.8	
Counterfactual	-1.4	0.5	142.2	504.7	700.3	
Change	0.2	12.5	125.6	330.1	429.9	
Explained by characteristics	1.4	13.7	32.7	93.3	135.5	
Explained by characteristics (%)	*600*	*109*	*26*	*28*	*32*	

Source: Authors' calculations using SCF (LWS) and BHPS waves 5, 10 and 15.

Notes: Unless otherwise stated units are thousands of 2005 $. Sample includes households with non-missing information on wealth and all other variables. Counterfactuals estimated using DFL re-weighting procedure with earliest year in each survey as a base year. Explanatory variables in reweighting function: age, education and race (US only) of the household head or respondent, household type, and household income net of capital gains and interest payments.

Table 5: DFL decomposition of the distribution of net worth

In the UK, the distribution of characteristics played an important role in explaining the changing net worth towards the bottom of the distribution but was less important further up. This can be seen clearly in Figure 5 where the 2005 counterfactual distribution is much closer to the 1995 distribution in the lower part of the distribution (there is little observable difference in the US). The relative role of characteristics was stronger in explaining changes up to 2000 rather than up to 2005. As Table 6 shows, this pattern mainly follows the effects for housing equity: in 2005 the effects of characteristics was weaker, reflecting the substantial growth in house prices (see Figure 2) which had a stronger effect on the housing equity levels (especially at the middle and in the upper part of the distribution). Financial wealth would have been substantially smaller if it had not been for the changes in the distribution of characteristics.

Table 7 examines the contribution of characteristics to the change in wealth inequality. In both countries this shows that changes in characteristics had an equalizing effect on the distribution of net worth. As mentioned in Section 3, US wealth inequality in 2000 and 2005 was higher than in 1995 and the increase would have been even higher if it had not been for the change in the distribution of characteristics. The equalizing effect of the changing distribution of characteristics appears to be stronger for inequality measures that pick up changes in the upper tail (the wealth share of the top 1% and P_{90}/P_{50}). In the UK the changing distribution of characteristics accounted for around 40% of the total change in inequality measured by the Gini coefficient and more than accounted for the change in wealth dispersion in the lower tail of the distribution, P_{25}/P_{50}, while they had a considerably smaller impact in explaining the dynamics in the concentration of wealth in the upper tail (the share of the top 10%, 5%, 1%).[16]

Table 8 presents results for the decomposition of changes in inequality by wealth component. In the US the changing distribution of characteristics explained a significant proportion of the decrease in the Gini coefficient of net financial wealth that occurred between 1995 and 2000 while the increase in inequality in the subsequent period would have been even larger if it had not been for the change in the distribution of characteristics. The rise in inequality of housing wealth does not appear to be due to changes in characteristics. Rather, the changing distribution of characteristics had an equalizing effect on the distribution of housing wealth. In the UK the distribution of characteristics explained 33% of the decrease in the Gini coefficient of net housing wealth that occurred between 1995 and 2005 but had a relatively smaller impact on the dynamics of housing wealth concentration (explaining, respectively, 23% and

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[16]Bastagli and Hills (2013) found that house prices growth explained over 90 per cent of the decrease in the Gini coefficient. By contrast, here the unexplained part of the distribution, which would include among others price effects, accounts for 60 per cent of the change. The main explanation for the difference between the two findings lies in sample selection: Bastagli and Hills (2013) used panel sample of households that were observed in both years (around 2,000 households). Given that these are the same households, within their select sample, the change in characteristics would be much smaller than in our cross-sectional sample.

	Net financial wealth			Net housing equity		
	P_{25}	P_{50}	P_{90}	P_{25}	P_{50}	P_{90}
SCF 1994						
Actual	-5.3	0.2	92.1	0	31.6	208.8
SCF 2000						
Actual	-5.0	1.1	175.4	0	40.8	297.7
Counterfactual	-5.3	0.5	154.8	0	34.0	281.2
Change	0.3	0.9	83.3	0	9.2	88.9
Explained by characteristics	0.3	0.6	20.6	0	6.8	16.5
Explained by characteristics (%)	*100*	*66.7*	*24.7*		*73.9*	*18.6*
SCF 2006						
Actual	-8.8	0.2	126.9	0	57.2	411.8
Counterfactual	-8.8	0	92.8	0	40.1	348.8
Change	-3.5	0	34.8	0	25.6	203.0
Explained by characteristics	0	0.2	34.1	0	17.1	63.0
Explained by characteristics (%)	*0*		*98.0*		*66.8*	*31.0*
BHPS 1995						
Actual	0	3.7	96.9	0	36.6	164.6
BHPS 2000						
Actual	0	3.7	82.3	0	63.9	285.9
Counterfactual	0	2.1	70.0	0	50.5	252.2
Change	0	0	-14.6	0	27.3	121.3
Explained by characteristics	0	1.6	12.3	0	13.4	33.7
Explained by characteristics (%)			*-84.2*		*49.1*	*27.8*
BHPS 2005						
Actual	0	5.2	112.6	0	157.2	471.7
Counterfactual	-0.3	2.0	94.8	0	135.2	424.5
Change	0	1.5	15.7	0	120.6	307.1
Explained by characteristics	0.3	3.2	17.8	0	22.0	47.2
Explained by characteristics (%)		*213.3*	*113.4*		*18.2*	*15.4*

Source: Authors' calculations using SCF (LWS) and BHPS waves 5, 10 and 15.

Notes: as For Table 5.

Table 6: DFL decomposition of the distribution of net worth

US SCF 1994, 2000 and 2006
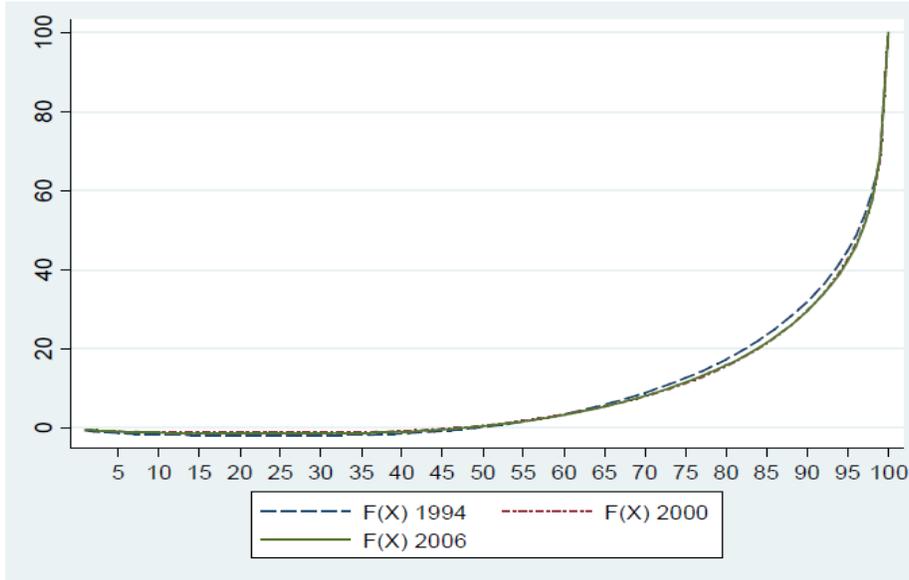
UK BHPS 1995, 2000 and 2005
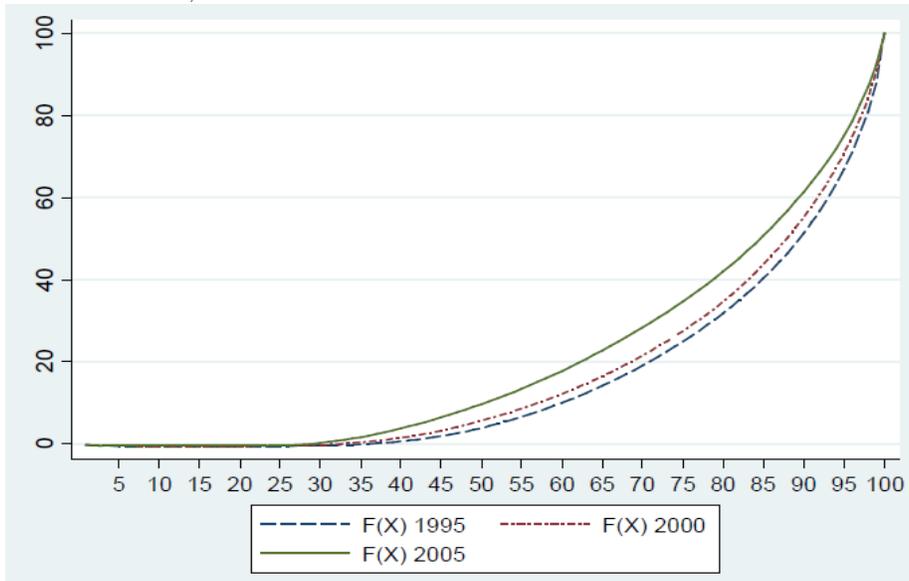
Figure 4: Lorenz curves of net worth

US SCF 1994, 2000 and 2006
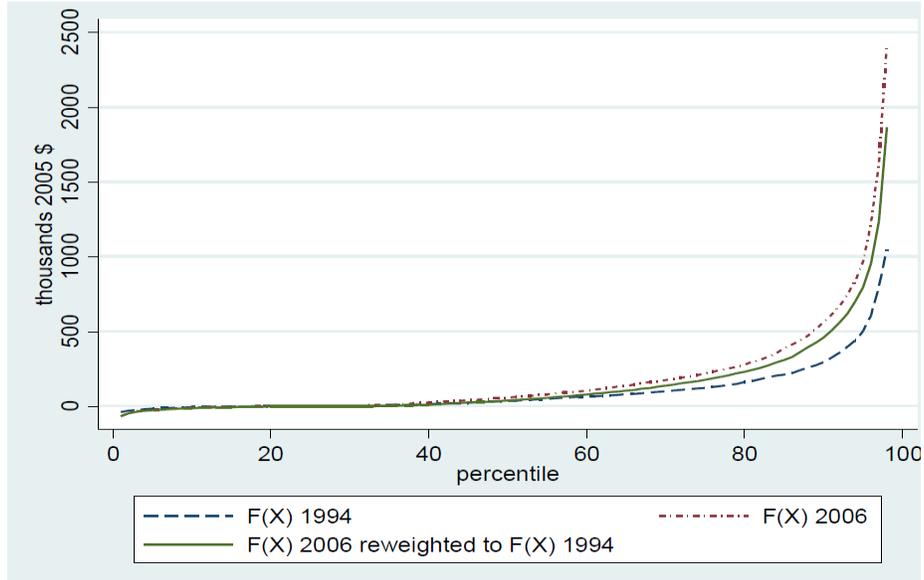
UK BHPS 1995, 2000 and 2005
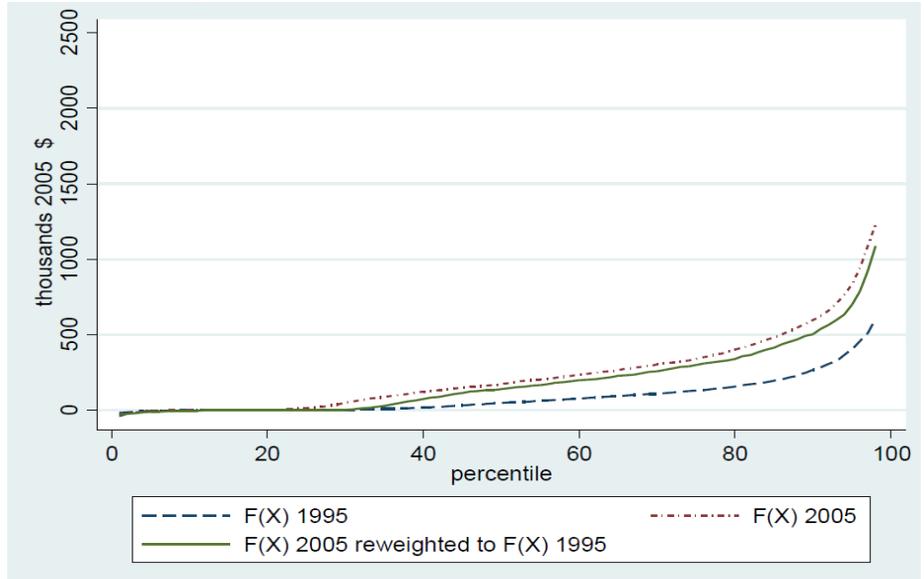
Figure 5: Actual and counterfactual net worth distributions: Pen Parades

US SCF 1994, 2000 and 2006
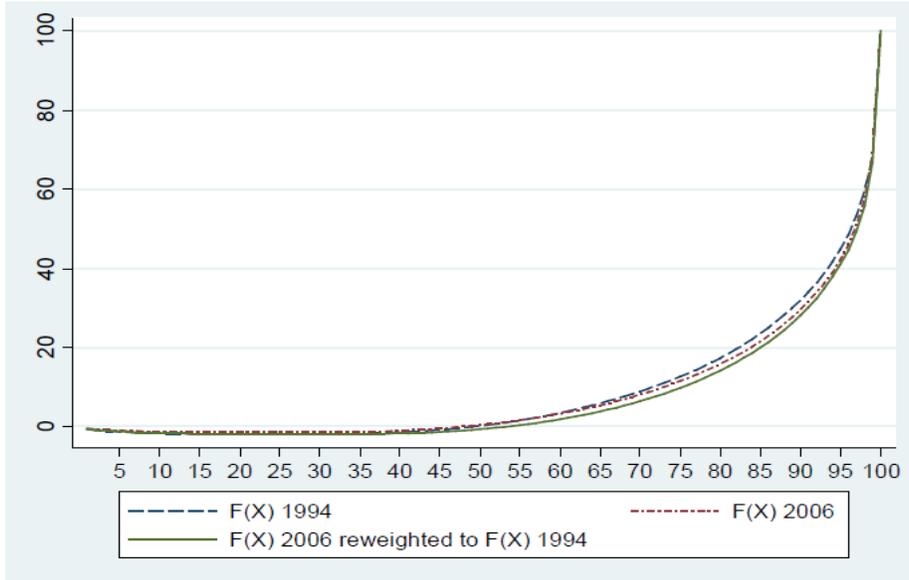
UK BHPS 1995, 2000 and 2005
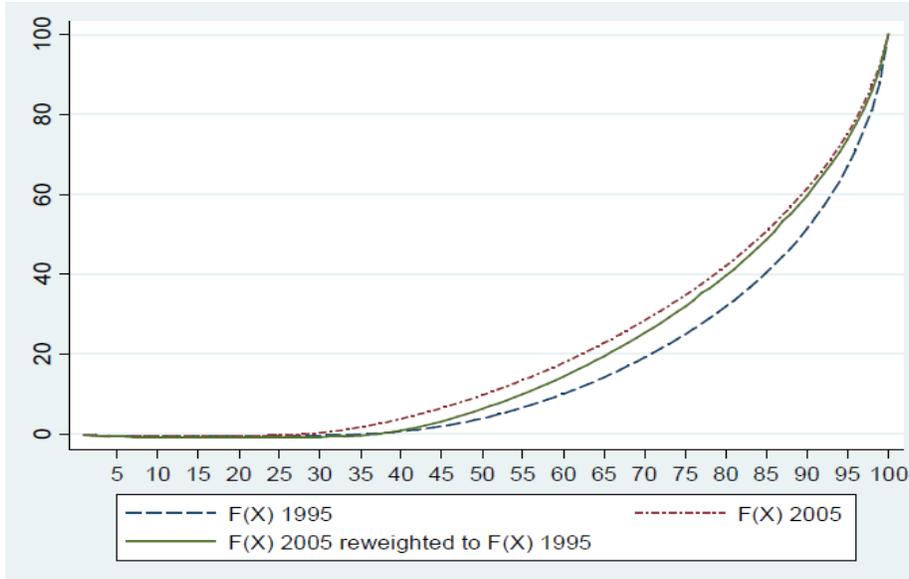
Figure 6: Actual and counterfactual wealth distributions: Lorenz curves

	P_{90}/P_{50}	P_{25}/P_{50}	Gini	Share of :		
				Top 10%	Top 5%	Top 1%
SCF 1994						
Actual	8.53	0	0.83	68.05	55.15	32.19
SCF 2000						
Actual	9.88	0.01	0.84	70.30	57.31	32.68
Counterfactual	11.62	0	0.85	71.74	58.59	33.99
Change	1.35	0.01	0.01	2.25	2.16	0.49
Explained by characteristics	-1.74	0.01	-0.01	-1.44	-1.28	-1.31
Explained by characteristics (%)	*-128.89*	*100*	*-100*	*-64*	*-59.26*	*-267.35*
SCF 2006						
Actual	9.64	0	0.84	70.44	57.85	31.22
Counterfactual	11.50	0	0.86	71.85	58.95	33.24
Change	1.11	0	0.01	2.39	2.70	-0.97
Explained by characteristics	-1.86	0	-0.02	-1.41	-1.1	-2.02
Explained by characteristics (%)	*-167.57*		*-200*	*-59*	*-40.74*	*208.25*
BHPS 1995						
Actual	5.43	0.03	0.69	48.65	33.09	12.15
BHPS 2000						
Actual	4.85	0.05	0.66	44.72	29.24	9.28
Counterfactual	5.28	0.01	0.68	46.67	30.56	9.91
Change	-0.58	0.02	-0.03	-3.93	-3.85	-2.87
Explained by characteristics	-0.43	0.04	-0.02	-1.95	-1.32	-0.63
Explained by characteristics (%)	*74.14*	*200*	*66.67*	*49.62*	*34.29*	*21.95*
BHPS 2005						
Actual	3.42	0.08	0.59	38.58	24.84	7.65
Counterfactual	3.55	0	0.63	40.36	26.36	8.48
Change	-2.01	0.05	-0.1	-10.07	-8.25	-4.50
Explained by characteristics	-0.13	0.08	-0.04	-1.78	-1.52	-0.83
Explained by characteristics (%)	*6.47*	*160*	*40*	*17.68*	*18.42*	*18.44*

Source: Authors' calculations using SCF (LWS) and BHPS waves 5, 10 and 15.

Notes: as For Table 5.

Table 7: Counterfactual decomposition of change in inequality in net worth in the US and the UK

	Net financial wealth			Net housing equity		
		Share of top:			Share of top:	
	Gini	5%	1%	Gini	5%	1%
US 1994						
Actual	1.10	85.21	58.04	0.74	42.67	21.74
US 2000						
Actual	1.02	78.82	51.38	0.76	47.81	25.17
Counterfactual	1.04	80.72	53.56	0.78	49.28	26.62
US 2006						
Actual	1.10	88.13	57.55	0.76	47.88	23.89
Counterfactual	1.15	92.29	61.53	0.78	48.45	24.83
UK 1995						
Actual	0.89	55.20	23.44	0.66	27.78	10.14
UK 2000						
Actual	0.94	52.45	21.05	0.64	28.29	9.51
Counterfactual	0.98	54.96	22.35	0.66	29.02	10.28
UK 2005						
Actual	0.98	54.48	21.28	0.57	23.70	7.54
Counterfactual	1.07	60.05	22.60	0.60	24.26	8.13

Source: Authors' calculations using SCF (LWS) and BHPS waves 5, 10 and 15.

Notes: as For Table 5.

Table 8: Decomposition of the change in inequality in net financial and housing wealth in the US and the UK

14% of the decrease in housing wealth concentration at the top 1% and 5% of the housing wealth distribution); this pattern may reflect the heterogeneity in returns to characteristics at the top of the distribution. The changing distribution of characteristics had an equalizing effect on the dynamics of financial wealth: once again financial wealth inequality would have increased more than it did if it had not been for the changing distribution of characteristics.

5.3   Decomposition: detail

So, we know that the changing distribution of characteristics appeared to have a sizable impact on wealth distribution on both sides of the Atlantic, during the decade preceding the financial crisis. But which of the characteristics were particularly important? To address this question Table 9 shows the impact on the counterfactual distribution of key attributes of the household and of the household head on the quantiles of the wealth distribution. As before, the counterfactual distributional statistics were estimated using the DFL decomposition re-weighting procedure;[17] all of the counterfactuals were estimated using the earlier year as a base, so that they represent the distribution that would have prevailed in the US and the UK of the mid 2000s had the distribution of characteristics been the same as in the mid 1990s. For each of the two countries the row 'Compositional effect' shows the effect on the quantiles of all the attributes taken together and 'Unadjusted difference' simply records the actual historical change in the quantiles over the period.

At high wealth levels, the story is clear: for both countries the change in the distribution of education was the most important among the personal characteristics that we identified in contributing to the change in wealth distribution. If the distribution of education in the US of 2006 had remained the same as a decade earlier, then the wealth of someone at P_{90} would have been \$84,400 lower; the effect is almost as great in the UK (P_{90} would have been \$76,820 lower). Education is almost the most powerful single characteristic at P_{90} (over 40 percent of the combined effect of all factors in the US, over 50 percent in the UK). Even at the median it is still important, particularly in the UK, although not as important as the simple age effect. But at the bottom of the wealth distribution the education effect did not do much, suggesting that in both countries it is unobserved wealth effects that drove changes in wealth at lower wealth levels.

6   Conclusions

What underlay the differences in wealth distributions and their evolution in the US and the UK, during the period immediately prior to the financial crisis? We know that, starting from the mid 1990s, mean household net worth almost doubled over the decade in the US and slightly more than doubled in the UK: the

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[17]For details about the specification of the detailed decomposition methods used here see Cowell et al. (2018).

	P_{10}	P_{25}	P_{50}	P_{75}	P_{90}
US 1995-2006					
Income	0.00	0.00	7.45***	31.66**	55.17*
Education	−0.23	0.00	4.66***	44.12***	84.39***
Household structure	0.00	0.00	0.70	3.03	2.56
Age	1.05*	0.00	8.26***	33.87***	49.00**
Race	−0.12	0.00	−2.33*	−8.38	−21.07*
Compositional effect	0.70	0.12	18.62***	104.29***	170.18***
Unadjusted difference	−3.96***	0.12	23.75***	266.21***	463.27***
UK 1995-2005					
Income	0.70	5.59***	0.93	22.35	28.40
Education	0.00	4.42***	15.36***	50.98***	76.82***
Household structure	0.00	−0.23	0.81	5.70	9.31
Age	0.58*	3.96**	15.71***	14.32**	20.95*
Compositional effect	1.40*	13.74***	32.71***	93.24***	135.49***
Unadjusted difference	0.23**	12.45***	125.60***	330.11***	429.87***

Source: Authors' calculations using SCF (LWS) and BHPS waves 5, 10 and 15.

Notes: Sample includes households with non-missing information on wealth and all other variables. ***, **, * indicate significance at p<.001, p<.01 and p<.05 significance level respectively; based on 10,000 replications.

Table 9: Detailed decompositions: Differences in selected percentiles of net worth distribution

growth came early in the period for the US, later for the UK. In one important respect the experience of the two countries over the pre-crisis decade was similar, and in one important respect they differ. First, both countries experienced house price booms that led to big increases in housing equity while financial assets followed a bumpier path, partly due to rises and falls in stock prices and partly to changes in financial debt. The house price boom may have led to a shift in resources from financial markets to housing markets where returns were higher; this would have made the wealth portfolios of households on both sides of the Atlantic more vulnerable to the turmoil in housing markets that followed.[18] However, second, the wealth-inequality paths of the two countries diverged: relative wealth inequality in the US increased slightly pre-crisis, while wealth inequality in the UK fell substantially.

Using decomposition analysis we show that changes in households' socio-economic characteristics explain a considerable part of the pattern of wealth changes; education is the most important driver of wealth changes among the socioeconomic characteristics used in our analysis. But the story is not uniform

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[18]See for example Ynesta (2008): 'After the stock market bubble burst, households preferred less risky financial assets.' Non-financial assets (mainly dwellings) as percentage of household wealth are as follows:

	1995	2000	2005
US	35.2%	33.3%	43.4%
UK	49.3%	50.4%	63.6%

throughout the wealth distribution. In both countries the changes in characteristics explain developments in the lower tail of the distribution quite well, but played only a moderate role in explaining changes at other parts of the distribution. Neither the increase in educational attainment nor the growth in income was the crucial factor behind the trends. Rather, in both countries, it was the differential growth in asset prices that drove the changes in the distribution of household wealth (see the discussion at the end of section 5.2). In the upper tail of the US distribution characteristics explained a greater share of observed changes in financial wealth holdings after 2000 as financial asset prices fell. Characteristics played a more moderate role in explaining changes in housing equity being effectively overshadowed by the substantial growth in house prices.

The net result in both countries was that changes in household characteristics had an equalizing effect on wealth inequality, particularly in the UK. These changes moderated the increase in the US and accounts for over one-third of the fall in inequality in the UK.

Supplementary material

Supplementary material is available on the OUP website. This comprises an online Data Appendix and the replication files. The Data Appendix contains a description of the sources and definition of key variables. It also gives finer breakdowns by wealth component for Tables 6 and 8 and standard errors in the decomposition analysis of Table 9. The paper uses confidential micro-data from the Survey of Consumer Finances Survey from the Luxembourg Wealth Study database and the British Household Panel Survey (BHPS). Registers users can access the BHPS data from the UK Data Service https://www.ukdataservice.ac.uk/ under an End of User Licence agreement and the SCF data from the LIS cross national data center http://www.lisdatacenter.org/. The replication files (which include a series of Stata do files) for the results of the paper are available online in the supplementary data. Data for the British Household Panel Survey were made available by the UK Data Archive. The BHPS is copyright Institute of Social and Economic Research (University of Essex, ISER, 2010). Neither the original data creators, depositors or copyright holders, nor the UK Data Archive bear responsibility for the analysis or interpretation

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