the review of income and wealth

Review of Income and Wealth 2014
DOI: 10.1111/roiw.12134

RELATIVE INCOME AND INDEBTEDNESS: EVIDENCE FROM PANEL DATA

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We examine patterns of indebtedness in the Panel Study of Income Dynamics, focusing on the period surrounding the housing bubble and its aftermath (i.e., 1999–2009). Leverage increased across households, but most quickly among lower income households during this period. We find additionally that leverage grew faster for households with lower *relative* income compared to other households in similar demographic groups or within a state controlling for own income. Together, these findings provide evidence for the thesis that the rising indebtedness of households in the U.S. is related to high levels of inequality, and that "Veblen effects," whereby relative income matters for individual well-being and decisions, may contribute to rising household indebtedness.

JEL Codes: D12, D31

Keywords: consumption, debt, inequality, Veblen effects

1. INTRODUCTION

> In 1995 [Mr. Baggett] moved into a house in the Harvard-Yale section of Salt Lake, a tree-lined neighborhood near the University of Utah that is home to many doctors, lawyers and professors. Mr. Baggett used credit cards to furnish the home with the kind of carpets and furniture his neighbors and relatives could afford. "I felt insecure; I was an hourly-paid worker in this fancy neighborhood," says Mr. Baggett. He says he was making $13 an hour for a time doing back-office work at a local bank while supporting two children. (From "Lagging Behind the Wealthy, Many Use Debt to Catch Up," *Wall Street Journal*, May 17, 2005)

This paper examines a commonly held but empirically under-explored hypothesis: the idea that rising indebtedness in the 2000s is linked with rising inequality in the United States. While this argument has been made in several forms, we are interested in the suggestion that "Veblen" effects—whereby one's own consumption is partially driven by the consumption of comparator groups—can partly help explain the rise in indebtedness of relatively lower income

Note: We thank Samuel Bowles and Joseph Stiglitz for advice. Any errors are our own.
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households as they seek to emulate the lifestyle of richer comparator households. Since indebtedness and leverage grew sharply for the majority of the population through the period (Wolff, 2010), we are here interested in the *growth rate* of leverage across the income distribution and the degree with which that is correlated with one's position in the income distribution during the 2000s.

Empirical evidence for Veblen effects has been found in several applications, as we detail in the following section. Perhaps most closely related to this paper is the work of Bertrand and Morse (2012), who find evidence for Veblen effects in consumption, where lower relative income households increase expenditures in response to average living standards. This is in keeping with the thesis of "Expenditure Cascades" (Levine *et al.*, 2010), which asserts that relative income and the expenditure patterns of those higher up the income ladder influence the expenditure of households lower down.

These ideas have not been applied to household borrowing behavior during the housing boom of the 2000s. Additionally, our paper is the first, to the best of our knowledge, to use a true panel dataset (the Panel Study of Income Dynamics (PSID) wealth supplements) to explore the relationship between indebtedness and inequality. Previous efforts to examine the evolution of household indebtedness have typically utilized repeated cross-sections such as the Survey of Consumer Finances or the Consumer Expenditure Survey. The PSID allows for a more careful tracing out of the patterns of indebtedness, the timing of surges in indebtedness, and its proximate correlates, and allows us to control for both time varying and invariant characteristics of households.

To foreground our findings, we show that although there is a positive link between debt growth and income growth for households on average, leverage (i.e., debt to income ratios) rose faster among lower income households than higher income households between 1999 and 2009—the period for which we have the most consistently collected data. We also find evidence that, controlling for own income, household leverage rose faster as the "distance" between a given household and other households above it in the income distribution increased. Distance here is measured as the proportion of households with higher income than a given household in a group.[1] We find that when the relative income is lower, leverage for the household increased faster. These findings are consistent with the hypothesis that Veblen effects have acted as drivers of increased leverage. It should be emphasized that we are not able to assert causality and do not claim to have a fully identified estimation, since obtaining convincing instruments for such an exercise is difficult. Rather we are providing evidence that is consistent with an often articulated, but empirically understudied hypothesis.

In what follows, we begin with a very brief discussion of the literature on the links between inequality and indebtedness, focusing most extensively on the literature on relative income and its importance for economic decisions and well-being. In the following section, we turn to the empirical discussion with a description of the PSID wealth data and an examination of broad trends in the

[1]We also utilized another measure—the gap in income between the highest income household in a group and the income of the household as an alternative measure in earlier versions. Our results remain robust to both measures, but as suggested by an anonymous referee, utilizing the first measure is superior as interpretation of the second measure becomes difficult.

U.S. for the period 1999–2009. We then provide econometric evidence for the relative income thesis. In the preferred specification, we find that a one standard deviation increase in reference group consumption increases the growth rate of leverage for a household by about 0.04 over an average of 0.034, controlling for own family income. The magnitude of this effect varies depending on how comparator groups are constructed, but is positive, relatively large, and significant across most specifications.

2. Relative Income, Inequality, and Borrowing

How might rising inequality affect decisions to borrow? Specifically, how can the welfare experienced by others induce behavioral changes for a given individual or household? An influential literature suggests that interpersonal comparison is a key argument in individual utility functions and thus rising inequality may be associated with behavioral changes. Positional concerns can drive individual perceptions of well-being and change economic decisions as individuals or households seek to emulate the actions of comparator groups. Research drawing from social comparison based utility functions has identified the theoretical significance (Veblen, 1899; Easterlin, 1974; Layard, 1980; Sen, 1983; Van Praag, 1989; Bagwell and Bernheim, 1996; Clark and Oswald, 1996; Akerlof and Kranton, 2000; Cooper *et al*., 2001; Frey and Stutzer, 2002; Rablen, 2008; Arrow and Dasgupta, 2009; Eaton and Eswaran, 2009) and empirical importance (Frank, 1989, 2008; Neumark and Postlewaite, 1998; Bowles and Park, 2005; Maurer and Meier, 2008; Oh *et al*., 2012) of Veblen effects.

The idea that consumption decisions in particular depend on both one's own income and that of others has a long history from at least Duesenberry (1949). Consumption preferences are driven by norms that are socially created by reference to appropriate comparator groups such as neighbors, those in the same broad social class, co-workers, models from the mass media, and so on. Psychologists and behavioral economists have provided substantial support in favor of these hypotheses.[2] Frank (2008) suggests that consumption goods act as positional externalities whereby individual households ramp up expenditure to achieve the socially created norm that evolves from the consumption of other (typically richer) households. The result is an Expenditure Cascade (Levine *et al*., 2010), where lower income households increase consumption following an increase in expenditure by higher income households. Schor (1999) suggests that media coverage and models provided in television and other mass media outlets provide comparator groups that extend beyond one's immediate social grouping.

Cynamon and Fazzari (2008) seek to understand the rise in household borrowing as arising out of similar considerations. They provide a comprehensive discussion of the implications of growing inequality, worsening relative income, and changing consumption norms for the decision to accrue debt. They suggest that the combination of rising inequality and institutional changes in the provision of credit since the 1980s have served to move households toward a new norm, as compared with social norms that prevailed in the decades before, in which

[2]See Folkes and Kiesler (1991) for a review of the literature.

borrowing to maintain consumption has become more acceptable. Seen in this light, the standard explanation of borrowing in which the representative household borrows to smooth consumption in response to changes in prices or wealth following the life-cycle model may need to include another argument: the relative position of the household in comparison with similar groups (Cynamon and Fazzari, 2008).

3. Data and Descriptive Statistics

Our data come from the main survey and wealth supplement of the PSID from 1999 to 2009. The PSID is a longitudinal dataset that began with roughly 5000 families and 18,000 individuals in 1968. The PSID follows all individuals either born to or adopted by someone in the original sample in subsequent years of the survey; in this sense it should be thought of as a panel of individuals with data on their respective families rather than a panel of families. The main survey was collected yearly until 1997, when it changed to a biennial survey. The wealth survey was collected in 1984, 1989, 1994, and biannually from 1999 to the present. The five year intervals between 1984 and 1999 is the primary reason for beginning the analysis in 1999.

There are three main categories of debt in the PSID: mortgage debt, vehicle debt, and other debt. We use only mortgage and other debt since data on vehicle debt is collected less frequently in the main period of interest (i.e., after 1999). The final sample used here contains 32,694 observations on 8241 individuals. Only individuals with the PSID "gene"[3] who are either a household head or spouse are included, resulting in each family being represented by at most one adult.[4] We exclude individuals with missing observations for family income, remaining mortgage principal, other debt, education, number of children, and/or marital status, which excludes roughly 1500 observations.

Table A1 in the Appendix provides some descriptive statistics for the panel. The mean family income over the period in 2009 dollars was approximately \$88,530, while debt was about \$74,942. Additionally, both debt and income have very large standard deviations, reflecting the skewness of the distribution. The average debt to income ratio of 0.87 is slightly larger than the debt to income ratio based on the average of debt and income, which is 0.84. The construction of the variables PG_s and PG_{ser}, which refer to the proportion of individuals whose family income is more than a given individual's family income in either the individual's state (s) or state by education by race (ser) group, will be discussed in more detail below.

[3]Having the PSID "gene" means the individual is a descendant of one of the original 1968 families by either birth or adoption.

[4]It is tempting to think of this as being a panel of individuals, as we use only family level variables in the analysis. However, the PSID is not well suited to following families through time as family—individuals related by blood, marriage, or adoption—are fluid. Thus, the typical procedure when using the PSID is to follow an individual through time, using data from whatever family that individual happens to be in. As the PSID gene individuals are the only individuals the PSID directly tracts, we follow them. Note that, because the PSID is designed to be used in this way, it remains nationally representative as long as weights are used.

TABLE 1
Distribution of Family Income and Total Family Debt

	Percentiles				
	10	25	50	75	90
Family income	21,729	36,701	61,910	99,748	152,000
Total debt	0	0	25,868	110,000	202,124

Notes: Author's calculations based on PSID from 1999–2009.

Because of the large standard deviations in income and debt, Table 1 reports income and debt by percentiles. The median income of $61,910 is considerably less than the mean, reflecting the skewness of the income distribution. Further, notice that the 25th percentile of total family debt is $0, indicating the large number of families who report zero debt.

4. Trends

Before turning to more formal exploration, we provide an examination of broad trends of interest. Figure 1(a) shows the growth in both total debt and income for households between 1999 and 2009. As the first panel shows, income rose slower than debt, leading to increased leverage. Between 1999 and 2009 average debt rose sharply from about $62,000 to over $85,000 in 2009 (in 2009 dollars). Real income rose much more slowly following the recession of the early 2000s, and the resulting leverage in 2009 stood at close to 100 percent. The results are in broad agreement with trends observed in other datasets such as the Survey of Consumer Finances (Wolff, 2010) and Flow of Funds (see http://www.federalreserve.gov/releases/z1/current/z1.pdf) which provides some measure of confidence for our subsequent empirical exploration.

In the second panel we restrict our sample to families that had positive debt throughout the period to control for the fact that debt is zero for a large number of families. As Figure 1(b) shows, among families with positive debt, average debt exceeded average income by 2003. Figure 1(c) confirms the common understanding that the main driver of debt is mortgage debt, which accounts for the largest fraction of total debt. While other debt remained relatively constant, mortgage debt increased steadily over the entire period, and at a faster rate during the 2000s.

Figures 1(d) and 1(e) depict the differential growth of income and leverage across the income distribution. We split the sample into three income groups based on their level of income in 1999. The figure plots the cumulative percent change of income and debt to income ratios respectively, from 1999 to 2009. Figure 1(e) shows that the lowest and middle income groups had the fastest growth in leverage, totaling about 35 and 30 percent, respectively, over the period. By contrast, the highest income group experienced only an 18 percent increase in leverage.

Our purpose in depicting these trends is to provide some motivation for our estimation of the impact of relative income on leverage patterns. Certainly, Figures 1(d) and 1(e) also reflect life-cycle patterns in both income and debt accumulation. Older families would typically have higher incomes in 1999 and also be paying

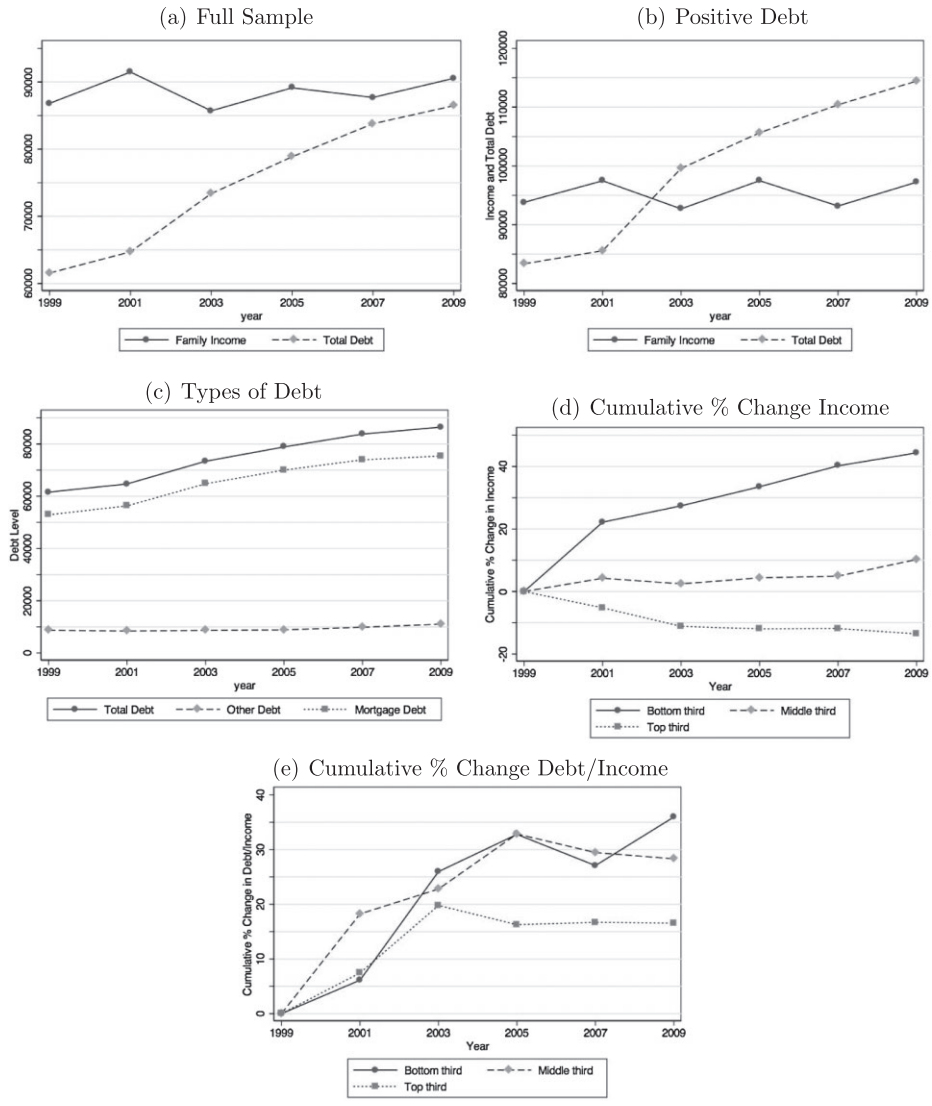

Figure 1. Trends in Family Income and Debt: 1999–2009

Source: Authors' calculations based on PSID core family survey plus wealth supplements from 1999–2009.

down debt accumulated earlier in their life-cycle. Life-cycle effects also help explain declining income for the top third of households in Figure 1(d). Further, it is important to keep in mind that the figures represent average within-panel changes for each income group, not average changes in the income group. The more familiar result, that income for high income families has been growing faster than income for low income families, is based on changes at the average often necessitated by the use of pooled cross-sectional data. It is not surprising to find

TABLE 2
Descriptive Statistics by Income Comparison Groups

	Low	Middle	High	Total
Debt/income	0.71	0.98	0.95	0.86
	(1.13)	(1.12)	(0.95)	(1.09)
Family income	42,082.38	73,628.22	156,522.22	82,554.97
	(40,637.63)	(47,356.20)	(181,952.46)	(110,763.90)
Age of head	37.87	43.09	48.66	42.42
	(12.92)	(12.20)	(10.81)	(12.91)
Married	0.40	0.70	0.86	0.62
	(0.49)	(0.46)	(0.34)	(0.49)
Child present	0.49	0.50	0.44	0.48
	(0.50)	(0.50)	(0.50)	(0.50)

Notes: Authors' calculations based on PSID core family survey plus wealth supplements from 1999–2009.

that a family whose income starts low sees its income grow faster than a family whose income starts high. This is entirely consistent with the observation that high incomes are growing faster than low incomes. The distinction comes from following an individual, as we do here, versus tracing changes at a point in the income distribution, as in the income inequality literature.

Table 2 shows that the high income group, with an average age of 49, is considerably older than the middle and low income groups, with average ages of 43 and 38, respectively, and individuals are considerably more likely to be married. Both the level of income and leverage are higher in the high income group, again suggesting that the trend in leverage partially reflects life-cycle effects. In our formal exploration however, we control for age effects in assessing the impact of relative income on leverage.[5]

5. Veblen Effects in Leverage

A social comparison based utility function suggests that it is not simply one's own absolute position but one's position in comparison to others that also motivates behavior. One is immediately confronted here with identifying a "relevant" comparator group. This is not a trivial exercise since there is no general agreement on the appropriate comparator in the literature. While it is certainly true that imitative behavior has been observed and successfully studied with respect to very small peer groups (see, e.g., Brock and Durlauf, 2001; Duflo and Saez, 2003; Bowles *et al.*, 2014), others have pointed to much larger groups as equally powerful motivators of individual identification and behavior. Cultural tropes are transmitted across media and are imitated at distance. In the empirical literature,

[5]We do not depict an age-adjusted figure in this section since removing the effect of the life-cycle in this context is less than straightforward. Using the standard methods of estimating permanent income, and an analogous concept for debt, would remove precisely the short-term trend that we are trying to capture. Using some measure of residual income and debt presents problems for calculating changes, as the residual from a regression of income on age will result in both negative and positive residual values of income. Finally, using the coefficients on year dummies of a regression of income on age also will not work because we need a time trend within each income group, not across the entire sample, but dividing the sample by income group also stratifies the sample by age.

researchers have found evidence of imitative behavior at the level of small neighborhoods, schools, and workplaces, but have also looked at much larger groups such as the state or nation-state (Bowles and Park, 2005; Luttmer, 2005; Charles *et al*., 2009; Bertrand and Morse, 2012; Oh *et al*., 2012).

As a first step, given that the largest component of debt is mortgage debt and this varies across states, we use state of residence as a reference group. One might like to use census tracts or similarly disaggregated geographical groupings to assess relative consumption patterns. However, the publicly available PSID only provides data at the state level, and hence we use families living in the same state as the primary comparison group. Using the state has the added benefit of reducing the effect of drivers of neighborhood choice, and hence mortgage debt, that have nothing to do with conspicuous consumption (Ioannides and Zabel, 2008). Researchers have found compelling evidence of strong peer comparison within racial categories (Hoxby, 2000). We construct six family categories by combining information on the head of the household across three racial categories (white, black, and other) with two educational categories (less than college and college or above). We then interact the racial and educational categories, respectively, with the individual's state of residence. This combination of location and demographic based groups is frequently used in the existing literature on both happiness and inequality (Luttmer, 2005; Clark *et al*., 2008; Carr, 2013) and the Veblen effects literature (Charles *et al*., 2009).

There are many possible measures of relative income. The behavioral economics literature suggests that social comparisons are localized in time and space; and that comparisons are typically made with reference to those above an individual in the income parade rather than the whole distribution or those below. We assume accordingly that individuals respond to the standard of living of those above them in the income distribution. For an indicator of relative income that possesses this property, we utilize an indicator developed in Brown *et al*. (2008): the proportion of families with income greater than family i, (PG_{igt}), defined as

$$PG_{igt} = \frac{N_{gt} - \sum I[I = 1 \mid inc_{-igt} > inc_{igt}]}{N_{gt}}, \tag{1}$$

where $I \in \{0, 1\}$ is an indicator variable indicating whether a given individual's family income is greater than individual i's family income, i indexes individuals, t indexes time, and g indexes group. PG_{igt} is bounded between 0 and 1 by construction. Descriptive statistics for the relative income measures are provided in Table A1. The means of the proportion greater (PG) variables are roughly 0.50 (as they should be given they are head count variables). Note that, because the dataset includes only one observation per family per year (the PSID gene holder), the indicator function can be thought of as counting families.

As discussed above, we define groups in two ways: the state an individual resides in at time t, and the state by education by race group an individual belongs to. Both education and race are determined by the characteristics of the head of the household, where educational attainment is two groups, having a Bachelor's Degree or not. We want to again emphasize that although the reference group definitions used here may cover a large geographic area, the validity of the analysis

does not hinge on a given individual knowing the characteristics of everyone in the reference group. It only requires that the outcomes of members of each group are positively correlated.

5.1. *Regression Results*

Our key regression is:

$$\Delta \log\left(\frac{D}{Y}\right)_{it} = \alpha + \omega y_{it} + \eta PG_{igt} + \boldsymbol{X}'_{it}\boldsymbol{\beta} + \delta_t + \gamma_i + u_{it}. \tag{2}$$

The dependent variable of interest $\Delta \log\left(\frac{D}{Y}\right)_{it}$ is the change in the debt to income ratio, and $\boldsymbol{X}$ is a vector of controls. The main independent variable is PG_{igt}, where g is an indicator that the comparator household either lives in the same state (s), or lives in the same state and has the same educational and racial category as one ($s/e/r$).[6]

The results of the regressions are shown in Table 3. The table reports six regressions, two individual fixed effects regressions using the full sample, two fixed effects regressions using a restricted sample described below, and two regressions that omit the individual fixed effects and use year fixed effects instead. Overall, we find that, all else equal, an increase in the proportion of the reference group above a given individual in the income distribution is associated with an increase in the growth rate of leverage. To get a sense of the magnitudes of the coefficients on the respective definitions of PG_{igt}, consider the effect of a one standard deviation increase in PG_{igt} on the growth rate of leverage. For the full sample with reference groups defined by the state, a one standard deviation increase in the variable is associated with a 0.16 ($0.29 \cdot 0.5678$) increase in the growth rate of leverage for a given household, compared with an average growth rate of 0.034. Put in another way, for a given household, if the proportion of households within its comparator group that were richer grew by one standard deviation (or equivalently, the household's position in the distribution fell by one standard deviation) holding income fixed, leverage for the household grew by over four times the average rate.

This is an extremely large and implausible effect, and is the result of two forces. First, defining the reference group as the state clearly biases the coefficient upward, as the effect size for the state/education/race reference group is considerably smaller, with a one standard deviation change resulting in a 0.08 ($0.29 \cdot 0.29$) increase in the growth rate of leverage. Second, the standard deviation used is the full panel standard deviation, which significantly overestimates the within-panel variation in the relative income variable (proportion greater), and does not correspond to the variation of the dependent variable which is the average within panel growth rate of leverage. Using the average within-panel standard deviation of 0.15, a one standard deviation increase in the proportion greater is associated with a

[6]It may be worth noting that, since y_{it} is used in the construction of PG_{igt}, η is estimated based on variation due in part to the non-linear relationship between y_{it} and PG_{igt}. We say "in part" because, given that PG_{igt} should be interpreted as measuring a given family's rank in the distribution of reference group family income, it is possible for family income to change without PG_{igt} changing, meaning that identification of the coefficient on PG_{igt} does not come solely from this non-linearity.

TABLE 3
FIXED EFFECTS REGRESSIONS FOR CHANGE IN DEBT/INCOME

Variables	Full Sample		Limited Income Changes		Cross-Section	
Log family income	–0.3571***	–0.4330***	–0.5762***	–0.5881***	–0.1180***	–0.1562***
	(0.0432)	(0.0415)	(0.0837)	(0.0644)	(0.0178)	(0.0138)
PG_s	0.5678***		0.3642*		0.2225***	
	(0.1210)		(0.2086)		(0.0525)	
PG_{ser}		0.2990***		0.3112**		0.1044***
		(0.0952)		(0.1277)		(0.0377)
Presence of children	–0.0909***	–0.0886***	–0.0590	–0.0579	–0.0262**	–0.0223*
	(0.0312)	(0.0311)	(0.0414)	(0.0413)	(0.0130)	(0.0130)
Married	0.0654	0.0565	0.0190	0.0203	0.0252	0.0195
	(0.0416)	(0.0416)	(0.0664)	(0.0667)	(0.0155)	(0.0154)
Age of head	–0.0066	–0.0087	–0.0235*	–0.0246*	–0.0124***	–0.0120***
	(0.0104)	(0.0103)	(0.0141)	(0.0141)	(0.0026)	(0.0026)
Age^2	–0.0001	–0.0000	0.0002	0.0002	0.0000*	0.0000*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Home owner	1.2539***	1.2457***	1.1916***	1.1859***	0.4628***	0.4558***
	(0.0475)	(0.0473)	(0.0754)	(0.0752)	(0.0192)	(0.0189)
Constant	3.3028***	4.3295***	6.0366***	6.2260***	1.3210***	1.7968***
	(0.5659)	(0.5163)	(1.0625)	(0.8036)	(0.2206)	(0.1728)
N	25,618	25,618	12,829	12,829	25,618	25,618
Individual FE	Yes	Yes	Yes	Yes	No	No
Year FE	No	No	No	No	Yes	Yes

Notes: Authors' calculations based on PSID core family survey plus wealth supplements from 1999 to 2009. Standard errors clustered on the individual. Significance levels: *10%, **5%, and ***1%.

0.044 ($0.15 \cdot 0.299$) increase in the growth rate of leverage, and is our preferred estimate.

5.2. *Transitory Income Shocks*

Holding individual income fixed, there are two ways in which the proportion of families with income greater than individual *i*'s family can increase: the family's permanent income growth could be slower than the income growth of other families near them in the income distribution, or the family could experience a transitory negative income shock. Getting at the role of transitory income shocks is important, both because standard consumption smoothing models imply broadly the same relationship as the way we have estimated the Veblen effects hypothesis, and because the large effect of PG_{igt} seen using the full sample standard deviation may be the result of treating changes in PG_{igt} due to differing growth rates of permanent income the same as larger transitory changes.

We deal with this problem in two different ways. The first way is presented in the Limited Income Changes columns of Table 3. With both reference groups, we limit the sample to only those individuals where the average of the absolute value of the growth rate of income is between the 25th and 75th percentiles of the overall average growth rates in absolute values. Because the panels are short, this procedure leaves a small number of larger income changes that are not transitory, but removes any family for the entire period who experienced a large transitory change in income anywhere during the time period, including families with individuals

who go through (short) periods of low or no employment or retirement. This procedure leaves most non-transitory large income shocks such as those due to marriage or a second earner returning to the labor force because, by definition, a transitory shock is short lived which generates two large income changes in the sample window, while these shocks generate only one large change. A family that experiences a large transitory shock to income will have both a large decrease (increase) and increase (decrease) in income during the sample window. This results in an average growth rate of income in absolute values that is very large, and thus excludes them from the sample. With the state reference groups, limiting the sample decreases the coefficient on the relative income variable by about 35 percent from 0.56 to 0.36. Using the smaller reference groups, limiting the sample actually increases the coefficient slightly, suggesting that with the properly specified referenc group, the results are not driven by transitory income shocks.

The second way of dealing with the transitory income shock issue is to change the source of identifying variation to cross-sectional variation. The last two columns of Table 3 report the results of this exercise, replacing the individual fixed effects with year fixed effects. The coefficients on the proportion greater variables are now considerably smaller, though both remain statistically significant. The primary implication of this result is that, even after limiting the sample to individuals with comparatively small changes in family income, it is likely that a portion of the variation captured in the individual fixed effects regressions comes from transitory income changes and the resulting consumption smoothing. This may be the case because we did not remove all of the observed transitory income changes, or because there are transitory shocks that are unobserved due to the fact that the PSID is collected every other year.[7] The second implication of this result comes from the fact that, by changing to year fixed effects, we are also asking a slightly different question. Given that the Veblen effects hypothesis should theoretically hold both in the cross-section and through time, the fact that it holds in the cross-section adds another robustness check to the basic theoretical point, in addition to being a robustness check on this particular estimation of the theory.

Another issue, though not necessarily one that undermines the validity of the above estimations, is that the largest part of debt is mortgage debt, and in the period under consideration there were differential patterns in the growth of lending across states which could mean we are estimating supply-side effects rather than demand side effects (Mayer and Pence, 2008). As a simple way to suggest the importance of supply-side effects for the differences across states in the rise of leverage, we divide the states into those with above median subprime originations and those with below median subprime originations in 2005. Appendix Table A2 provides descriptive statistics for the two groups. In general the characteristics are very similar, although income is slightly higher on average in high subprime states than in low subprime states. Leverage is, however, the same in the two groups of states. This may appear both to be counterintuitive and to rule out the role of

[7]This is a common problem when looking at labor market outcomes and other outcomes where transitions happen quickly and potentially frequently. If a family experiences an income shock shortly after the data is collected in year t, but the shock is corrected before year $t + 2$, consumption smoothing behavior may show up in the stock of debt but not be observable in the flow of income.

TABLE 4

Fixed Effects Regressions for Change in Debt/Income by Amount of Subprime Lending in State

	Low	High
Log family income	–0.3667***	–0.3711***
	(0.0587)	(0.0610)
PG_{ser}	0.2386*	0.2575*
	(0.1336)	(0.1465)
Presence of child	–0.0462	–0.0020
	(0.0510)	(0.0436)
Married	0.3606***	0.2118***
	(0.0700)	(0.0559)
Age of head	0.0214	0.0504***
	(0.0153)	(0.0150)
Age^2	–0.0003*	–0.0005***
	(0.0002)	(0.0002)
Constant	3.4241***	2.7385***
	(0.7409)	(0.7571)
N	11,120	14,498

Notes: Based on authors' calculations of PSID data for 1999 to 2009. Standard errors are clustered on the individual. Significance levels: *10%, **5%, and ***1%.

supply-side effects, but it could be that if one has debt, the debt level is higher in a high subprime state, but there are fewer families with debt.

Table 4 runs our main regression on the two samples separately. The coefficient on PG_{igt} is approximately the same size in both high and low subprime origination states, but is smaller than before and only significant at the 10% level, whereas it was significant at the 1% level in the earlier regressions. This pattern of results suggests that, although there is still strong evidence for Veblen effects, part of the effect of relative income on leverage was driven by supply-side factors that were also correlated with relative income. This makes perfect sense, as borrowing constraints should have been more binding for individuals lower in the income distribution, and thus with higher values of $PG_{S/E/R}$. So, although individuals in high-subprime lending states may have found it easier to borrow and thus could accumulate debt more quickly, all else equal, relative income matters equally in both categories of states for the accumulation of debt relative to income.

6. Conclusion

In this paper we address the following questions using the PSID. First, were low income households more likely to leverage up than higher income households during the increase in household leverage in the early 2000s? And second, was leverage higher when the relative income of a household is lower? Using various specifications, we find compelling evidence in support of both hypotheses. We do not here try and address causality issues. Recent research in behavioral economics provides substantial reason to have some confidence in the notion that relative income and consumption are key drivers of behavior. Our finding here adds to the literature. We identify a dynamic of "keeping up with the neighbors" that may

have been a key and under-appreciated part of the rise in debt in the 2000s among less affluent households. In this paper we are not able to identify the specific reasons for the increase in indebtedness; for example, we cannot say whether this was due to households attempting to move to more affluent school districts, whether they were buying larger houses, or simply whether they were choosing to upgrade and renovate the housing stock. This and other related topics are important areas for further research.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table A1: Descriptive Statistics: 1999–2009
Table A2: Descriptive Statistics by Subprime Lending Rate: 1999–2009