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Stock Market Returns and Consumption

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ABSTRACT

This paper employs Swedish data on households' stock holdings to investigate how consumption responds to changes in stock market returns. We instrument the actual capital gains and dividend payments with past portfolio weights. Unrealized capital gains lead to a marginal propensity to consume of 23% for the bottom 50% of the wealth distribution and about 3% for the top 30% of the wealth distribution. Household consumption is significantly more responsive to dividend payouts across all parts of the wealth distribution. Our findings are consistent with households treating capital gains and dividends as separate sources of income.

IN THE UNITED STATES, STOCKHOLDINGS REPRESENT the largest share of financial assets on households' balance sheets, reaching more than $32 trillion (with about $15 trillion in nonretirement accounts), which makes them comparable in importance to the stock of housing wealth. Given their prominence, movements in stock prices and dividend payments might significantly affect households' consumption and savings decisions. With soaring stock prices, households' savings rate is at a 12-year low, which raises the question of

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whether stock market trends do indeed drive households' spending habits.[1] This shift away from saving, however, could leave some consumers exposed to changes in market conditions. Furthermore, concerns about the consumption-wealth effects of stock market returns have been the main driver of U.S. monetary policy sensitivity to stock price movements (Cieslak and Vissing-Jørgensen (2020)). A natural question that arises is thus how much of a decline in aggregate consumption should we expect if stock prices take a sudden turn for the worse as they did during past recessions?

Despite the central importance of these questions, the literature lacks a comprehensive study on the *causal* impact of changes in stock market wealth on households' consumption. This is due to several challenges. First, aggregate movements in stock prices are endogenous with respect to other macroeconomic shocks, such as expectations of future income growth and consumer confidence (Beaudry and Portier (2006)). Second, due to home bias, exploiting regional cross-sectional variation to control for macroeconomic fluctuations is also not ideal. One could potentially address these challenges by exploiting household-level data such as the Consumer Expenditure Survey (CEX), but the advantages of using such data are counterbalanced by the lack of accuracy in the reported measures of capital gains (Dynan and Maki (2001)).[2] Furthermore, households bias their investments toward their own companies and local industries, resulting in correlations between capital gains and other factors that directly affect their income, which may introduce a new source of endogeneity that is absent in the aggregate data (Benartzi (2001), Coval and Moskowitz (2001), Mitchell and Utkus (2003), Meulbroek (2005)). Finally, given the skewness of stockholdings, it is important to estimate the consumption behavior of households at the top of the wealth distribution, which are usually underrepresented in surveys.[3]

In this paper, we overcome these challenges by using highly granular household-level data from Sweden. Due to the presence of a wealth tax, we are able to obtain a full picture of households' balance sheets at the end of each year from 1999 to 2007, when the tax was repealed. We have data on the universe of households' portfolio holdings at the security level, as well as information about their debt obligations and real estate transactions. To measure consumption, we follow the residual approach proposed by Koijen, Van Nieuwerburgh, and Vestman (2015) and impute consumption as a residual of households' disposable income net of other transactions, and we validate

[1] The Commerce Department has reported that the savings rate was 2.4% of disposable household income in December 2017, the lowest rate since September 2005. The savings rate had risen to 6.6% when the recession ended in June 2009.

[2] There is no direct measure of capital gain in the CEX, and capital gains are imputed based on changes in total security holdings and the amount of sales and purchases during that year. Any such imputation requires strong assumptions on the timing and portfolio rebalancing of households. Moreover, many households report zero capital gains in years in which the stock market performs remarkably well.

[3] See Table A.1 for the distribution of stock holdings in the United States according to the Survey of Consumer Finances.

this measure against survey information. Koijen, Van Nieuwerburgh, and Vestman (2015), Eika, Mogstad, and Vestad (2020), and Kolsrud, Landais, and Spinnewijn (2019) discuss the quality of this imputed measure of consumption based on administrative data and their comparison with survey data. These papers show that the quality of the consumption measure based on the residual method depends on the availability of detailed household-level asset allocation data as well as data on housing transactions.

Even with such data, households' portfolio choices are endogenous and might be driven by omitted factors that also drive their consumption behavior. We address this issue in several ways. First, we exploit the panel nature of our data and estimate all of our regressions using first differences. This allows us to capture time-invariant differences across households that might be correlated with the level of their capital gains or dividend income. Second, we limit the heterogeneity across households' portfolios by estimating the marginal propensity to consumer (MPC) separately for different parts of the wealth distribution. Third, we also exclude stockholdings in households' own industry from their portfolios before computing capital gains and dividends. This ensures that our results are driven by households' holdings in industries other than their own, as fluctuations in such industries are less likely to be correlated with changes in households' income.

One might still be concerned that changes in capital gains and dividend income could be driven by *dynamic* changes in households' portfolios. Indeed, changes in households' portfolios may be driven by factors such as the liquidation of stock holdings due to an expenditure shock or a large durable purchase, the very same factors that are likely responsible for household consumption. We therefore implement a simulated IV strategy where we instrument the variations in capital gains and dividend income with the capital gains and dividend income that would have accrued had the household kept its portfolio the same as observed in previous years. Intuitively, the portfolio weights in previous years should not be determined by future shocks that drive both stock returns and consumption choices. In other words, our identification comes from the stickiness in households' portfolios, for which we find strong evidence in our data.

Our first main result is that the MPC out of (unrealized) capital gains for households in the top 30% of the financial wealth distribution is about 3% and does not exhibit significant variation between, for instance, households in the 70^{th} to 90^{th} percentile and households in the top 5% of the wealth distribution. In contrast, the MPC for households in the bottom half of the distribution is significantly higher at about 23%. However, it is worth noting that these households own less than 7% of overall stockholdings. Our estimates are robust to directly controlling for realized capital gains, which we observe for a subsample. Intuitively, households can freely respond to changes in unrealized capital gains by adjusting their savings decisions.[4] In further tests, we also

[4] Note that this is also why transaction costs, related to the liquidation of stock holdings, are unlikely to drive the difference between the MPC for capital gains and dividends.

condition on households sharing the same employer, which ensures that they share a similar income stream, and provide several tests to show that our estimates are not driven by measurement error. Overall, the results show that households' consumption is responsive to paper wins.

Moreover, consistent with buffer stock models of consumption, such as Zeldes (1989), Carroll (1997), Gourinchas and Parker (2002), and the extension of these models to life-cycle portfolio choice as in Cocco, Gomes, and Maenhout (2005), we show that what determines the heterogeneity in MPC out of capital gains is not financial wealth per se, but rather the ratio of financial wealth to average income. The MPC out of capital gains of buffer stock households, defined as households with financial wealth less than six months of their disposable income, is almost 40%, but, conditional on not being a buffer stock household, their MPC is almost invariant with respect to wealth at about 3%.

Second, consistent Baker, Nagel, and Wurgler (2007), we find that households are significantly more responsive to changes in dividends. Indeed, for all of our wealth groups, the MPC out of dividends is around 40% to 60%, that is, more than 10 times the MPC out of capital gains for the top 50^{th} percentile of the wealth distribution. It is worth mentioning that this result is not driven by a potentially endogenous sorting of households with higher levels of consumption (relative to their income) into stocks that pay more dividends. This is because all of our estimates are based on within-household variation in consumption that is caused by changes in the same firms' dividend payments. Although it is hard to reconcile this result with a fully rational model without transaction costs, our result on MPC out of dividends and capital gains is consistent with near rational behavior whereby households separately optimize their consumption with respect to capital gains and dividend income as if they were independent of each other.[5] This interpretation is consistent with the so-called free dividend fallacy identified by Hartzmark and Solomon (2019): investors view capital gains and dividend income as separate attributes of a stock.

Finally, we explore the mechanisms driving the results. We find evidence consistent with life-cycle models such as Gourinchas and Parker (2002), where older and unconstrained households have higher MPC to transitory income (or wealth) shocks, since they consume those capital gains over a shorter period of time and face significantly less uncertainty about their lifetime income and wealth.

Our findings are most closely related to Baker, Nagel, and Wurgler (2007) and Hartzmark and Solomon (2019). Baker, Nagel, and Wurgler (2007) exploit cross-sectional variation in households' consumption, capital gains, and dividend income in CEX, in addition to using data from a large discount brokerage. The authors document that households' consumption and withdrawal behavior is significantly more responsive to dividend income than to capital gains.[6]

[5] See Baker, Nagel, and Wurgler (2007) for a comprehensive discussion on the inconsistency of this result with a fully rational model.

[6] When using data from the brokerage accounts, Baker, Nagel, and Wurgler (2007) proxy for consumption expenditures using net withdrawals from the accounts. In contrast to a zero MPC for

Our results confirm the main finding of Baker, Nagel, and Wurgler (2007) and suggest that the significant difference between MPC out of capital gains and dividend income is not driven by measurement error in capital gains, endogeneity of households' portfolio choice, or lack of data on the household balance sheet outside a brokerage account. Moreover, our results are helpful in discerning between the different underlying theories. Indeed, our estimate of a significantly positive MPC out of capital gains allows us to conclude that near rational behavior, whereby households treat capital gains and dividends as separate sources of income, might be a better description of households' behavior than a mental accounting model in which households consume out of dividends but not capital gains, which is the leading explanation for the differential MPCs out of dividend and capital gains in Baker, Nagel, and Wurgler (2007).

Hartzmark and Solomon (2013) and Harris, Hartzmark, and Solomon (2015) investigate the impact on stock prices of investors' demand for dividend income. Hartzmark and Solomon (2019) show that, in contrast to Miller and Modigliani (1961), investors do not fully appreciate that dividends come at the expense of price decreases. Our results show that this fallacy translates into differential consumption responses, which suggests that it might have aggregate effects on the real economy.

Our results also contribute to the extensive literature that attempts to measure households' MPC. For example, Johnson, Parker, and Souleles (2006), Johnson et al. (2013), Agarwal and Qian (2014), and Jappelli and Pistaferri (2014) discuss estimates of MPC out of one-time transfers like tax rebates. In contrast, Baker (2018) and Kueng (2018) estimate MPC out of more regular income shocks. Most of this literature finds MPCs for nondurables of about 20% and for total consumption between 60% and 80%. Our estimates of MPC out of dividend income are in line with these estimates, especially once one takes into account the fact that the majority of stockowners are not financially constrained.

Also closely related is the literature linking housing wealth and stock wealth with consumption expenditures; see Davis and Palumbo (2001), Case, Quigley, and Shiller (2005, 2013), Carroll, Otsuka, and Slacalek (2011), Carroll and Zhou (2012), Dynan and Maki (2001), Guiso, Paiella, and Visco (2006), and Paiella and Pistaferri (2017). More recently, Chodorow-Reiche, Nenov, and Simsek (2020) exploit regional heterogeneity in stock market wealth to identify the causal effect of stock price changes on labor market outcomes. The estimated MPCs out of capital gains in both groups of papers range from as low as 0% to as high as 10%.[7] Poterba (2000) and Paiella (2009), as well as Table A.2, provide a more detailed review of the literature on stock market wealth

capital gains when they use CEX, they estimate a 2% MPC when they analyze brokerage account data.

[7] See Mian and Sufi (2011), Aladangady (2017), Campbell and Cocco (2007), Cloyne et al. (2019), and Agarwal and Qian (2017) for estimates of MPC out of housing wealth that are based on microdata.

and consumption. Our paper contributes to this literature by ensuring that the measurement error on individuals' stockholdings of is minimal and that households in the top of the wealth distribution are not underrepresented.[8] Moreover, the data on households' holdings of each individual security help us distinguish between exogenous changes in the capital gains of households due to market movements and the endogenous variation due to changes in households' portfolios.

The rest of the paper is organized as follows. Section I describes the data and provides summary statistics. Section II lays out our empirical strategy. Section III presents the main results, while Section IV presents several tests showing that measurement error is not the main driver of our results. Section V explores potential mechanisms for our findings by investigating heterogeneous responses to capital gains. Section VI presents additional robustness checks. Section VII discusses implications of the paper's findings and concludes.

I. Data

To construct our analysis sample, we begin with administrative data containing information on all Swedish residents, including information on income, municipality of residence, basic demographic information, and detailed wealth data. For information on households' wealth, we mainly use the Swedish Wealth Register (Förmögenhetsregistret), collected by Statistics Sweden for tax purposes between 1999 and 2007, when the wealth tax was abolished. The data include all financial assets held outside of retirement accounts at the end of each tax year (December 31) as reported by different sources. Financial institutions provided information to the Swedish Tax Agency on customers' security investments and dividends, interest paid, and deposits. Importantly, this information was reported even for individuals below the wealth tax threshold.[9]

Since these data were collected for tax purposes, we observe an end-of-year snapshot of each listed bond, stock, or mutual fund held by individuals,

[8] Dynan and Maki (2001) argue that the imputation of household-level capital gains based on the CEX responses might be problematic. For instance, they mention that in the 1995 to 1998 period, a period of very strong market growth, 30% of households with positive security holdings reported no change in their security holdings. Therefore, instead of using capital gains based on CEX, they impute the level of stock holding of each household in the beginning of each year and assume that all households experience the aggregate market return on their portfolio.

[9] During this time period, the wealth tax was paid on the assets of the household, including real estate and financial securities, with the exception of private businesses and shares in small public businesses (Calvet, Campbell, and Sodini (2007)). In 2000, the wealth tax was levied at a rate of 1.5% on net household wealth exceeding SEK 900,000. This threshold corresponds to $95,400 at the end of 2000. In 2001, the tax threshold was raised to SEK 1,500,000 for married couples and nonmarried cohabitating couples with common children and 1,000,000 for single taxpayers. In 2002, the threshold rose again to SEK 2,000,000 for married couples and nonmarried cohabitating couples and 1,500,000 for single taxpayers. In 2005, the threshold for married couples and cohabitating couples rose to SEK 3,000,000 (Black et al. (2017)).

reported by their International Securities Identification Number (ISIN).[10] Using each security's ISIN, we collect data on the prices, dividends, and returns for each stock, coupons for each bond, and net asset values per share for each mutual fund in the database from a number of sources, including Datastream, Bloomberg, SIX Financial Information, Swedish House of Finance, and the Swedish Investment Fund Association (FondBolagens Förening).[11] This additional information allows us to compute the total returns on each asset, as well as the capital gains and dividends paid to each individual.

From these data, we also observe the aggregate value of bank accounts, mutual funds, stocks, options, bonds, debt, debt payment, and capital endowment insurance as well as total financial assets and total assets. We use data from the Income Register to measure disposable income for our sample. As a result, we are able to obtain a close-to-complete picture of each household's wealth portfolio.

It should be noted that during the 1999 to 2005 period, banks were not required to report small bank accounts to the Swedish Tax Agency unless the account earned more than 100 SEK in interest during the year. From 2006 onward, all bank accounts above 10,000 SEK are reported. In surveys, 99% of Swedes aged 15 and above have a bank account, which indicates that in reality the people who are measured as having zero financial wealth probably have some bank account balance. We follow Calvet, Campbell, and Sodini (2007), Calvet and Sodini (2014), and Black et al. (2017) and impute bank account balances for households without a bank account using the subsample of individuals for whom we observe their bank account balance even though the interest earned is less than 100 SEK. As a robustness check, we run our analysis for the subsample of households for which the imputed balance accounts for less than 10% of the total reported bank accounts and confirm that our results are not sensitive to this design choice.

Since we are interested in the effect of capital gains on consumption, we limit our analysis sample to households with a portfolio in the previous period. Furthermore, we restrict attention to households in which the head is younger than 65 years of age.

Additionally, to mitigate potential measurement errors in households' asset changes and consumption, we follow the restrictions that Koijen, Van Nieuwerburgh, and Vestman (2015) impose on the data.[12] In particular, we limit the sample to households with a fixed number of household members between two consecutive periods, those that remain in the same municipality, and those

[10] Two exceptions to this are the holdings of financial assets within private pension accounts, for which we only observe total yearly contributions, and "capital insurance accounts," for which we observe the account balance but not the asset composition. The reason is that tax rates on these two types of accounts depend merely on the account balances and not on actual capital gains.

[11] For a more in-depth description of this component of the data, see Calvet, Campbell, and Sodini (2007, 2009), who use the Swedish Wealth Register for the period 1999 to 2002.

[12] See table XIII of Koijen, Van Nieuwerburgh, and Vestman (2015) for the effect of each of these steps on their sample size. The effects of these restrictions on our sample size are detailed in Table A.3.

for which none of the household members are self-employed or own nonlisted stocks, due to valuation problems. Using the real estate transaction register, we drop households that have cash flow from real estate transactions.[13] We also drop observations for which a household member owns any derivative product (e.g., options), since it is difficult to value those assets correctly, and households for which the calculated financial asset return on the portfolio of stocks and mutual funds is in the bottom 1% or top 1% of the return distribution in each year.

Finally, to mitigate measurement error, we remove households with extreme changes in financial cash flow between two consecutive periods. This could happen for reasons such as bequests or inter vivos transfers from family members, which we do not observe. We drop households for which the changes in financial cash flow are in the top or bottom 2.5% in the corresponding year-specific distribution.[14]

As mentioned before, when measuring capital gains and dividends, we distinguish between assets that belong to firms that are active in the same industries in which household members work versus firms in other industries and exclude those assets that belong to households' industry of activity from their portfolio. To do so, we categorize each security held by an individual in our sample into a four-digit NACE industry code and do the same for the firm in which a person works. This ensures that our results are driven by households' holdings in industries other than their own, as fluctuations in such industries are less likely to be correlated with changes in household income, which reduces the concern that the relation between capital gains and household consumption is driven by a household's expectation about its future income.

Table I presents detailed summary statistics for the main variables of interest for our base sample. The main takeaway is that there is significant heterogeneity across households along all dimensions. For instance, average consumption ranges from 235,000 SEK in the bottom 50% of the financial wealth distribution to 592,000 SEK for the top 5%.[15] Although the average value of stock wealth is around 27,000 SEK among the stockholders in the bottom 50% of the wealth distribution, it is worth around 715,000 SEK in the top 5%. Also, for the sample of people participating in the stock market, about 45% of their total financial wealth is stock wealth (including both direct holdings of stocks and indirect holdings of stocks through mutual funds) for the bottom 50%, versus 55% for the top decile. There is also some heterogeneity within each

[13] As explained in Koijen, Van Nieuwerburgh, and Vestman (2015), this is because any error in the recorded transaction price of houses can introduce a new source of measurement error. Using the same specification as in Table III but including households involved in a real estate transaction, we find that there is no statistical relationship between capital gains and being involved in a real estate transaction. In particular, the coefficient estimate on the impact of capital gains on having a real estate transaction is –0.001 and for dividend payments is 0.002 with standard errors of 0.004 and 0.007, respectively.

[14] As we show later in the paper, our results are not sensitive to this threshold.

[15] Ranking in the distribution of financial wealth is based on financial wealth in year $t - 2$ and is conducted before all other aforementioned restrictions are imposed.

Table I
Summary Statistics

This table reports summary statistics for financial characteristics as well as imputed consumption of households in different wealth groups. Each observation refers to a household-year. Monetary values are reported in 1,000 SEK. The sample covers the period 2001 to 2007 and is restricted to households (i) that participate in the stock market in two consecutive periods, (ii) in which the head is younger than 65 years of age, (iii) with a fixed number of members in two consecutive periods, (iv) that remain in the same municipality, (v) for which none of the members are self-employed, owns nonlisted stocks, or owns derivative products, and (vi) that have neither moved nor received cash flows from the sale of real estate. We also drop households for which we observe nonidentified dividend payments. Finally, we drop households for which the calculated financial asset return on their portfolio of stocks and mutual funds is in the bottom 1% or the 1% of the return distribution in each year, the change in financial cash flow is in the bottom or top 2.5% of the corresponding year-specific distribution, dividend income over three-year average income is in the top 0.5% of the distribution, capital gains over three-year average income is in the bottom or top 0.5% of the distribution, or consumption over three-year average income is in the bottom or top 0.5% of the distribution. Ranking in the distribution of financial wealth is based on financial wealth in year $t - 2$ and is conducted before all other restrictions are imposed. Financial wealth includes bank accounts, bond holdings, and stockholdings. Stock wealth includes both direct holdings of stocks and holdings of mutual funds. Income includes both labor income and financial income minus dividend income plus transfers. Portfolio gain is the passive return on the portfolio of the household as of the previous year. Dividend income is based on the dividends of identified assets. Consumption is imputed according to equation (1).

	p10	p25	p50	p75	p90	p99	Mean	*SD*
Panel A: Entire Sample (6.35 Million Observations)								
Financial wealth	18.12	48.93	128.82	319.7	690	2,115	278	442.5
Stock wealth	2.62	13.30	50.96	155.7	378.9	1,376	147.4	285.9
Income	119.9	168.9	256.9	379.8	482.5	741.3	285.9	321.3
Consumption	115.4	165.6	261.9	400.2	549.8	984.3	307.2	255.3
Capital gain	−17.64	−1.05	1.03	9.57	36.23	204.5	6.15	57.73
Dividend	0.001	0.081	0.465	1.670	4.634	20.83	1.851	4.568
Panel B: 0 to 50th Percentile of Financial Wealth (2.49 Million Observations)								
Financial wealth	8.41	19.79	44.66	83.55	131.6	274.2	60.80	59.44
Stock wealth	0.65	3.98	14.90	37.64	69.67	157.91	27.30	35.73
Income	93.95	138.9	188.7	288.5	382.7	525.7	217.2	112.5
Consumption	103.7	140.3	194.8	301.4	418	708.3	235.1	140.6
Capital gain	−3.76	−0.25	0.28	2.34	7.21	26.88	1.11	8.18
Dividend	0.00	0.012	0.115	0.376	0.782	2.008	0.287	0.546
Panel C: 50th to 70th Percentile of Financial Wealth (1.65 Million Observations)								
Financial wealth	50.67	103.35	184.36	305.2	465.3	829	228.7	178.7
Stock wealth	9.24	32.48	86.95	173	292.9	610.1	125.77	131.6
Income	124	170.6	252.4	370.8	466.2	684.5	279.7	159.4
Consumption	114.4	164.7	257.2	386.2	521.2	899.5	295.7	282.8
Capital gain	−23.12	−3.08	2.263	13.08	34.02	111.6	4.61	32.62
Dividend	0.014	0.213	0.799	1.907	3.599	9.134	1.450	2.102

(*Continued*)

Table I—*Continued*

Panel D: 70th to 90th Percentile of Financial Wealth (1.62 Million Observations)								
Financial wealth	72.83	142.7	290	562.3	927.7	1,765	413	382.4
Stock wealth	12.14	40.96	117.49	281.4	541.5	1,265	213.8	268.4
Income	167.5	229.9	332.6	421.8	511.7	727.5	337.7	139.6
Consumption	149.5	222.6	331.2	452.6	588.1	975.1	356.9	189.9
Capital gain	−31.24	−3.57	2.87	16.66	47.25	179.8	6.348	50.62
Dividend	0.058	0.348	1.202	3.242	6.921	19.63	2.673	4.249
Panel E: 90th to 95th Percentile of Financial Wealth (361,000 Observations)								
Financial wealth	140.4	280.8	579.4	1,061	1,630	2,848	757.7	633.8
Stock wealth	25.65	86.27	245.3	558	985.5	2,065	400	448.4
Income	212.5	298.9	404.8	511.4	621	892.5	417.7	1,181
Consumption	200.7	296.8	423.4	568.9	737.6	1,203	455.7	523.8
Capital gain	−77.13	−6.49	8.83	48.83	125.3	372.9	18.52	109.7
Dividend	0.193	0.847	2.755	7.089	13.78	34.44	5.398	7.408
Panel F: 95th to 100th Percentile of Financial Wealth (226,000 Observations)								
Financial wealth	218	456.4	965.6	1,791	2,787	5,380	1,299	1,206
Stock wealth	44.26	151.1	437.8	990.2	1,748	3,742	714.6	821.7
Income	253.4	354.1	478.1	616.3	771.4	1,296	507.8	243.3
Consumption	253.6	376.5	536.5	733.4	977.7	1,681	591.6	332.7
Capital gain	−126.6	−11.93	15.25	90.69	230.4	651.5	37.37	191.0
Dividend	0.418	1.659	5.445	13.81	26.50	67.03	10.48	14.34

financial wealth bin as the standard deviations for our main variables are still noticeable. Our research design aims to explain part of this heterogeneity as a function of the returns on households' portfolios.

II. Research Design

This section describes our empirical strategy. First, we follow the approach proposed by Koijen, Van Nieuwerburgh, and Vestman (2015) to impute consumption expenses. Specifically, we impute consumption expenditure from the household budget constraint by combining information from the Swedish registry data on income, detailed asset holdings, and asset returns that we collect from third-party sources. For each household i, we compute consumption as

$$c_{it} = y_{it} - \textit{Debt Interest Payment}_{it} + \Delta \textit{Debt}_{it} - \Delta \textit{Bank Account}_{it} - \textit{Active Financial Saving}_{it} - \textit{Active Housing Saving}_{it} - \textit{Pension Contribution}_{it}. \quad (1)$$

Intuitively, consumption is the difference between households' after-tax labor and financial asset income (plus transfers plus rental income from renting out owned houses), y_t, and the payment on existing debt, financial and housing savings (which do not include capital gains), and pension contributions. We

also take into account changes in the indebtedness level. The granularity of the Swedish tax records allows us to measure the right-hand side of equation (1).

This approach has the advantage of allowing us to build a panel of the consumption measure for each household. However, it does have some limitations. For instance, stock holdings are observed at an annual frequency, which means that we have to ignore changes in stock prices and active portfolio rebalancing within a year, as well as gifts and transfers. Eika, Mogstad, and Vestad (2020) show that conditional on having information on real estate transactions, taking into account stock transactions within a year does not reduce measurement error much.[16]

Having imputed consumption expenditures, we are interested in estimating the following specification relating consumption to capital gains and dividends:

$$c_{it} = \alpha_i + \gamma_t + \beta_1 Capital\ Gain_{it} + \beta_2 Dividend\ Income_{it} + \epsilon_{it}, \tag{2}$$

where β_1 and β_2 are the main coefficients of interest, α_i denotes household fixed effects, and γ_t denotes time fixed effects. More formally, we estimate

$$c_{it} = \alpha_i + \gamma_t + \beta_1 (X_{it} \cdot r_t) + \beta_2 Dividend\ Income_{it} + \epsilon_{it}, \tag{3}$$

where X_{it} is a vector of household i's shareholdings in the beginning of year t (which we approximate with holdings that we observe on the last day of year t – 1), r_t is the return during period t on portfolios held in the beginning of the period, and $Dividend\ Income_{it}$ is the observed dividend income of household i in period t.

By exploiting the panel nature of our data set and estimating first differences, we control for time-invariant household characteristics that might affect both consumption choices and capital gains. More specifically, we estimate

$$\begin{aligned}\Delta c_{it} = {} & \beta_1 (X_{it} \cdot r_t - X_{it-1} \cdot r_{t-1}) + \beta_2 (Dividend\ Income_{it} - Dividend\ Income_{it-1}) \\ & + \beta_3 \Delta Income_{it} + \beta_4 \Delta Wealth_{it-1} + \beta_5 ND_{it,t-1} + \delta_t + \epsilon_{it},\end{aligned} \tag{4}$$

where we also control for the change in disposable income (net of dividend payment) between time t – 1 and t, the change in lagged financial wealth, time fixed effects, and a dummy for whether the household received dividend payments in either of the two periods.

However, even after excluding households' own-industry stockholdings (as explained before), both the change in capital gains and the change in dividend income in equation (4) contain not only an exogenous component that arises from changes in market returns to each stock (r_t) or changes in dividend payments per share, but also an endogenous component that comes from changes in household portfolio allocation X_{it}. In particular, the change in capital gains (equivalently for dividends) can be rewritten as $X_{it-1} \cdot (r_t - r_{t-1}) +$

[16] Following Koijen, Van Nieuwerburgh, and Vestman (2015), in our main analysis we exclude a few households with negative imputed consumption. Our results are qualitatively and quantitatively the same without excluding those observations.

$(X_{it} - X_{it-1}) \cdot r_t$. Although variation in the first term is driven by variation in stock market returns, variation in the second term is driven entirely by changes in the portfolio endogenously made by the household.

For instance, consider a household that receives a positive income shock and as a result increases its consumption. The positive income shock can also result in an expansion of the portfolio and therefore a positive change in capital gains, since $(X_{it} - X_{it-1})$ will be positive. Alternatively, consider a household that received an expenditure shock in period $t - 1$ and liquidated part of its portfolio to finance the shock. Since the shock is a one-time shock, everything else being fixed, Δc_{it} will be negative. However, because the household liquidated part of its portfolio in $t - 1$, $(X_{it} - X_{it-1})$ will be negative and therefore the change in capital gains will be negative. These are just two examples of why one might observe a positive correlation (assuming that the market return in that year was positive) between changes in consumption and capital gains without that correlation being driven by the causal impact of capital gains on household consumption.

Our main proposed solution to address the endogeneity concern above is to employ passive changes in returns $(X_{it-1} \cdot (r_t - r_{t-1}))$ and passive changes in dividends $(X_{it-1} \cdot (D_t - D_{t-1}))$, where D_t and D_{t-1} are dividend payments per share at time t and $t - 1$, to instrument for actual changes in total portfolio returns $([(X_{it} \cdot r_t) - (X_{it-1} \cdot r_{t-1})])$ and total dividends $(Dividend\ Income_{it} - Dividend\ Income_{it-1})$ in the first-difference regression.[17] By doing so, we capture the effect of changes in actual returns from what would have been household *i*'s capital gains and dividend income, assuming no changes in its portfolio.[18] Intuitively, under this setup, any variation in portfolio allocations cannot drive our results, which mitigates endogeneity concerns. In theory, the weights can change significantly from year to year, but we show that households' portfolio choice is relatively stable and that our instruments strongly predict the actual capital gains and dividends.

Our baseline specification is an IV estimation of equation (4) for different wealth groups. Specifically, we separately identify coefficients for households between the 5th and the 50th, 50th and 70th, 70th and 90th, 90th and 95th, and 95th to 100th percentiles of the financial wealth distribution. The coefficients β_1 and β_2 capture the MPC for every dollar of capital gains and dividends.

We devote Section V to discuss and investigate whether measurement error in capital gains and consumption could bias our estimates.

III. Main Results

In this section, we present our main results. We start by reporting the ordinary least squares (OLS) results for specification (4), where the returns are

[17] To compute passive changes in dividends, we obtain data on dividend payments per share from Datastream.

[18] Calvet, Campbell, and Sodini (2009) use a similar strategy to calculate the share of risky assets in household portfolios in the absence of rebalancing.

Table II

Stock Returns and Consumption—OLS Regressions

The table reports the OLS regression of changes in households' consumption as a function of changes in their capital gains and dividend income, $\Delta c_{it} = \beta_1 \ \Delta Capital\ Gain_{it} + \beta_2 \ \Delta Dividend\ Income_{it} + \beta_3 \Delta Income_{it} + \beta_4 \Delta Wealth_{it-1} + \beta_5 ND_{it,t-1} + \delta_t + \varepsilon_{it}$. The table reports separate regressions for each wealth group. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Consumption				
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.531	0.217	0.113	0.053	0.038
	(0.017)***	(0.007)***	(0.004)***	(0.005)***	(0.006)***
Dividend	0.385	0.311	0.362	0.308	0.170
	(0.122)***	(0.049)***	(0.039)***	(0.057)*	(0.030)**
Disposable income	0.767	0.786	0.691	0.696	0.761
	(0.004)***	(0.012)***	(0.020)***	(0.004)***	(0.014)***
Lag wealth	6.089	8.504	9.060	8.017	1.704
	(0.081)***	(0.121)***	(0.201)***	(0.198)***	(0.776)**
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.087	0.091	0.066	0.097	0.123

driven by the actual portfolio weights. The results here are due to changes in capital gains and dividend income that are generated by passive returns due to market movements and endogenous rebalancing of portfolios by households between the two periods. Comparing these results with the IV estimates (in Table III) sheds light on the importance of the endogeneity concern.

Table II presents the results. We find that households in the bottom 50% of the wealth distribution consume about 53 cents for every dollar of capital gains. This MPC declines monotonically with household wealth to about 4 cents for the top 5% of the distribution. We find a larger reaction of consumption to dividend payments. Except for the households in the top 5^{th} percentile of the wealth distribution, households consume about 30 to 40 cents for every dollar of dividend income. For households in the top 5% of the wealth distribution this accounts to 17 cents per dollar. Although these estimates account for possible endogeneity arising from households' own-industry exposure, they do not address the endogeneity concern related to changes in capital gain or dividend income due to changes in households' portfolio.

To address the latter endogeneity concern, we next focus on the IV estimates of specification (4), where households' capital gain and dividend income are instrumented by their passive capital gain and passive dividend income. The first-stage results are presented in Panel A of Tables A.4 and A.5. Table A.4 shows that passive capital gains strongly predict actual capital gains, which is

Table III

Stock Returns and Consumption—IV Regressions

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income when changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income: $X_{it-1} \cdot (r_t - r_{t-1})$ *and* $X_{it-1} \cdot (D_t - D_{t-1})$, where X_{it} is a vector of the stockholding shares of household i in the beginning of year t, while r_t and D_t are vectors of stock returns and dividends as defined in Section III of the paper. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Tabel I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Consumption					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.233	0.068	0.037	0.027	0.028
	(0.026)***	(0.008)***	(0.005)***	(0.007)***	(0.007)***
Dividend	0.560	0.601	0.512	0.587	0.386
	(0.109)***	(0.050)***	(0.038)***	(0.057)***	(0.030)***
Disposable income	0.766	0.786	0.690	0.696	0.661
	(0.004)***	(0.012)***	(0.020)***	(0.004)***	(0.014)***
Lag wealth	6.991	8.251	8.820	7.867	1.683
	(0.081)***	(0.120)***	(0.196)***	(0.194)***	(0.766)**
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.081	0.089	0.062	0.097	0.123

consistent with evidence on the persistence of households' portfolio allocations. Interestingly, the explanatory power of passive capital gains for total capital gains increases with household wealth, as can be seen from an increase in the R^2 of the regressions in the first stage. Although for the bottom 50^{th} percentile of the wealth distribution, changes in passive capital gains explain 36% of the variation in total capital gains, the same number is around 80% for the top 5% of the wealth distribution. These results suggest that the endogeneity concern is a more important problem for households in the lower part of the wealth distribution. Table A.5 provides similar evidence for dividend payments and confirms that passive dividend income is a strong predictor of total dividend income. It is worth noting that the data we use to estimate passive dividend income (from Datastream) have lower coverage than our data on stock returns (which come from six different sources, including Datastream) and thus our estimated coefficients on the effect of passive dividend income on actual dividend income are smaller than the analogous coefficients in the capital gains regression. This is also reflected in the lower R^2 values of the regressions reported in Table A.5.

We further find that disposable income and lagged financial wealth are only weakly related to capital gains and dividend income, and that the first-stage

regression coefficients remain the same in the absence of these control variables. Panel B of Tables A.4 and A.5 also reports the first-stage estimates for capital gains and dividend income without including the controls. The results confirm that our instruments are not correlated with observable controls and that adding controls does not change the explanatory power of our instruments for actual capital gains and dividend income.

As in Table II, each column in Table III presents the average MPC out of capital gains and dividends for a specific wealth group. All specifications include disposable income (net of dividend payments) and a lagged measure of financial wealth as controls, as well as year fixed effects and a dummy for whether the household has received dividend payments in the two periods. Moreover, our specification in first differences captures time-invariant household characteristics that might be correlated with the consumption decision.

We find that the highest MPC belongs to the bottom 50^{th} percentile of the wealth distribution, for which it is about 23 cents for every dollar increase in capital gains. The MPC decreases significantly to about 3 cents for households in the top 30^{th} percentile of the wealth distribution. The second row of Table III shows that the MPC out of changes in dividends is significantly larger than the MPC for capital gains in all wealth groups, at about 40 to 60 cents for all wealth groups.

These results are consistent with models of buffer stock households, such as those proposed by Zeldes (1989), Carroll (1997), Gourinchas and Parker (2002), and, more recently, Kaplan and Violante (2014), that predict households with low liquid wealth exhibit higher MPC from temporary income or wealth shocks.

Table IA.I in the Internet Appendix reports results of the same regressions without any controls.[19] This analysis ensures that our results are not contaminated by the fact that we do not use exogenous variation in households' income. Tables IA.II.1, IA.II.2, and IA.II.3 in the Internet Appendix show that our results are robust to alternative restrictions in the sample construction. Where specifically, Table IA.II.1 reports results when we do not exclude observations with negative imputed consumption, Table IA.II.2 restricts our sample to households for which the total balance of bank accounts (imputed or not) is less than or equal to 10% of the reported bank accounts,[20] and Table IA.II.3 drops households for which the change in financial cash flow is in the top or bottom 1% of the distribution in each year (as opposed to 2.5% in the base sample). Finally, in Table IA.III in the Internet Appendix, we allow for a lagged impact of capital gains and dividend income on households' consumption and find similar results as for the baseline specifications.

What can explain the difference in the MPC out of capital gains and MPC out of dividends? Baker, Nagel, and Wurgler (2007) discuss in detail why this difference is inconsistent with fully rational behavior but is in line with mental

[19] The Internet Appendix is available in the online version of this article on *The Journal of Finance* website.

[20] Imputed bank accounts, on average, account for less than 1% of total bank accounts for this sample.

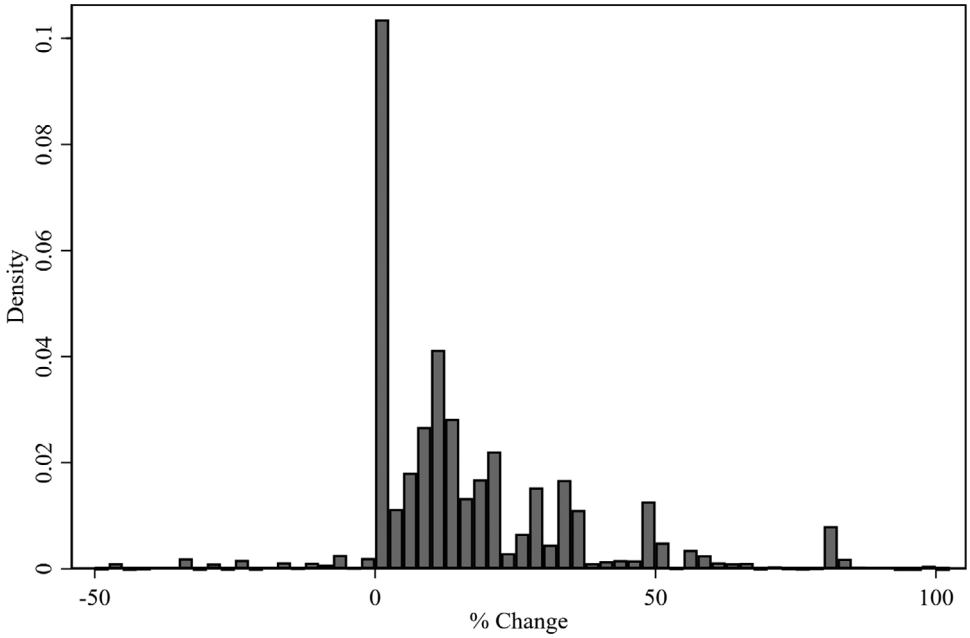

Figure 1. Distribution of percentage of annual changes in dividend payments. This figure displays the distribution of the percentage of annual changes in dividend payments weighted by dividend amount at the firm level. The sample includes both domestic and foreign firms from Datastream and covers the period 1999 to 2007.

accounting by households (Shefrin and Thaler (1988)). At the root of the inconsistency with a fully rational model is the fact that, to the extent that stock prices reflect the value of all future dividends, any change in dividend payouts should not have any additional effect on household consumption. Although it is difficult to reconcile our findings with a fully rational model, our result on MPC out of dividends versus capital gains is consistent with near-rational behavior in which households optimize their consumption with respect to capital gains and dividend income as if the two were independent from each other. In particular, in our data, dividend income changes are significantly more persistent than changes in capital gains (as shown in Figure 1). Thus, to the extent that households consider capital gains and dividend income as separate sources of income, this can rationalize an MPC out of dividend income that is significantly larger than MPC out of capital gains.[21]

[21] In the extreme case in which any change in dividend payments is permanent, the "optimal" response of households in this near-rational framework is to increase their consumption by one dollar for each one-dollar increase in their dividend income. Alternatively, if the price of a security follows a random walk, a one-dollar increase in stock price today does not have any predictive power about future movements in the stock price. In that case, the optimal response of household consumption to this one-time wealth shock is the same as the consumption response of the household to a one-time temporary income shock—since households can always transfer a dollar

A. Capital Gains, Dividend Income, and Components of Household Saving

The depth of our data and the fact that we observe all components of the household balance sheet allow us to go a step further and study not only the response of household consumption to stock market returns, but also the relation between capital gains and dividend income and each component of household financial saving. This analysis also sheds light on how shocks to capital gains or dividend income can propagate to other markets through households' balance sheets.

Table IV presents the results. Panel A reports the impact of capital gains on household active financial saving and its components.[22] Each cell corresponds to a separate regression. For example, the first row reports the impact of capital gains on the total cash flow of households when estimated separately for each wealth group. By construction, these coefficients are equal to the MPC estimates of capital gains times –1. The first row in Panel B reports the impact of dividend income on households' active financial saving. Again, by construction these coefficients are equal to 1 minus the estimated MPC out of dividend income (reported in Table III). The estimated coefficients for dividend income show that, on average, households save 40% to 60% of their dividend income.

We next we investigate the response of different components of households' balance sheets to capital gains and dividend income. Row (a) in Panel A of Table IV shows that households in the top 50th percentile of the wealth distribution reduce their savings in stocks by about 10 cents with respect to one-dollar increase in their portfolio value (i.e., 90 cents net increase in the value of their portfolio in response to one dollar of capital gains). This effect comes from both selling some of their existing stocks and, more importantly, adjusting their savings and purchase of new stocks, which will not incur any transaction cost. Rows (b) and (c) of Panel A show that households use part of this additional cash flow (from either liquidating stocks or reducing their savings in stocks) to pay down their debt and increase their holdings in their bank accounts. Row (a) of Panel B shows that, indeed, households in the top 50th percentile of wealth distribution reinvest about 30 to 50 cents of each dollar of income from dividends in stocks. Rows (b) and (c) show that they also move some of the dividend income in their bank account and use another 10 cents to pay down debt.

B. Realized versus Unrealized Capital Gains

Thus far, we have focused on the effects of capital gains on households' consumption, regardless of whether such gains are realized or not. This focus is driven partly by data limitations—since we are unable to observe stock transactions for most of the sample period, we cannot cleanly identify the price at

of transitory income shock to a dollar of wealth and vice versa—and is equal to the annuity income of one dollar, which is significantly less than one.

[22] Note that our imputed consumption is equal to household disposable income minus household active financial saving.

Table IV

Stock Returns and Active Financial Saving—IV Regressions

The table reports results of the IV regression of changes in one-year active financial saving and its components as a function of changes in capital gains and dividend income for each wealth group. Each cell corresponds to a separate regression. Portfolio gains and dividend income are instrumented by passive capital gains and passive dividend income. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Active Financial Saving					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Panel A: Capital Gain and Components of Household Financial Saving					
1. Portfolio return	−0.223	−0.068	−0.037	−0.027	−0.028
	(0.026)***	(0.008)***	(0.005)***	(0.007)***	(0.007)***
(a) Portfolio	−0.313	−0.118	−0.100	−0.088	−0.074
	(0.024)***	(0.006)***	(0.008)***	(0.008)***	(0.012)***
(b) Bank accounts	0.004	0.022	0.022	0.043	0.047
	(0.008)	(0.004)***	(0.004)***	(0.007)***	(0.009)***
(c) Debt	0.098	0.043	0.043	0.017	0.021
	(0.015)***	(0.006)***	(0.004)***	(0.005)***	(0.007)***
(d) Private pension	0.000	0.000	0.006	0.005	0.001
	(0.001)	(0.001)	(0.001)***	(0.001)***	(0.004)
(e) Bonds	−0.005	−0.003	0.002	0.005	0.008
	(0.005)	(0.002)	(0.002)	(0.003)*	(0.005)
(f) Capital insurance	−0.004	−0.009	−0.008	−0.010	−0.031
	(0.003)	(0.001)***	(0.001)***	(0.002)***	(0.003)***
(g) Debt service	−0.003	−0.003	−0.002	0.000	0.000
	(0.001)***	(0.000)***	(0.000)***	(0.001)	(0.001)
Panel B: Dividend Income and Components of Household Financial Saving					
1. Dividend	0.440	0.399	0.488	0.413	0.614
	(0.110)***	(0.053)***	(0.039)***	(0.057)***	(0.028)***
(a) Portfolio	0.179	0.291	0.351	0.283	0.462
	(0.027)***	(0.031)***	(0.030)***	(0.122)***	(0.033)***
(b) Bank accounts	0.140	0.056	0.041	0.034	0.064
	(0.049)***	(0.052)	(0.047)	(0.068)	(0.045)
(c) Debt	0.109	0.049	0.088	0.089	0.077
	(0.104)	(0.051)	(0.027)***	(0.036)**	(0.035)**
(d) Private pension	0.000	0.000	0.001	0.001	0.004
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)***
(e) Bonds	0.000	0.001	0.004	0.003	0.002
	(0.014)	(0.021)	(0.015)	(0.016)	(0.017)
(f) Capital insurance	0.000	0.001	0.003	0.003	0.005
	(0.009)	(0.004)	(0.011)	(0.090)	(0.010)
(g) Debt service	0.012	0.001	0.000	0.000	0.000
	(0.004)***	(0.002)	(0.001)	(0.001)	(0.001)

Table V

Realized versus Unrealized Capital Gain—IV Regression

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income, controlling for realized capital gains. Changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income: $X_{it-1} \cdot (r_t - r_{t-1})$ and $X_{it-1} \cdot (D_t - D_{t-1})$, where X_{it} is a vector of the stockholding shares of household i in the beginning of year t; while r_t and D_t are vectors of stock returns and dividends as defined in Section III of the paper. The sample is restricted to the period 2005 to 2007 (i.e., 2006 and 2007 in the difference regressions). Other controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t or in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Consumption				
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.172	0.051	0.042	0.046	0.043
	(0.041)***	(0.017)***	(0.012)***	(0.015)***	(0.013)***
Dividend	0.648	0.494	0.516	0.483	0.495
	(0.200)**	(0.058)***	(0.084)***	(0.087)***	(0.035)***
Realized cap. gain	0.430	0.485	0.116	0.212	0.101
	(0.049)***	(0.027)***	(0.055)**	(0.031)***	(0.056)*
Disposable income	0.736	0.793	0.686	0.703	0.735
	(0.007)***	(0.006)***	(0.041)***	(0.058)***	(0.018)***
Lag wealth	6.903	7.139	10.488	9.316	6.603
	(0.104)***	(0.145)***	(0.225)***	(0.344)***	(0.451)***
Observations	771,036	501,804	420,437	121,349	91,315
R^2	0.101	0.082	0.086	0.089	0.119

which households bought the stocks, which makes it impossible to compute realized capital gains.

However, between 2005 and 2007, households' realized capital gains for different asset categories were reported in the Capital Income Registry. Table IA.IV in the Internet Appendix reports detailed summary statistics for realized and total capital gains during this period. We exploit this additional piece of information to try to shed light on whether the realized capital gains are the only determinant of changes in households' consumption. The hypothesis is that, if all of the estimated coefficients are driven by the realized capital gains, then the coefficient on our measure of capital gains should decrease when we add realized gains as an additional control. Since we have this additional information for only three years, we first estimate our baseline IV regression in equation (4) for the subsample and report the results in Table IA.V in the Internet Appendix. The table shows that the coefficients on both capital gains and dividends for the sample are similar to those for the full sample (Table III).

Table V presents the results. We find that, although an increase in realized capital gains is positively correlated with an increase in consumption, the

coefficient on our measure of total capital gains (including both realized and unrealized capital gains) is almost unaffected.

It should be noted that while our estimated coefficient for total capital gains relies on passive variation in capital gains that is not affected by household choices, realized capital gains are affected by households' endogenous decision to rebalance their portfolio (e.g., a household receives an expenditure shock and liquidates part of its stockholdings to smooth that shock), and therefore the estimated coefficient can be biased upward.[23]

The fact that households' consumption is responsive to unrealized capital gains suggests that in response to a positive capital gain, households do not necessarily need to liquidate their stocks to increase their consumption. Rather, they can reduce (or increase) their savings rate, which in turn affects their expenditures. Adjustment through the change in savings rate is also tax advantageous because doing so allows households to avoid paying capital gains tax. In sum, it seems that adjusting the savings rate is an important channel through which households' consumption responds to capital gains.

IV. Measurement Error

One potential concern with our analysis above is that the lack of transaction-level data may introduce measurement error in both capital gains and imputed consumption, which could result in a biased MPC estimate (Baker et al. (2018)). In this section, we investigate both theoretically and empirically the extent to which this is a concern in our setting.

A. Measurement Error in Dividends

It should be emphasized that our data include a measure of total dividends earned by the household each year. As a result, we use *actual* dividend income, and not imputed dividends, in our measure of imputed consumption and as our right-hand-side variable in the estimation of the MPC out of dividend income. Specifically, households' portfolios in previous years are used only to construct of passive changes in dividend income, which is used only as an *instrument* for *actual* changes in dividend income. Therefore, a change in the household's portfolio during the year will not lead to any error in the measure of total dividend income. Consequently, measurement error in dividend income is not likely to be a source of bias in our estimates of MPC out of dividend income.

B. Measurement Error in Capital Gains

Unlike dividend income, unrealized capital gains are not taxed and therefore our measure of capital gains is a noisy measure of actual capital gains. We now

[23] Meyer and Pagel (2019) use the liquidation of mutual funds as an exogenous source of variation in realized capital gains and find an asymmetric response of households to realized capital gains.

examine whether the measurement error in our imputed capital gains could bias the MPC estimates. We first discuss the requirements for the estimate of MPC in levels to be unbiased. We then extend our framework to the first-difference estimates used in the paper. It should be noted that all of our main analyses based on Swedish data control for time fixed effects. This means that we are only exploiting the cross-sectional variation in stock returns. Therefore, throughout this section we assume that the expected return of the assets is equal to 0.

B.1. Measurement Error in Capital Gains and Level Regressions

We assume the true relation between consumption c_{it} and capital gains R_{it} is given by

$$c_{it} = \beta R_{it} + \varepsilon_{it}. \tag{5}$$

However, not having transaction-level data results in measuring R_{it} with error. We define δ_{it} as the measurement error in estimating the capital gain of household i in period t:

$$\tilde{R}_{it} = R_{it} + \delta_{it}, \tag{6}$$

where $\tilde{R}_{it}$ is the imputed capital gain.

This error in the measurement of capital gains affects our measure of imputed consumption and implies that the relation between actual consumption and imputed consumption ($\tilde{c}_{it}$) is

$$\tilde{c}_{it} = c_{it} + \delta_{it} + \mu_{it}. \tag{7}$$

Consequently, the relation between imputed consumption and imputed capital gains is

$$\tilde{c}_{it} = \beta \tilde{R}_{it} + (1 - \beta)\delta_{it} + \mu_{it} + \varepsilon_{it}. \tag{8}$$

Therefore, a necessary condition to estimate an unbiased MPC out of capital gains in our setting is for the measured capital gains ($\tilde{R}_{it}$) to be uncorrelated with the measurement error in capital gains (δ_{it}).

To shed more light on the assumptions required for our MPC estimates to be unbiased, assume that each year is divided into two subperiods, but we only observe the household's portfolio in the first subperiod of the year. In this case, we can write

$$R_{it} = X_{it}^1 \cdot r_t^1 + X_{it}^2 \cdot r_t^2, \tag{9}$$

where X_{it}^{j} is the vector that contains the holdings of household i in subperiod j in year t and r_t^j is the vector of market returns in subperiod j of year t.[24] Assuming that all trades between year t and year $t+1$ happen at the end of year t, the measured capital gains are

$$\tilde{R}_{it} = X_{it}^{1} \cdot \left(r_t^1 + r_t^2\right) = X_{it}^{1} \cdot r_t, \tag{10}$$

where r_t is the vector of total market returns for each stock in year t. Therefore, measurement error in capital gains is given by

$$\delta_{it} = \left(X_{it}^{1} - X_{it}^{2}\right) \cdot r_t^2 = u_{it} \cdot r_t^2, \tag{11}$$

where u_{it} is defined as the within-year change in the household's portfolio. The requirement for the MPC estimates in levels to be unbiased is that the measured capital gains $X_{it}^{1} \cdot r_t$ be uncorrelated with δ_{it}. This requirement implies that changes in the household's portfolio (u_{it}) need to be uncorrelated with the portfolio of the household at the beginning of the year (X_{it}^{1}), with the market returns in that subperiod (r_t^2), and with the market returns in the previous subperiod (r_t^1). The independence of the household's initial portfolio from subsequent changes in the household's portfolio does not seem unreasonable. The independence of changes in a household's portfolio and the return on the portfolio in that subperiod also follows directly from the lack of households' ability to time the market.

However, changes in the number of shares held by the household (and not the value of the household's stockholdings per se) and in the market return in the first subperiod (r_t^1) can be correlated, for example, due to a positive feedback in trading behaviors. If households tend to invest a higher fraction of their income in the stock market when the market return is higher, there will be a negative correlation between our measurement error in capital gains (δ_{it}) and imputed capital gains and as a result our estimates of the MPC out of capital gains will be biased downward. Alternatively, if households tend to respond to positive capital gains by rebalancing their portfolio and liquidating part of their portfolio (either to consume or to keep the fraction of their investment between stocks and nominal assets constant), there will be a positive correlation between δ_{it} and the market return in the first subperiod. However, here the size of the bias is also a function of the correlation between the household's portfolio return in the first subperiod and the household's portfolio return in the second subperiod (i.e., $E[(X_{it}^{1} \cdot r_t^1)(u_{it} \cdot r_t^2)]$).

The discussion above suggests that whether the measurement error in capital gains and imputed capital gains are correlated is an empirical question. Using the annual snapshots of household portfolios in Sweden, we cannot test directly whether the lack of transaction-level data results in any error in our estimates. We therefore employ external data to provide evidence on this question. Specifically, we use transaction-level data from a large brokerage in

[24] Note that X_{it}^{1} is the same as X_{it} in Section III, that is, the vector of household i's stockholdings on the first day of year t (or the last day of year $t-1$).

the United States supplemented with monthly dividend distributions from the Center for Research in Securities Prices (CRSP).[25] Following the data preparation steps in Baker, Nagel, and Wurgler (2007) yields a data set that contains monthly household information on total portfolio value, net withdrawals, capital gains, and dividend income as shares of the previous month's assets. Similar to Baker, Nagel, and Wurgler (2007), we use withdrawals as a proxy for consumption expenditures. Also similar to Baker, Nagel, and Wurgler (2007), we account for outliers by excluding household-month observations for which CRSP stocks and mutual funds do not account for at least 75% of the portfolio value in month $t - 1$, excluding households whose portfolio value falls below \$10,000 or whose dividend information is missing in months t to $t - 11$, and excluding household-month observations for which the absolute value of net withdrawals exceeds 50%. This leaves us with 98,951 household-month observations.

We construct measures of annual net withdrawals, annual capital gains, and dividend income for those households present in our data set for at least three years. We also use the annual snapshots of the data (households' portfolio holdings as of the end of December each year) to construct measures of net withdrawals, capital gains, and dividend income that we would have estimated if we only had annual data. The net withdrawals measure based on annual data incorporates a proxy for stocks and funds bought and sold between year t and year $t + 1$ using midyear (June) prices.

Column (1) of Table VI provides evidence on the correlation between measurement errors in capital gains due to lack of monthly data and passive annual capital gains in levels. Column (2) replicates this same analysis after normalizing the independent and dependent variables by the value of households' previous-year assets, following Baker, Nagel, and Wurgler (2007). In both columns, we find that errors in the passive capital gains and measurement error in the imputed capital gains are uncorrelated, which implies that estimates of MPCs based on annual data are unbiased. To illustrate this point more directly, column (3) replicates table VI, Regression 3 of Baker, Nagel, and Wurgler (2007) and estimates net brokerage withdrawals on total dividends and total returns using monthly data.[26] Since the main objects of interest in our analysis are the relations between consumption on the one hand and capital gains and dividend income on the other hand at an annual frequency, as opposed to monthly frequency, we next use the same data but construct measures of annual household withdrawals, annual capital gains, and dividend income. Column (4) reports the results for the same specification as in column (3) using annual household data constructed by aggregating the monthly withdrawals, capital gains, and dividends and reporting their annual values as

[25] See Barber and Odean (2000) for more details on the data. We are grateful to Terrence Odean for providing the data.

[26] The small difference between our result and that in Baker, Nagel, and Wurgler (2007) is likely due to our using slightly different data on the dividend payments of mutual funds. This is because of the missing CUSIPs for mutual funds in CRSP data (see Pástor, Stambaugh, and Taylor (2015) for details on missing CUSIPs for mutual funds and various ways to address it).

Table VI

Measurement Error Robustness—Measurement Error in Capital Gains

The table reports regression results of the consumption measure (net withdrawals) as a function of capital gains and dividend income. The data are transaction-level data from a large brokerage in the United States (see Barber and Odean (2000) for more details) supplemented with monthly dividend distributions from CRSP. The data preparation follows the same steps as in Baker, Nagel, and Wurgler (2007), which results in a data set containing monthly household information on total portfolio value, net withdrawals (the consumption measure), capital gains, and dividend income. Column (1) shows the relationship between the measurement error in imputed capital gains due to a lack of transaction-level data and passive annual capital gains based on an annual snapshot of the data. In columns (2) to (5), similar to Baker, Nagel, and Wurgler (2007), the dependent variables and all right-hand-side variables are scaled by the previous year's assets—for example, column (2) is scaled by assets in year $t-1$ and column (3) is scaled by assets in month $t-12$. Column (2) repeats the analysis in column (1) but for the normalized variables. Column (3) replicates the table 6, Regression 3 result in Baker, Nagel, and Wurgler (2007). Column (4) investigates the relationship between net annual withdrawals and capital gains and dividend income based on monthly data. Column (5) only uses annual snapshots of the data to estimate the relationship between annual consumption and annual capital gains and annual dividend income. The net withdrawals and capital gains measures incorporate a proxy for stocks and funds bought and sold during the year using midyear (June) prices. Constants are not reported in the table. Robust standard errors are reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Capital Gains Measurement Error		Net Withdrawal (as Share of Last Year Assets)		
	Level	Share of Last Year Assets	Monthly	Annual based on Monthly Data	Annual based on Snapshot
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Returns in month t			0.025 (0.003)***		
Dividends in month t			0.666 (0.046)***		
Annual capital gains based on monthly data				0.037 (0.012)***	
Annual dividend based on monthly data				0.439 (0.165)***	
Annual passive capital gains based on annual snapshot data	−0.022 (0.020)	−0.005 (0.003)			0.036 (0.013)***
Annual dividend based on annual snapshot data	−0.036 (0.106)	−0.014 (0.029)			0.339 (0.167)**
Observations	2,146	2,146	98,757	2,146	2,146
R^2	0.022	0.001	0.003	0.011	0.008

shares of households' previous-year assets. One can think of this as the relation between annual consumption (net withdrawals) and annual capital gains and dividend income in the absence of measurement error due to a lack of transaction-level data.[27] Column (5) uses only annual snapshots of the data to construct annual consumption, annual capital gains, and annual dividend income and therefore is the closest in spirit to our setting. Given the fact that in these data the measurement error in capital gains is not correlated with the passive capital gains, it is not surprising that our estimated MPCs based on annual data and monthly data are almost the same. The estimated "MPCs" out of capital gains and dividend income using the brokerage data in the United States mirror the results that we find for Swedish households, further validating our main estimates.

In sum, this exercise provides evidence that the measurement error due to not observing intrayear transactions is likely orthogonal to the measured "passive" return. This could be because of the unpredictable nature of changes in holdings within the year and the fact that changes in holdings do not predict returns. In other words, actual "active" returns are measured returns plus noise uncorrelated with the passive return.[28]

B.2. Measurement Error in Capital Gains and First Difference Regressions

We now discuss bias due to capital gains measurement error while estimating the MPC out of capital gains in first differences. Extending equations (9) to (11) to this new setting, for the OLS regression in the first differences to be unbiased, the correlation below needs to be equal to 0:

$$\begin{aligned}\operatorname{cov}\left[\tilde{R}_{it}-\tilde{R}_{it-1},\delta_{it}-\delta_{it-1}\right] &= \operatorname{cov}\left[X^1_{it}\cdot r_t - X^1_{it-1}\cdot r_{t-1}, u_{it}\cdot r_t^2 - u_{it-1}\cdot r_{t-1}^2\right]\\ &= \operatorname{cov}\left[X^1_{it-1}\cdot (r_t - r_{t-1}), u_{it}\cdot r_t^2 - u_{it-1}\cdot r_{t-1}^2\right]\\ &\quad + \operatorname{cov}\left[\left(X^1_{it}-X^1_{it-1}\right)\cdot r_t, u_{it}\cdot r_t^2 - u_{it-1}\cdot r_{t-1}^2\right].\end{aligned} \tag{12}$$

Although the requirements for the first term of the covariance to equal 0 or be negligible is similar to the requirements that we discussed for the level regressions, the covariance in the second term can be different from zero. This is because any trend in the household's portfolio, for example, due to life-cycle patterns in portfolio choice such as accumulation or liquidation of assets depending on the income growth path, will result in a negative correlation between the change in the household's portfolio from

[27] In additional analysis, we find some households reinvest part of their dividend income with some delay and therefore the annual "MPC" out of dividend income is slightly smaller than the monthly "MPC" out of dividends.

[28] We have also tested whether the fact that the capital gains have been imputed using price data from the end of the year could be a concern. Specifically, we performed a similar analysis but imputed households' consumption by changing our assumption about the price at which they traded their shares to June prices. These estimates are very similar to the baseline estimates.

one year to the next ($X^1_{it} - X^1_{it-1}$) and the change within a year (i.e., u_{it} and u_{it-1}). Assuming that the stock returns are independent across years, $\text{cov}[(X^1_{it} - X^1_{it-1}) \cdot r_t, u_{it-1} \cdot r^2_{t-1}]$ will be equal to zero. This assumption can be justified by the fact that we control for time fixed effects in all of our regressions. However, given the positive correlation between r_t and r^2_t, the term $\text{cov}[(X^1_{it} - X^1_{it-1}) \cdot r_t, u_{it} \cdot r^2_t]$ can still be negative, which would bias the OLS estimates of MPC in the first-difference setting.

Our IV methodology, however, ignores any variation in capital gains that is due to changes in households' portfolios across two years and relies only on the changes in capital gains that would have occurred in the absence of any such changes (i.e., $X^1_{it-1} \cdot (r_t - r_{t-1})$). Therefore, the requirements for the impact of capital gains measurement error on our first-difference IV estimate to be negligible is similar to the requirements for the level regressions.

B.3. Household Portfolio Turnover and Capital Gain Measurement Error

Although we cannot directly test the size of the bias in our first-difference IV estimates, we now compare the estimated MPCs for households with high versus low average annual turnover to provide suggestive evidence on the size of the measurement error bias induced by the lack of data on capital gains. This comparison is not perfect because the selection into high versus low turnover is endogenous and can be correlated with behavioral characteristics of households that may directly affect their consumption behavior. Moreover, our measure of household portfolio turnover is based on the annual turnover of household portfolios and not portfolio turnover within the year. However, it is difficult to imagine that annual turnover and turnover within the year would not be highly correlated with each other.

Specifically, we define a measure of household portfolio similarity across years based on the share of each stock or mutual fund for each household portfolio in a given year and divide our sample in each wealth group into a high versus low turnover group. Table VII reports similar estimates for the estimated MPC out of capital gains for low and high turnover households across different wealth groups. This result is suggestive of the limited importance of the measurement error in capital gains in our first-difference IV estimates of MPC. However, as mentioned before, low turnover households are different from high turnover households. For instance, low turnover households are more likely to have more passive investment strategies, and they may be more likely to opt into automatic reinvestment of their dividends, which would result in lower MPC out of dividends for this group.

V. Heterogeneity

To provide further evidence on the mechanisms behind the results, we examine whether households with different access to liquid wealth and those in

Table VII

Measurement Error Robustness—Stock Returns and Consumption for Low versus High Turnover Households

Low versus high turnover is defined based on average household turnover in all periods within each wealth category. The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income when changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income: $X_{it-1} \cdot (r_t - r_{t-1})$ and $X_{it-1} \cdot (D_t - D_{t-1})$, where X_{it} is a vector of the stockholding shares of household i in the beginning of year t, while r_t and D_t are vectors of stock returns and dividends as defined in Section III of the paper. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Consumption					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Panel A: Low Turnover					
Portfolio return	0.292	0.085	0.026	0.023	0.024
	(0.038)***	(0.010)***	(0.006)***	(0.009)***	(0.010)**
Dividend	0.310	0.537	0.244	0.236	0.232
	(0.095)***	(0.079)***	(0.074)***	(0.096)***	(0.035)***
Observations	1,203,247	810,691	800,781	178,763	112,241
Panel B: High Turnover					
Portfolio return	0.191	0.044	0.039	0.022	0.032
	(0.037)***	(0.011)***	(0.007)***	(0.010)**	(0.010)***
Dividend	0.844	0.576	0.601	0.684	0.416
	(0.267)***	(0.067)***	(0.050)***	(0.068)***	(0.066)***
Observations	1,203,246	810,688	800,777	178,763	112,241

different parts of their life cycle exhibit heterogeneous consumption responses to changes in their portfolio returns.

To investigate the effect of access to liquid wealth, we define "buffer stock" households as those whose level of liquid wealth (cash, stocks, funds, bonds, and endowment insurance) is less than six months of disposable income and examine whether the response to capital gain differs with being liquidity constrained.[29] For each wealth group, we interact capital gain and dividend income with a dummy indicating whether a household is a buffer stock household and employ the corresponding instrumental variables. Note that few households in the top 10% of the distribution qualify as buffer stock, and hence, we do not have reliable interaction estimates for households in those groups.

[29] The six months of income threshold used here is somewhat arbitrary, but the results are robust to using three or nine months of income as the threshold.

Table VIII

Heterogeneity in Liquid Wealth over Income and Stock Market MPC

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains, changes in dividend income, as well as those changes interacted with whether the household is a buffer stock household (i.e., has financial saving less than six months of its disposable income). Changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$, and their respective interactions with whether the household is a buffer stock household. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Consumption				
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.070	0.042	0.036	0.023	0.024
	(0.037)*	(0.008)***	(0.005)***	(0.007)***	(0.007)***
Return × buffer stock	0.392	0.195	0.178		
	(0.043)***	(0.020)***	(0.024)***		
Dividend	0.554	0.607	0.509	0.579	0.382
	(0.405)	(0.065)***	(0.040)***	(0.053)***	(0.044)***
Div. × buffer stock	0.044	0.048	0.061		
	(0.423)	(0.100)	(0.078)		
Controls	Y	Y	Y	Y	Y
Controls × buffer stock	Y	Y	Y	Y	Y
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.084	0.092	0.066	0.098	0.124

Table VIII reports the results. We find that the interaction coefficients for capital gains are statistically and economically significant. The results indicate that when households have access to "high enough" liquidity, the response to capital gain shocks varies much less across wealth groups. The result on the interaction term with capital gains also shows that the buffer stock households have significantly higher MPC out of capital gains. Although this result is consistent with the prediction of life-cycle consumption models with financial frictions such as Carroll (1997) and Gourinchas and Parker (2002), it may also be consistent with a model in which both lower financial wealth and higher MPCs are caused by households being less patient.

The interaction terms with dividends are positive but not statistically significant. This may be due in part to the fact that, even in models with financial frictions and precautionary savings motives, households' consumption response to permanent changes is not a function of their financial constraints and is close to one. To the extent that changes in dividend payments are perceived by households as relatively stable, we should expect less heterogeneity in MPC out of dividend income between buffer stock households and other households.

Table IX

Life Cycle and MPC out of Stock Market Capital Gains

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income for different age and wealth groups. Each age and wealth group combination corresponds to a separate regression. Changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income: $X_{it-1} \cdot (r_t - r_{t-1})$ and $X_{it-1} \cdot (D_t - D_{t-1})$, where X_{it} is a vector of the stockholding shares of household i in the beginning of year t, while r_t and D_t are vectors of stock returns and dividends as defined in Section III of the paper. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Consumption				
	Financial Wealth Percentile	Age $\leq$ 40 (1)	40 $<$ Age $\leq$ 55 (2)	55 $<$ Age $\leq$ 65 (3)
Portfolio return	5th to 50th	0.244	0.322	0.346
		(0.035)***	(0.041)***	(0.051)***
	50th to 90th	0.001	0.057	0.078
		(0.008)	(0.006)***	(0.006)***
	90th to 100th	0.015	0.018	0.055
		(0.016)	(0.008)***	(0.007)***
Dividend	5th to 50th	0.480	0.499	0.667
		(0.250)*	(0.129)***	(0.142)***
	50th to 90th	0.450	0.551	0.647
		(0.073)***	(0.046)***	(0.062)***
	90th to 100th	0.586	0.418	0.493
		(0.101)***	(0.040)***	(0.045)***

The insignificant coefficient may also be due to shocks to dividend income (especially for households in the bottom 90th percentile of wealth distribution) accounting for less than 1% of households' annual income. This can make the standard errors in our estimates of the MPC out of dividend income larger, which makes it even more difficult to find a significant difference between MPC out of dividends for buffer stock households compared to other households.

We also examine whether households in different parts of their life cycle exhibit heterogeneous consumption responses to changes in their portfolio returns. To do so, in Table IX we report estimates separately for three age groups: less than 40, between 40 and 55, and between 55 and 65. What seems to emerge here, especially in the case of heterogeneous responses to portfolio returns, is that households consume more out of capital gains as they get older. This result is consistent with the prediction of life cycle models with less than complete bequest motives, that older unconstrained households have a higher MPC out of transitory income or wealth shocks, since they consume those gains over a shorter period of time and face significantly less uncertainty about their lifetime income and wealth.

Table X

Robustness Check I—Controlling for Other Types of Wealth

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income when changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income. Controls include changes in financial wealth (net of portfolio wealth), changes in home value (instrumented by changes in the average home value at the municipality level), income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Consumption				
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.221	0.074	0.050	0.036	0.030
	(0.027)***	(0.008)***	(0.005)***	(0.007)***	(0.007)***
Dividend	0.533	0.558	0.536	0.573	0.418
	(0.112)***	(0.046)***	(0.035)***	(0.065)***	(0.029)***
Home value	107.3	28.90	42.86	46.78	35.64
	(7.537)***	(4.390)***	(2.915)***	(4.905)***	(4.888)***
Fin. wealth net	0.390	0.305	0.248	0.223	0.147
of portfolio	(0.007)***	(0.005)***	(0.007)***	(0.012)***	(0.010)***
Disposable income	0.806	0.688	0.719	0.697	0.779
	(0.005)***	(0.010)***	(0.018)***	(0.004)***	(0.014)***
Lag wealth	5.511	7.524	8.545	7.885	1.683
	(0.113)***	(0.128)***	(0.195)***	(0.214)***	(0.776)*
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.071	0.077	0.079	0.094	0.147

VI. Robustness Tests

So far we have abstracted from the potential role of other types of wealth in our regressions. However, passive capital gains could be correlated with changes in housing wealth or financial wealth net of portfolio wealth. To investigate this possibility, we add controls for financial wealth and instrument changes in housing wealth with the average changes at the municipality level. The results are presented in Table X. The coefficient estimates for capital gains and dividend income are not significantly affected. This finding suggests that our coefficients of interest are not driven by changes in the value of other types of wealth.

Additionally, although in our main analysis all of the variation in capital gains comes from passive movements in individual stock prices, one may be concerned about the potential determinants of households' static portfolio choice, such as the riskiness of household income or the comovement of household income with the aggregate economy, and how such factors affect household consumption. To alleviate these concerns, we directly match households based

Table XI

Robustness Check II—Nonparametric Controls for Income, Age, and Financial Characteristics

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income when changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. We define 4,500 bins based on 10 wealth deciles, nine age groups between 18 and 65, 10 income deciles within each wealth group, and five groups based on the share of directly held stocks within each wealth group. We then repeat the exercise in Table III replacing year fixed effects with 4,500 × 6 (27,000) bin-year fixed effects. Standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Consumption					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.249	0.093	0.039	0.026	0.022
	(0.040)***	(0.019)***	(0.006)***	(0.007)***	(0.009)**
Dividend	0.502	0.537	0.566	0.591	0.413
	(0.118)***	(0.049)***	(0.041)***	(0.058)***	(0.033)***
Disposable income	0.794	0.752	0.709	0.730	0.688
	(0.005)***	(0.007)***	(0.012)***	(0.009)***	(0.015)***
Lag wealth	7.172	8.013	7.725	6.948	2.391
	(0.093)***	(0.120)***	(0.202)***	(0.189)***	(0.552)***
Observations	2,340,428	1,647,177	1,620,781	313,740	189,920
R^2	0.141	0.182	0.164	0.208	0.241

on several characteristics, such as their financial wealth, age, income, portfolio dividend yield, portfolio value, and share of directly held holdings (i.e., not held through mutual funds).

Specifically, we define bins based on 10 wealth deciles, nine age groups between 18 and 65, 10 income deciles within each wealth group, and five groups based on the share of directly held stocks within each wealth group. We thus obtain 4,500 finely defined groups. We then re-estimate our baseline regression in Table III, but let observations in each of these 4,500 bins have a different time trend. In other words, we only exploit the variation in capital gains and consumption within these very narrowly defined groups to estimate the MPC out of capital gains and dividend income. Overall, the results, presented in Table XI, are consistent with our previous findings.

Next, to ensure that we are not capturing a spurious correlation between individuals' stockholdings and consumption, in Table IA.VI in the Internet Appendix we run placebo regressions in which we match nonstockholders with the closest stockholder based on observable factors such as wealth, age, and income and investigate whether the imputed consumption of nonstockholders is correlated with the capital gains and dividend income of their matched

Table XII

Robustness Check III—Exploiting Variations between Similar Workers Sharing the Same Employer

The table reports results of the IV regression of changes in households' consumption as a function of changes in capital gains and dividend income when changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income. Controls include income (net of dividend payments), one-year lagged financial wealth of the household, and $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. We define bins based on each employer (firm) in our sample of households, five wealth quintiles, three age groups between 18 and 65, four income quartiles within each wealth group, and two groups based on the share of directly held stocks within each wealth group. We then repeat the exercise in Table III, replacing year fixed effects with bin-year fixed effects. Standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Consumption					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return	0.239	0.086	0.041	0.032	0.027
	(0.056)***	(0.033)***	(0.012)***	(0.018)*	(0.020)
Dividend	0.713	0.556	0.615	0.416	0.424
	(0.294)**	(0.096)***	(0.053)***	(0.102)***	(0.154)***
Disposable income	0.763	0.779	0.661	0.714	0.692
	(0.011)***	(0.019)***	(0.026)***	(0.029)***	(0.037)***
Lag wealth	6.825	7.792	7.638	6.477	1.992
	(0.147)***	(0.203)***	(0.255)***	(0.216)***	(0.638)***
Observations	933,673	705,632	612,663	67,932	37,161
R^2	0.355	0.394	0.406	0.462	0.499

stockholders. We find that the estimated placebo MPCs are not significantly different from zero.

Finally, in our most restrictive specification, we use the variation for households that share the same employer (for the head of the household) and also have similar wealth, income, age, and share of stocks in their portfolios. The same employer requirement ensures that our results are not driven by differential exposure of households' income to the business cycle. In particular, we define new bins based on each employer (firm) in our data, five wealth groups, four income quartiles within each wealth group, three age groups (less than 35, 35 to 50, and older than 50), and two groups based on the share of stocks within each wealth group. We then allow workers within each bin to have a different time trend. The results, reported in Table XII, confirm our baseline estimates.[30]

[30] Note that the number of observations within each wealth category that we use to present results is reduced to less than half of the number of observations in Table III. This is because, for this specification, we require at least two workers with the same employer and the same bin based on wealth, income, age, and stocks' share. Also, we have fewer wealth/income/age/share of directly

Table XIII

Stock Returns and Consumption: Factor Related versus Idiosyncratic Returns, 2003 to 2007

The table reports results of the IV regression of changes in households' consumption as a function of *factor related* and *idiosyncratic* changes in capital gains as well as dividend income. To perform this exercise, we use a two-year rolling window to estimate the loading of each individual stock or mutual fund on the Swedish stock market index and the four-factor model for Sweden and decompose each individual stock's return into the component predicted by the four-factor model and a residual component (idiosyncratic returns). Changes in capital gains and dividend income are instrumented by their passive capital gains and passive dividend income. The sample is restricted to the 2002 to 2007 period (2003 to 2007 difference). Controls include income (net of dividend payments), one-year lagged financial wealth of the household, $ND_{it,\,t-1}$, a dummy equal to 1 if the household did not receive a dividend payment in period t nor in period $t-1$. Wealth is represented in 1,000 SEK. Year fixed effects are included and standard errors are clustered at the household level. See Table I for variable descriptions and the restrictions on the sample. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Consumption				
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Portfolio return—predicted by four factor model	0.014 (0.017)	0.002 (0.011)	0.003 (0.006)	0.004 (0.008)	0.021 (0.008)***
Portfolio idiosyncratic returns	0.274	0.071	0.036	0.033	0.023
	(0.012)***	(0.008)***	(0.006)***	(0.007)***	(0.013)*
Dividend	0.685	0.642	0.480	0.481	0.352
	(0.116)***	(0.050)***	(0.041)***	(0.055)***	(0.031)***
Disposable income	0.752	0.788	0.695	0.696	0.745
	(0.005)***	(0.010)***	(0.024)***	(0.004)***	(0.016)***
Lag wealth	6.948	7.590	8.461	8.264	1.709
	(0.091)***	(0.138)***	(0.228)***	(0.226)***	(0.840)**
Observations	1,891,747	1,221,282	1,205,877	286,164	186,805
R^2	0.061	0.063	0.022	0.091	0.113

Another potential concern relates to the role of differential exposures to aggregate risk factors in creating bias. Households with different portfolio weights might also have different consumption growth paths. To shed light on whether the observed return differences in the cross section capture ex ante differences in loading on various risk factors or ex post idiosyncratic differences, we decompose our measure of total capital gains into the part that can be explained by the loading on the four-factor model and a residual (idiosyncratic returns) and then replicate our MPC regressions. The idea is that even if households endogenously choose the loading of their portfolio on different factors, it will be difficult for them to predict the idiosyncratic component of their returns. To be clear, we do not argue that the factor-related returns are expected, although they may be correlated with consumption growth. We only need to assume that households do not have any ability to predict the idiosyncratic component of their returns and therefore do not endogenously sort their portfolio based on that component. To perform this exercise, we use a two-year rolling window to estimate the loading of each individual stock or mutual fund on the Swedish stock market index and the four-factor model for Sweden, and we decompose each individual stock's return into factor-related and idiosyncratic returns.

The results, presented in Table XIII, show that after we control for individual characteristics such as financial wealth, income, and demographics as well as time fixed effects, which all likely contribute to the loadings on the different factors, our estimated MPCs are driven by the idiosyncratic component of returns. Since most people are exposed to the stock market through index funds, our controls likely capture most of the variation generated by the factor-related returns, as this will be common across individuals. This result likely explains why the factor-related returns do not appear to be driving households' consumption decisions in a significant way.

VII. Conclusion

In this paper, we take advantage of a unique administrative data set containing household-level information on stock holdings and imputed consumption for the entire Swedish population to examine whether stock market trends drive households' spending habits and whether this relation depends on households' overall wealth.

Two main advantages of our approach set this paper apart from existing literature. First, we are able to address endogeneity issues arising from the fact that a change in portfolio value could be the result of passive changes in asset prices as well as active (endogenous) rebalancing of portfolios, as well as the fact that factors such as income shocks or bonus payments might increase both household consumption and household stockholdings, by fixing households' portfolio weights when computing capital gains and dividends to those

held stock groups than in the previous exercise to have a large enough number of final bins that contain at least two households.

observed in previous years. Second, the scope of our data allows us to investigate heterogeneity in households' responses based on the level of household wealth.

We uncover three main findings. First, we show that the MPC out of capital gains for the households in the top 50% of the financial wealth distribution varies between 3% and 7% and that it generally decreases with wealth. In contrast, it is significantly higher for the bottom 50% of the distribution. Importantly, we find that in the absence of limited access to liquid wealth, there is not much heterogeneity in MPC out of stock wealth among households in different parts of the wealth distribution. This result is consistent with models of buffer stock consumption in which households with high-enough liquid wealth behave in line with the predictions of the permanent income hypothesis.

We also find that, for all of our wealth groups, the MPC out of dividends is much larger than the MPC out of capital gains. Higher MPC out of dividend payments is consistent with near-rational behavior whereby households optimize their consumption with respect to capital gains and dividend income as if the two were separate sources of income.

To provide further evidence on the mechanisms driving the results, in addition to investigating the role of having access to *enough* liquid wealth compared to monthly disposable income, we examine whether, within each wealth group, households in different parts of their life cycle exhibit heterogeneous responses to changes in capital gains and dividend income. We find that among households with high-enough financial wealth, MPC out of capital gains is significantly larger for older households. This finding is consistent with life-cycle models such as Gourinchas and Parker (2002) and Cocco, Gomes, and Maenhout (2005), where older unconstrained households have a higher MPC to transitory income (or wealth) shocks, since they consume those gains over a shorter period of time and they face significantly less uncertainty about their lifetime income and wealth.

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Appendix

Table A.1

Summary Statistics of Stock Wealth (Survey of Consumer Finances)

This table reports summary statistics for household stock wealth and its components in thousands of USD, as reported by the Survey of Consumer Finances (SCF). Note that this sample includes both stockholders and nonstockholders. Each observation refers to a household-year. The sample includes observations for the year 2016. Because the SCF is not an equal-probability design (some types of households are overrepresented, particularly those with higher financial wealth), the Federal Reserve assigns analysis weights to each household in the sample. These weights were used in calculating the summary statistics reported below, and each panel reports the number of actual observations used as well as the equivalent number of observations in the weighted sample. Stock wealth is the sum of directly held stocks, quasi-liquid retirement accounts, stock mutual funds, and combination (/other) mutual funds. Share is the share of stock wealth for each group that is outside the retirement accounts.

	p25	p50	p75	p90	p99	Mean	*SD*	Total ($ Trillion)
Panel A: Entire Sample (31,240 Observations, 126.0 Million Weighted)								
Financial wealth	1.8	22	155	598	5,484	334	2,470	42.1
Stock wealth	0	3.5	91	420	3,485	218	1,559	27.4
Directly held stocks	0	0	0	7	800	46	1,068	5.74
Quasi-liquid retirement	0	1.1	67	310	1,712	119	414	15.0
Stock mutual funds	0	0	0	0	1,000	47	647	5.94
Combination and other	0	0	0	0	25	6	282	0.76
Panel B: 0 to 50th Percentile of Financial Wealth (12,723 Observations, 63.0 Million Weighted)								
Financial wealth	0.4	1.9	7	14	21	4.6	5.7	0.29
Stock wealth	0	0	0	5	17	1.4	3.6	0.09
Directly held stocks	0	0	0	0	1.7	0.07	0.8	0.00
Quasi-liquid retirement	0	0	0	5	16	1.3	3.4	0.08
Stock mutual funds	0	0	0	0	0	0.03	0.5	0.00
Combination and other	0	0	0	0	0	0	0	0.00

(*Continued*)

Table A.1—*Continued*

Panel C: 50th to 70th Percentile of Financial Wealth (5,086 Observations, 25.2 Million Weighted)								
Financial wealth	33	51	73	90	103	54	23	1.37
Stock wealth	7	25	48	70	100	30	26	0.76
Directly held stocks	0	0	0	2	30	1.5	6.1	0.04
Quasi-liquid retirement	1.3	23	45	66	100	28	26	0.69
Stock mutual funds	0	0	0	0	32	1.2	6.5	0.03
Combination and other	0	0	0	0	0	0.2	0.5	0.00
Panel D: 70th to 90th Percentile of Financial Wealth (6,153 Observations, 25.2 Million Weighted)								
Financial wealth	155	221	348	473	583	261	131	6.58
Stock wealth	90	152	251	3,800	530	178	132	4.49
Directly held stocks	0	0	0	30	200	12	42	0.30
Quasi-liquid retirement	50	1,240	220	348	502	151	128	3.81
Stock mutual funds	0	0	0	45	240	14	47	0.35
Combination and other	0	0	0	0	50	1.4	14	0.04

(*Continued*)

Table A.1—*Continued*

Panel E: 90th to 95th Percentile of Financial Wealth (2,032 Observations, 6.3 Million Weighted)								
Financial wealth	688	819	1,007	1,174	1,280	861	199	5.42
Stock wealth	466	632	810	990	1,180	628	275	3.96
Directly held stocks	0	0	60	250	700	71	149	0.45
Quasi-liquid retirement	200	483	687	888	1,140	465	311	2.93
Stock mutual funds	0	0	75	366	700	82	166	0.52
Combination and other	0	0	0	0	800	11	83	0.07
Panel F: 95th to 100th Percentile of Financial Wealth (5,246 Observations, 6.3 Million Weighted)								
Financial wealth	1,687	2,321	4,471	8,784	3,175	4,515	10,135	28.5
Stock wealth	1,228	1,654	3,000	5,780	1,886	2,879	6,371	18.1
Directly held stocks	0	70	554	1,600	7,620	787	4,712	4.96
Quasi-liquid retirement	450	935	1,558	2,357	5,300	1,189	1,344	7.49
Stock mutual funds	0	100	800	2,000	9,120	800	2,781	5.04
Combination and other	0	0	0	50	1,810	103	1,256	0.65

Table A.2
Summary of Literature Review

Panel A: Wealth Effects in Aggregate Data

	Country/Data	Sample Period	MPC	Elasticity
Davis and Palumbo (2001)				
Financial wealth	US/FFA and NIPA	1960 to 2000	0.057	0.07
Nonfinancial wealth			0.08	0.36
Case, Quigley, and Shiller (2013)				
Financial wealth	USA states/FFA, SCF, CPH	USA: 1978 to 2009	0 to 0.06	–
Housing wealth			0.04 to 0.15	–
Carroll, Ostuka, and Slacalek (2011)				
Financial wealth	USA/FFA and NIPA	1960 to 2007	0.06	–
Housing wealth			0.09	–
Carroll and Zhou (2012)				
Financial wealth	USA/various	2001 to 2005	0.00*	–0.02*
Housing wealth			0.05	0.24

Panel B: Wealth Effects in Survey Data

	Country/Data	Sample Period	MPC	Elasticity
Dynan and Maki (2001)				
Equity	USA/CEX	1983 to 1999	0.05 to 0.15	–
Guiso, Paiella, and Visco (2006)				
Financial wealth	Italy/SHIW	1991 to 2002	0.04	–
Housing wealth			0.02	0
Baker, Nagel, and Wurgler (2007)				
Total stock	USA/CEX	1988 to 2001	–0.01*	0.004*
Returns				
Dividends			0.75	0.23
Grant and Peltonen (2008)				
Equity	Italy/SHIW	1989 to 2002	0.004	–
Housing wealth			0.08	–
Bostic, Gabriel, and Painter (2009)				
Financial wealth	USA/FFA and CEX	1989 to 2001	–	0.02
Housing wealth			–	0.06
Paiella and Pistaferri (2017)				
Financial wealth	Italy/SHIW	2008 to 2010	–	–0.07*
Housing wealth			–	0.03

*Not statistically significant.

Table A.3
Sample Selection

Criteria Applied	Number of Observations Remaining
Households whose head is between the ages of 18 and 65	20,406,435
Participated in the stock market in two consecutive periods	12,813,758
Fixed number of family members across the two periods	10,895,293
No entrepreneurs in household in two consecutive periods	9,911,965
Did not move across municipalities and did not have real estate cash flow in two consecutive periods	8,643,639
Did not own derivatives	8,460,112
No unidentified dividend	7,156,787
Drop households for which financial asset return is in the top or bottom 1% of the distribution in each year	7,029,328
Drop households for which change in financial cash flow is in the top or bottom 2.5% of the distribution in each year	6,789,877
Drop households for which dividends over three-year average income is in the top 0.5% of the distribution	6,751,108
Drop households for which capital gain or consumption over three-year average income is in the top or bottom 0.5% of the distribution	6,624,248
Drop households with negative consumption	6,350,712

Table A.4

First Stage for Capital Gains

The table reports results of the first stage of IV regressions in Table III, where actual capital gains are instrumented by passive capital gains. The right-hand-side specification in this Panel A is the same as in Table III, while Panel B removes the controls. Year fixed effects are included and standard errors are clustered at the household level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: First Stage with Controls

Dependent Variable: Capital Gains					
Wealth group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Passive capital gains	0.714	0.761	0.844	0.852	0.894
	(0.013)***	(0.003)***	(0.002)***	(0.003)***	(0.004)***
Passive dividend	0.171	−0.095	0.001	−0.067	0.137
	(0.045)***	(0.038)**	(0.024)	(0.046)	(0.065)**
Disposable income	−0.001	−0.000	−0.003	0.000	−0.010
	(0.000)***	(0.000)	(0.001)***	(0.000)***	(0.005)*
Lag financial wealth	−0.049	−0.153	−0.198	0.013	0.055
	(0.005)***	(0.010)***	(0.015)***	(0.027)	(0.028)*
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.362	0.625	0.690	0.748	0.794

Panel B: First Stage without Controls

Dependent Variable: Capital Gains					
Wealth group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Passive capital gains	0.714	0.762	0.844	0.852	0.894
	(0.013)***	(0.003)***	(0.002)***	(0.003)***	(0.004)***
Passive dividend	0.166	−0.105	−0.012	−0.066	0.136
	(0.045)***	(0.038)***	(0.024)	(0.046)	(0.063)**
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.362	0.623	0.689	0.745	0.793

Table A.5

First Stage for Dividend Income

The table reports results of the first stage of IV regressions in Table III, where actual dividend income is instrumented by passive dividend income. The right-hand-side specification in this Panel A is the same as in Table III, while Panel B removes the controls. Year fixed effects are included and standard errors are clustered at the household level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: First Stage with Controls

Dependent Variable: Dividend Income					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Passive capital gains	−0.002	−0.003	−0.004	−0.005	−0.005
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Passive dividend	0.219	0.188	0.211	0.180	0.259
	(0.016)***	(0.013)***	(0.005)***	(0.018)***	(0.007)***
Disposable income	0.000	0.000	0.000	−0.000	−0.001
	(0.000)***	(0.000)	(0.000)	(0.000)***	(0.001)
Lag financial wealth	0.006	0.017	0.022	0.029	0.005
	(0.000)***	(0.001)***	(0.001)***	(0.002)***	(0.002)**
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.084	0.107	0.141	0.139	0.167

Panel B: First Stage without Controls

Dependent Variable: Dividend Income					
Wealth Group	5^{th} to 50^{th} (1)	50^{th} to 70^{th} (2)	70^{th} to 90^{th} (3)	90^{th} to 95^{th} (4)	95^{th} to 100^{th} (5)
Passive capital gains	−0.002	−0.003	−0.004	−0.005	−0.005
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Passive dividend	0.220	0.189	0.212	0.181	0.259
	(0.016)***	(0.013)***	(0.005)***	(0.018)***	(0.007)***
Observations	2,495,037	1,647,177	1,620,781	361,389	226,328
R^2	0.084	0.106	0.140	0.139	0.166

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Supporting Information

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

Appendix S1: Internet Appendix.
Replication code.