

FitzRoy, Felix; Nolan, Michael A.

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Education, Income and Happiness: Panel Evidence for the UK

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DISCUSSION PAPER SERIES

IZA DP No. 11185

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Felix FitzRoy
Michael Nolan

NOVEMBER 2017

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Felix FitzRoy

University of St Andrews and IZA

Michael Nolan

University of Hull

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ABSTRACT

Education, Income and Happiness: Panel Evidence for the UK*

Using panel data from the BHPS and its Understanding Society extension, we study life satisfaction (LS) and income over nearly two decades, for samples split by education, and age – to our knowledge for the first time. The highly educated went from lowest to highest LS, though their average income was always higher. In spite of rapid income growth up to 2008/09, the less educated showed no rise in LS, while highly educated LS rose after the crash despite declining real income. In panel LS regressions with individual fixed effects, none of the income variables was significant for the highly educated.

JEL Classification: I31, O47

Keywords: education, income, economic growth, life satisfaction, Easterlin Paradox

Corresponding author:

Felix FitzRoy
University of St Andrews
St Andrews, KY16 8QX
United Kingdom
E-mail: frf@st-andrews.ac.uk

* A standard disclaimer applies. Access to the British Household Panel Survey (BHPS) and Understanding Society data was obtained via the UK Data Service.

1. Introduction and Background

Since education is correlated with income and health, both of which have positive effects on life satisfaction (LS), and those with higher education generally have access to more interesting and better-paid jobs, while manual labour is systematically correlated with lower LS, it is not surprising that (higher) education is generally considered to be beneficial for subjective well-being, happiness or LS, as well as for objective individual economic and social goals. Thus in their wide-ranging, cross-country survey of ‘Happiness at Work’, De Neve and Ward (2017) find a highly significant, positive effect of high education on LS in the presence of many other relevant controls.

It is thus surprising that our previous study of LS with BHPS data found a robust, significant *negative* effect of higher education in various specifications with numerous controls, while the positive effect was equally robust in German SOEP data (FitzRoy et al., 2014).

Here, we extend the British Household Panel Survey (BHPS) panel with the corresponding component of the Understanding Society dataset (part of which involves individuals drawn from the BHPS) to study the development of life satisfaction (LS) and income over a longer period of 17 years in different education (and age) groups. Real household income (deflated by the Consumer Prices Index¹) was always highest for the highly educated, and for all groups grew substantially for 10 years up to the financial crash of 2008/09. It then declined rapidly for the highly educated but recovered partially, and declined slightly for the middle and low education groups, leaving only small increases for all over the whole period.

LS, on the other hand, rose fastest for the highly educated from a surprising lowest to being highest among the education groups, a significant increase over a period when the number of highly educated roughly doubled. LS declined steeply for the low education group up to and beyond the crash, in spite of their rising income. Average LS declined up to the crash despite

¹ Measured by ONS series D7BT.

rapid income growth. Except for the highly educated before the crash, whose income and LS both increased, these results contradict standard economic growth theories, but are consistent with the Easterlin Paradox found in macro data. The negative association between high education and LS seems to be restricted to the first 8 years of the sample.

Various additional details emerge when we split the samples by age – specifically, for those aged under 45, and for those aged 45+. The LS of the younger, high education group overtook the rest after just two waves, while in the older group, LS only overtook the rest after the crash of 2008/9, while relative incomes were similar. The older low educated suffered the steepest decline of LS over the whole period.

Easterlin's (1974) seminal paper found no correlation between long term economic growth in rich countries, and subjective well-being (SWB – evaluated in surveys of life satisfaction (LS) or happiness). With 40 years of additional data, and economic growth, there is little evidence of any generally increasing SWB trend², (even in some of the fastest growing developing countries such as China). However, there is a strong cyclical relationship between real GDP per capita and SWB, with unemployment being a major cause of unhappiness that moves with the cycle, and critics have usually failed to distinguish carefully between trend growth and deviations from the trend (Easterlin, 2013). Confirming and explaining these results, on the basis of 'loss-aversion', De Neve et al. (2014) show that economic downturns have *negative* effects on SWB which are several times the magnitude of the impact of longer periods of equivalent positive growth.

The paradox is deepened by the fact that richer people are generally happier than the poor in any one country at a given time, though many other factors such as health, family and

² Helliwell et al. (2017).

employment are more important than income (but often also correlated with income).³ The well-established importance of socio-economic status or *relative income* is often advanced as part of the explanation, but studies using only macro-data on *average* happiness and per capita GDP obviously cannot explore this factor, while also omitting numerous important individual variables such as health, age, education and others, which *do* actually change in the aggregate over time. Other possible factors that could offset the benefits of growing average real incomes are rising inequality, and the widely observed decline in many components of social capital, such as community, personal and family relationships, as well as security of employment, although these issues are beyond the scope of this paper. Adaptation to higher income was found to have only small effects by Layard et al. (2010).

It thus seems appropriate to use available large panel data sets, which follow individuals over time, to examine the effects of income (growth) on their well-being, while controlling for both individual fixed effects and changing characteristics recorded in the survey data. Our main innovation here is to disaggregate the sample by three levels of education, and by age. To the best of our knowledge, the education split in this context is a novel approach, which yields some really surprising results, including the lack of *any significant* own-or-comparison income effects on the LS of the highly educated, although their LS increased more than in other groups in the period. Another puzzle is why the high education group had lowest LS initially, but overtook the less educated to become most satisfied while higher education was rapidly expanding.

³ Rich countries are also generally happier than poor countries, though there is much variation within these groups and various problems with international comparisons of SWB which do not concern us here.

2. *Data and methodology*

Our main data are taken from Waves 6-10 and 12-18 of the British Household Panel Survey⁴, (BHPS), covering a period that runs from 1996/07 to 2008/09; and from those parts of Waves 2-6 of the section of the new Understanding Society⁵ longitudinal study that relate to active, consenting former members of the BHPS sample, covering a period from 2010/11 to 2014/15. As is evident in Figure 1, LS data were not collected for BHPS Wave 11. Also evident from Figure 1 (and its 95% confidence limits) is the fact that not all of the time variation in average LS can be attributed to sampling variation. For regression analysis, we use data for 178,166 observations across 21,757 individuals, with those cases where there are missing values, and the highest income outliers⁶, excluded. As usual, we note the deliberate over-sampling of the smaller nations of the UK since Wave 9 – so that about half of the individuals in the BHPS are from Scotland, Wales and Northern Ireland⁷, compared to less than 20% in the overall population.

A plausible hypothesis is that those with higher education, who generally have the best-paid and most interesting jobs, would be most likely to enjoy increasing life satisfaction with higher incomes, so we split the sample into three groups. For the initial BHPS waves, classification through the International Standard Classification of Education (ISCED) is available – and the split is into higher (ISCED categories 5a and 6), middle (ISCED categories 3a and 5b) and low (ISCED categories primary, secondary and 3c) education. However, no ISCED codings are yet available for the Understanding Society waves – so that the three-way split had to be undertaken on the basis of a less sophisticated derived highest

⁴ The earlier waves of the BHPS (up to Wave 10) were limited in coverage to Great Britain. The full United Kingdom (including Northern Ireland) is covered in Waves 12-18. BHPS data are available via the UK Data Service (formerly the UK Data Archive).

⁵ Since Wave 2 of Understanding Society is the first to follow on from BHPS Wave 18, we re-number the Understanding Society waves (2-6) as 19-23.

⁶ A cut-off of 9.5 for the natural logarithm of (deflated) monthly household income is around £160,000 per year.

⁷ Across Waves 6-23, 44% of observations are for individuals outside England. Northern Ireland was not included in the BHPS data until Wave 11.

qualification variable⁸. Figures 2a-2c reveal the striking and quite counter-intuitive contrast between the high- and especially the low- education groups, but since the crucial difference is between the higher and the two lower groups, we aggregate the latter pair to simplify our regressions.

Our estimation approach is quite similar to FitzRoy et al. (2014) – we use individual fixed effects in estimation of a LS equation with quite a number of controls – many of which are fairly standard when using BHPS data. These include marital status (including cohabiting), number of children, health status, education, labour market status, time spent in panel, whether year of last interview, log household size, age (via six age dummies to create seven age categories), housing ownership status, wave number and regions. In the appendix, sample means are shown for many of the controls in Table A1a: the sample is also split by education level. We also follow Moulton (1990) in recognising the potential (cluster-related) effect of aggregate regressors on standard errors. Given that we are focusing on the estimation of individual-specific fixed effects regressions, we assume clustering at the level of the individual.

For the crucial test of the effects of income on LS in different education groups, we include (deflated) own household income (for the month before interview) and comparison (peer group) income separately. The definition used here for comparison income follows that employed by FitzRoy et al. (2014) – whereby comparison groups are defined by age bands (between 3 years younger and 6 years older), sex, education (two categories) and region (three categories). We also experiment with the inclusion of upward and downward changes in own household income, allowing for asymmetric LS responses. In addition to including a full set of regional dummies (with Greater London as the reference region), we control for

⁸ This split is essentially between degrees, A levels, and GCSEs (alongside others, and none).

(the ILO measure⁹ of) regional unemployment – which is not exclusively cyclical, of course – as well as regional house prices¹⁰. The type of equation that is estimated – sometimes split by age range (below 45 and 45+, respectively) and sometimes split by education level (high, versus medium/low) – takes the following form, for the typical fixed effects regression:

$$LS_{it} = \beta_0 + \beta_1 \ln \bar{Y}_{jt} + \beta_2 \ln Y_{it} + \beta_3 \ln \left(\frac{Y_{it}}{Y_{it-1}} \right)^+ + \beta_4 \ln \left(\frac{Y_{it-1}}{Y_{it}} \right)^- + \alpha \mathbf{X}_{it} + v_i + \varepsilon_{it}, \quad (1)$$

where the i subscript indexes the individual, the t subscript indexes the wave (year) of the panel data, and j denotes the reference group (regarding individual i) for comparison income (\bar{Y}). Household income is denoted Y , whilst the $+$ and $-$ superscripts capture, respectively, the cases where deflated household income rises (relative to the previous wave) or falls. The \mathbf{X} term captures a vector of additional included controls, with an attendant vector of estimated coefficients α . The individual fixed effect is denoted v , whilst ε is the remaining disturbance term.

We also tested for any additional effects of regional gross value added (GVA) per capita, in unreported regressions. It is clear from Appendix Figure A2 how different Greater London is, in this respect (as in many others) from the other UK NUTS1 regions. Like Pfaff and Hirata (2013), we found little systematic effect of regional GVA, which is not surprising since they also included household income, and we add comparison income. In contrast to their claims, this hardly supports Easterlin, since (on average) household incomes grow with macro-income measures, and are closely related to LS in cross-section, and in some of our panel results.

⁹ The annual ILO unemployment rates for NUTS1 regions of the UK are to be found in series YCNC-YCNK and YCNM-YCNN.

¹⁰ The use of a simple average of house prices across all dwellings is a simplification, but it does enable the availability of a longer continuous run of data.

3. Results and discussion

Figure 1 demonstrates the lack of an obvious time trend in LS across Waves 6-18 of the BHPS¹¹ – although, within the Understanding Society waves, there appears to be some evidence of a lagged adverse reaction to the infamous Great Recession (itself evident via the real GVA per capita plots in Figure A1). There is also a bounce-back in LS between Waves 22 and 23.

We present plots of LS by education in Figures 2a-2c, log real household income in Figure 3a and normalised¹² real household income by education in Figures 3b-3d. The most surprising message from these plots is that the highly educated (top 14% or so overall, but with a trend from 10% in Wave 6 to 15% in Wave 18 and 20% in Wave 23 – as shown in Figure 2d) started with the *lowest* LS, but consistently have the highest LS from Wave 15 onwards (Figure 2a). This is despite the fact that the percentage growth (around 18%) in their average real household incomes over the period (implied by the log incomes in Figure 3b) was very similar to those with medium education (17%), and below that for those with low education (24%). An interesting further dimension is the expansion of the proportion of the UK population that are highly educated (see Figure 2d). Between BHPS Waves 6 and 18, this rose by 42%; and 95% between BHPS Wave 6 and Wave 23 (Understanding Society Wave 6)¹³.

Summary statistics are displayed for a few key variables in Table 1a – split by education level. Overall, there is a tendency towards a positive link between LS and education level.

¹¹ Close examination of wave-specific means and standard errors for life satisfaction indicate a little more volatility than might be naturally expected, with high satisfaction in Wave 8 (1998/99 – maybe a sign of hopes springing from the 1997 General Election victory by Labour, after 18 years of Conservative governments), and low satisfaction in Waves 10 and 15 (2000/01 and 2005/06).

¹² The normalising division by the square root of household size (the “square root scale”) is employed in a number of OECD publications on income inequality and poverty (albeit across countries). In fact, the appearance of Figures 3b-3d is similar to the look of corresponding plots for raw log real household incomes. Figures 3a-3d all include income data for BHPS Wave 11, although no LS data was collected for that wave.

¹³ The percentage increase among women over the same period was even greater, but we do not pursue the gender dimension further in this paper. It should be noted that there is noticeable attrition between Waves 6 and 23: differential attrition (by education level) might exaggerate the rise in the percentage of highly qualified. So too might the move away from an ISCED-based definition of qualifications in the Understanding Society data.

There is a more noticeable (and expected) positive link between household income and education level, and this unsurprisingly is also reflected in comparison income. The decline in average age by education level is consistent with the known ongoing increase in access to higher levels of education in the UK, over the last couple of decades (and beyond).

A further split of the sample into a younger group (under 45s) and an older group (those aged 45+) reveals that the positive relationship between LS and education level for the former is reversed for the latter. This can also be seen by examining Figures 2b and 2c, where the older highly educated have the lowest LS for most of the period. On the other hand, average household income (and also average comparison income) is robustly higher for an increase in education level, for both age groupings (see also Figures 3c and 3d). For age itself within the younger group, the highly educated tend to be older – which is likely to be a reflection of the longer time taken to complete education to a high level. Meanwhile, there is a negative relationship between age and education level within the older age grouping, which provides further evidence that the incidence of high education is increasing among successive birth cohorts. This view is broadly supported by Figures A2a and A2b, although a switch from low to medium education is especially noticeable for the younger age grouping (Figure A2b).

Most of the compositional aspects in the dataset are unsurprising. For instance, the highly educated group is drawn disproportionately from Greater London, South East England and Scotland. Its members are more likely to be employed, and less likely to be unemployed or to be long-term sick or disabled (across the full age range, and on both sides of the age split). They are also less likely to rent their dwelling. Among those aged 45+, the highly educated are less likely to be retired and they enjoy a marked health advantage (present, to a lesser extent, in the younger age range too). Perhaps less obvious is the fact that the highly educated under 45s have a lower average household size than the low or medium educated; but, among those aged 45+, the highly educated have the highest average household size.

Our first estimation results are in Table 2a, containing estimates of LS fixed effects regressions across all education levels – initially across the entire age range, and then for younger (<45) and older (45+) subgroups. Controls for high education are included (among the long list of controls), with an interaction to allow for a differential impact of high education on LS from Wave 14 onwards (in line with Figure 2a). We report only coefficients of the various income variables, plus those for the high education * Wave 14+ interaction. A positive interaction effect is indeed evident for Waves 14-23, but the overall effect of being highly educated across those waves is significant at the 5% level only for the 45+ age range¹⁴. Own income and its upward changes have strong positive effects across the age range, and for the under 45s taken alone. Meanwhile, comparison income has the positive, signalling effect for them that we found previously for the under 45s¹⁵; and only has the usual negative effect for those aged 45+, or for the whole sample across the entire age range. We also tested the alternative of a traditional polynomial age specification – and again found results quite similar to FitzRoy et al. (2014).

Although the alternative of pooled cross-section estimation is problematic for such a sample, we have included Table A2a in the appendix, for additional context. This shows similar comparison income results to those found previously in Table 8 of FitzRoy et al. (2014) – with a significant negative estimate for the full age range, and also for the 45+ sample. Estimates for own household income are also broadly in line with that earlier work¹⁶. Moreover, unreported regressions across the whole age range, with comparison income interacted with the age grouping control categories and own income interacted with an ‘aged 45+’ dummy, generated chiefly similar results to those in Table 24 of FitzRoy et al. (2014), both for fixed effects and for pooled OLS.

¹⁴ Nikolaev and Rusakov (2016) find a positive effect of education on LS that increases with age in Australian panel data.

¹⁵ FitzRoy et al. (2014).

¹⁶ However, that earlier work did not have additional regressors for upward and downward changes in own income.

In Table 2b, we report the same specification for the highly educated, with the really remarkable result that none of the standard income variables is significant for either age group (or across the full age range). The increase in LS for both age groups must be due to other factors, beyond a minority of the controls that we have already identified (which themselves have significant attached estimates): although sampling variation may be a component of the explanation (especially given that this education grouping contains fewer observations), calculation of the standard errors of the wave-specific LS arithmetic means indicates a statistically significant increase in LS between BHPS Wave 6 and BHPS Wave 18 across the highly educated, while the number of highly educated individuals nearly doubled. The impact of the Great Recession did seem to push down LS somewhat across Waves 20-22, albeit with a bounce-back in Wave 23. The pooled cross-section results for this group (Table A2b) do not appear to offer solutions to this puzzle: instead, alongside some standard positive effects for own household income level, some additional queries are raised – by the significant negative estimate for comparison income among the under 45s, and also the positive estimates for the magnitude of negative changes in own income.

For medium and low education, the effect of comparison income on LS is almost fully consistent with FitzRoy et al. (2014) – although now not statistically significant (though still negative) across the whole age range. However, own income and upward changes are only positive and significant for those aged under 45. We find no explanation for the decline in LS in this sample, in spite of their rising incomes up to the recession, which suggests that the offsetting negative externalities of economic growth or associated social change such as increasing prevalence of non-standard and precarious employment may be even more important than hitherto suspected¹⁷. Corresponding pooled cross-section results (Table A2c) also appear similar to their counterparts for the full sample across the whole education range.

¹⁷ Unfortunately, such trends are not picked up by means of the standard labour market controls included within our regression specifications.

Thus in one sense we disagree with Easterlin (2013) by finding rising household incomes *and* LS for the high education group up to the recession; but we are consistent with his Paradox for the less (low/medium) educated – since LS *declined* over this period in spite of faster rising income. Our fixed effects estimation highlights a major puzzle – the complete lack of significance of any of the income variables in explaining rising LS for the high education sample. With the expansion of higher education reaching more families without any prior tradition, it might be that beneficiaries are simply enjoying their new-found status independently of earnings, though again surprisingly, the high education dummy only affected the 45+ group (although this effect is only statistically significant at the 5% level for BHPS Waves 14 and beyond – since about 2004), who represent the traditional elite. Exploring these factors remains an important topic for future research.

4. *Conclusions*

Our results contradict standard findings from growth and happiness economics, but declining LS for the *older* least educated, in spite of growing real income until about 2010, is certainly consistent with the support of this group for populist movements in several countries, including Brexit in the UK. However, the obvious correlation between rising income and LS for the highly educated up to the crash leaves the insignificance of income variables in fixed effects regressions for this group all the more surprising, and to the best of our knowledge, unprecedented in happiness economics. The older high educated have the lowest LS for most of the period, right up to the recession, in spite of having the highest incomes and presumably the best jobs in the age group, and in contradiction to standard findings for other countries. We are left with major puzzles and an obvious need for more research in this area.

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Figures and Tables

Figure 1: Life Satisfaction, BHPS/USoc, Waves 6-10 & 12-23.

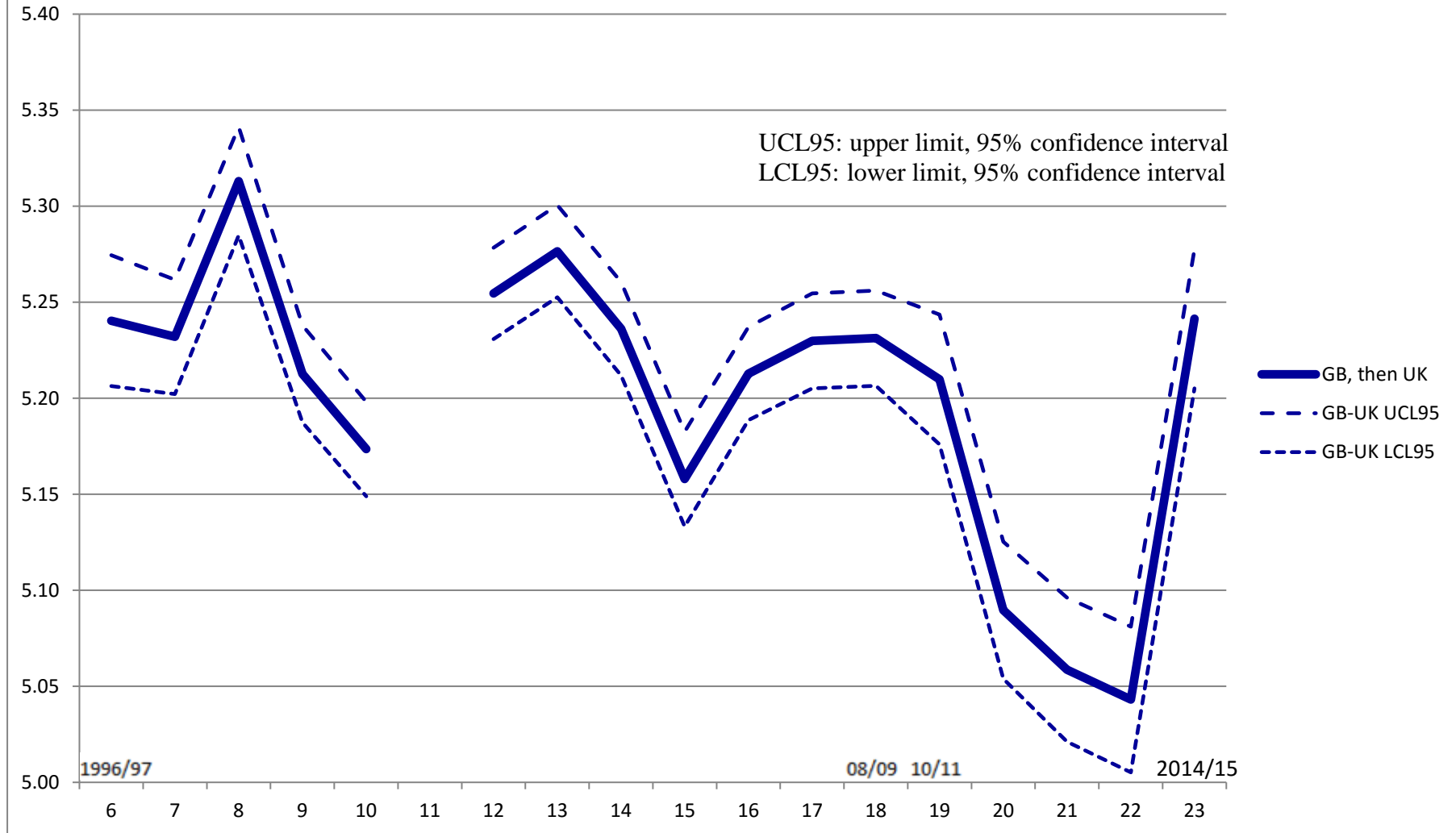


Figure 2a: Life Satisfaction by education, BHPS & USoc, Waves 6-10 & 12-23.

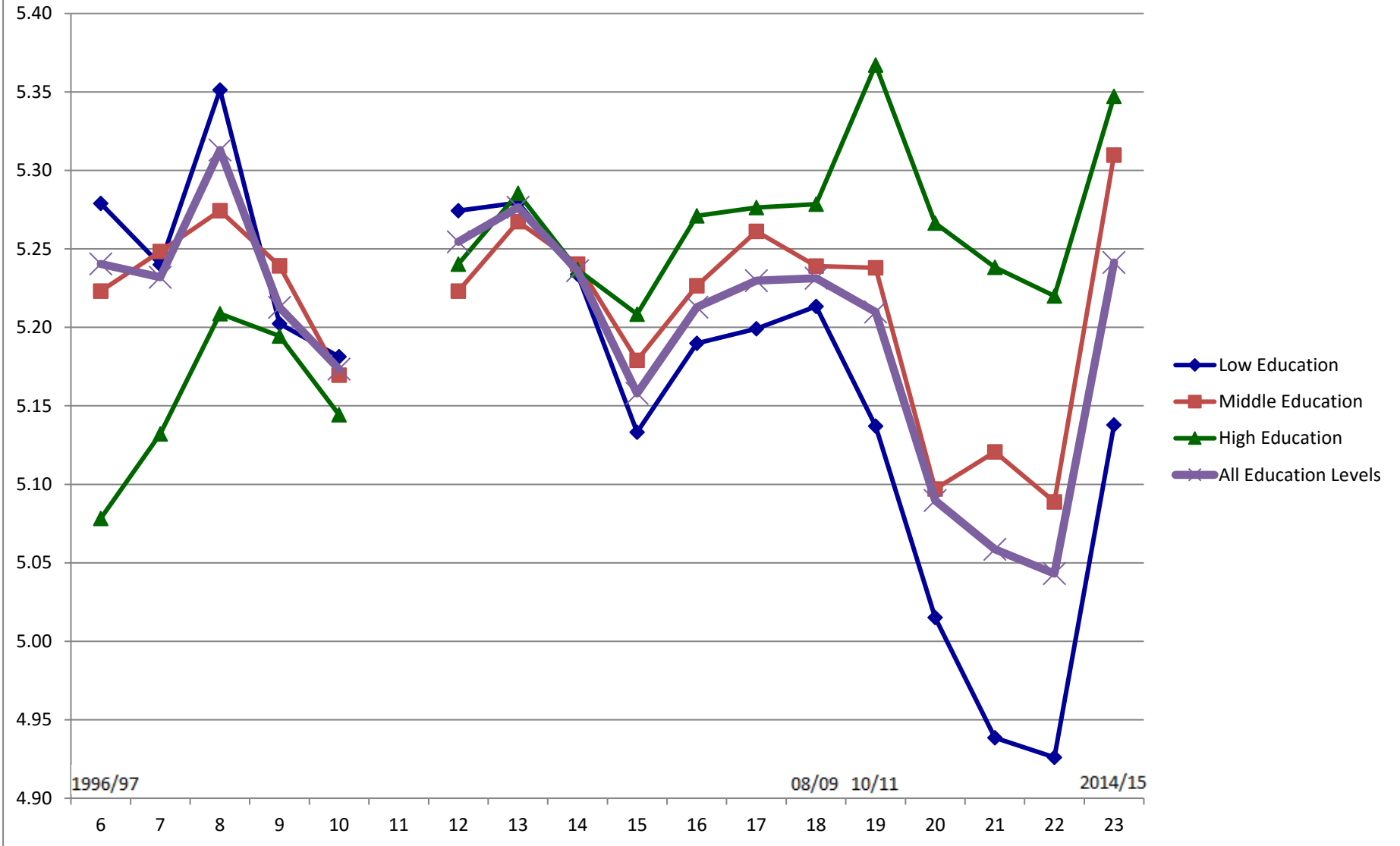


Figure 2b: Life Satisfaction by education, BHPS & USoc, Aged <45, Waves 6-10 & 12-23.

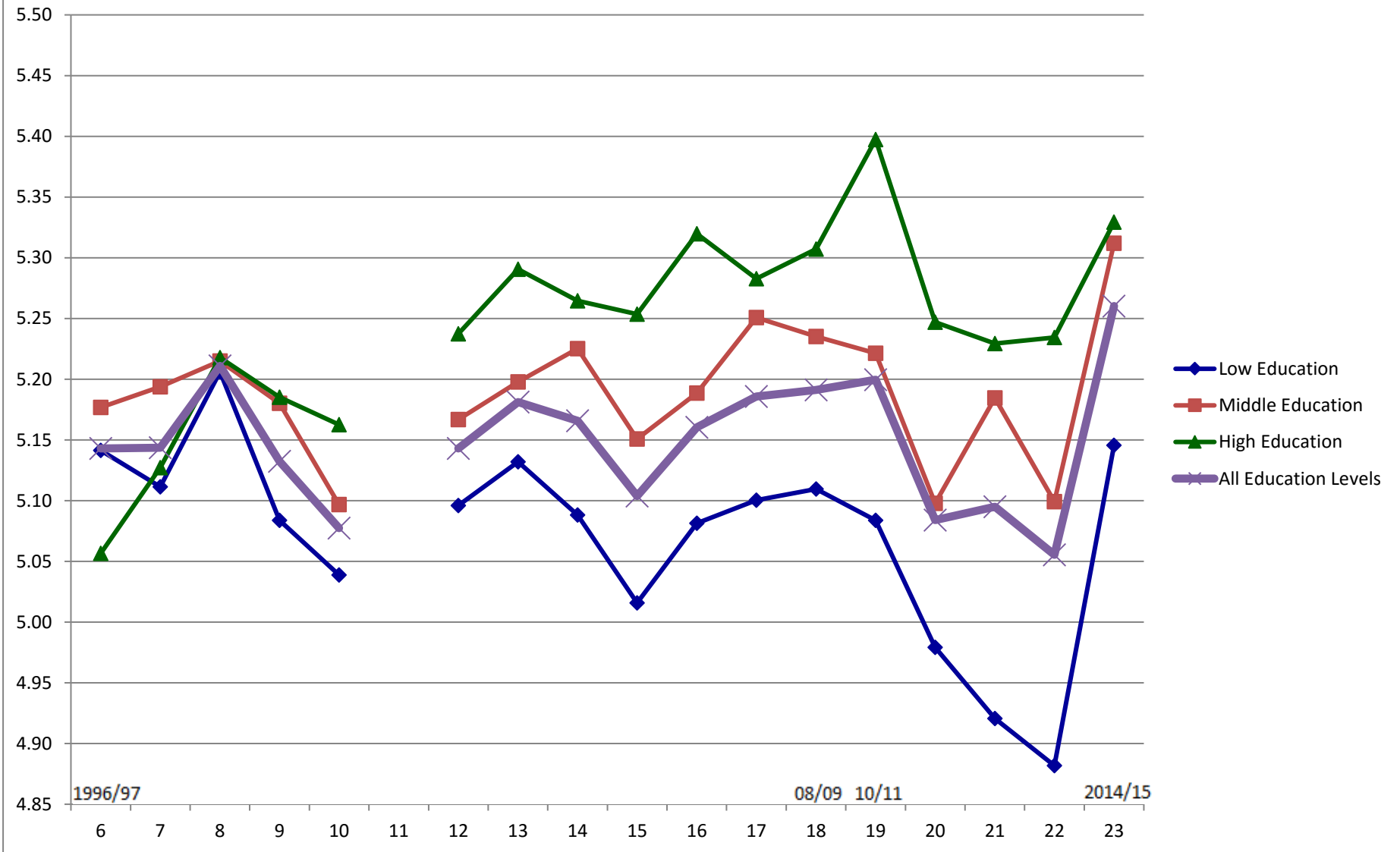


Figure 2c: Life Satisfaction by education, BHPS & USoc, Aged 45+, Waves 6-10 & 12-23.

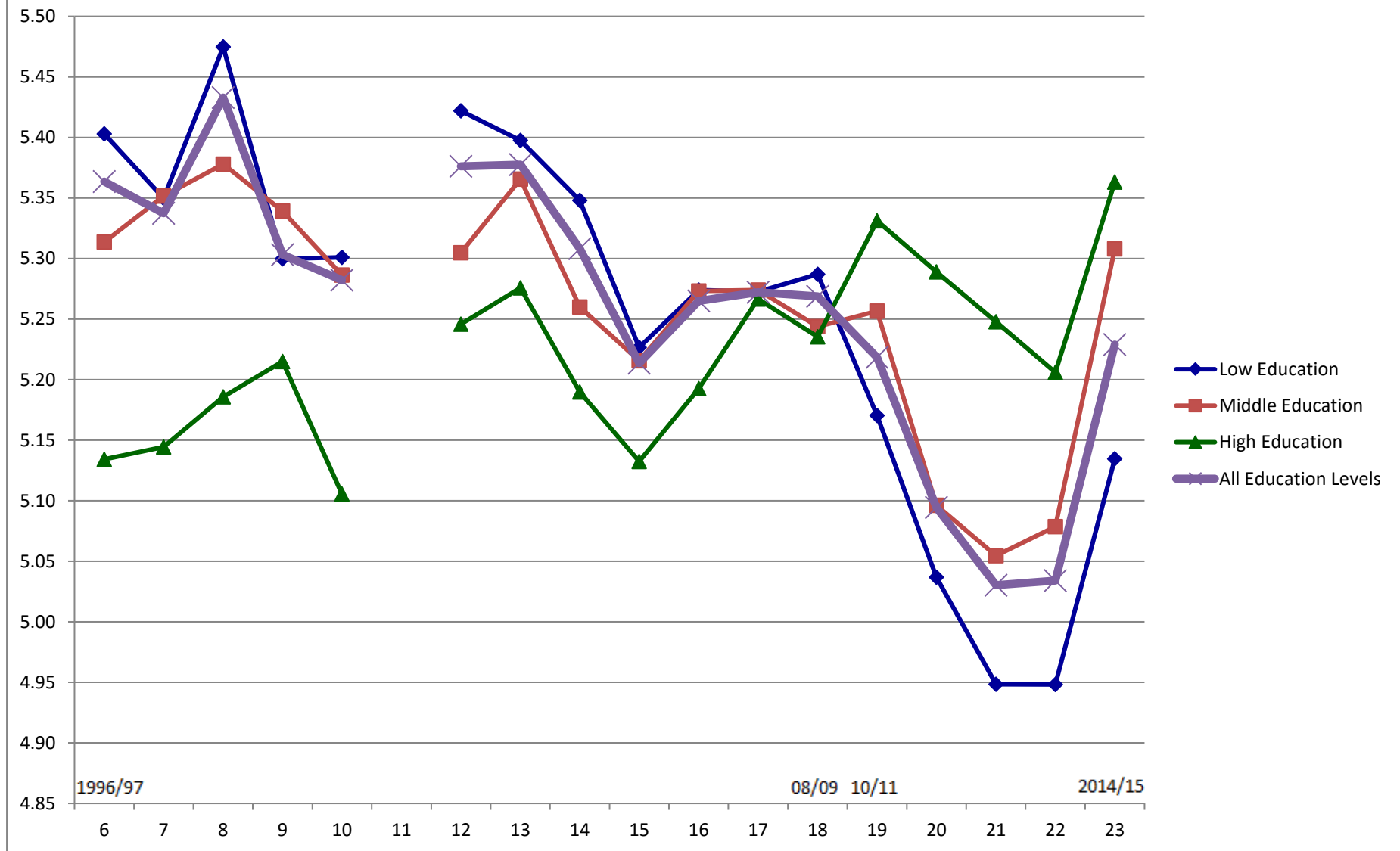


Figure 2d: Education categories, BHPS & USoc, Waves 6-10 & 12-23.

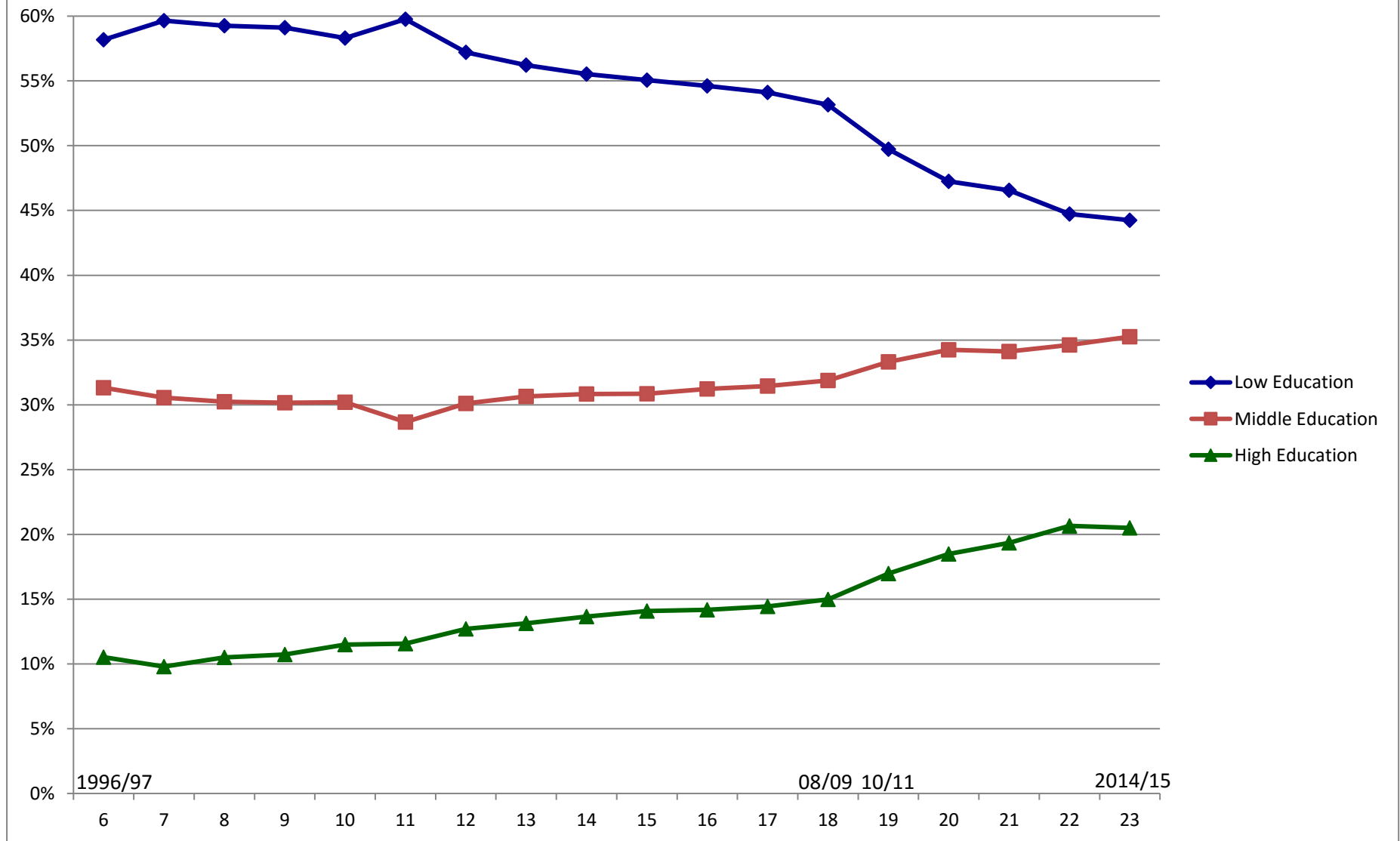


Figure 3a: Log real income, BHPS/USoc, Waves 6-10 & 12-23.

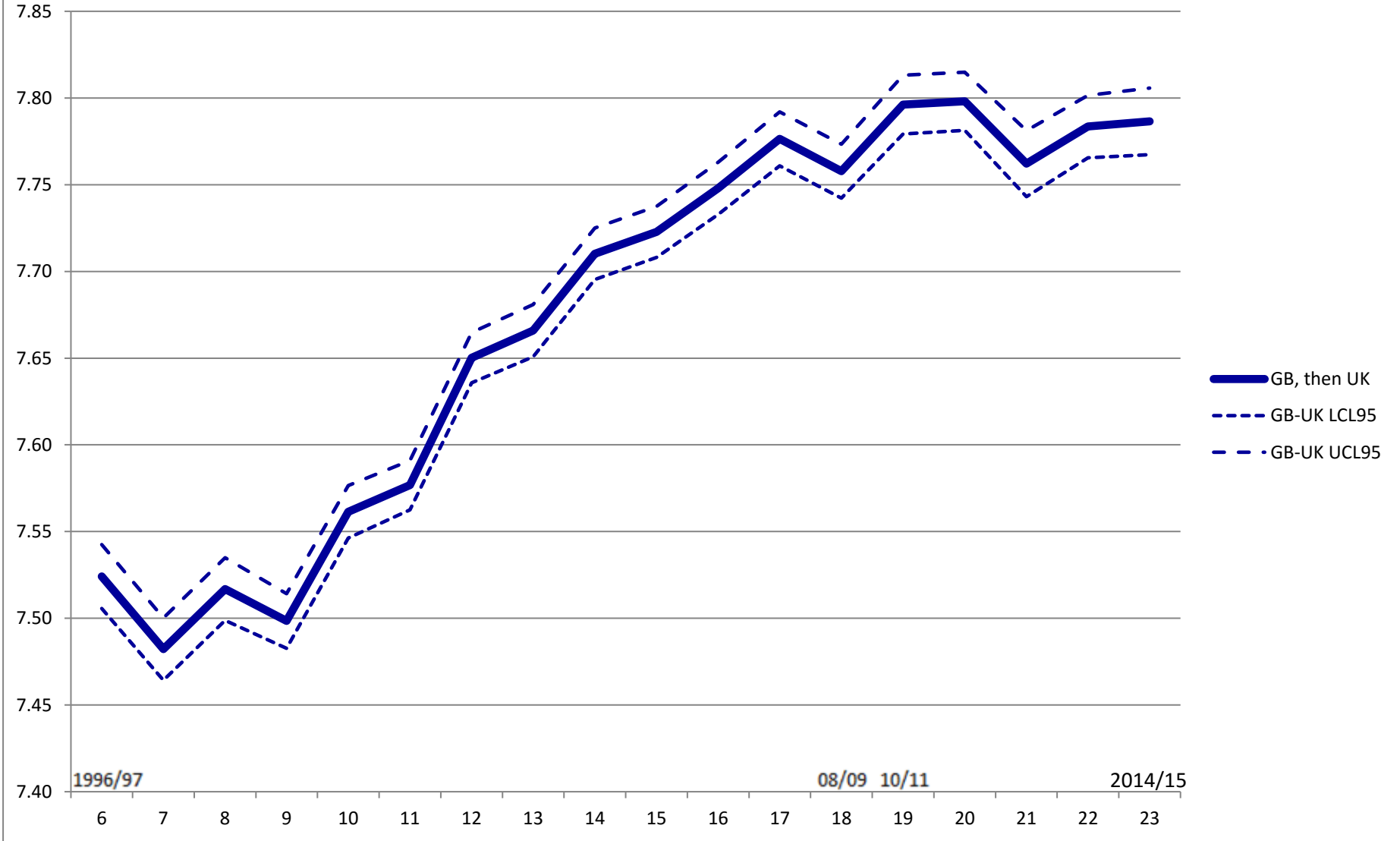


Figure 3b: Normalised real income by education, BHPS & USoc, Waves 6-10 & 12-23.

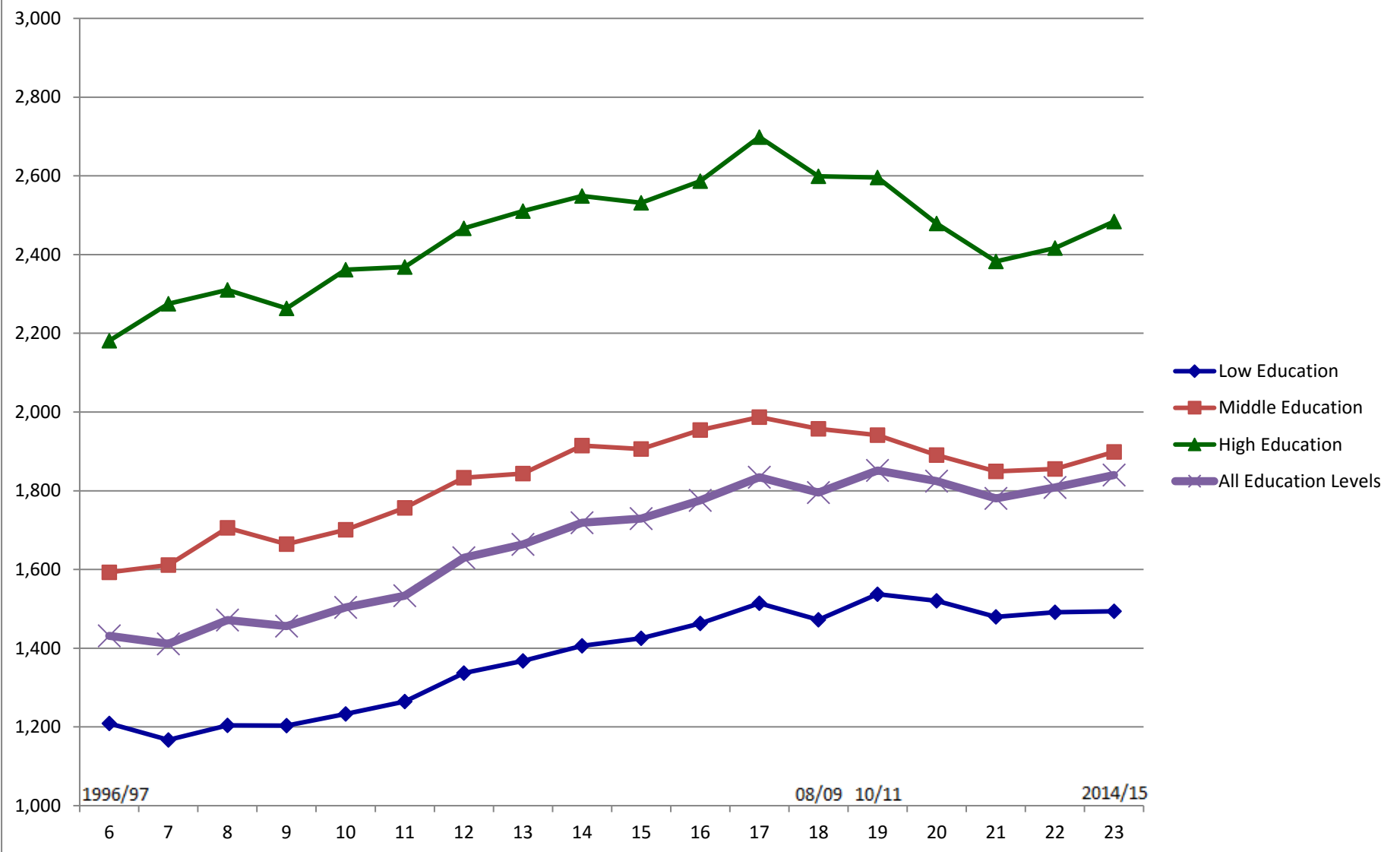


Figure 3c: Normalised real income by education, BHPS & USoc, Aged <45, Waves 6-10 & 12-23.

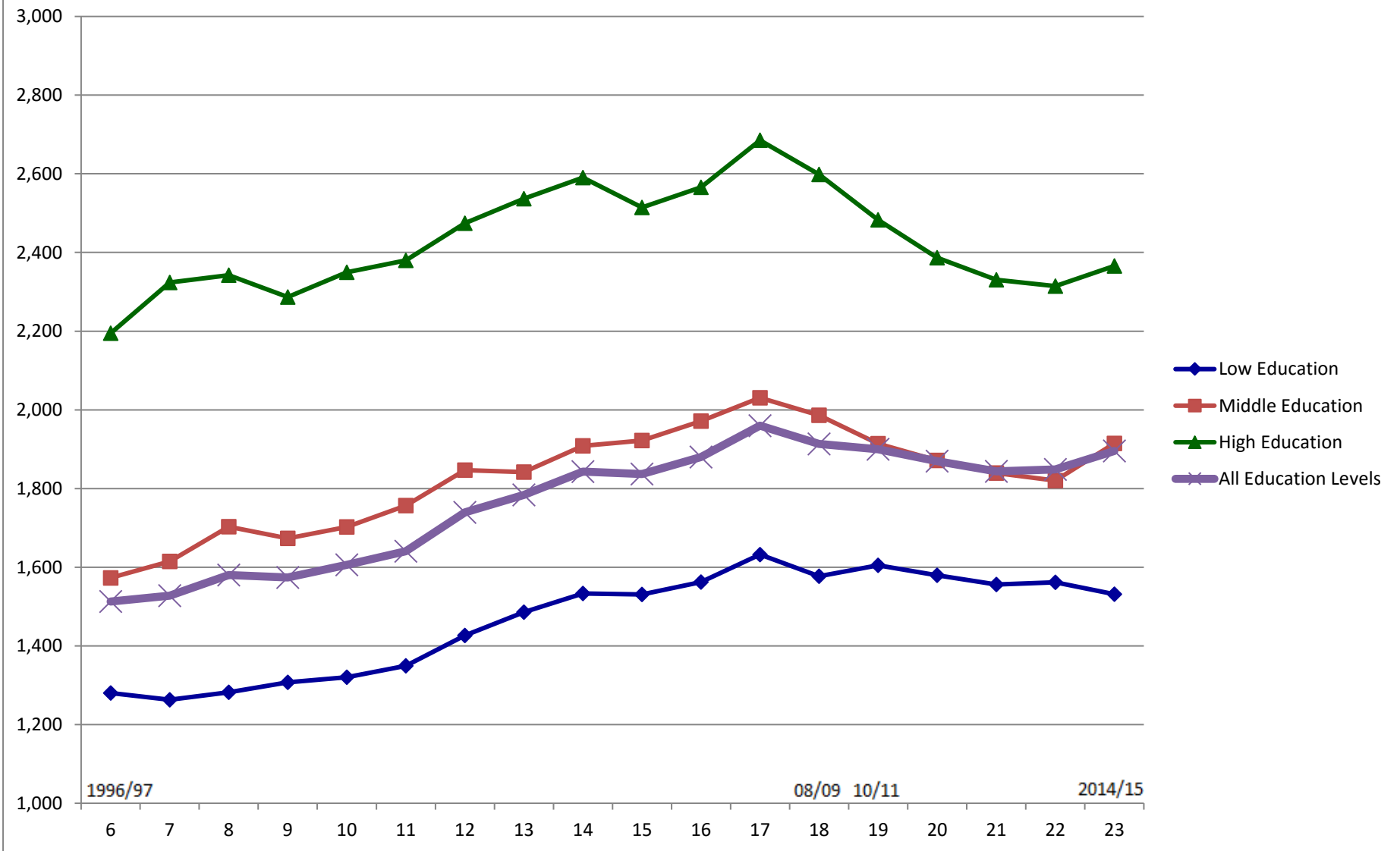


Figure 3d: Normalised real income by education, BHPS & USoc, Aged 45+, Waves 6-10 & 12-23.

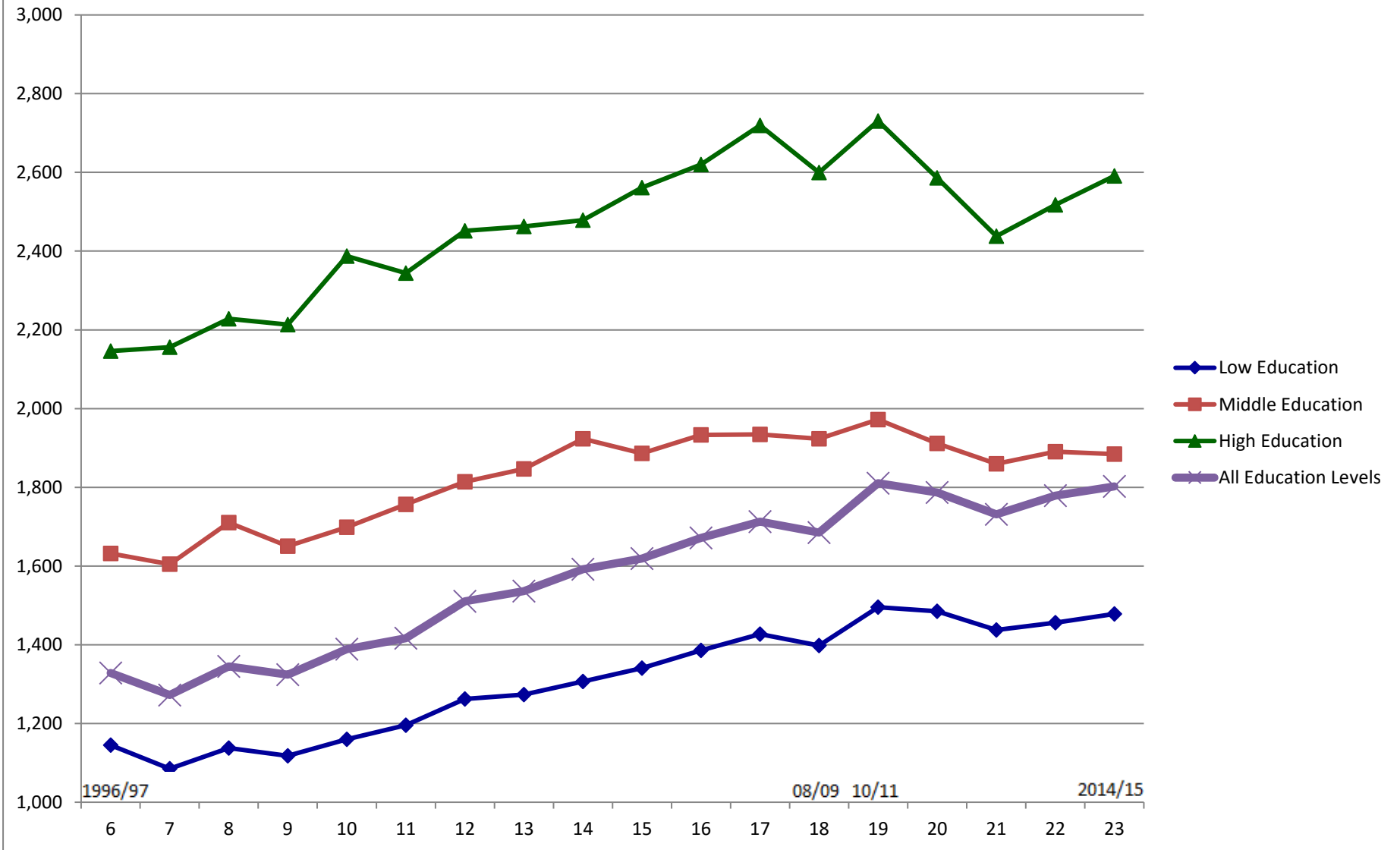


Table 1a	(1)	(2)	(3)	(4)
UK, BHPS, Waves 6-10, 12-23	All	Low Education	Medium Education	High Education
<i>Summary Statistics</i>				
Life satisfaction (mean)	5.23	5.19	5.22	5.24
Life satisfaction (SD)	1.34	1.43	1.26	1.17
Age (mean)	46.16	49.19	42.79	41.99
Age (SD)	18.45	19.50	17.35	14.08
Household income (mean)	2784.40	2291.09	3076.13	4036.76
Household income (SD)	2124.58	1777.10	2183.75	2645.99
Comparison income (mean)	2750.17	2317.12	3127.07	3578.89
Comparison income (SD)	883.58	712.77	788.97	677.68
Observations	196,828	107,047	62,075	27,706

Table 1b	(1)	(2)	(3)	(4)
UK, BHPS, Waves 6-10, 12-23	Under 45s	Low Education, <45	Medium Education, <45	High Education, <45
<i>Summary Statistics</i>				
Life satisfaction (mean)	5.15	5.08	5.19	5.25
Life satisfaction (SD)	1.27	1.35	1.21	1.14
Age (mean)	30.69	30.30	30.24	32.68
Age (SD)	8.42	8.94	8.32	6.69
Household income (mean)	3123.71	2683.77	3236.43	4082.68
Household income (SD)	2092.59	1785.09	2157.40	2359.95
Comparison income (mean)	3125.57	2778.12	3295.82	3712.08
Comparison income (SD)	619.34	410.08	618.82	487.29
Observations	98,247	45,879	35,492	16,876

Table 1c UK, BHPS, Waves 6-10, 12-23	(1) Aged 45+	(2) Low Education, 45+	(3) Medium Education, 45+	(4) High Education, 45+
<i>Summary Statistics</i>				
Life satisfaction (mean)	5.26	5.27	5.26	5.23
Life satisfaction (SD)	1.41	1.47	1.32	1.22
Age (mean)	61.57	63.35	59.56	56.49
Age (SD)	11.54	11.72	10.89	9.60
Household income (mean)	2446.24	1996.56	2862.11	3965.20
Household income (SD)	2102.20	1713.00	2200.35	2810.08
Comparison income (mean)	2376.05	1971.36	2901.76	3371.35
Comparison income (SD)	946.63	695.71	923.86	856.85
Observations	98,581	61,168	26,583	10,830

Table 2a: Individual Fixed Effects, Across Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.093** (-2.20)	0.152** (2.09)	-0.241*** (-4.21)
Household income	0.038*** (4.13)	0.062*** (4.99)	0.010 (0.76)
Household income upward change	0.023*** (3.12)	0.024** (2.52)	0.018 (1.60)
Household income downward change size	-0.002 (-0.19)	0.010 (0.73)	-0.013 (-0.86)
Highly qualified * Wave 14+ (interaction)	0.116*** (6.18)	0.109*** (4.60)	0.125*** (3.90)
Observations	178,166	85,273	92,893
Individuals	23,742	14,742	12,637

Dependent variable: Life-Satisfaction. Controls for marital status (including cohabiting), number of children, health status, education, labour market status, time in panel, year of last interview, household size, age groupings, housing ownership, wave number and regions are included. Standard errors clustered at the individual level, robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2b: Individual Fixed Effects, High Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.122 (-0.99)	-0.023 (-0.11)	-0.069 (-0.39)
Household income	0.015 (0.64)	0.042 (1.50)	-0.020 (-0.54)
Household income upward change	0.018 (1.13)	0.011 (0.59)	0.027 (1.00)
Household income downward change size	0.010 (0.38)	0.048 (1.47)	-0.032 (-0.82)
Highly qualified * Wave 14+ (interaction)	0.082 (0.51)	-0.160 (-0.73)	0.395 (1.39)
Observations	25,468	15,188	10,280
Individuals	3,426	2,685	1,419

Dependent variable: Life-Satisfaction. Controls as in Table 2a, except for education. *** p<0.01, ** p<0.05, * p<0.1

Table 2c: Individual Fixed Effects, Medium/Low Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.050 (-1.07)	0.202** (2.47)	-0.215*** (-3.51)
Household income	0.038*** (3.79)	0.059*** (4.14)	0.016 (1.11)
Household income upward change	0.024*** (2.85)	0.030** (2.58)	0.014 (1.17)
Household income downward change size	-0.008 (-1.00)	-0.002 (-0.10)	-0.011 (-0.71)
Observations	152,698	70,085	82,613
Individuals	21,386	13,014	11,302

Dependent variable: Life-Satisfaction. Controls as in Table 2a, except for education (medium dummy only). *** p<0.01, ** p<0.05, * p<0.1

Appendix

Figure A1: Regional Gross Value Added per Capita, deflated by CPI, 1997-2015.

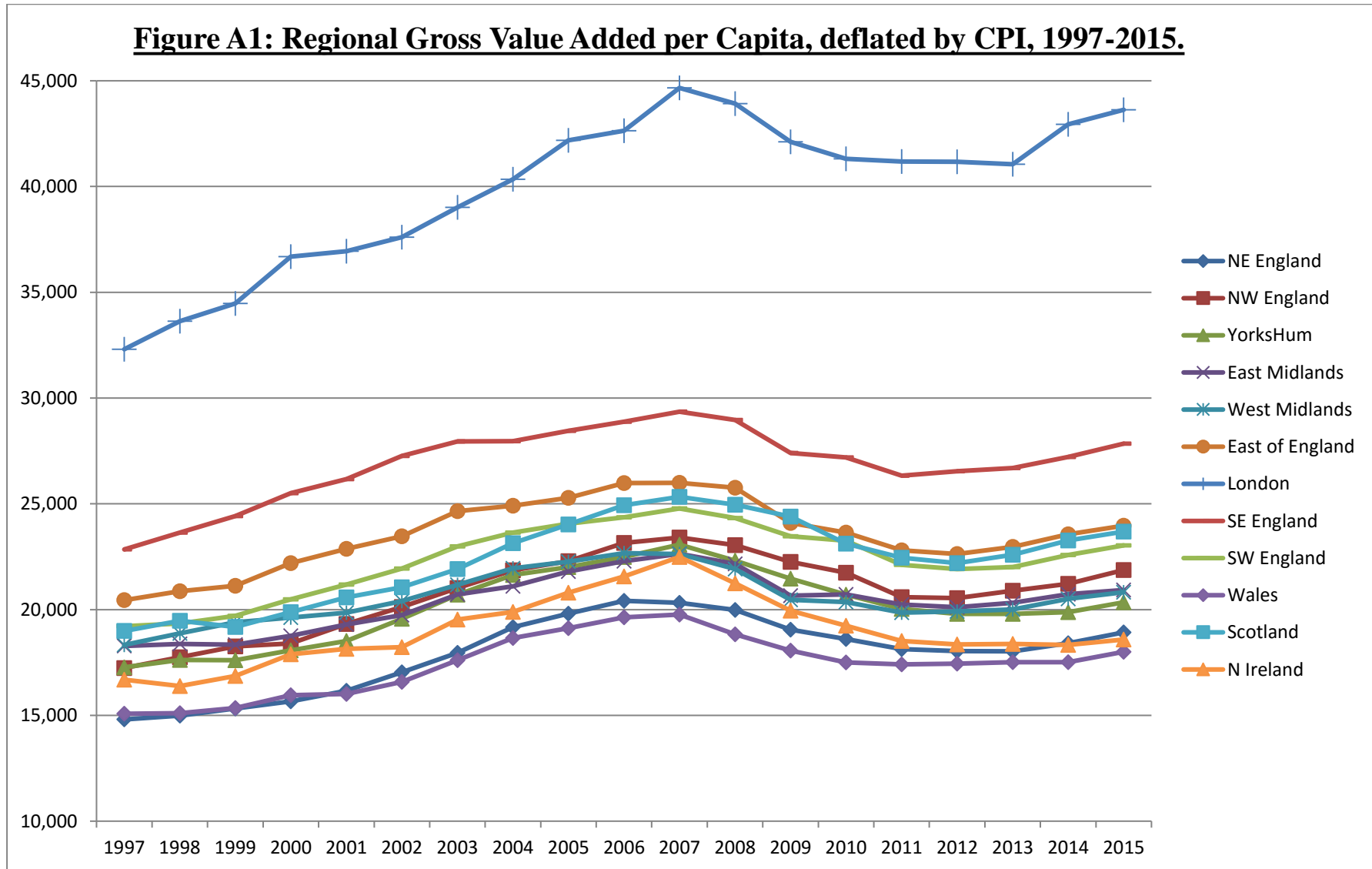


Figure A2a: Education categories, BHPS & USoc, Aged <45, Waves 6-10 & 12-23.

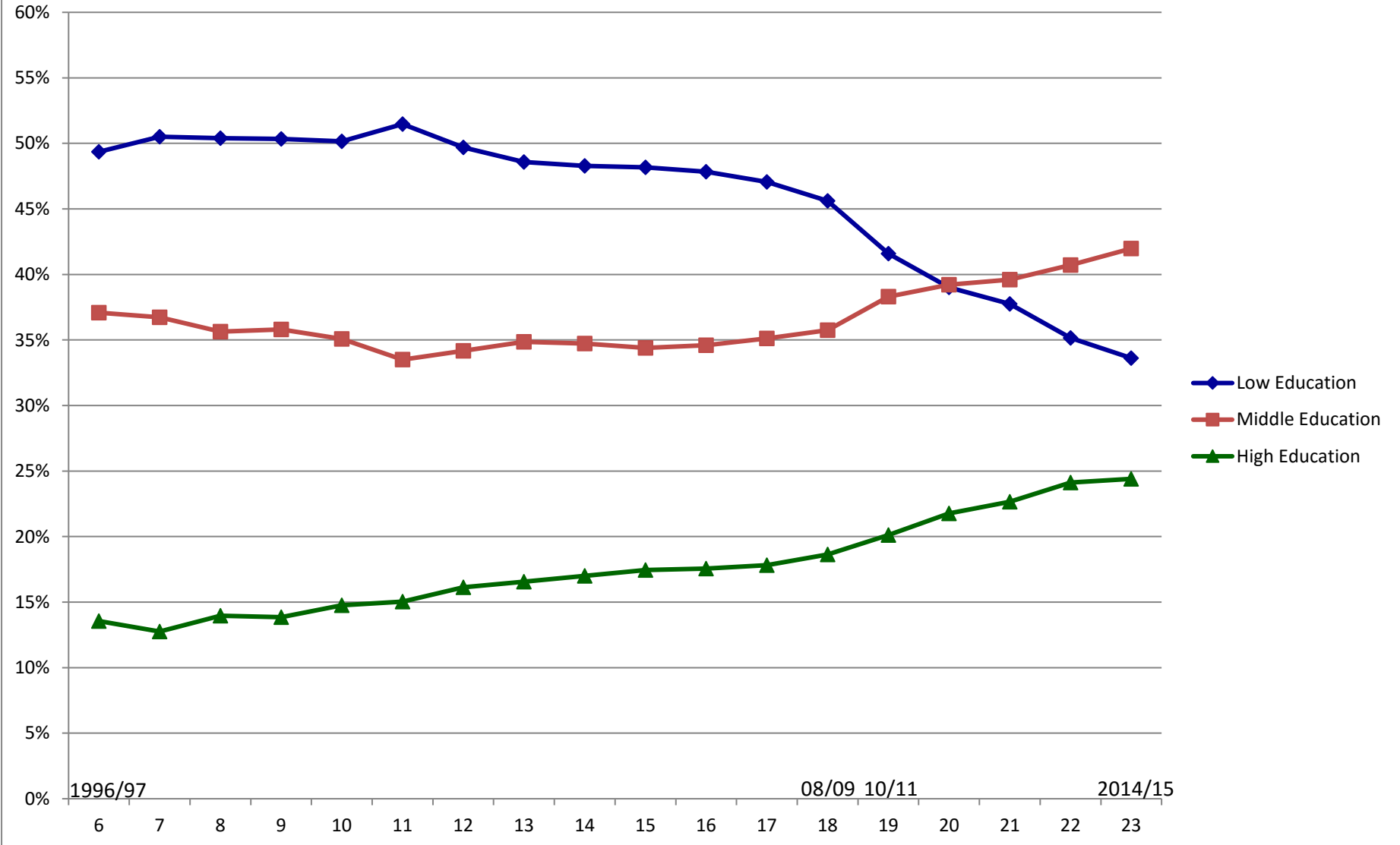
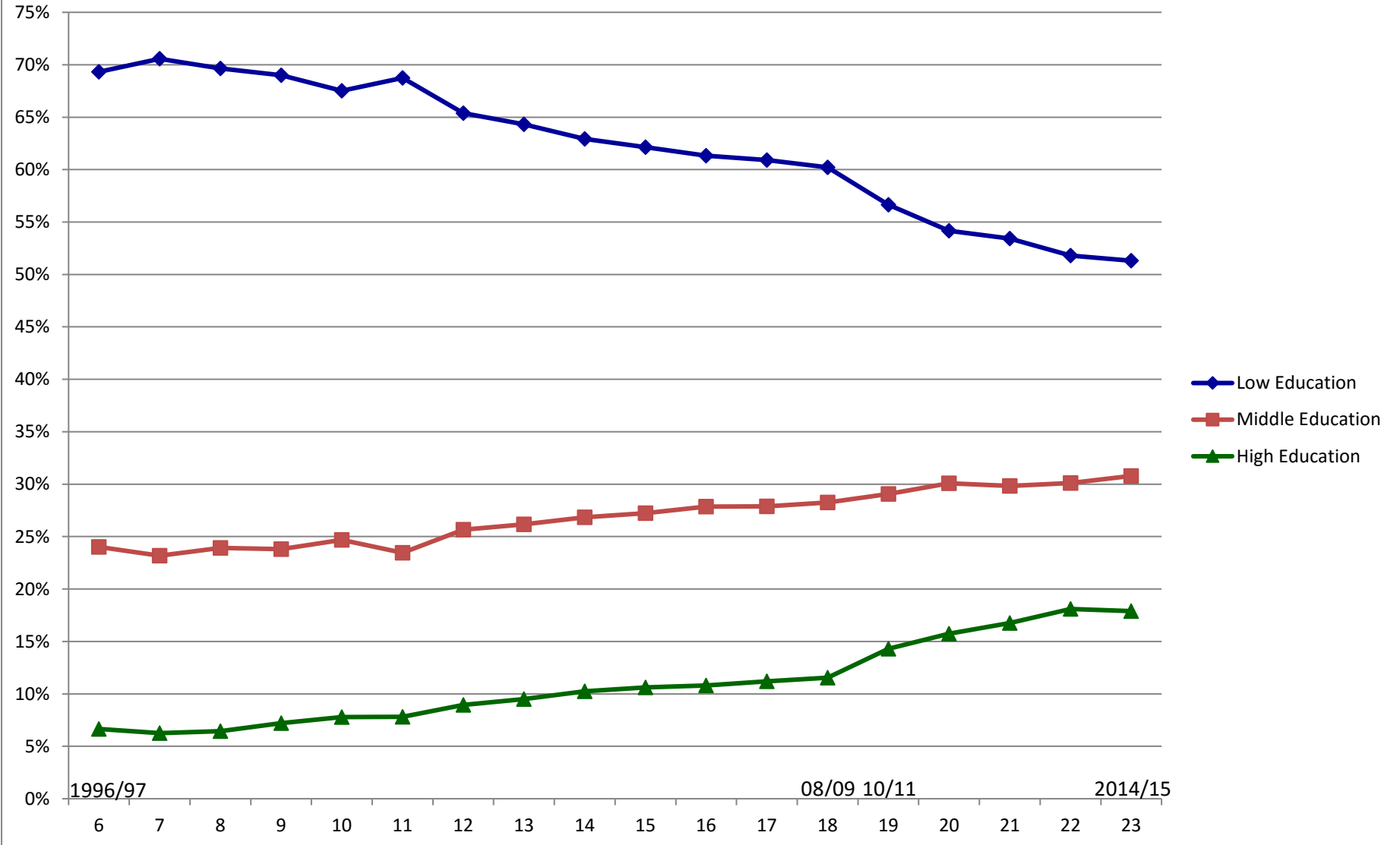


Figure A2b: Education categories, BHPS & USoc, Aged 45+, Waves 6-10 & 12-23.



Appendix table of sample means (not intended for publication)

Table A1a	(1)	(2)	(3)	(4)
UK, BHPS, Waves 6-10, 12-23	All	Low Education	Medium Ed.	High Ed.
<i>Sample Means</i>				
Life satisfaction	5.207	5.191	5.217	5.243
Female	0.547	0.572	0.518	0.516
Age	46.157	49.187	42.793	41.985
Age squared (divided by 50)	49.419	55.990	42.641	39.220
Last wave	0.125	0.117	0.134	0.138
Run of waves	8.571	8.293	8.640	9.491
Run of waves squared	105.465	100.357	106.406	123.092
Household size	2.854	2.814	2.933	2.830
Employee	0.507	0.420	0.568	0.707
Self-employed	0.069	0.060	0.076	0.088
Retired	0.214	0.276	0.157	0.102
Family care or maternity	0.070	0.090	0.049	0.041
Full-time study	0.057	0.046	0.093	0.023
Long-term sick or disabled	0.041	0.058	0.026	0.010
Other economic activity	0.006	0.006	0.006	0.006
Unemployed	0.035	0.044	0.025	0.023
Invalidity benefit	0.012	0.018	0.007	0.004
Married	0.533	0.525	0.531	0.572
Cohabiting	0.115	0.103	0.124	0.139
Widowed	0.070	0.101	0.039	0.020
Divorced	0.057	0.063	0.053	0.044
Health positive	0.639	0.579	0.691	0.754
Health negative	0.116	0.144	0.092	0.059
Low educated	0.544	1.000	0.000	0.000
Medium educated	0.315	0.000	1.000	0.000
Highly educated	0.141	0.000	0.000	1.000
One child	0.122	0.109	0.133	0.144
Two children	0.116	0.102	0.123	0.155
Three or more children	0.047	0.048	0.044	0.052
Own house outright	0.289	0.307	0.277	0.248
Mortgaged house	0.453	0.375	0.524	0.596
Regional unemployment rate	6.029	5.978	6.056	6.168
Regional house price	144542.6	138715.9	146973.2	161609.6
Greater London	0.053	0.044	0.051	0.093
South East	0.094	0.084	0.103	0.111
South West	0.062	0.065	0.062	0.053
East Anglia	0.063	0.060	0.067	0.063
East Midlands	0.059	0.063	0.055	0.048
West Midlands	0.057	0.058	0.059	0.050
Yorkshire and the Humber	0.063	0.066	0.061	0.052
North East	0.030	0.032	0.027	0.026
North West	0.081	0.082	0.081	0.080
Wales	0.158	0.169	0.153	0.124
Scotland	0.171	0.153	0.191	0.194
Northern Ireland	0.111	0.124	0.089	0.106
Observations	196,828	107,047	62,075	27,706

Table A2a: Pooled Cross-Section, Across Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.095*** (-3.75)	0.012 (0.30)	-0.079** (-2.31)
Household income	0.104*** (14.98)	0.158*** (16.57)	0.063*** (6.57)
Household income upward change	0.001 (0.14)	0.011 (1.07)	-0.004 (-0.34)
Household income downward change size	0.040*** (4.05)	0.096*** (7.24)	0.010 (0.66)
Highly qualified * Wave 14+ (interaction)	0.142*** (8.57)	0.109*** (5.31)	0.188*** (7.03)
Observations	178,166	85,273	92,893

Dependent variable: Life-Satisfaction. Controls as in Table 2a. *** p<0.01, ** p<0.05, * p<0.1

Table A2b: Pooled Cross-Section, High Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.044 (-0.48)	-0.501*** (-2.89)	0.033 (0.29)
Household income	0.159*** (9.69)	0.164*** (7.30)	0.149*** (6.16)
Household income upward change	0.009 (0.56)	0.012 (0.67)	0.003 (0.10)
Household income downward change size	0.114*** (4.77)	0.153*** (4.84)	0.072** (2.01)
Highly qualified * Wave 14+ (interaction)	0.386*** (3.04)	0.267* (1.65)	0.582*** (2.79)
Observations	25,468	15,188	10,280

Dependent variable: Life-Satisfaction. Controls as in Table 2a, except for education. *** p<0.01, ** p<0.05, * p<0.1

Table A2c: Pooled Cross-Section, Medium/Low Education – UK, BHPS, Waves 6-10, 12-23

Regressor	All	<45	45+
Comparison income	-0.071*** (-2.66)	0.033 (0.83)	-0.051 (-1.40)
Household income	0.096*** (12.58)	0.155*** (14.68)	0.053*** (5.06)
Household income upward change	-0.00005 (-0.01)	0.012 (0.97)	-0.003 (-0.22)
Household income downward change size	0.030*** (2.74)	0.084*** (5.84)	0.004 (0.28)
Observations	152,698	70,085	82,613

Dependent variable: Life-Satisfaction. Controls as in Table 2a, except for education (medium dummy only). *** p<0.01, ** p<0.05, * p<0.1