Monetary Policy and Racial Inequality

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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 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.

Keywords: monetary policy, racial inequality, income distribution, wealth distribution, wealth effects

JEL classification codes: E40, E52, J15

"The Fed has a profound impact on our economy. . . . . [it] promotes maximum employment, and stable prices. . . . the 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 $181,440, compared to only $20,730 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 ($38,688) is 58 percent of the median income of white households ($67,196).

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. 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 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 income and wealth of black and white households.

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[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

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 unemployed, or stayed unemployed for longer. Marginal workers that are drawn into the labor market by such accommodative policies are oftentimes 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. In support of this view, Carpenter and Rodgers (2004) find a higher sensitivity of black workers' labor market outcomes to monetary policy shocks. In their study of the distributional effects of monetary policy, Coibion et al. (2017) refer to this effect on low-income workers as 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 which explicitly aims at affecting asset prices (Bernanke, 2020; Wu and Xia, 2016).

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

This paper quantifies and compares the size of the earnings and portfolio effects of monetary policy in a unified empirical framework. We use instrumental variable local projections (LP-IVs) following Stock and Watson (2018) and Jordà, Schularick, and Taylor (2020) to study the effects of monetary policy shocks on both asset markets and black-white employment gaps over five-year horizons. To infer portfolio effects on the wealth distribution, we first study how monetary policy shocks affects the price of houses, equities, and other financial

assets. For the empirical analysis, we rely on the most widely used monetary policy shock series -– the (extended) Romer-Romer shocks (Coibion et al., 2017) – as well as financial market surprise measures taken from Bernanke and Kuttner (2005) and Gertler and Karadi (2015). We then link the estimated asset price changes to the portfolios of white and black households using the comprehensive wealth data from the most recent SCF wave in 2019, and determine the effect on the net wealth of black and white households. We then compare the estimate for the earnings and portfolio effects 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 unemployment rate falls by about 0.2 percentage points more than the white unemployment rate after an unexpected accommodative 100bp interest rate shock. This translates into higher earnings for the mean black household relative to the mean white household of $97 annually. But the same shock also pushes up stock prices by about 5 percent, and house prices by 2 percent, while lowering bond yields on corporate and government debt. The effects on employment and asset prices appear to be a robust feature in the data, across different shock specifications, estimation methods, and samples.

Importantly, the effects of accommodative monetary policy shocks on wealth are comparatively large, while the effects on employment and earnings are comparatively small. For white households, we find that on average, a 100-basis-point accommodative policy shock leads to capital gains from asset price changes of at least $25,000, which is about a quarter of their average annual income. The wealth gains for black households are substantially smaller, about $5,000, corresponding to 9 percent of their 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 effects are somewhat smaller for the median black and white household, but the relative increase in wealth inequality is even more pronounced as the median black household does not own stocks or a house.

It is widely accepted that monetary policy shocks have only temporary effects.[3] So how should one think about the capital gains induced by transitory monetary policy shocks? To start with, in our estimations the effects of a policy rate shocks on asset prices remains visible over a multi-year period, as in other recent research (Paul, 2020a). When it comes

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[3]Some authors also argue that monetary policy can also affect the long-run equilibrium interest rate (Rungcharoenkitkul, Borio, and Disyatat, 2021). In such settings, the effects that we document could be long-lasting. The focus in this paper is on cyclical effects only.

to unconventional monetary policy, the effects on asset prices are not only intended, but the decade-long use of these tools has also blurred the distinction between transitory and long-lasting effects on asset markets. Moreover, even temporary asset price changes can have important macroeconomic effects. In recent models with heterogeneous agents, the asset price channel of monetary policy transmission has featured prominently (Auclert, 2019; Auclert, Rognlie, and Straub, 2020; Caramp and Silva, 2020; Kekre and Lenel, 2020).

There are at least three notable channels through which policy-induced asset price changes can affect the macroeconomy. First, asset prices 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 relative capital gain of roughly $20,000 for white households translates into additional consumption expenditures of $600 – about six times our estimate of the relative earnings effect for black households. 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. 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 asset holdings. If past discrimination in housing markets implies that black households are structurally "short" housing and have plans to become homeowners, asset price increases would tend to make those households worse off.

Third, rising assets prices may also temporarily relax collateral constraints for borrowing linked to business formation. To the extent that such effects predominantly fall on white households and encourage business formation by white households more than business

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[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.

formation of black 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.

Heterogeneous agent models bring important new elements to the study of the distributional effects of monetary policy, including racial inequality. While a comprehensive analysis of the welfare effects of monetary policy along racial lines is beyond the scope of this paper, 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.

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 income and consumption inequality. However, these results for the U.S. have not been confirmed in more granular Scandinavian administrative data. Andersen et al. (2021) use Danish microdata to study the effects of monetary policy on income, consumption and wealth inequality. The key finding is that rich households benefit much more than poor ones so that accommodative policy shocks widen both income and wealth inequality. Analyzing Norwegian data, Holm, Paul, and Tischbirek (2020) find evidence that contractionary monetary policy shocks increase income inequality, but decrease wealth inequality. Amberg et al. (2021) find a U-shaped instead of monotonically increasing income effects of monetary policy in Swedish administrative data. A few papers have examined the effect of monetary policy on wealth inequality directly. Adam and Tzamourani (2016) use Euro-area data from the Household Finance and Consumption Survey to estimate the impact of asset price changes on the wealth distribution. Albert and Gómez-Fernández (2018) estimate the effect of a high-frequency policy shock on asset prices and the wealth distribution.

The structure of the paper is as follows. In Section 2, we discuss racial inequalities in income and wealth, present the data and discuss portfolio differences between black and white households. We present our estimates of the effects of monetary policy shocks on asset prices and the unemployment gap in Section 3. In Section 4, we examine the impact of a typical monetary policy shock on black and white wealth 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 data, present key trends and discuss the pronounced portfolio heterogeneity between black and white households that gives rise to different sensitivities to changes in asset prices.

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 (2016a); 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, 2016a). 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 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

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

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. Trends in racial income and wealth inequality

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.

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

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.

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[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.

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 of equity 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. For example, 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, 2016b). 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: *Long-run trends of the racial wealth and income gaps*

(a) *Racial wealth gap*   **(b)** *Racial income gap*
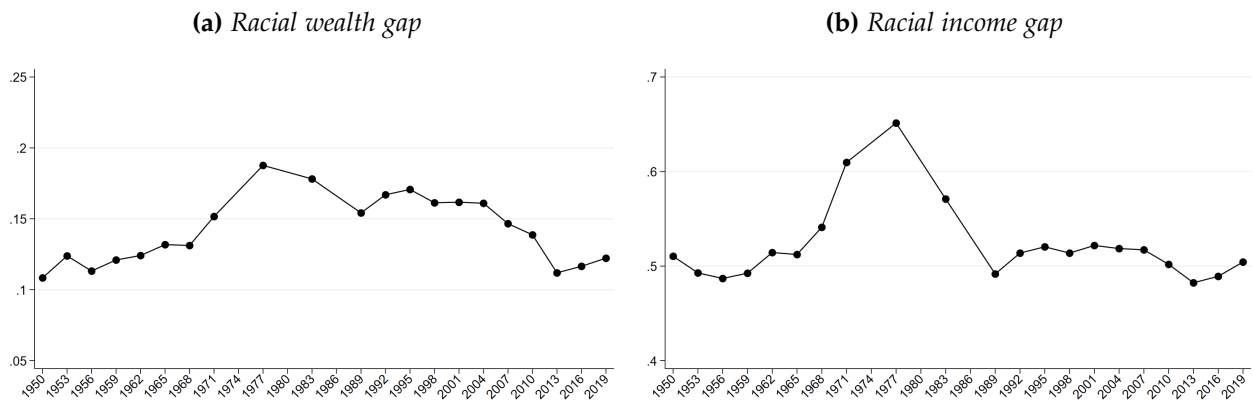
Notes: The left (right) panel shows the evolution of the ratio of average black to average white wealth (income) over time. The data were winsorized at the 98th percentile within each year-race bin and smoothed by taking a moving average across three neighboring SCF waves.

Kuhn, Schularick, and Steins (2020) compiled household-level data from early waves of SCF data to examine the financial situation of U.S. households going back to 1950. Using these data, Figure 1a shows three-wave moving averages of the racial wealth gap, i.e., the ratio of average black to average white wealth. Figure 1b shows analogous results for income.[8]

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

[8]The data are winsorized at the 98th percentile within each year-race bin because there are some extreme outliers in the historical data due to small sample sizes and imputations.

The racial wealth gap declined from the 1950s to the 1970s, but then it began to widen. In the aftermath of the financial crisis, the racial wealth gap reached levels not seen since the 1950s, largely driven by the collapse of house prices (Kuhn, Schularick, and Steins, 2020; Wolff, 2016). The trends in the income gap are similar. There was a reduction in racial income inequality in the 1960s and 1970s, which was followed by a return to earlier levels of the gap in the 1990s.[9]

Figure 2: *Change in wealth and wealth-to-income ratios relative to 1971*

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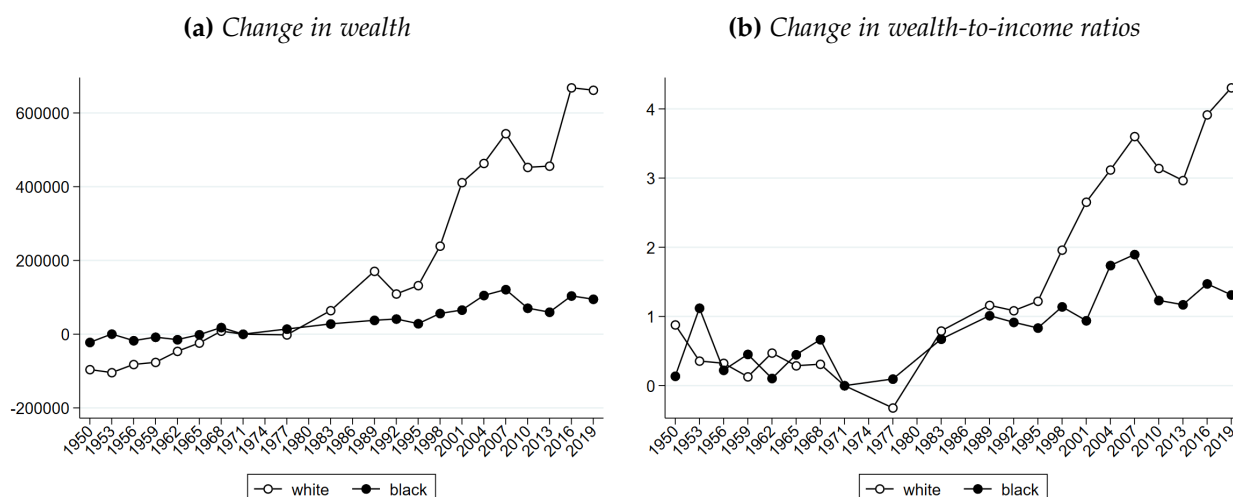
Notes: The left panel shows the change in average wealth of black and white households over time. The right panel shows the change in wealth-to-income ratios of black and white households over time. In both panels, changes are shown as differences to the 1971 values for each group.

In Figure 2a, we contrast the dollar changes in average wealth levels of black and white households in the United States over the past 70 years relative to 1971. While average white wealth increased by about three-quarters of a million dollars in today's 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 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 2b 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-

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[9]The gap in median incomes is different; median income inequality is reduced since the 1990s, although the gap is still larger than in the late 1970s. See Kuhn, Schularick, and Steins (2020) for a detailed discussion.

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

1990s, when a rapid divergence took place. By 2019 (see Table 1), white households owned 8.6 dollars of wealth per dollar of income, while black households owned only 2.5 dollars of wealth per dollar of income. Over the 40-year time period from 1980 to today and when taking the racial income gap into account, we still find that black households increased their wealth by only about one year's income, while the wealth of white households increased by about four times their annual income. High wealth-to-income ratios imply that changes in asset prices lead to large wealth gains relative to income, so that differences in saving rates operating on income *flows* can have only a small impact on the wealth gap compared to the impact of asset price changes operating on much larger wealth *stocks*.

Figure 3: *Racial unemployment gap*
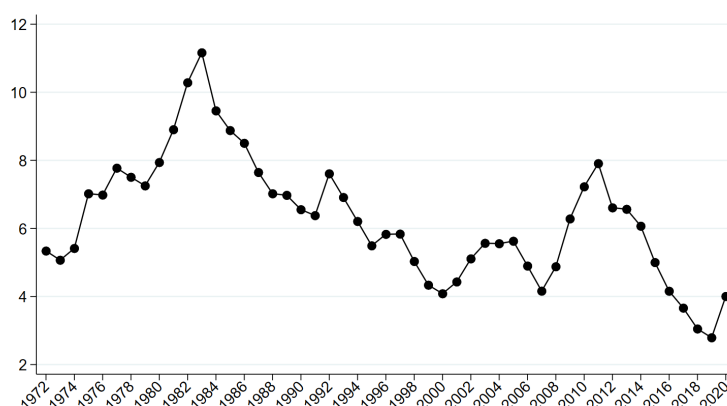
Notes: The figure shows the racial unemployment gap from 1972 to 2020 (in percentage points), computed as the difference between the average annual unemployment rates of black and white workers. Data on monthly unemployment rates by racial group are taken from FRED (LNU04000003 and LNU04000006).

In addition to the large wealth and income differences between black and white households in the United States, there is a large gap in unemployment rates. 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 the black unemployment rate data comes available.[11] Figure 3 shows the black-white 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 was less than 2 percentage points in the tight labor market prior to the Covid-19 pandemic. The time series show some clear countercyclical patterns, with the unemployment gap increasing in recessions and falling during expansions.

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

2.3. Household portfolios and asset price changes

Figure 4 displays the portfolio composition of black and white households by showing the average share of each asset class in total assets.[12] 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 percent) 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 of household wealth 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.

To illustrate the different sensitivity of black and white portfolios to asset price changes, we consider a 10-percent change in the price of each asset and look at how such a shock affects the wealth of the average black and white household. Figure 5a shows the dollar wealth

Figure 4: *Average portfolio shares of white and black households (percent of total assets)*
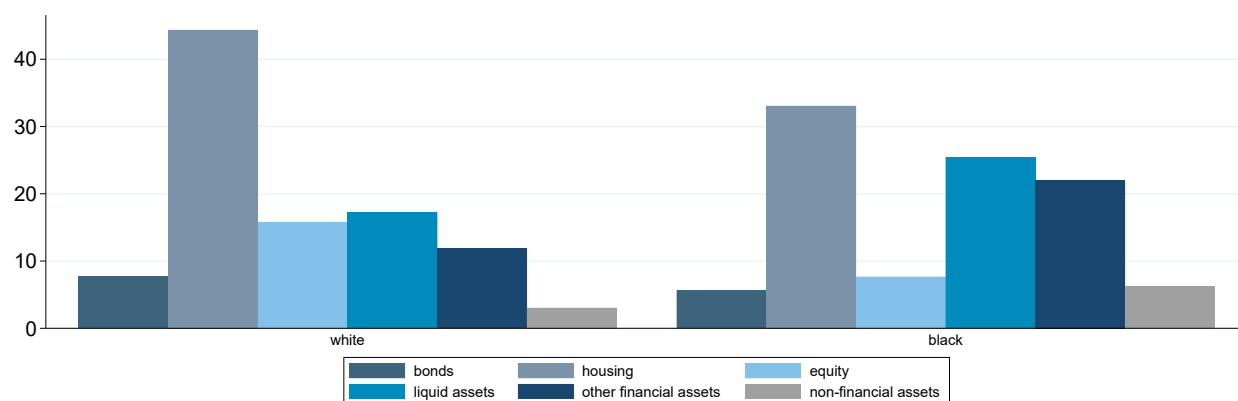
Notes: The figure shows the portfolio shares of bonds, housing, equity, liquid assets, other financial assets, and non-financial assets in percent of total assets, averaged across all white (left) and black (right) households in the 2019 SCF. See text for details regarding construction of asset classes.

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[12]Note that the figure shows average portfolio shares, which are different 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.

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

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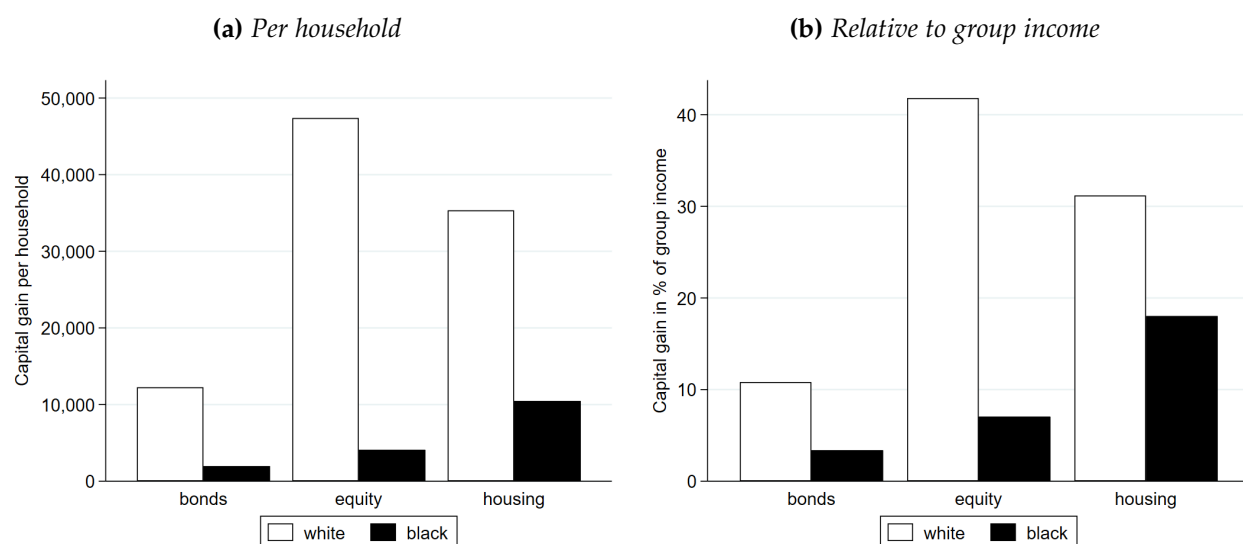
Notes: The left panel shows the average capital gains for black and white households from a 10-percent increase in bond, stock, or house prices. Capital gains are computed as the product of the price change and the average stock of asset holdings of the respective racial group. The right panel shows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

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 dollar 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.

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.

2.4. Portfolio composition and interest rate changes

Black and white households are also affected differently when interest rates change. We consider two ways in which households are affected by lower interest rates after an accommodative monetary policy shock. First, lower interest rates will lead to lower interest income on bank accounts and similar 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 an additional loss in interest income when rates fall.[13]. The second way in which households are affected by lower interest rates is if a household is a borrower, 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 and these 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, then the household 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 interest income and refinancing effects from interest rate changes is, given changing balances and maturities, very complex. To examine the impact of monetary-policy-induced interest changes on wealth gaps, 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.

Figure 6a shows the average loss in interest income on liquid assets and newly issued bonds after a 100bp decline in interest rates and similarly the average gain from mortgage refinancing. 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

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[13]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

larger for white than for black households. Over one year, the 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 6b shows that they are small: about 0.6 percent of annual income for white households and about half as much for black households.

Figure 6: *Effect on interest payments from a 100bp decline in interest rates*

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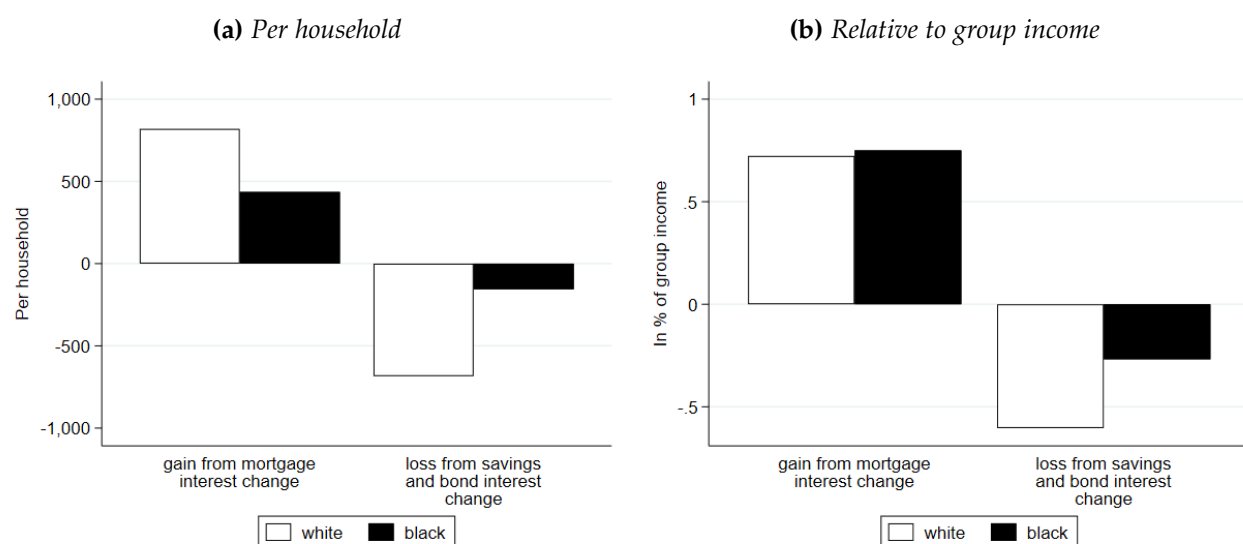
Notes: The left panel shows the average gains for black and white households after a 100bp decline in mortgage interest rates and their average losses after a 100bp decline in savings and bond interest rates (see text for details). The right panel shows the same gains as a percentage share of each group's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

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., 2020). The dollar decline in mortgage payments from refinancing after a 100bp decrease in interest rates is shown in Figure 6a. 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 6b 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 in mind the distribution of homeownership; 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.

3. Monetary policy, asset prices and the unemployment gap

In Section 2, we provided evidence for the heterogeneity in portfolio composition between black and white households and differences in their labor market outcomes, specifically the racial unemployment gap. We have shown that portfolio heterogeneity leads to different gains when a loose monetary policy results in a 10-percent increase in asset prices or a 100bp decline in interest rates. In the following, we will combine estimates of the effects of monetary policy shocks on asset prices with data on household portfolios from the SCF. In this section, we develop our estimates of monetary policy shocks and examine their impact on asset prices and the unemployment gap. In Section 4, we will investigate the wealth effects of an accommodative policy shock for black and white households and compare them to the income effects that result from a closing of the racial unemployment gap.

Our empirical strategy has two parts. In the first step, we use macro data to estimate the effects of a monetary policy shock on the price of assets – equities, houses, bonds – and on the black-white unemployment gap. We use three common measures for monetary policy shocks to determine a plausible range of the asset price and employment effects. The resulting income and wealth effects are examined in the second step using the SCF micro data. Specifically, we calculate how monetary policy differentially affects the wealth and income of black and white households, using information on portfolio composition from the SCF. That is, we use high-frequency macro data to estimate average effects that we apply to "typical" black and white households from the survey data. The results should be seen as a first-order approximation under the assumption that price effects are equal across asset classes, i.e., black and white households essentially have identical returns on their equity and housing portfolios. We have no information whether differences in portfolio composition lead to different returns within each asset class. .

3.1. Estimation of the effects of monetary policy

To study the effects of monetary policy shocks on black (white) employment and wealth, we will use instrumental variable local projections (LP-IV) following Stock and Watson (2018) and Jordà, Schularick, and Taylor (2020). This means we will treat monetary policy shock measures as proxies for the structural shocks in an instrumental variable set-up. The idea here is that surprises and structural shocks are imperfectly correlated. High-frequency surprise measures suffer from measurement error introduced by trading noise and random zero observations in months without FOMC meetings. Instrumenting the current Federal

Funds rate (FFR) instead of future rates reduces the problems raised by the potential release of private central bank information discussed by 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, and let Δz_t denote the surprise component. We denote as x the vector of controls, which includes 6 lags of the outcome and the shock variable, as well as other predetermined variables such as the unemployment rate, industrial production, and asset prices.

To start with, 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 $t = 1, \ldots, T$.

To obtain exogenous variation in Δr_t, we will turn to proxy measures for structural policy shocks provided by Coibion et al. (2017), Bernanke and Kuttner (2005), Gertler and Karadi (2015). These provide an instrument for the change in the FFR. We will estimate the

Table 2: *Monetary policy shock series*

Name & Source	Method	Time Period
Coibion et al. (2017)	Extended Romer-Romer shocks identified as component of policy changes that is orthogonal to the Fed's information set, Federal Reserve Greenbook projections for GDP and inflation, and unemployment	3/1969 - 12/2014
Bernanke and Kuttner (2005)	Shocks identified through the difference between the target rate and the rate implied by front-month Fed Funds Futures contracts	11/1988 - 11/2020
Gertler and Karadi (2015)	Shocks identified through a combination of surprise changes to both front-month and 3-month-forward Fed Funds Futures contracts in a 30-minute window after FOMC meeting	11/1988 - 6/2012

Notes: The table provides information on the three monetary policy shock series used in the analysis. The first column reports the source of the original series, the second column sketches the identification approach, the last column reports the time period for which data series are available.

Variable	Description	Time Period	Source
Federal Funds Rate	Federal Funds Target	11/1988 - 11/2020	FRB
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
House price	Case-Shiller house price index	1/1975 - 9/2017	S&P Corelogic
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
Unemployment rate	seasonally adjusted unemployment	1/1960 - 9/2017	BLS
Unemployment gap	difference in black and white unemployment rates	1/1972 - 9/2017	BLS

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.

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 form in (1), and where the estimates of $\Delta \widehat{r}_t$ come from the first-stage regression

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

The control vector x will include contemporaneous values of the variables except the outcome variable.[14] The inclusion of contemporaneous variables provides insurance against variation in the policy intervention known to agents at the time of the policy treatment.

Table 2 provides an overview of the three monetary policy shock series that we use in the following analysis. Our benchmark is the widely used shock series by Romer and Romer (2004), extended to 2014 by Coibion et al. (2017) (RR in the following). We also use an extended version of the original shock measure by Bernanke and Kuttner (2005) (BK) that sparked interest in the effect of monetary policy on asset prices. The final shock measure is based on high-frequency price changes in financial markets in a short window around FOMC meetings. We use the series compiled by Gertler and Karadi (2015) (GK).[15]

Data for the prices of financial assets, interest rates and the unemployment rate gap,

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[14]This avoids singularity as we begin at $h = 0$.

[15]The series cover different time periods. We present results from using all available data per shock series. However, the differences in the results are minor when using a common overlapping sample. We also tested the shocks series by Barakchian and Crowe (2013), and the more recent shocks by Nakamura and Steinsson (2018) and Paul (2020b). The results are similar in the LP-IV setting, but often show larger effects in the time-varying VAR set-up of Paul (2020b).

along with the controls, are all standard macroeconomic time series and publicly available. Specific variables, definitions and sources are shown in Table 3.

3.2. Impacts of monetary policy shocks: results

Figure 7 presents our benchmark estimates for the effect of monetary policy shocks on asset prices and the black-white unemployment gap over a 5-year horizon using the extended RR shock series. We find that stock markets rise by about 5 percent in response to the shock and the effect remains sizeable and significant over the entire 5-year horizon. By contrast, the house price response is about half as large in size and falls back to less than 1 percent by year 5. Treasury yields fall on impact, but then return to their original level within a few years. The black-white unemployment gap closes by 0.2 to 0.3 percentage points over the 5-year period.

In Figure 8, we compare the RR shock response to the other measures for monetary surprises, as discussed above.[16] As Ramey (2016) points out, different shock measures can lead to different results for individual variables, but in our case the results remain broadly consistent, with a 5-percent increase in equity prices, and a smaller and more transient increase in house prices of 2-3 percent. 10-year Treasury yields drop on impact and remain depressed for some time, before recovering later on.

The effect on the unemployment gap is also roughly consistent across the estimations. Only the RR shocks show a significant response at the 90 percent level at all projection horizons, suggesting that there is some residual uncertainty with respect to the differential employment effects of expansionary monetary policy. Yet we find that all point estimates show that unemployment rates decline more for black than for white workers so that the unemployment gap closes. Our results show that the effects are quantitatively small; after a 100bp expansionary shock, the unemployment gap closes by at most 20 to 30 bp. 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 0.15 percentage points more than the white unemployment rate. Their estimated effect is persistent; it declines slightly over time, but remains significant even after four years.[17]

Table 4 shows the complete set of results, including the effects on corporate bond yields

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[16]Confidence intervals for the estimates with the BK and GK shocks are shown in Appendix A1

[17]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.

and inflation that we use to gauge the bond price effects. We find that corporate bond yields fall somewhat more than Treasury yields so that bond spreads compress by about 10 to 15bp, depending on the shock series.

In a recent paper, Paul (2020b) proposed a time-varying VAR (TV-VAR) to capture different responses of asset prices to monetary policy shocks over time, depending, for instance, on whether risk appetite in markets is high. We report TV-VAR estimates using the Paul (2020b) methodology in Appendix Table A.1. It is noteworthy that the equity price response is about twice as large in the TV-VAR set-up, reaching double-digit effects on stock prices, for instance. Against this background, our asset price estimates that remain close to the original estimates by Bernanke and Kuttner (2005) could be a lower bound. By contrast,

Figure 7: *Benchmark estimates using Romer-Romer shocks*
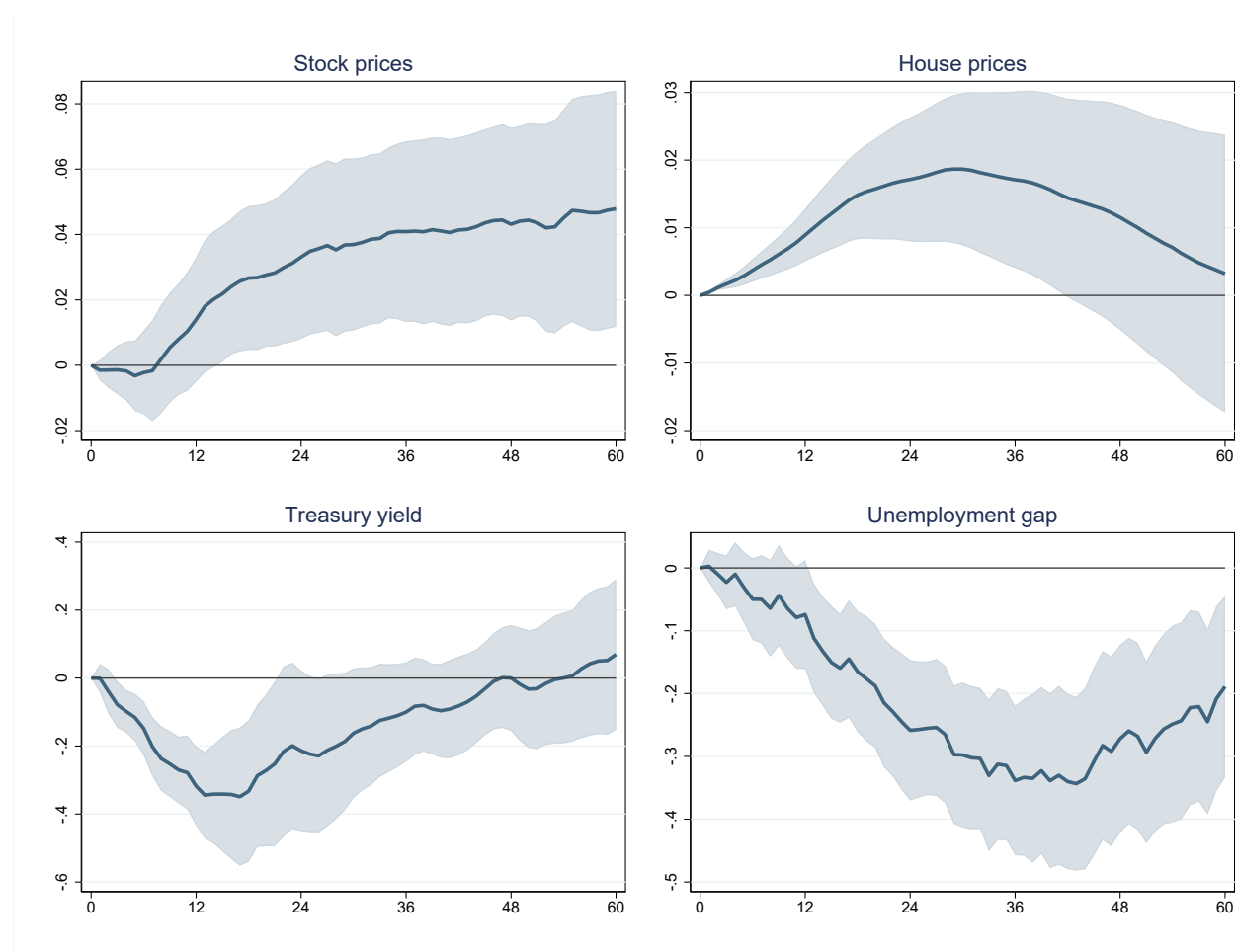
Notes: The figure shows the impulse responses for stock prices, house prices, 10-year treasury yields, and the unemployment gap after a Romer-Romer (RR) 100bp expansionary monetary policy shock. Impulse responses are shown as solid lines and shaded areas show 90-percent confidence bands. The horizontal 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.

Figure 8: *Effects of different monetary policy shocks on asset prices and unemployment gap*
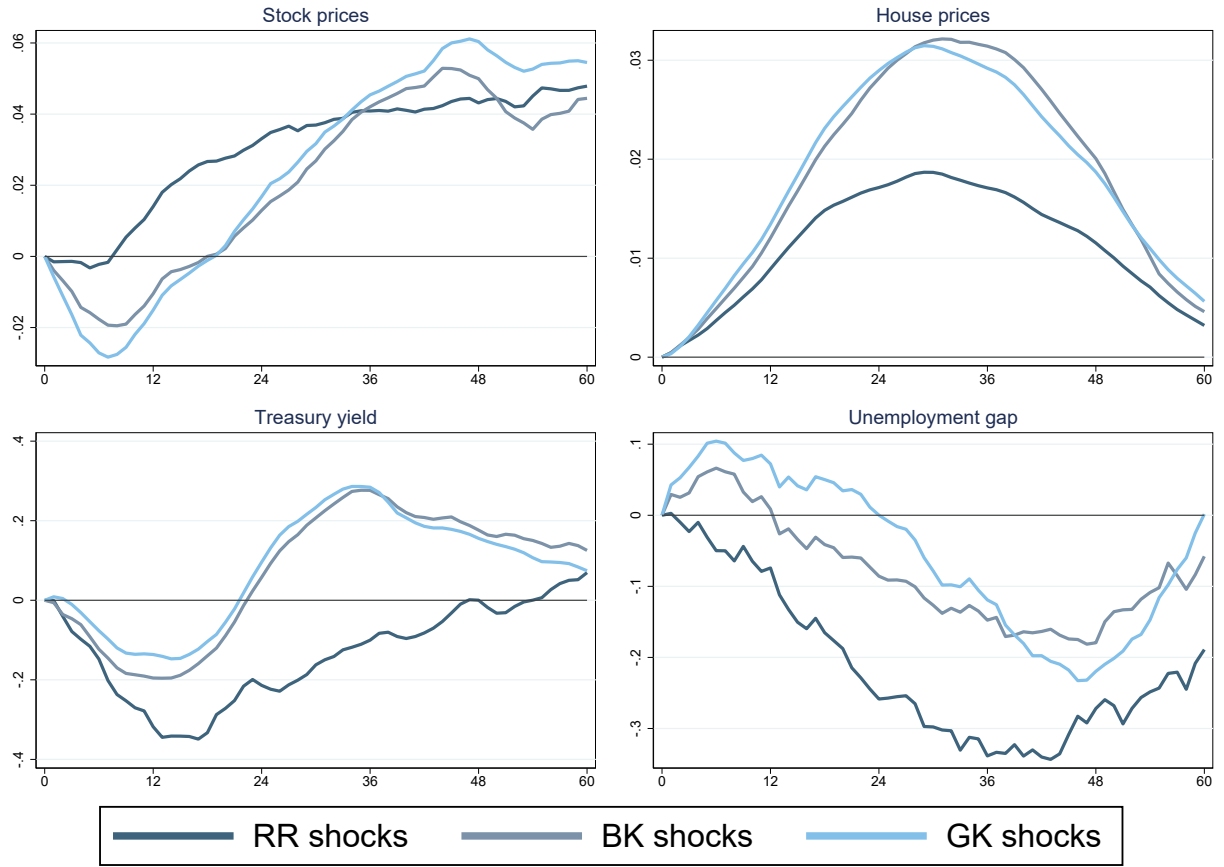
Notes: The figure shows the impulse responses for stock prices, house prices, 10-year treasury yields, and the unemployment gap after a 100bp expansionary monetary policy shock. Romer-Romer (RR) are shown as dark blue lines, Bernanke and Kuttner (BK) are shown as gray-blue lines, and Gertler and Karadi (GK) as light blue lines. 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 gap.

allowing for a time-varying response of the unemployment gap yields slightly lower and mostly insignificant effects of monetary policy on the unemployment gap between black and white households. The effects peak at 20bp and remain indistinguishable from zero throughout. In this light, our result on the employment effect from the LP-IV estimations could mark an upper bound.

The asset price effects of monetary policy were often considered short-lived. However, there is a growing consensus now 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 (2020b) argues that monetary policy today has larger and more persistent effects on asset prices than in the past.

Table 4: *LP-IV estimates for response to 100bp expansionary monetary policy shock for different shock series*

Shock	Horizon	Stock prices %	House prices %	Treasury yield pp	BAA yield pp	Unemployment gap pp	Inflation %
RR	1Y	1.40	0.89***	-0.32***	-0.37***	-0.07	-0.43***
		(3.30,-0.50)	(1.28,0.50)	(-0.20,-0.43)	(-0.28,-0.46)	(0.01,-0.16)	(-0.22,-0.64)
	2Y	3.31**	1.71***	-0.21	-0.36**	-0.26***	-0.43
		(5.81,0.81)	(2.63,0.80)	(0.02,-0.45)	(-0.13,-0.60)	(-0.15,-0.37)	(0.01,-0.88)
	3Y	4.09**	1.71**	-0.10	-0.23**	-0.34***	-0.20
		(6.85,1.33)	(3.02,0.41)	(0.05,-0.25)	(-0.05,-0.42)	(-0.22,-0.46)	(0.33,-0.74)
	4Y	4.32**	1.15	0.00	-0.04	-0.27***	0.03
		(7.26,1.37)	(2.82,-0.51)	(0.16,-0.16)	(0.12,-0.21)	(-0.12,-0.42)	(0.65,-0.59)
	5Y	4.79**	0.32	0.07	0.08	-0.19**	-0.06
		(8.40,1.18)	(2.37,-1.73)	(0.29,-0.15)	(0.29,-0.13)	(-0.04,-0.33)	(0.68,-0.81)
BK	1Y	-1.05	1.20***	-0.20	-0.28	0.01	-0.36
		(8.93,-11.03)	(1.87,0.54)	(0.12,-0.51)	(0.21,-0.78)	(0.37,-0.35)	(0.04,-0.76)
	2Y	1.29	2.82	0.06	-0.25**	-0.09	-0.35*
		(5.89,-3.31)	(5.76,-0.12)	(0.29,-0.17)	(-0.09,-0.41)	(0.18,-0.35)	(-0.02,-0.67)
	3Y	4.21	3.14	0.28	-0.13	-0.15	0.08
		(9.66,-1.24)	(8.28,-2.00)	(0.58,-0.03)	(0.19,-0.45)	(0.10,-0.39)	(0.67,-0.51)
	4Y	5.00	2.01	0.18	0.00	-0.18	0.47
		(12.79,-2.80)	(7.73,-3.71)	(0.57,-0.22)	(0.21,-0.20)	(0.49,-0.85)	(1.59,-0.65)
	5Y	4.44	0.46	0.13	0.21	-0.06	0.31
		(10.94,-2.05)	(5.86,-4.94)	(0.63,-0.38)	(0.73,-0.31)	(0.68,-0.80)	(2.01,-1.39)
GK	1Y	-1.51	1.34***	-0.14	-0.22***	0.07	-0.37**
		(1.74,-4.76)	(1.94,0.74)	(0.02,-0.30)	(-0.09,-0.34)	(0.22,-0.08)	(-0.12,-0.61)
	2Y	1.68	2.90***	0.10	-0.24**	0.00	-0.43**
		(6.10,-2.74)	(4.43,1.36)	(0.29,-0.10)	(-0.08,-0.40)	(0.18,-0.18)	(-0.10,-0.75)
	3Y	4.54	2.92*	0.28***	-0.08	-0.12	-0.07
		(9.10,-0.02)	(5.45,0.39)	(0.42,0.15)	(0.10,-0.26)	(0.11,-0.34)	(0.35,-0.48)
	4Y	6.04**	1.87	0.16	-0.01	-0.22*	0.23
		(10.76,1.32)	(5.56,-1.82)	(0.32,-0.01)	(0.19,-0.20)	(-0.02,-0.42)	(0.74,-0.28)
	5Y	5.45	0.56	0.07	0.14	0.00	0.05
		(11.35,-0.45)	(5.16,-4.03)	(0.22,-0.07)	(0.35,-0.06)	(0.23,-0.22)	(0.49,-0.39)

Notes: The table shows LP-IV response estimates for asset prices, interest rates, and the unemployment gap after a 100bp expansionary monetary shock for different monetary policy shock series. The first panel shows results for Romer-Romer (RR) shocks, the middle panel for Bernanke-Kuttner (BK) shocks, and the bottom panel for Gertler-Karadi (GK) shocks. The rows for each shock series 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. * indicates significance at the 10 percent level, ** indicates significance at the 5 percent level, and *** indicates significance at the 1 percent level. The number of observations for the estimations using RR shocks is 452; for BK shocks 287; for GK shocks 284.

4. Earnings and portfolio effects of monetary policy

The empirical results in Section 3 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. 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.

### 4.1. 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-backed securities (5.47), and corporate bonds (5.43) and apply them to the corresponding asset categories in the SCF data.[18] 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 funds rate) on asset prices. The portfolio capital gains on each asset class are shown in Figure 9 with the RR policy shocks (Figure 9a), the BK shocks (Figure 9b), and the GK shocks (Figure 9c). In all cases, the total capital gains from an unanticipated monetary policy accommodation to white households are much larger than the gains to black households.

There are small differences in the size and persistence of the responses depending on the shock series used to estimate price and interest rate effects. The results with RR shocks are somewhat smaller than with BK or GK shocks, although the effects are more persistent with the RR shocks. With the RR policy shock, the largest effects are after three years, reaching about $25,000 for white households and about one-fifth as much for black households. The

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

Figure 9: *Capital gains for black and white households from monetary policy shocks over time*
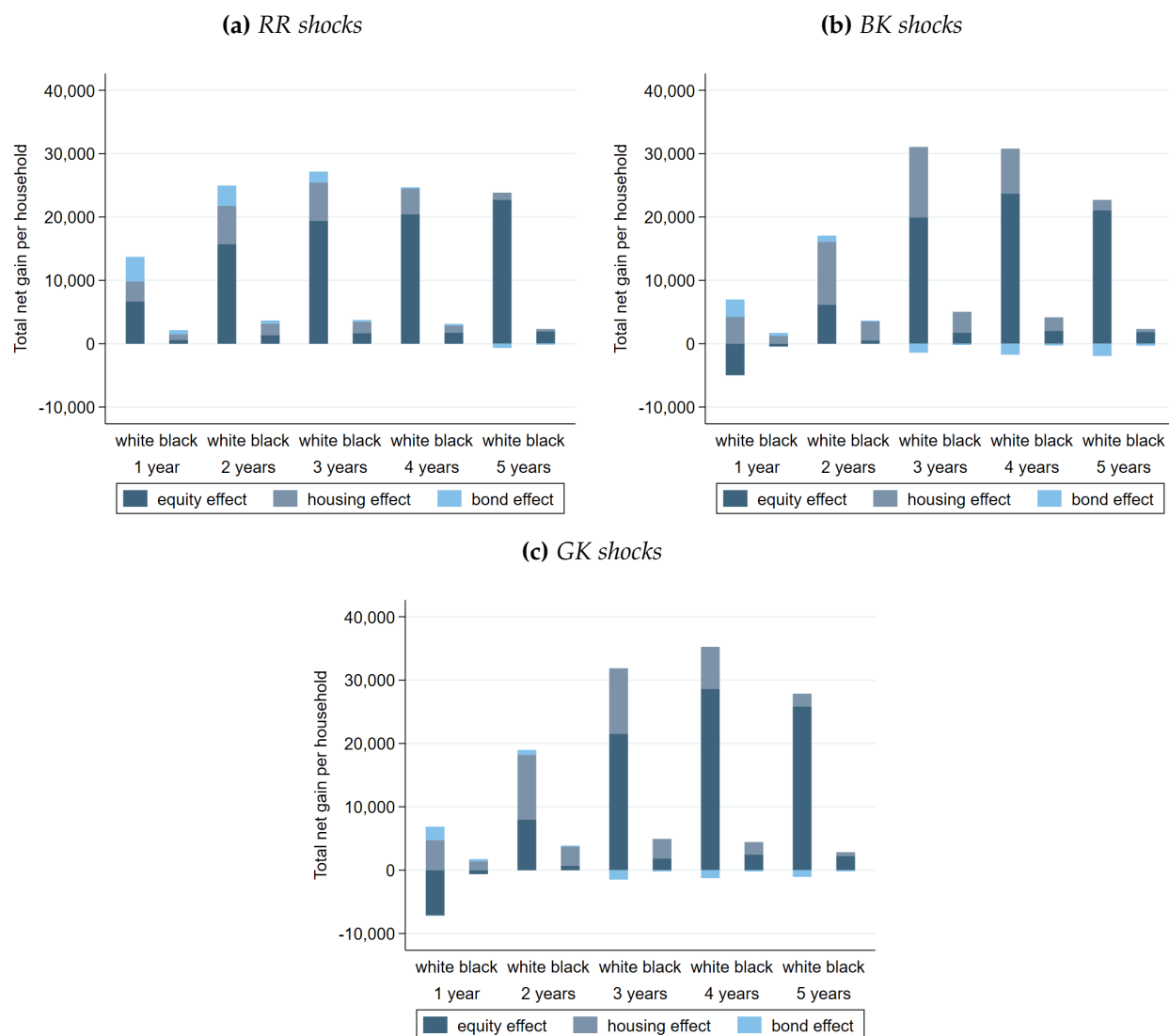
(a) *RR shocks*
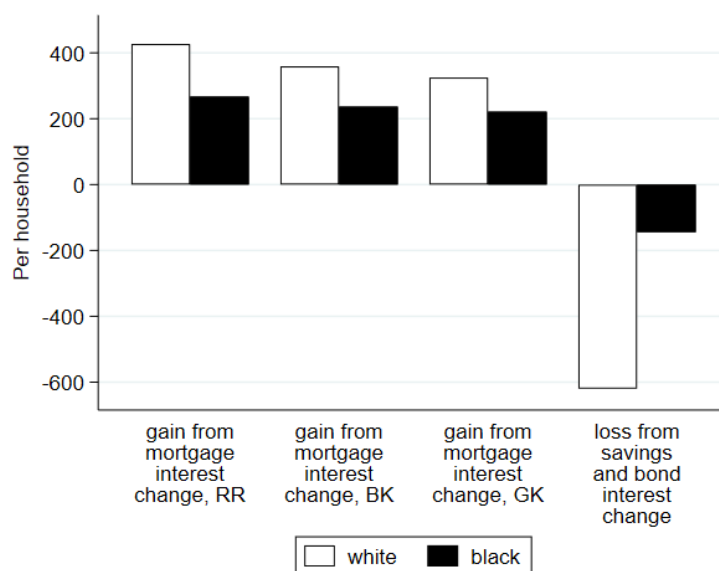
(b) *BK shocks*

(c) *GK shocks*

Notes: The figure shows the average wealth effects for black and white households after a 100bp monetary shock over time. Panel (a) shows results obtained with the Romer-Romer (RR) shocks, panel (b) results obtained with the Bernanke-Kuttner (BK) shocks, and panel (c) results obtained with the Gertler-Karadi (GK) shocks. The wealth effects are computed by combining the estimates from Table 4 with portfolio data from the SCF. See text for details.

effects are largest with the GK shocks, with a peak after four years of about $35,000 for white households and about $5,000 for black households. With all shock series, the biggest effect comes from the large and persistent effect of equity prices. The house price influence is larger with the GK estimates, although it diminishes over time with both sets of shock estimates. Bond effects are small because bond holdings are only a small fraction of total wealth for both black and white households.

In addition to the portfolio effects, i.e., the direct effects of capital gains from the mone-

Figure 10: *Effects of monetary policy shocks on interest gains and losses for black and white households*

Notes: The graph shows the average gains for black and white households after a decline in mortgage interest rates as implied by the Romer-Romer (RR), Bernanke-Kuttner (BK) and Gertler-Karadi (GK) shocks after one year, and their average losses after a 100/29/22bp decline in savings/coporate bond/mortgage-backed-bond interest rates (see text for details).

tary shock, there are potentially additional indirect effects of monetary policy shocks if accommodative monetary shock reduces mortgage interest rates and the interest earned on deposit-type assets and corporate and mortgage-backed bonds. We estimate these effects using the methodology described in Section 2.4. We assume that the impact of the 100bp accommodative monetary shock on mortgage rates is given by the impacts on the 10-year Treasury rate shown in Table 4 and use the impact at a 1-year horizon to calculate the savings on monthly mortgage payments, which are annualized to give an approximation of the implicit increase in wealth that occurs when mortgages are refinanced at a lower rate. For liquid assets and bonds, we assume that the decline in interest earnings is the same size as the monetary policy shock, 100bp. For bonds, we use the average effects on treasury (-22bp) and BAA yields (-29bp) after one year across the three shocks from Table 4, given that the effects are similar for all shock series and the bond interest effects are generally small, such that differences are minimal.

In Figure 10, we show the interest rate effects from the monetary shock, using the RR, BK and GK shocks. 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, almost 600 dollars, are about 200 dollars larger than the average annual gains from refinancing. The gains from refinancing

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are somewhat smaller with the BK and GK shocks and differences between the gains from mortgage refinancing to black and white households are moderate. This calculation is again based on a scenario in which all households refinance. Lower refinancing probabilities of black households would increase the gap between black and white households (Gerardi, Willen, and Zhang, 2021).

It is important to not 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 extended periods of several years. Our results build on a growing literature that estimates persistent asset prices changes in response to monetary policy shocks (Bernanke and Kuttner, 2005; Jordà, Schularick, and Taylor, 2015; Paul, 2020b; Rigobon and Sack, 2004). Such a period can easily account for 10 percent of the economically active lifetime of a household.

Second, distributional effects may persist even if gains and losses average out over time and asset prices revert to an equilibrium, as indicated in theory (Auclert, 2019). This arises 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 suffering welfare consequences from not adjusting their asset positions.

In general, the life cycle puts young households systematically on the buyer side of the market 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 their 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.

Moreover, 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 purposes. 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.

4.2. Portfolio effects along the wealth distribution

Our estimates of the effects of asset price changes on the wealth of black and white households shown above consider the average black and white household. Since the U.S. wealth distribution is highly skewed (Kuhn and Ríos-Rull (2016a) 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.

Figure 11: *Lorenz curve of estimated portfolio gains after expansionary monetary policy shock*
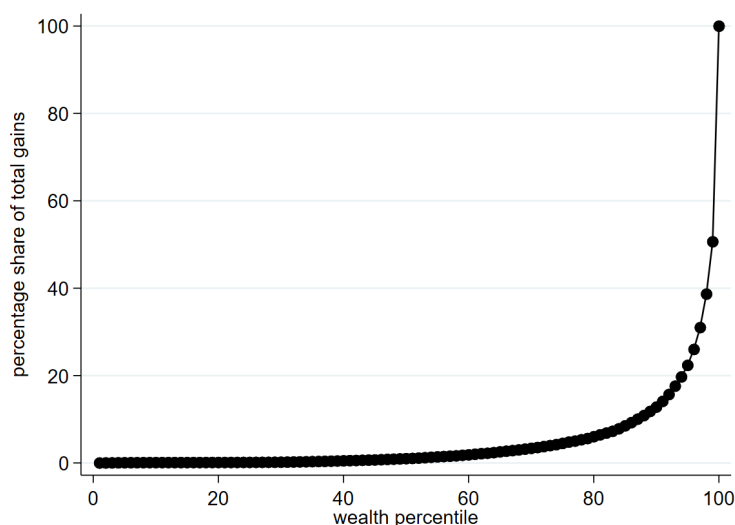
Notes: The graph shows the Lorenz curve of the total portfolio effect in year 5 after after an expansionary 100bp Romer-Romer shock. The x-axis shows percentiles of the wealth distribution, and the y-axis shows the share of total gains accruing to households up to the percentile indicated on the x-axis.

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 11, 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 distribution of wealth for all households. About 80 percent of all gains accrue to households in the top 5 percent of the wealth distribution and about 50 percent 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 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.[19]

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 12. Comparing the effects around the median to the average effects in Figures 9a to 9c, 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 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. The fact that housing plays a more dominant role around the median than at the mean also makes the gains slightly less persistent. Still, we find that the gains are almost the same size in year 5 as in year 1.

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 100bp shock. We again consider estimates that use our baseline with the RR shocks, and refer to households with a portfolio gain below one percent of income as having no portfolio effect. We find that about one third of white households (36 percent) fall in the group of households with no portfolio effect after 5 years. By contrast, the share among black households is about twice as large (65 percent). Hence, almost two out of three black households are left with no portfolio gains 5 years after an expansionary monetary policy shock.[20]

In Figure 13, we show the effects of monetary policy shocks on mortgage refinancing

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[19]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.

[20]If we consider a 5-percent threshold instead of the 1-percent threshold, the shares increase to 69 percent for white households and 91 percent for black households.

Figure 12: *Capital gains for black and white households around the median from monetary policy shocks over time*
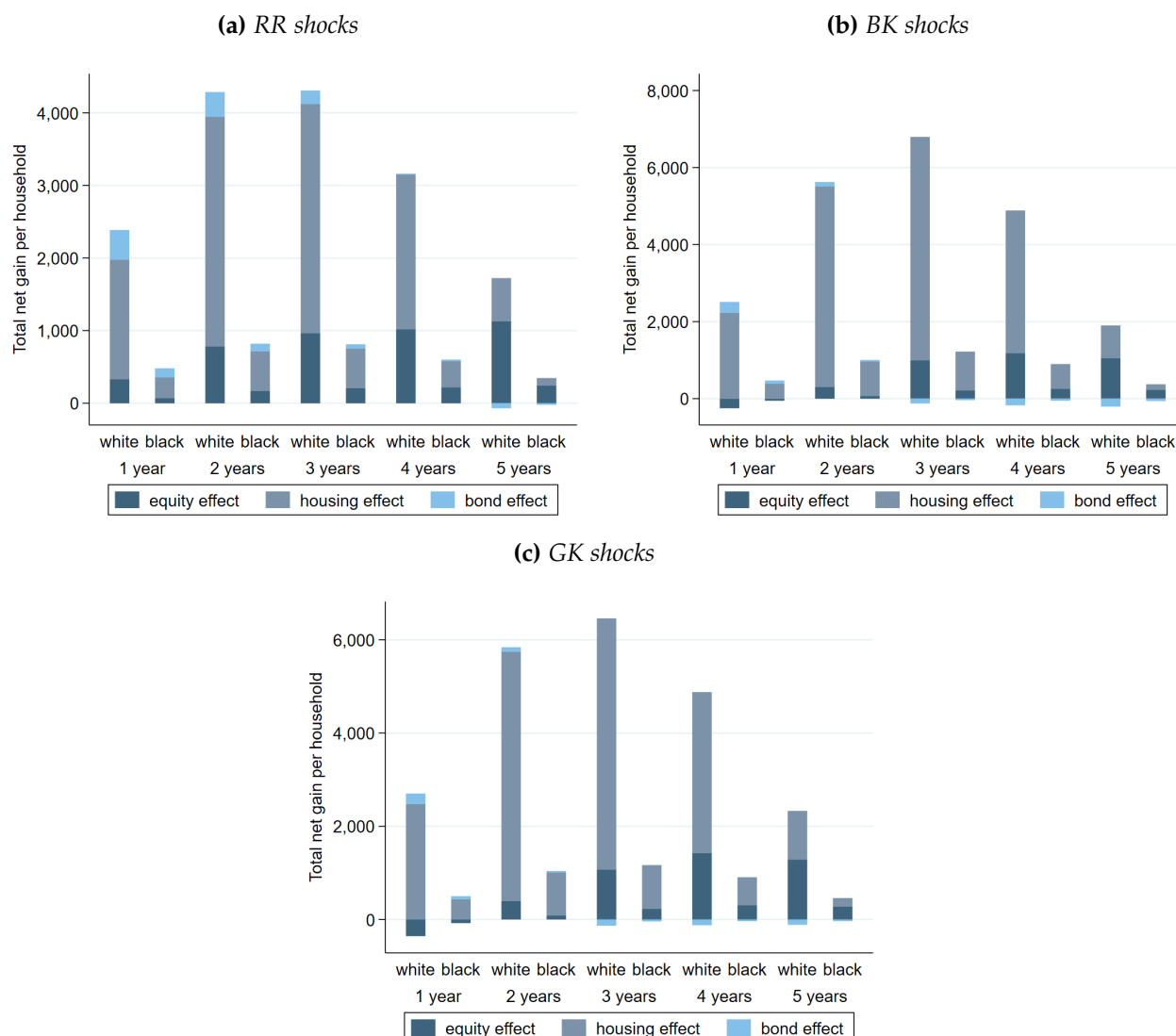
(a) *RR shocks*

(b) *BK shocks*

(c) *GK shocks*

Notes: The figure shows the average wealth effects for black and white households around the median after a 100bp monetary shock over time. Panel (a) shows results obtained with the Romer-Romer (RR) shocks, panel (b) results obtained with the Bernanke-Kuttner (BK) shocks, and panel (c) results obtained with the Gertler-Karadi (GK) shocks. The wealth effects are computed by combining the estimates from Table 4 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.

and interest on saving and corporate and mortgage-backed bonds for black and white households around the median, using the same assumptions as in the results for the mean households in Figure 10. White households around the median have gains from mortgage refinancing which are about four times larger than the gains for black households, a much larger difference than for the mean household because many more of the black households

Figure 13: *Effects of monetary policy shocks on mortgage refinancing and savings interest for black and white households around the median*
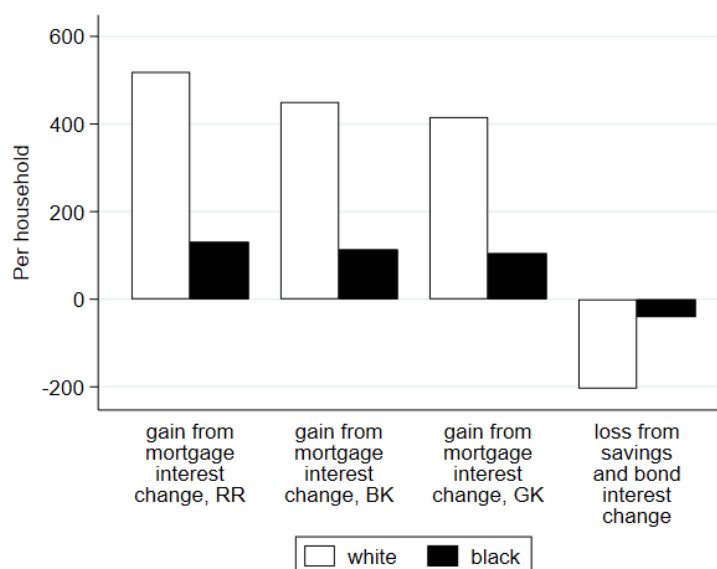
Notes: The graph shows the average gains for black and white households around the median after a decline in mortgage interest rates as implied by the Romer-Romer (RR), Bernanke-Kuttner (BK) and Gertler-Karadi (GK) shocks, and their average losses after a 100/29/22bp decline in savings/coporate bond/mortgage-backed-bond (see Section 4.1 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.

around the median do not own a home.

The analysis so far has examined the portfolio effects for black and white households and has not addressed any additional demographic differences. Many more white households consist of married or cohabiting couples and more of the single black households are led by women. We explore the implications of gender and marital status on the portfolio effects in Appendix B.

4.3. Quantifying the earnings effect

Our estimates from Section 3.2 indicate that an accommodative monetary policy shock benefits black households since it reduces their unemployment rates more than for white households. In this section, we aim to quantify the earnings effects from 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 start with the estimated impact of an accommodative monetary policy shock on the unemployment gap between black and white households shown in Table 4 and then make a number of conservative assumptions in order to relate the change in the unemployment gap to earnings changes. Specifically, we assume that each household who finds employment receives the average earnings of employed black households.

For our estimate of the increase in black earnings, 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. Once more, we use a conservative assumption, namely that white households who find employment enjoy the same average earnings gain as black households, namely $56,200 – $27,500 = $28,700. The additional 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 $\Delta Y^B = Y^B_E - Y^B_U$ where Y^B_E denotes average labor income of black households who

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[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.

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 monetary policy shock, $\Delta_h Y$, can then be expressed as

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

The largest effect on the unemployment gap in Table 4 is estimated with the RR shock series. The effect peaks in year 3, when the unemployment rate gap is reduced by 0.34 percentage points. The relative earnings gain is found my multiplying this number with the average earnings gain, which yields a relative gain per black household of $97.6, or 0.19 percent of annual total income for all black households.

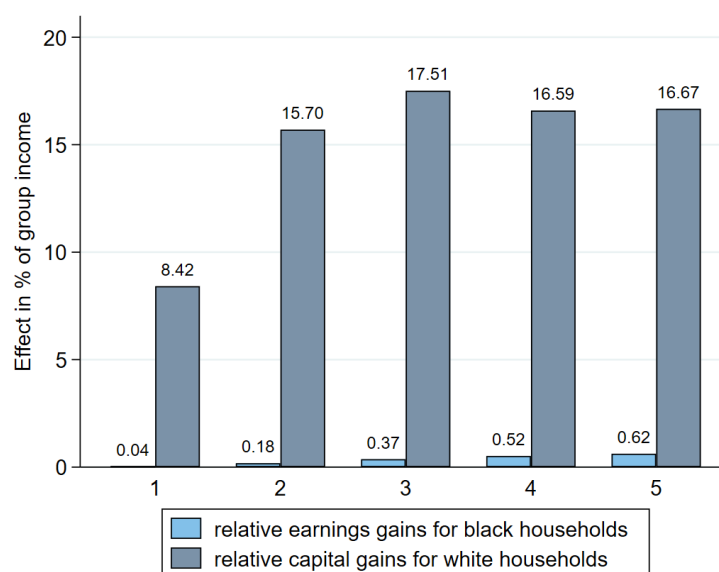## 4.4. Comparing earnings and portfolio effects

$\Delta_h Y$ 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 $\Delta_3 Y = \$97.60$ or 0.19 percent of annual income, the corresponding portfolio effect after three years estimated with the RR shock series shock is about 24 percent of annual income for white households and 6.5 percent for black households. The differential gain of white households relative to black households is 17.5 percent of annual household income. This comparison suggests that the portfolio effect for white households is substantially larger than the earnings effect for black households that we already constructed as a conservative upper bound. Put differently, the 17.5 percent differential capital gain of white households as a fraction of income is two orders of magnitude larger than the earnings effect of 0.19 percent.

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 also in subsequent years. To take this difference 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.

Figure 14 shows the year-by-year accumulated earnings effects and the difference in the portfolio effects on black and white households 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 baseline, the RR shock series, to estimate the impact of monetary policy shocks on asset prices, interest rates and the unemployment gap. Estimates with the BK or GK shocks are very similar. 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 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 average capital gain from an accommodative monetary policy

Figure 14: *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. The relative earnings effect is computed by combining the estimated effect of the monetary policy shock on unemployment with earnings data from the SCF. The relative portfolio effect is calculated as the difference between the capital gains of white and black households from Figure 9a. Please refer to the text for a detailed explanation of the construction of the earnings and portfolio effects.

shock is about $20,000 larger for white than for black households, which corresponds to additional expenditures of about $600. The portfolio effect on consumption for white households is thus about six times as large as the earnings effect for black households of $97.60. Hence, we find support for the idea 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]

5. 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 bring 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.

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

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A. Appendix

A.1. Impulse responses and confidence intervals with other shock measures

Figure A.1: *Gertler-Karadi shocks*
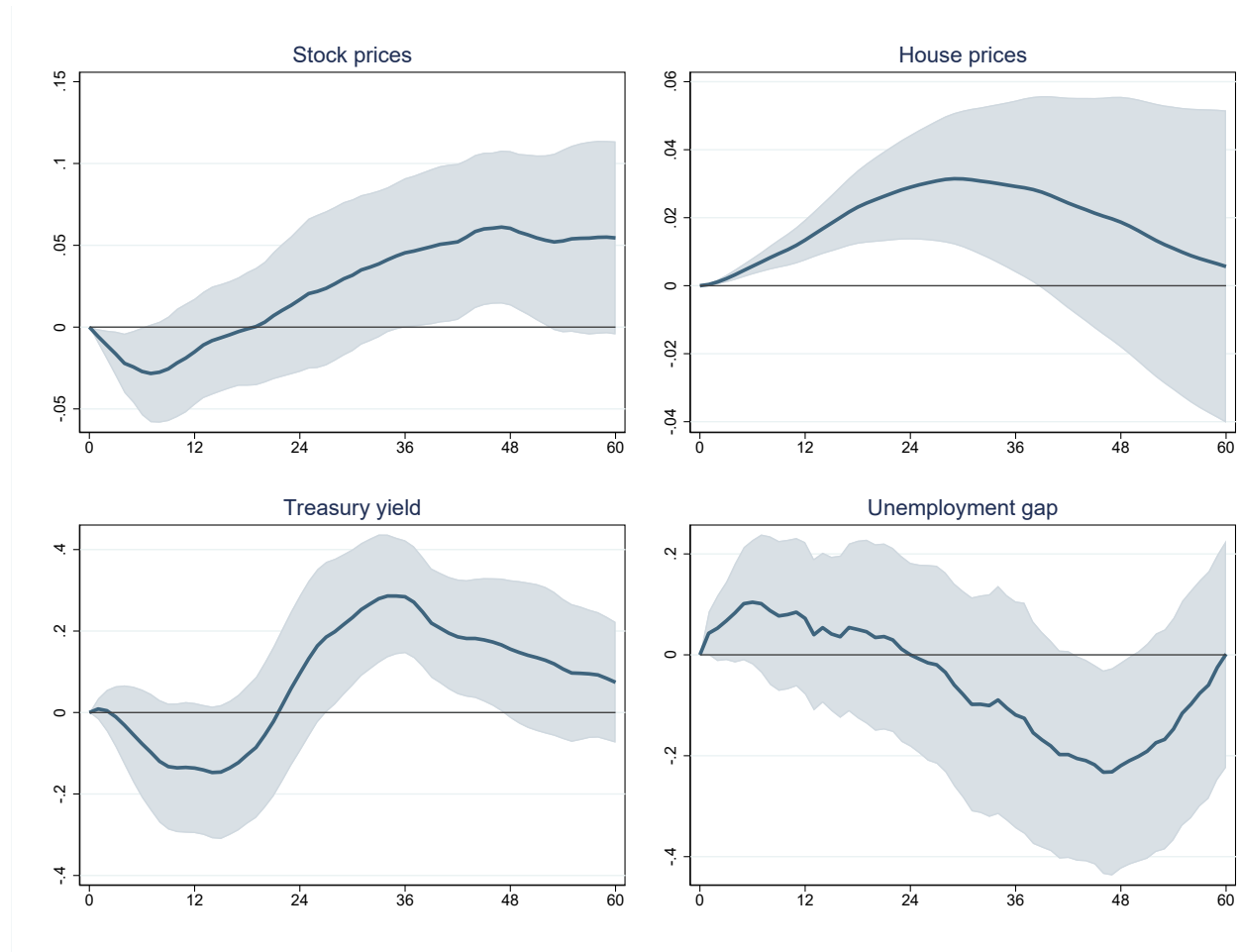
Notes: The figure shows the impulse responses for stock prices, house prices, treasury yields, and the unemployment gap after a Gertler-Karadi (GK) 100bp expansionary monetary policy shock. Impulse responses are shown as solid lines and shaded areas show 90-percent confidence bands. The horizontal axes 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 yield, and in percentage points for the racial unemployment gap.

Figure A.2: *Bernanke-Kuttner shocks*

Stock prices

House prices

Treasury yield

Unemployment gap

Notes: The figure shows the impulse responses for stock prices, house prices, treasury yields, and the unemployment gap after a Bernanke-Kuttner (BK) 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 the 10-year treasury yield, and in percentage points for the racial unemployment gap.

A.2. Appendix: 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

Table A.1: *TV-VAR estimates for response to 100bp expansionary monetary policy shock following Paul (2020b)*

Shock	Horizon	House prices %	Stock prices %	Treasury yield pp	BAA yield pp
Paul (2020b)	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 (2020b). 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

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 (2020b) as our instrument. These can be directly integrated into the model as follows:

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

B. 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 Section, we will examine the impact of monetary policy shocks on the income and

wealth of black and white households of different types.

B.1. Decomposition by marital status and sex

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.[24]

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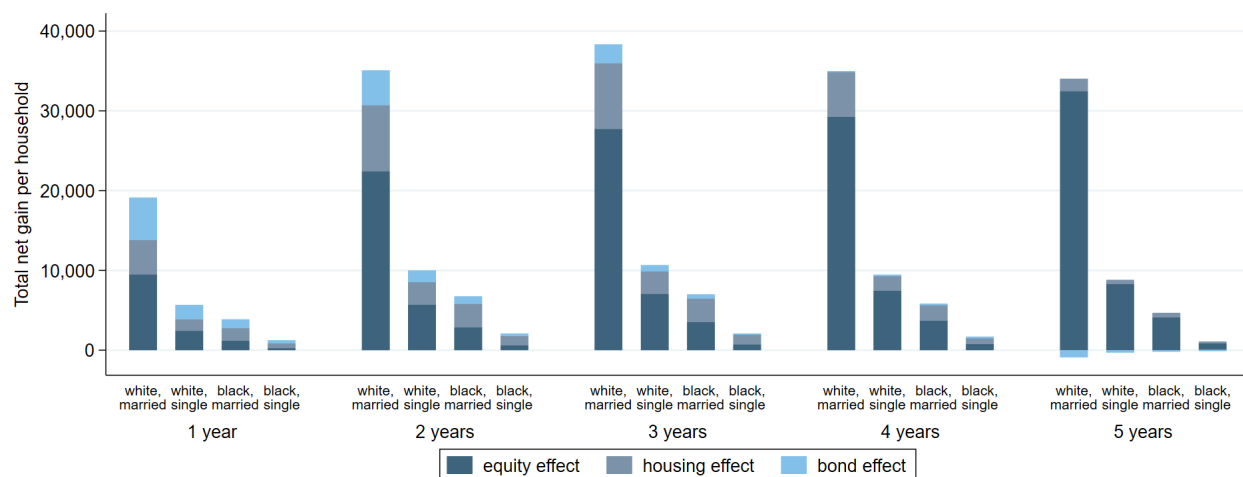
Summary statistics for black and white households by type are shown in Table A.2. The racial wealth gap is large for all household types. White single and married households have about 5 times as much wealth as comparable black households. Average income of white single households with male or female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

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[24]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.

B.2. Portfolio effects on wealth gap

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 Figure A.3 and by sex for singles in Figure A.4.

Figure A.3: *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 4 with portfolio data from the SCF. See main text for details.

Figure A.4: *Total effects over time by sex (singles), per household*
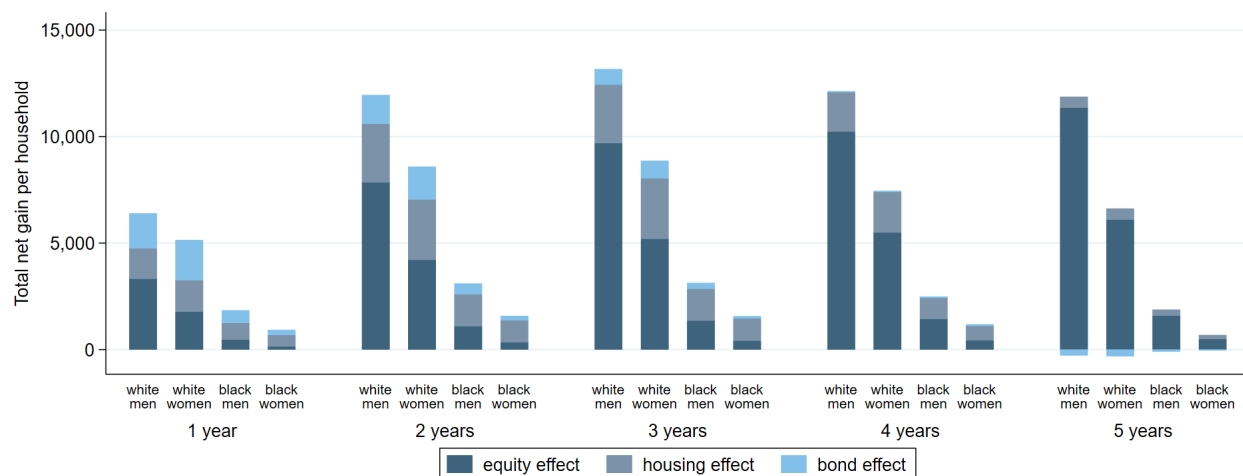
Notes: The figure shows the average wealth effects for black and white households after a 100bp monetary shock (Romer-Romer shocks) over time, stratified by sex. The wealth effects are computed by combining the estimates from Table 4 with portfolio data from the SCF. See main text for details.

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 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 monetary policy shock on the gains from mortgage refinancing and the loss in interest earnings on savings are shown in Figure A.5 for marital status and Figure A.6 by sex for singles.

Figure A.5: *Effects of monetary policy shocks on mortgage refinancing and savings interest by marital status, per household*
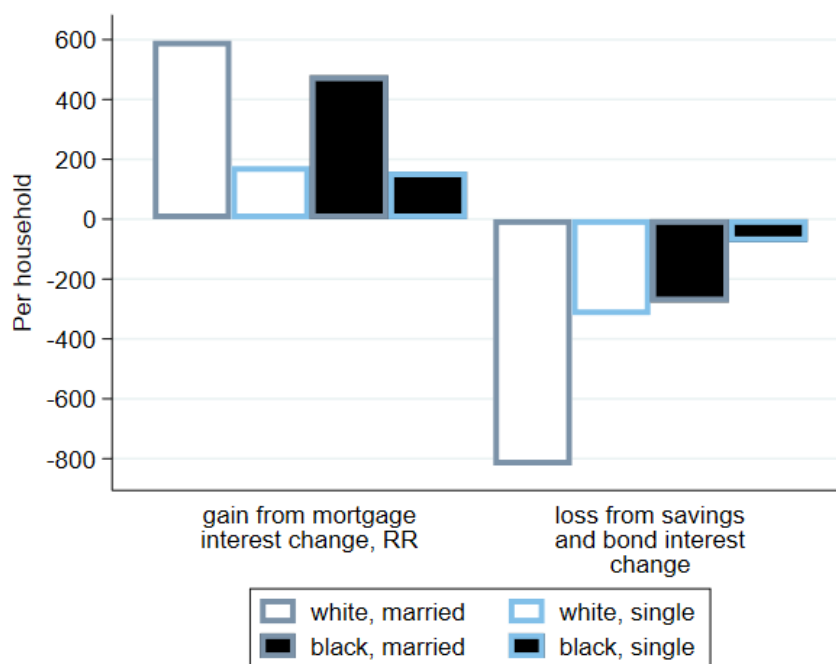
Notes: The figure shows the average gains for married and unmarried black and white households after a decline in mortgage interest rates as implied by the Romer-Romer shocks, and their average losses after a 100/29/22bp decline in savings/coporate bond/mortgage-backed-bond (see Section 4.1 for details).

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

Figure A.6: *Effects of monetary policy shocks on mortgage refinancing and savings interest by sex (singles), per household*
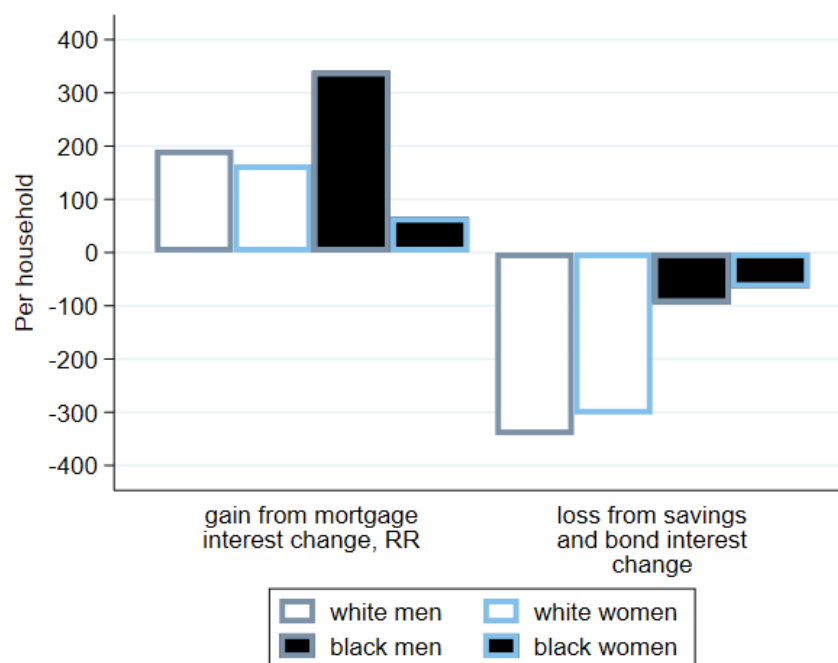
Notes: The figure shows the average gains for male and female black and white singles after a decline in mortgage interest rates as implied by the RR shocks, and their average losses after a 100/29/22bp decline in savings/coporate bond/mortgage-backed-bond (see Section 4.1 for details).

other groups, and therefore also lose a higher amount due to a change in savings interest rates. 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 Figure A.7. 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.

There are significant differences in the demographic composition of households with white and black heads. Many more of the white households are married, and more of the single white households have a male head. Further, there are substantial differences in portfolio composition across demographic types. Nevertheless, the overall finding of the paper is unaffected when we examine results disaggregated by household type. The portfolio gains of white households of any

Figure A.7: *Comparison of earnings and portfolio effects by sex (singles)*
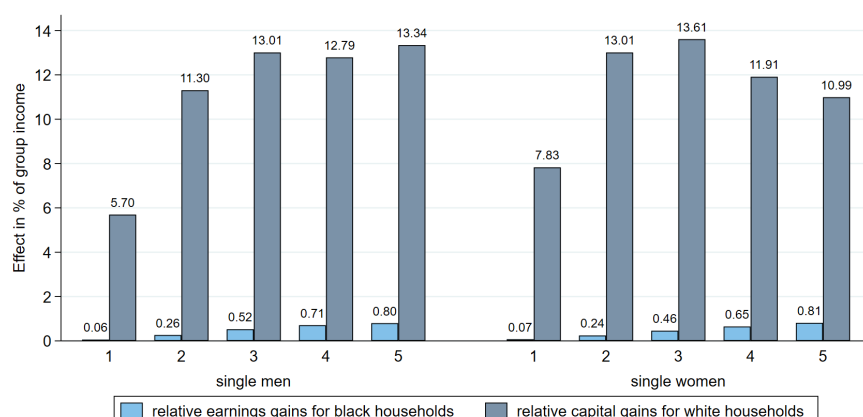
Notes: The figure compares the cumulated earnings effect to the portfolio effect based on the Romer-Romer shocks for single men and women. The effects are reported as a percentage of average annual household income of the respective racial group. The relative earnings effect is computed by combining the estimated effect of the monetary policy shock on unemployment with earnings data from the SCF. The relative portfolio effect is calculated as the difference between the capital gains of white and black households from Figure A.4. Please refer to the main text for a detailed explanation of the construction of the earnings and portfolio effects.

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.