

Height, Income and Voting

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Abstract

At the core of political economy theory is the claim that income drives political preferences, yet empirical estimates of income's effect on political behavior range widely, even using the same data. Drawing from a tradition in economic history and anthropology, we propose the use of height as a proxy for economic well-being. Using data from the British Household Panel Study, we find that taller individuals are more likely to support the Conservative party, support conservative policies, turn out to vote, and vote conservative when they do; a one-inch increase in height increases support for Conservatives by 0.6%. As an extension, we also employ height as an instrumental variable for income, and find that each additional thousand pounds of annual income translates to a two to three percentage point increase in probability of supporting the Conservatives, and that income also drives political beliefs and voting in the same direction.

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At the core of modern political economy theory is the idea that income drives political preferences. Since Downs' (1957) seminal contribution, the workhorse models of redistributive politics (Romer, 1975; Roberts, 1977; Meltzer and Richard, 1981) characterize individuals by income to generate key predictions; other factors such as ideology (Lindbeck and Weibull, 1987; Dixit and Londregan, 1996) or multi-dimensional preferences are then introduced to complicate this basic framework. Indeed, the starting point for micro-founded models of all manner of political economy phenomena—including growth, redistribution, and transitions to democracy—is to write a utility function in which agents are differentiated by income. Other literatures, such as class-based interpretations of citizen activism (Manza and Brooks, 1999) and welfare state expansion (Korpi, 1983), also explicitly or implicitly assume that income plays a key role in driving political behavior.

Surprisingly, despite its centrality to foundational research agendas in economics, political science, and sociology, we lack clear evidence of income's effect on political preferences. The range of empirical findings ranges widely; some studies report that income strongly predicts conservative political preferences, while others find small or even negative effects. In the American context, several analyses find relatively small differences between the poor and wealthy with respect to public policy preferences and political party supported (Glaeser, Ponzetto and Shapiro, 2005; Ansolabehere, Rodden and Snyder, 2006; Glaeser and Ward, 2006; Soroka and Wlezein, 2008; Ura and Ellis, 2008; Bhatti and Erikson, 2011; Brunner, Ross and Washington, 2013; Rhodes and Schaffner, 2013). Other studies find substantial and increasingly strong income effects, arguing that income predicts Republican partisanship and presidential voting since the 1950s (Brooks and Brady, 1999; McCarty, Poole and Rosenthal, 2003; Stonecash, 2006; Bartels, 2006; Gelman et al., 2007, 2008; Rehm, 2011), and that support for increased spending on redistributive and welfare state policies declines markedly with income (Alesina and La Ferrara, 2005; Gilens, 2009; Page and Hennessy, 2010; Gelman, Lee and Ghitza, 2010; Alesina and Giuliano, 2011).

Outside the United States, the evidence is similarly mixed. Single country studies often find that voters' evaluations of their own personal economic situation are a relatively unimportant determinant of vote choice; cross-country analyses also report weak or even negative effects of income

on propensity to vote for the right (De La O and Rodden, 2008). In Norris' (2004) analysis of the sources of voting behavior in 37 countries, for example, income influences voting in the predicted direction (lower income individuals supporting left parties) in only one-third of the sample. De La O and Rodden (2008) conclude that the empirical basis for formal political economy models is weak in that income poorly predicts voting behavior and that any effect is driven by the top income quartile. And yet, a range of other comparative studies of voting behavior and the rich-poor voting gap suggest that wealthier voters tend to exhibit more conservative preferences and voting patterns (Nannestad and Paldam, 1997; Lind, 2007; Powdthavee and Oswald, 2014).

One factor that may be driving these different estimates is measurement error of income. In cross-sectional analysis, classical measurement error will attenuate estimates toward zero. More problematic is the possibility that the rich may disproportionately underreport income on a survey, yielding underestimates of income's effect on political behavior. Income fluctuations offer another potential explanation for the mixed findings in the literature. If political preferences are driven by permanent income, as predicted by many political economy models, we will tend to underestimate the causal relationship due to the volatility reflected in annual measures of income.

More broadly, the wide disparity of estimates suggest that income's effect on political preferences is highly subject to sensitivity to model specification. This is most clearly seen in studies that report divergent results even when using the same data. Using the same British data analyzed in this paper, Brynin and Sanders (1997) and Sanders and Brynin (1999) find small and statistically insignificant effects of income on voting, while Oswald and Powdthavee (2010; 2014) report that high income people lean rightward. This suggests that merely adding additional control variables to regression models will not alleviate problems of inference.

Spurred by such disparate findings, this paper draws from the toolkit of anthropologists and economists to offer a novel measure to capture the effect of economic well-being on political behavior: height. Scholars outside of political science have long used height to assess affluence among historical populations in the absence of detailed information on income and wealth. The relevance of height as a proxy for income has, moreover, been vindicated by modern social surveys,

which collect both anthropometric measures and information on income. A wide range of studies have documented a robust relationship between height and income across at both the aggregate and individual-level across a wide range of settings. At the national level, Steckel (1983; 2008) finds that average height moves with a country's level of economic development. Numerous micro-level studies also find a sizeable height premium in the labor market. For example, Case and Paxson (2008) find that for both men and women, an additional inch of height is associated with a one to two percent increase in earnings. Similarly, Persico, Postlewaite and Silverman (2004) find that among white males in Britain and the US, the tallest quarter of the population has a median wage that is more than 13 percent higher than that of the shortest quarter. Thus, although there exists a healthy debate among scholars as to the precise channels through which height affects income,¹ the general finding of a direct relationship remains robust.

If our goal is to capture a more general sense of economic well-being, height arguably enjoys many advantages relative to income. First, height is increasingly collected in modern surveys, and self-reported height is arguably less prone to measurement error than income. Moreover, it is substantially easier to verify a respondent's height in the course of administering a survey. Finally, unlike income, height is not subject to annual fluctuations. It thus proxies permanent income, which drives preferences in canonical political economy models.² For these reasons, Mankiw and Weinzierl (2010) argue, somewhat tongue in cheek, that taller individuals should be taxed on utilitarian grounds, and produce example tax tables calibrated to the height earnings premium.

In focusing on the relationship between economic well-being and political preferences, our paper complements but is distinct from two related strands of the literature on economic voting. First, we are not principally concerned with the dynamic interplay between income fluctuations and voting behavior—what is typically termed pocketbook voting. Second, we do not focus on

¹Scholars have identified cognitive ability (Case and Paxson, 2008), self-esteem (Persico, Postlewaite and Silverman, 2004), discrimination (Loh, 1993; Magnusson, Rasmussen and Gyllensten, 2006; Hübler, 2009; Cinnirella and Winter, 2009), and physical strength (Steckel, 1995; Strauss and Thomas, 1998) as potential mechanisms linking height to income.

²Consider, for example, the Meltzer-Richards model. The key idea behind this and similar models is to consider the political behavior of classes (rich, middle, and poor) as defined by income. Class in these models is not driven by transitory income shocks; it is instead a fairly stable phenomenon.

the extent to which individuals punish or reward incumbents based on macroeconomic conditions. Instead, our use of height is aimed at generating a measure of permanent economic well-being, motivated by the core models of political economy which posit income as central to the choice of tax rate and the optimal size of government.

1 Data

In order to explore the relationship between height and political outcome measures, we use data from 2006 (wave 16) of the British Household Panel Study (BHPS), a nationally representative sample of the adult population in the United Kingdom. The BHPS contains data from approximately 5000 households and over 12,000 adults, interviewed from 1991 onward in the autumn of each year. This dataset has clear attractions for our purposes. First, it contains self-reported height data, as well as detailed income data. Equally important, the BHPS provides a number of political variables, such as party support, policy preferences and vote choice. Finally, the BHPS also offers a rich set of control variables, including educational attainment, religious affiliation, and ethnicity.

Our central dependent variable is a binary “supports Conservatives,” coded as 1 if the respondent supports the Conservative party. We focus foremost on party support, which we believe offers the most stringent test of the core claims of political economy models, since individuals often announce greater desire for redistribution than revealed in the actual support for a party which would likely redistribute income away from them (Norton and Ariely, 2011). Another useful feature of BHPS is that it contains multiple questions on policy preferences, enabling the investigation of various dimensions of political behavior. We consider a series of policy preferences that probe specific aspects of government intervention in markets. Finally, we examine actual political behavior: voting conditional on turnout.

To operationalize the dependent variable, we use the “Economic Dimension” (dimension 1) from Benoit and Laver’s (2006) Party Policy in Modern Democracies (PPMD) project to order British parties according to their support for redistribution. As Huber and Stanig (2006) note, this measure is useful for positioning parties on the dimension most relevant for testing workhorse

political economy models: the tax-and-transfer scale. In the PPMD data, country experts place parties on a scale ranging from 1 (“promotes raising taxes to increase public services”) to 20 (“promotes cutting public services to cut taxes”). The data support our ordering of the British political landscape into Conservative versus non-Conservative: the Conservative Party receives a score of 15.3, far right of Labour’s 8.1 and the Liberal Democrats’ 5.8; the average of all UK parties is 6.3, with a standard deviation of 1.3. This expert-based ranking, with the Conservatives most far to the right, is well in line with positioning based on party manifestos (Bara and Budge, 2001; Bara, 2006).

Height is measured in inches; both height and income are winsorized at 0.5 percent to deal with implausibly extreme values. Our sample consists of respondents age 18 and above living in England, Scotland, and Wales. We exclude Northern Ireland from the estimation sample due to their very different political environment, although we report all-inclusive specifications in our robustness checks. Summary statistics, presented in the Appendix, indicate that our variables of interest look reasonable. Height, for both men and women, is normally distributed, with men on average being six inches taller than women. Approximately 25 percent of the sample support the Conservative Party; this is the case for both men and women.

2 Height and Political Preferences

The first key result of this paper is that taller people are more likely to support the Conservative Party and to hold conservative political positions. This pattern can be seen in Figure 1, which plots propensity to support Conservative on height, using a multivariate smoother to control for age and gender. We see that support for the Conservative moves steadily with height across the bulk of the distribution; for this group, the relationship is almost linear, moving from a predicted value of around .2 at the 10th percentile of height to .3 at the 90th. Interestingly, support for Conservative flattens and even dips slightly at the top of the height distribution. This drop in Conservative support among extremely tall individuals is consistent with a dip in income among this group,

which we will see below.³

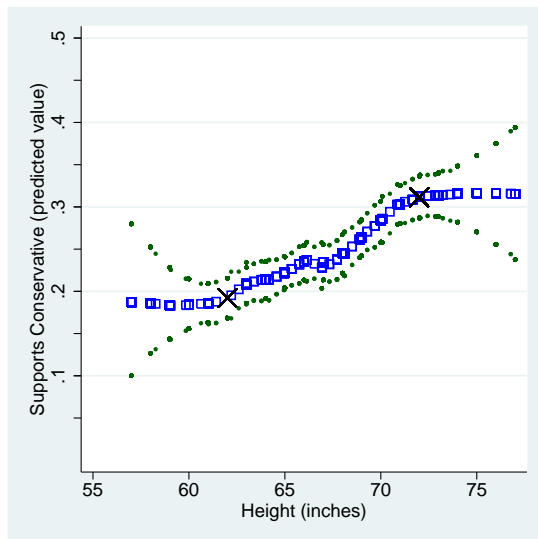


Figure 1: Taller People Support Conservatives

Note: Running line smooth of “supports Conservative party” on height, adjusted for age and gender. The X’s mark the 10th and 90th percentile of the height distribution. 95 percent pointwise bootstrapped confidence intervals displayed.

We next investigate the effect of height parametrically. Formally, we estimate linear probability models of the form:

$$V = \chi + \phi H + \mathbf{X}'\lambda + \eta \quad (1)$$

where V is our political variable, H is height, and \mathbf{X} is a matrix of covariates. All specifications here and throughout the paper report heteroskedasticity-robust standard errors, clustered by household.

The coefficient of interest, ϕ , is the direct effect of height on support for the Conservatives. In the second row of Table 1, we estimate this effect. Here and throughout, we suppress the complete regression output; full tables for all results are reported in the Appendix. Column (1) employs an extremely simple specification, including as controls only age, sex, and region. Here, we find that each additional inch yields a 0.8 percentage point higher probability of supporting the Conservative party. In column (2), we add controls for race, years of schooling, marital status, and religion. These slightly reduce height’s effect to 0.6 ppt per inch, translating to a one standard deviation

³That income falls among the tallest has been noted by other scholars (Hübler, 2009), and has been attributed to health problems unique to extremely tall individuals, such as increased risk of musculo-skeletal conditions and certain cancers (Nettle, 2002).

increase in height yielding a 2.4-3.2 ppt higher probability of supporting the Conservatives. In sum, the regression results of the direct relationship between height and Conservative support reinforce the pattern seen in the raw data.

This result is robust to changes in the estimation sample and alternative functional forms. In columns (3) and (4) of Table 1, we consider an age-restricted sample. Since we want our height variable to proxy for long-term physical well-being, we estimate specifications including only prime-age individuals (18-65). This approach avoids inadvertently capturing health factors which slow youths' attainment of their adult height (Roche, 1992) or increase shrinkage of the elderly (Wannamethee et al., 2006)—such factors could potentially contaminate our research design by acting as direct impetus for favoring robust national health care. In results reported in the appendix, we also show that the findings are robust to including residents of Northern Ireland in the sample and to the use of height as collected in wave 14. In the appendix we also reproduce all linear probability estimates using logit and probit, and ordered response models using ordered logits and ordered probits. For all results, average marginal coefficients are qualitatively similar.

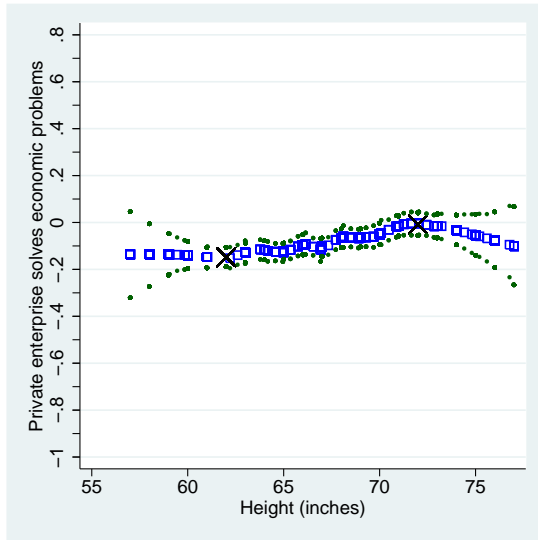
The relationship between height and political preferences identified here is not an artifact of a reliance on a single outcome, but instead is consistent across an array of political preferences and behavior. Although the BHPS does not directly probe individuals' preferred levels of taxes and transfers, it does ask a series of questions about the relative balance that should be struck between state versus market. Respondents are asked the extent to which they support (a five-point ordinal measure, from -2 "strongly disagree" to 2 "strongly agree") the following statements: "Private enterprise is the best way to solve the UK's economic problems"; "Major public services and industries ought to be in state ownership"; "The government should place an upper limit on the amount of money that any one person can make"; and "It is the government's responsibility to provide a job for everyone who wants one."

The association between height and these preferences is presented in Figure 2. All are broadly consistent with the results from "support Conservative": taller people look more favorably on private enterprise and less favorably on the need for state ownership of public services, govern-

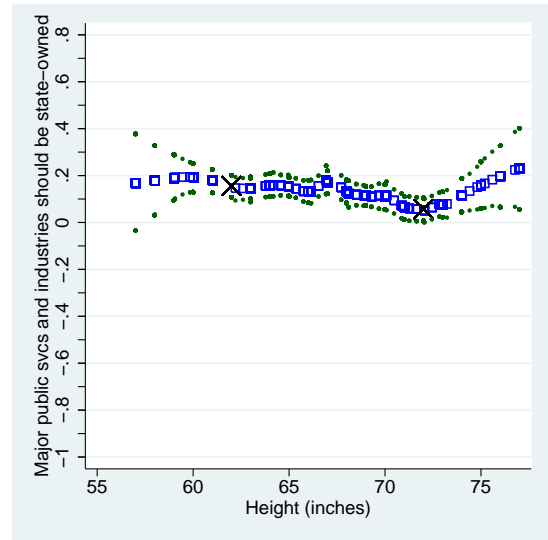
	Whole (1)	Whole (2)	Prime (3)	Prime (4)	Cog (5)	Fam (6)	Fam (7)	F (8)	F (9)	M (10)	M (11)
Height (inches)	0.008*** (0.002)	0.006*** (0.002)	0.009*** (0.002)	0.008*** (0.002)	0.005*** (0.002)	0.005*** (0.002)	0.004*** (0.002)	0.006*** (0.002)	0.004* (0.002)	0.010*** (0.002)	0.008*** (0.002)
Controls:											
Age, region	X	X	X	X	X	X	X	X	X	X	X
Sex	X	X	X	X	X	X	X				
Extended		X		X	X	X	X		X		X
Cognitive ability					X						
Parents' schooling						X					
Father's HGS							X				
Prime age only			X	X							
F-stat	42.663	41.352	23.494	23.370	42.091	29.565	34.179	34.879	32.899	24.813	23.551
N	9705	9465	5527	5469	9428	7990	7147	5146	5035	4559	4430

Table 1: Political and Economic Effects of Height

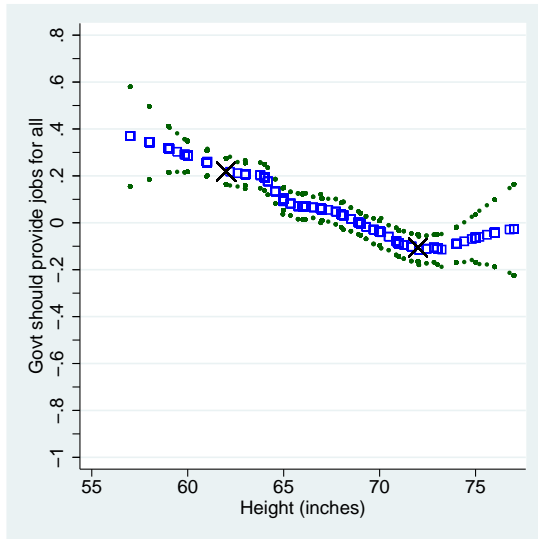
Note: Least squares regression of “supports Conservative party” on height. Extended controls include: married, white, years of schooling, religion. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by household. Statistical significance: *10% ; **5% ; ***1%



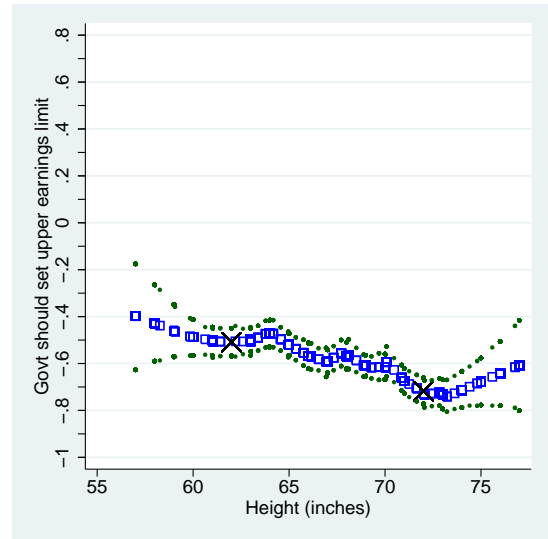
(a) Private Enterprise



(b) State Ownership



(c) Govt Should Provide Jobs



(d) Upper Earnings Limit

Figure 2: Height's Political Consequences: Policy Preferences

Note: Running line smooths of (a) "Private enterprise is the best way to solve the UK's economic problems"; (b) "Major public services and industries ought to be in state ownership"; (c) "It is the government's responsibility to provide a job for everyone who wants one"; and (d) "The government should place an upper limit on the amount of money that any one person can make" on height, adjusted for age and gender. Each dependent variable indicates strength of support, ranging from -2 (strongly disagree) to 2 (strongly agree). The X's mark the 10th and 90th percentile of the height distribution. 95 percent pointwise bootstrapped confidence intervals displayed.

	Pvte Enterpr (1)	State Ownership (2)	Govt Jobs (3)	Limit Income (4)	Vote Cons. (5)
Height (inches)	0.007*** (0.003)	-0.007*** (0.003)	-0.018*** (0.004)	-0.011*** (0.004)	0.005*** (0.002)
Controls:					
Age, sex, region	X	X	X	X	X
Extended	X	X	X	X	X
F-Stat	25.445	1.523	40.655	19.977	33.219
N	11142	11226	11505	10918	7182

Table 2: Height and Policy Preferences

Note: Direct relationship between height and political preferences. Dependent variables are (1) “Private enterprise is the best way to solve the UK’s economic problems”; (2) “Major public services and industries ought to be in state ownership”; (3) “It is the government’s responsibility to provide a job for everyone who wants one”; (4) “The government should place an upper limit on the amount of money that any one person can make”; and (5) “Voted for Conservative Party in 2005 General Election”. Each dependent variable indicates strength of support, ranging from -2 (strongly disagree) to 2 (strongly agree). Extended controls include: married, white, years of schooling, religion. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by household. Statistical significance: *10% ; **5% , ***1%

ment provision of jobs, and state-mandated limits on earnings. As with Conservative support, the estimated effect is close to linear over the bulk of the distribution, and flips at the top of the height distribution. The same pattern holds when we parametrically examine height's effect, in columns (1)-(4) of Table 2. Here, we treat each dependent variable as continuous and estimate equation (1), including controls for age, sex, race, religion, years of schooling, marital status, and region. Consistent with the figure, point estimates are larger for government provision of jobs and state-mandated limits on earnings.⁴ Finally, Figure 3 shows that the positive relationship between height and Conservative voting conditional on turnout also holds. Including controls in a regression framework, column (5) of Table 2 shows that each additional inch is associated with a 0.5 percentage point increase in propensity to vote for the Conservative party.

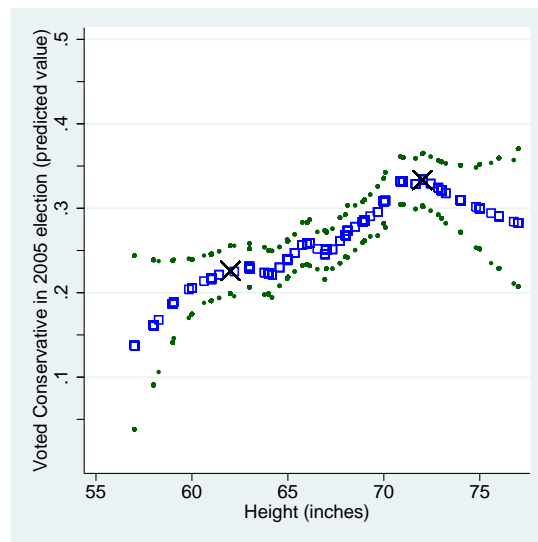


Figure 3: Taller People Vote for Conservatives

Note: Running line smooth of “Voted for Conservative Party in 2005 General Election” on height, adjusted for age and gender. The X’s mark the 10th and 90th percentile of the height distribution. 95 percent pointwise bootstrapped confidence intervals displayed.

⁴We see these findings on height’s political effects as complementary to a literature in evolutionary psychology which examines the relationship between physical formidability and preferences for redistribution. See for example Price et al. (2015).

2.1 Alternative Channels

One concern in employing height as a proxy for economic well-being is that it may be picking up other factors that drive political behavior. For instance, Case and Paxson (2008) argue that the early life circumstances which determine adult height also generate cognitive advantages. If these cognitive advantages directly affect political preferences, this will contaminate the interpretation of the height effect. This problem is probably less relevant in our setting precisely because existing research offers mixed evidence that cognition directly affects partisan support. Studies based on US data suggest that it has a negligible (Carl, 2015) or inconsistent (Caplan and Miller, 2010) effect on political preferences. In contrast, a study from the UK Deary, Batty and Gale (2008) finds that cognition is associated with left voting, while two emerging from Sweden suggest the opposite: that it increases support for right-wing policies and reduces support for redistribution (Mollerstrom and Seim, 2010; Oskarsson et al., forthcoming).⁵ Given the clear lack of consensus in the literature, it is thus important to control for cognition.

While our data do not permit a direct measure of cognitive ability, we take two steps to assess cognition's potential as a channel through which height shapes political preferences. First, we add education in the form of years of schooling to the regression model. While years of schooling is probably a poor proxy for innate cognitive ability, we find that height's effect on Conservative support is the same in specifications with and without this measure. Second, in the British setting, studies of cognition have found that cognitive ability tests scores correlate well with scores on O-level and GCSE examinations (Deary et al., 2007; Mackintosh, 1998); fortunately, information about these examinations is available in the BHPS. We follow Deary et al. (2007) in constructing a measure which assigns point values to each high versus low O-level/GCSE passes received by an individual. Column (5) of Table 1 shows that the point estimate on height remains positive and strongly significant even when we include this proxy measure for cognitive ability as a control. The result is robust to using alternative measures, such as the number of GCSE passes, restricting

⁵If we consider education as a proxy for cognition, cross-country work is more consistent, finding that schooling acts as a cross-cutting cleavage with respect to income: although income may induce individuals to vote conservative, those with more education are more likely to hold left-wing political values and to vote for left-wing parties (van der Waal, Achterberg and Houtman, 2007; Stubager, 2009), especially in wealthy nations such as the UK (Weakliem, 2002).

only to high passes, and other variations on this theme.

Another possible channel through which height may drive Conservative support is through parents' background. For example, if parents' income and political orientations during childhood predict height, then these parental influences may directly shape one's political preferences, rendering height a proxy for parents' characteristics rather than economic well-being. We test this potential explanation directly using the BHPS youth survey. For this sample of children aged 11-17 of main survey respondents, we can link children's height to various self-reported parental characteristics of interest: income, years of schooling, and Conservative support.⁶ Table 3 illustrates that these parental characteristics have very little predictive power over children's height. The coefficient for father's and mother's support for Conservatives are actually negative, although substantively small and statistically insignificant—this is also the case for father's schooling. The coefficients on mother's schooling and parent' income, although slightly positive, are also small and statistically insignificant.

This finding militates against height serving as a proxy for parental political preferences. As an alternative strategy of assessing the influence of parents' characteristics, we employ models which explicitly control for family background characteristics: father's and mother's highest educational attainment, and father's score on the Hope Goldthorpe scale (HGS). The HGS, commonly used in British analyses of social class, is an occupational index which classifies jobs according to their social desirability. The scale is an updated version of a 1974 survey of the social standing of various occupations in the UK. Occupational groups in the BHPS are collapsed into 36 categories and then ranked according to their reputation. The final ordering assigns scores between 0 (unavailable occupation or employment status) and 82 (occupation with highest reputation). While in principle the score is a useful measure of social background, the HGS is often difficult to recover from retrospective data. In our case, including the score cuts the sample size by 25%, and missings are very likely nonrandom. Results are displayed in columns (6) and (7) of Table 1. In column

⁶To clarify, we do not employ children's reports of their parents' characteristics, which can produce biased estimates of intergenerational transmission due to poor recall. Instead, we link the main survey's self-reports of income and other educational characteristics, to the youth survey, which queries the children of the main survey respondents.

	Height (1)	Height (2)	Height (3)	Height (4)	Height (5)
Mother's Support	-0.012 (0.351)				
Father's Support		-0.172 (0.336)			
Mother's yrs school			0.005 (0.050)		
Father's yrs school				-0.075 (0.052)	
Parents' real income (000s)					0.006 (0.005)
Controls:					
Age, sex, region	X	X	X	X	X
Extended	X	X	X	X	X
F-Stat	39.313	42.503	51.245	39.982	55.083
N	875	620	1071	740	1106

Table 3: Child Height and Parents' Characteristics

Note: Least squares regression; dependent variable is height (in inches) for youths aged 11 to 17. Each row represents a separate regression. All specifications include age, sex, race, religion and region controls. Full models reported in Appendix.

(6), we add mother’s and father’s educational attainment to the most complete specifications from Table 1. Column (7) includes father’s Hope-Goldthorpe score. In both cases, adding these family background variables to the model slightly decreases point estimates, but overall the main finding of height’s strong and positive effects on support for Conservative hold. In fact, the decline in the point estimates is almost wholly due to the nonrandom nature of missing parental information. Reproducing the earlier column (2) specification using only the samples for whom parental characteristics are available yields almost identical coefficients to those in columns (6) and (7).

The upshot, then, is that we have both direct and indirect reasons to doubt that cognition or parental characteristics are driving height’s effect on Conservative support.⁷

3 Over Time and Gendered Results

One attractive feature of our dataset is its longitudinal nature; while height was only elicited in waves 14 and 16, we have information on income and political behavior dating back to the beginning of the panel.⁸ Separately for each wave, we reproduce our specification with the extended set of controls corresponding to column (2) of Table 1, and plot the results in Figure 4.

Starting with the direct relationship between height and political preferences reported in Panel (a), we see that the estimated effect of height on support for the Conservatives is broadly consistent over time. The estimated effect fluctuates a bit, spiking in wave 6, falling in waves 7 and 8, and then picking up to resume its original trajectory starting in wave 9. However, the 95 percent confidence intervals, while always excluding zero, are wide enough that we cannot reject a constant effect over time.

Given the rise of a political gender gap across the advanced industrialized countries in recent

⁷In the appendix, we assess two other channels through which height may shape preferences: health and risk tolerance. If height operates through both income and health/risk tolerance, this would contaminate our interpretation of the height effect and violate the exclusion restriction in the IV models, which are discussed in section 4 below. We find that controlling for these variables in our models do not alter either the point estimates on or the significance of height’s direct effect on preferences, nor the IV second-stage models of income instrumented with height.

⁸Because one of the voting questions we use to generate our Conservative support indicator is not asked in wave 2, we report all results beginning with wave 3. Also, to avoid dropping individuals who happen to be missing in wave 16, we use the mean of the reports of height from waves 14 and 16; all results are robust to using the wave 16 measure.

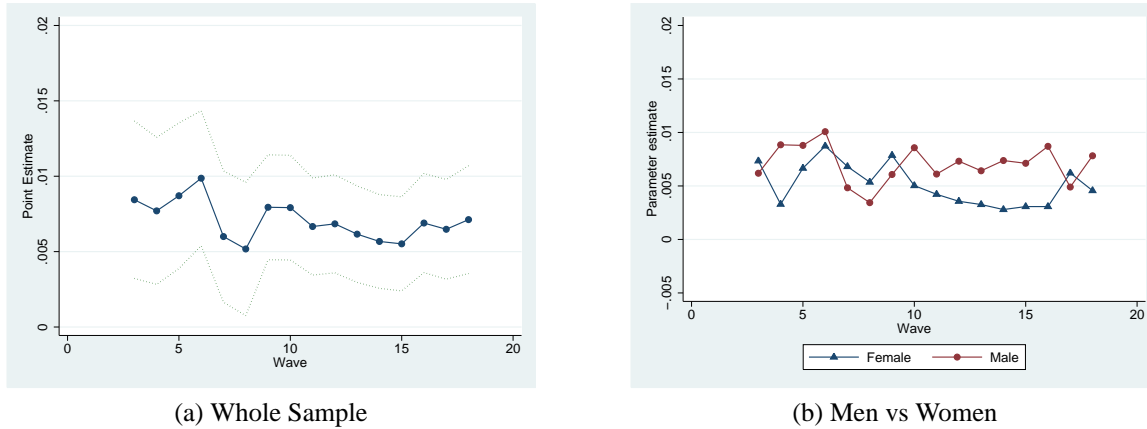


Figure 4: Height and Conservative Support Over Time

Note: Point estimates and 95% confidence intervals are produced in separate, wave-specific regressions, using the specification corresponding to column 2 of Table 1. Panel (a) reports the direct effect of height on Conservative support; (b) reports these same models for men and women separately.

years, another important question is whether the effects of economic standing on political preferences vary substantially between men and women. To this point, all results have used the whole sample and controlled for gender; here, we split the sample by sex and reproduce our earlier specifications. For brevity, we choose two specifications to report in columns (8) through (11) of Table 1: the simple specification (corresponding to column 1 of Table 1), and the extended controls (corresponding to column 2). These wave 16 results suggest that the effect of height on political preferences is roughly twice as large for men than for women.

Panel (b) of Figure 4 explores whether these differences between men and women present in the wave 16 data extend over time. In this figure, the plotted estimates reflect the effect of a standard deviation increase in height (by wave and by gender) on Conservative support. We must be extremely cautious in interpreting this figure, as confidence intervals overlap over the entire period. This said, the broad pattern from the estimates is striking. An additional inch of height increases the propensity of both men and women to support the Conservative Party, and for both sexes, height is associated with higher income. Although in both instances the estimated effects are usually higher for men than for women, given the size of the confidence intervals we cannot reject the null of no difference.

4 Height as an Instrument

Thus far, we have documented a robust positive relationship between height and political preferences, arguing that the most reasonable interpretation of this result is that economic well-being drives individual partisanship. In order to situate our findings, we pursue a thought experiment. Under the assumption that height’s effect on political preferences operates only through its effect on income, we can treat height as an instrumental variable that allows us to identify the effect of income on support for the Conservatives. This strategy enables us to make statements about the political effect of an additional thousand pounds of income, and to assess the extent of bias of existing OLS-based estimates of income’s effects on political preferences.

Formally, we estimate two-stage least squares models of the following form, where V , H , and \mathbf{X} are as before, and I is income. Here, height is employed as an instrument to identify the first stage equation:

$$\begin{aligned} I &= \zeta + \gamma H + \mathbf{X}'\delta + v \\ V &= \alpha + \beta H + \mathbf{X}'\mu + \varepsilon \end{aligned} \tag{2}$$

The underlying logic of instrumental variables estimation is that the bias in OLS when a regressor is partially endogenous can be corrected by identifying another factor—the instrumental variable—that is correlated with the endogenous regressor and only affects the variable of interest through that channel, after controlling for other included regressors. More concretely, in our case, an instrumental variable should be sufficiently well correlated with income (relevant) and should only affect the outcome of interest insofar as it affects income (excludable: in equation (2), that $\mathbb{E}(h_i\varepsilon_i) = 0$).

We argue that height is likely to meet both these criteria. As to relevance, as we have seen, many studies find a strong relationship between height and income, and as we will show below, height also strongly predicts income in the BHPS data. Indeed, F -statistics on the excluded instrument, reported at the bottom of Table 5, exceed conventional weak instruments thresholds. Excludability is a matter of judgment, and we believe that height is plausibly excludable for several reasons.

First, as a measure of long-term physical well-being, height is unlikely to directly affect (or be correlated with omitted variables that directly affect) political behavior other than through its ability to predict income. Unlike, for example, short term health shocks or even chronic health conditions, height is unlikely to shape individuals' preference for specific health policies (and hence taste for redistribution). Instead, in our setting, height captures quasi-random shocks in early life that drive an individual to enjoy a higher income in adulthood, but are unlikely to directly affect the dependent variables of interest. For example, when we examined parental background in the previous section, we found little relationship between these characteristics and a child's height, suggesting that height is indeed a credible source of exogenous variation.

In the instrumental variable models presented in Table 5, the central independent variable of interest is real annual income, measured in thousands of pounds. The income variable we use includes income from labor and non-labor sources, but does not include income from government transfers. Throughout we employ a standard set of control variables: age, sex, region, race, educational attainment, and religion, whose construction is detailed in the Appendix.

4.1 First Stage

To serve as an instrument variable, height must be a strong predictor of income. Figure 5 uses a multivariate smooth to plot income on height while controlling for age and gender. Income moves steadily with height, an almost linear relationship for the bulk of distribution. Moving from the 10th to the 90th percentile of height is associated with an approximately 5000 pound increase in income. At the very top of the height distribution, predicted income actually dips down, consistent with the pattern in Figure 1 for Conservative support.

We estimate the first stage relationship between income and height in equation (2) in Table 4. Results shown in columns (1) and (2), for example, show that height is a strong predictor of income; each additional inch translates to between 200-350 pounds of income, which in turn is between one and two percent of mean income—comparable to earlier waves of the BHPS (Case, Paxson and Islam, 2009). These effects are highly statistically significant. Both from the raw data

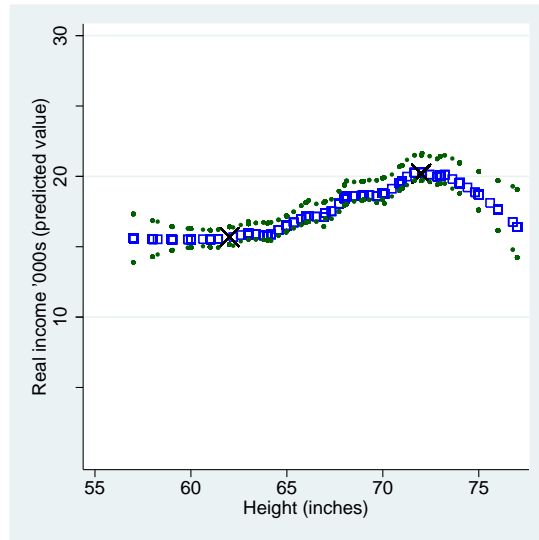


Figure 5: Income and Height

Note: Running line smooth of “Real Income (’000s of pounds)” on height, adjusted for age and gender. The X’s mark the 10th and 90th percentiles of the height distribution. 95 percent pointwise bootstrapped confidence intervals displayed.

and from the regression results, the upshot is that height appears to be a good predictor of income and that our estimated coefficients lie comfortably within the range produced in the literature.

Should we be concerned about the self-reported nature of our height measure? In general, classical error in measurement of the instrumental variable will weaken the estimated effect of the instrument but will not bias the second stage estimates of income’s effect on political preferences. As we have seen, the instrument is highly relevant, so that this is not a concern in our data. This said, systematic misreporting of height, such that richer individuals disproportionately report being tall, will potentially bias both the first stage and the second stage estimates. Fortunately, we are able to test for this type of misreporting within the subset of our sample who were reinterviewed in the BHPS’s successor survey (the United Kingdom Household Longitudinal Study). In the UKHLS, as part of a larger anthropometric module, trained nurses measured respondents’ height, thus giving us an independent check of self-reported height. In results available from the authors, we find that income does not predict misreporting.

We can again exploit the panel structure of the data, reestimating the first stage relationship between income and wave 16 height in each wave of the BHPS. As seen in panel (a) of Figure

	Whole (1)	Whole (2)	Female (3)	Female (4)	Male (5)	Male (6)
First Stage:						
Height (inches)	0.352*** (0.049)	0.211*** (0.047)	0.247*** (0.053)	0.162*** (0.051)	0.491*** (0.081)	0.239*** (0.078)
Controls:						
Age, region	X	X	X	X	X	X
Sex	X	X				
Extended		X		X		X
F-Stat excl. instrument	47.678	16.684	23.413	10.413	30.049	7.009
N	11303	11001	6145	6004	5158	4997

Table 4: Instrumental Variables First Stage

Note: Dependent variable is “Real Income (‘000s of pounds)”. First stage of 2SLS regression corresponding to Table 1. Extended controls include: married, white, years of schooling, religion. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by household. Statistical significance: *10% ; **5% ; ***1%

6, which plots the estimated coefficient on height from separate wave-specific regressions that employ the extended controls, the first stage relationship between income and height is quite stable, hovering around 250 pounds per inch. To our knowledge, this is the first study to show that height’s effect on income remains steady for a panel of individuals over such a long period.

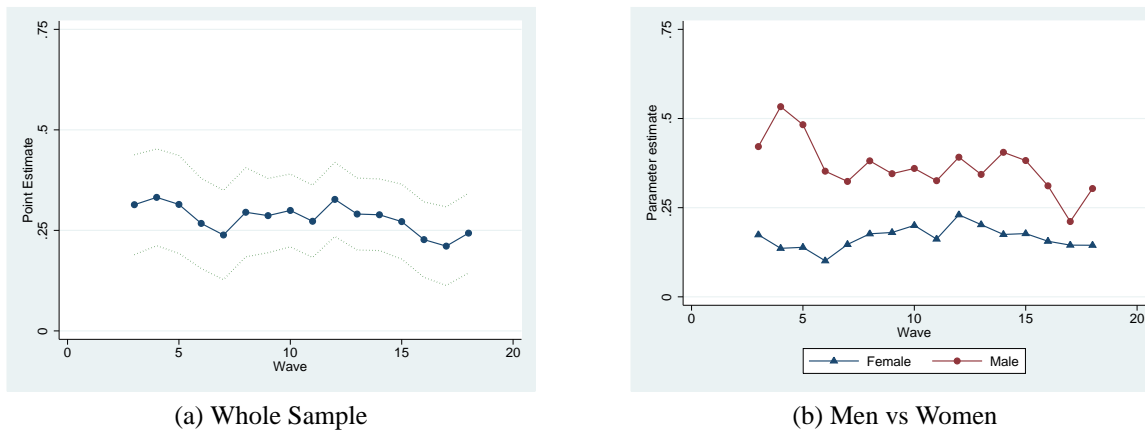


Figure 6: Instrumental Variables First Stage: Over Time Results

Note: Point estimates of the effect of height on income are produced in separate, wave-specific regressions, using the specification corresponding to columns (2), (4), and (6) of Table 4.

4.2 Instrumental Variable Results

Turning now to the second-stage, we estimate linear probability models of “support for Conservative,” where income has been fitted in the first stage using height as an instrumental variable. The first row of Table 5 reports the estimates. In the simplest specification controlling for only age, sex and region (column 1), each additional thousand pounds of annual income translates to a 2.4 ppt increase in probability of supporting the Conservative party. This estimate slightly increases to 3.2 ppt when we add additional controls in column (2).⁹



Figure 7: Income and Support for Conservatives

Note: Running line smooths of “supports Conservative party” on income and income projected on height, adjusted for age and gender. The X’s mark the 10th and 90th percentile of the income and predicted income distributions.

Figure 7 offers suggestive evidence as to why the relationship between income and political preference is difficult to capture in the absence of an explicit identification strategy. Here we plot propensity to support Conservatives on income, corresponding to the OLS specification, and the projection of income on height, corresponding to the IV specification. The latter curve is substantially steeper.¹⁰

⁹Although the instrument is strong by traditional standards, we also report weak instruments-robust 95 percent confidence intervals formed by inverting the Anderson-Rubin statistic (Mikusheva and Poi, 2006). These exclude zero.

¹⁰In the OLS curve, income is more widely dispersed; this is because the IV estimates use income projected on height, which constrains the domain of predicted income.

	Whole (1)	Whole (2)	Prime (3)	Prime (4)	Cog (5)	Fam (6)	Fam (7)	F (8)	F (9)	M (10)	M (11)
IV Second Stage:											
Real Income (000s)	0.024*** (0.005)	0.032*** (0.011)	0.020*** (0.005)	0.027*** (0.009)	0.048*** (0.023)	0.029*** (0.012)	0.019*** (0.010)	0.022*** (0.009)	0.026* (0.015)	0.023*** (0.006)	0.037*** (0.016)
OLS:											
Real Income (000s)	0.003*** (0.000)	0.002*** (0.000)	0.003*** (0.000)	0.003*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.001 (0.001)	0.001 (0.001)	0.003*** (0.000)	0.003*** (0.000)
Controls:											
Age, region	X	X	X	X	X	X	X	X	X	X	X
Sex	X	X	X	X	X	X	X				
Extended		X		X	X	X	X	X	X	X	X
Cognitive ability					X						
Parents' schooling						X					
Father's HGS							X				
Prime age only			X	X							
F-stat	32.783	24.524	19.514	15.390	15.682	18.365	28.267	28.389	23.914	16.273	9.337
A-R Conf. interval	[.014,.036]	[.015,.065]	[.012,.033]	[.013,.057]	[.019,.138]	[.011,.069]	[.002,.047]	[.007,.045]	[.002,.079]	[.013,.037]	[.016,.1]
N	9616	9377	5477	5419	9341	7917	7085	5104	4994	4512	4383

Table 5: Support for Conservatives: Second Stage IV and OLS

Note: Dependent variable is "supports Conservative party". The first row reports coefficients on income from second stage of 2SLS regressions; the second row reports coefficients on income from OLS regressions. Extended controls include: married, white, years of schooling, religion. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by household. Statistical significance: *10% ; **5% ; ***1%

Table 5 provides parametric estimates of this relationship. The second row reports linear probability model estimates, regressing support for Conservatives on income. Here, an additional thousand pounds yields only a 0.2-0.3 percentage point higher probability of supporting the Conservatives (columns 1 and 2). In contrast, the IV estimates in the first row of columns (1) and (2) are an order of magnitude larger.

What should we make of these results? The first key point is the one that we have just seen: straightforward OLS estimates are close to zero (even as the model is saturated), while the instrumental variable estimates are substantially larger. Insofar as these results apply to other settings, estimates of the effect of income on right-leaning political preferences may be biased downwards, helping to explain the negligible or zero effects found in several other studies.

The second thing to note is that while our IV estimates dominate the OLS, they are not extremely large. Looking at our IV estimates in Figure 7, we see that income appears to have a fairly linear effect on preferences for the bulk of the sample. From our point estimates presented in Table 5, a one thousand pound increase in income, which is 5.8 percent of mean income, translates to a 3.2 percentage point increase in propensity to support the Conservatives. At the same time, we also see that this estimate can only explain a small fraction of the variance in Conservative support, precisely because even in the 10th income percentile, predicted Conservative support is above 20 percent, and in the 90th percentile is just above 30 percent. In this sense, our estimates indeed support the work of De La O and Rodden (2008) and Huber and Stanig (2006), among others, who attempt to probe alternative determinants of partisanship.

As with the reduced form estimates reported in the first part of this paper, the IV results suggest that income drives not simply conservative support but also a wide range of redistributive preferences. This can be seen the first row of Table 6, which report regressions of support for various policy preferences on income, instrumented with height. The effect of income follows the pattern seen for Conservative support, with policy preferences turning against market intervention as income rises.¹¹ To interpret the substantive size of the effects, consider that the standard deviation of

¹¹We also generate estimates controlling for family background. For private enterprise and state ownership of major public services, coefficients remain qualitatively similar in all specifications, but lose statistical significance

	Pvte Enterpr (1)	State Ownership (2)	Govt Jobs (3)	Limit Income (4)	Vote Cons. (5)
IV 2nd Stage:					
Real Income (000s)	0.025*** (0.012)	-0.025* (0.013)	-0.068*** (0.017)	-0.056*** (0.021)	0.029*** (0.014)
OLS:					
Real Income (000s)	0.005*** (0.001)	-0.004*** (0.001)	-0.011*** (0.001)	-0.009*** (0.001)	0.001*** (0.000)
Controls:					
Age, sex, region	X	X	X	X	X
Extended	X	X	X	X	X
F-Stat	23.299	1.454	23.925	14.587	21.265
A-R Conf. interval	[.003,.052]	[-.054,-.001]	[-.109,-.04]	[-.116,-.02]	[.008,.082]
N	11142	11226	11505	10816	7118

Table 6: Policy Preferences and Voting Conservative in 2005 General Election

Note: Dependent variables are (1) “Private enterprise is the best way to solve the UK’s economic problems”; (2) “Major public services and industries ought to be in state ownership”; (3) “It is the government’s responsibility to provide a job for everyone who wants one”; (4) “The government should place an upper limit on the amount of money that any one person can make”; and (5) “Voted for Conservative Party in 2005 General Election”. Each dependent variable indicates strength of support, ranging from -2 (strongly disagree) to 2 (strongly agree). The first row reports the second stage of 2SLS, the second row reports results from OLS regressions. Extended controls include: married, white, years of schooling, religion. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by household. Statistical significance: *10% ; **5% ; ***1%

each outcome is approximately 1, and standard deviation of income is approximately 14 thousand pounds. Thus, for the proposition regarding private enterprise, a standard deviation increase in income corresponds to about a .4 standard deviation increase in support for the proposition. As in the reduced form, the effect of income is strongest with respect to the statement that the government should provide jobs for all. Here, a standard deviation increase in income corresponds roughly to a standard deviation decrease in support for the statement. Finally, in column (5) of Table 6 we see again that voting follows support, with each additional thousands pounds yielding a 2.8 ppt increase in voting Conservative. Again, in contrast to the OLS estimates (reported in the second row of Table 6), which display a near-zero effect of income on voting, the IV results are an order of magnitude larger.

Taken together, these results suggest that income positively influences not only support for conservative political parties, but also for more conservative public policy positions.

4.3 IV Results: Over Time

The preceding instrumental variables results use Conservative support as measured in wave 16, contemporaneous with the measurement of height. Do these results—for the whole sample, but also for the sub-samples of men and women—hold over time? To correctly compare the income gradient over a period when real income is rising, Panel (a) plots point estimates multiplied by a standard deviation of income in each wave. As with the reduced form and first stage, the consistency of the estimates over time is striking. The OLS estimates hover close to zero over the entire period; in contrast, the IV estimates are substantially larger. The IV results also point to some intriguing patterns, although again confidence intervals are wide enough that we cannot reject a constant effect. Income's effect on political support remains fairly consistent up through wave 15 (1995), with a standard deviation increase in income translating to a 30 ppt increase in propensity to support the Conservatives. We see some volatility in waves 6 through 8, with the dip in the

when controlling for father's Hope-Goldthorpe score, which substantially cuts our sample size. As with support for Conservatives, the loss in significance is seen even when the original specification is used for the sample with non-missing father's Hope-Goldthorpe, suggesting that it is not parents' background itself that reduces income's estimated effect.

relationship between income and Conservative support falling most substantially in 1997, the year of Labour's landslide victory. Wave 16 marks a sizeable increase in the income gradient; in the last three waves of the BHPS, a standard deviation increase in income results in a nearly 50 ppt increase in Conservative support. Due to the wide confidence intervals, these changes are merely suggestive, but these dips and rises are consistent with what we might expect from a voting model in which broad-based decline in support for a party increases the proportion of ideologues among its supporters, lowering the estimated income gradient. This explanation is confirmed by narrative evidence that the Conservative Party's emphasis on 'deep' Conservative convictions reduced it to core voters in the 1997 to 2005 period (Kelly, 2001; Garnett and Lynch, 2002), but that after Cameron's 2005 rise to power the party made successful appeals to a broader base (Green, 2010).

Results for wave 16 broken down by gender are presented in columns (8) through (11) of Table 5. For both sexes, we see the same patterns as in the whole sample: estimated IV effects are an order of magnitude larger than OLS. Whereas in the OLS, an additional thousand pounds of income has almost no effect on Conservative support among women, in the IV specification it results in a 1.8-2.4 ppt increase in propensity to support the Conservatives, although in the fullest specification that includes parents' schooling the estimate for women becomes statistically insignificant. The point estimate of income's effect is stronger for men. With mean incomes of £13,370 for women and £21,770 for men, this represents a steeper income gradient of political preference for men than for women: a ten percent increase in income results in a 2.3 to 3.4 ppt increase in probability of supporting Conservatives for women, and a 7.8 to 8.2 ppt increase among men.

Plotting the gendered estimates over time complicates this story. In the early waves of the panel, the income gradient for women actually dominates that for men until wave 10, when this relationship flips. The differential between men and women peaks in wave 16; by the last two years (2007-8) the estimates converge. Why men begin to exhibit a steeper income gradient of political preference starting in the early 2000s is somewhat puzzling. In a separate paper, we study the political effects of a 2000 court case which altered the distribution of assets upon divorce and thereby shifted women's expected income relative to men, but the results from that study do not

suggest that the income gradient itself would shift.

The results over time should give us pause in interpreting the IV results for women and men in columns (8) through (11) of Table 5. When plotted over time, wave 16 is actually an outlier; for most of the period the male and female income gradients track each other fairly closely, and are statistically indistinguishable. In sum, while there is suggestive evidence that it was stronger for women in the 1990s and then stronger for men in the 2000s, with the genders converging by the end of the period, the fact of extensively overlapping confidence intervals suggests that we cannot detect a substantial gender difference in income’s effect on political preferences.

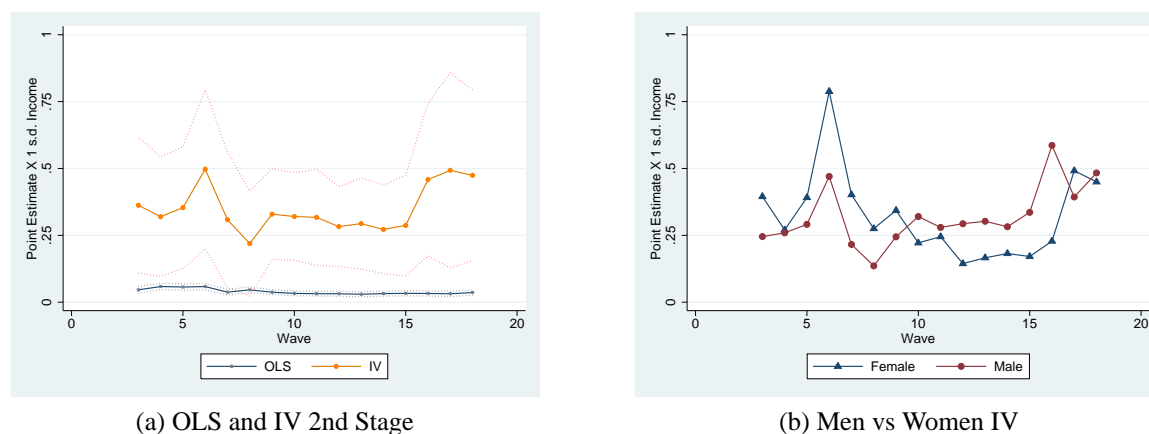


Figure 8: Over Time Results

Note: Point estimates and 95% confidence intervals are produced in separate, wave-specific regressions, using the specification corresponding to column 2 of Table 1. Panel (a) and (b): Effect of a standard deviation increase in income (by year; by year and sex) on Conservative support.

4.4 Permanent versus Transitory Income

Finally, we return to the disjoint between theory and the bulk of empirical work on income and voting. Implicit in formal political economy models is the notion that it is permanent income which generates political preferences; as Lind (2007) observes, however, most studies which examine effects on voting use a measure of current income. For example, tests of egocentric/pocketbook voting typically ask whether an individual’s personal economic situation has improved, stayed the same, or worsened in the previous year. To probe whether transitory income shapes political preferences, we exploit the entire panel from 1991 to 2008 and regress support for Conservative

on income, including year dummies and individual fixed effects. Effectively, by differencing out average income, we can isolate the effects of short-term changes in income on political behavior.¹²

	Whole (1)	Women (2)	Men (3)
Real income (000s pounds)	.000*** (.000)	-.001*** (.000)	.000* (.000)
F-stat	91.318	49.032	43.761
N	172986	92106	80880

Table 7: Fixed Effects: OLS

Note: Linear probability model with individual fixed effects and year dummies; dependent variable is “supports Conservative party”. Full models reported in appendix. Heteroskedasticity-robust standard errors, clustered by individual. Statistical significance: *10% ; **5% ; ***1%

To clarify what the fixed effects model captures, consider someone who earns an average of 10,000 pounds a year over fifteen years. In one of those years, she receives 1000 pounds more than average. Does this make her more likely to support the Conservative party in that year, given that her permanent income is unchanged? Table 7 reports the results: precisely estimated near-zero effects, both in the whole sample and for women and men separately, suggesting that short-term fluctuations in income do not predict political preferences. Placed in conjunction with our earlier results, our finding is that it is permanent income, and not transitory income, that shapes political behavior.¹³ The fact that most studies focus on the latter income measure may explain their varied findings (which may be sensitive to specification) and often small estimated effects.

There are important caveats to the fixed effects results, however. Although the within estimator pulls out some omitted variables bias from time-invariant characteristics that differ across individuals, it is open to two other problems. First, if annual fluctuation in income is small relative to baseline, this creates a problem akin to multicollinearity and may exacerbate attenuation bias. Second, problems with errors-in-variables are exacerbated in the fixed effects setting because we

¹²We would like to allow inclusion of time-invariant covariates, but Sargan tests of the orthogonality condition required for random effects estimators reject these restrictions.

¹³Our interpretation is in contrast to Lind (2010) despite the fact that we both find negligible estimates of income from fixed effects estimators. In our view, his fixed effects estimates may correctly identify the effect of transitory income; however, lacking a credible instrument for income in the cross-section, they do not identify the effect of permanent income.

are focusing on within-individual variation over time. Potentially reasonable error structures that apply to income measurement can lead to perverse results, including attenuation bias and even sign reversal. Both concerns exist in our setting. For this reason, when pulling together our findings from the IV approach with the fixed effects results, we conclude that there is substantial evidence that permanent income shapes political preferences, but we do not find evidence that short term fluctuations in income matter.

5 Conclusion

Does income drive political behavior? The notion that individuals' economic standing shapes their political preferences enjoys a long intellectual lineage. Machiavelli advised his prince to abstain from touching citizens' property, which could only serve to attract hatred and threaten the political order. By the era of classical liberalism, the notion that income shapes voting was implicitly accepted. John Stuart Mill, for example, saw universal taxation as a necessary complement of extension of the franchise, as "any power of voting possessed by [those who pay no taxes] is . . . a severance of the power of control from the interest in its beneficial exercise." (Mill, 1861/1946). As we have argued, the idea that economic self-interest drives political behavior has remained at the core of modern political economy theory, yet the empirical evidence has remained mixed.

In this paper we employ height as a lever to gain traction on this problem. Economic historians have long viewed height as a strong predictor of income, and anthropologists often use height to proxy for economic well-being when income measures are absent. Building on this tradition, we present two main findings. First, taller individuals are more likely to support the Conservative party, support conservative policies, turn out to vote, and vote conservative when they do. As an extension, we employ height as an instrumental variable for income, finding that each additional thousand pounds of annual income translates to a two to three percentage point increase in probability of supporting the Conservatives, and that income also drives political beliefs and voting in the same direction.

This paper should be of particular interest to several groups of scholars. First, the direct effect

of height on voting will interest students of political behavior. In recent years, much has been made over the inability of economic fundamentals to effectively predict vote choice. As a result, analysts have increasingly shifted to analyzing Facebook, Twitter and other forms of social media, leveraging information on user connections to more effectively predict vote choice (Conover et al., 2011; DiGrazia et al., 2013). In contrast, we identify an ascriptive characteristic—height—that can be easily measured and which generates strong, clean predictions of voting behavior.

More generally, this paper’s strategy of using height as a measure of economic well-being can be extended to a broad range of settings. Political scientists have decried the credibility of income measures in surveys which provide political information; see for example Donnelly and Pop-Eleches (2012) on the World Values Survey and Bratton (2006) on Afrobarometer. There are also many populations and associated large-sample surveys for which income variables do not even exist. For example, the Demographic and Health Surveys, which have been used to examine the effect of democracy on outcomes of interest in sub-Saharan Africa, elicit height but do not include an income module. In contrast, height is present in a number of major surveys which ask a broad range of political questions.¹⁴

Finally, our results should be useful to studies that take positive political economy models to empirical data. The implications of such models often depends on the elasticity of voting behavior to income, which is rarely parametrized beyond assuming that income matters. This paper fills this gap by providing one such estimate, which shows that income indeed drives political preferences. At the same time, our estimates leave much of the variation in partisanship unexplained, reinforcing the continued relevance of investigating non-economic sources of voting behavior.

¹⁴For example, height is asked in the General Social Survey, Fragile Families Survey, the European Social Survey, as well as a number of individual and household panel datasets, including those in: Britain (BHPS), Germany (GSOEP), Poland (POLPAN), Russia (RLMS-HSE), India (ARIS-REDS), and Indonesia (IFLS). Moreover, in many of these surveys, height is collected by trained enumerators or nurses, in contrast to the majority of economic variables which continue to be self-reported.

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