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Abstract

Recent studies of economic inequality almost always separately examine income inequality, consumption and wealth inequality, and hence, these studies miss the important synergy between the three measures explicit in the life-cycle budget constraint. Stiglitz et al. (2009) states: "…the most pertinent measures of the distribution of material living standards are probably based on jointly considering the income, consumption, and wealth position of households or individuals." This paper examines the relationship between the three resource measures, determines how changes in income and wealth affect changes in consumption, and examines whether these changes are more dramatic at higher or lower levels of wealth. Using the Panel Study of Income Dynamics (PSID) from 1999-2013, we examine the conjoint distributions of income, consumption, and wealth for the same individuals. Using this conjoint distribution, we estimate the Euler equation for how consumption changes with respect to changes in income. We find that the overall marginal propensity to consume (MPC) is 0.10. We also show that the MPC is lower at higher wealth quintiles; the MPC is 0.15 for the lowest quintile and 0.06 for the highest quintile. This suggests that low wealth households cannot smooth consumption as much as do other households and therefore they respond more to changes in income. Using this distribution of MPCs, we find that this yields a larger expenditure multiplier, meaning a transfer of wealth to low wealth households would result in an increase in growth by 4 percentage points.

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Recent studies of economic inequality almost always separately examine income, consumption and wealth, and hence, miss the important synergy between the three measures explicit in the life-cycle budget constraint. Stiglitz et al. 2009 states: "…the most pertinent measures of the distribution of material living standards are probably based on *jointly* considering the income, consumption, and wealth position of households or individuals." Recent research shows that these joint distributions are important in evaluating macroeconomic impacts due to the heterogeneity in responses to changes in income and wealth (see Krueger et al. (2015)).

This heterogeneity in the consumption response to income changes can have significant impact on the effectiveness of government fiscal policy. Alan Krueger, in his Council of Economic Advisors inequality address (Krueger, 2012), suggests that with differential responses to income changes across the distribution "… if another $1.1 trillion had been earned by the bottom 99% instead of the top 1%, annual consumption would be about $440 billion higher. This would be a 5% boost to aggregate consumption." By estimating the differential responses to income changes, we evaluate this proposition.

Fisher et al. (2016a) are the first to use the Panel Study of Income Dynamics (PSID) to examine the conjoint distribution of income, consumption and wealth. They find that the correlation between the three measures is high, but not perfect. This paper furthers that earlier work and examines the relationship between the three resource measures, determines how changes in income and wealth affect changes in consumption, and examines whether these changes are more dramatic at lower levels of wealth. The PSID is the only panel data set that includes all three measures over time for the same households. We use the PSID from 1999-2013 to examine how changes in income and the level of wealth affect changes in consumption, which are then used to calculate the marginal propensity to consume (MPC).

Following a long line of research (see for example Zeldes (1989), Hall and Mishkin (1982), Lusardi (1996), Blundell et al. (2008), and Dynan (2012)) that estimate the impacts of changes in income on changes in consumption, we estimate the marginal propensity to consume (MPC) using a broader measure of consumption. Due to the survey questions, most of the early research uses spending on food as the measure of consumption or an imputed measure of non-durable consumption based on spending on food and demographic characteristics.[2] The PSID first introduced something approaching a full measure of consumption and also started collecting wealth in every wave in 1999. Before 1999, the PSID only had spending on food and housing. Thus our analysis starts in 1999, and we use consistent measures of consumption, income and wealth in every wave.

Recent research has demonstrated that the MPCs differ across the income and wealth distribution. For instance, Kaplan, Violante, and Weidner (2014) find the wealthy hand-to-mouth households, with high illiquid wealth but little liquid savings, have the highest MPCs. Johnson et al. (2006) find that consumption response to the 2001 tax rebates were larger for households with low wealth (and income). These differential MPCs are important in examining the impacts of government fiscal policy, as suggested by Krueger (2012). We provide further evidence in support of this research by estimating the MPC by wealth quintile. We are also the

[2] The following papers use the Food consumption measure: Morgan (1971), Hall and Mishkin (1982), Altonji and Siow (1987), Zeldes (1989), Dynan (1993), Carroll (1994), Lusardi (1996), Jappelli, Pischke and Souleles (1998), Ziliak (1998), Stephens (2001), Gourinchas and Parker (2002), Hurst and Stafford (2004), Filer and Fisher (2007), and Gorbachev (2011). Fisher and Johnson (2006), Blundell, Pistaferri, and Preston (2008), Heathcote, Perri, and Violante (2010), Dynan (2012), Attanasio and Pistaferri (2014), Kaplan, Violante and Weidner (2014), Dogma and Gorbachev (2015), Krueger, Mitman, and Perri (2016), Choi et al. (2015) and, Fisher, Johnson, Latner, Thompson and Smeeding (2016) use a broader measure of consumption.

first paper to test whether the marginal propensity to consume changed since the Great Recession using expenditure data.[3]

Using the changes in income and consumption between pairs of periods (basically, biennial changes), we can estimate the Euler equation for how consumption changes with respect to changes in income. We find that the overall marginal propensity to consume (MPC) is about 10 percent, which lies at the low end of the range examined in other research (see Carroll et al. (2017)). We also find that the MPC is lower for higher wealth quintiles, which suggests that low wealth households cannot smooth consumption as much as do wealth holding households at the same income level, and therefore they respond more to changes in income per se. At the other end, wealthy households can more closely, even if imperfectly, follow the life-cycle permanent income hypothesis.

We examine the characteristics of these households, the relationship between the APCs and MPCs, and wealth, and the inter-temporal changes in all three measures. We find that the MPC changes over the fourteen years and examine the differences in the APC and MPC before and after the Great Recession. Given the differences in MPC across wealth (and income) quintiles, we use the simple method in Fixler and Johnson (2014) to illustrate how these different MPCs can be used to construct an autonomous expenditure multiplier that is larger than the standard single MPC multiplier. And hence, redistribution to the lower quintiles will stimulate economic growth. These findings support the broad conclusion in Krueger (2012) that aggregate

[3] Gross, Notowidigdo, and Wang (2016) use credit card data to estimate the marginal propensity to consume out of credit limit increases before, during, and after the Great Recession. Their sample is limited to those who have their bankruptcy flag removed during one of these time periods and therefore had an exogenous increase in the credit limit. Their approach is comparable to Filer and Fisher (2007) who use the PSID to estimate how the effect of bankruptcy flag removal affects the responsiveness of consumption to changes in income.

consumption would be higher if income was transferred from high wealth to low wealth households.

Background

The best way to understand the conjoint distribution is to have income, consumption, and wealth in the same survey.[4] The Panel Study of Income Dynamics (PSID) asks about income, consumption, and wealth in every wave since 1999. Because the PSID contains all three measures, it represents a ready-made source, as evidenced by Krueger et al. (2016) and Fisher, Johnson, Latner, Smeeding and Thompson (2016a).

Economic theory suggests that a household's well-being (as measured by the household's utility) depends on the household's characteristics and its consumption levels. The life-cycle/permanent-income hypothesis (LCPIH) suggests that the household's well-being depends on the current-income stream that occurs over the household's lifetime. The LCPIH assumes households can smooth consumption through personal savings or credit markets. As a consequence, households should change their consumption plans in response to permanent shocks to income and react far less in terms of consumption (responding only to the annuitized value of transitory shocks) if there is uncertainty. At the other extreme, assuming that households have access to complete markets in which they are able to completely insure against any shocks, then consumption should not react to either permanent or transitory income shocks. If households have access to some insurance mechanism (formal or informal), they will be able to smooth out, at least in part, income shocks.

[4] Blundell (2014) in his address to the Royal Statistical Society states the importance of all three measures: "One thing is for sure, the results of the research presented here provide a strong motivation for collecting consumption data, along with asset and earnings data, in new longitudinal household surveys and linked administrative register data."

Over the life-cycle, the LCPIH indicates that a household smooths consumption so that even if income varies significantly over the life-cycle, consumption is less variable than income from year to year. In addition, the hump-shaped income and consumption profile reflects the LCPIH, with income rising until middle age and then falling, and consumption following a similar, although less pronounced, hump-shaped pattern.

If households can completely self-insure against income shocks, the MPC out of permanent shocks and the MPC out of transitory shocks is zero, suggesting that an increase in income inequality generated by changes in permanent or transitory shocks does not affect consumption inequality. Instead wealth inequality increases, which also increases the capacity to address further shocks and allows greater possibilities for intergenerational wealth transfer. On the other extreme if households have zero ability to self-insure and the MPCs instead equal one, then an increase in income inequality completely passes through to consumption inequality, with no change in wealth inequality.

Johnson, et al. (2006) evaluate the consumption response to tax rebates and find that the MPCs change with income and asset levels, yielding larger MPCs for lower income and liquidity constrained households. Misra and Surico (2014) further examine this heterogeneity in consumption response and find that the aggregate impact decreases due to these heterogeneous consumption responses.

Following Baker (2015) and Dynan (2012), we estimate an Euler equation for relationship between the changes in consumption and income. Baker (2015) finds that the income elasticity of consumption of 0.3, which increases with the level of assets (and decreases with debt). Carroll et al. (2017) compare much of this literature, with MPCs ranging from 0.2 to 0.6, which

is much larger than those commonly used in the macro-economic literature. In fact, Carroll et al. (2017) suggest that "some of the dispersion in MPC estimates from the microeconomic literature (where estimates range up to 0.75 or higher) might be explainable by the model's implication that there is no such thing as "the" MPC—the aggregate response to a transitory income shock should depend on details of the recipients of that shock in ways that the existing literature may not have been sensitive to (or may not have been able to measure)." Using a model with preference heterogeneity, they demonstrate the relationship between wealth and MPCs.

Data and Methods

It is important to use a consistent theoretical framework to define these measures. The most comprehensive concept of income and consumption is drawn from the suggestions of Haig and Simons where income represents the capacity to consume without drawing down net worth. Economists have used the equation that income (Y) equals consumption (C) plus the change in net worth (ΔW) as the working definition of Haig-Simons income. No studies use this definition to the fullest extent because no household survey has the necessary variables to create a full measure of Haig-Simons income.[5] Our research goal is to have measures of disposable income, consumption, and net worth that are accurate and as closely linked as possible given the data limitations. Our measures of income and consumption do not completely characterize the Haig-Simons income measure. One particular category missing from both income and consumption are government-provided and employer-provided health benefits, which would lead to lower levels of inequality (see Hardy et al. (2015)). Another uncertain category is the level and

[5] Smeeding and Thompson (2011) discuss the Haig-Simons income measure and construct a "More Complete Income" measure that attempts to account for the realized and unrealized returns on asset income.

frequency of some intergenerational transfers in-vivos, which are likely not included in our measures of income or consumption.

To evaluate all three measures it is necessary to have one data set with all three measures, whether a panel or a series of cross-sections. In this paper we use the PSID that includes all three measures over time. Since 1968, the PSID has collected a broad range of socioeconomic and other information on families on an annual basis and since 1997 on a biannual basis. The PSID first introduced an extensive wealth module in 1984, which was repeated every five years until 1999 and on a biannual basis since then. The PSID first introduced a fairly comprehensive measure of consumption in 1999. Before 1999, the PSID only had spending on food and housing. Our analysis starts in 1999 because it is the first year with all three measures in every wave.

Data are collected in the year of the survey; income is reported for the previous taxable year, wealth is reported for the time of interview (the survey year), and consumption is a mixture of time periods. In our analysis, we use the survey year to represent the year for the resource, convert measures to constant 2013 dollars, adjust by family size using an equivalence scale given by the square root of family size, and use the family level file[6] and longitudinal weights.[7]

Total Family Income is the sum total of taxable, transfer, and social security income of the head, wife, and other family units. We use after tax income, by imputing taxes using a model constructed by Kimberlin et al. (2014) using NBER TAXSIM.

Total household wealth is the sum total of eight asset variables minus debt. Asset variables are farm and business, checking and savings, other real estate (i.e. second home, land, rental real

[6] Results are similar if we exclude the supplemental low-income (SEO) sample, and only use the SRC sample.
[7] We also compare the cross-section results using the family weights and results are qualitatively similar.

estate, or money owed on a land contract), stocks, vehicles, other assets (i.e. life insurance policy), annuity/IRA, and home equity. Up until 2007, debt was total debt. Beginning in 2009, debt is the sum total of debt from farm or business, real estate, credit card, student loan, medical, legal, family loan, or other. While the PSID wealth module also covers all major wealth components—namely, housing wealth, a range of financial and real assets, retirement wealth, and various types of liabilities—it draws on fewer survey items than does the SCF. Total wealth estimates produced from the PSID are comparable to those from the SCF. The primary exception is for the wealthiest 1 to 3 percent of households, which the SCF reaches through its IRS oversample and the PSID does not (Juster et al. (1999) and Pfeffer et al. (2016)).[8]

The definition of consumption changes in the PSID. Up until 2003, consumption is the sum total of food,[9] housing, transportation, education, and child care. Beginning, in 2005, consumption also includes spending on travel, clothing, other recreation, home repair, home furnishings, and home phones. Hence, we use 1999-2003 measure of consumption over the entire period and include a rental value of home-ownership given by 6 percent of the house value.

Several recent papers have judged the quality of the PSID income, consumption, and wealth data in comparison to similar surveys.[10] As shown by Andreski et al. (2014), the consumption measure from PSID is similar to that in the CE. Other research also shows the consistency between the PSID and SCF wealth measures and Krueger, Mitman and Perri (2015) confirm that the trends in income and consumption from the PSID are similar to the trends shown in the

[8] Similar to Wolff (2016), wealth does not include defined benefit retirement or social security holdings. Future work will attempt to include this pension wealth following Devlin-Foltz et al. (2016)
[9] Following Fisher and Johnson (2006) and Attanasio and Pistaferri (2014), we include the amount of food stamps (or SNAP) in the total food consumption.
[10] See Pfeffer et al (2016) for a comparison of the wealth data

national accounts from the Bureau of Economic Analysis (BEA).[11] Fisher and Johnson (2006) demonstrate that the PSID captures more income than the CE, and Andreski et al. (2014) favorably compare the income levels in the PSID to the CPS.

Similar to Krueger et al. (2015), we use this conjoint distribution to examine the differential effects of changes in income and wealth on changes in consumption. These differential effects have important consequences for changes in the economy. If consumption is more sensitive to changes for low-wealth households, distributional changes can impact changes in aggregate consumption.

Results

Before estimating the marginal propensity to consume, we first establish that the average propensity to consume (APC) differs by wealth. Fisher, et al. (2016a) document that the APC falls with income, with an APC above .8 for the bottom 10% and an APC below .6 for the top 10%. Table 1 shows the APCs by wealth quintile and by income quintile for 1999 and 2013. There is a negative relationship between wealth quintile and APC, with the APC for the bottom wealth quintile of .64 and the APC for the top wealth quintile of .56. The APC is steeper by income quintile than wealth quintile, but that is expected because savings is positively correlated with income (Dynan, Skinner, and Zeldes, 2004).

Estimating the Marginal Propensity to Consume

To examine the impact of income changes on consumption inequality, we need to construct the changes in income and consumption over time. Figure 1 illustrates our result. Figure 1A shows

[11] However, Dettling et al. (2015) suggest that only the SCF has levels of wealth accumulation that correspond well to the national aggregates in the Financial Accounts from the Federal Reserve.

the scatter plot between changes in income and changes in consumption between 2005 and 2007. The scatter plot shows that there are many households with very different changes in their income and consumption over the two year period. But the unconditional relationship indicates a positive correlation between changes in income and changes in consumption, with a coefficient of 0.18.[12] Figure 1B limits the households to those in the top and bottom wealth quintiles (show in black for the top and red for the bottom). While the dispersion is similar, the unconditional relationship for each quintile is different. The bottom quintiles shows a higher coefficient (0.37) than the top quintile (0.10), illustrating that households at the bottom of the wealth distribution have a higher MPC than those at the top.[13]

We now turn to our estimation of the impacts of income changes on consumption. Following Baker (2014), we estimate the Euler equation (below) for the change in log consumption on the change in log income, with demographic controls, Z (see Table 2). The controls for year indicate the changing nature of consumption over the Great Recession, with the fall in consumption largest between 2007 and 2009.

$$\Delta lnC_{it-2} = \alpha + \beta \Delta lnY_{it-2} + \delta Z_{it-2} + \rho_1 state_{it-2} + \rho_2 year_{it-2} + \varepsilon_i \quad (1)$$

The dependent variable is the change in log consumption between *t-2* and *t* for household *i*, and the key independent variable is the change in log income between *t-2* and *t*. The coefficient on the change in log income provides an estimate of the elasticity. To obtain the marginal propensity to consume, we need to multiply the elasticity by the average propensity to consume.

[12] Similar to JP Morgan Chase (2015), which uses a panel of consumers that use a JP Morgan Chase-affiliated credit card and JP Morgan Chase-affiliated checking account to measure the volatility of income, we find that almost half of PSID families experience large changes in income and consumption (over +/-30 percent). Future work will attempt to identify the characteristics of the households with these large differences.

[13] Krueger et al. (2016) calculates the changes in mean consumption (and income and wealth) before and after the recession and find that the lowest quintile has the largest impact on the change in consumption over this period. Appendix Table B provides the same calculations as in Krueger et al. (2016) and show similar falls in the changes in consumption.

All models include a state and year fixed effects. We pool all families in 1999-2013. This yields over 35,000 families. We cluster the standard errors for repeat families and use the longitudinal weights in the regressions.

Table 2 shows the various versions of the model. All models include the change in log income, and the columns show how the income elasticity is affected by the inclusion of additional controls. Column (a) shows the base model with only year dummies and state fixed effects, (b) adds control variables of age group, number of adults and children, marital status, race/ethnicity and whether there were changes in marital status and family size between waves. As shown in Table 2, using the base model, the overall income elasticity of consumption is about 0.10. Given an APC of .8, this implies an MPC of 0.08. While lower than those shown in Carroll et al. (2017), these are could be that the longer time period leads to smaller changes. Dynan (2012) and Oh and Reis (2015) also find MPCs of about 10 percent.

These elasticities (and respective MPCs) are lower than those found in Baker (2015). This could be due to the time period; Baker (2015) uses changes in quarterly income and consumption, while the PSID has biennial changes.[14] As shown in Carroll et al. (2017) all estimates use a shorter time period than 2 years. Kaplan et al. (2014) use the PSID to determine the MPCs for the wealthy hand-to-mouth consumers. Using a technique to determine the transitory responses, they find MPCs around .3. Again, our MPC estimates include all income changes (both permanent and transitory), and hence, they will be smaller than previous estimates. The key

[14] We also include asset variables and the interaction with the change in log income (following Baker (2015)). Similar to Baker (2015) and others (see Johnson et al. (2006)), the income elasticity of consumption falls with the level of assets. Column (c) adds an interaction term between the change in log after-tax income and debt/assets; (d) adds an interaction term between the change in log after-tax income and debt/income; (e) adds an interaction terms between change in log after-tax income with net assets

result is that, similar to Kaplan et al. (2014), the MPC for the lowest wealth consumers is much larger than that of the MPC for highest wealth consumers.

The Marginal Propensity to Consume By Wealth

To show the importance of wealth as a form of self-insurance, we include interaction terms with the change in income and the wealth quintile in which the household belongs.

$$\Delta lnC_{it-2} = \alpha + \alpha_i WealthQ_{it-2} + \beta \Delta lnY_{it-2} + \beta_i \Delta lniY_{it-2} * WealthQ_{it-2} + \delta Z_{it-2} + \varepsilon_i \quad (2)$$

Using the base model (b) in Table 2, we create net wealth quintiles based on net wealth in year t-2 (e.g., for 1999-2001 using 1999 net wealth). We create a new variable for being in the wealth quintile ($WealthQ_i$) and then interact this with the change in log income variable to see if consumption is less responsive at higher wealth. Table 3 shows the results for three time periods (1999-2013, 1999-2007, 2007-2013). Again, we pool all households over the waves and use clustered standard errors, and control for demographics. The first panel provides the income elasticity of consumption for the bottom quintile of 0.141, and shows that the highest wealth quintile has a lower elasticity of 0.03.[15] Also note that the elasticity for the third wealth quintile is not statistically different from the elasticity for the lowest wealth quintile. The second and fourth wealth quintiles have an elasticity about half as large as the bottom quintile. As shown in Fisher et al. (2016b), the economic gains in recent years have gone to the top quintile, with the remaining four quintiles experiencing declines in the share of resources held. Thus it seems that the extra wealth held by those in the fourth quintile has not helped these households self-insure against income shocks.

[15] We discuss how these elasticities translate into MPCs below.

The next two panels compare changes before and after the Great Recession. These show that the elasticity is larger before the Great Recession and that the lower elasticity for the highest wealth occurs mostly after the Great Recession.[16] This could be due to the different response to increases in income as compared to decreases, and we evaluate these differences in Table 4. Given the fact that the consumption and income is from the previous year, we conduct an analysis for each pair of waves. Appendix Table A shows that most of the higher MPC in the period before the recession is due to the changes between 2005-2007 (or 2004-2006 just before the recession). The changes between 2007-2009 (or 2006-2008) are much smaller, with a slightly larger elasticity between 2009-2011 (or 2008-2010) at the end of the recession.

Gross, Notowidigdo, and Wang (2016) use credit card data to estimate the marginal propensity to consume out of an increase in credit limit. They find an increase in the MPC during the Great Recession, while we see a fall in the MPC. The difference in the results may be that they are studying an increase in credit limit due to the removal of the bankruptcy flag during a time of negative income shocks. A household that experienced a negative income shock but a positive credit limit shock may have a higher MPC. In addition as we'll show below, we find that households have a larger MPC out of positive shocks than out of negative shocks. Gross et al. (2016) only include positive shocks, and hence, we would predict that they would estimate a higher MPC as we include both positive and negative shocks.

Sensitivity Tests

Tables 4A and 4B compare the results using different samples and consumption measures. Table 4A shows that excluding house value from wealth and restricting to non-elderly adults do not

[16] Including shift parameters in the models in Table 2 for before and after the recession finds that these effects are not statistically significantly different.

change the results. The last column replaces the wealth quintiles with income quintiles to show that the MPCs fall for the highest income quintile. Table 4B compares the use of alternative measures of consumption. The first column uses housing expenses (mortgage payments and property tax) for homeowners instead of the imputed rent (or 6% of property value). Alternatively, the last column uses a measure of consumption that excludes housing. This separates out the direct relationship between housing and wealth and yields a smaller MPC and similar MPCs for the top wealth quintile. Following earlier research that uses the PSID for consumption, we use food at home as the measure of consumption and obtain a larger MPC and smaller MPCs for the top three quintiles (see Table 4B). Finally, using a broader consumption measure (which includes more components after 2007) finds a similar relationship for high wealth households.

Testing for Liquidity Constraints

Finally, we follow Filer and Fisher (2007) to examine the impact of increases and decreases in income. The basic LCPIH model predicts that households do not respond to predictable income changes, and thus consumers behaving as if they follow the LCPIH would not alter their consumption in the face of predictable positive or predictable negative changes. For predictable positive changes, households would borrow against future income, and for predictable negative changes they would draw down savings. However, the consumption of households that do not follow the LCPIH could react to predictable changes in consumption.

The model can be refined to separate out households that are borrowing or liquidity constrained from myopic households. The consumption of a borrowing constrained household would react to predictable increases in household income because the household was unable to borrow against

future income, but a borrowing constrained household would self-insure against predictable negative shocks through their own savings and therefore would not respond to predictable negative income shocks. The consumption of myopic households, on the other hand, responds to predictable negative and positive income changes. They neither borrow nor save in advance of predictable income changes. Previous research has found that high wealth households are more likely to follow the LCPIH, while low wealth households are myopic (Zeldes (1989), Runkle (1991)). Thus we will interact the predictable changes in income with wealth quintile.

We predict the income change following Filer and Fisher (2007), and for those that have a predicted increase in income, the variable for positive change is the predicted value.[17] It is zero for those that have a negative predicted change in income. We use these in a regression (shown in Table 5) in which for those that have a predicted negative change in income, the negative income change variable is the predicted decrease; for those that have a positive predicted increase, the negative income change variable equals zero. This allows us to examine the differential impact of increases or decreases in income on consumption. These results tell us how households might respond to predictable income transfers by wealth quintile, again providing evidence on how a predictable transfer from high wealth households to low wealth households would affect aggregate consumption.

The first column in Table 5 combines the positive and negative changes into one variable, and it shows that the bottom three quintiles react to predictable changes in income, violating the LCPIH. The top two wealth quintiles have no response to predictable changes in income, as the

[17] The sample size is smaller than that used in Table 3 since we are only using those households for which we can predict income.

main effect of 24 percent is completely offset by the interaction term for the top quintiles. This first column also yields a slightly larger elasticity (than in Table 3)

The second and third columns of Table 5 test whether the households are myopic or borrowing constrained. Households in the bottom two wealth quintiles increase consumption by 22 percent in response to predictable income increases, while the three top wealth quintiles have no consumption response to positive income shocks. None of the wealth quintiles appear to respond to predictable negative income shocks. Combined, the results suggest that those in the two bottom wealth quintiles are borrowing constrained, while the top three wealth quintiles follow the LCPIH. The use of predictable changes yields a larger MPC, and a larger difference between the top and bottom wealth quintiles, which suggests that examining the permanent and transitory components are an important next step.[18] Consistent with the results in Table 4, these results show that the consumption is more responsive to positive income changes than to negative income changes.

Estimating an Aggregate Consumption Multiplier

As shown in Fixler and Johnson (2014), we can use these differential elasticities (and MPCs) and calculate a simple expenditure multiplier that does not incorporate any behavioral responses. The purpose of the example below is not to add to the discussion about the magnitude of the multiplier, but rather to show in a simplified way how the incorporation of income distribution might impact an expenditure multiplier. Fixler and Johnson (2014) consider a simple closed Keynesian model (similar to Chipman, 1950) in which the expenditure component captures all

[18] One possible improvement is to use the models in Blundell et al. (2008) and Kaplan et al. (2014) and use the residuals from the regressions in changes in income and consumption to determine the MPCs (similar to Choi et al. (2015)).

expenditures.[19] To compare this with the simple textbook multiplier that assumes constant MPC we would divide the *N*-sector multiplier by 1/*N* so as to obtain the textbook, 1/(1 – *mpc*).

To produce MPCs, we use the elasticities from the model and the APCs by quintile shown in Table 1. This Table demonstrates the usual fall in the APC as income increases; however, these are lower than those obtained using the CE data and lower than those obtained in Fisher et al. (2016b) using the SCF. Table 2 suggests that the elasticities by wealth quintile are {0.141, 0.06, .0.138, 0.062, 0.029}. Using the APCs and the elasticities, we can determine the MPCs by wealth category, {0.123, 0.041, 0.088, 0.038, 0.015} by wealth quintile (see Table 1 for APCs).

Using the simple MPCs by wealth quintile yields a multiplier of 1.07 compared to the multiplier for constant MPCs of 1.05. As a result, an equalizing redistribution will have a small positive impact on aggregate consumption.[20] Using the elasticities by income quintile and the adjusted APCs (accounting for the PSID accounting for 80 percent of spending) yields a multiplier 4 percentage points larger, and using the elasticities obtained in Table 5 yield larger MPCs and a 3% impact on consumption of a similar redistribution.[21] We expect our multiplier to be lower than the one estimated in Krueger (2012) because we are examining a transfer from the top 20% to the bottom 80%, while Krueger focused on a transfer from the top 1%. The top 1% have a smaller APC than the next 19% (Fisher, Johnson, Smeeding, and Thompson, 2015).

Conclusions and Next Steps

[19] Blinder (1975) also uses a simple method to examine redistribution by quintiles.
[20] Auclet and Rognlie (2016) provide an alternative method to examine the impact of differential MPCs on aggregate demand.
[21] Our MPCs are smaller than those obtained in other research. If we use ones closer to the 0.2-0.4 range, then the impact of a transfer increases to 5%.

We find that the overall MPC is about 10 percent, which lies at the low end of the range examined in other research. Our MPC is expected to be lower because we look at two-year changes in income and consumption, while the previous research used shorter changes. We also find that the MPC is lower for higher wealth quintiles, which suggests that low wealth households cannot smooth consumption as much as do wealth holding households at the same income level, and therefore they respond more to changes in income per se. At the other end, wealthy households can more closely, even if imperfectly, follow the life-cycle permanent income hypothesis.

These findings support the broad conclusion in Krueger (2012) that aggregate consumption would be higher with a transfer from high wealth households to low wealth households. In addition, precautionary savings could rise if income was transferred from high wealth to low wealth households. But the extent of these differences are smaller than in Krueger's estimates. His claim is that if $1.1 trillion had been earned by the bottom 99% instead of the top 1%, annual consumption would be about $440 billion higher, a 5% boost to aggregate consumption. Our estimates suggest a more muted response, with about a 4 percent multiplier effect. We expect our estimate to be lower because we analyze a transfer from the top 20% to the bottom 80%. The PSID does not allow us to more closely evaluate the claim in Krueger (2012). Regardless, we find a transfer from the top 20% to the bottom 80% would boost aggregate consumption by 4 percent.

Our data, however, run only until 2013 and aggregate housing values and financial assets increase substantially in recent years (see Bricker et al (2014)). Further, the PSID does not capture the wealth in the top percentiles of the distribution. As a result, the PSID (as compared

the SCF) misses about 40 percent of total net worth held by the top one percent of wealth holders.

In the future, we plan to further examine other methods to separate the transitory from the permanent income changes (as in Kaplan et al. (2014) and Blundell et al. (2008)), and use the data to estimate the MPC with respect to changes in wealth. We also plan to use the longitudinal nature of the PSID to create a household balance sheet and a Haig-Simons measure of income such that income equals consumption plus the change in wealth. The PSID is the only U.S. data set that allows for a full creation of a Haig-Simons measure of income because it is the only data set with income, consumption, and the *change* in wealth over time. This allows us to further examine the relationship between wealth and income changes and their effect on consumption or otherwise classified wealth transfers.

The rise, fall, and change in wealth have been instrumental in financing consumption and stabilizing incomes more generally. The explosion and implosion in home values, the main asset of the middle class, can be juxtaposed with the increase in the longer term value of financial assets, which has benefited mainly the rich. These asset holdings give parental and older (grandparental) generations massive leverage to affect offspring ability to pay for college, finance homes, find good jobs and purchase other key goods that enhance the fortunes and status of younger generations. In this work we have only begun to scratch the surface of these effects in so far as they are reflected in consumption as measured in the PSID.

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Figure 1A: Scatter plot of changes in income and consumption, 2005-2007

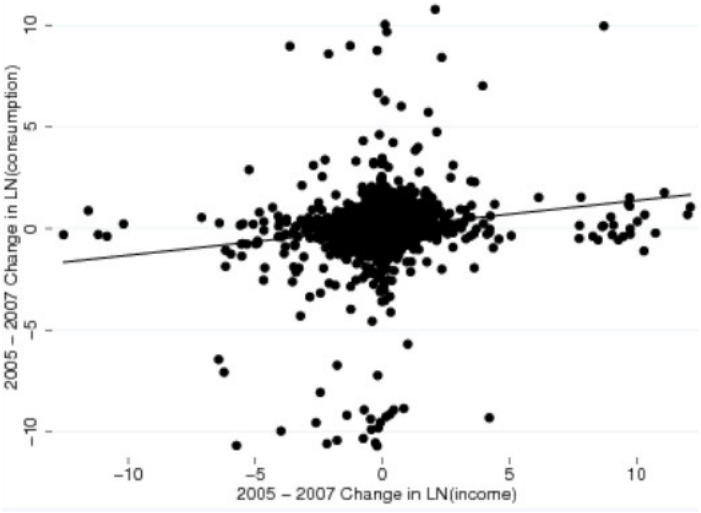

Figure 1B: Scatter plot of changes in income and consumption for top and bottom wealth quintiles, 2005-2007

Table 1: APCs by income and wealth quintile

	Income		Wealth	
	1999	2013	1999	2013
Q1	1.499	1.564	0.636	0.646
Q2	0.778	0.848	0.583	0.634
Q3	0.635	0.674	0.574	0.581
Q4	0.578	0.585	0.547	0.595
Q5	0.401	0.430	0.558	0.546
ALL	0.570	0.585	0.570	0.585

Table 2: Pooled Euler Equation

	a	b	c	d	e
ΔlnY_{t-2}	0.100***	0.095***	0.095***	0.098***	0.141***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.024)
Number of Adults		0.059***	0.059***	0.059***	0.056***
		(0.007)	(0.007)	(0.007)	(0.007)
Number of Children		0.010**	0.010**	0.010**	0.011**
		(0.003)	(0.003)	(0.003)	(0.003)
If Change in family size		-0.030*	-0.030*	-0.029*	-0.028*
		(0.013)	(0.013)	(0.013)	(0.013)
Married		0.012	0.012	0.012	-0.015
		(0.010)	(0.010)	(0.010)	(0.010)
If Change in marital status		-0.082**	-0.082**	-0.082**	-0.076**
		(0.025)	(0.025)	(0.025)	(0.025)
Age		-0.004***	-0.004***	-0.004***	-0.005***
		(0.000)	(0.000)	(0.000)	(0.001)
Black		0.000	0.000	0.001	0.026
		(0.014)	(0.014)	(0.014)	(0.015)
Other		0.022	0.022	0.022	0.028
		(0.014)	(0.014)	(0.014)	(0.014)
Hispanic		-0.053**	-0.053**	-0.053**	-0.037*
		(0.018)	(0.018)	(0.018)	(0.018)
ΔlnY_{t-2} and debt/assets			0.000	0.000	0.000**
			(0.000)	(0.000)	(0.000)
Debt/assets			0.000	0.000	0.000*
			(0.000)	(0.000)	(0.000)
ΔlnY_{t-2} and debt/income				0.000	0.000
				(0.000)	(0.000)
Debt/income				0.000	0.000
				(0.000)	(0.000)
ΔlnY_{t-2} and net assets (ln)					-0.006**
					(0.002)
Net assets (ln)					0.011***
					(0.002)
Constant	0.053***	0.137***	0.137***	0.136***	0.072
	(0.015)	(0.038)	(0.038)	(0.038)	(0.039)
Observations	35,286	35,286	35,286	35,286	35,286
Clusters	7,874	7,874	7,874	7,874	7,874
R^2	0.018	0.027	0.027	0.027	0.031

The dependent variable is the change in log consumption between t and t-2. The demographic characteristics are measured as of t-2, include the debt/assets and debt/income variables. State and year fixed effects are not shown; Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: Panel Study of Income Dynamics, 1999-2013.

Table 3: Euler Equation Estimation with Interactions with Wealth quintile

	All years		1999 – 2007		2007 - 2013	
	b	**se**	**b**	**se**	**b**	**se**
ΔlnY_{t-2}	0.141***	0.027	0.185***	0.049	0.142***	0.031
ΔlnY_{t-2} Wealth quintile (t-2) = 2	-0.076*	0.037	-0.139*	0.061	-0.065	0.043
ΔlnY_{t-2} Wealth quintile (t-2) = 3	-0.003	0.051	-0.086	0.058	0.015	0.074
ΔlnY_{t-2} Wealth quintile (t-2) = 4	-0.079*	0.033	-0.107	0.059	-0.078*	0.039
ΔlnY_{t-2} Wealth quintile (t-2) = 5	-0.112***	0.031	-0.128*	0.053	-0.118**	0.036
Observations	35,286		18,899		21,427	
Clusters	7,874		6,151		6,959	
R^2	0.030		0.036		0.032	
F test of interaction terms						
Wealth quintile == 2 ΔlnY_{t-2}	0.039		0.023		0.136	
Wealth quintile == 3 ΔlnY_{t-2}	0.946		0.142		0.842	
Wealth quintile == 4 ΔlnY_{t-2}	0.018		0.069		0.047	
Wealth quintile == 5 ΔlnY_{t-2}	0.000		0.015		0.001	

The dependent variable is the change in log consumption between t and t-2. Control variables for wealth quintile, race, family size, married, age, change in size/marital status, state, and year are not shown

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Panel Study of Income Dynamics, 1999-2013.

Table 4A: Euler Equation Estimated with Alternative Models, Households and Variables

	Excludes House value from Wealth	Only non-elderly adults	By income Quintile[1]
ΔlnY_{t-2}	0.110***	0.131***	0.102***
	(0.026)	(0.026)	(0.0208)
ΔlnY_{t-2} & Wealth quintile 2	0.031	-0.072	0.015
	(0.044)	(0.038)	(0.032)
ΔlnY_{t-2} & Wealth quintile 3	-0.008	-0.022	0.000
	(0.0454)	(0.057)	(0.030)
ΔlnY_{t-2} & Wealth quintile 4	-0.056	-0.081*	-0.051
	(0.0304)	(0.032)	(0.027)
ΔlnY_{t-2} & Wealth quintile 5	-0.074*	-0.112***	-0.059*
	(0.029)	(0.031)	(0.024)
R^2	0.030	0.039	0.028

Table 4B: Euler Equation Estimation Using Alternative Definitions of Consumption

	Housing expenses[2]	Food at home	Broader measure[3]	Non-housing
ΔlnY_{t-2}	0.142***	0.217***	0.137***	0.131***
	(0.027)	(0.043)	(0.029)	(0.026)
ΔlnY_{t-2} & Wealth quintile 2	-0.072	-0.126	-0.046	-0.051
	(0.037)	(0.064)	(0.044)	(0.038)
ΔlnY_{t-2} & Wealth quintile 3	-0.003	-0.105	-0.024	0.020
	(0.052)	(0.070)	(0.045)	(0.052)
ΔlnY_{t-2} & Wealth quintile 4	-0.070*	-0.104	-0.074*	-0.004
	(0.034)	(0.080)	(0.037)	(0.067)
ΔlnY_{t-2} & Wealth quintile 5	-0.116***	-0.146*	-0.112**	-0.101**
	(0.031)	(0.057)	(0.034)	(0.031)
R^2	0.029	0.014	0.035	0.026

[1]restricted to 2007-2013; [2]using income quintiles instead of wealth quintiles; [3] uses mortgage payments and property for homeowners; [4] uses only non-elderly. The dependent variable is the change in log consumption between t and t-2. Control variables for wealth quintile, race, family size, married, age, change in size/marital status, state, and year are not shown * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: Panel Study of Income Dynamics, 1999-2013.

Table 5: Euler Equation Estimation Using Predictable Changes in Income

	$\Delta\hat{y}_{t-2}$	**(1)** $\Delta\hat{y}_{t-2}+$	**(2)** $\Delta\hat{y}_{t-2}-$
$\Delta\hat{y}_{t-2}$	0.188*	0.240*	0.161
	(0.073)	(0.102)	(0.093)
$\Delta\hat{y}_{t-2}$ Wealth quintile (t-2) = 2	-0.082	-0.030	-0.139
	(0.126)	(0.208)	(0.121)
$\Delta\hat{y}_{t-2}$ Wealth quintile (t-2) = 3	-0.019	-0.237*	0.206
	(0.131)	(0.118)	(0.219)
$\Delta\hat{y}_{t-2}$ Wealth quintile (t-2) = 4	-0.180*	-0.237*	-0.142
	(0.086)	(0.119)	(0.111)
$\Delta\hat{y}_{t-2}$ Wealth quintile (t-2) = 5	-0.196*	-0.219	-0.208*
	(0.081)	(0.116)	(0.101)
Observations	20,348	20,348	20,348
Clusters	5,664	5,664	5,664
R^2	0.019	0.019	0.017

Control variables for race, family size, married, age, change in size/marital status, state, and year are not shown
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: Panel Study of Income Dynamics, 1999-2013. The predictable changes in income are estimated following Filer and Fisher (2007).

Appendix Table A: Using consistent consumption by wave

	1999 – 2001	2001 – 2003	2003 – 2005	2005 – 2007	2007 – 2009	2009 - 2011	2011 - 2013
ΔlnY_{t-2}	0.130***	0.133	0.136	0.364**	0.086*	0.150**	0.053
	(0.023)	(0.085)	(0.072)	(0.116)	(0.037)	(0.049)	(0.030)
Wealth quintile (t-2) = 2	-0.114*	-0.002	0.026	-0.139	-0.106	-0.106	-0.163*
	(0.049)	(0.062)	(0.069)	(0.075)	(0.064)	(0.055)	(0.066)
Wealth quintile (t-2) = 3	-0.115	-0.030	0.131	-0.042	-0.138*	-0.164**	-0.019
	(0.073)	(0.067)	(0.071)	(0.072)	(0.059)	(0.050)	(0.058)
Wealth quintile (t-2) = 4	-0.128	0.032	0.100	-0.097	-0.148*	-0.188**	-0.010
	(0.081)	(0.074)	(0.077)	(0.078)	(0.060)	(0.057)	(0.069)
Wealth quintile (t-2) = 5	-0.125	0.022	0.163*	-0.048	-0.165*	-0.155*	-0.011
	(0.091)	(0.082)	(0.078)	(0.083)	(0.066)	(0.064)	(0.086)
ΔlnY_{t-2} & Wealth quintile 2	-0.089	-0.104	-0.019	-0.293	0.103	0.109	-0.050
	(0.084)	(0.086)	(0.089)	(0.150)	(0.077)	(0.136)	(0.078)
ΔlnY_{t-2} & Wealth quintile 3	-0.108	0.118	-0.137	-0.313*	0.116	-0.005	0.016
	(0.085)	(0.146)	(0.101)	(0.131)	(0.177)	(0.083)	(0.044)
ΔlnY_{t-2} & Wealth quintile 4	-0.080	-0.073	-0.207	-0.214	0.032	-0.093	-0.059
	(0.087)	(0.090)	(0.159)	(0.133)	(0.054)	(0.056)	(0.036)
ΔlnY_{t-2} & Wealth quintile 5	-0.156*	-0.059	-0.057	-0.263*	-0.070	-0.176*	-0.025
	(0.079)	(0.088)	(0.080)	(0.126)	(0.040)	(0.073)	(0.079)
Observations	4,402	4,591	4,866	5,040	5,300	5,488	5,599
R^2	0.043	0.076	0.051	0.076	0.042	0.070	0.039

Control variables for family size, age are not shown
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Table B: Annual changes by wealth quintile before and after recession. Table to match Table 3 in Krueger et al. (2016)

	Income		Consumption		Wealth	
	2005-07	2007-11	2005-07	2007-11	2005-07	2007-11
Q1	-1.0%	-0.5%	4.6%	-0.3%	-12.2%	-32.5%
Q2	-1.7%	-2.5%	0.8%	-2.3%	6.8%	-17.5%
Q3	-0.1%	-1.3%	0.0%	-3.3%	-19.0%	-10.8%
Q4	-0.6%	-1.5%	1.3%	-1.6%	4.9%	-8.7%
Q5	-1.0%	-2.0%	3.2%	-2.6%	10.9%	-5.3%

NOTE: Following Krueger et al. (2016), we keep the identity of the households fixed; for example, to compute the 2005-2007 (Krueger et al. (2016) labels these as 2004-2006 and 2006-2010) change in net worth for Q1 of the wealth distribution, we select all households in the bottom quintile of the wealth distribution in 2005, compute their average wealth (or income or consumption) in 2005 and 2007, and then calculate the percent changes between the two averages and annualize the change over the two year or four year period.