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Alina K. Bartscher | Moritz Kuhn | Moritz Schularick | Paul Wachtel

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Abstract

This paper aims at an improved understanding of the relationship between monetary policy and racial inequality. We investigate the distributional effects of monetary policy in a unified framework, linking monetary policy shocks both to earnings and wealth differentials between black and white households. Specifically, we show that, although a more accommodative monetary policy increases employment of black households more than for white households, the overall effects are small. At the same time, an accommodative monetary policy shock exacerbates the wealth difference between black and white households, because black households own fewer financial assets that appreciate in value. Over a five-year horizon, the employment effects remain substantially smaller than the countervailing portfolio effects.

Key words: monetary policy, racial inequality, income distribution, wealth distribution, wealth effects

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Bartscher: Danmarks Nationalbank (email: alkb@nationalbanken.dk). Kuhn: University of Bonn, CEPR, IZA (email: mokuhn@uni-bonn.de). Schularick: Sciences Po Paris, University of Bonn, CEPR (email: moritz.schularick@sciencespo.fr, schularick@uni-bonn.de). Wachtel: NYU Stern (email: pwachtel@stern.nyu.edu). Previous versions of this paper were produced when Schularick worked at the Federal Reserve Bank of New York. The authors thank Klaus Adam, Adrien Auclert, James Bullard, Ellora Derenoncourt, Keshav Dogra, Michael Fleming, Linda Goldberg, Jordi Galí, Bev Hirtle, Ethan Ilzetzky, Chi Hyun Kim, Anna Kovner, Alexander Kriwoluzky, Keith Kuester, Òscar Jordà, David Lucca, Ben Moll, Emanuel Mönch, Gernot Müller, Marco del Negro, Emil Holst Partsch, Pascal Paul, Anna Rogantini Picco, Andrea Tambalotti, Alan Taylor, and John Williams for comments and suggestions. The views expressed herein are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Federal Reserve Bank of New York or the Federal Reserve System. Dean Parker, Sven Eis, Francisco Ruela, and Siddhi Jagdale provided excellent research assistance. The project received support from the Deutsche Forschungsgemeinschaft (DFG) under Germany's Excellence Strategy – EXC 2126/1 – 39083886. The paper has benefited from a visit by Paul Wachtel as a fellow at the Frankfurt Center for Advanced Studies: Foundations of Law and Finance funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) - project FOR 2774.

"The Fed has a profound impact on our economy. [...] It's existing mandate promotes maximum employment, and stable prices. [...] [T]he Fed should add to that responsibility, and aggressively target persistent racial gaps in jobs, wages, and wealth [...]."

Joseph Biden, Wilmington, Delaware, July 28, 2020[1]

1. Introduction

The racial tensions that spread across the United States in 2020 attracted the attention of monetary policymakers. Fifty years past the accomplishments of the Civil Rights Movement, racial gaps in income and wealth remain enormous. There is widespread recognition that — despite a decline in overt labor market discrimination and gains in educational opportunities since the onset of the Civil Rights movement — racial gaps persist and have even grown larger by some measures (Bayer and Charles, 2018; Dettling et al., 2017; Kuhn, Schularick, and Steins, 2020; Thompson and Suarez, 2017; Wolff, 2017). The size and persistence of the gaps between both the income and wealth of black and white households are striking (Chetty et al., 2020; Emmons, 2020). According to the 2019 Survey of Consumer Finances (SCF), the median wealth of a white household was $181,400, compared to only $20,700 for the median black household, implying that the typical black household owns only about 11 percent of the wealth of the typical white household. The income ratio is smaller but still large: the median income of black households ($38,700) is 58 percent of the median income of white households ($67,200).

Traditionally, macroeconomists and monetary policymakers held the view that racial inequities were outside their purview. However, the view that central banks should pay attention to racial inequalities in income and wealth has recently gained ground. For instance, Raphael Bostic, president of the Federal Reserve Bank of Atlanta, suggests that the Federal Reserve "can play an important role in helping to reduce racial inequities and bring about a more inclusive economy."[2] Yet so far we lack a deeper understanding of how

[1] https://www.rev.com/blog/transcripts/joe-biden-racial-equity-plan-speech-transcript-july-28

[2] https://www.frbatlanta.org/about/feature/2020/06/12/bostic-a-moral-and-economic-imperative-to-end-racism

monetary policy impacts racial inequities, a topic that has for a long time received little attention from the research community. Our goal in this paper is to examine the effects of monetary policy on the income and wealth of black and white households.

One line of thinking that links monetary policy to distributional outcomes runs as follows: at the business cycle frequency, a more accommodative monetary policy lowers unemployment and increases labor income for workers who would otherwise have become or stayed unemployed. Marginal workers that are drawn into the labor market by such accommodative policies are often low-income and minority households. Consequently, the gap between unemployment rates of black and white households can be expected to shrink under a more accommodative policy.[3] In support of this view, Carpenter and Rodgers (2004) find a higher sensitivity of black workers' labor market outcomes to monetary policy shocks. Coibion et al. (2017) call this effect on low-income workers the earnings channel.

Yet at the same time, monetary policy affects heterogeneous household balance sheets through its impact on asset prices (Brunnermeier and Sannikov, 2013; Kaplan, Moll, and Violante, 2018). Asset price changes will affect the racial wealth distribution if portfolios differ systematically between black and white households. Using SCF data, we show that portfolio heterogeneity is a very pronounced fact in the data: black households hold substantially different portfolios and in particular less financial assets than white households, so that monetary policy shocks potentially have larger effects on white households' portfolios. The median black household has no stock holdings, nor owns a house. Thus, any effect that monetary policy has on the price of such assets bypasses the majority of black households. The effects could be particularly pronounced in the case of unconventional monetary policy, which explicitly aims at affecting asset prices (Bernanke, 2020; Wu and Xia, 2016).

In addition to the earnings and portfolio effects, monetary policy will impact interest rates and dividends directly. We call the effect on interest earnings on savings and bonds, dividend earnings and the gains or losses from mortgage refinancing the capital income effect. To the extent that black and white households' portfolios differ, there will be differential capital income effects of monetary policy.

Since accommodative monetary policy boosts asset returns, it is likely that the portfolio and earnings effects go in opposite directions. On the one hand, more accommodative

[3]This channel is often emphasized in policy discussions (Aliprantis and Carroll, 2019). In the words of Atlanta Fed President Bostic (see footnote 2): "The Federal Reserve acts to create a foundation upon which businesses, families, and communities can thrive. Our success means that businesses can grow faster and hire more workers and that more innovation can be supported, which would mean more opportunities for African Americans and others who have not been as attached to the economy."

monetary policy may benefit black households by reducing unemployment and increasing labor market participation and earnings, thereby helping to reduce the racial income gap -– and over time even the wealth discrepancy, if part of the additional income is saved. But on the other hand, the same policies may widen racial wealth differences if white households benefit more from rising asset prices than black households due to their different portfolio composition and greater wealth. The capital income effects can go in either direction, since lower interest rates reduce household interest income but the opportunity to refinance mortgages at a lower rate can have positive effects on disposable income.

This paper quantifies and compares the size of the earnings, portfolio and capital income effects of monetary policy. We begin with a comparative statics exercise, examining the impact of a given change in asset prices and interest rates. We then develop a unified empirical framework that uses instrumental variable local projections (LP-IVs) following Stock and Watson (2018) and Jordà, Schularick, and Taylor (2020) to study the effects of a monetary policy shock on asset prices, interest rates and black-white employment gaps over a five-year horizon. For this analysis, we rely on the most widely used monetary policy shock series -– the (extended) Romer-Romer shocks (Coibion et al., 2017). We apply the asset price and interest rate changes to the portfolios of white and black households from the most recent SCF wave in 2019, and determine the effect on the net wealth of black and white households. We further combine the estimated effects on the unemployment gap with unemployment and earnings data from the SCF and compare them to the portfolio effects in response to the estimated monetary policy shocks over different time horizons.

Our core finding is that an accommodative monetary policy shock leads to larger employment gains for black households, but also to larger wealth gains for white households. More precisely, the black falls more than the white unemployment rate after an unexpected accommodative interest rate shock. This translates into a relative earnings gain for the mean black household relative to the mean white household. Our results indicate that after five years, the relative cumulative earnings gain for black households is $134.

The same monetary policy shock pushes up stock prices by up to 5 percent, and house prices by 2 percent, while lowering bond yields on corporate and government debt and increasing dividend payments. Since portfolio size and composition of black and white households differ, there are large differences in the effects on the wealth of black and white households. For white households, we find that on average, a 100bp accommodative policy shock leads to a peak effect on capital gains from asset price changes of $25,000, which is about a quarter of their average annual income. The wealth gains for black households are substantially smaller, about $4,000, corresponding to 7 percent of their average annual

income. The larger capital gains for white households mainly stem from the stock market, as most stocks are owned by white households. Although housing is more equally owned, capital gains from the housing market still fall disproportionately to white households, as do interest savings from lower mortgage interest rates. The effect of a policy shock on the earnings gap pales in comparison to its effects on the wealth gap.

Our empirical findings strongly suggest that monetary policymakers face a trade-off: Monetary accommodation widens racial wealth inequality as it reduces income inequality. There is little reason to think that monetary policy can play a significant role in reducing racial inequities in both income and wealth at the same time. The conventional tools of monetary policy seem ill suited for these important tasks.

CHANNELS OF MONETARY POLICY EFFECTS. There are at least three notable channels through which policy-induced asset price changes can affect the macroeconomy. First, asset price changes can affect household consumption through a standard wealth effect. Berger et al. (2018) demonstrate that a calibrated heterogeneous agent model is quantitatively consistent with large estimated asset price effects on consumption. In our setting, such wealth effects on the consumption of white households are under plausible assumptions substantially larger than the relative earnings effects for black households. For instance, estimates indicate that the marginal propensity to consume out of capital gains is about 3 cents per dollar.[4] This means that our estimated difference between the capital gain received by white and black households after five years, which is roughly $15,300, translates into additional consumption expenditures of around $500 – about four times our estimate of the cumulated relative earnings effect for black households over five years. An accommodative monetary policy shock would need to have a much larger effect on black unemployment and earnings than what is typically estimated in order to offset the impact of changes in asset prices on the consumption of white households.

Second, asset price changes lead to redistribution between prospective buyers and sellers of assets, as emphasized in Moll (2020). Households planning to buy the asset that appreciates in value will experience welfare losses, while households who plan to sell will experience gains. For instance, households at different points of the life cycle differ in whether they plan to buy and sell assets (cf. also Greenwald et al. 2021). Glover et al. (2020) explore such life-cycle redistribution with a focus on the consequences of the large asset price changes during the financial crisis. A similar logic can be applied to racial differences in

[4]The literature on the marginal propensity to consume out of capital gains on housing and the stock market is summarized in Poterba (2000) and Paiella (2009). More recently Di Maggio, Kermani, and Majlesi (2020) and Chodorow-Reich, Nenov, and Simsek (2021) present similar estimates based on micro data.

asset holdings. If past discrimination in housing markets implies that black households are structurally "short" in housing and have plans to become homeowners, asset price increases would tend to make those households worse off.

Third, rising asset prices may also temporarily relax collateral constraints, e.g. for business formation. To the extent that such effects predominantly fall on white households, they can induce permanent effects on income and wealth through entrepreneurial activity (Boerma and Karabarbounis, 2021). Similarly, after an accommodative monetary policy shock households can permanently lock in lower mortgage rates through refinancing. The evidence we present below is consistent with such permanent gains accruing predominantly to white households.

This implies that even if monetary policy shocks only have temporary effects on asset prices, they can have persistent economic consequences. Moreover, our estimated effects of a policy rate shock on asset prices remain visible over a multi-year period, as in other recent research (Paul, 2020). Hence, even temporary policy shocks can alter the equilibrium characteristics of the economy with long-lasting effects.

PREVIOUS LITERATURE. Much of the existing literature on the distributional consequences of monetary policy focuses on income and consumption inequality. Coibion et al. (2017) find that a contractionary monetary policy shock increases inequality in pre-tax incomes and consumption. They estimate the effects of monetary policy shocks in the spirit of Romer and Romer (2004) on aggregate inequality measures. Using a similar approach and administrative data from Norway, Holm, Paul, and Tischbirek (2021) find evidence that contractionary monetary policy shocks increase inequality in disposable income and consumption, but decrease wealth inequality. By contrast, Andersen et al. (2021) find an increase in disposable income inequality after an accommodative monetary policy shock. They use Danish microdata and exploit the peg of the Danish krone to the euro in order to identify monetary policy shocks. Unlike the previous two studies, the authors consider households along the *within-age* total income distribution, and estimate inequality effects based on income effects at the household level, instead of estimating the effects on aggregate measures of inequality. While Andersen et al. (2021) find monotonically increasing effects of accommodative monetary policy shocks on disposable incomes along the income distribution, Amberg et al. (forthcoming) find U-shaped income effects based on Swedish administrative data. They identify monetary policy shocks with a high-frequency approach and study the effects on total post-tax income. Similar to Andersen et al. (2021), they compute inequality effects from income effects at the individual level. Due to the U-shape of income effects, the overall effects on income inequality depend on the considered in-

equality measure. For instance, they find that inequality increases as measured by the Gini coefficient, yet decreases as measured by the ratio of the 90th to the 10th percentile.

Only a few papers have explicitly focused on the effect of monetary policy on wealth inequality. For instance, Adam and Tzamourani (2016) use Euro-area data from the *Household Finance and Consumption Survey* to estimate the impact of changes in different asset prices along the wealth distribution. Albert and Gómez-Fernández (2021) use the high-frequency monetary policy shocks of Gertler and Karadi (2015) in a structural VAR model to estimate the effects on interest rates, dividends and stock and house prices. They link these effects to data from the 2016 SCF and find that an expansionary monetary policy shock increases wealth inequality, especially in the long run. Moreover, the effects of housing, stock prices and interest rates differ along the wealth distribution.

Although we are not aware of any other examination of the effect of monetary policy on the racial wealth gap, the size and persistence of the wealth gap has been shown in previous work, most recently by Emmons and Ricketts (2019), Kent and Ricketts (2021) and Aladangady and Forde (2021). The differential effect of monetary policy on black and white unemployment rates was observed in the 1990s, see for example Zavodny and Zha (2000). Carpenter and Rodgers (2004) find a higher sensitivity of black workers' labor market outcomes to monetary policy shocks. Finally, Rodgers (2008) explores differential effects of monetary policy on the duration of unemployment for black and white workers. His evidence points towards a stronger effect on the unemployment duration of black workers than for white workers after contractionary monetary policy shocks.

Recent theoretical macro models with heterogeneous agents have emphasized the asset price channel of monetary policy transmission (Auclert, 2019; Auclert, Rognlie, and Straub, 2020; Caramp and Silva, 2020; Kekre and Lenel, 2020). Heterogeneous agent models bring important new elements to the study of the distributional effects of monetary policy, but the exisiting literature does not discuss our topic, racial inequality.

STRUCTURE OF PAPER. In Section 2, we discuss racial inequalities in income and wealth, present the data and discuss portfolio differences between black and white households. In Section 3 we examine the effect of a 10-percent change in asset prices and a 100bp change in interest rates on the portfolios of black and white households. We present our estimates of the effects of a monetary policy shock on asset prices, interest rates, dividends and the wage and unemployment gaps in Section 4. In Section 5, we examine the impact of a typical monetary policy shock on black and white wealth and capital income and compare the wealth effects to the estimated earnings effects. The last section concludes.

2. Racial inequalities in income and wealth

In this section, we describe the Survey of Consumer Finances (SCF) data and present summary statistics. The data from the 2019 SCF indicate that the median wealth of white households was almost nine times higher than for black households, while white median income was 1.7 times larger than for black households. Not only is the wealth gap between black and white households large, it has hardly changed over the last 50 years. We show trends in the financial situation of black and white households with the data compiled by Kuhn, Schularick, and Steins (2020) from early waves of SCF going back to 1950.

2.1. SCF data

The SCF provides representative data on the financial situation of U.S. households, employing a survey design that oversamples wealthy households. The detail of the financial information, the data quality, and the extent of the household coverage have made the SCF the primary source for studying the distribution of income and wealth among U.S. households. In the 2019 SCF data, 68 percent of household heads reported being white, 16 percent answered being non-black and non-white, and 16 percent of households answered that they have a black household head. For our analysis, we focus on households who either have a black or a white head.[5]

We follow the definitions of income and wealth in the previous literature (Bricker, Henriques, et al. (2016); Kuhn and Ríos-Rull (2016); Kuhn, Schularick, and Steins (2020)). In particular, wealth is the sum of all assets minus all debt of a household. We consider marketable wealth so that we do not include claims against social security or defined-benefit retirement plans. Defined-contribution retirement plans are part of marketable wealth and constitute 17 percent of wealth in the United States (Kuhn and Ríos-Rull, 2016). Housing includes the primary residence, other residential real estate, and the net value of non-residential real estate. For income, we consider income from all sources; for earnings, we use wage and salary income. We convert all nominal variables throughout the paper to 2019 dollars using the Consumer Price Index (CPI).

We use the approach of Bricker, Dettling, et al. (2017) to construct household holdings of all asset classes, calculating total stock and bond positions as the sum of direct and indirect holdings. Directly held bond and stock investments are allocated to their respective

[5]The SCF convention is that in a couple the male spouse is the household head and we follow this convention.

Table 1: *Mean and median black and white wealth and income in the 2019 SCF*

	Means		Medians		Share with holdings (%)	
	White	Black	White	Black	White	Black
Bonds	122,700	19,600	0	0	47	27
Housing	353,500	104,700	170,000	0	75	46
Equity	474,000	40,900	9,000	0	64	35
Other non-financial assets	33,400	13,500	17,000	8,000	90	72
Liquid assets	57,000	13,900	8,000	1,400	99	95
Other financial assets	28,400	7,600	0	0	37	30
Net wealth	951,300	139,800	181,400	20,700		
Debt	117,300	60,400	35,000	10,100		
Income	113,300	58,100	67,200	38,700		

Notes: The table shows mean and median asset positions, wealth, debt and income for black and white households from the 2019 SCF. All dollar values are rounded to the nearest 100 dollars. The last two columns show the share of black and white households with positive holdings of each asset classes in percent.

positions. For indirect holdings, we allocate stock and bond investment components for stock and bond mutual funds, annuities and trusts, retirement accounts and investment savings accounts to the respective total stock and bond holdings. In the end, total stock holdings are the sum of directly held stocks, stock mutual funds, where we take 50 percent of the holdings of combination mutual funds, and the share of retirement plans, other managed investments and investment saving accounts which are invested in stocks, as reported by the survey participants. We proceed accordingly for bonds.

2.2. Summary statistics, 2019 SCF

Table 1 provides a summary of the financial situation of black and white households in the United States in 2019. We report several asset components from household balance sheets, as well as total debt, wealth, and income.[6] We report means and medians for asset positions, wealth, debt and income, and in addition the share of households with positive holdings of each asset class.

[6]Housing includes other real estate. Equity includes business wealth. Liquid assets are the sum of checking accounts, saving accounts, call accounts, money market deposit accounts, prepaid accounts and certificates of deposit. Other financial assets include the cash value of life insurance. Non-financial assets are the value of vehicles and other non-financial assets, e.g., jewellery or gold.

The SCF data show that the average black household has 51 cents for each dollar of white household income. The average wealth gap is dramatically larger; the average black household has only 15 cents per dollar of white household wealth. The racial wealth gap is prevalent on the entire household balance sheet but it is much smaller for non-financial assets. For example, for housing, the average black household owns 30 cents per dollar of the average white household. By contrast, if we look at equities, black households hold on average only 9 cents for every dollar held by white households.

Comparing means and medians highlights the large skewness of the U.S. wealth distribution, with means being much larger than medians. The racial wealth gap is larger at the median than at the mean, with the typical black household owning only about 11 percent of the wealth of the typical white household.[7] For many asset types, the median is zero or close to zero because the share of households with holdings is small. The last two columns of Table 1 show that only 35 percent of black households own equities, just a bit more than half the share of white households. Black households are heavily underrepresented at the top of the U.S. wealth distribution, where financial wealth is concentrated (Kuhn and Ríos-Rull, 2016). Many black households in the U.S. do not have any financial assets at all, so if asset prices increase, they will not benefit.

Figure 1 displays the portfolio composition of black and white households by showing the average share of each asset class in total assets.[8] Housing is the largest portfolio component for both black and white households. The housing share is larger for white households, who on average hold 44 percent of their assets in housing, compared to an average share of 33 percent for black households.

The equity share of white households (around 16%) is about twice as high as for black households. For bonds, the discrepancy in average portfolio shares between black and white households is smaller. Differences in portfolio composition translate into differences in exposure to asset price changes (Kuhn, Schularick, and Steins, 2020). The portfolio shares for housing, equities and bonds are larger for white households, making them more exposed to changing asset prices than black households, who have a larger share of low-return liquid assets, life insurances and non-financial assets such as vehicles.

[7] Medians are computed within asset classes and might therefore not correspond to the asset holdings of the median-wealth household.

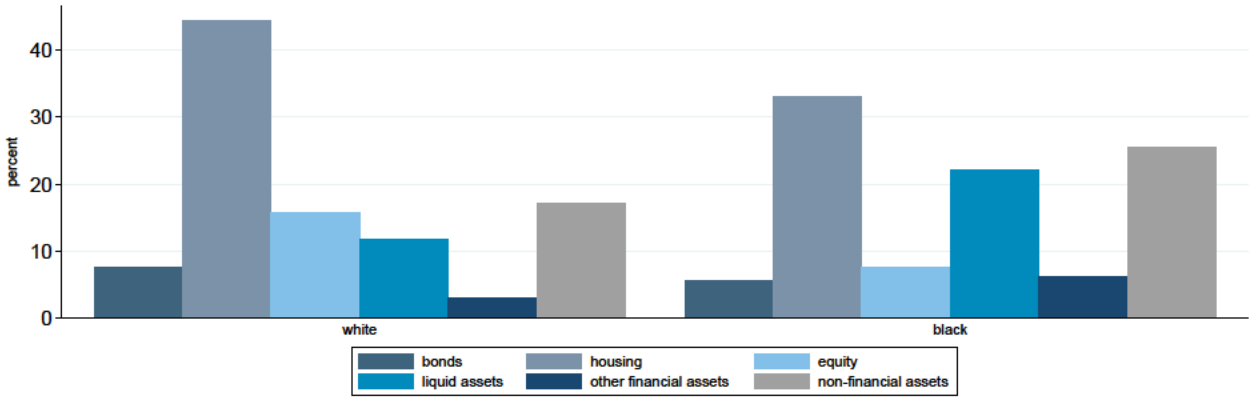
[8] Note that the figure shows average portfolio shares, which differ from the portfolio shares of the average household obtained by dividing the average holdings of each asset class by average total assets (as found in Table 1). The latter would amount to an asset-weighted average of the household-level portfolio shares.

2.3. Trends in racial income and wealth inequality

We use data from the "SCF+" (Kuhn, Schularick, and Steins, 2020) to show trends in racial wealth and income gaps since the 1950s. Based on these data, Figure 2a shows the racial wealth gap, i.e., the ratio of average black to average white wealth, and Figure 2b shows analogous results for income. The racial wealth gap decreased somewhat from the 1970s until the financial crisis; it now stands at about 15%, just as in the 1950s. This reversal was largely driven by the collapse of house prices (Kuhn, Schularick, and Steins, 2020; Wolff, 2016). In particular, despite some fluctuations over time, the ratio of black to white average stock and business wealth has remained at persistent low levels, without any indication of an upward trend (see Appendix Figure A.1a). The same holds true for the second major asset class, namely housing. The housing wealth gap only closed for a short period in the 2000s (see Appendix Figure A.1b). The trends in the income gap are similar. There was a reduction in racial income inequality since the mid-1960s, which was followed by a return to earlier levels of the gap in the 1990s.[9]

In Figure 3a, we contrast the dollar changes in average wealth of black and white households in the U.S. over the past 70 years relative to 1971. While average white wealth increased by about 650,000 dollars in 2019 dollars, the wealth of black households increased by a little more than 100,000 dollars, keeping the wealth gap at roughly the same level as in the 1950s. The stock market boom of the 1990s provided a boost to white wealth, which increased by

Figure 1: *Average portfolio shares of white and black households (percent of total assets)*

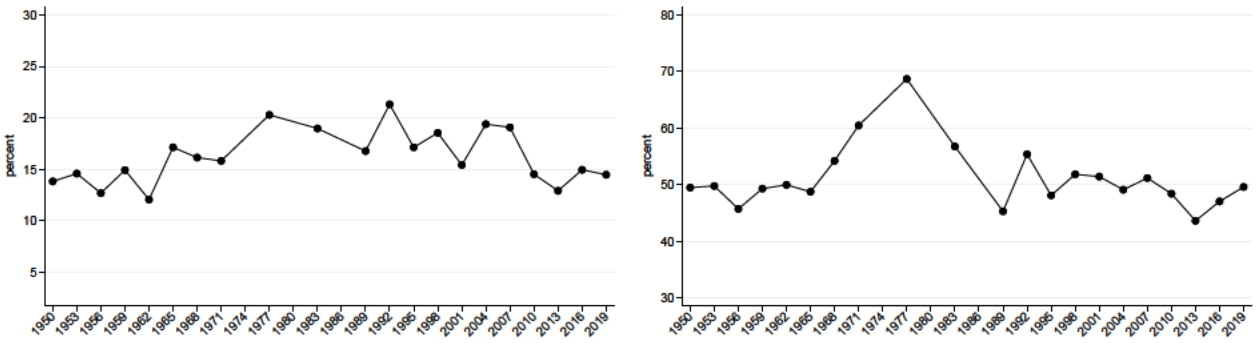


Notes: The figure shows the portfolio shares of bonds, housing, equity, liquid assets, other financial assets, and non-financial assets in percent of total assets, averaged across all white (left) and black (right) households in the 2019 SCF. See text for details regarding construction of asset classes.

[9]Similar patterns emerge when looking at medians, although the median gaps in income and wealth are sightly smaller in the 2010s than in the 1950s.

Figure 2: *Long-run trends of the racial wealth and income gaps*

(a) *Racial wealth gap* **(b)** *Racial income gap*

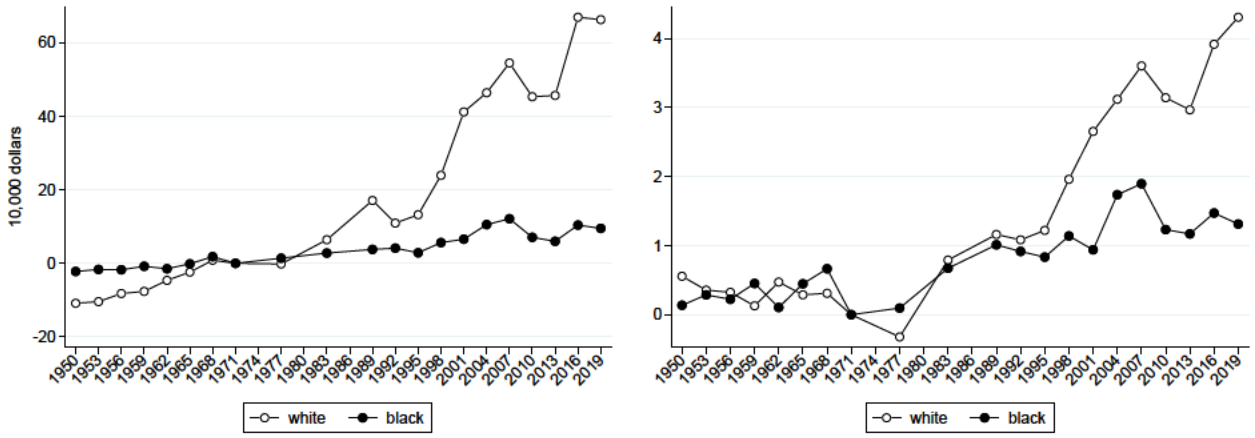


Notes: The left (right) panel shows the evolution of the ratio of average black to average white wealth (income) over time. The data were winsorized at the 1st and 99th percentile within each year-race bin.

about 400,000 dollars per household between 1995 and 2007, while average black wealth increased by less than 100,000 dollars. Such large differences stem from the much higher exposure to equity markets of wealthy, typically white, U.S. households.[10]

Figure 3: *Change in wealth and wealth-to-income ratios relative to 1971*

(a) *Change in wealth* **(b)** *Change in wealth-to-income ratios*



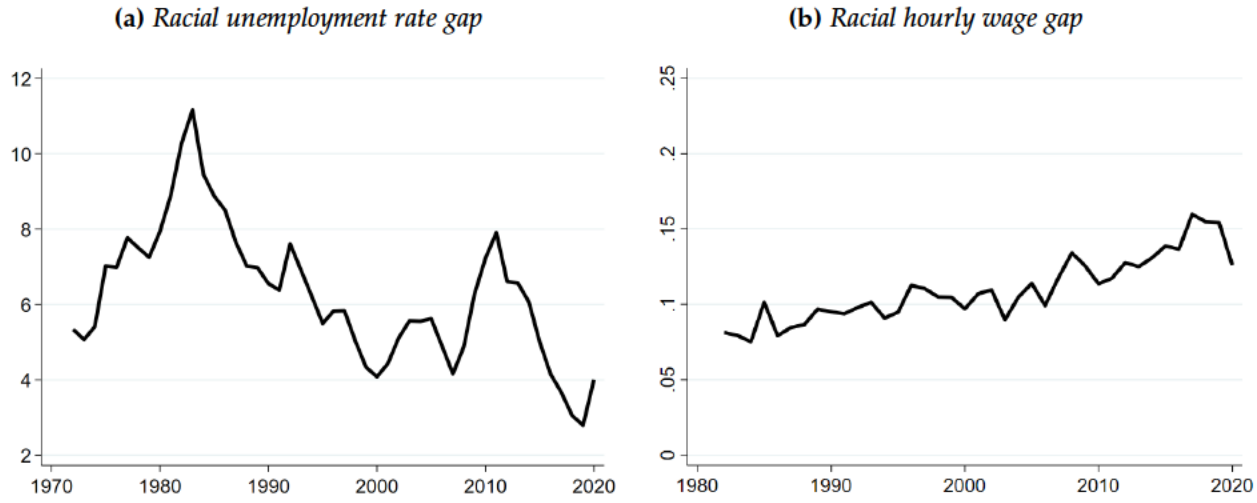
Notes: The left panel shows the change in average wealth of black and white households over time. The right panel shows the change in wealth-to-income ratios of black and white households over time. In both panels, changes are shown as differences to the 1971 values for each group.

Figure 3b compares the changes in wealth-to-income ratios of black and white households relative to the 1971 ratio. We find a strong co-movement from the early 1950s to the mid-1990s, when a rapid divergence took place. By 2019, white households owned 8.6

[10] Increases in equity prices during the 1990s also tended to increase wealth inequality *among* white households (Kuhn, Schularick, and Steins, 2020).

dollars of wealth per dollar of income, while black households owned only 2.5 dollars (see Table 1). Between the early 1970s and today, black households increased their wealth by only slightly more than one year's income, while the wealth of white households increased by about four times their annual income. This stark increase was mainly driven by equity and business wealth. Appendix Figure A.2 shows the counterfactual change in black and white wealth-to-income ratios when keeping wealth from equity, businesses and defined-contribution pension accounts (which are to a large extent invested in equities) at their 1971 levels after this year. Without the equity- and business-induced wealth gains, wealth-to-income ratios would have remained relatively stable from the mid-1990s to today, apart from a short-lived housing-based increase around the Financial Crisis. In particular, black and white wealth-to-income ratios would have evolved in a strikingly similar way. High wealth-to-income ratios imply that changes in asset prices lead to large wealth gains relative to income. Accordingly, differences in saving rates, which operate on income *flows*, can have only a small impact on the wealth gap compared to the impact of asset price changes, which operate on much larger wealth *stocks* (Kuhn, Schularick, and Steins, 2020).

Figure 4: *Racial unemployment and wage gaps*



Notes: The left panel shows the racial unemployment gap from 1972 to 2020 (in percentage points), computed as the difference between the average annual unemployment rates of black and white workers. Data on monthly unemployment rates by racial group are taken from FRED (LNU04000003 and LNU04000006). The right panel shows the racial (log) wage gap from 1982 to 2020 for annual averages of log wage data for black and white workers who are paid by the hour. Data on wages are obtained from the Outgoing Rotation Groups of the Current Population Survey (CPS).

In addition to the large wealth and income differences between black and white households, there are differences in labor market outcomes of black and white households. Specifically, the racial gaps in unemployment rates and wages are large. The racial unemployment gap is the focus of discussions about the earnings effect of monetary policy. We use

Bureau of Labor Statistics (BLS) data on unemployment rates starting in 1972, when black unemployment rate data become available.[11] Figure 4a shows the black-white annual unemployment gap from 1972 to 2020. The gap has rarely been smaller than 4 percentage points. It reached 12 percentage points during the 1982 recession and reached a low of 3 percentage points in the tight labor market prior to the Covid-19 pandemic.

For the wage gap, we use data for black and white workers from the Current Population Survey (CPS) (Flood et al., 2021). Wage data for all employed workers paid by the hour in the CPS outgoing rotation groups are available from January 1982 onward. The racial wage gap shown in Figure 4b is the difference between log wages of black and white workers. The series has a slight upward trend from 8 percent lower wages for black workers in 1982 to almost 15 percent today. The wage gap does not show systematic cyclical fluctuations around this secular trend. The increasing wage gap counteracts some of effects of the historical decline in the racial unemployment gap shown in Figure 4a.[12]

3. Household portfolios, asset prices and interest rates

In the following, we will illustrate the different sensitivity of black and white household asset portfolios to changes in asset prices and to interest rates.

3.1. Portfolio composition and asset price changes

To illustrate the effect of asset price changes, we consider a 10-percent increase in the price of each asset and look at how this affects the wealth of the average black and white household.[13] Figure 5a shows the dollar wealth changes for three major asset classes – bonds, equity, and housing – following a 10-percent asset price increase. Changes in asset prices lead to much larger capital gains for white compared to black households, which is not surprising given the large differences in the average wealth levels shown in Table 1.

[11] The gap is the difference between black and white unemployment rates, where the data are seasonally adjusted with Census X-12 ARIMA.

[12] Another reason for the trend might be changes in the group of workers who are paid by the hour. We also considered data on the racial gap in mean and median weekly earnings and found our results to be robust.

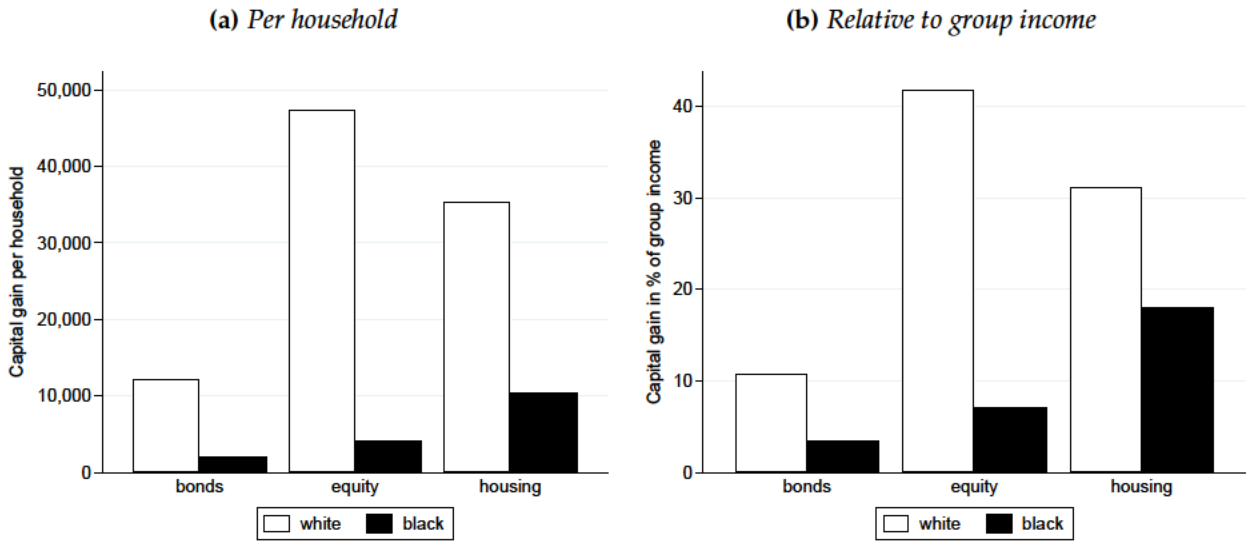
[13] A 10-percent changes seem to be a reasonable benchmark in light of the substantial increases in asset prices that have occurred during the past 15 years. Over this time period, U.S. home prices rose by 69 percent, stock prices by 95 percent and bond prices by 22 percent. These numbers are based on the annual average S&P Case Shiller U.S. National Home Price Index, the end of year S&P 500 stock price index and the annual average U.S. 10-year government bond yield with the assumption that duration is 7 years.

These racial differences in capital gains are only partially mitigated when we look at the wealth gains relative to household income, as shown in Figure 5b. Even in relation to income, we find the differences to still be large. For example, if stock prices rise by 10 percent, capital gains for white households are over 40 percent of annual income. For black households, the corresponding number is less than 10 percent. These results mean that any capital gains from asset price changes accrue disproportionately to white households.

Housing, the largest asset of most Americans, is particularly important due to the possibility of racial discrimination in housing markets.[14] Table 1 already hinted at lower homeownership rates for black families. Zero housing wealth at the median implies that not even every second black household owns a house. By contrast, the housing wealth of white households at the median is already $170,000, more than the average total wealth of black households.

To explore how much differences in homeownership and differences in the level of housing wealth contribute to the capital gain differences from the housing market, we conduct two counterfactual experiments. In the first experiment, we increase black homeownership at

Figure 5: *Capital gains from 10-percent increase in asset prices*



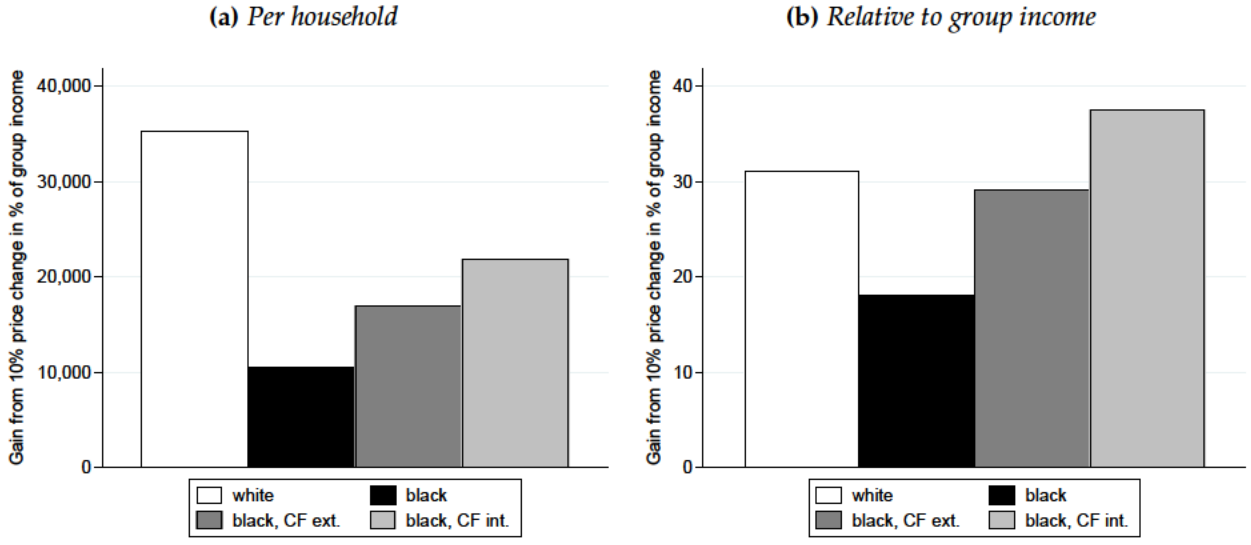
Notes: The left panel shows the average capital gains for black and white households from a 10-percent increase in bond, stock, or house prices. Capital gains are computed as the product of the price change and the average stock of asset holdings of the respective racial group. The right panel shows the capital gains in each asset class as a percentage share of each group's average annual household income.

[14] See, for example, Center for American Progress, "Racial Disparities in Home Appreciation" https://www.americanprogress.org/issues/economy/reports/2019/07/15/469838/racial-disparities-home-appreciation/ and Harvard Joint Center for Housing Studies,"The State of the Nation's Housing 202" https://www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2020_Report.pdf

the extensive margin by equalizing homeownership rates of black and white households (*CF ext.*). In the second experiment, we increase homeownership at the intensive margin by equalizing the average value of houses of black and white homeowners (*CF int.*). Considering a 10-percent increase in house prices as before, Figure 6a shows the dollar capital gains and Figure 6b shows the gains as a fraction of income.

If we consider the counterfactual situation where white and black households have the same homeownership rate (black, *CF ext.*) and consider a 10-percent house price shock, we find that the gap closes slightly in levels (Figure 6a) and almost completely as a fraction of income (Figure 6b). This result suggests that a substantial part of the differences in capital gains in the housing market stems from differences in homeownership; 75 percent of white households are homeowners but only 46 percent of black households. Lastly, we consider the effect from equalizing house values for black and white households (black, *CF int.*). That is, we show what the capital gains to the average black household would be if black-owned homes were as valuable as white-owned homes. The effects are large because homes owned by white households are more than twice as valuable as homes owned by black households. In levels, the capital gains of the average black household are now almost two-thirds of the capital gain of the average white household, while it was less than one third in the baseline. If we look at the relation to income in Figure 6b, we find

Figure 6: *Capital gains from 10 percent house price increase*



Notes: The left panel shows the average capital gains from a 10-percent increase in house prices for black and white households, as well as two counterfactual experiments for black households: *CF ext.* shows the counterfactual capital gain if black households had the same homeownership rate as white households. *CF int.* shows the counterfactual capital gain if black households owned houses of the same average value as white households. The right panel shows the same capital gains as a percent of each group's total income.

that the capital gains as a fraction of income are now even larger for black than for white households because of the underlying racial income gap.

Whether it is red-lining, other forms of discrimination or other factors that have led to black households owning fewer and less valuable homes, these differences mean that black households gain less from overall home price appreciation. This potentially fuels further racial inequalities when monetary policy leads to capital gains in the housing market.

3.2. Portfolio composition and interest rate changes

Black and white households are also affected differently when interest rates and dividend payments change. Households are affected by such changes in several ways after an accommodative monetary policy shock. First, lower interest rates will lead to lower interest income on bank accounts and deposit-type assets. Unlike for fixed-rate bonds that will increase in value, the money value of an account balance will not change. What will change are the future income flows from this balance, making a household with a positive balance poorer in expectation. Falling interest rates also reduce the interest earnings on bonds when maturing bonds are reinvested at a lower rate. Around 13.4 percent of corporate and 20.6 percent of mortgage-backed bonds are refinanced each year, which leads to a loss in interest income when rates fall.[15]. Second, we assume that a policy accommodation that leads to increased equity prices and profits will also lead to an increase in dividend payments. Given the higher stock market participation and average stock holdings of white compared to black households, this source of income mainly matters for white households.

The final way in which households are affected by lower interest rates is via borrowing, in particular if the household borrows with a mortgage contract that allows refinancing at a lower interest rate. Most U.S. mortgages are fixed-rate mortgages with a built-in call option that allows for the opportunity to prepay. Although refinancing is costly and cumbersome, refinancing activity typically increases when interest rates fall. The lower rates will persist for the remaining duration of the mortgage (Bhutta and Keys, 2016). Refinancing activity is therefore an important example where even transitory changes in interest rates resulting from monetary policy can have long-lasting redistributive effects as households "lock in" the lower interest rate for the remaining maturity of the mortgage. If the mortgage balance is not increased upon refinancing, but future interest payments are lowered, the household

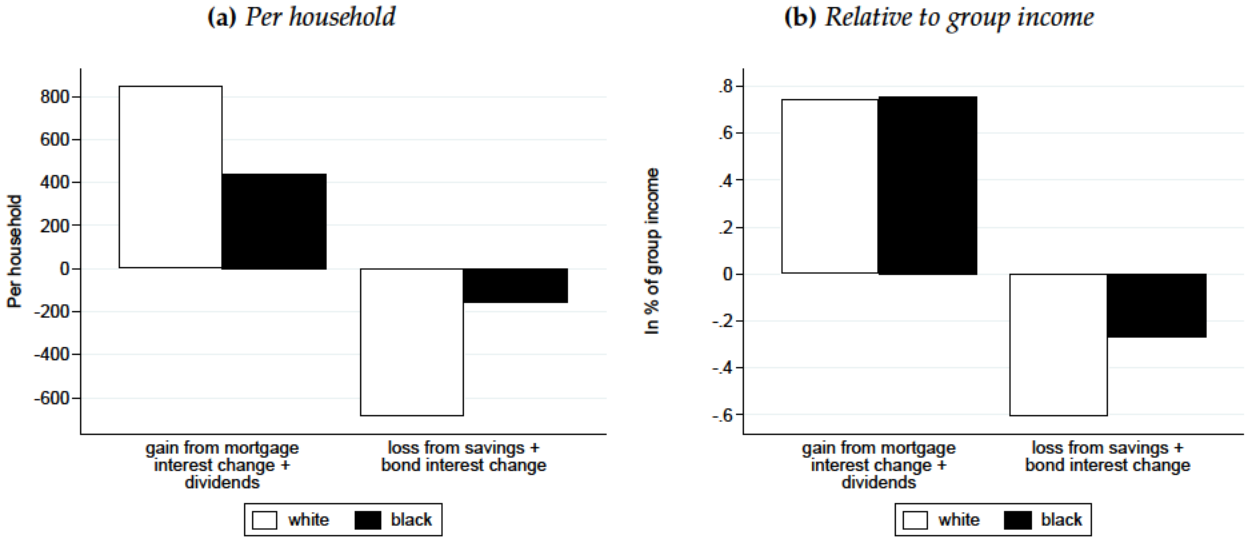
[15]The proportions of bonds maturing are estimated as total issuance less the change in bonds outstanding as a fraction of bonds outstanding, averaged over the ten years since 2011, based on data from the Securities Industry and Financial Markets Association

is effectively richer. In this sense, households with reduced monthly payments will be richer even if their net worth is unchanged in an accounting sense.

Exploring the capital income effects of a monetary accommodation through interest rate, dividend and refinancing effects is, given changing balances and maturities, very complex. To examine the impact of monetary-policy-induced interest changes, we will consider a 100bp fall in interest rates over a one-year horizon. First, we compute the loss in income from lower rates on deposit-type assets and refinanced corporate and mortgage-backed bonds for the one-year horizon. This effect is the foregone income due to the fall in interest rates. Second, to compute the effect from reduced mortgage payments, we assume that all fixed-rate mortgages are refinanced to the lower rate without changing the mortgage balance or remaining time to maturity. The latter effect reflects the change in annual mortgage payments if a household locks in the new lower interest rate by refinancing a fixed-rate mortgage. Finally, we consider a 1% increase in dividend incomes.

Figure 7a shows the average loss in interest income on liquid assets and newly issued bonds after a 100bp decline in interest rates, and the average gain from mortgage refinancing and higher dividend incomes. Given that the average holdings of liquid assets and bonds are larger for white households (as shown in Table 1), it is expected that the decline in interest income is much larger for white than for black households. Over one year, the

Figure 7: *Capital income effects from a decline in interest rates after one year*



Notes: The left panel shows the average gains for black and white households after a 100bp decline in mortgage interest rates and a 1% increase in dividend income, and their average losses after a 100bp decline in savings and bond interest rates (see text for details). The right panel shows the same gains and losses as a percentage share of each group's total income.

interest income of the average black household goes down by about 160 dollars and it goes down about four times as much for white households. Expressing these losses relative to income, Figure 7b shows that they are small: about 0.6 percent of annual income for white households and about half as much for black households.

Mortgage debt balances of U.S. households are, after four decades of growth, large, and correspond to almost 100 percent of SCF household income (Bartscher et al., 2021). The dollar decline in mortgage payments from refinancing after a 100bp decrease in interest rates is shown in Figure 7a, along with the gain from higher dividend incomes, which is small. We find that the mortgage payments per household decline by 800 dollars for white households and by roughly half as much, 400 dollars, for black households. Figure 7b shows that as a fraction of current annual income, the responses are almost equal. For both black and white households, the reduction in mortgage payments corresponds to roughly 0.7 percent of annual income. It is however important to keep the distribution of homeownership in mind; more than every second black household does not own a house and therefore typically also does not owe mortgage debt. Moreover, the calculations are based on a scenario in which all households actually take advantage of the fall in the mortgage interest rate and refinance. Yet recent evidence by Gerardi, Willen, and Zhang (2021) suggests that black households benefit less because they are substantially less likely to refinance when interest rates decline.

4. Monetary policy, asset prices and the unemployment gap

In Section 2, we showed the heterogeneity in portfolio composition between black and white households and differences in their labor market outcomes, specifically the racial unemployment and wage gaps. In Section 3, we showed that portfolio heterogeneity leads to different gains when a loose monetary policy results in an increase in asset prices and dividends and a decline in interest rates. In the following, we will develop estimates of the effects of a monetary policy shock on the prices of assets – equities, houses, bonds – as well as on interest rates, dividends and labor market outcomes. In Section 5, we will combine these estimates with the household portfolio data from the SCF in order to investigate the wealth and capital income effects of an accommodative policy shock for black and white households and compare them to the earnings effects that result from changes in the racial unemployment gap.

To study the effects of monetary policy shocks on asset prices and other outcomes, we use

instrumental variable local projections (LP-IV) following Stock and Watson (2018) and Jordà, Schularick, and Taylor (2020). We employ the widely used extended Romer and Romer series for policy shocks (Coibion et al. (2017) and Romer and Romer (2004)) as an instrument for the change in the Funds rate. In the interest of comparability and transparency, we will also show simple local projection results for uninstrumented changes in the Fed Funds rate. Although there is a wide range of estimates of the effects of policy shocks on macro outcomes, we maintain that the estimates provide plausible approximations that illustrate the underlying economic mechanisms.

We show estimates of the impact of monetary policy shocks over a five-year period. There is a growing consensus in the literature that monetary policy moves asset prices over extended periods. Rigobon and Sack (2004) and Bernanke and Kuttner (2005) pioneered empirical approaches. Both studies found substantial effects of policy surprises on stock prices that mainly come from changes in risk premia (excess returns). In both studies, a surprise 100bp shock lowers stock prices by between 5 and 7 percent. Jordà, Schularick, and Taylor (2015) document substantial effects of exogenous changes in monetary conditions on all major asset classes over multi-year horizons in a long-run cross-country data set. A recent paper by Paul (2020) argues that monetary policy today has larger and more persistent effects on asset prices than in the past. Similar findings have been reported for non-conventional monetary policy (Bernanke, 2020; Wu and Xia, 2016). The same mechanism that we describe in this paper – greater wealth effects for white households than for black households following monetary policy-induced asset price gains – can be applied to these findings as well. Only the size and duration of the effects will vary across different studies.

4.1. Estimation of the effects of monetary policy

We will first show simple local projections based on OLS. In a second step, we will treat the monetary policy shock measure as a proxy for the structural shocks in the LP-IV set-up. The intuition is that surprises and structural shocks are imperfectly correlated. Monetary surprise measures suffer from measurement error due to noise and random zero observations in months without FOMC meetings. Instrumenting the Federal Funds rate (FFR) instead of future rates also reduces the problems raised by the potential release of private central bank information (Nakamura and Steinsson, 2018). Throughout the analysis, we will scale the policy shocks to represent a 100bp surprise cut in the current FFR.

Let Δr_t denote the change in the FFR at time t. We denote as x the vector of controls, which

Table 2: *Macroeconomic data*

Variable	Description	Time Period	Source
Federal Funds Rate	Federal Funds Target	11/1988 - 9/2017	FRB
Unemployment rate	seasonally adjusted unemployment	1/1960 - 9/2017	BLS
Unemployment gap	difference in black and white unemployment rates	1/1972 - 9/2017	BLS
Hourly wages	Black and white workers	1/1982 - 9/2017	BLS
Weekly earnings	Black and white workers	1/1982 - 9/2017	BLS
Industrial production	industrial production index	1/1960 - 9/2017	FRB
Stock price	S&P500 price	1/1960 - 9/2017	S&P
Inflation	CPI, all urban consumers	1/1960 - 9/2017	BLS
M2 growth	Real money stock	1/1960 - 9/2017	FRB
House price	Case-Shiller house price index	1/1975 - 9/2017	S&P Corelogic
Dividends	Real dividends, S&P500	1/1960 - 9/2017	R. Shiller
Corporate debt yield	Moody's seasoned corporate BAA yield	1/1960 - 9/2017	FRB
Treasury yield	10-year constant maturity T-note yield	1/1960 - 9/2017	FRB

Notes: The table summarizes the macroeconomic time series used in the LP-IVs. It shows the different variables with descriptions, the time period for which the data are available, and the source of the data.

includes two lags of the outcome and the interest rate variables, as well as other variables such as the unemployment rate, inflation, industrial production, corporate bond yields, the dividend-price ratio, money growth, and asset prices. Consider the following set of local projections relating future economic outcomes such as stock and house price changes, as well as the black-white unemployment rate, to changes in interest rates today:

$$y_{t+h} = \alpha_h + \Delta r_t \, \beta_h + x_t \, \gamma_h + v_{t+h} \, ; \quad \text{for } h = 0, \ldots, H-1, \tag{1}$$

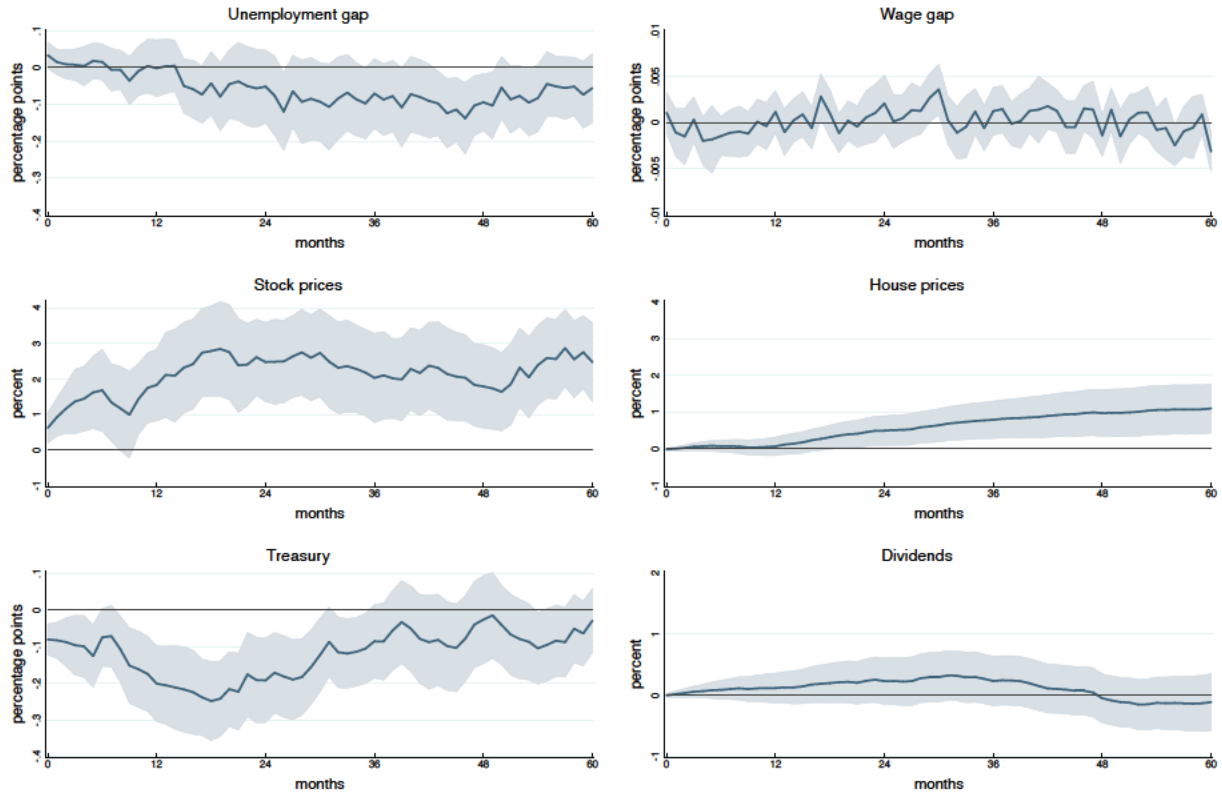
where $t = 1, \ldots, T$.

Estimates of this equation will show the effects of changes in the Fed Funds rate, but will not allow for a causal interpretation, as changes in the interest rates are endogenous to the state of the economy. To obtain exogenous variation in Δr_t, we will use the structural policy shocks introduced by Romer and Romer (2004). The Romer-Romer (RR) shocks are the component of policy changes that are orthogonal to the Fed's information set, Federal Reserve Greenbook projections for GDP, inflation and unemployment. Taking account of the delay in the publication of the Greenbook, the data are currently available for the period from 1969 to 2015. More specifically, let Δz_t denote the surprise component. We will estimate the following set of local projections using instrumental variables (LP-IV):

$$y_{t+h} = \alpha_h + \Delta \widehat{r}_t \, \beta_h + x_t \, \gamma_h + v_{t+h} \, ; \quad \text{for } h = 0, \ldots, H-1 \, , \tag{2}$$

which can be compared to the LP-OLS etimation from (1). The estimates of $\Delta \widehat{r}_t$ come from

Figure 8: *Effects of a 100bp decline in Fed Funds Rate LP-OLS)*



Notes: The figure shows the impulse responses for stock prices, house prices, 10-year treasury yields, the unemployment and wage gaps, and dividends after a 100bp expansionary monetary policy change in the Fed Funds rate. Impulse responses are shown as solid lines and shaded areas show 90-percent confidence bands. The horizontal axes shows calendar time in months and the vertical axes show asset price changes in percent for stocks and houses, change in basis points for 10-year treasury yields, and the percentage point change in the racial unemployment and wage gap.

the first-stage regression:

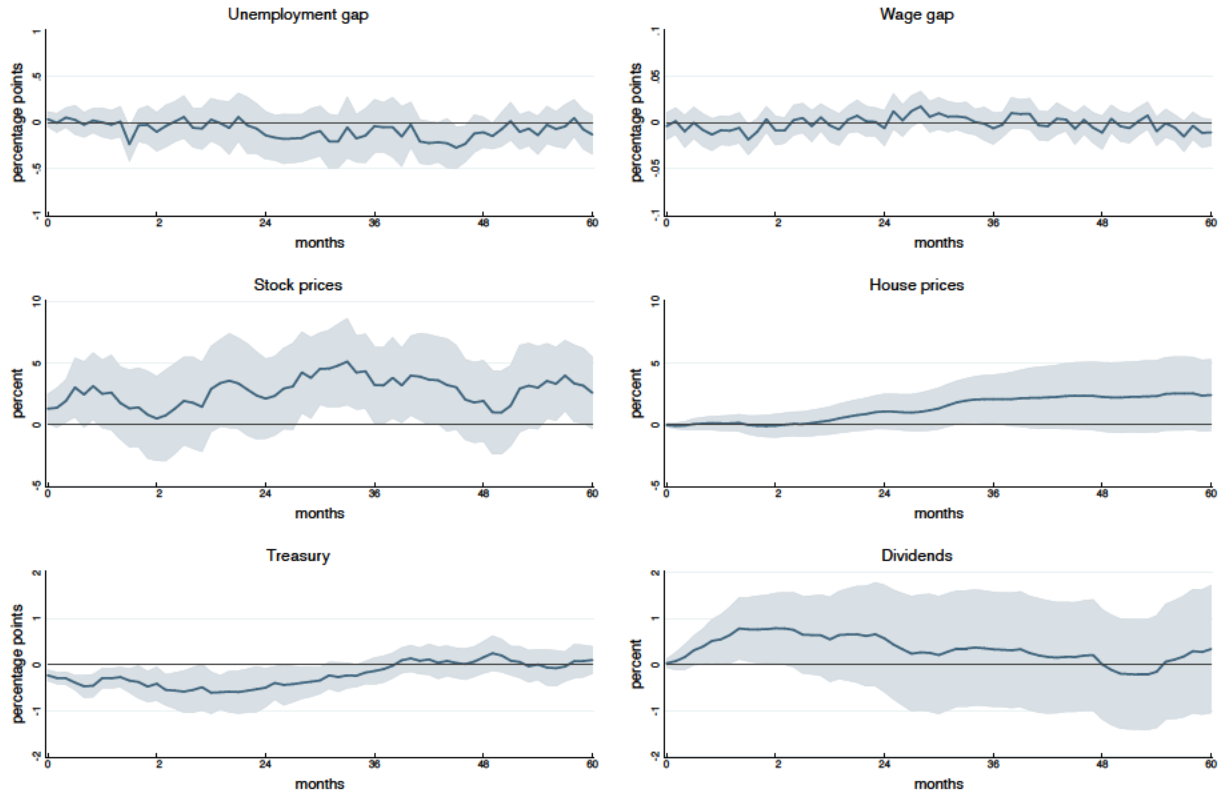
$$\Delta r_t = \Delta z_t \, b + x_t \, g + \epsilon_t \, . \tag{3}$$

Data for the outcome variables, along with the controls, are all standard, publicly available macroeconomic time series. Specific variables, definitions and sources are shown in Table 2.

4.2. Effects of monetary policy: results

We begin by showing estimates of the response of financial and labor market outcomes to changes in the Fed Funds rate over a 5-year horizon with the simple LP-OLS procedure

Figure 9: *Effects of a 100bp monetary policy shock (LP-IV estimation with Romer-Romer)*



Notes: The figure shows the impulse responses for stock prices, house prices, 10-year treasury yields, the unemployment and wage gaps, and dividends after a Romer-Romer (RR) 100bp expansionary monetary policy shock. Impulse responses are shown as solid lines and shaded areas show 90-percent confidence bands. The horizontal axes shows calendar time in months and the vertical axes show asset price changes in percent for stocks and houses, in basis points for 10-year treasury yields, and in percentage points for the racial unemployment gap.

discussed above. Figure 8 shows a peak increase of 3 percent in equity prices and 1 percent in house prices. The 10-year Treasury yield drops on impact and remains depressed for at least three years. The unemployment gap appears to shrink by about 0.1pp, while dividends rise very slightly. The wage gap between black and white workers is unaffected.

Figure 9 presents our benchmark estimates for the effect of a 100bp expansionary monetary policy shock on asset prices and the labor market gaps. We use the extended RR shock series as an instrument for changes in the Fed Funds rate. Unsurprisingly, the estimations now show a larger response of stock markets that peaks at about 5 percent in less than three years. The effect declines to about 3 percent by year 5, but remains sizeable over the entire horizon. By contrast, the house price response takes over a year to get started and peaks at a little more than 2 percent after five years. Treasury yields fall on impact, but then

Table 3: *LP-IV estimates for response to 100bp expansionary monetary policy shock (Romer-Romer)*

Horizon	Unemployment Gap	Wage Gap	Stocks	Houses	Treasury	Dividends
	%	%	pp	pp	pp	%
0M	0.038	-0.004	1.268*	-0.074	-0.236***	0.026
	(0.121,-0.045)	(0.011,-0.018)	(2.461,0.074)	(0.069,-0.217)	(-0.117,-0.355)	(0.119,-0.067)
6M	0.004	-0.008	2.479	0.080	-0.299**	0.548*
	(0.161,-0.154)	(0.008,-0.024)	(5.254,-0.295)	(0.687,-0.527)	(-0.082,-0.516)	(1.088,0.007)
12M	-0.009	-0.008	0.463	-0.118	-0.420*	0.787*
	(0.111,-0.308)	(0.007,-0.024)	(3.903,-2.976)	(0.835,-1.070)	(-0.055,-0.785)	(1.553,0.020)
24M	-0.137	-0.006	2.089	1.046	-0.505**	0.566
	(0.123,-0.396)	(0.013,-0.025)	(5.346,-1.169)	(2.475,-0.383)	(-0.085,-0.925)	(1.731,-0.598)
36M	-0.038	-0.006	3.206*	2.047*	-0.143	0.328
	(0.253,-0.328)	(0.011,-0.023)	(6.333,0.078)	(4.044,0.051)	(0.148,-0.434)	(1.575,-0.918)
48M	-0.104	-0.011	1.905	2.230	0.154	0.001
	(0.061,-0.269)	(0.008,-0.029)	(5.211,-1.401)	(5.049,-0.589)	(0.500,-0.192)	(1.195,-1.193)
60M	-0.129	-0.011	2.564	2.383	0.097	0.334
	(0.084,-0.342)	(0.004,-0.025)	(5.493,-0.365)	(5.299,-0.533)	(0.393,-0.199)	(1.723,-1.054)

Notes: The table shows LP-IV response estimates for the unemployment and wage gaps, stock prices, house prices, 10-year treasury yields and dividends after a 100bp expansionary monetary shock for Romer-Romer (RR) shocks. The rows for each variable show the point estimates of the response after 0, 6, 12, 24, 36, 48 and 60 months. Brackets below the point estimates at each horizon show the 90-percent confidence intervals. * indicates significance at the 10 percent level, ** indicates significance at the 5 percent level, and *** indicates significance at the 1 percent level.

return to their original level after about three years. The coefficient estimates at projection horizons ranging from impact to five years are shown in Table 3.[16]

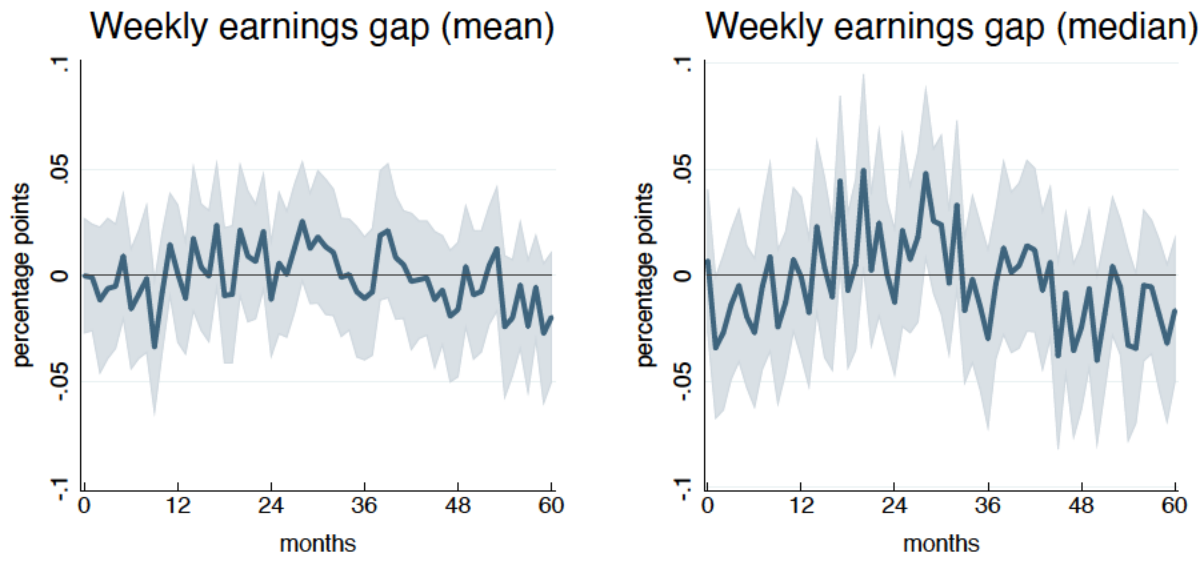
4.2.1 Labor market outcomes

Both the results with the instrumented and uninstrumented change in the Funds rate indicate that there is a small effect on the unemployment gap, which is sometimes significant at the 90 percent level. After a 100bp expansionary shock, the unemployment gap closes by 0.14pp. Similar results are reported in Carpenter and Rodgers (2004), who find that a one-standard-deviation monetary policy shock reduces the black unemployment rate on average by 0.15pp more than the white unemployment rate. Their estimated effect is also persistent; it declines slightly over time, but remains significant even after four years.

The results above do not suggest any discernible effect of an expansionary monetary policy shock on the mean black-white hourly wage gap. We also examined alternative measures

[16]The effects of the policy shock on inflation and the corporate bond yield are not shown to conserve space.

Figure 10: *LP-IV effects of a 100bp monetary policy shock on the weekly earnings gap*



Notes: The figure shows the impulse responses after a Romer-Romer (RR) 100bp expansionary monetary policy shock. Impulse responses are shown as solid lines and shaded areas show 90-percent confidence bands. The horizontal axes shows calendar time in months.

of earnings, namely the gap in mean and median weekly earnings of black and white workers from the BLS. The effect of the policy shock on each of these series is shown in Figure 10. The results confirm the previous picture based on average hourly wages, with no discernible effect on the relative weekly earnings. The estimation results for the earnings gap also suggest that hours react little so that employment changes stem mainly from the extensive margin of employment. Our conclusion is that any effect that more accommodative monetary policy has on labor market outcomes of black Americans is likely to come from employment gains and less from relative wage effect.

4.2.2 Alternative shock series

Our benchmark estimates above rely on the widely used shock series by Romer and Romer (2004) to instrument the change in the Fed Funds rate. The RR policy shocks are the component of the change in the Federal Funds rate that is not explained by the Fed's information set. There are many other ways to estimate policy shocks, including estimates that utilize information from the Fed Funds futures markets. However, Ramey (2016) shows that estimates of the effects of policy shocks are often sensitive to small changes in technique, definition or estimation period. Moreover, confidence intervals for policy

effects are often wide. Thus, we do not claim to have identified precise point estimates for policy effects, but we suggest that our benchmark estimates with the RR-shocks are within a plausible range suggested by different approaches.

In Appendix B we show that results with three other shock series are broadly similar to the results shown above. The first series shown is the measure introduced by Bernanke and Kuttner (2005) that sparked interest in the effect of monetary policy on asset prices. It is based on the difference between the Funds target rate and the rate implied by futures contracts. We then show shocks based on Gertler and Karadi (2015) that use high-frequency responses from the Fed Funds futures markets immediately following each FOMC meeting to identify a policy shock.

We also show results with a time-varying VAR (TV-VAR) approach following Paul (2020). The TV-VAR aims to capture different responses of asset prices to monetary policy shocks over time, depending, for instance, on whether risk appetite in markets is high. The TV-VAR methodology is described in Appendix C and the estimates are presented in Appendix Table A.1. The effects of the alternative shock series on key outcome variables are shown in Appendix Figure A.5.

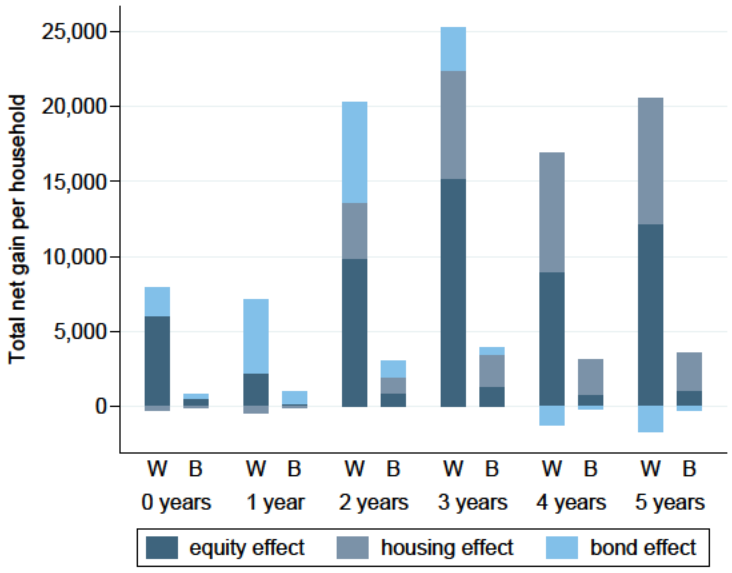
5. Earnings and portfolio effects of monetary policy

The empirical results in Section 4 show substantial and persistent positive asset price effects of a surprise monetary easing, in combination with a reduction in the black-white unemployment gap. In this section, we use these estimates to calculate the effects of a monetary policy shock on the wealth of the average black and white household. Since the wealth distribution is highly skewed, we also examine the portfolio effects along the wealth distribution and around the median. Finally, we calculate the effect of a monetary policy shock on the gap between black and white earnings and compare the size of the portfolio and earnings effects over different horizons.

5.1. Effects on household wealth

One additional step is needed before we can estimate the impact of a monetary policy shock on wealth. For bonds, we need to transform the effect on interest rates into a change in the asset price using an assumption about duration. We use duration estimates from Bloomberg for the average duration of outstanding 10-year Treasuries (7.07), mortgage-

Figure 11: *Capital gains for black and white households from monetary policy shocks over time*



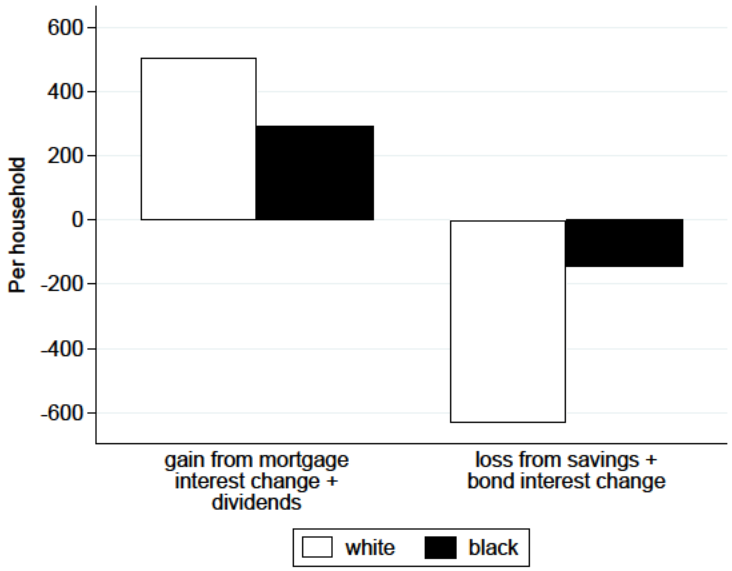
Notes: The figure shows the average wealth effects for black (B) and white (W) households after a 100bp monetary shock over time. The wealth effects are computed by combining the estimates from Table 3 with portfolio data from the SCF.

backed securities (5.47), and corporate bonds (5.43) and apply them to the corresponding asset categories in the SCF data.[17] To be consistent with stock and house price changes, which are real, the nominal change in each bond wealth category is deflated using the estimated responses of inflation to the policy shock.

We are now in a position to estimate the effects of the monetary policy shock (a 100bp surprise decline in the Federal Funds rate) on household wealth. The portfolio capital gains on each asset class are shown in Figure 11. At every horizon, the total capital gains from an unanticipated monetary policy accommodation to white households are much larger than the gains to black households. The largest effects are after three years, reaching about $25,000 for white households and about $4,000 for black households. The biggest impact comes from the large and persistent effect of equity prices. The house price effect reaches a peak after three years. The bond effects are small because bond holdings are only a small fraction of total wealth for both black and white households. An unanticipated monetary policy accommodation leads to asset price changes that benefit white households to a much larger extent than black households because average white wealth is much larger and a larger fraction is held in equities, where asset prices react most strongly.

[17] We use corporate duration and yield for corporate and foreign bonds, treasury duration and yield for government, state and municipal bonds, and MBS duration and corporate yield for mortgage-backed bonds.

Figure 12: *Effects of monetary policy shocks on capital income for black and white households after one year*



Notes: The graph shows the average gains for black and white households after a decline in mortgage interest rates and increase in dividend income, and their average losses after a decline in savings and bond interest rates, as implied by the Romer-Romer shocks after one year (see text for details).

In addition to the direct effects on capital gains from the monetary shock, there are also indirect effects on capital income. That is, monetary policy shocks can reduce mortgage interest rates and the interest earned on deposit-type assets and corporate and mortgage-backed bonds, and increase dividends. We estimate the effects based on the results from Table 3 and the method described in Section 3.2. We assume that the impact of the 100bp accommodative monetary shock on mortgage rates is given by the impact on the 10-year Treasury rate and use the estimate at a 1-year horizon to calculate the savings on annual mortgage payments. For liquid assets, we assume that the decline in interest earnings is the same size as the monetary policy shock, 100bp. For bonds, we use the effects on treasury (-42bp) and BAA yields (-36bp) after one year, and for dividends we apply the percentage change after one year (0.8%) to average black and white dividend income from the SCF.

In Figure 12, we show the capital income (dividend and interest rate) effects from the accommodative monetary shock. Black households, with small deposit balances to begin with, lose little from lower interest rates, and on net, the average black household gains more from mortgage refinancing. White household deposit interest losses, which amount to around 600 dollars, are about 100 dollars larger than the average annual gains from refinancing and dividend increases. This calculation is again based on a scenario in which all households refinance. Lower refinancing rates of black households would increase the

gap between black and white households (Gerardi, Willen, and Zhang, 2021).

5.1.1 A note on the persistent effects of policy shocks

It is important to note that while monetary policy shocks by construction capture cyclical variation, they can still have persistent effects on inequality. First, we find that asset prices change after monetary policy shocks for an extended period of five years. Our results build on a growing literature that estimates persistent asset price changes in response to monetary policy shocks (Bernanke and Kuttner, 2005; Jordà, Schularick, and Taylor, 2015; Paul, 2020; Rigobon and Sack, 2004). Such a period can easily account for 10 percent of the economically active lifetime of a household.

Second, recent theoretical and empirical work suggests that monetary policy shocks can affect the long-run equilibrium interest rate (Bianchi, Lettau, and Ludvigson, forthcoming; Rungcharoenkitkul, Borio, and Disyatat, 2021). Bianchi, Lettau, and Ludvigson (forthcoming) show that monetary policy leads to regime shifts with long-lasting effects on relative asset prices. In this case, there can be permanent impacts on asset prices.

Moreover, distributional effects may be persist even if gains and losses average out over time and asset prices revert to an equilibrium, as indicated in theory (Auclert, 2019). This is because portfolio decisions by households are often driven by changes in their life-cycle situation rather than financial returns. For example, household formation or changes in family composition can lead to portfolio adjustments such as the purchase or sale of a house. In such instances, households cannot simply wait for asset prices to revert back to their long-run level without welfare consequences from not adjusting their asset positions.

In general, the life cycle puts young households systematically on the buyer side and older households on the seller side of the market and will induce constant trading needs that are not governed by asset price movements. That is, capital gains are often realized by households due to life-cycle events such as marriage, divorce, family formation, job loss or job change. Hence, differences along racial lines in household demographic structure or unemployment experience can induce differences in the propensity to buy and sell assets, in addition to the racial differences in the exposure to asset price change.

Also, asset prices changes may alleviate or tighten collateral constraints as, for example, discussed in Iacoviello (2005). An expansionary monetary policy shock relaxes borrowing constraints and offers the opportunity to access additional credit for consumption or investment. This collateral effect will likely play out differently along racial lines, as the

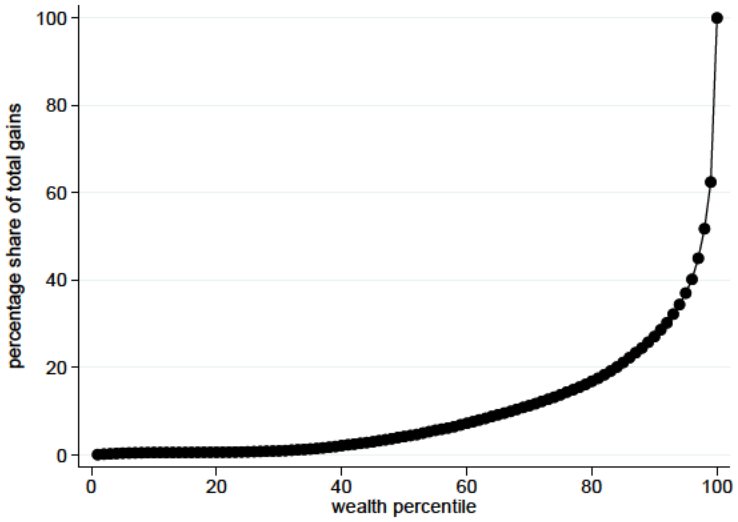
fraction of homeowners is larger among white households and housing is the key asset through which the collateral channel can work. Even a short-lived price change can trigger this channel, given that borrowing constraints only have to hold when the loan is originated.

5.2. Portfolio effects along the wealth distribution

Our estimates of the portfolio effects of asset price changes shown above consider the average black and white household. Since the U.S. wealth distribution is highly skewed (Kuhn and Ríos-Rull 2016 and Table 1), these results might not be fully representative. In this section, we examine whether the skewness of the wealth distribution affects our conclusions regarding the effect of a monetary policy shock on the wealth gap.

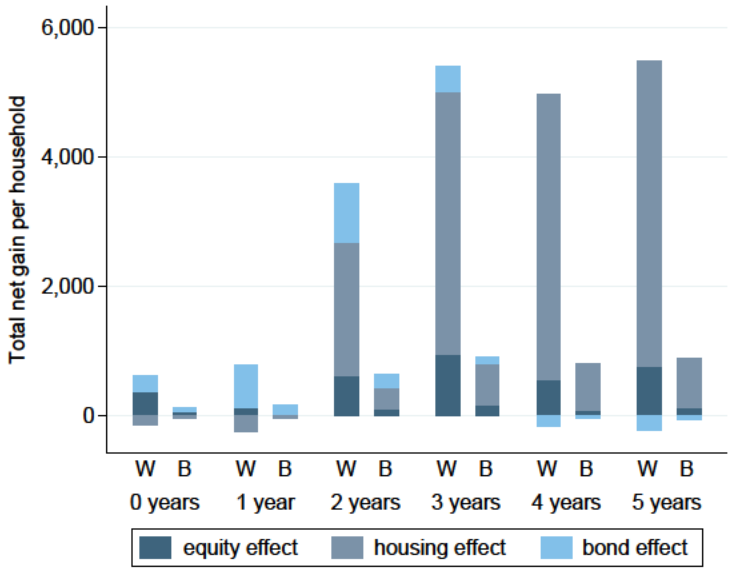
We will consider a 100bp monetary policy surprise and use the same methodology as before to estimate the effects on asset prices, interest rates and hence wealth. The distributional implications of the portfolio effects are shown in Figure 13, where we show the impact of a monetary policy surprise after five years based on our benchmark RR shocks. The figure presents a Lorenz curve of the wealth gains along the wealth distribution for all households. About 75% of all gains accrue to households in the top 10 percent of the wealth distribution and about 38% go to the top 1 percent. Notably, this distribution is substantially more unequal than the distribution of wealth itself. The facts that (a) equity gains account for

Figure 13: *Lorenz curve of estimated portfolio gains after expansionary monetary policy shock*



Notes: The graph shows the Lorenz curve of the total portfolio effect in year 5 after after an expansionary 100bp Romer-Romer shock. The x-axis shows percentiles of the wealth distribution, and the y-axis shows the share of total gains accruing to households up to the percentile indicated on the x-axis.

Figure 14: *Capital gains for black and white households around the median from monetary policy shocks over time*



Notes: The figure shows the average wealth effects for black (B) and white (W) households around the median after a 100bp monetary shock over time. The wealth effects are computed by combining the estimates from Table 3 with portfolio data from the SCF. See text for details. The underlying portfolios are constructed by averaging across all households between the 40th and 60th percentile of the respective wealth distributions separately for black and white households.

a large share of the total gains and (b) equity holdings are highly concentrated along the wealth distribution lead to a high concentration of the gains from monetary policy in the – mainly white – top 10 percent of the wealth distribution.[18]

Since portfolio gains are so highly concentrated among wealthy households, it is reasonable to suspect that the wealth gap among more "typical" households is less affected by asset price changes. In order to examine this, we will look at black and white households around the median, which we define as households between the 40th and 60th percentiles of their respective wealth distributions.

The portfolio effects of a monetary policy surprise on black and white households around the median are shown in Figure 14. Comparing the effects around the median to the average effects in Figure 11, we find that gains are smaller in levels but that the relative differences between black and white households persist. We still find that the gains of white households are more than four times larger than for black households. The gains

[18]The black households in our data are very unequally distributed along the wealth distribution. Among the bottom 50 percent of households, the share of black households is 24 percent. Their share is 9 percent among households between the 50th and 90th percentile. Only 2 percent of households among the top 10 percent wealthiest households are black.

around the median differ in their composition relative to the mean effects because of the differences in the portfolio composition along the wealth distribution. We find that around the median, most of the gains stem from housing, whereas equity gains are the largest part at the mean. As a result, it takes about two years for gains to accumulate and they are persistent after that. The capital gains are about the same size in year 5 as in year 3.

In Table 1, we reported that a large share of black households do not own any assets of several types and if they do, their holdings are often small. To see the implications of this, we look at the shares of black and white households who have portfolio gains that are less than one percent of their annual income 5 years after an expansionary shock. We refer to households with a portfolio gain below one percent of income as having no portfolio effect. We find that about one fourth of white households (24 percent) have no portfolio effect after 5 years. By contrast, the share among black households is more than twice as large (53 percent). Hence, almost half of black households are left with no portfolio gains 5 years after an expansionary monetary policy shock.[19]

By construction, black and white households with similar portfolios will have similar capital gains. Figure 15a shows that capital gains for black and white households are indeed similar when looking at households between the 40th and 60th percentile of the *overall* wealth distribution. The effects are only slightly smaller for black households, mostly due to somewhat smaller housing capital gains. The remaining differences in capital gains disappear when normalizing by income, as shown in Appendix Figure A.3. However, black households are underrepresented in the middle and upper parts of the aggregate wealth distribution. Appendix Figure A.4 shows that the share of black households in the upper half of the wealth distribution has consistently been lower than the overall population share of black households since the 1950s. Moreover, black households have become less likely to make it to the top 10%, and more likely to be in the bottom 50%, since the 1970s.

Figure 15b looks at capital gains for black and white households around the median of the aggregate *income* distribution. Here, we again see pronounced differences between black and white households. In other words, even black households who by construction have similar incomes as white households do have lower wealth and therefore reap lower capital gains after expansionary monetary policy shocks. On average, the capital gains of white households between the 40th and 60th percentile of the aggregate income distribution are two to three times larger than those of their black counterparts.

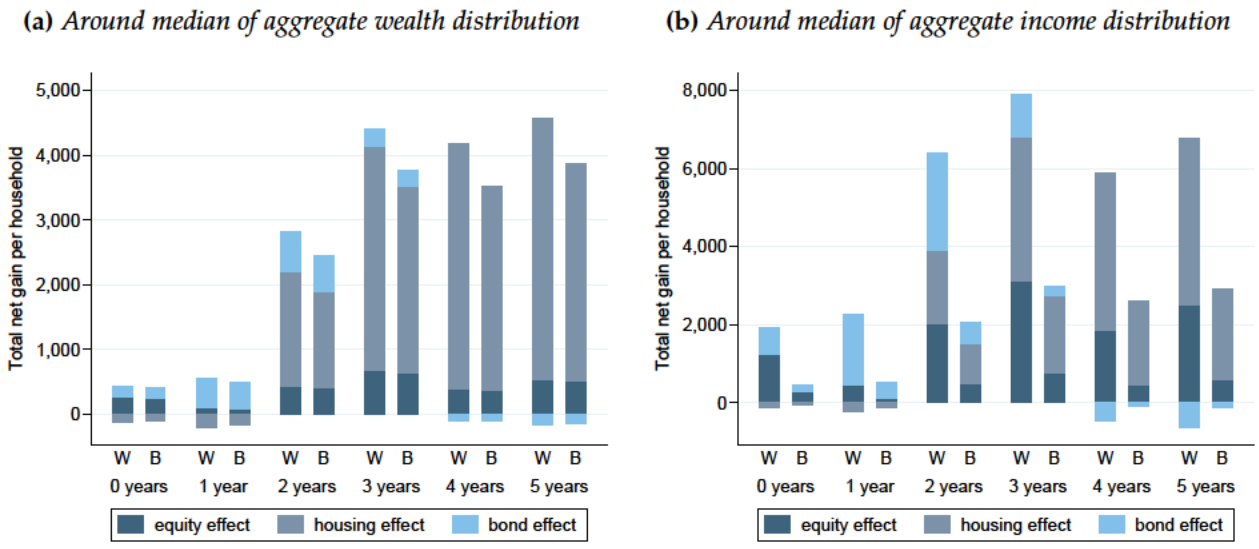
[19] If we consider a 5-percent threshold instead of the 1-percent threshold, the shares increase to 41 percent for white households and 68 percent for black households.

In Figure 16, we show the capital income effects of a monetary policy shock for black and white households around the median, using the same assumptions as in the results for the mean households in Figure 12. White households around the median have gains from mortgage refinancing which are about three times larger than the gains for black households, a much larger difference than for the mean household because many more of the black households around the median do not own a home.

5.3. Differences among households by marital status and sex

The analysis so far has examined the portfolio effects for black and white households and has not addressed any additional demographic characteristics, although there are significant differences in the demographic composition of households with white and black heads.[20] Many more white households consist of married or cohabiting couples and more of the single black households are led by women. In Appendix D, we show the effects of a RR monetary policy shock on first, households separated by marital status and second, single households separated by sex of the head. The overall findings of the paper are unaffected

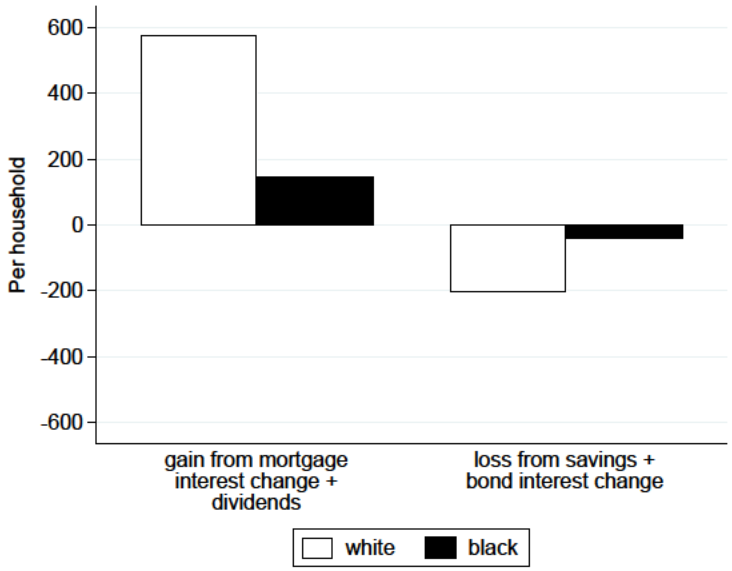
Figure 15: *Capital gains for black and white households around the median of the aggregate wealth and income distribution*



Notes: The figure shows the average wealth effects for black and white households around the median of the *aggregate* wealth (panel a) and income (panel b) distribution after a 100bp monetary shock over time. The wealth effects are computed by combining the estimates from Table 3 for the Romer-Romer shocks with portfolio data from the SCF. See text for details. The underlying portfolios are constructed by averaging across all households between the 40th and 60th percentile of the aggregate wealth (income) distribution.

[20] As only 15% of the SCF households have a black head, the granularity of further breakdowns is limited.

Figure 16: *Effects of monetary policy shocks on capital income for black and white households around the median after one year*



Notes: The graph shows the average gains for black and white households around the median after a decline in mortgage interest rates and increase in dividend income, and their average losses after a decline in savings and bond interest rates, as implied by the Romer-Romer shocks after one year (see text for details). The underlying portfolios are constructed by averaging across all households between the 40th and 60th percentile of the respective wealth distributions for black and white households.

when we examine results disaggregated by household type. The portfolio gains of white households of any type are almost always larger in both absolute terms and relative terms than for the corresponding group of black households. Notably, the gains to single white households are typically larger than the gains to married black households.

5.4. Quantifying the earnings effect

Our estimates in Section 4.2 indicate that an accommodative monetary policy shock reduces the unemployment rate for black households more than for white households, although there are no discernible effects on the gap in wages. Nevertheless, the employment effects will reduce the gap in mean earnings by increasing the relative number of people receiving labor income. In this section, we aim to quantify the earnings effects from the reduced unemployment rates. We combine the low-frequency 2019 SCF data on labor income with our estimates of the impact of monetary policy shocks on the unemployment gap. Using this estimate, we will be in a position to compare the relative gains from the earnings and wealth effects for black and white households.

For our calculation, we focus on prime-age household heads (age 25-55) and on the information if the head has been unemployed during the 12 months before the interview.[21] There are large differences in the unemployment experiences of black and white households. The share of black household heads experiencing unemployment in the year prior to the interview is 12.4 percent, while the share for white heads is 8.3 percent. Comparing earnings of households who have been and who have not been unemployed during the past 12 months, we find that average earnings of black households whose head has not been unemployed are \$56,200. For households whose head experienced unemployment within the last 12 months, the average annual labor income is \$27,500.[22] By contrast, we find that white households who experienced unemployment during the last 12 months still report average earnings of \$50,300 – almost the level of black households without unemployment experience. White households without unemployment experience over the last 12 months report an average labor income of more than \$103,000 in the 2019 SCF data.

To derive the earnings effect, we multiply the difference in earnings between black households that have and have not experienced unemployment by our estimates of the impact of monetary policy on the differential between black and white unemployment rates from Table 3. We then make a conservative assumption in order to relate the change in the unemployment gap to earnings changes. In particular, we assume that each household who finds employment receives the average earnings gain of a black household finding employment, such that the earnings gain is \$56,200 – \$27,500 = \$28,700. The relative income gain of black households is computed by multiplying the estimated impact of the monetary policy shock on the unemployment gap with the average earnings gain of \$28,700.

More formally, let us denote the estimated effect on the unemployment gap at projection horizon h by $\Delta_h u$ and the earnings gain from leaving unemployment for black households by $\Delta Y^B = Y_E^B - Y_U^B$ where Y_E^B denotes average labor income of black households who have not been unemployed over the past 12 months and Y_U^B denotes labor income of black households who have been unemployed at least for some time in the past year. In the 2019 SCF data, we find $\Delta Y^B = \$28,700$. Our estimate for the relative earnings gain for black households relative to white households in period h after the shock, $\Delta_h Y$, is thus

$$\Delta_h Y = \Delta_h u \Delta Y^B = \Delta_h u (Y_E^B - Y_U^B)$$

[21] We consider the last 12 months rather than the current labor force status at the interview because the surveyed labor income also refers to the previous calendar year.

[22] Sample sizes are small: we observe 182 white households and 64 black households whose head reports unemployment during the last 12 months.

The effect on the unemployment gap in Table 3 peaks after 2 years, when the unemployment rate gap is reduced by 0.137 percentage points. The relative earnings gain is found by multiplying this number with the average earnings gain, which yields a relative gain per black household of $39.3, or 0.07 percent of annual total income for all black households.

5.5. Comparing earnings and portfolio effects

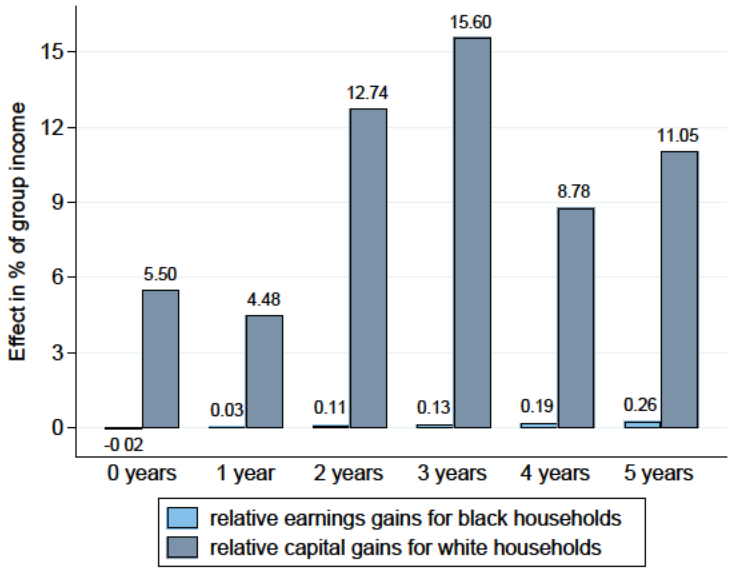
$\Delta_h Y$ is the impact of the monetary policy shock on the difference in earnings between black and white households. Thus, the appropriate comparison is to the difference in capital gains accruing to black and white households. Continuing with the above calculation, where we found $\Delta_2 Y = \$39.3$, the corresponding portfolio effect after 2 years estimated is about $20,300 for white households and $3,000 percent for black households. The differential gain of white households relative to black households is thus $17,300. This comparison suggests that the portfolio effect for white households is substantially larger than the earnings effect for black households. Put differently, the differential capital gain of white households as a fraction of income is two orders of magnitude larger than the earnings effect.

However, there is an important conceptual difference between the two effects. The earnings effect applies to the flow of earnings, while the capital gains are a gain on the stock of wealth. Thus, the capital gain is a one-time change in the valuation of assets, while the earnings effect applies to incomes year by year. To take this into account, we compare the difference in capital gains between white and black households over the five-year horizon to the accumulated estimate of the differential earnings effect over this time period.

After five years, the accumulated earnings effect of the benchmark monetary policy shock is $134. In Figure 17, we show the year-by-year accumulated earnings effects and the difference in the portfolio effects on black and white households in percent of each group's from a monetary policy shock. Note that for easier comparison, we construct the differences to be always positive; capital gains are larger for white households and earnings gains are larger for black households. The estimates shown use our benchmark shock series to estimate the impact of monetary policy shocks on asset prices, interest rates and the unemployment gap. Even as the earnings effect accumulates over time, it remains orders of magnitude smaller than the effects from capital gains.

In a final step, we compare the wealth effect on consumption to the earnings effect and find that under plausible assumptions, the wealth effect on consumption for white households is larger than the earnings effect for black households. There is a large literature that estimates

Figure 17: *Comparison of relative earnings and portfolio effects*



Notes: The graph compares the cumulative relative earnings effect for black households to the relative portfolio effect for white households based on an expansionary 100bp Romer-Romer shock. The effects are reported as a percentage share of average annual household income of the respective racial group. See the text for the calculation of the relative earnings effect. The relative portfolio effect is calculated as the difference between the capital gains of white and black households from Figure 11.

the marginal propensity to consume out of wealth, see footnote 4. For example, Chodorow-Reich, Nenov, and Simsek (2021) exploited regional variation in stock market exposure in the U.S. and estimate a 3.2 percent marginal propensity to consume out of capital gains. Our estimated capital gain after five years from an accommodative monetary policy shock is about $15,600 larger for white than for black households (Figure 11), which corresponds to additional expenditures of about $500. Thus the portfolio effect on consumption for white households after 5 years is almost 4 times larger than the earnings effect for black households of $134. There is evidence that expansionary monetary policy improves the labor market situation of black households more than for white households. Yet, when we contrast these effects to the gains from asset price changes, the earnings gains of black households are dwarfed by the portfolio gains of white households.[23]

[23]The earnings effects for single households led by men and women are shown in Appendix Figure A.10. They are small when compared to the corresponding portfolio effects.

6. Conclusion

We have shown that policy shocks that change asset prices have differential effects on the wealth of black and white households. White households gain more because they have more financial wealth and hold portfolios that are more concentrated in interest-rate-sensitive assets such as equities. At the same time, monetary policy shocks reduce the gap between black and white unemployment rates and entail larger earnings gains for black households. Bringing the two together, however, leads to a stark finding: the reduction in the earnings gap pales in comparison to the effects on the wealth gap.

Our analysis therefore does not bode well for the suggestion made by politicians and central bankers that a more accommodative monetary policy helps alleviate racial inequalities. With the instruments available – all of which work through effects on asset prices and interest rates – a central bank would not be able to design policies for an income gap reduction objective without increasing wealth inequality. Clearly, this does not mean that achieving racial equity should not be a first-order objective for economic policy. We strongly think it should. But the tools available to central banks might not be the right ones, and could possibly be counter-productive.

References

Adam, Klaus and Panagiota Tzamourani (2016). "Distributional Consequences of Asset Price Inflation in the Euro Area." In: *European Economic Review* 89, pp. 172–192.

Aladangady, Aditya and Akila Forde (2021). *Wealth Inequality and the Racial Wealth Gap*. technical report.

Albert, Juan-Francisco and Nerea Gómez-Fernández (2021). "Monetary Policy and the Redistribution of Net Worth in the US." In: *Journal of Economic Policy Reform*.

Aliprantis, Dionissi and Daniel R. Carroll (2019). *What Is Behind the Persistence of the Racial Wealth Gap?* Working Paper February. URL: https://ideas.repec.org/a/fip/fedcec/00095.html.

Amberg, Niklas, Thomas Jansson, Mathias Klein, and Anna Rogantini Picco (forthcoming). "Five Facts about the Distributional Income Effects of Monetary Policy." In: *American Economic Review: Insights*.

Andersen, Asger Lau, Niels Johannesen, Mia Jørgensen, and José-Luis Peydró (2021). *Monetary Policy and Inequality*. Working Paper.

Auclert, Adrien (2019). "Monetary Policy and the Redistribution Channel." In: *American Economic Review* 109.6, pp. 2333–67.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub (2020). *Micro Jumps, Macro Humps: Monetary Policy and Business Cycles in an Estimated HANK Model*. Working Paper. National Bureau of Economic Research.

Bartscher, Alina K., Moritz Kuhn, Moritz Schularick, and Ulrike I. Steins (2021). *Household Debt and Inequality in the U.S., 1950-2019*. Working Paper.

Bayer, Patrick and Kerwin Kofi Charles (Jan. 2018). "Divergent Paths: A New Perspective on Earnings Differences Between Black and White Men Since 1940." In: *The Quarterly Journal of Economics* 133.3, pp. 1459–1501.

Berger, David, Veronica Guerrieri, Guido Lorenzoni, and Joseph Vavra (2018). "House Prices and Consumer Spending." In: *The Review of Economic Studies* 85.3, pp. 1502–1542.

Bernanke, Ben S. (2020). "The New Tools of Monetary Policy." In: *American Economic Review* 110.4, pp. 943–83.

Bernanke, Ben S. and Kenneth N. Kuttner (2005). "What Explains the Stock Market's Reaction to Federal Reserve Policy?" In: *The Journal of finance* 60.3, pp. 1221–1257.

Bhutta, Neil and Benjamin J. Keys (2016). "Interest Rates and Equity Extraction during the Housing Boom." In: *American Economic Review* 106.7, pp. 1742–74.

Bianchi, Francesco, Martin Lettau, and Sydney C. Ludvigson (forthcoming). "Monetary Policy and Asset Valuation." In: *Journal of Finance*.

Boerma, Job and Loukas Karabarbounis (2021). *Reparations and Persistent Wealth Gaps*. Working Paper.

Bricker, Jesse, Lisa J. Dettling, Alice Henriques, Joanne W. Hsu, Lindsay Jacobs, Kevin B. Moore, Sarah Pack, John Sabelhaus, Jeffrey Thompson, and Richard A. Windle (2017). "Changes in US Family Finances from 2013 to 2016: Evidence from the Survey of Consumer Finances." In: *Federal Reserve Bulletin* 103, p. 1.

Bricker, Jesse, Alice Henriques, Jacob Krimmel, and John Sabelhaus (2016). "Measuring Income and Wealth at the Top Using Administrative and Survey Data." In: *Brookings Papers on Economic Activity* 2016.1, pp. 261–331.

Brunnermeier, Markus and Yuliy Sannikov (2013). "Redistributive Monetary Policy." In: *Proceedings of the 2012 Jackson Hole Economic Policy Symposium*, pp. 331–384.

Caramp, Nicolas and Dejanir H. Silva (2020). *Monetary Policy and Wealth Effects: The Role of Risk and Heterogeneity*. Working Paper.

Carpenter, Seth B. and William M. Rodgers (2004). "The Disparate Labor Market Impacts of Monetary Policy." In: *Journal of Policy Analysis and Management* 23.4, pp. 813–830.

Chetty, Raj, Nathaniel Hendren, Maggie R. Jones, and Sonya R Porter (2020). "Race and Economic Opportunity in the United States: An Intergenerational Perspective." In: *The Quarterly Journal of Economics* 135.2, pp. 711–783.

Chodorow-Reich, Gabriel, Plamen T. Nenov, and Alp Simsek (2021). "Stock Market Wealth and the Real Economy: A Local Labor Market Approach." In: *American Economic Review* 111.5, pp. 1613–57. URL: https://www.aeaweb.org/articles?id=10.1257/aer.20200208.

Coibion, Olivier, Yuriy Gorodnichenko, Lorenz Kueng, and John Silvia (2017). "Innocent Bystanders? Monetary Policy and Inequality." In: *Journal of Monetary Economics* 88, pp. 70–89. URL: http://www.sciencedirect.com/science/article/pii/S0304393217300466.

Dettling, Lisa J., Joanne W. Hsu, Lindsay Jacobs, Kevin B. Moore, and Jeffrey P. Thompson (2017). *Recent Trends in Wealth-Holding by Race and Ethnicity : Evidence from the Survey of Consumer Finances*. FEDS Notes. Board of Governors of the Federal Reserve System.

Di Maggio, Marco, Amir Kermani, and Kaveh Majlesi (2020). "Stock Market Returns and Consumption." In: *The Journal of Finance* 75.6, pp. 3175–3219.

Emmons William, Ana H. Kent and Lowell R. Ricketts (2019). *Just How Severe Is America's Racial Wealth Gap?" Federal Reserve Bank of St. Louis October 9, 2019*. Working Paper.

Emmons, William (2020). *Housing Wealth Climbs for Hispanics and Blacks, Yet Racial Wealth Gaps Persist, Federal Reserve Bank of St. Louis, April 1, 2020*. Working Paper.

Flood, Sarah, Miriam King, Renae Rodgers, Steven Ruggles, J. Robert Warren, and Michael Westberry (2021). *Integrated Public Use Microdata Series, Current Population Survey: Version 9.0 (dataset)*. IPUMS. Minneapolis, MN.

Gerardi, Kristopher S., Paul S. Willen, and David Hao Zhang (2021). *Mortgage Prepayment, Race, and Monetary Policy*. Working Paper.

Gertler, Mark and Peter Karadi (2015). "Monetary Policy Surprises, Credit Costs, and Economic Activity." In: *American Economic Journal: Macroeconomics* 7.1, pp. 44–76.

Glover, Andrew, Jonathan Heathcote, Dirk Krueger, and José-Víctor Ríos-Rull (2020). "Intergenerational Redistribution in the Great Recession." In: *Journal of Political Economy* 128.10, pp. 3730–3778.

Greenwald, Daniel L., Matteo Leombroni, Hanno Lustig, and Stijn Van Nieuwerburgh (2021). *Financial and Total Wealth Inequality with Declining Interest Rates*. Working Paper 28613. National Bureau of Economic Research.

Holm, Martin Blomhoff, Pascal Paul, and Andreas Tischbirek (2021). "The Transmission of Monetary Policy under the Microscope." In: *Journal of Political Economy* 129.10, pp. 2861–2904.

Iacoviello, Matteo (2005). "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle." In: *American Economic Review* 95.3, pp. 739–764.

Jordà, Òscar, Moritz Schularick, and Alan M Taylor (2015). "Leveraged Bubbles." In: *Journal of Monetary Economics* 76, S1–S20.

— (2020). "The Effects of Quasi-Random Monetary Experiments." In: *Journal of Monetary Economics* 112, pp. 22–40.

Kaplan, Greg, Benjamin Moll, and Giovanni L. Violante (2018). "Monetary Policy According to HANK." In: *American Economic Review* 108.3, pp. 697–743.

Kekre, Rohan and Moritz Lenel (2020). "Monetary Policy, Redistribution, and Risk Premia." In: *University of Chicago, Becker Friedman Institute for Economics Working Paper* 2020-02.

Kent, Ana Hernandez and Lowell Ricketts (2021). *Wealth Gaps between White, Black and Hispanic Families in 2019*. technical report.

Kuhn, Moritz and José-Víctor Ríos-Rull (2016). "2013 Update on the US Earnings, Income, and Wealth Distributional Facts: A View from Macroeconomics." In: *Federal Reserve Bank of Minneapolis Quarterly Review* 37.1. Updated 2016 version, pp. 2–73.

Kuhn, Moritz, Moritz Schularick, and Ulrike I. Steins (2020). "Income and Wealth Inequality in America, 1949–2016." In: *Journal of Political Economy* 128.9, pp. 3469–3519. URL: https://ideas.repec.org/a/ucp/jpolec/doi10.1086-708815.html.

Moll, Benjamin (2020). "Discussion of "Sources of US Wealth Inequality: Past, Present, and Future"." In: *NBER Macroeconomics Annual 2020, volume 35*. University of Chicago Press.

Nakamura, Emi and Jón Steinsson (2018). "Identification in Macroeconomics." In: *Journal of Economic Perspectives* 32.3, pp. 59–86.

Paiella, Monica (2009). "The Stock Market, Housing and Consumer Spending: A Survey of the Evidence on Wealth Effects." In: *Journal of Economic Surveys* 23.5, pp. 947–973.

Paul, Pascal (2020). "The Time-varying Effect of Monetary Policy on Asset Prices." In: *Review of Economics and Statistics* 102.4, pp. 690–704.

Poterba, James M. (2000). "Stock Market Wealth and Consumption." In: *Journal of Economic Perspectives* 14.2, pp. 99–118. URL: https://www.aeaweb.org/articles?id=10.1257/jep.14.2.99.

Ramey, Valerie A. (2016). "Macroeconomic Shocks and Their Propagation." In: *Handbook of Macroeconomics, Volume 2*. Elsevier, pp. 71–162.

Rigobon, Roberto and Brian Sack (2004). "The Impact of Monetary Policy on Asset Prices." In: *Journal of Monetary Economics* 51.8, pp. 1553–1575.

Rodgers, William M. (2008). "African American and White Differences in the Impacts of Monetary Policy on the Duration of Unemployment." In: *American Economic Review* 98.2, pp. 382–86.

Romer, Christina D. and David H. Romer (2004). "A New Measure of Monetary Shocks: Derivation and Implications." In: *American Economic Review* 94.4, pp. 1055–1084.

Rungcharoenkitkul, Phurichai, Claudio Borio, and Piti Disyatat (2021). *Monetary Policy Hysteresis and the Financial Cycle*. Working Paper.

Stock, James H. and Mark W. Watson (2018). "Identification and Estimation of Dynamic Causal Effects in Macroeconomics Using External Instruments." In: *The Economic Journal* 128.610, pp. 917–948.

Thompson, Jeffrey P. and Gustavo Suarez (2017). *Updating the Racial Wealth Gap*. FEDS Working Paper. Federal Reserve Board.

Wachtel, Paul and Mario I. Blejer (2020). "A Fresh Look at Central Bank Independence." In: *Cato Journal* 40.1, pp. 105–132.

Wolff, Edward N (2017). *Household Wealth Trends in the United States, 1962 to 2016: Has Middle Class Wealth Recovered?* Working Paper 24085. National Bureau of Economic Research.

— (2016). "Household Wealth Trends in the United States, 1962 to 2013: What Happened Over the Great Recession?" In: *RSF: The Russell Sage Foundation Journal of the Social Sciences* 2.6, pp. 24–43.

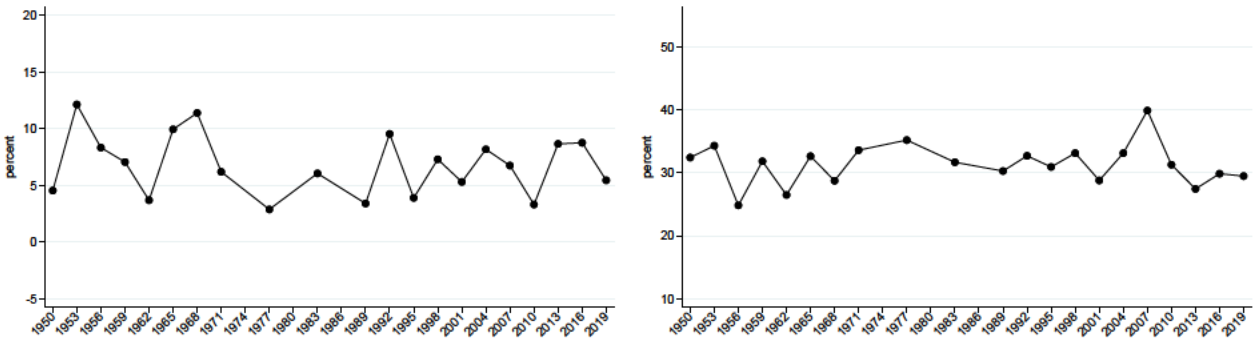
Wu, Jing Cynthia and Fan Dora Xia (2016). "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound." In: *Journal of Money, Credit and Banking* 48.2-3, pp. 253–291.

Zavodny, Madeline and Tao Zha (2000). "Monetary Policy and Racial Unemployment Rates." In: *Federal Reserve Bank of Atlanta Economic Review* Fourth Quarter, pp. 1–16.

A. Supplementary results

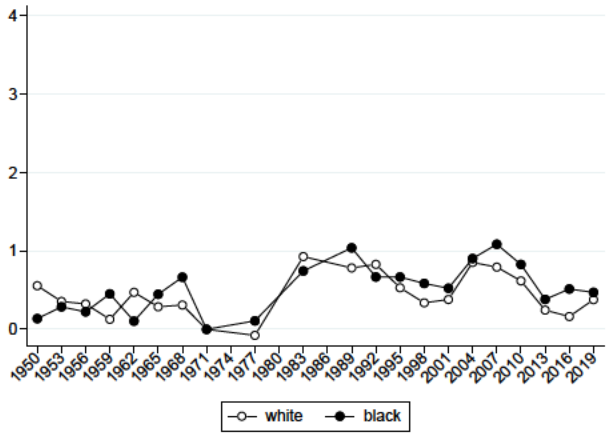
Figure A.1: *Long-run trends of the racial equity and housing gaps*

(a) *Racial equity and business wealth gap* **(b)** *Racial housing wealth gap*



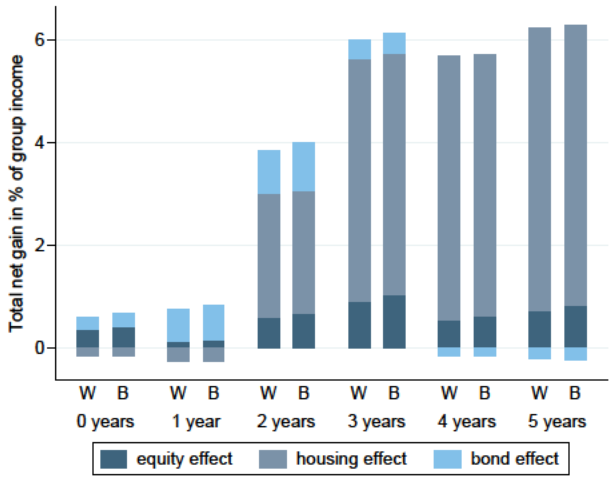
Notes: The left (right) panel shows the evolution of the ratio of average black to average white equity and business (housing) over time. The data were winsorized at the 1st and 99th percentile within each year-race bin. Equity and business wealth includes mutual funds and other managed assets. Housing includes the net value of other real estate.

Figure A.2: *Counterfactual change in wealth-to-income ratios relative to 1971*



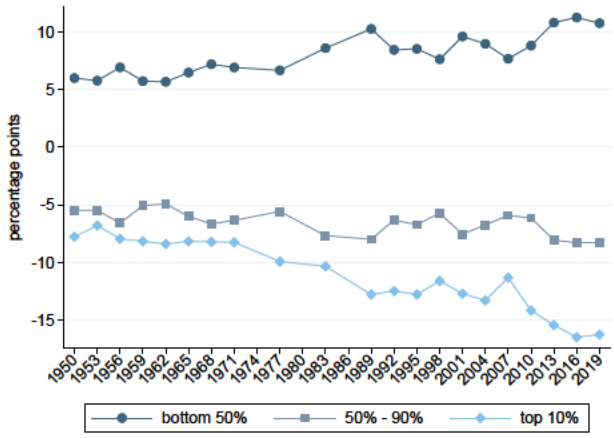
Notes: The graph shows the counterfactual change in wealth-to-income ratios of black and white households over time when fixing wealth from equity (comprising mutual funds and other managed assets), business and pensions at its 1971 level for subsequent years. Changes are shown as differences to the 1971 values for each group.

Figure A.3: *Capital gains for black and white households around the median of the aggregate wealth distribution, normalized by income*



Notes: The figure shows the wealth effects for black and white households around the median of the *aggregate* wealth distribution after a 100bp monetary shock over time, normalized by each group's average income. The wealth effects are computed by combining the estimates from Table 3 for the Romer-Romer shocks with portfolio data from the SCF. See text for details. The underlying portfolios are constructed by averaging across all households between the 40th and 60th percentile of the aggregate wealth distribution.

Figure A.4: *Share of black households in different parts of the aggregate wealth distribution, relative to overall population share*



Notes: The figure shows the share of black households in the bottom 50%, middle 40% and top 10% of the aggregate wealth distribution over time, normalized by subtracting the overall population share of black households in the given year.

B. Alternative shock estimates

Figure A.5 shows the impact on key outcome variables of the alternative monetary policy shocks discussed in Section 4.2.2. The measure introduced by Bernanke and Kuttner (2005) (BK) produces substantially larger asset price effects than the benchmark RR-series. The effects of an 100bp exogenous decline in the Fed Funds pushes up both stock and house prices by 20 percent or more over an extended period. Also the effects on the unemployment gap are larger than with the RR estimate. The shocks based on Gertler and Karadi (2015) (GK) that use high-frequency Fed Funds futures markets data show smaller asset price effects. In this case, stock prices rise by a little less than 10 percent over a three year horizon, but the response is similar and more persistent in the case of house prices. By contrast, with the GK shock series, the unemployment gap is essentially unaffected for three years following a monetary shock. All in all, the alternative shock series lend support to the idea that more accommodative monetary policy boosts asset prices over some time horizon. In many of our estimates that time horizon is an extended one, encompassing multiple years. There is also evidence, mixed with respect to statistical significance, that accommodative monetary policy has a short-run effect on the unemployment gap between black and white workers. The wage gap is never really affected.

Similar results are shown with a time-varying VAR (TV-VAR) approach following Paul (2020) (PP). The TV-VAR aims to capture different responses of asset prices to monetary policy shocks over time, depending, for instance, on whether risk appetite in markets is high. The TV-VAR methodology is shown in Section C and the estimates are in Table A.1. It is noteworthy that the equity price response reaches double-digits with the TV-VAR set up. Stock prices rise and remain more than 10 percent higher over a five year period. Statistical significance here is borderline, while the confidence intervals for BK-shocks are extremely wide for asset and labor market responses.

C. TV-VAR Estimates

Consider the structural form of the evolution of a set of macroeconomic variables and controls, Y_t, relative to a series of structural shocks, ϵ_t:

$$HY_t = C_0 + \sum_{i=1}^{k} C_k Y_{t-k} + \epsilon_t$$

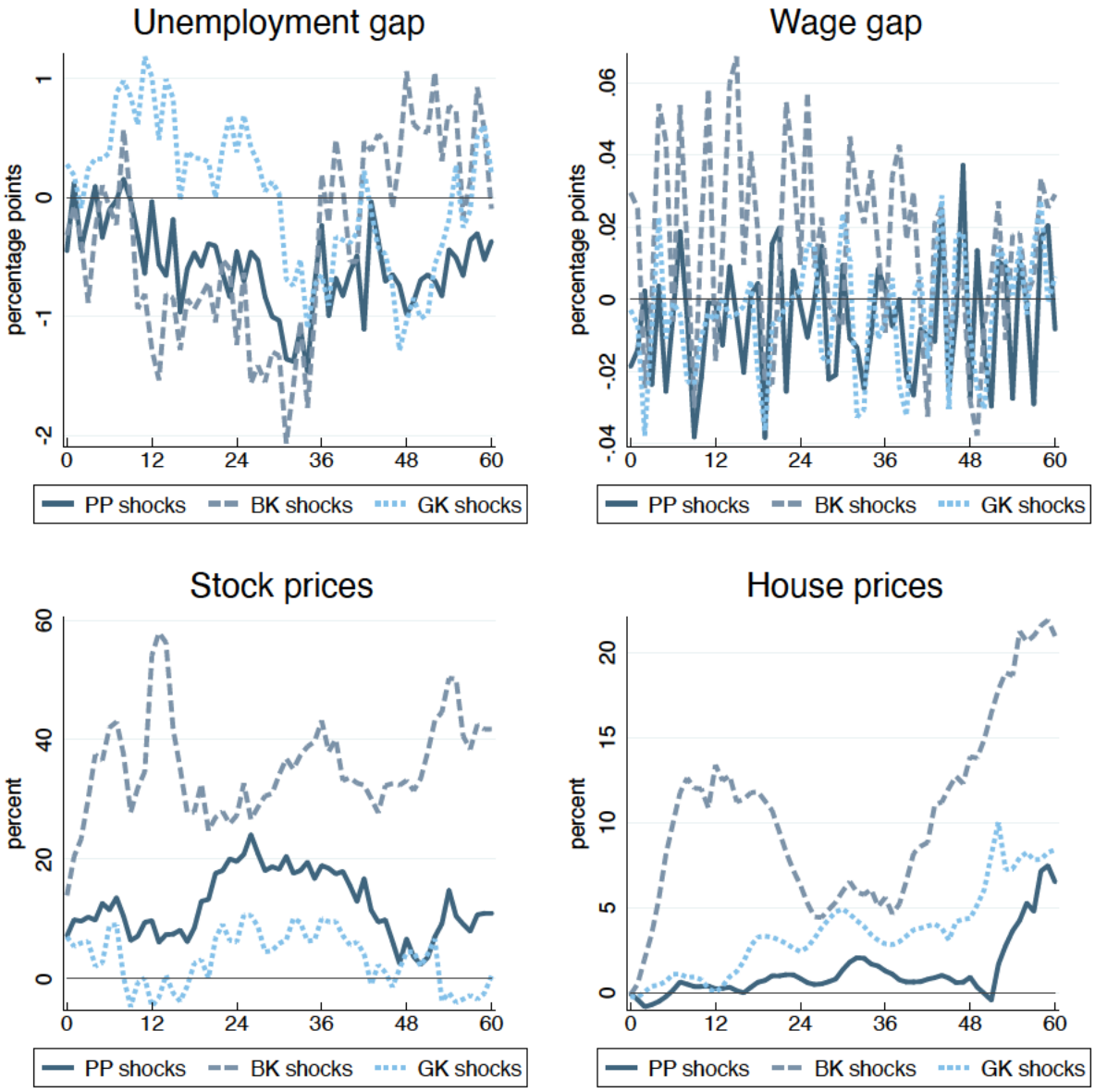
Solving for Y_t yields the following expression, in which $u_t = H^{-1}\epsilon_t$ represents reduced-form innovations which pick up the contemporaneous effects of the structural shocks on all the variables within Y_t:

$$Y_t = B_0 + \sum_{i=1}^{k} B_k Y_{t-k} + u_t$$

The ϵ_t are not directly observable, so an external instrument related to the shock must be introduced. Let $\epsilon_{1,t}$ be the primary structural shock of interest, so that the instrument z_t can be related as $z_t = \phi\epsilon_{1,t} + \eta_t$, where η_t is normally distributed with mean zero and independent of all other variables. We use the shocks calculated in Paul (2020) as our instrument. These can be directly integrated into the model as follows:

$$Y_t = B_{0,t} + \sum_{i=1}^{k} B_{i,t} Y_{t-i} + A_t z_t + u_t$$

Figure A.5: *LP-IV estimates: other shock measures*



Notes: The figure shows the impulse responses for the unemployment and wage gap, stock prices, and house prices after BK, PP, and GK shocks. The horizontal axes shows calendar time in months and the vertical axes show asset price changes in percent for stocks and houses, and in percentage points for the racial unemployment and wage gap.

Table A.1: *TV-VAR estimates for response to 100bp expansionary monetary policy shock*

Shock	Horizon	House prices %	Stock prices %	Treasury yield pp	BAA yield pp
Paul (2020)	1y	1.4	13.85	0.24	-0.11
		(-3.1, 5.82)	(-0.99, 29.48)	(-0.76, 1.29)	(-0.61, 0.34)
	2y	1.98	12.41	0.16	-0.1
		(-5.34, 9.54)	(-4.2, 30.69)	(-0.96, 1.36)	(-0.69, 0.47)
	3y	2.19	11.29	0.14	-0.09
		(-6.51, 12.1)	(-6.49, 30.95)	(-1.14, 1.39)	(-0.82, 0.54)
	4y	2.14	10.64	0.13	-0.06
		(-8.03, 14.24)	(-8.69, 31.45)	(-1.24, 1.5)	(-0.88, 0.62)
	5y	1.95	10.12	0.12	-0.04
		(-9.02, 16.24)	(-9.84, 32.93)	(-1.37, 1.67)	(-0.93, 0.73)

Notes: The table shows TV-VAR response estimates for asset prices, interest rates, and the unemployment gap after a 100bp expansionary monetary shock for the monetary policy shock series of Paul (2020). The rows show the point estimates of the response after 1 to 5 years. Brackets below the point estimates at each horizon show the 90-percent confidence intervals. TV-VAR method uses Gibbs sampling to uncover the distribution of responses over different time periods

D. Demographic composition of households

The results in the body of the paper take all black and all white households together without any attention paid to other demographic differences. The portfolio holdings and unemployment responses of households might differ for reasons other than race, such as marital status and the sex of the household head. If households with a single versus a married or male versus female head have different asset portfolios, they are likely to be affected differently by a monetary policy shock. In this Appendix, we will examine the impact of monetary policy shocks on the income and wealth of black and white households of different types.

Since only 15% of the SCF households have a black head, the granularity of other demographic characteristics will be limited. We start with a distinction between households with a single rather than married head, where married includes cohabiting couples. Two-thirds of white households are married, while the proportion for black households is only 35%. Households with a single head can further be distinguished into male and female heads, whereas the head is always male for married couples by the SCF's convention. Among black single households, 66% have a female head, while among white single households 56% have a female head.[27]

Summary statistics for black and white households by type are shown in Appendix Table A.2. The racial wealth gap is large for all household types. White single and married households have about 5 times as much wealth as comparable black households. Average income of white single households with male or female heads is about 1.3 times the average income of the corresponding

[27]Single households include both individuals living alone and individuals with children. A further breakdown is not feasible because of small sample sizes in sub-categories. There are only 166 black households with a single male head, our smallest category.

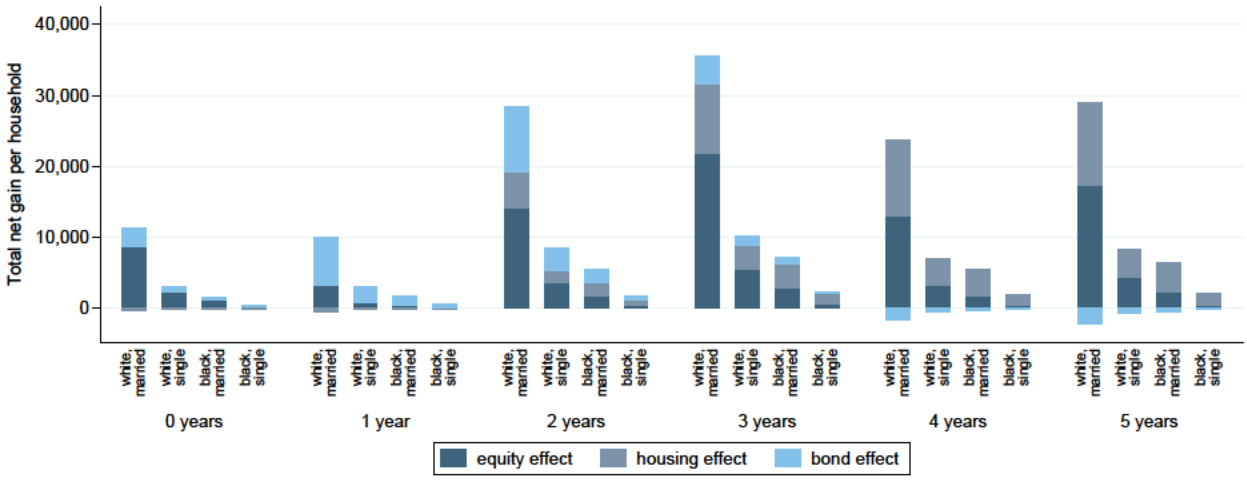
Table A.2: *Summary statistics by marital status and sex*

	Mean income	Mean wealth	Share of housing in total assets	Share of equity in total assets
		White		
Single	57614	403456	0.36	0.38
Men	69194	469742	0.30	0.45
Women	49373	356279	0.41	0.31
Married	151141	1323076	0.32	0.46
		Black		
Single	41466	82248	0.58	0.15
Men	51961	118201	0.54	0.20
Women	36146	64022	0.62	0.10
Married	90825	253066	0.49	0.24

Notes: The table shows average wealth and income, as well as the shares of housing and equity in total assets for black and white households, by marital status and sex.

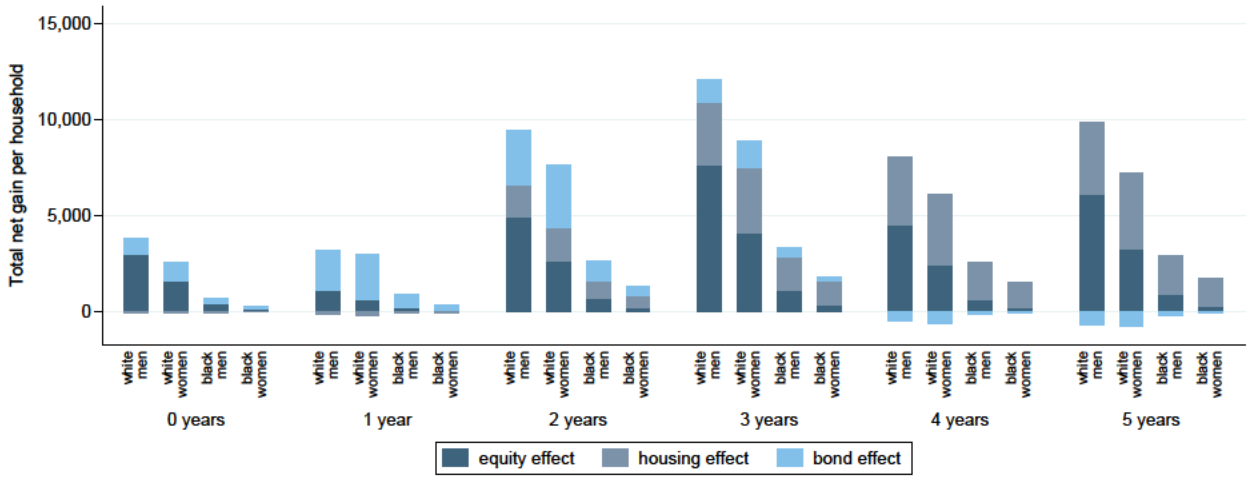
black households. For married households, the ratio of white to black average income is 1.7. The table also shows two key elements of the portfolio distribution, the shares of housing and equity in total assets. Black households of all types own larger shares of their assets in housing than white households, although average housing assets for black households are only a fraction of the average housing assets of white households of the same type. By contrast, black households have very small equity shares compared to white households across all household types.

Figure A.6: *Total effects over time by marital status, per household*



Notes: The figure shows the average wealth effects for black and white households after a 100bp monetary shock (Romer-Romer shocks) over time, stratified by marital status. The wealth effects are computed by combining the estimates from Table 3 with portfolio data from the SCF.

Figure A.7: *Total effects over time by sex (singles), per household*



Notes: The figure shows the average wealth effects for black and white households after a 100bp monetary shock (Romer-Romer shocks) over time, stratified by sex. The wealth effects are computed by combining the estimates from Table 3 with portfolio data from the SCF.

We use our benchmark RR shocks to examine the impact of an accommodative monetary policy shock on the portfolios of households of different types. The average portfolio effects by marital status are shown in Appendix Figure A.6 and by sex for singles in Appendix Figure A.7.

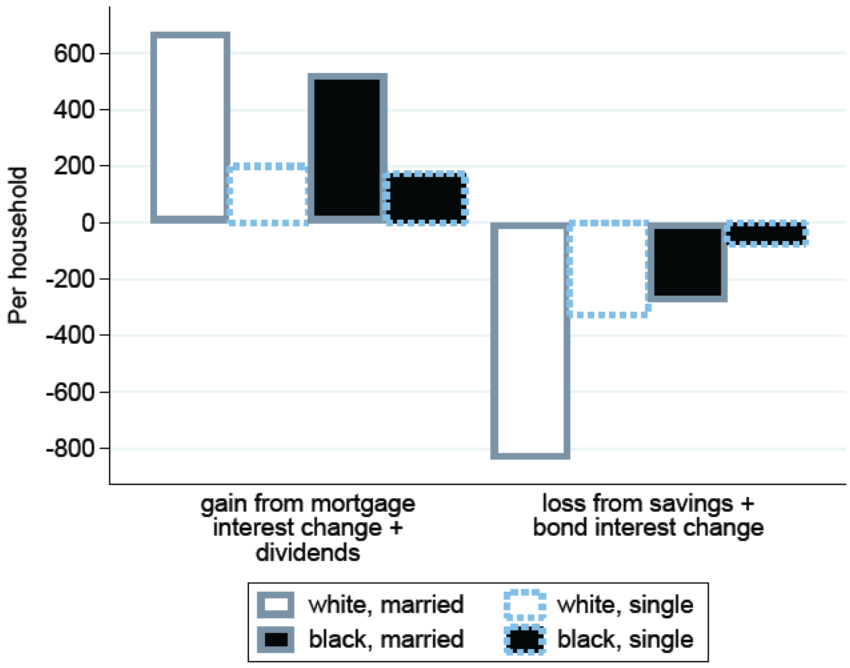
The portfolio gains for white households of all types are much larger than the gains for black households. This is true for the absolute dollar gains shown in the figures and also for the gains relative to income in each group. Because the racial wealth differences are so much larger than the income differences (see Appendix Table A.2), the differences in capital gains are still large when we examine them relative to income.

Looking at year 3, the capital gains of white married households are about 5.5 times larger than for black married households, and the difference is similar for single households.The capital gains for white male singles are 4 times larger than for their black counterparts, and for white and black women the corresponding ratio is almost 6. At all time horizons, the gains for white households of any type are considerably larger than for black households of the same type. Moreover, white single households have larger gains than black married or single households. To a large extent, these comparisons are due to differences in equity ownership. White married couples and single men own more equity than other household types. Other household types benefit more from housing gains, but these are smaller and less persistent.

The effects of the benchmark (RR) monetary policy shock on capital income, the gains from mortgage refinancing increases and the loss in interest earnings on savings, are shown in Figure A.8 for marital status and Figure A.9 by sex for singles.

The savings from mortgage refinancing are similar for black and white households, although somewhat larger for white households, in particular if they are married. However, the gains of black singles mostly accrue to men, whereas they are more equally distributed among white single men and women. White married households have substantially higher liquid asset holdings than the other groups, and therefore also lose a higher amount due to a change in savings interest rates.

Figure A.8: *Effects of monetary policy shocks on capital income by marital status, per household, after one year*



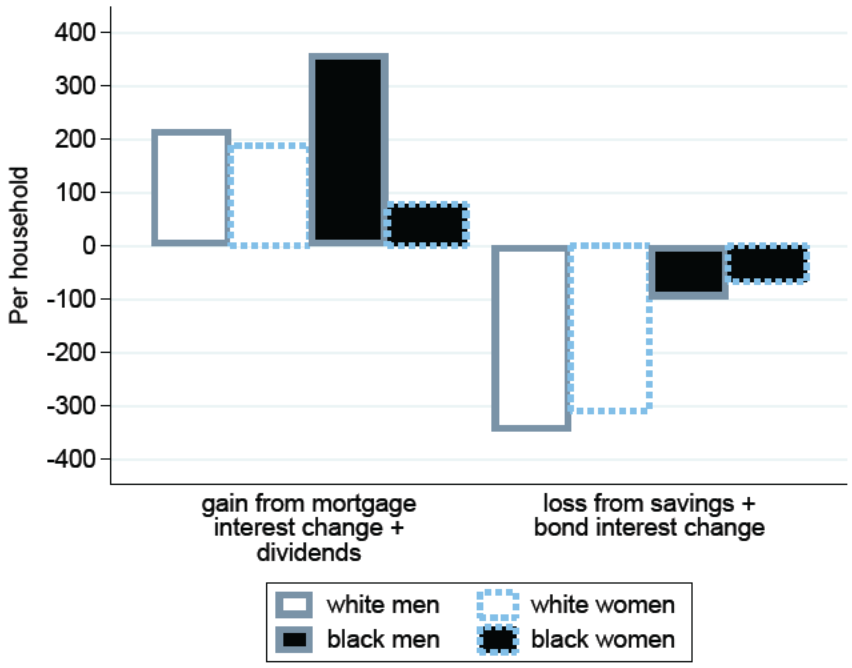
Notes: The figure shows the effects of an expansionary policy shock on capital income after one year for married and unmarried black and white households. See Section 5.1 for details.

Among the singles, there are only small differences between men and women for both black and white households.

To estimate the earnings effects of a monetary policy shock, we need to estimate the impact of the shock on the difference in unemployment rates for each household type. Unemployment rates are not available by marital status but they are available by race-sex category. We use the same methodology as before to estimate the impact of the RR shock on the racial unemployment rate gaps for men and women. We then use the same assumptions as before regarding the incomes of newly employed individuals to estimate the impact of a monetary policy shock on the difference in earnings between black and white single men and women.

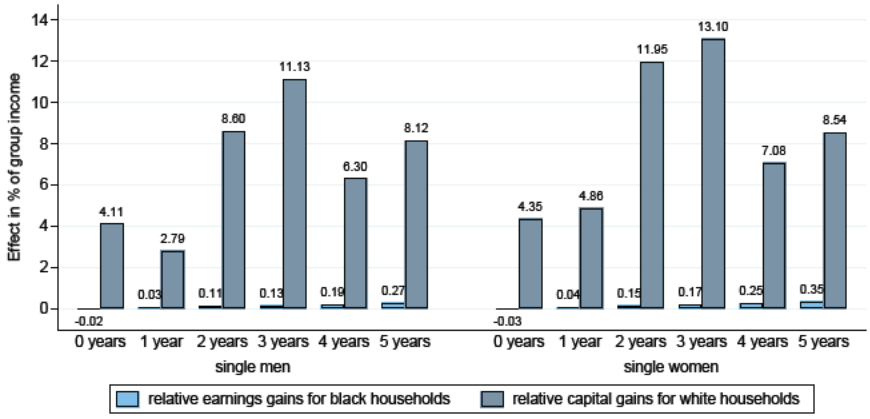
The effect of the monetary policy shock on the racial earnings gap can be compared to the difference in portfolio effects for each group, as shown in Appendix Figure A.10. The earnings effects as a percent of average income are small when compared to the portfolio effects for both single male and single female households.

Figure A.9: *Effects of monetary policy shocks on capital income by sex (singles), per household, after one year*



Notes: The figure shows the effects of an expansionary monetary policy shock on capital income after one year for male and female black and white singles. See Section 5.1 for details.

Figure A.10: *Comparison of earnings and portfolio effects by sex (singles)*



Notes: The figure compares the cumulated earnings effect to the portfolio effect based on the Romer-Romer shocks for single men and women. The effects are reported as a percentage of average annual household income of the respective racial group. The relative earnings effect is computed by combining the estimated effect of the monetary policy shock on the unemployment gap for singles with earnings data from the SCF using the methodology in Section 5.4. The relative portfolio effect is calculated as the difference between the capital gains of white and black households from Appendix Figure A.7.