

# Supplementary materials

## A Counterfactual wages

In term iv) of equation 4, we estimate the impact on the income distribution of changes to wages, but fixing the HE wage premia and amount of education at their  $t = 1$  levels. To construct the counterfactual in term iv), wages are hence predicted for the  $t = 1$  sample of workers by: a) applying the coefficients  $\hat{\beta}_0$ ,  $\hat{\gamma}_0$ ,  $\hat{\pi}_0$  and  $\hat{\rho}_0$  from the models estimated on  $t = 0$  data; b) applying the returns to higher education (HE) from the models estimated on  $t = 1$  data; and c) adjusting the predicted residuals by the ratio of the estimated standard deviation of the residuals in  $t = 0$  and  $t = 1$ :

$$\begin{aligned}
 \ln \hat{y}_{i(h)}^{wBm} &= x_{i(h1)}^{wBm} \hat{\beta}_0 + e_{i(h1)}^{wBm} \hat{\lambda}_1 + \hat{\epsilon}_{i(h1)} * \frac{\sigma(\hat{\epsilon}_{i(h0)})}{\sigma(\hat{\epsilon}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{nwBm} &= x_{i(h1)}^{nwBm} \hat{\gamma}_0 + e_{i(h1)}^{nwBm} \hat{\delta}_1 + \hat{\eta}_{i(h1)} * \frac{\sigma(\hat{\eta}_{i(h0)})}{\sigma(\hat{\eta}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{wBw} &= x_{i(h1)}^{wBw} \hat{\pi}_0 + e_{i(h1)}^{wBw} \hat{\nu}_1 + \hat{\mu}_{i(h1)} * \frac{\sigma(\hat{\mu}_{i(h0)})}{\sigma(\hat{\mu}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{nwBw} &= x_{i(h1)}^{nwBw} \hat{\rho}_0 + e_{i(h1)}^{nwBw} \hat{\theta}_1 + \hat{v}_{i(h1)} * \frac{\sigma(\hat{v}_{i(h0)})}{\sigma(\hat{v}_{i(h1)})}
 \end{aligned} \tag{A.1}$$

In terms v) to viii) of equation 4, we use the same procedure as above but apply the returns to HE from the models estimated on  $t = 0$  data. The counterfactual wages are:

$$\begin{aligned}
 \ln \hat{y}_{i(h)}^{wBm} &= x_{i(h1)}^{wBm} \hat{\beta}_0 + e_{i(h1)}^{wBm} \hat{\lambda}_0 + \hat{\epsilon}_{i(h1)} * \frac{\sigma(\hat{\epsilon}_{i(h0)})}{\sigma(\hat{\epsilon}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{nwBm} &= x_{i(h1)}^{nwBm} \hat{\gamma}_0 + e_{i(h1)}^{nwBm} \hat{\delta}_0 + \hat{\eta}_{i(h1)} * \frac{\sigma(\hat{\eta}_{i(h0)})}{\sigma(\hat{\eta}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{wBw} &= x_{i(h1)}^{wBw} \hat{\pi}_0 + e_{i(h1)}^{wBw} \hat{\nu}_0 + \hat{\mu}_{i(h1)} * \frac{\sigma(\hat{\mu}_{i(h0)})}{\sigma(\hat{\mu}_{i(h1)})} \\
 \ln \hat{y}_{i(h)}^{nwBw} &= x_{i(h1)}^{nwBw} \hat{\rho}_0 + e_{i(h1)}^{nwBw} \hat{\theta}_0 + \hat{v}_{i(h1)} * \frac{\sigma(\hat{v}_{i(h0)})}{\sigma(\hat{v}_{i(h1)})}
 \end{aligned} \tag{A.2}$$

## B Data

### B.1 Education

The FRS has only one education variable (on age completed full-time education, variable ‘tea’) that is consistent across the four years of data used in the paper.<sup>1</sup> Therefore, this is the main variable we use in the paper, which has been also used by others (Brewer and Wren-Lewis, 2015; Blundell et al., 2018).

The variable ‘tea’ has missing values for a small proportion of the sample: 6% in 2001/02, 6.9% in 2007/08, 3.1% in 2011/12 and 9% in 2017/18 among those aged 15-64. To fill in the missing values, we use information on age at the time of interview and the variable ‘fted’ (whether presently in full-time education).<sup>2</sup> In 2007/08, everyone with missing information for ‘tea’ has answered that they are in full-time education. In the other three waves, this is also true, apart from very few cases (10 cases in 2001/02, 80 cases in 2011/12, 94 cases in 2017/18) who have answered that they are not in full-time education and have missing value for ‘tea’. As a result, they are not classified in any of our education categories.

Table B.1 compares the FRS education distribution to the LFS education distribution. Although we do not measure directly education level, those with HE are most likely to be in our education category ‘completed education aged 20+’. We compare this category with the published LFS statistics. Table B.1 shows that the FRS has lower levels of HE than the LFS data in all years. Both sources show a substantial increase in education attainment, although the trends differ somewhat by period: in 2001-07 LFS shows a 2.8 percentage points (pp) increase vs 4.3pp in FRS; 4.5pp increase in LFS vs 2.3pp in FRS in 2007-11; and 5.5pp increase in LFS vs 5.0pp in FRS in 2011-17. This comparison suggests that, relative to using LFS data, our results for the impact on the income distribution of the education expansion may be overestimated for the period 2001-07 since our HE variable overstates the education expansion; for the 2007-11 and 2011-17 period our results may be (somewhat) underestimated. Nevertheless, we conclude that our FRS education variable picks up the main trends in education and is of reasonable quality.

Furthermore, there are alternative education variables, which refer to the highest qualification achieved and that are available but only for three of the four waves in the analysis: variable ‘edattn’ in FRS 2007/08, variable ‘hi2qual’ in FRS 2011/12 and variable ‘dvhiqual’ in FRS 2017/18. These alternative education variables all ask about the person’s highest qualification: edattn provides two choices – at degree

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<sup>1</sup>The variable on ‘type of school or college attended’ (variable ‘typeed’; ‘typeed2’ in FRS 2017/18) also exists in all four waves but it has about 90% non-response in the sample of those aged 15-64.

<sup>2</sup>For those aged 16 or less we assume that they are in education if with missing information.

level or above; or another kind of qualification. Hi2qual provides 8 options, one of which is degree level or equivalent. Dvhiqual includes 86 options. Table B.2, Table B.3 and Table B.4 compare our education variable with these alternative variables where possible. In contrast to the LFS validation, these both give closer estimates of the share with degree compared to the variable we use in the paper: 30.3% with FRS (our education variable) vs 28.6% with alternative FRS in 2007 (Table B.2); 32.2% with FRS vs 29.8% with alternative FRS in 2011 (Table B.3); and 31.6% with FRS vs 33.1% with alternative FRS in 2017 (Table B.4). This comparison suggests that our FRS education variable is of good quality relative to alternative education definitions.

**Table B.1:** *Share of individuals with university degree*

	<i>shares</i>				<i>% points change</i>		
	2001	2007	2011	2017	2001-07	2007-11	2011-17
LFS	25.9	28.7	33.2	38.7	2.8	4.5	5.5
FRS	20.2	24.5	26.8	31.8	4.3	2.3	5.0

*Notes:* LFS statistics refer to individuals with ‘tertiary education (levels 5-8)’ which includes: short-cycle tertiary education (level 5), bachelor’s or equivalent level (level 6), master’s or equivalent level (level 7) and doctoral or equivalent (level 8). Own derived variable with FRS includes individuals who completed full-time education aged 20+. Sample is based on individuals aged 15-64.

*Source:* LFS statistics: Eurostat website, indicator edat\_lfse\_03, based on the Labour Force Survey.

**Table B.2:** *Share of individuals by education attainment in 2007*

	FRS	alternative FRS
not university	69.7	71.4
university	30.3	28.6

*Notes:* FRS: individuals are sorted into category ‘not university’ if completed full-time education aged  $\leq 19$ ; and category ‘university’ if completed full-time education aged 20+. Alternative FRS: category ‘not university’ includes those who answered ‘or another kind of qualification’; category ‘university’ includes those who answered ‘at degree level or above’. Sample includes individuals aged 15 to 64 and with non-missing values for both variables.

*Source:* Author’s calculations using the Family Resources Survey for 2007/08 (2007).

**Table B.3:** *Share of individuals by education attainment in 2011*

	FRS	alternative FRS
secondary	36.2	41.0
college	31.5	29.2
university	32.2	29.8

*Notes:* FRS: individuals are sorted into category ‘secondary’ if completed full-time education aged  $\leq 16$ ; category ‘college’ if completed full-time education aged 17-19; and category ‘university’ if completed full-time education aged 20+. Alternative FRS: category ‘secondary’ includes O Level/GCSE equivalent (Grade A-C) or O Grade/CSE equivalent (Grade 1) or Standard Grade level 1-3; GCSE grade D-G or CSE grade 2-5 or Standard Grade level 4-6; No formal qualifications; category ‘college’ includes Higher educational qualification below degree level; A-Levels or Highers; ONC/National Level BTEC; Other qualifications (including foreign qualifications below degree level); category ‘university’ includes Degree level qualification (or equivalent). Sample includes individuals aged 15 to 64 and with non-missing values for both variables.

*Source:* Author’s calculations using the Family Resources Survey for 2011/12 (2011).

**Table B.4:** *Share of individuals by education attainment in 2017*

	FRS	alternative FRS
secondary	37.1	39.4
college	31.2	27.6
university	31.6	33.1

*Notes:* FRS: individuals are sorted into category ‘secondary’ if completed full-time education aged  $\leq 16$ ; category ‘college’ if completed full-time education aged 17-19; and category ‘university’ if completed full-time education aged 20+. Alternative FRS: category ‘secondary’ includes e.g. entry level qualifications, CSE, Skills for work; GCSE or equivalent; O-Level or equivalent; GNVQ/GSVQ; category ‘college’ includes e.g. National Certificate; ONC; AS-level or equivalent; Welsh/Scottish Baccalaureate; category ‘university’ includes Degree level qualification (or equivalent). Sample includes individuals aged 15 to 64 and with non-missing values for both variables.

*Source:* Author’s calculations using the Family Resources Survey for 2017/18 (2017).

## B.2 Ethnicity

To distinguish between different ethnic groups of workers, we use information on self-reported ethnicity from the FRS (variable `ethgrp`). We split workers into two categories: **1) white British** and **2) non-white-British**. We classify as **1)** those who responded to be “White – British” (in 2001 and 2007) or “White – English/Welsh/ Scottish/ Northern Irish/ British” (in 2011 and 2017). We classify everyone else as **2)**, i.e. who have responded: “Any other white background”; “White – Irish” or “White – Gypsy or Irish Traveller” (in 2011 and 2017); “Mixed – White and Black Caribbean”; “Mixed – White and Black African”; “Mixed – White and Asian”; “Any other mixed background”; “Asian or Asian British – Indian”; “Asian or Asian British – Pakistani”; “Asian or Asian British – Bangladeshi”, “Any other Asian/Asian British background”; “Black or Black British – Caribbean”; “Black or Black British – African”; “Any other Black/Black British background”; “Chinese”; “Arab” (in 2011 and 2017); “Any other”.

## B.3 Incomes

Earnings are based on the variable ‘`ugrspay`’ (gross weekly pay from a job). The variable includes information on usual gross earnings, excluding income from odd jobs.

The measure of household net incomes used throughout the paper is:

- + **gross (pre-tax) market incomes:** earnings, self-employment income, investment income, private pensions, income from rent, private transfers paid to minus received from other households (e.g. maintenance payments), incomes of children aged below 16;
- + **pensions:** retirement pension, occupational pension, war pension, widow pension;
- + **means-tested benefits and tax credits:** working families tax credit and disabled person tax credit (in 2001), working tax credit and child tax credit (in 2007,

- 2011 and 2017), universal credit (in 2017), income support, pension credit (in 2007, 2011 and 2017), housing benefit, council tax benefit, income-based jobseeker’s allowance, income-related employment and support allowance (in 2011 and 2017);
- + **non-means-tested benefits:** contributory jobseeker’s allowance, student payments, student loans, attendance allowance, disability living allowance, disability living (mobility) allowance/personal independence payment, incapacity benefit, contributory employment and support allowance, industrial injuries pension, invalid care allowance, severe disablement allowance, statutory sick pay, training allowance, statutory maternity pay, maternity allowance, winter fuel allowance, child benefit, any other national insurance or state benefit;
  - **personal income tax** (including child tax credit in 2001);
  - **council tax**;
  - **employee and self-employed national insurance contributions.**

In-kind benefits (and indirect taxes) are disregarded as there is not enough information in the FRS which would allow to simulate these policies with EUROMOD. The same reason applies to certain tax deductions such as for mileage/motoring, union fees, loan repayments or charities which are not taken into account in EUROMOD simulations.

## B.4 Sample adjustments

We adjust the data by dropping the bottom 4% and top 1% of the net income distribution and by dropping Northern Ireland from the 2007/08, 2011/12 and 2017/18 waves. Table B.5 shows sample sizes before and after the sample restrictions we impose on the FRS data:

**Table B.5:** *Family Resources Survey*

data wave	original	adjusted
<i>2001/02</i>		
n households	25,320	23,805
n individuals	59,499	56,510
<i>2007/08</i>		
n households	24,977	21,788
n individuals	56,926	49,902
<i>2011/12</i>		
n households	20,759	17,748
n individuals	47,744	41,051
<i>2017/18</i>		
n households	19,105	16,224
n individuals	42,847	36,633

*Notes:* The adjusted sample is derived after dropping individuals from Northern Ireland (from the 2007/08, 2011/12 and 2017/18 waves) and trimming the bottom 4% and top 1% of the household net income distribution.

## C Comparing income statistics based on simulated vs reported incomes

In this Appendix, first we show that what we infer about changes in the income distribution broadly holds, regardless of whether we use simulated incomes (derived from EUROMOD simulations and FRS data) or reported incomes (based on FRS data only). Second, we explain in what ways our income estimates depart from the HBAI official statistics as well as the estimates by Jenkins (2017) (for 2001-2011), using HBAI data.

To ensure that the baseline distributions of simulated and reported incomes are very close to each other, we compare various income statistics derived from reported vs simulated incomes. To make the comparisons meaningful, first we impose the same sample restrictions on the distributions of simulated and reported incomes, i.e. we drop households from Northern Ireland and trim the bottom 4% and top 1% of the respective income distributions. Second, we compare like with like: as we focus on cash-only incomes in our analysis, we constructed a variable for cash household net incomes using the FRS. Despite our best efforts, the definition of household net income is not completely identical using the simulated vs reported incomes since reported net incomes are net of certain deductions and tax on dividends and include tax rebates which could not be separated out from reported incomes and are not part of the simulated incomes.<sup>3</sup> We expect that these differences in the income definition will not cause large discrepancies between the two income distributions.

In addition, there are other reasons which may lead to larger discrepancies between the distributions based on simulated and reported incomes. First, for any given year the policy rules simulated by EUROMOD are as of June, 30. The FRS data, on the other hand, collects from households information on benefits and taxes throughout the financial year.<sup>4</sup> Second, the FRS reported benefit incomes may be misreported for reasons such as stigma or recollection error. Third, there may be measurement error in the simulated incomes for the following reasons: the analyst may have made an error coding the policy rules; the information used in the calculations of benefits and taxes may suffer from measurement error (e.g. in earnings which enter benefit income-tests and are levied with taxes) or may not be available in the underlying FRS data (e.g. fuel expenditures used to calculate some tax deductions); tax evasion as well as tax avoidance are not taken into account in the

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<sup>3</sup>The reason why these components are not simulated with EUROMOD is the lack of information in the FRS which allows the identification of i) individuals who are liable/entitled to such policies and ii) the amount which individuals are liable/entitled to.

<sup>4</sup>In contrast to benefits which are collected in much details in the FRS, there is no direct measure of personal incomes taxes or national insurance contributions in the FRS. The user can infer about their size by comparing gross with net income figures.

personal tax simulations; benefit non-take-up may not be accurately modelled.<sup>5</sup>

Table C.1 shows various income statistics derived from simulated incomes (EUROMOD with FRS) and reported incomes (FRS). As we analyse *changes* in the income distribution rather than levels, our primary interest lies with the last two columns of Table C.1 which derive the difference in the estimates based on reported vs simulated incomes for the changes in the three periods (2001-07, 2007-11 and 2011-17) – we will refer to these as the difference-in-change estimates. We calculated bootstrapped standard errors for the difference-in-change estimates based on 1,000 replications. A bootstrap sample for each year is constructed by sampling households with replacement and by drawing samples of the same size as the raw unweighted data.

The key message from Table C.1 is that the results for the changes in the income statistics based on both simulated and reported incomes are of similar magnitude, with some exceptions where the difference-in-change estimates are statistically significantly different from 0. Thus, what we infer about changes in the income distribution broadly holds, regardless of whether we use simulated or reported incomes.

In more detail, in the period 2001-07 the income growth at the bottom quintile/decile derived from simulated incomes is overstated compared to the estimate based on reported incomes and so is the drop in the 90/10 and 50/10 quintile ratios. On the other hand, the income growth in the fourth quintile/eight and ninth deciles based on simulated incomes is somewhat understated compared to the growth based on reported incomes. Nevertheless, if we look at the difference-in-change estimates for the Gini coefficient, population mean and the rest of quintile/decile medians, the estimates for the changes derived from simulated incomes are not statistically significantly different from those derived from reported incomes.

For the period 2007-11, the income growth at the top of the distribution based on simulated incomes is somewhat overstated compared to the income change based on reported incomes. As a result, the difference-in-change in the 90/50 quintile ratio is statistically significant and so is the difference-in-change in the population mean.

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<sup>5</sup>In the presence of benefit non-take-up, if the calculation of benefit entitlements do not account for non-take-up, then the impact on household income of benefit changes (as well as the automatic stabilisation response of benefits) will be overstated compared to the true effect. Thus, benefit calculations by EUROMOD are adjusted for non-take-up to reflect that some benefits may not be claimed by all entitled families. Different take-up proportions are applied by benefit and in some cases also by region or household type. Take-up rates are based on the mid-point estimates on a caseload basis published in the reports by the Department for Work and Pensions (DWP) and Her Majesty's Revenue and Customs (HMRC). DWP reports are available at: <https://www.gov.uk/government/collections/income-related-benefits-estimates-of-take-up--2>. HMRC reports are available at: <https://www.gov.uk/government/collections/personal-tax-credits-statistics#older-and-related-statistics>. The adjustments are done by randomly selecting households from the FRS sample, so the number of families/households who do take-up their benefit entitlements matches the official take-up estimates.

In 2011-17, the income growth at the bottom and middle of the distribution is somewhat higher based on simulated incomes than based on reported incomes. As a result, the increase in the 90/10 ratio is smaller when estimated with simulated incomes than with reported incomes; while the drop in the 90/50 ratio is bigger based on simulated than reported incomes. The implications for the Gini coefficient are that inequality slightly fell based on simulated incomes while inequality slightly increased based on reported incomes and the difference between these two estimates for the change in inequality is statistically significantly different from zero.

In the rest of the Appendix, we comment on why our results based on simulated incomes depart from the official HBAI statistics as well as from the estimates by Jenkins (2017) – for 2001-07 and 2007-11 – using HBAI data. In comparison to us, Jenkins (2017) combines inequality estimates from HBAI survey and tax returns data to capture better inequality at top incomes. He notes that HBAI estimates, derived entirely from the FRS data, do not capture changes at the top of the income distribution which dominated the inequality trends in the 2000s (see also Jenkins, 2016, Burkhauser et al., 2016 and Belfield et al., 2014). In contrast to us, Jenkins finds an increase in the Gini between the mid-1990s and 2007 with most of the change occurring between 2004 and 2007 and driven by increased top income shares (see also Atkinson et al., 2011). Between 2007 and 2010, he finds a larger drop in inequality than us that is attributed to the introduction of the 50% marginal tax rate (see HM Revenue & Customs (2012) for analysis of the income ‘forestalling’ effects induced by the tax reform).

Our results depart from the official HBAI statistics and the estimates by Jenkins (2017) for the following reasons: First, we focus only on cash incomes. In comparison, the definition of household net incomes in HBAI includes the cash value of in-kind benefits (free school milk and meals and free TV license for those aged 75 and over) and certain tax deductions (for mileage/motoring, union fees, loan repayments or charities) not simulated with EUROMOD. On the whole, we expect that these differences in the income concept will not matter much for the results. The next two reasons for departure are more important: the HBAI official statistics as well as estimates by Jenkins (2017) are based on the entire household sample of the FRS. To mitigate the risk of measurement error at the tails, we trim our sample by dropping the bottom 4% and top 1% of the income distribution. We also focus on households from Great Britain only and exclude those from Northern Ireland. Furthermore, HBAI incomes include imputations at the bottom (e.g. negative incomes are recoded to zero) and, more importantly, adjustments for individuals with very high incomes using the Survey of Personal Incomes (SPI). On the other hand, Jenkins (2017) combines inequality estimates from the HBAI survey and SPI data to capture better inequality at top incomes. In contrast, we provide evidence on the

income changes experienced by the middle 95% of the distribution but are oblivious to what happened at the tails.

**Table C.1:** *Comparing income statistics based on simulated vs reported incomes*

	simulated incomes (EUROMOD with FRS)										reported incomes (FRS)				difference in estimates based on reported vs simulated incomes for the:			
	% $\Delta$ in					% $\Delta$ in					% $\Delta$ in		% $\Delta$ in		$\Delta$ in		$\Delta$ in	
	2001	2007	2011	2017	2001-07	2007-11	2011-17	2001-02	2007-08	2011-12	2017-18	2001-07	2007-11	2011-17	$\Delta$ in 2001-07	$\Delta$ in 2007-11	$\Delta$ in 2011-17	
quintile medians in £																		
Quintile 1	174	219	256	287	25.53	17.07	12.20	162	200	233	254	23.28	16.31	9.21	-2.25 **	-0.76	-2.99 **	
															(1.02)	(1.25)	(1.48)	
Quintile 2	241	297	335	397	23.19	12.55	18.53	236	290	322	378	22.99	11.23	17.26	-0.21	-1.32 **	-1.27	
															(0.65)	(0.66)	(0.82)	
Quintile 3 (population median)	325	398	435	523	22.23	9.46	20.14	321	394	431	513	22.51	9.47	19.01	0.28	0.01	-1.14 *	
															(0.57)	(0.58)	(0.65)	
Quintile 4	431	528	576	687	22.62	9.00	19.43	433	535	580	690	23.61	8.36	18.97	0.99 **	-0.63	-0.45	
															(0.69)	(0.49)	(0.62)	
Quintile 5	653	797	864	1003	21.97	8.51	16.03	670	825	882	1033	23.05	6.96	17.09	1.07	-1.55 *	1.06	
															(0.96)	(0.82)	(1.01)	
Ratio of top to bottom quintile medians (90/10 ratio)	3.75	3.64	3.38	3.49	-2.83	-7.31	3.42	4.13	4.12	3.79	4.07	-0.19	-8.04	7.22	2.64 ***	-0.73	3.80 **	
															(0.96)	(1.10)	(1.62)	
Ratio of top to median quintile medians (90/50 ratio)	2.01	2.00	1.99	1.92	-0.21	-0.86	-3.42	2.09	2.09	2.05	2.01	0.44	-2.29	-1.61	0.65	-1.43 *	1.81 **	
															(0.72)	(0.82)	(0.90)	
Ratio of median to bottom quintile medians (50/10 ratio)	1.87	1.82	1.70	1.82	-2.63	-6.50	7.08	1.98	1.97	1.85	2.02	-0.62	-5.88	8.97	2.00 **	0.63	1.89	
															(0.91)	(1.05)	(1.49)	
Gini coefficient	0.278	0.275	0.268	0.262	-0.89	-2.52	-2.26	0.295	0.294	0.283	0.287	-0.28	-3.73	1.48	0.62	-1.22	3.74 ***	
															(0.46)	(0.86)	(0.93)	

*(continued on the next pages)*

(Table C.1 continued from previous page)

	simulated incomes (EUROMOD with FRS)										reported incomes (FRS)					difference in estimates based on reported vs simulated incomes for the:								
	2001		2007		2011		2017		% Δ in		% Δ in		2001-07		2007-11		2011-17		Δ in 2001-07		Δ in 2007-11		Δ in 2011-17	
decile medians in £																								
Decile 1	155	191	222	248	23.11	16.30	11.79	138	165	197	202	19.20	19.58	2.46	-3.90 **	3.28	-3.90 **	3.28	-3.90 **	3.28	-3.90 **	3.28	-3.90 **	3.28
Decile 2	186	232	271	308	25.13	16.76	13.63	174	216	249	275	23.95	15.46	10.47	-1.19	-1.31	-1.19	-1.31	-1.19	-1.31	-1.19	-1.31	-1.19	
Decile 3	222	275	313	367	23.76	13.70	17.11	215	266	297	345	23.37	11.91	16.10	-0.39	-1.78 **	-0.39	-1.78 **	-0.39	-1.78 **	-0.39	-1.78 **	-0.39	
Decile 4	261	322	357	425	23.46	11.01	19.15	256	314	348	408	22.78	10.68	17.39	-0.67	-0.33	-0.67	-0.33	-0.67	-0.33	-0.67	-0.33	-0.67	
Decile 5	302	369	407	489	22.15	10.04	20.17	299	366	402	476	22.25	9.90	18.41	0.10	-0.13	0.10	-0.13	0.10	-0.13	0.10	-0.13	0.10	
Decile 6	349	428	465	560	22.54	8.66	20.47	345	425	463	552	22.96	9.06	19.12	0.42	0.40	0.42	0.40	0.42	0.40	0.42	0.40	0.42	
Decile 7	401	490	536	640	22.41	9.32	19.39	401	493	540	637	22.97	9.53	18.02	0.57	0.21	0.57	0.21	0.57	0.21	0.57	0.21	0.57	
Decile 8	468	573	628	743	22.44	9.53	18.25	473	585	634	750	23.82	8.36	18.28	1.37 ***	-1.18 **	1.37 ***	-1.18 **	1.37 ***	-1.18 **	1.37 ***	-1.18 **	1.37 ***	
Decile 9	577	701	764	897	21.52	9.01	17.38	590	724	782	919	22.54	8.09	17.57	1.02 *	-0.92	1.02 *	-0.92	1.02 *	-0.92	1.02 *	-0.92	1.02 *	
Decile 10	803	977	1065	1213	21.75	8.94	13.93	831	1018	1081	1261	22.53	6.19	16.57	0.78	-2.74 **	0.78	-2.74 **	0.78	-2.74 **	0.78	-2.74 **	0.78	
Population mean in £	383	469	518	604	22.53	10.54	16.52	383	470	514	599	22.71	9.21	16.55	0.18	-1.33 **	0.18	-1.33 **	0.18	-1.33 **	0.18	-1.33 **	0.18	
															(0.32)	(0.62)	(0.32)	(0.62)	(0.32)	(0.62)	(0.32)	(0.62)	(0.32)	

Notes: Income amounts are weekly and equivalised using modified OECD equivalence scale (couple with no children as the reference). Significance levels indicated as \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$  and standard errors shown in parentheses. Bootstrapped standard errors after 1,000 replications.

Source: Authors' calculations using EUROMOD and the Family Resources Survey.

## D OLS regression results

This Appendix presents the model specification for wages and the OLS regression results. In the wage models, education level (completed full-time education aged 16 or less, aged 17-19, aged 20+) is interacted with age group (in 5 year bands). The vector of observable individual and household characteristics includes  $x = \{1, \text{number of children in the household (1, 2, 3+), number of adults in the household (1, 2, 3+), being the head of the household, household average age, being in a couple, age group (in 5-year bands), number of hours worked (in bands), region}\}$ . The estimation sample is restricted to employed workers aged 25 to 65 (men)/60 (women).

When analysing the different periods, the regression model estimated on the workers sample from  $t = 0$  is in fact estimated for  $\ln \alpha y_{i(ht)}$  where  $\alpha$  equals the Consumer Price Index (CPI) and  $y_{i(ht)}$  are worker's earnings. The reason we adjust  $y_{i(h0)}$  by CPI is because we need to bring  $t = 0$  wage levels to  $t = 1$  prices to construct the wage counterfactuals. Thus, when analysing the period 2001-07, the regression model for 2001 is in fact estimated on  $\ln \alpha y_{i(h2001)}$  with  $\alpha$  value of 1.1137 while that for 2007 is estimated for  $\ln y_{i(h2007)}$ . When analysing the period 2007-11, the regression model for 2007 is estimated on  $\ln \alpha y_{i(h2007)}$  with  $\alpha$  equal to 1.1039 and the model for 2011 is estimated on  $\ln y_{i(h2011)}$ . Finally, for the period 2011-17, the model for 2011 is estimated on  $\ln \alpha y_{i(h2011)}$  with  $\alpha$  equal to 1.1044 and the model for 2017 is estimated on  $\ln y_{i(h2017)}$ .

The OLS regression results are presented in: Table D.1 (men) and Table D.2 (women) for 2001 and 2007; Table D.3 (men) and Table D.4 (women) for 2007 and 2011; Table D.5 (men) and Table D.6 (women) for 2011 and 2017.

**Table D.1:** *OLS log-earnings estimation results for men in 2001 and 2007*

	2001 wB	2007 wB	2001 nwB	2007 nwB
Constant	7.697*** (.059)	7.831*** (.069)	7.366*** (.201)	7.538*** (.155)
Children in the household: none (ref)				
1	-.059** (.019)	-.034 (.021)	-.045 (.066)	-.012 (.059)
2	-.010 (.024)	-.000 (.028)	.038 (.092)	-.018 (.068)
3+	-.041 (.033)	-.015 (.044)	-.224** (.095)	-.152 (.093)
Adults in the household: 1 (ref)				
2	-.021 (.030)	.013 (.033)	.196* (.101)	.103 (.067)
3+	-.021 (.027)	.025 (.030)	.095 (.106)	.039 (.069)
Head of the household	.402*** (.016)	.423*** (.021)	.483*** (.065)	.338*** (.048)
Average age in the household	-.003** (.001)	-.003** (.001)	.001 (.004)	.003 (.003)
In a couple	.157*** (.027)	.146*** (.029)	.071 (.099)	.093* (.053)
Working hours: 50+ (ref)				
1-29	-1.195*** (.051)	-1.237*** (.056)	-1.387*** (.104)	-1.442*** (.080)

30-39	-.086*** (.016)	-.138*** (.023)	-.111* (.066)	-.283*** (.059)
40-49	-.127*** (.014)	-.139*** (.022)	-.113* (.066)	-.235*** (.056)
Age: 40-44 (ref)				
25-29	-.297*** (.028)	-.296*** (.032)	-.809** (.299)	-.345** (.123)
30-34	-.214*** (.024)	-.263*** (.032)	-.286** (.087)	-.332** (.137)
35-39	-.186*** (.020)	-.253*** (.031)	-.364*** (.094)	-.301** (.101)
45-49	-.128*** (.023)	-.177*** (.025)	-.214* (.122)	-.122 (.125)
50-54	-.142*** (.023)	-.200*** (.029)	-.300** (.120)	-.347*** (.091)
55-59	-.193*** (.029)	-.240*** (.040)	-.400 (.251)	.023 (.159)
60-64	-.315*** (.035)	-.312*** (.038)	-.557*** (.132)	-.121 (.222)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.087** (.032)	.056 (.038)	.620** (.312)	.056 (.123)
age 30-34 & completed education aged 17-19	.146*** (.030)	.096** (.040)	.033 (.088)	.131 (.150)
age 35-39 & completed education aged 17-19	.245*** (.037)	.216*** (.039)	.208* (.124)	.148 (.105)
age 45-49 & completed education aged 17-19	.212*** (.037)	.228*** (.039)	.174 (.179)	.148 (.142)
age 50-54 & completed education aged 17-19	.232*** (.045)	.269*** (.045)	-.068 (.212)	.222 (.178)
age 55-59 & completed education aged 17-19	.220** (.077)	.336*** (.059)	.591 (.361)	-.017 (.233)
age 60-64 & completed education aged 17-19	.245** (.096)	.308*** (.082)	.242 (.264)	.619** (.288)
age 30-34 & completed education aged 20+	.282*** (.033)	.185*** (.038)	.854** (.322)	.294** (.120)
age 30-34 & completed education aged 20+	.438*** (.034)	.354*** (.039)	.442*** (.097)	.466*** (.132)
age 35-39 & completed education aged 20+	.547*** (.035)	.542*** (.043)	.474*** (.111)	.421*** (.107)
age 45-49 & completed education aged 20+	.523*** (.050)	.467*** (.062)	.370** (.138)	.210 (.143)
age 50-54 & completed education aged 20+	.534*** (.047)	.610*** (.076)	.031 (.200)	.518** (.158)
age 55-59 & completed education aged 20+	.470*** (.059)	.533*** (.071)	.349 (.278)	.302 (.226)
age 60-64 & completed education aged 20+	.400** (.200)	.361** (.134)	.578*** (.156)	.028 (.319)
Region: London (ref)				
North East	-.360*** (.035)	-.323*** (.045)	-.102 (.157)	-.194 (.243)
North West	-.305*** (.027)	-.342*** (.036)	-.324*** (.082)	-.241*** (.065)
Yorkshire and the Humber	-.350*** (.029)	-.374*** (.034)	-.174 (.114)	-.171** (.071)
East Midlands	-.296*** (.027)	-.330*** (.036)	-.128 (.107)	-.366*** (.066)
West Midlands	-.280*** (.027)	-.337*** (.038)	-.256*** (.065)	-.218*** (.066)
East of England	-.144*** (.027)	-.242*** (.035)	.014 (.100)	-.042 (.063)
South East	-.061** (.026)	-.142*** (.035)	.074 (.061)	-.115** (.058)
South West	-.299*** (.030)	-.308*** (.033)	-.224** (.111)	-.161* (.089)
Wales	-.381*** (.034)	-.392*** (.040)	-.252** (.113)	-.236** (.118)
Scotland	-.309*** (.027)	-.277*** (.033)	-.648 (.401)	-.123* (.066)
R-squared	.379	.349	.380	.425
N	9,012	7,572	963	1,164

Notes: *wB*=white British and *nwB*=non-white-British. Significance levels indicated as \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$  and standard errors shown in parentheses. Bootstrapped standard errors after 400 replications.

Source: Author's calculations using the Family Resources Survey.

**Table D.2:** *OLS log-earnings estimation results for women in 2001 and 2007*

	2001 wB	2007 wB	2001 nwB	2007 nwB
Constant	7.229*** (.084)	7.589*** (.069)	7.264*** (.237)	7.244*** (.176)
Children in the household: none (ref)				
1	-.085** (.029)	-.066** (.023)	-.078 (.073)	-.020 (.067)
2	-.073** (.025)	-.049* (.029)	-.083 (.096)	-.003 (.085)
3+	-.152*** (.038)	-.050 (.054)	-.038 (.121)	.136 (.131)
Adults in the household: 1 (ref)				
2	.016 (.026)	-.021 (.025)	-.099 (.085)	-.020 (.074)
3+	-.042* (.025)	-.083** (.027)	-.117 (.088)	-.002 (.078)
Head of the household	.318*** (.019)	.311*** (.017)	.250*** (.052)	.383*** (.048)
Average age in the household	.002* (.001)	-.002** (.001)	.003 (.005)	.003 (.004)
In a couple	.221*** (.019)	.251*** (.020)	.132* (.071)	.086 (.062)
Working hours: 40+ (ref)				
1-15	-1.599*** (.028)	-1.595*** (.035)	-1.679*** (.106)	-1.445*** (.102)
16-29	-.763*** (.019)	-.800*** (.023)	-.863*** (.082)	-.734*** (.061)
30-39	-.086*** (.017)	-.091*** (.017)	-.025 (.049)	-.073 (.048)
Age: 40-44 (ref)				
25-29	-.177*** (.032)	-.194*** (.038)	-.121 (.112)	-.346** (.122)
30-34	-.227** (.077)	-.264*** (.035)	-.093 (.121)	-.204 (.164)
35-39	-.136*** (.024)	-.224*** (.029)	-.203 (.145)	-.039 (.105)
45-49	-.182*** (.025)	-.163*** (.027)	-.197** (.100)	-.108 (.099)
50-54	-.249*** (.026)	-.193*** (.031)	-.282** (.137)	-.179* (.106)
55-59	-.305*** (.032)	-.218*** (.035)	-.363** (.151)	-.125 (.142)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.138*** (.036)	.010 (.046)	.019 (.110)	.306** (.133)
age 30-34 & completed education aged 17-19	.290*** (.085)	.160*** (.043)	.021 (.106)	.278 (.170)
age 35-39 & completed education aged 17-19	.227*** (.028)	.223*** (.038)	.237* (.143)	.028 (.104)
age 45-49 & completed education aged 17-19	.216*** (.035)	.233*** (.034)	-.045 (.130)	.192* (.106)
age 50-54 & completed education aged 17-19	.248*** (.050)	.173*** (.048)	.152 (.147)	.345** (.125)
age 55-59 & completed education aged 17-19	.264*** (.056)	.208*** (.050)	.238 (.152)	-.019 (.159)
age 30-34 & completed education aged 20+	.381*** (.036)	.236*** (.040)	.198** (.095)	.350** (.127)
age 30-34 & completed education aged 20+	.637*** (.093)	.564*** (.041)	.327** (.108)	.495** (.162)
age 35-39 & completed education aged 20+	.588*** (.065)	.599*** (.051)	.369** (.158)	.289** (.115)
age 45-49 & completed education aged 20+	.654*** (.045)	.567*** (.058)	.271** (.099)	.262* (.144)
age 50-54 & completed education aged 20+	.588*** (.045)	.524*** (.053)	.178 (.162)	.307* (.163)

age 55-59 & completed education aged 20+	.610*** (.067)	.563*** (.058)	.440* (.249)	.117 (.169)
Region: London (ref)				
North East	-.286*** (.070)	-.303*** (.040)	.060 (.132)	-.217** (.103)
North West	-.251*** (.066)	-.319*** (.035)	-.238** (.085)	-.262** (.109)
Yorkshire and the Humber	-.249*** (.068)	-.322*** (.036)	-.178* (.097)	-.102 (.103)
East Midlands	-.234*** (.066)	-.305*** (.035)	-.230** (.093)	-.389*** (.074)
West Midlands	-.270*** (.066)	-.287*** (.035)	-.085 (.072)	-.242** (.076)
East of England	-.153** (.065)	-.258*** (.037)	-.003 (.078)	-.003 (.075)
South East	-.138** (.064)	-.164*** (.034)	-.033 (.065)	-.121* (.065)
South West	-.269*** (.066)	-.312*** (.037)	-.061 (.090)	-.356*** (.101)
Wales	-.291*** (.067)	-.415*** (.044)	-.234 (.168)	-.303** (.094)
Scotland	-.247*** (.065)	-.289*** (.032)	-.043 (.187)	-.216*** (.057)
R-squared	.471	.550	.532	.453
N	8,583	7,221	851	1,023

Notes and Source: see Table D.1

**Table D.3:** OLS log-earnings estimation results for men in 2007 and 2011

	2007 wB	2011 wB	2007 nwB	2011 nwB
Constant	7.930*** (.069)	7.881*** (.086)	7.636*** (.155)	7.747*** (.183)
Children in the household: none (ref)				
1	-.034 (.021)	-.005 (.029)	-.012 (.059)	.043 (.065)
2	-.000 (.028)	.044 (.045)	-.018 (.068)	.079 (.083)
3+	-.015 (.044)	.022 (.049)	-.152 (.093)	-.245** (.110)
Adults in the household: 1 (ref)				
2	.013 (.033)	.092** (.044)	.103 (.067)	-.051 (.098)
3+	.025 (.030)	.061 (.040)	.039 (.069)	-.164* (.093)
Head of the household	.423*** (.021)	.401*** (.034)	.338*** (.048)	.373*** (.053)
Average age in the household	-.003** (.001)	-.003** (.002)	.003 (.003)	.002 (.004)
In a couple	.146*** (.029)	.071* (.037)	.093* (.053)	.069 (.066)
Working hours: 50+ (ref)				
1-29	-1.237*** (.056)	-1.206*** (.060)	-1.442*** (.080)	-1.411*** (.088)
30-39	-.138*** (.023)	-.185*** (.027)	-.283*** (.059)	-.300*** (.072)
40-49	-.139*** (.022)	-.179*** (.026)	-.235*** (.056)	-.230** (.073)
Age: 40-44 (ref)				
25-29	-.296*** (.032)	-.394*** (.051)	-.345** (.123)	-.618** (.197)
30-34	-.263*** (.032)	-.375*** (.040)	-.332** (.137)	-.307** (.125)
35-39	-.253*** (.031)	-.228*** (.038)	-.301** (.101)	-.391*** (.114)
45-49	-.177*** (.025)	-.104** (.036)	-.122 (.125)	-.166 (.110)
50-54	-.200*** (.029)	-.118** (.037)	-.347*** (.091)	-.033 (.117)
55-59	-.240*** (.040)	-.144** (.044)	.023 (.159)	-.240 (.151)
60-64	-.312***	-.238***	-.121	-.332**

	(.038)	(.049)	(.222)	(.141)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.056 (.038)	.053 (.057)	.056 (.123)	.390* (.206)
age 30-34 & completed education aged 17-19	.096** (.040)	.193*** (.047)	.131 (.150)	-.074 (.117)
age 35-39 & completed education aged 17-19	.216*** (.039)	.124** (.051)	.148 (.105)	.131 (.122)
age 45-49 & completed education aged 17-19	.228*** (.039)	.191*** (.051)	.148 (.142)	.147 (.130)
age 50-54 & completed education aged 17-19	.269*** (.045)	.279*** (.058)	.222 (.178)	-.056 (.137)
age 55-59 & completed education aged 17-19	.336*** (.059)	.280*** (.060)	-.017 (.233)	.056 (.189)
age 60-64 & completed education aged 17-19	.308*** (.082)	.045 (.104)	.619** (.288)	.169 (.145)
age 30-34 & completed education aged 20+	.185*** (.038)	.302*** (.053)	.294** (.120)	.556** (.194)
age 30-34 & completed education aged 20+	.354*** (.039)	.534*** (.047)	.466*** (.132)	.291** (.117)
age 35-39 & completed education aged 20+	.542*** (.043)	.563*** (.101)	.421*** (.107)	.531*** (.117)
age 45-49 & completed education aged 20+	.467*** (.062)	.436*** (.070)	.210 (.143)	.422** (.143)
age 50-54 & completed education aged 20+	.610*** (.076)	.564*** (.072)	.518** (.158)	.017 (.253)
age 55-59 & completed education aged 20+	.533*** (.071)	.423*** (.071)	.302 (.226)	.101 (.169)
age 60-64 & completed education aged 20+	.361** (.134)	.482*** (.102)	.028 (.319)	.217 (.238)
Region: London (ref)				
North East	-.323*** (.045)	-.415*** (.057)	-.194 (.243)	-.208* (.118)
North West	-.342*** (.036)	-.299*** (.047)	-.241*** (.065)	-.215** (.074)
Yorkshire and the Humber	-.374*** (.034)	-.329*** (.046)	-.171** (.071)	-.174** (.087)
East Midlands	-.330*** (.036)	-.364*** (.048)	-.366*** (.066)	-.136* (.077)
West Midlands	-.337*** (.038)	-.315*** (.049)	-.218*** (.066)	-.322*** (.075)
East of England	-.242*** (.035)	-.174** (.065)	-.042 (.063)	-.165** (.071)
South East	-.142*** (.035)	-.169*** (.047)	-.115** (.058)	.060 (.069)
South West	-.308*** (.033)	-.266*** (.046)	-.161* (.089)	-.111 (.108)
Wales	-.392*** (.040)	-.378*** (.053)	-.236** (.118)	-.063 (.122)
Scotland	-.277*** (.033)	-.256*** (.044)	-.123* (.066)	-.124 (.083)
R-squared	.349	.346	.425	.462
N	7,572	5,915	1,164	1,104

Notes and Source: see Table D.1

**Table D.4:** *OLS log-earnings estimation results for women in 2007 and 2011*

	2007 wB	2011 wB	2007 nwB	2011 nwB
Constant	7.688*** (.069)	7.472*** (.084)	7.343*** (.176)	7.368*** (.188)
Children in the household: none (ref)				
1	-.066** (.023)	-.097*** (.027)	-.020 (.067)	-.049 (.067)
2	-.049* (.029)	-.006 (.040)	-.003 (.085)	-.125 (.104)
3+	-.050 (.054)	-.235*** (.056)	.136 (.131)	-.033 (.138)
Adults in the household: 1 (ref)				
2	-.021 (.025)	.065* (.036)	-.020 (.074)	.073 (.096)
3+	-.083**	.007	-.002	-.056

	(.027)	(.039)	(.078)	(.093)
Head of the household	.311***	.364***	.383***	.345***
	(.017)	(.029)	(.048)	(.049)
Average age in the household	-.002**	-.000	.003	.002
	(.001)	(.001)	(.004)	(.004)
In a couple	.251***	.239***	.086	.140**
	(.020)	(.028)	(.062)	(.061)
Working hours: 40+ (ref)				
1-15	-1.595***	-1.495***	-1.445***	-1.502***
	(.035)	(.042)	(.102)	(.128)
16-29	-.800***	-.763***	-.734***	-.854***
	(.023)	(.034)	(.061)	(.075)
30-39	-.091***	-.060**	-.073	-.075
	(.017)	(.024)	(.048)	(.055)
Age: 40-44 (ref)				
25-29	-.194***	-.349***	-.346**	-.370
	(.038)	(.056)	(.122)	(.280)
30-34	-.264***	-.300***	-.204	-.140
	(.035)	(.069)	(.164)	(.130)
35-39	-.224***	-.189***	-.039	-.316**
	(.029)	(.047)	(.105)	(.117)
45-49	-.163***	-.237***	-.108	.043
	(.027)	(.037)	(.099)	(.139)
50-54	-.193***	-.213***	-.179*	-.416**
	(.031)	(.041)	(.106)	(.131)
55-59	-.218***	-.346***	-.125	-.182
	(.035)	(.085)	(.142)	(.143)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.010	.118**	.306**	-.112
	(.046)	(.059)	(.133)	(.332)
age 30-34 & completed education aged 17-19	.160***	.183**	.278	.036
	(.043)	(.069)	(.170)	(.138)
age 35-39 & completed education aged 17-19	.223***	.102**	.028	.395**
	(.038)	(.047)	(.104)	(.151)
age 45-49 & completed education aged 17-19	.233***	.210***	.192*	-.060
	(.034)	(.035)	(.106)	(.161)
age 50-54 & completed education aged 17-19	.173***	.276***	.345**	.421**
	(.048)	(.044)	(.125)	(.148)
age 55-59 & completed education aged 17-19	.208***	.301**	-.019	-.021
	(.050)	(.094)	(.159)	(.167)
age 30-34 & completed education aged 20+	.236***	.330***	.350**	.187
	(.040)	(.064)	(.127)	(.290)
age 30-34 & completed education aged 20+	.564***	.548***	.495**	.211
	(.041)	(.070)	(.162)	(.151)
age 35-39 & completed education aged 20+	.599***	.504***	.289**	.546***
	(.051)	(.045)	(.115)	(.125)
age 45-49 & completed education aged 20+	.567***	.730***	.262*	.195
	(.058)	(.049)	(.144)	(.174)
age 50-54 & completed education aged 20+	.524***	.564***	.307*	.443**
	(.053)	(.060)	(.163)	(.154)
age 55-59 & completed education aged 20+	.563***	.703***	.117	.063
	(.058)	(.106)	(.169)	(.179)
Region: London (ref)				
North East	-.303***	-.279***	-.217**	-.210
	(.040)	(.053)	(.103)	(.202)
North West	-.319***	-.312***	-.262**	-.207**
	(.035)	(.066)	(.109)	(.071)
Yorkshire and the Humber	-.322***	-.257***	-.102	-.132
	(.036)	(.050)	(.103)	(.102)
East Midlands	-.305***	-.266***	-.389***	-.214**
	(.035)	(.051)	(.074)	(.091)
West Midlands	-.287***	-.207***	-.242**	-.362***
	(.035)	(.048)	(.076)	(.104)
East of England	-.258***	-.133**	-.003	-.232**
	(.037)	(.062)	(.075)	(.087)
South East	-.164***	-.159***	-.121*	-.093*
	(.034)	(.047)	(.065)	(.054)
South West	-.312***	-.278***	-.356***	-.359**
	(.037)	(.048)	(.101)	(.130)
Wales	-.415***	-.254***	-.303**	-.171
	(.044)	(.055)	(.094)	(.155)
Scotland	-.289***	-.196***	-.216***	-.115
	(.032)	(.046)	(.057)	(.114)
R-squared	.550	.390	.453	.461

N	7,221	5,809	1,023	955
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Notes and Source: see Table D.1

**Table D.5:** *OLS log-earnings estimation results for men in 2011 and 2017*

	2011 wB	2017 wB	2011 nwB	2017 nwB
Constant	7.980*** (.086)	7.962*** (.086)	7.846*** (.183)	7.148*** (.158)
Children in the household: none (ref)				
1	-.005 (.029)	-.042 (.030)	.043 (.065)	.014 (.059)
2	.044 (.045)	.034 (.036)	.079 (.083)	.133* (.068)
3+	.022 (.049)	-.043 (.054)	-.245** (.110)	-.009 (.107)
Adults in the household: 1 (ref)				
2	.092** (.044)	.074* (.039)	-.051 (.098)	-.030 (.084)
3+	.061 (.040)	.059 (.038)	-.164* (.093)	-.033 (.082)
Head of the household	.401*** (.034)	.404*** (.021)	.373*** (.053)	.449*** (.045)
Average age in the household	-.003** (.002)	-.004** (.001)	.002 (.004)	.011*** (.003)
In a couple	.071* (.037)	.103** (.033)	.069 (.066)	.242*** (.052)
Working hours: 50+ (ref)				
1-29	-1.206*** (.060)	-1.050*** (.054)	-1.411*** (.088)	-1.230*** (.082)
30-39	-.185*** (.027)	-.151*** (.027)	-.300*** (.072)	-.122** (.061)
40-49	-.179*** (.026)	-.134*** (.027)	-.230** (.073)	-.102 (.062)
Age: 40-44 (ref)				
25-29	-.394*** (.051)	-.415*** (.049)	-.618** (.197)	-.107 (.140)
30-34	-.375*** (.040)	-.282*** (.045)	-.307** (.125)	-.185 (.124)
35-39	-.228*** (.038)	-.200*** (.046)	-.391*** (.114)	-.298** (.097)
45-49	-.104** (.036)	-.102** (.036)	-.166 (.110)	-.376** (.146)
50-54	-.118** (.037)	-.083** (.040)	-.033 (.117)	-.223** (.110)
55-59	-.144** (.044)	-.173*** (.044)	-.240 (.151)	-.211* (.116)
60-64	-.238*** (.049)	-.153** (.049)	-.332** (.141)	-.360** (.123)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.053 (.057)	.163** (.053)	.390* (.206)	-.025 (.147)
age 30-34 & completed education aged 17-19	.193*** (.047)	.049 (.047)	-.074 (.117)	-.038 (.128)
age 35-39 & completed education aged 17-19	.124** (.051)	.129** (.052)	.131 (.122)	.069 (.111)
age 45-49 & completed education aged 17-19	.191*** (.051)	.202*** (.050)	.147 (.130)	.159 (.181)
age 50-54 & completed education aged 17-19	.279*** (.058)	.162** (.058)	-.056 (.137)	-.073 (.131)
age 55-59 & completed education aged 17-19	.280*** (.060)	.261*** (.072)	.056 (.189)	-.123 (.136)
age 60-64 & completed education aged 17-19	.045 (.104)	.137* (.074)	.169 (.145)	.046 (.210)
age 30-34 & completed education aged 20+	.302*** (.053)	.272*** (.052)	.556** (.194)	.116 (.147)
age 30-34 & completed education aged 20+	.534*** (.047)	.374*** (.051)	.291** (.117)	.231* (.125)
age 35-39 & completed education aged 20+	.563*** (.101)	.400*** (.054)	.531*** (.117)	.427*** (.099)
age 45-49 & completed education aged 20+	.436*** (.070)	.455*** (.060)	.422** (.143)	.532** (.165)

age 50-54 & completed education aged 20+	.564*** (.072)	.596*** (.061)	.017 (.253)	.293** (.133)
age 55-59 & completed education aged 20+	.423*** (.071)	.463*** (.071)	.101 (.169)	.350 (.240)
age 60-64 & completed education aged 20+	.482*** (.102)	.383*** (.090)	.217 (.238)	.358* (.205)
Region: London (ref)				
North East	-.415*** (.057)	-.309*** (.054)	-.208* (.118)	-.352*** (.101)
North West	-.299*** (.047)	-.254*** (.044)	-.215** (.074)	-.318*** (.084)
Yorkshire and the Humber	-.329*** (.046)	-.290*** (.045)	-.174** (.087)	-.271*** (.075)
East Midlands	-.364*** (.048)	-.270*** (.044)	-.136* (.077)	-.146** (.065)
West Midlands	-.315*** (.049)	-.287*** (.050)	-.322*** (.075)	-.137* (.075)
East of England	-.174** (.065)	-.129** (.047)	-.165** (.071)	.016 (.062)
South East	-.169*** (.047)	-.113** (.043)	.060 (.069)	.062 (.055)
South West	-.266*** (.046)	-.308*** (.047)	-.111 (.108)	-.111 (.070)
Wales	-.378*** (.053)	-.318*** (.046)	-.063 (.122)	-.201 (.135)
Scotland	-.256*** (.044)	-.206*** (.044)	-.124 (.083)	-.109 (.121)
R-squared	.346	.358	.462	.428
N	5,915	5,083	1,104	1,122

Notes and Source: see Table D.1

**Table D.6:** *OLS log-earnings estimation results for women in 2011 and 2017*

	2011 wB	2017 wB	2011 nwB	2017 nwB
Constant	7.571*** (.084)	7.514*** (.084)	7.467*** (.188)	7.364*** (.155)
Children in the household: none (ref)				
1	-.097*** (.027)	-.078** (.038)	-.049 (.067)	-.093 (.057)
2	-.006 (.040)	.031 (.041)	-.125 (.104)	-.050 (.083)
3+	-.235*** (.056)	-.146** (.063)	-.033 (.138)	.088 (.103)
Adults in the household: 1 (ref)				
2	.065* (.036)	.056* (.033)	.073 (.096)	-.083 (.068)
3+	.007 (.039)	.036 (.038)	-.056 (.093)	-.091 (.071)
Head of the household	.364*** (.029)	.389*** (.024)	.345*** (.049)	.319*** (.045)
Average age in the household	-.000 (.001)	.002 (.002)	.002 (.004)	.005 (.003)
In a couple	.239*** (.028)	.260*** (.029)	.140** (.061)	.225*** (.059)
Working hours: 40+ (ref)				
1-15	-1.495*** (.042)	-1.555*** (.055)	-1.502*** (.128)	-1.614*** (.097)
16-29	-.763*** (.034)	-.678*** (.033)	-.854*** (.075)	-.855*** (.058)
30-39	-.060** (.024)	-.112*** (.026)	-.075 (.055)	-.125** (.045)
Age: 40-44 (ref)				
25-29	-.349*** (.056)	-.285*** (.054)	-.370 (.280)	-.140 (.157)
30-34	-.300*** (.069)	-.365*** (.058)	-.140 (.130)	-.427** (.164)
35-39	-.189*** (.047)	-.187** (.081)	-.316** (.117)	-.454*** (.124)
45-49	-.237*** (.037)	-.230*** (.041)	.043 (.139)	-.196* (.104)
50-54	-.213***	-.202***	-.416**	-.132

	(.041)	(.039)	(.131)	(.099)
55-59	-.346***	-.279***	-.182	-.423**
	(.085)	(.048)	(.143)	(.143)
Aged 40-45 & completed education aged 16 or less (ref)				
age 25-29 & completed education aged 17-19	.118**	.020	-.112	-.059
	(.059)	(.064)	(.332)	(.156)
age 30-34 & completed education aged 17-19	.183**	.226***	.036	.345*
	(.069)	(.065)	(.138)	(.176)
age 35-39 & completed education aged 17-19	.102**	.041	.395**	.350**
	(.047)	(.099)	(.151)	(.126)
age 45-49 & completed education aged 17-19	.210***	.246***	-.060	.209*
	(.035)	(.048)	(.161)	(.125)
age 50-54 & completed education aged 17-19	.276***	.174***	.421**	.060
	(.044)	(.043)	(.148)	(.124)
age 55-59 & completed education aged 17-19	.301**	.185**	-.021	.338**
	(.094)	(.059)	(.167)	(.163)
age 30-34 & completed education aged 20+	.330***	.228***	.187	.123
	(.064)	(.063)	(.290)	(.157)
age 30-34 & completed education aged 20+	.548***	.433***	.211	.552***
	(.070)	(.068)	(.151)	(.163)
age 35-39 & completed education aged 20+	.504***	.396***	.546***	.691***
	(.045)	(.092)	(.125)	(.120)
age 45-49 & completed education aged 20+	.730***	.579***	.195	.376**
	(.049)	(.053)	(.174)	(.119)
age 50-54 & completed education aged 20+	.564***	.363***	.443**	.292**
	(.060)	(.055)	(.154)	(.120)
age 55-59 & completed education aged 20+	.703***	.536***	.063	.604**
	(.106)	(.063)	(.179)	(.242)
Region: London (ref)				
North East	-.279***	-.319***	-.210	.058
	(.053)	(.065)	(.202)	(.111)
North West	-.312***	-.227***	-.207**	-.195**
	(.066)	(.048)	(.071)	(.069)
Yorkshire and the Humber	-.257***	-.258***	-.132	-.323***
	(.050)	(.059)	(.102)	(.093)
East Midlands	-.266***	-.199***	-.214**	-.157*
	(.051)	(.048)	(.091)	(.091)
West Midlands	-.207***	-.240***	-.362***	-.060
	(.048)	(.053)	(.104)	(.065)
East of England	-.133**	-.184***	-.232**	.041
	(.062)	(.055)	(.087)	(.068)
South East	-.159***	-.140**	-.093*	.019
	(.047)	(.052)	(.054)	(.052)
South West	-.278***	-.199***	-.359**	-.192**
	(.048)	(.058)	(.130)	(.091)
Wales	-.254***	-.287***	-.171	-.090
	(.055)	(.056)	(.155)	(.152)
Scotland	-.196***	-.212***	-.115	-.101
	(.046)	(.049)	(.114)	(.243)
R-squared	.390	.465	.461	.532
N	5,809	4,884	955	1,058

Notes and Source: see Table D.1

## E Breaking down the change in net income by income source

Figure E.1 shows results for the PCMI components by breaking down the change in net income by income source: earnings, self-employment income, other market incomes (private pensions, investment income, rent and private transfers between households (received minus paid)) and automatic stabilisers (tax-benefit effect). Such break-down can help us understand how the PCMI components affected the different income sources that make up household net income. So, for example, a

positive change (i.e. an increase) in net income due to earnings in graph ix) means that education expansion led to gains in earnings and so, to higher net income.

Automatic stabilisers capture the automatic response of the (same) tax-benefit policies to the wage/education changes (Dolls et al. 2012, Figari et al. 2015, Paulus and Tasseva 2020). So, a negative change (i.e. a reduction) in net income due to automatic stabilisers in graph ix) means that tax-benefit policies offset the growth in gross market income (e.g. earnings) resulting from the education expansion. This is because policies in a progressive system such as is the UK are expected to work in the opposite direction to market incomes – when market incomes go up, policies should offset (part of) the gain through higher tax/NI liabilities and lower benefit entitlements and vice versa. Tax-benefit policies would tend to mitigate (part of) the inequality increase in case of more unequally distributed market incomes, but they may also partly offset the inequality-reducing impact of more equally distributed market incomes.

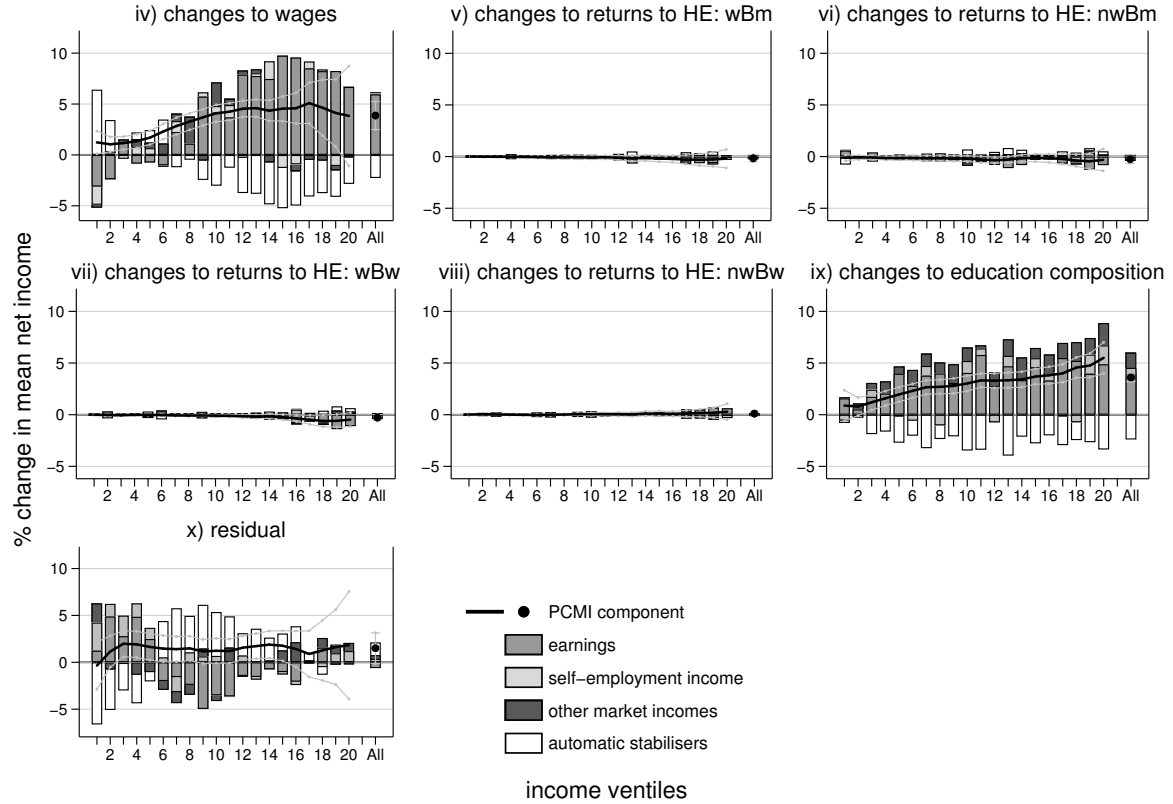
The most striking feature of Figure E.1 is that changes to wages (component iv) and education expansion (i.e. education composition changes) (component ix) led to increases in net income through earnings that were larger for the middle and top of the income distribution than the bottom; while the automatic stabilisation response of policies was to offset part of these increases. We find that changes to wages contributed on average to a rise in earnings of 6% but 2.3 percentage points was lost to lower benefit entitlements and/or higher tax/NI liabilities. Education expansion (ix) led to statistically significant increases in mean earnings (4%), self-employment income (0.5%) and other types of market incomes such as private pensions (0.8%) and investment income (0.4%). The gains from earnings, self-employment and investment income were larger for the upper part of the distribution while the gains from private pensions were somewhat more equal across the distribution. Tax-benefit policies partly offset the income gains due to education expansion.

Breaking down the change in net income in 2007-11 (Figure E.2) by income source shows that earnings fell in the 10th, 13th, 15th and 16th ventiles (for the rest of the distribution changes were not statistically significant) due to wage changes (iv) but the losses were partly offset by the automatic stabilisation effect of policies.

Education expansion (component ix), contributed to statistically significant increases in mean earnings (2.5%) and other market incomes, in particular private pensions (1%). Increases in investment income were smaller, at 0.2%. The tax-benefit system, through automatic stabilisation, partly reduced the income gains due to changes in the education composition.

Figure E.3 breaks down the change in net income by income source in 2011-17. We estimate a growth in mean earnings for the 8th, 10th, 14th and 15th ventile due to wage changes (component iv). For the 19th and 20th ventile, we estimate a large

**Figure E.1:** *Breaking down by income source the change in mean incomes due to changes in PCMI between 2001 and 2007*



*Notes:* HE=higher education; wBm=white British men; nwBm=non-white-British men; wBw=white British women; nwBw=non-white-British women. The bars add up to the PCMI component in each graph. Changes to incomes in real terms. Household ranking is not fixed, based on the respective (actual or counterfactual) distribution of equivalised household net income. Confidence intervals around PCMI component (grey lines) are estimated after 400 bootstrap replications.

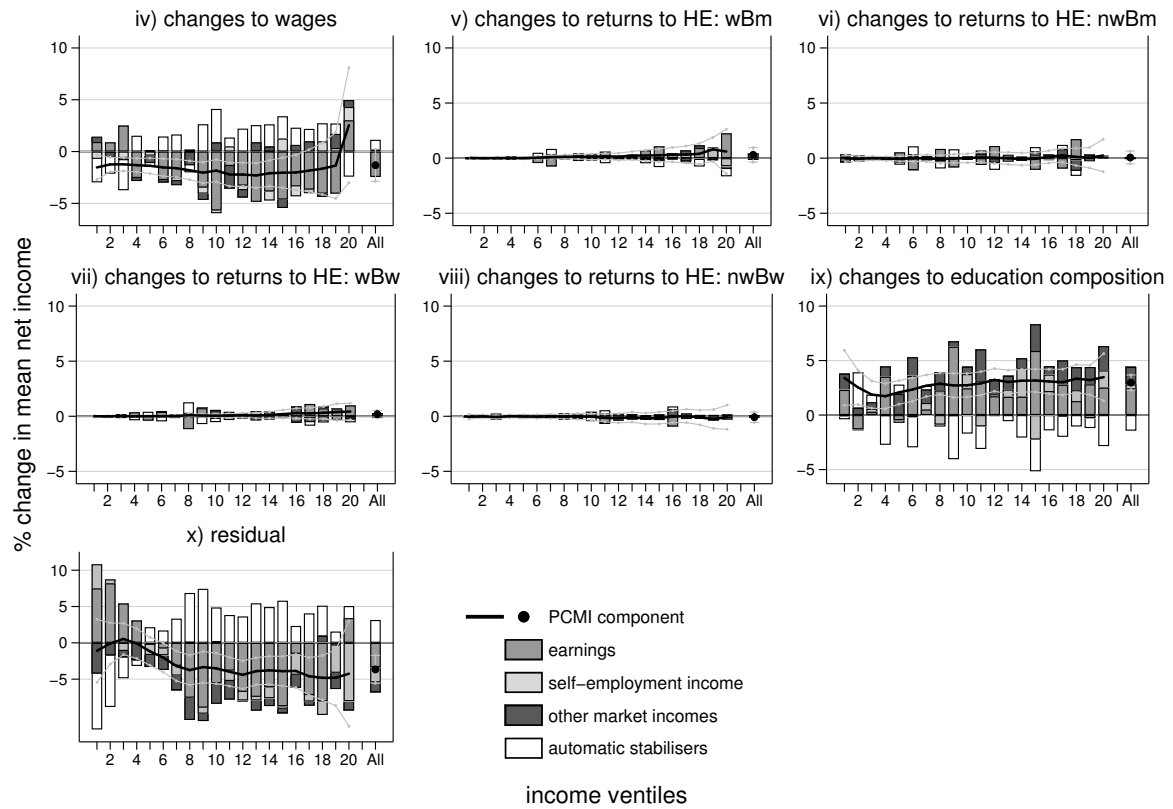
*Source:* Author's calculations using EUROMOD and the Family Resources Survey.

drop in mean earnings due to wage changes although not statistically significant. Due to education expansion (component ix), earnings went up on average by 3.6% and self-employment income by 0.6%. The change in gross market incomes across the distribution were partly mitigated by automatic stabilisers.

In the richest three ventiles in graph vii) of Figure E.3, we estimate a loss in mean earnings of 2-3% due to changes in the HE wage premium among white British female workers, which was partly offset by automatic stabilisers. However, as the returns to HE remained broadly the same for male and non-white-British female workers, there were no other statistically significant changes in incomes (components v, vi and viii).

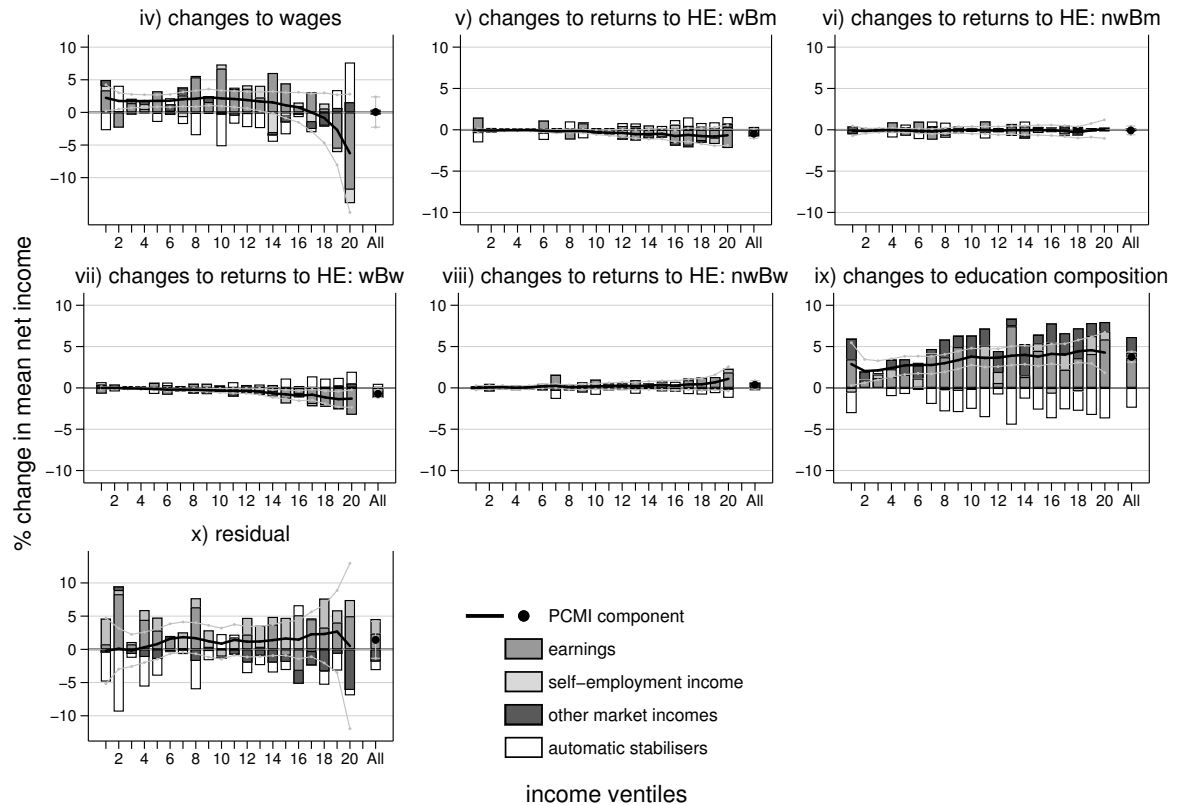
The residual (component x) captures the continued growth in earnings and self-employment income, especially at the bottom and top of the distribution. Both investment income and private pensions – part of “other market income” – fell on average by 0.8% and 1%, respectively. Across the distribution, these losses were most prevalent in the top ventiles, where they offset the gains in earnings and self-employment income.

**Figure E.2:** *Breaking down by income source the change in mean incomes due to changes in PCMI between 2007 and 2011*



Notes and Source: see Figure E.1.

**Figure E.3:** *Breaking down by income source the change in mean incomes due to changes in PCMI between 2011 and 2017*



Notes and Source: see Figure E.1.

## F Results by age group

We repeat the analysis presented in section 4.2 of the paper, but in this Appendix we show results for the change in mean income by *age group* (instead of by *ventiles*), focusing on the PCMI effect and its components only. As before, results are based on *equivalised* household incomes; thus, the effects by age group partly depend on the household composition. For example, if education composition changes led to higher earnings among working-age individuals, we will observe income gains for the age group of these individuals and the age group containing their children because of the equal household income sharing rule we apply.

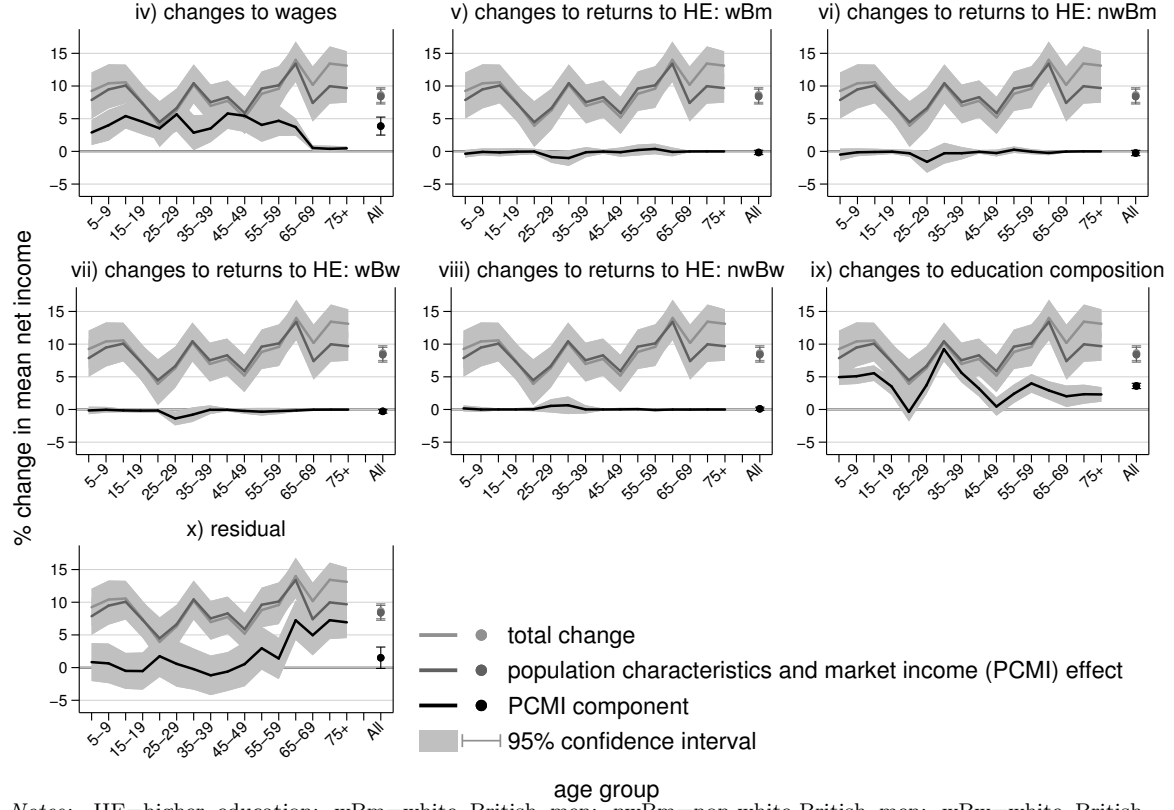
In what follows, each figure shows the change in mean income by age group (5-year age bands) and for the total population (*All*): Figure F.1 consists of seven graphs each showing the change in mean net income in 2001-07 due to one of the PCMI components: iv) changes to wages, excluding the returns to HE; v) to viii) changes to the HE wage premia by sex and ethnicity; ix) compositional changes to education; and x) a residual. In each graph, the PCMI component is illustrated in black (a black line for the income change across ventiles and a black circle for the income change for the whole population). The total change in income (a light grey line/circle) and the total PCMI effect (a dark grey line/circle) are illustrated repeatedly in each graph in Figure F.1. The results for 2007-11 are shown in Figure F.3 and those for 2011-17 in Figure F.5. The results for the 2001-07 change in mean net income are then broken down by income source in Figure F.2: earnings, self-employment income, other market incomes (private pensions, investment income, rent and private transfers between households (received minus paid)) and automatic stabilisers (tax-benefit effect). The results for 2007-11 are shown in Figure F.4 and those for 2011-17 in Figure F.6.

The main findings are: We find that education expansion (i.e. changes to the education composition) led to income gains along the age distribution which were largest for the age group of 30-35 in 2001-07 (graph ix) in Figure F.1), 35-39 in 2007-11 (Figure F.3) and 40-45 in 2011-17 (Figure F.5). In each period, there were large income gains due to education expansion also among the younger age groups of 0-19 (due to shared income gains within the household). Education expansion led to higher net incomes mostly through higher earnings, among the age groups below 60 years. Among the older age groups, above 60 years, the income gains due to the increase in the amount of education were mostly achieved through higher private pensions, shown as part of “other market incomes” (graph ix) in Figure F.2 for 2001-07, Figure F.4 for 2007-11 and Figure F.6 for 2011-17).

We estimate small income losses due to reductions in the HE wage premium among white British female workers in 2011-17 (graph vii) in Figure F.6), largest

(of -1.5%) for the 30-35 age group. Overall, we find that the HE returns by sex and ethnicity remained broadly unchanged and so, we do not find an effect on household incomes.

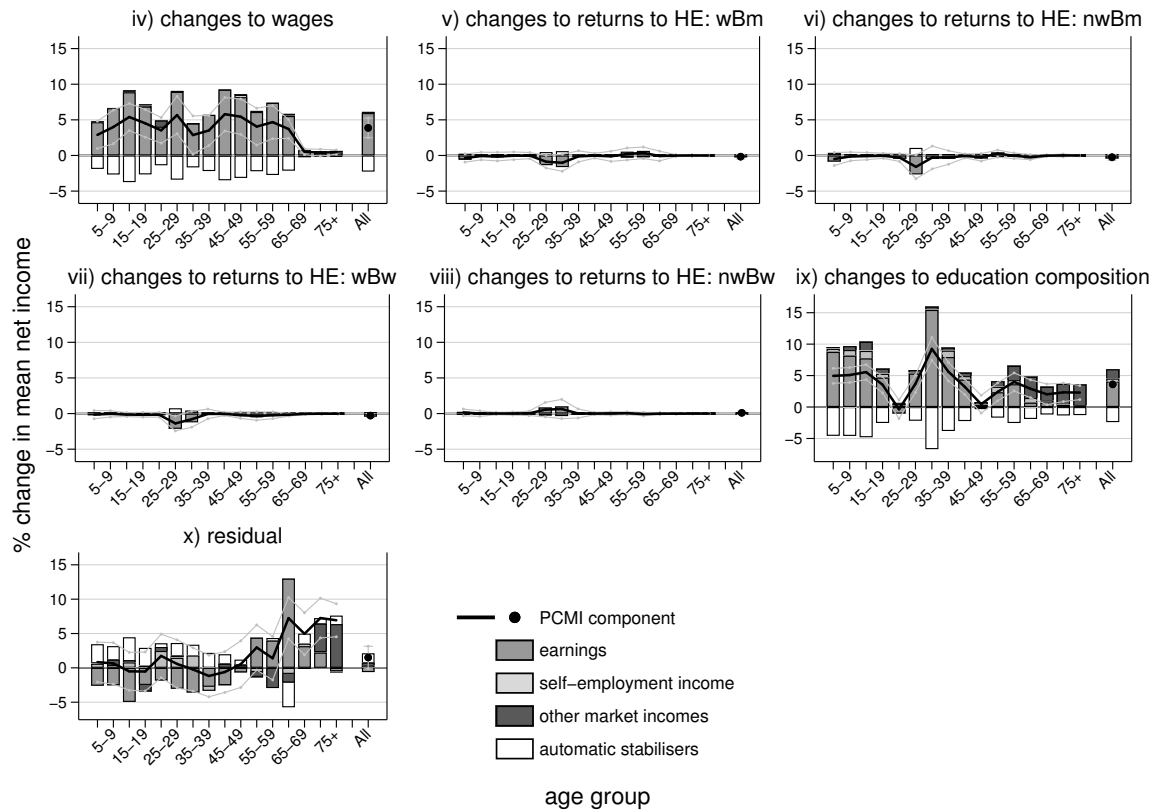
**Figure F.1:** *Decomposing the change in mean incomes by age group in 2001-07*



*Notes:* HE=higher education; wBm=white British men; nwBm=non-white-British men; wBw=white British women; nwBw=non-white-British women. The total change and the total PCMI effect are illustrated repeatedly in each graph. What differs across graphs is the change in net income due to the PCMI component. The PCMI components sum up to the total PCMI effect. Changes to incomes are estimated in real terms and based on equivalised household net income. Confidence intervals are estimated after 400 bootstrap replications.

*Source:* Author's calculations using EUROMOD and the Family Resources Survey.

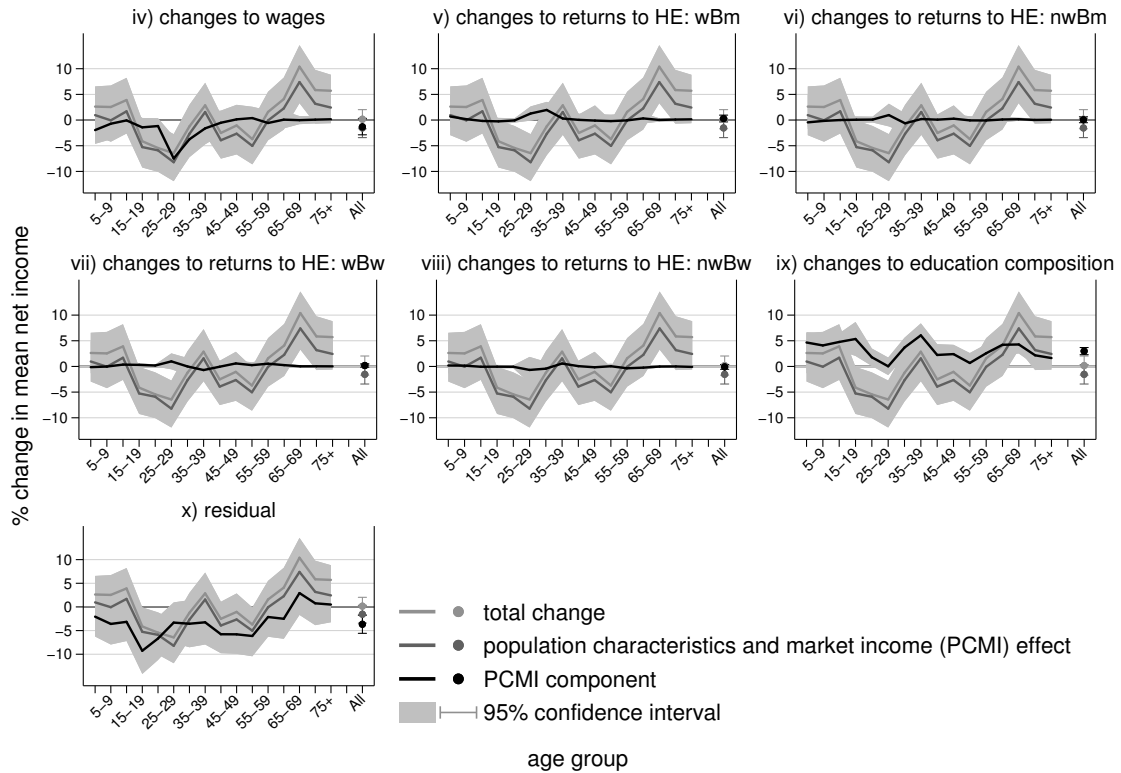
**Figure F.2:** *Breaking down by income source the change in mean incomes due to changes in PCMI in 2001-07*



*Notes:* HE=higher education; wBm=white British men; nwBm=non-white-British men; wBw=white British women; nwBw=non-white-British women. The bars add up to the PCMI component in each graph. Changes to incomes are estimated in real terms and based on equivalised household income. Confidence intervals around PCMI component (grey lines) are estimated after 400 bootstrap replications.

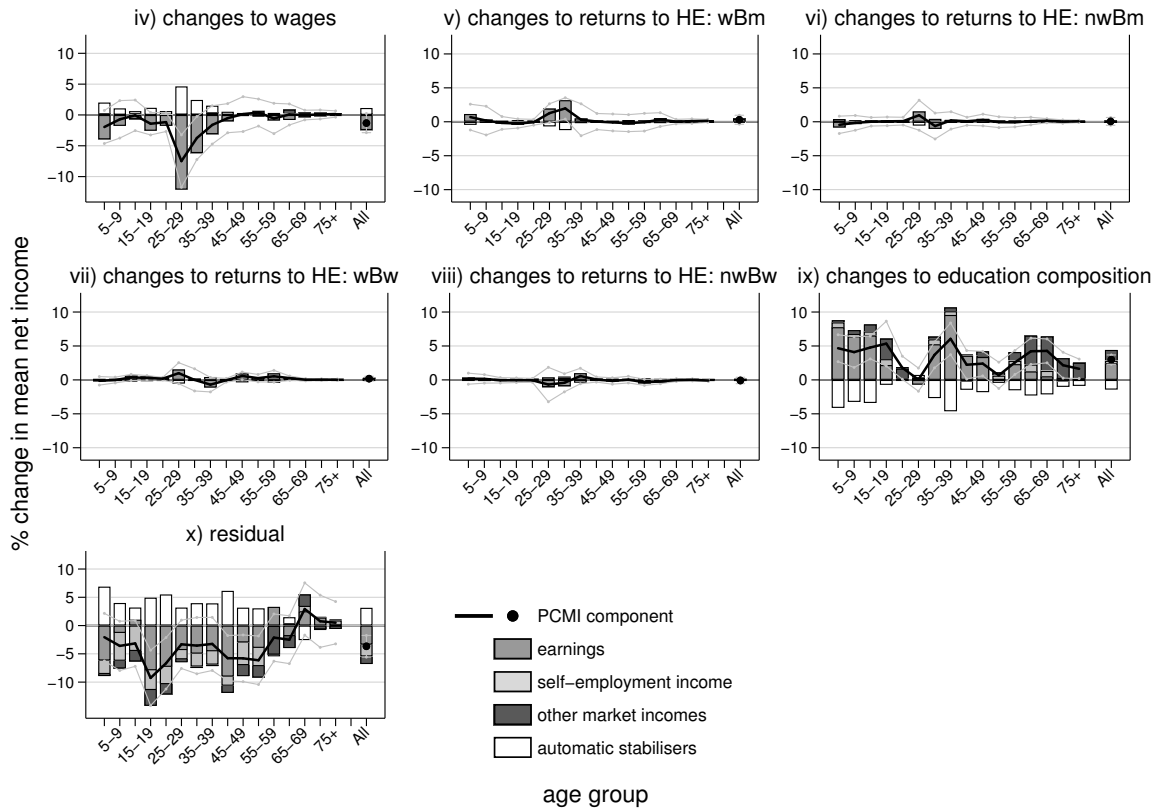
*Source:* Author's calculations using EUROMOD and the Family Resources Survey.

**Figure F.3:** *Decomposing the change in mean incomes by age group in 2007-11*



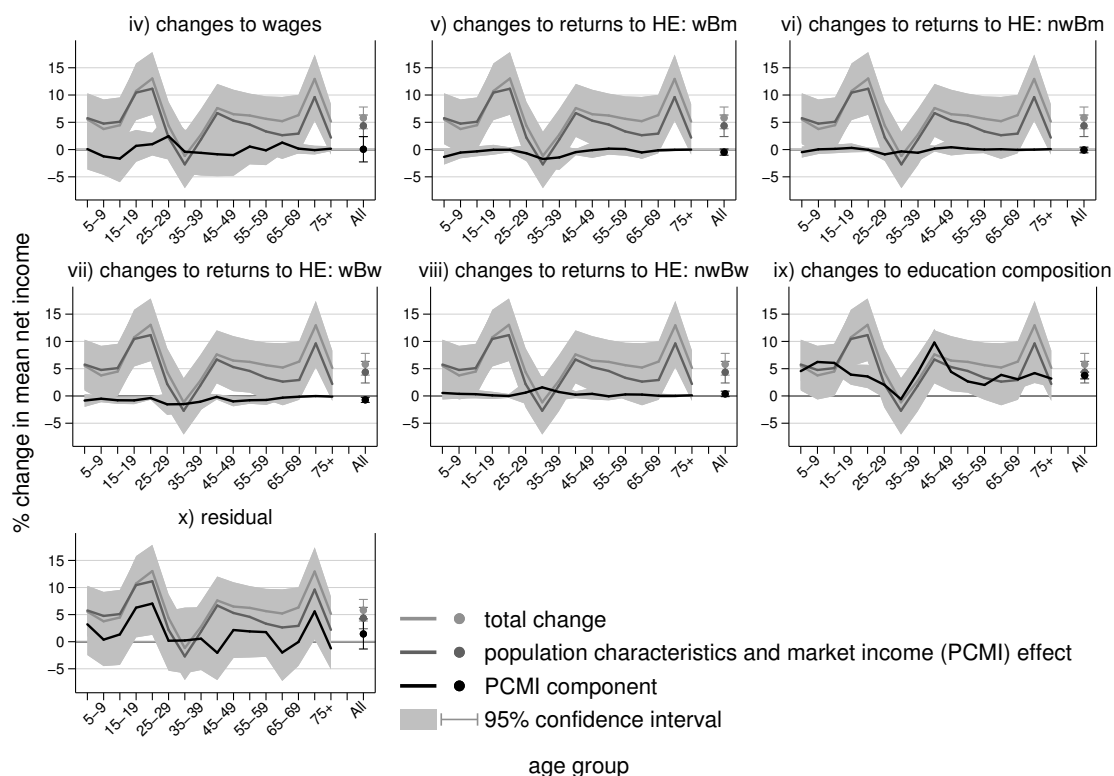
Notes and Source: see Figure F.1.

**Figure F.4:** *Breaking down by income source the change in mean incomes due to changes in PCMI in 2007-11*



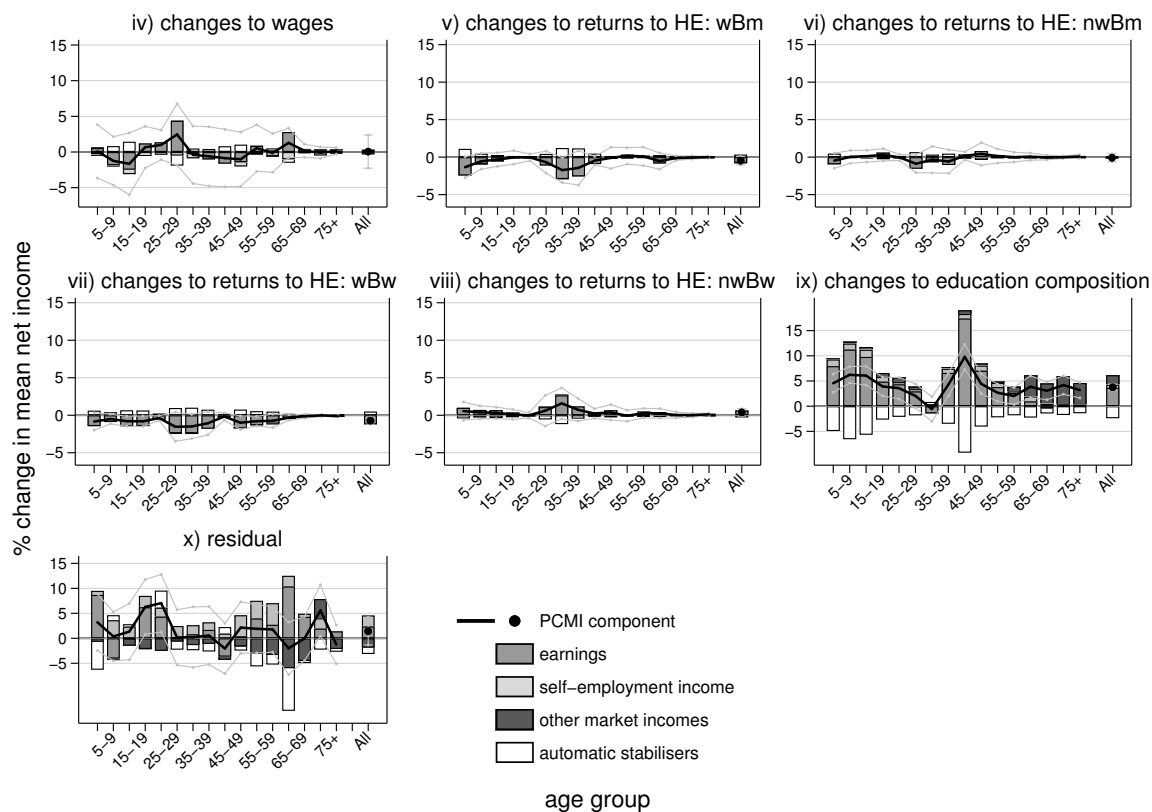
Notes and Source: see Figure F.2.

**Figure F.5:** *Decomposing the change in mean incomes by age group in 2011-17*



Notes and Source: see Figure F.1.

**Figure F.6:** *Breaking down by income source the change in mean incomes due to changes in PCMI in 2011-17*



Notes and Source: see Figure F.2.

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