

Monetary Policy Transmission by Gender and Race: The Inequality Unexplained by Income

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Abstract

This paper finds evidence that the effects of monetary policy shocks on consumption vary significantly by gender and race. Differences in household composition, age, education, mortgage debt, and income do not explain these differences in consumption responses. I also estimate labor market and income outcomes. I find that contractionary monetary policy shocks often negatively impact black men and women more than whites. I also show that contractionary, rather than expansionary, shocks generally drive responses. Macroeconomic models should account for the heterogeneity unexplained by income and the asymmetry of monetary policy shock direction to inform policymakers of potential unequal policy impacts.

JEL classification: E21, E24, E52, E58, J15, J16

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Understanding the distributional effects of monetary policy is crucial for effective policy-making. Previous studies have emphasized that the effects of monetary shocks on household outcomes differ by wealth or income. Some studies argue that monetary policy might be less effective if those that benefit from expansionary policy and have higher incomes also have low marginal propensities to consume (Auclert 2019; Cloyne, Ferreira, and Surico 2020; Bartscher et al. 2021). Others explore the disproportionate burden of contractionary policy on certain groups through labor market and income outcomes (Seguino and Heintz 2012; Coibion et al. 2017; Furceri, Loungani, and Zdzienicka 2018). However, it is unclear whether heterogeneous effects on consumption are driven solely by differences in finances, or if discrimination and barriers to employment and credit also determine responses.

This paper addresses this question by providing an investigation into the transmission of monetary policy to consumption separately for white men, white women, black men, and black women. It is the first, to my knowledge, that estimates and explains consumption responses by gender and race with a state-of-the-art methodology and shock identification method. Contractionary policy is expected to lower consumption, raise unemployment, and lower incomes. However, some demographic groups are affected more than others. Studying heterogeneous reactions solely through income inequality obscures additional reasons why monetary policy affects groups differently.

This paper first estimates how monetary policy affects consumption differently for U.S. households disaggregated by gender and race, furthering Puig (2022). I find that gender and racial gaps in consumption responses persist when accounting for household composition, age, education, mortgage debt, and income. Thus, monetary policy transmission channels such income inequality or mortgage refinancing do not fully explain heterogeneous responses by gender and race to policy shocks.

I next provide evidence that differences in consumption responses are mainly due to variations in labor earnings by estimating effects on unemployment, labor force participation, and salary income. Most of the different effects of monetary

policy on salary income by gender and race are explained by worker concentration in certain sectors, although I also find that some differences persist within sectors. This unexplained inequality suggests discrimination and societal barriers existing in the labor market.

Lastly, I estimate consumption, labor market, and income responses separately for contractionary and expansionary monetary policy shocks. I find that the effects of contractionary shocks are significant and differ by gender and race, but those of expansionary shocks are unclear.

I use the Consumer Expenditure Survey (CE) to measure household consumption and income. The higher frequency and comprehensive expenditure data of this survey is an advantage over other U.S. household surveys. To complement the analysis on consumption and income, I study labor market outcomes using Bureau of Labor Statistics aggregates of individual-level data.

As a measure of exogenous monetary policy shocks, I use the series identified by Bu, Rogers, and Wu (2021). The identification method in Bu, Rogers, and Wu (2021) is one of the latest for high frequency shocks that are stripped of the central bank information effect. These shocks span both conventional and unconventional monetary policy times, which allows for the analysis of a longer period compared to the prominent literature that estimates effects up to the Great Recession. This research contributes to the literature studying gender and racial inequality by examining the effects of unexpected changes in monetary policy rather than movements in realized interest rates.

I estimate the previously mentioned effects of monetary policy shocks on group outcomes from 1994 to 2019 with local projections (Jordà 2005). Local projections have been widely used to estimate effects of monetary policy (Coibion et al. 2017; Cloyne, Ferreira, and Surico 2020; Bartscher et al. 2021). I also conduct several exercises that confirm the robustness of the results. These include using alternative monetary policy shock series, changing control lag lengths, omitting controls, and differing time periods.

The results show that contractionary monetary policy shocks most negatively impact the consumption of households headed by black men and black women. Households headed by black men decrease their consumption of durable goods 15% more than households headed by a white men after a one standard deviation contractionary monetary policy shock.

I additionally estimate consumption responses while accounting for differences in the head of household's marital status, age, and education, and the household's number of paid workers, debt category, and percentile of family income.¹ The comparison of outcomes for all of these groups is an additional contribution to the literature, especially given that gender and racial inequalities in household responses still appear within these groups.

The analysis also explores several channels through which contractionary shocks affect consumption. These include the differential responses of labor earnings, various types of incomes, and debt burden. I find that earnings heterogeneity largely explains differences in consumption responses. The lower consumption responses of Black households are accompanied by higher unemployment, occupational concentration in exposed sectors, and lower household salary incomes. Groups with higher unemployment rates and concentration in lower-wage jobs likely have very different consumption patterns than employed and richer workers. Care and unpaid work responsibilities additionally influence labor market decisions and consumption baskets, especially due to the large burden on women of color.

The earnings heterogeneity channel results are as follows. After a one standard deviation contractionary monetary policy shock, the unemployment rate rises almost 2 percentage points higher for black men than white men. Labor force participation rises for white women but falls for blacks. Household salary incomes fall for all groups, but 40% more for households headed by black men than white men.

I next investigate income, savings, and debt. I estimate the income composition

1. Debt category refers to whether households have a mortgage, own their house, or rent following Cloyne, Ferreira, and Surico (2020).

channel, which distinguishes between household primary sources of income (labor earnings, business, or finance). However, I find that salary income drives total income results for all groups. Although I find that households with mortgages decrease their spending more than owners or renters following contractionary shocks, racial gaps in responses persist within these groups.

This paper contributes needed insight into the debate on the distributional effects of monetary policy. The results show that consumption heterogeneity exists by gender and race which is unexplained by income gaps. Also, that contractionary shocks affect most outcomes more than expansionary shocks. Future work should build macroeconomic models that include gender and racial heterogeneity and shock asymmetry to inform policymakers of potential unequal policy impacts. Central banks should understand these individual-level implications to determine the aggregate effects of interest rate policies.

Contributions Relative to the Literature

This paper contributes to the growing literature studying how monetary policy affects inequality.² Much research finds clear gaps in household reactions by different income and debt groups (Coibion et al. 2017; Auclert 2019; Cloyne, Ferreira, and Surico 2020; Dolado, Motyovszki, and Pappa 2021). For example, Cloyne, Ferreira, and Surico (2020) find that households with mortgages drive aggregate consumption responses during conventional monetary policy periods, relative to households that own their homes or rent. Furceri, Loungani, and Zdzienicka (2018) show that shock signs have asymmetric effects, with contractionary shocks clearly increasing income inequality.

Yet, little is understood about whether income and debt inequality drive all differences in reactions to monetary policy, or if systemic inequalities related to gender and race also contribute. This paper adds to this literature by finding that income and household balance sheets do not fully explain household response heterogeneity. Another contribution is that gender and racial inequality is driven by contractionary

2. See Kappes (2023) for a comprehensive survey.

shocks, while expansionary shocks have unclear effects on groups.

There is evidence that consumption and savings patterns vary by gender and race. Gaps are largely driven by within-household distributions of paid and unpaid work (Seguino and Floro 2003). Banks (2020) attributes racial differences in household distributions of paid and unpaid work to racial and ethnic group disparities, theorizing the community as an additional site of non-market production for non-white women. Patterson (2023) also shows that marginal propensities to consume vary by race, although gaps are implied to be due to economic inequalities. In this paper, I discuss household divisions of paid and unpaid work in its analysis and add evidence that the added worker effect exists only within white households. I also show that racial consumption gaps persist within other economic characteristics.

This paper also adds to the literature on monetary policy's effects on gender and racial inequality. Several studies have shown that monetary policy is not gender-neutral (Seguino 2019). Seguino and Heintz (2012) find significant heterogeneity in the effects of monetary tightening on U.S. workers by gender and race, with the largest negative unemployment effects on black women and black men. Takhtamanova and Sierminska (2009) similarly find that employment is more sensitive for women than men in the U.S.³ However, the previously mentioned papers only study the impacts of movements in realized interest rates and end their analysis before the Great Recession. Few papers address the effects of quantitative easing on gender gaps, although Metzger and Young (2020) describe how unconventional monetary policy could affect wealth gender gaps in euro-area countries. This paper fills these gaps by studying gender and race inequality with state-of-the-art monetary policy shocks void of the central bank information effect. Further contributions include bridging a long period of conventional and unconventional monetary policy as well as the separate analysis of contractionary and expansionary shocks.

Lastly, this paper contributes to the literature showing that monetary policy is

3. Takhtamanova and Sierminska (2009) and Akin (2020) find no effect of interest rates on gender disaggregated employment outcomes in general in OECD countries. Braunstein and Heintz (2008) find disproportionate effects of interest rate shocks on women's employment in developing countries.

not race-neutral. Black and Hispanic unemployment rates react more than white unemployment rates during contractionary monetary policy episodes (Thorbecke 2001; Rodgers 2008). In particular, black and women's employment are more sensitive than white and men's employment to monetary policy changes, both in conventional and unconventional policy times (Seguino and Heintz 2012; Ume and Williams 2019; Bergman, Matsa, and Weber 2020). Bartscher et al. (2021) finds that expansionary monetary policy increases employment more for blacks, but the effect is small and dwarfed by the large wealth effects that benefit whites more than blacks. This research, however, does not address whether gender and racial gaps are driven fully by income inequality. Also, gender and racial inequalities are solely studied in employment and wealth in isolation. This paper fills these numerous gaps by linking consumption, labor market, and income outcomes while supporting previous findings with the asymmetric shock analysis.

1 Background: The Granular Effects of Monetary Policy

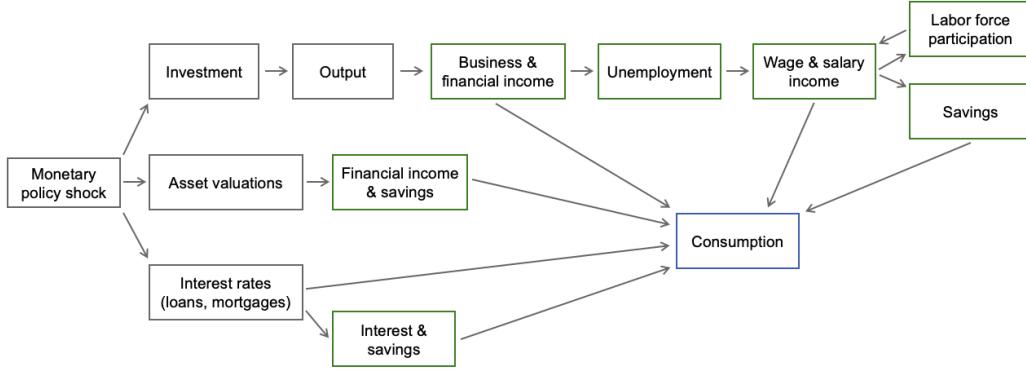
Monetary policy is theoretically transmitted to the public directly through its changes in interest rates and indirectly through fluctuations in labor market outcomes and income (see Figure 1). Coibion et al. (2017) identify the earnings heterogeneity channel and the income composition channel as two indirect transmission channels of monetary policy shocks to consumption. I follow Kappes (2023) in my discussion of monetary policy's direct transmission through the debt burden channel.

Household total (pre-tax) income can thus be broken down into various components:

$$y_{g,t} = w_{g,t}N_{g,t}LF_{g,t} + rA_{g,t} + \Delta VSt_{g,t} + div_{g,t} + \pi_{g,t} - iL_{g,t}, \quad (1)$$

where y is the average income available to spend for demographic group g at time t . The first term represents labor market income, with wages (w), number of working hours (N), and a dummy for whether someone is in the labor force (LF). Finance income is composed of wealth such as savings and bonds (A) with interest r , changes

Figure 1: Transmission of monetary policy to consumption



Note: The chart shows an illustration of the transmission of monetary policy shocks to consumption through various economic variables; variables estimated in this paper are in color.⁴ Arrows show the direction of the effects in partial equilibrium.

in valuations (V) of assets such as stocks (St), and dividends (div). Total income is also determined by business income in the form of profits (π) and loans (L) such as mortgages or credit cards with interest (i). This equation is adapted from Montecino and Epstein (2017) to the data that will be used in the empirical analysis in the next sections of this paper.

Household consumption and saving are determined by their total after-tax income and government transfers. The household budget constraint follows as:

$$C_{g,t} + \Delta Sa_{g,t} = y_{g,t} + T_{g,t}, \quad (2)$$

where C is consumption of durable goods, nondurable goods, and services and ΔSa is changes in savings. Average income (y) is as defined in equation (1). Vector T includes other sources that could add or subtract from household total income, such as government transfers and taxes. The discussion in this paper, however, abstracts from transfers and taxes.

⁴. “Wage and salary income” is used interchangeably with “salary income” and “labor earnings”.

1.1 Earnings Heterogeneity Channel

The earnings heterogeneity channel traces the effects of monetary policy shocks on consumption through labor market outcomes and earnings. A plausible chain of events is that higher interest rates increase the cost of capital, which reduces investment as firms are less likely to take out loans. Decreased firm revenue may lead to higher unemployment, as businesses lay off workers to cut costs, and therefore lower average salary incomes for households. As salary incomes fall, households have less disposable income to spend and save. Workers in low-wage jobs that are first to be fired and in industries that are sensitive to interest rates are likely the most exposed to these effects.

Black workers are likely more affected by monetary policy than white workers, however, in certain cases women might be more exposed but in others men might be more exposed. Blacks and women are more concentrated in low-wage and precarious jobs with stagnant wages given the history of discrimination in the U.S. that has created barriers in access to equal opportunities in education and employment advancement (Thorbecke 2001; Seguino and Heintz 2012). Blacks and women are additionally more often the last hired and thus first fired workers (Seguino and Heintz 2012). In contrast, men's higher concentration in industry sector jobs likely results in their higher exposure relative to women due to employment in these jobs being highly sensitive to business cycle fluctuations (Duzhak 2021). It thus theoretically follows that black male workers are most likely to be unemployed and have lower labor earnings following contractionary monetary policy. In equation (1), I expect that monetary policy shocks have a negative relationship with w and N with the largest magnitudes for black men. The ambiguity of the theoretical sign of the gender gaps needs to be clarified with empirical work.

There are several additional reasons why labor market gender gaps may change in response to monetary policy. Higher unemployment of men relative to women may lead households to adjust who enters the labor force per the added worker effect

(see Juhn and Potter (2007) and sources cited therein). For example, if the husband is unemployed then the wife may enter the labor force to supplement their family income. The division of paid and unpaid care work within the household can also dictate how labor market outcomes respond to monetary policy. The theoretical model in Akin (2020) explains how macroeconomic policy shocks affect gender gaps in employment through labor market segregation, gender division of labor, and labor supply dynamics. The effects of monetary policy on gender gaps in employment may differ between races. On average, white women tend to leave the labor force due to unpaid household work while black women cannot afford to stop working in addition to providing unpaid household and community care work (Banks 2020). In equation (1), I thus expect that monetary policy shocks impact LF positively for women, especially white women, but negatively or neutrally for men.

Changes in household labor income could affect both consumption and savings behaviors. As a result of lower earnings, households might either spend less or spend the same amount by saving less, using existing savings, or taking out a loan. Constrained households would thus see consumption (C) and savings (Sa) fall in equation (2). This is especially relevant for durable goods that can fluctuate, however, nondurable goods spending might not change for certain groups. Constrained households, which are more likely be blacks and women than whites and men, may not be able to purchase fewer necessities such as food and clothing, and thus take on credit card or other debt to finance this spending.

Consumption patterns also differ between households that have different relationship statuses (single vs married) and numbers of employed spouses. Intra-household consumption decisions vary between married and single households. Also, two-earner households probably have more consumption flexibility than one- or zero-earner households. It is especially important to consider these groups by race since black women are more often single heads of household and have both unpaid and paid work responsibilities. Monetary policy thus affects the labor market outcomes of groups disaggregated by gender and race very differently, and therefore their spending be-

haviors may also differ.

1.2 Income Composition Channel

The income composition channel sheds light on differences in household consumption responses due to receiving different types of income. Households headed by men and blacks have larger shares of salary income than women and whites. In contrast, business and finance incomes comprise a larger share of total income for households headed by whites compared to blacks. Households headed by women, especially black women, receive larger portions of their incomes from other sources such as government benefits, welfare and alimony. It is thus important to analyze these demographic groups separately since the average compositions of their incomes differ.

Contractionary monetary policy shocks that lower firm investment should theoretically decrease output and thus business income for business-owners. Leahy and Thapar (2022) find that age explains exposure to monetary policy for entrepreneurs starting businesses, with older age groups responding more to policy shocks. Monetary policy should thus have a negative relationship with business income due to changes in profits π .

Determining the sign of financial income is complex given that its various components react to monetary policy in opposite directions. Higher interest rates devalue assets since firm activity falls, resulting in lower financial income for shareholders from stocks. Financial income could at the same time be raised due to higher interest generated on savings accounts and bonds. Therefore, monetary policy has an ambiguous relationship with finance income in equation (1) due to falling stock valuations ΔVSa and dividends div , but rising interest on other assets rA .

Business income and each component of financial income are not theoretically supposed to react differently for demographic groups. What matters, are the size of the share of each category for total household income. Since assets compose a larger share of incomes for whites than blacks, finance incomes of white households are likely more negatively exposed to monetary policy. Bartscher et al. (2021) find that white

households are affected more by changes in capital gains than interest on savings and bonds. Montecino and Epstein (2017) find that asset changes during Quantitative Easing policy outweighed other effects such as employment and mortgage refinancing.

As incomes fall and assets become devalued, households could either consume less or find other means to finance their consumption. Racial gaps in consumption responses likely exist within income percentiles, following the finding in Ganong et al. (2020) that black households consumption is 50% more sensitive to income shocks than white households. In equation (2), lower y could lead to consumption (C) and savings (Sa) falling for constrained households. Spending likely falls for the majority of people who cannot rely on their savings to smooth their consumption. Demographic characteristics other than gender and race, such as age, education, and employment seniority likely inform these income and consumption gaps. This paper accounts for these characteristics to determine whether they drive different consumption responses between genders and races.

1.3 Debt Burden Channel

Household debt burdens rise on average following contractionary monetary policy due to higher rates on loans, such as mortgages. In equation (1), monetary policy shocks have a positive relationship with loan interest payments iL given that this policy changes interest rates. During periods of high rates, groups could on average have larger interest payments due to new loans, forced refinancing, or floating loan rates. Larger mortgage payments greatly constrain household disposable income and likely shrink savings and consumption, especially if households cannot refinance due to tight credit standards (Montecino and Epstein 2017).

Some studies find significant effects of the mortgage refinancing transmission channel in the U.S. Cloyne, Ferreira, and Surico (2020) show that households with mortgages drive overall consumption responses to monetary policy, even when accounting for income and age. In contrast, Wong (2015) finds that young populations drive this result due to having higher propensities to refinance existing loans or enter

new loans. Credit card and student loans also greatly constrain households, especially when contractionary monetary policy raises rates and thus interest payments on variable rates or new loans. The empirical estimation accounting for loans is focused on mortgages in this paper due to data limitations.

Contractionary monetary policy is especially burdensome on people that are charged higher-than-average interest rates. This is especially relevant if the pass-through of monetary policy is higher for certain groups (Gerardi, Willen, and Zhang 2023). Groups that have lower financial standing, such as lower credit scores, or that are more often discriminated against would be more affected by changes in monetary policy. On average, blacks pay higher rates on mortgages than whites due to higher initial rates, lower refinancing opportunities, higher insurance premiums, and higher property taxes (Aronowitz, Golding, and Choi 2020; Avenancio-León and Howard 2020; Gerardi, Willen, and Zhang 2023).

Households that are renters, which on average blacks are more than whites (Puig 2022), can also be disadvantaged due to rental payments not automatically being counted towards building credit history. Households that rent may additionally be negatively affected by contractionary policy due to higher rental payments. When there are higher mortgage rates, people could be discouraged from buying new houses and instead rent. Rental unit prices could therefore increase due to high demand (Dias and Duarte 2022).

High debt burdens shrink y in equations (1) and (2). Households that are affected by this channel may respond to monetary policy by lowering their consumption and savings in equation (2). These exposed households thus see large changes in their consumption and savings due to the combined effects of the earnings heterogeneity, income composition, and debt burden channels.

2 Data & Methodology

2.1 Data

The time frame of analysis is 1994-2019. The data for consumption and income are U.S. household survey data from the Consumer Expenditure Survey (CE). The CE surveys households every quarter about their previous three months of consumption, income, and expenditures. It is a rotating panel, meaning that households are dropped once they are surveyed for four consecutive quarters. Categorization of consumption and income follows the classifications in Coibion et al. (2017). I impute data prior to 2004 following Coibion et al. (2017) to account for the CE's imputation of data after 2004. The data are aggregated to a quarterly frequency and seasonally adjusted using a four quarter moving average. Values are deflated by the Consumer Price Index to create a real series in 2019 prices and converted into per capita values to control for differences in household size.⁵ A limitation of the CE is its less comprehensive income and wealth data; however, it is still preferable over other surveys given this paper's focus on consumption outcomes.

To calculate the gender and racial gaps in outcomes, households in the CE are disaggregated by the demographics of their head of household. The CE assigns a reference person for each household who provides the most information on family composition, income, taxes, and expenditures. The researchers classify this individual as the head of household due to their extensive knowledge of household details and role in the survey.⁶ Details on the age, education, sex, and race of the reference person and other family members are provided in the raw data. I follow Cloyne,

5. The constructed total consumption CE series is highly correlated (0.87) with the quarterly Real Personal Consumption Expenditures series by the Bureau of Economic Analysis. The constructed total after tax income CE series is correlated (0.54) with the Income After Taxes series by the Bureau of Labor Statistics (BLS). The lower correlation between the income series can be attributed to differences in their construction. The constructed CE series is quarterly and excludes certain households, while the BLS series is annual, includes all households, and needs to be converted to real values. See Appendix A for additional details on CE data cleaning.

6. In households with spouses, the CE allows for either person to be the reference person. This flexibility is an advantage over other popularly used household surveys that automatically assign this position to the man in the household.

Ferreira, and Surico (2020) and Coibion et al. (2017) in using this classification of reference person as the household head. The racial analysis focuses on comparing households headed by whites and blacks due to the small sample sizes of households headed by Asians, Native Americans, and Hispanics.⁷

The data used to study the unemployment rate, unemployment duration, employment by sector, and labor force participation are from the Bureau of Labor Statistics (BLS). The BLS collects data at the individual level and reports group aggregates that are seasonally adjusted.

Monetary policy shocks are the high frequency series by Bu, Rogers, and Wu (2021) at a quarterly frequency. Following Bu, Rogers, and Wu (2021), this series is used in conjunction with controls for industrial production sourced from the Board of Governors of the Federal Reserve System, the consumer price index (CPI) from the BLS, the core commodity price index from Thompson Reuters, and the excess bond premium from Favara et al. (2016). The control variables are measured as the average value in each quarter.

2.2 Descriptive Statistics

The CE data resembles the gender and racial composition of the U.S. and gaps between groups (see Table 1). In the sample, 48% of households are headed by women and 52% by men. Also, 82% are headed by whites and 12% by blacks, mirroring the division of race within the U.S. population during this time period. On average, consumption is considerably lower and more volatile for households headed by blacks compared to whites. Blacks, especially black men, have higher unemployment rates and duration than whites. Labor force participation is higher for men than women, but higher for black women than white women. Additionally, households headed by blacks and women have lower incomes and savings than whites and men. Overall, gaps are larger by race than by gender except for labor income.

7. The CE collects data on Hispanics starting in 2009, with data on a few Latin American nationalities starting in 2003. This limits studying this ethnicity with the entire sample and comparing responses to white and black populations.

Table 1: Median quarterly outcome variable over the full sample

Outcome	White Men	White Women	Black Men	Black Women
HH consumption of durable goods (\$)	729	620	557	411
HH consumption of nondurable goods & services (\$)	3,874	3,643	3,045	2,745
Unemployment rate (%)	4.7	4.5	10.5	9.6
Unemployment duration (median weeks)	10	9	12	11
Labor force participation rate (%)	76.2	59.7	70.9	63.4
HH total (after tax) income (\$)	28,790	22,499	21,440	14,487
HH labor income (\$)	24,085	12,618	19,115	7,666
HH business income (\$)	2,475	1,471	944	425
HH finance income (\$)	3,527	2,948	1,695	920
HH savings (\$)	2,138	1,671	558	236

Note: The table shows median quarterly outcomes for white men and women and black men and women. Labor market statistics are at the individual level. Income and consumption are at the household level (HH = Household), identified by the head of household. Dollar amounts are in 2019\$ and per capita. Savings statistics describe households that have positive savings since most households have zero savings.

This distribution reflects the trends in the U.S. population, as men and white workers have more access to high paying and stable jobs. It may also be explained by the proportion of dual income earner households in each group since black, especially women, heads of household are more likely to be single and thus support their family alone both in income and care work. Black households also have less access to public and private goods; relying more on community care that is often provided by black women (Banks 2020).

In households headed by men, 55% of wives who do not work in formal employment instead take care of the household, providing unpaid care work and increasing familial welfare. In households headed by women, husbands who do not work are usually retired (67%) or ill or disabled (21%), possibly providing pensions to the household, but not explicitly contributing to housework. This arrangement may lead to an additional burden on these working women heads who provide unpaid care to their elderly, ill, or disabled husbands. This inequality of within-household distribution of income and unpaid work likely affects decision-making around spending on consumption (Doss 2021).

The significant differences in distribution of work and income between households disaggregated by gender and race puts into question the generalizability of aggregate household results. It is thus important to analyze the effects separately by groups of households.

2.3 Monetary Policy Shock Identification

Interest rates are endogenous to economic variables, as central bankers often set policy in response to aggregate economic fluctuations. It is therefore crucial to correctly identify monetary policy shocks to estimate the effects of unexpected policy rate changes on economic outcomes. It is additionally important to study unexpected rate changes since it is often possible to anticipate central bank policies given economic conditions and public central bank communications. Numerous methods of identifying monetary policy shocks have been used in the literature, although some result in puzzling effects on aggregate variables. The central bank information effect is often cited as driving results that contradict macroeconomic theory (Bu et al. (2021) and sources cited therein).

The monetary policy shocks used in this paper are the series by Bu, Rogers, and Wu (2021) aggregated to a quarterly frequency. I use the first shock in the quarter as a measure of the quarterly surprise to estimate its effects on outcome variables collected at this frequency.⁸ Bu, Rogers, and Wu (2021) identify an exogenous monetary policy shock series from 1994-2019 through a novel partial least squares approach. They estimate the unobservable shock through a two-step regression; in the first step they estimate the sensitivity of various interest rates to FOMC announcements, and in the second step they regress outcome variables onto their sensitivity index at each time period. Their minimal data requirements allows for the construction of the series over a longer horizon than others such as the narrative series extended by Coibion et al. (2017) or other high frequency series. Major contributions of Bu, Rogers, and

8. See the robustness section for a discussion of alternative monetary policy shock series. Results are consistent across different measures.

Wu (2021) are that their series is unpredictable from economic information and is free of a central bank information effect.

The Bu, Rogers, and Wu (2021) shock series produces conventionally-signed effects on macroeconomic variables; contractionary monetary policy shocks lower output and inflation during the entire period as well as separately before and after 2008. This series mirrors certain characteristics in other monetary policy shock series. However, its unpredictability and lack of information effect distinguish it from other identification methods.

2.4 Empirical Methodology

The effects of monetary policy shocks on various demographic groups are estimated through the local projections methodology proposed by Jordà (2005). This single equation approach regresses the dependent variable on its lags and the monetary policy shock series at each horizon. In accordance with the literature, lags of the endogenous variable are included as controls due to the relatively short sample time frame. Controls are also included following Bu, Rogers, and Wu (2021). The below equation is estimated:

$$x_{g,t+h} - x_{g,t-1} = c_g^{(h)} + \sum_{j=1}^J \alpha_j^{(h)} (x_{g,t-j} - x_{g,t-j-1}) + \sum_{j=1}^J \beta_j^{(h)} shock_{t-j} + \sum_{j=1}^J \gamma_j^{(h)} Z_{t-j} + e_{g,t+h}; \quad h = 0, \dots, H \quad (3)$$

where x can be log consumption, labor market outcomes, or log income. Regressions are run separately for each demographic group g (individuals or households headed by white men, white women, black men, and black women). All variables are over quarterly time t through to time horizon h . The monetary policy shock is $shock$. The vector of controls, Z , includes lags of log industrial production, log CPI, log commodity prices, and the excess bond premium.⁹ As a benchmark, $J=2$ and the

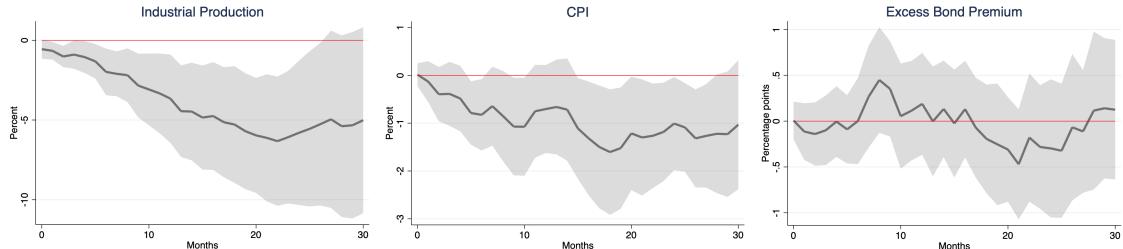
9. These control variables are included to account for variations in macroeconomic outcomes over time; removing the effect of these economic conditions from the estimates of monetary policy.

estimates cover $H=20$ quarters.

3 Results: Overall

The local projections using the Bu, Rogers, and Wu (2021) high frequency shock series produce conventionally signed effects on macroeconomic aggregates (see Figure 2). Following a contractionary monetary policy shock, industrial production and CPI fall, while the excess bond premium initially increases consistent with Bu, Rogers, and Wu (2021).¹⁰ The results in the following sections are estimated at a quarterly frequency due to the CE survey data being recorded at this frequency.

Figure 2: Effect of contractionary monetary policy shock on aggregate variables



Note: The figure shows the effects of a one standard deviation contractionary monetary policy shock on aggregate variables at a monthly frequency. Dark lines denote estimates using 12 lags and variables are ordered as if in a VAR, following Bu, Rogers, and Wu (2021): the cumulative shocks, log industrial production, log CPI, log commodity prices, and the excess bond premium. Shaded areas represent 90% confidence intervals.

3.1 Aggregate Effects

I find that contractionary monetary policy shocks lower aggregate consumption, savings, and income, and raise unemployment and labor force participation.¹¹ These results are largely consistent with the literature, such as Coibion et al. (2017), al-

Each control is needed due to the following reasons: industrial production provides a measure of economic output; the CPI represents overall market price fluctuations; the commodity price index tracks prices of basic goods that are the first affected by economic conditions; and the excess bond premium measures investor sentiment in the corporate bond market.

10. The results are similar if estimated at a quarterly frequency. See Appendix B for these estimates.

11. See Appendix B for these aggregate variable estimates.

though I estimate larger magnitudes due to using a different shock series and units. The finding that consumption of durable goods is more exposed to shocks than non-durable goods and services is also similar to the literature (Coibion et al. (2017) and Cloyne, Ferreira, and Surico (2020), among others). However, my result that finance income falls following contractionary shocks differs from Coibion et al. (2017). My estimated negative response could be attributed to the undersampling of high income individuals in the CE, which could omit households with higher interest-gaining assets that would see their finance income rise (Coibion et al. 2017). In the next sections, I explore how the aforementioned outcome variables react for different demographic groups.

3.2 Consumption Responses

There are clear gender and racial gaps in household durable goods and nondurable goods and services consumption responses to contractionary monetary policy shocks (see Figure 3).¹² Consumption falls more for households headed by men than women. However, the racial gap differs by the type of goods consumed.

Figure 3 shows that households headed by blacks and men decrease their consumption of durable goods more than whites and women.¹³ Households headed by black men reduce spending on these goods the most; by about 35% over five years after a one standard deviation contractionary monetary policy shock.¹⁴ Since black households on average spend less than white households, as seen in Table 1, this result implies that consumption inequality rises after a contractionary shock consistent with Coibion et al. (2017).

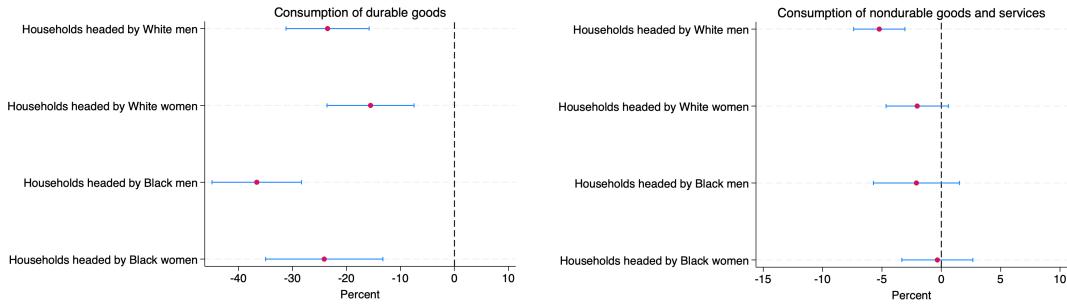
In contrast to durable goods, nondurable goods and services spending is decreased

12. See Appendix C for the impulse responses of these expenditure outcomes and gap measures.

13. The durable goods consumption gaps between households headed by black men, white men, and white women are statistically significant at this horizon. The gap between households headed by black men and black women is also significant. See Appendix C.

14. Household consumption responds with a delay to monetary policy relative to labor market and income outcomes, with the largest cumulative effects seen even later for blacks. For this reason, I consider consumption estimates after 19 quarters.

Figure 3: Cumulative effect of contractionary monetary policy shock on consumption after 19 quarters



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock on consumption of durable goods (left) and nondurable goods and services (right) after 19 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

most by households headed by white men, by about 5% over five years.¹⁵ This behavior is driven by purchases of luxury nondurable goods and services, which are only decreased by households headed by white men.¹⁶ This is likely due to these households consuming larger quantities of these goods. Black households also do not significantly decrease their spending of basic nondurables, such as food and non-luxury clothing, in contrast to white households. Households that typically consume larger quantities of goods or more expensive versions of products will have the choice to decrease their spending and still live comfortably when their income falls. This behavior is most often exemplified by households headed by white men. In contrast, households that spend most of their money on necessities will not be able to largely decrease their spending; relying on their savings or credit to finance their essential-goods consumption when their incomes fall. The different reactions of durable and nondurable goods spending shows that it is important to consider the baskets of goods that households typically consume when understanding consumption behaviors.

I next investigate whether the gaps in responses in Figure 3 are driven by household characteristics other than gender and race. If, for example, gender and racial

15. The nondurable goods and services consumption gaps between households headed by white men and all others are statistically significant at this horizon. See Appendix C.

16. See Appendix C for the impulse responses of these outcomes and gap measures.

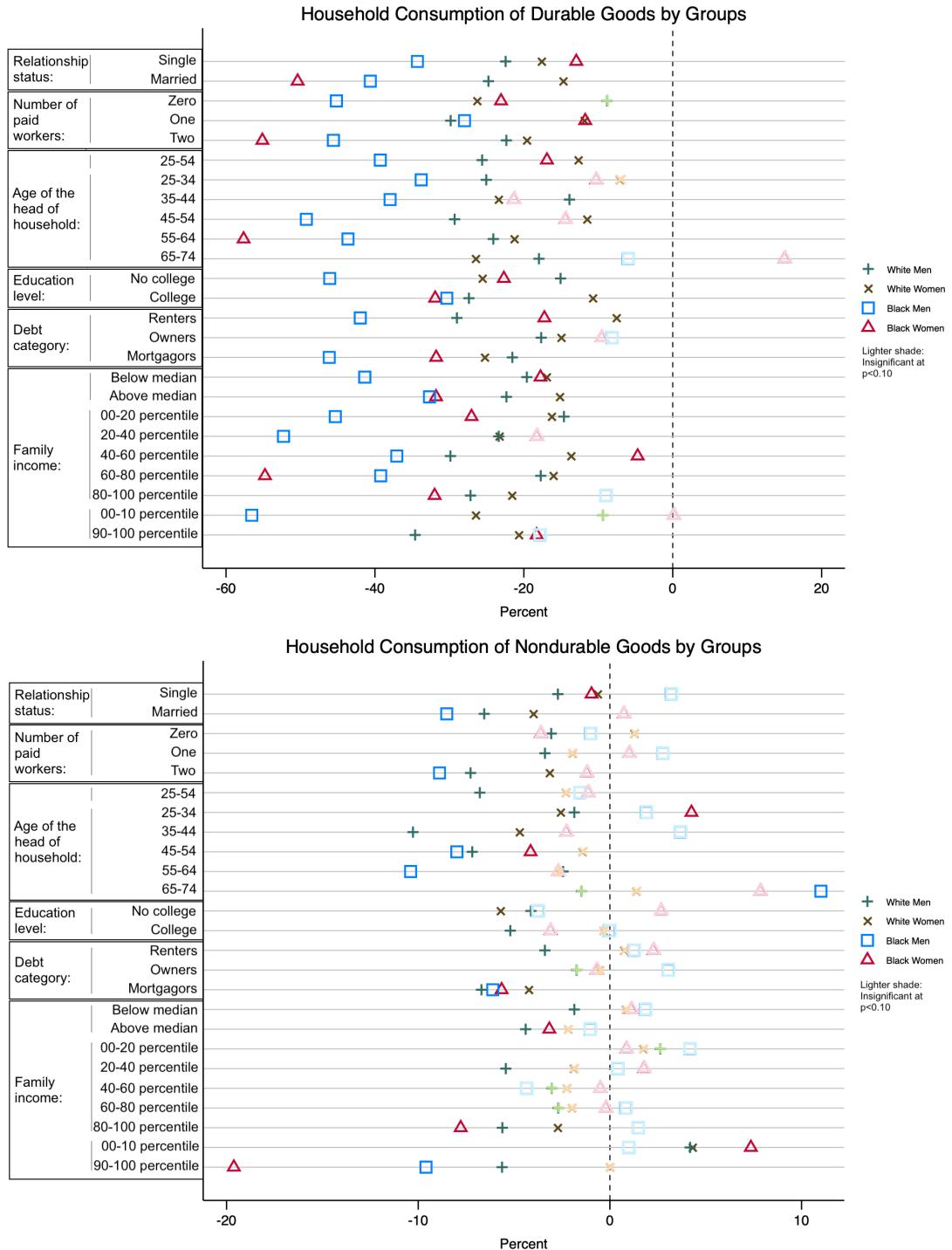
consumption gaps were solely driven by income inequality, these gaps would not exist within income percentiles. However, I find that gender and racial gaps in consumption responses persist even when accounting for household characteristics that could theoretically drive the gaps between groups. As shown in Figure 4, spending continues to be decreased more by households headed by blacks than whites, with a clear racial gap in responses of durable goods consumption.¹⁷ This result is consistent with the racial consumption gaps found in Ganong et al. (2020). Nondurable goods and services spending is often decreased more by households headed by men than women, supporting the earlier analysis that households headed by men spend more on luxury goods.

I show that household composition does not drive racial and gender gaps in consumption responses. I first separate households by whether the head of household is single or married. It is important to study households separately by relationship status because the responses of single households more closely identify that individual's preferences, while married households spending may be a joint decision between spouses given shared responsibilities or divisions of paid and unpaid work. Second, I separate households by the number of spouses with paid work. Households with two spouses may have one who is working for pay and the other providing unpaid work for the household, or two working for pay. Even amongst households where both spouses are employed, women still bear the majority of the house and care work (Thébaud 2010).

The main results from Figure 3 hold within different relationships and number of paid workers: durable goods consumption is decreased most by black households, while nondurable goods and services spending is decreased most by households headed by men. Households headed by black women who are married or have two income earners decrease their consumption of durable goods the most. These households experience combined negative effects on black women and on the men in these

17. Several estimates are statistically insignificant due to not having a clear response to monetary policy. Insignificance may in part be due to the small sample sizes of households headed by blacks when disaggregated into these sub-groups.

Figure 4: Cumulative effect of contractionary monetary policy shock on household consumption by subgroups after 19 quarters



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock on consumption of durable goods (top) and nondurable goods and services (bottom) after 19 quarters. Households are divided into subgroups within six categories. Symbols denote the estimates of each group by household head (dark shade are statistically significant; lighter shade are insignificant at $p < 0.10$).

households, such as higher unemployment and lower overall incomes. Among households that have a single head or one paid worker, men decrease their consumption more than women. This may be due to households headed by single women, especially black women, more often having children and thus mainly buying basic goods that cannot be decreased.

The age of the head of household also does not drive gender and racial consumption gaps. Figure 4 presents the responses for households with heads of prime working age followed by decade. Although households age 55 and above initially decrease their spending on durable goods more than younger households, gaps between aggregate age bands disappear three years after the shock. Nondurable goods and services consumption falls most for households age 35-44, however, there is no clear trend between younger versus older households as in Leahy and Thapar (2022) or Wong (2015). Consumption gaps in Figure 3 are maintained across age bands, consistent with Cloyne, Ferreira, and Surico (2020).

The education level of the head of household does not remove gender and racial gaps in consumption responses to monetary policy. Households are separated based on whether the head has up to high school and no college education or if the head has at least some college education. Black households decrease their consumption of durable goods the most, while white households - especially white men headed households - decrease their consumption of nondurable goods and services the most.

I next show that neither household mortgage debt nor income explain the gender and racial consumption gaps from Figure 3. To measure the debt burden channel of monetary policy, I separate households by whether they rent, own their house, or have a mortgage. I find that households with mortgages decrease their spending the most compared to owners and renters, consistent with Cloyne, Ferreira, and Surico (2020). However, I still find racial and gender gaps within these debt categories. Black households drive the fall in mortgagor spending on durable goods. Also, renter households headed by blacks decrease their durable goods consumption more than whites. Lastly, gender and racial consumption gaps persist within different levels of

family income.¹⁸ Consumption of durable goods falls more for households headed by blacks than whites in almost all percentiles.

Geographical location is also important to consider, as monetary policy's effects on inequality vary by the share of each demographic group in that region (Seguino and Heintz 2012). Seguino and Heintz (2012) find larger racial unemployment gaps from monetary tightening and higher discrimination against blacks in U.S. states with higher black population density. I find that households headed by blacks decrease their consumption most in rural areas, in places where they are highest concentrated (i.e., the South Atlantic), and in places that are most exposed to shocks.¹⁹ More investigation is needed to understand the drivers of these results.

These results demonstrate that monetary policy does not influence consumption to the same degree for all demographic groups. Gender and racial consumption gaps are in part unexplained by differences in household composition, age, education, debt, and income. The proceeding sections investigate how labor market and income outcomes determine households' abilities to spend when there is an unexpected change in monetary policy. Black households are more likely to be credit constrained, and thus are expected to decrease their spending most due to disproportionate job and income losses.

3.3 Channel: Earnings Heterogeneity

Monetary policy shocks are transmitted to consumption in large part through the earnings heterogeneity channel. This channel groups fluctuations in people's unemployment, labor force participation, and salary incomes.²⁰

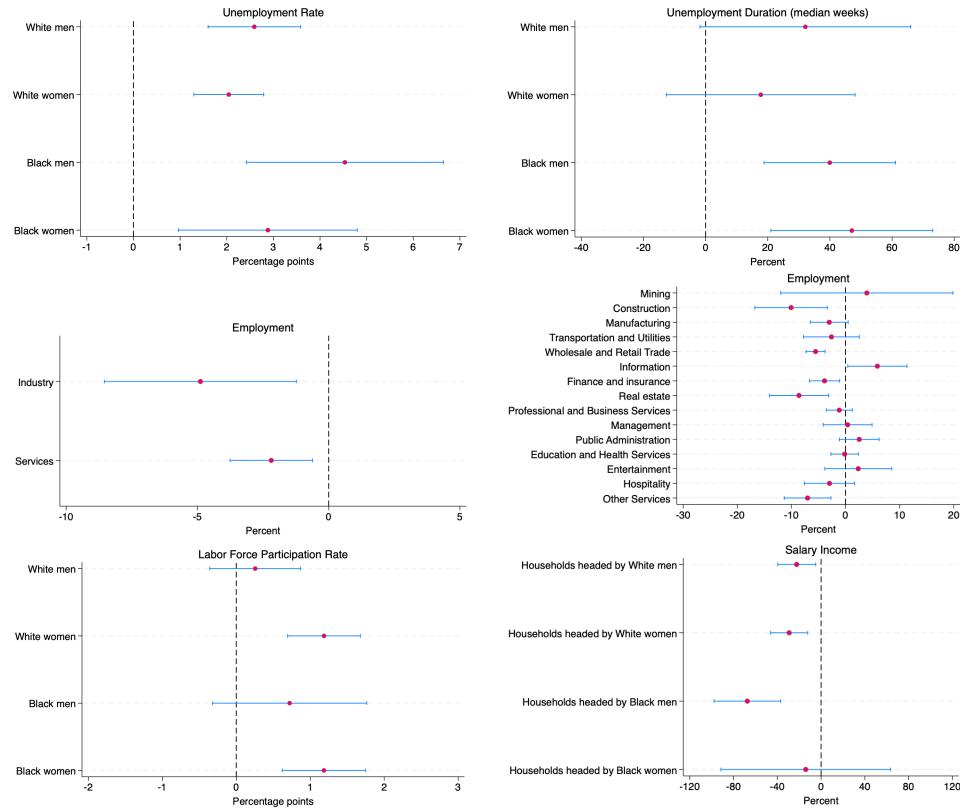
Figure 5 shows the cumulative impact of contractionary monetary policy shocks on labor market outcomes. Unemployment rates ultimately rise above 2 percentage

18. Family income percentile thresholds are the same for all gender and racial groups. These results hold when using a measure of household labor earnings instead of total income. I also find similar gaps when disaggregating households by their savings and wealth. Estimates are available upon request.

19. See Appendix D for the impulse responses of consumption by geographical location.

20. See Appendix E for the impulse responses of labor market outcomes and gap measures.

Figure 5: Cumulative effect of contractionary monetary policy shock on labor market outcomes after 16 quarters



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock on unemployment (top), employment (middle), labor force participation (bottom-left), and salary income (bottom-right) after 16 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals. Employment sub-sectors data (middle-right graph) are only available from 2000-2019.

points for all demographic groups following a one standard deviation contractionary shock. However, men are significantly more exposed than women and blacks more than whites.²¹ Black men see their unemployment rate rise above 4 percentage points and blacks' unemployment duration rises by over 40%. Thus, the gender gap between women and men's rates narrows and the racial gap between blacks and whites widens.

21. The unemployment rate gaps between black men, white men, and white women are statistically significant at this horizon. The gap between black men and black women is also significant. See Appendix E. The unemployment rate results holds for employment and employment-to-population ratios (estimates available by request). Employment falls for all groups following a contractionary monetary policy shock, however it clearly falls for men more than women and blacks more than whites.

This racial unemployment gap result is consistent with Bartscher et al. (2021) who find that expansionary monetary policy shocks decrease the unemployment gap between whites and blacks. Blacks also stay unemployed for significantly longer periods of time, which means that they are both more likely to be unemployed and find it harder to find jobs once unemployed.

The unemployment gaps in Figure 5 can largely be explained by changes in employment by sector. Employment in industry is more exposed to monetary policy shocks than in services, which clearly follows from industry firms being more dependent on changes in interest rates.²² Construction and manufacturing have the largest employment losses in industry, while real estate, other services, and wholesale and retail trade have the largest losses in services. Men's high concentration in industry jobs versus women's concentration in services jobs drives the gender gap, while black worker concentration in wholesale and retail trade, other service jobs, and manufacturing drives the racial gap in unemployment. These estimates mirror the findings in Duzhak (2021) that male black and Hispanic workers face higher unemployment during downturns in part due to their occupational concentration.

However, sector exposure does not fully explain the unemployment gaps because I find gender and racial gaps within certain sectors. Women are more affected than men in manufacturing and entertainment, while men are more than women in wholesale and retail trade and real estate. Blacks are more affected than whites in manufacturing and finance and insurance sectors. This component of labor market gaps that is unexplained by occupational concentration calls for further investigation into labor market inequalities.

There is a gender gap in the response of labor force participation to monetary policy that follows the added worker hypothesis. After a contractionary shock, women clearly raise their labor force participation while men do not.²³ Also, salary incomes

22. The agriculture sector is omitted due to unclear results and it being a small share of the US economy (on average 1% of GDP). Results available upon request.

23. The labor force participation gaps between white men and white and black women are statistically significant at this horizon. See Appendix E.

of households headed by white women fall more than those of white men, although households headed by black men are hardest hit.²⁴ When women are entering the labor force during contractionary shock periods, they take lower-paying jobs just to make ends meet when their spouses are unemployed.²⁵ These results show that the added worker hypothesis holds in response to unexpected monetary policy episodes.

The result that households headed by black men have the most exposed salary incomes fits expectations, as black workers are more unemployed than whites following a shock. Evidence of salary income gaps contrast Coibion et al. (2017) and Bartscher et al. (2021), which both find that monetary policy shocks do not clearly affect earnings or wage inequality. However, past literature does not disaggregate groups further than by income percentile or race. My results provide a deeper look into individual-level responses that might be obscured with aggregated groups.

3.4 Channel: Income Composition

Salary income, rather than the income composition channel appears to drive the response of total income inequality to monetary policy shocks. Total income inequality rises after contractionary shocks, consistent with Coibion et al. (2017), and is largely explained by rising salary income inequality since the average household in the sample receives the majority of its income from labor earnings. Thus, the results in section 3.3 explain why total incomes fall most for households headed by black men and white women (see Figure 6).²⁶

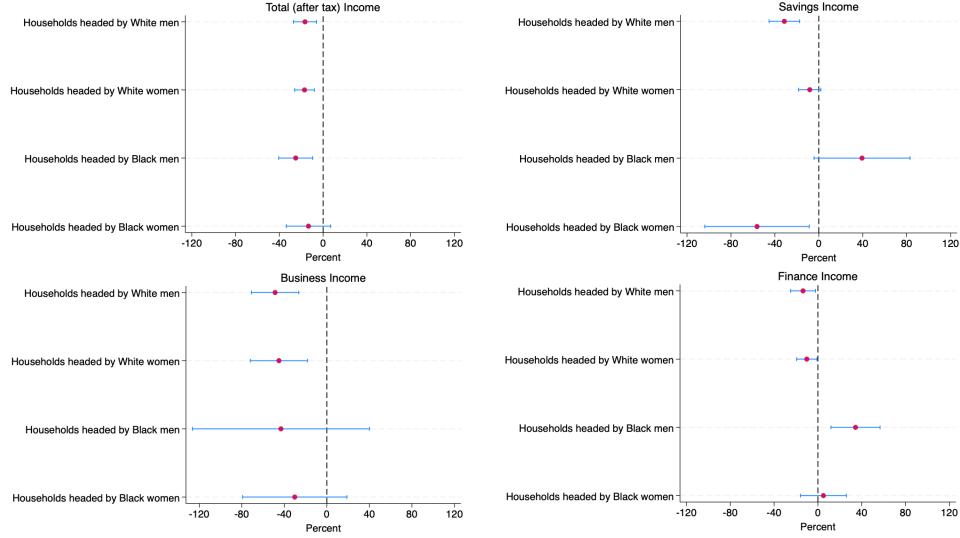
Figure 6 also shows the cumulative impact of contractionary monetary policy shocks on business and finance income. Business incomes fall for all households with

24. These salary income gaps are statistically significant at this horizon. See Appendix E.

25. This result holds in the literature and when tested in an OLS regression using CE data. During a contractionary shock, a household in which a wife enters the labor force following her husband's unemployment (an added-worker household) has significantly lower labor earnings than a household in which only the wife is employed, controlling for the woman's age, race, and education. These results hold when estimating the effects during all quarters and when comparing added-worker households to all households in which a woman is employed.

26. Results for total income are consistent between the measure after tax and before tax. Total income after tax is used for results to be comparable with the literature.

Figure 6: Cumulative effect of contractionary monetary policy shock on income & savings after 16 quarters



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock on income - total (top-left), business and finance (bottom) - and savings (top-right) after 16 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

no gender or racial gaps in exposure after four years. However, business incomes fall significantly more for households headed by black women than other groups in the first three years after the shock. Finance incomes fall for households headed by whites and black women through the second year after a contractionary shock. While the cumulative effect of finance incomes for white households stays negative, it rises for households headed by black women with large uncertainty. Four years after the shock, the results thus show that finance incomes fall for whites and do not clearly change for households headed by black women. In contrast, finance incomes rise for households headed by black men.²⁷

The gaps in finance income responses are explained by the composition of this income for each group.²⁸ I separately analyze income from interest and dividends, pensions, and rent (it is not possible to separate interest and dividend income due to

27. See Appendix F for the impulse responses of income outcomes and gap measures. These gaps are statistically significant at this horizon.

28. Results available upon request.

data limitations). Contractionary monetary policy shocks have negative effects on all three components for households headed by white men: lower dividends outweigh higher interest payments consistent with Bartscher et al. (2021); lower pensions in the short-run; and lower rental property income in the longer-run. The finance component responses of households headed by white women are of the same sign but smaller magnitude as white men. Thus, white finance responses in Figure 6 are driven by decreases in dividends (plus interest). This holds since the share of finance income that is interest and dividends is considerably larger for households headed by whites (30%) than blacks (9%).

Finance income responses of black households to a contractionary monetary policy shock are driven by interest, pension and rental incomes. Although finance income is mainly composed of pension income for all groups, shares are larger for blacks (85%) than whites (65%). Unclear falls in pension incomes therefore increase the overall finance income results for households headed by blacks relative to whites. Households headed by black women experience higher interest incomes that outweigh lower dividends, and higher rental incomes with high uncertainty. These positive effects result in an unclear effect on overall finance income. Households headed by black men have the largest shares of rental income (7%) compared to other groups in the sample. The positive response of finance income for households headed by black men is thus driven by a clear rise in rental property income; effects of interest and dividends are neutral and of pensions are unclear.

It is additionally important to look at how household savings fluctuate during monetary policy changes. Following higher unemployment and lower income, households will need to use other means to finance consumption to avoid decreasing it. Households with larger savings will have a secure buffer against income losses, enabling them to continue to consume the same or similar basket of goods. Figure 6 shows the cumulative impact of contractionary monetary policy shocks on savings for households that have positive savings accounts. Savings for households headed

by black women decrease the most over any other group with a significant gap.²⁹ Although savings of households headed by black men rise, the estimate is highly uncertain. The savings gap between households headed by black women and others thus further widens.

Falls in savings in Figure 6 suggest that most households use existing savings to smooth their consumption, especially of essential goods. Following contractionary monetary policy shocks households headed by blacks experience higher unemployment and lower incomes, yet do not decrease their consumption of nondurable goods and services in Figure 3. Households headed by black women use the largest percentages of their saved income, consistent with being the most likely to be constrained by a minimum consumption of essentials due to lower income and higher dependent care responsibilities. More research is needed to fully understand why and how consumption responses of essential goods are smoothed.

4 Results: Shock Asymmetry

I next test whether the direction of monetary policy shocks are transmitted asymmetrically to each outcome. I run local projections for each demographic group, expanding on equation (3) with an additional dummy variable for whether the shock is contractionary (positive) or expansionary (negative) as in Furceri, Loungani, and Zdzienicka (2018). The below equation is estimated:

$$\begin{aligned} x_{g,t+h} - x_{g,t-1} &= c_g^{(h)} + \sum_{j=1}^J \alpha_j^{(h)} (x_{g,t-j} - x_{g,t-j-1}) + \sum_{j=0}^J \beta_j^{(h)} shock_{t-j} D_{t-j} \\ &\quad + \sum_{j=0}^J \beta_j^{(h)} shock_{t-j} (1 - D_{t-j}) + \sum_{j=1}^J \gamma_j^{(h)} Z_{t-j} + e_{g,t+h}; \quad h = 0, \dots, H \end{aligned} \tag{4}$$

where all variables are specified as in equation (3) and D is a dummy variable that equals one when the monetary policy shock is positive and zero otherwise.

29. See Appendix F for the impulse responses of savings and gap measures. These gaps are statistically significant at this horizon.

Section 3 estimates are generally driven by contractionary rather than expansionary shocks, consistent with the literature. Additionally, the difference in responses to each monetary policy shock sign is statistically significant for most outcomes and groups.³⁰ Responses also fluctuate more for households headed by blacks than whites.

4.1 Consumption Responses

Contractionary shocks increase racial and gender consumption gaps by large magnitudes while expansionary shocks do not have clear effects on most groups (see Figure 7). Households headed by black women decrease their consumption of nondurable goods the most, which in the overall results in section 3.2 is balanced by their increased spending following expansionary periods. While households headed by whites may decrease luxury good spending, households headed by blacks may also buy fewer nondurables due to the large falls in income they experience. In contrast, expansionary shocks only significantly affect households headed by black women by raising their nondurable goods and services consumption.

4.2 Labor Market & Income Responses

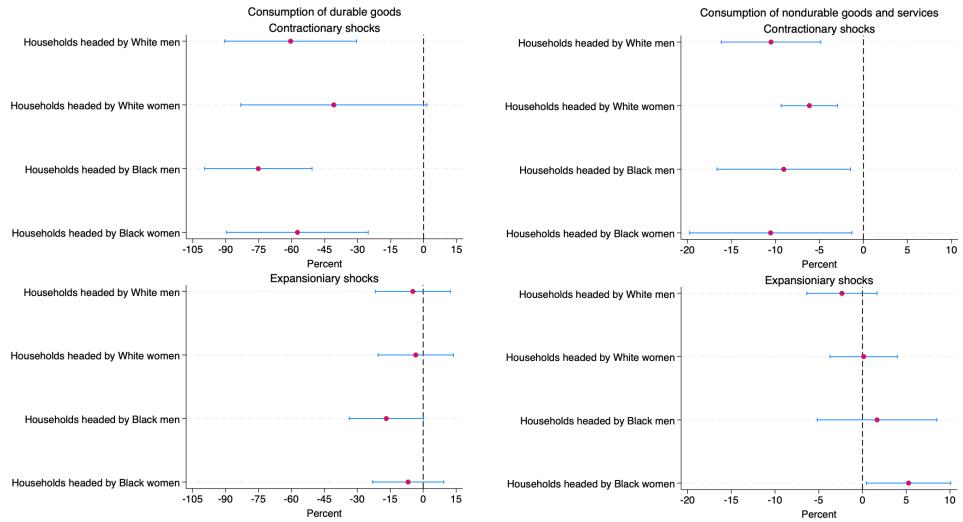
Positive and negative monetary policy shocks are also transmitted asymmetrically to labor market outcomes and income (see Figure 8).³¹ Contractionary shocks raise the unemployment rate and duration most for blacks, while expansionary shocks have no clear effect on unemployment for any group. These estimates cast doubt on assuming a symmetric transmission when studying expansionary policy and unemployment.

The added worker effect only appears in white women's in labor force participation. Following a contractionary monetary policy shock, the labor force participation rate falls most for black men and women, while uncertainly falling for white men and rising for white women. Thus, the added worker effect may only exist for white households, since black women also experience higher unemployment rates seen by men.

30. See Appendix H, I & G for the impulse responses by shock type and tables with F-test results.

31. See Appendix H & I for the impulse responses of labor market and income outcomes to asymmetric shocks.

Figure 7: Cumulative asymmetric effects of monetary policy shock direction on consumption after 19 quarters

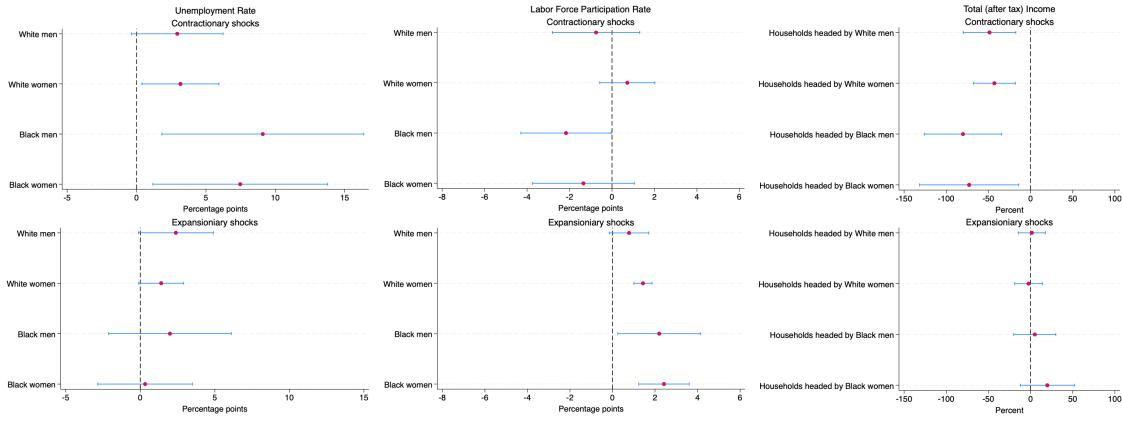


Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock (top) or expansionary monetary policy shock (bottom) on consumption of durable goods (left) and nondurable goods and services (right) after 19 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

This racial difference also follows from differences in women's roles between white and black households. In contrast to white women, black women cannot often afford to leave the labor force to focus on house and care work. They are thus more exposed to labor market dynamics like black men. Following expansionary shocks, all groups increase their labor force participation although blacks more than whites. Overall, participation decisions are more sensitive to monetary policy shocks for blacks than whites, consistent with Cajner et al. (2017).

Following contractionary shocks, household incomes (total, salary, business, and finance) fall most for households headed by blacks and least for households headed by white men. Racial and gender gaps widen during these periods. Salary and business incomes fall most for households headed by black men, while finance income falls most for households headed by black women. In contrast, expansionary shocks do not clearly raise total incomes for any group, however, households headed by black women see higher salary incomes.

Figure 8: Cumulative asymmetric effects of monetary policy shock direction on labor market and income outcomes after 16 quarters



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock (top) or expansionary monetary policy shock (bottom) on labor market and income outcomes after 16 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

5 Robustness

I conduct several additional robustness checks to verify the results in section 3. I first test for the sensitivity of the results to the monetary policy shock specification. I run equation (3) substituting the *shock* variable by Bu, Rogers, and Wu (2021) with three alternative series: the Bauer and Swanson (2023) orthogonalized monetary policy shocks; the Jarocinski and Karadi (2020) monetary policy median shocks; and the Wu and Xia (2016) shadow rates. Each series is used from 1994-2019 and is aggregated to a quarterly frequency by the sum of all shocks within the quarter. The effects of contractionary monetary policy on consumption, labor market, and income outcomes are generally qualitatively consistent with those presented using the shock series by Bu, Rogers, and Wu (2021).³²

I then check whether the results are affected by different lag lengths or controls

32. Following contractionary shocks, total income and consumption of durable goods falls most for households headed by black men. The unemployment rate also rises most for black men. Consumption of nondurables either falls most for households headed by White men or falls without a clear racial or gender gaps. See Appendix J & K for the estimates of main outcomes in response to alternative shock measures.

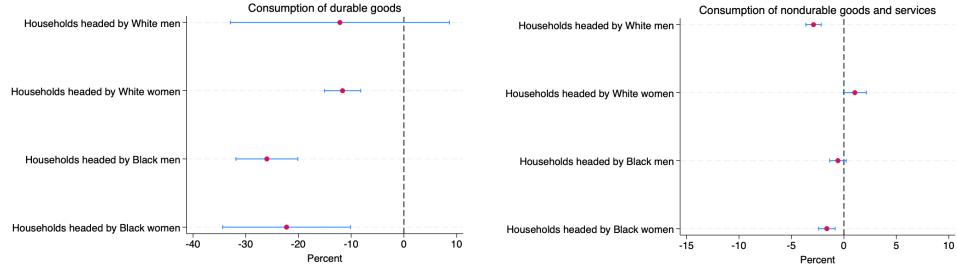
in equation (3). The results are similar up to four lags; including controls and shocks with five or more lags distorts the results. Using less than five lags is consistent with the local projections literature. I next test for the importance of the vector of controls Z in equation (3) by running the local projections without this vector. The majority of results are consistent. I also test removing only the commodity prices measure, and the results are qualitatively similar. However, it is important to include all Z controls in the estimation to separate out the effects of macroeconomic conditions. Omitting all or some of the controls likely produces incorrect estimates. I additionally confirm that the results are consistent with including control variables that are constructed with the values in the beginning of the quarter, instead of the average, to match the shock series construction.

I next study the dependence of the consumption results on different periods.³³ First, I see whether using shocks only from the unconventional monetary policy period affect the estimates. I find that the results for the full sample are consistent with those post-2008, similar to Bu, Rogers, and Wu (2021). Figure 9 shows that consumption of durable goods falls more for households headed by blacks than whites, while consumption of nondurable goods and services falls most for households headed by white men.

Lastly, I test whether the consumption responses to monetary policy shocks are driven by recessionary periods. I run local projections following equation (4), changing D to be a dummy variable that equals one when the economy is in a recession and zero otherwise. Following a contractionary shock, households decrease their consumption less when the economy is in a recession. Figure 10 shows that although gender and racial gaps in consumption responses exist in each period, non-recession years drive the overall consumption responses of households to contractionary shocks. One explanation could be that households already have low consumption during recessions; a contractionary shock thus does not lower spending much further. In contrast, households spend at normal or larger quantities during years when the

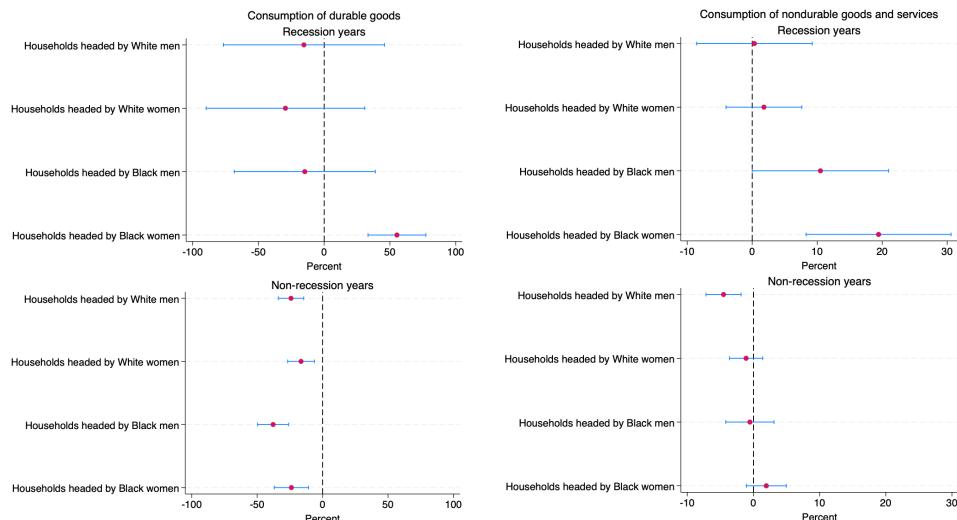
³³ See Appendix L for the estimates of the time dependency robustness checks.

Figure 9: Cumulative effect of contractionary monetary policy shocks on consumption after 19 quarters, sample 2008-2019



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock on consumption of durable goods (left) and nondurable goods and services (right) after 19 quarters for the sample 2008-2019. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

Figure 10: Cumulative effect of contractionary monetary policy shocks on consumption after 19 quarters, recessions



Note: The figure shows the cumulative impact of a one standard deviation contractionary monetary policy shock during U.S. recession years (top) and non-recession years (bottom) on consumption of durable goods (left) and nondurable goods and services (right) after 19 quarters. Red dots mark the estimates and blue lines denote the 90% confidence intervals.

economy is not in a recession. Central bank officials often employ contractionary policy to curb this extra spending and inflation. This explanation follows theory and shows how contractionary policy impacts consumption more during periods of economic growth.

6 Conclusion

This paper is the first to estimate gender and racial gaps in household consumption responses to monetary policy shocks with this methodology and extended time period, as far as I know. It is also novel in explaining consumption responses through estimated impacts on labor market and income outcomes. Consumption behaviors are influenced by total disposable income, which in turn is determined by access to education, employment, and financial opportunities. These other forms of inequality, which are more often faced by people of color and women, are masked by measures of income inequality. Since income gaps obscure these other inequalities that affect how monetary policy is transmitted, focusing solely on income inequality has limited previous research.

I fill this gap in the literature by separately studying consumption responses of households headed by white men, white women, black men, and black women while accounting for various household characteristics. I also trace monetary policy transmission through labor market and income outcomes. Consistent with theory, the empirical results show that falls in consumption following contractionary monetary policy shocks are driven by rising unemployment rates and falling incomes.

However, the transmission of monetary policy is not equal for all demographic groups. Gender and racial gaps exist, with blacks experiencing the largest negative effects of contractionary shocks. The ultimate result of the labor market and income responses is that consumption gaps widen by gender and race. Households headed by blacks, especially black men, decrease their spending of durable goods more than other groups. Neither household composition, age, education, balance sheets, nor income explain gender and racial consumption gaps. Lastly, I find evidence that contractionary monetary policy shocks widen inequalities while expansionary shocks have unclear effects on outcomes.

The findings in this paper are relevant for central banks who may intend to affect household spending through interest rate policy. Policymakers must understand the

determinants of aggregate outcomes. Also, how responses differ between positive and negative rate shocks to know whether monetary policy changes are having their intended effects. This can be done by studying the unequal transmission of policy at the individual level and delving into the complexities of household spending behaviors. Quantifying the effects of monetary policy is especially needed given the current reliance on the Federal Reserve to stabilize the economy.

More research is needed to trace the causal effects of monetary policy. Daily or monthly survey data that is representative and records comprehensive household member demographics, financial details, and reactions to policies is crucial for the use of high frequency monetary policy shocks. Additional efforts are needed to incorporate gender and racial heterogeneity into models studying the effects of monetary policy. My empirical estimates can inform model parameters to reflect gender and racial heterogeneity in labor market, income, and consumption outcomes. The results also imply that models should not assume that contractionary and expansionary monetary policy shocks have symmetric effects, especially when studying expansionary policy.

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A Appendix: CE Data Cleaning

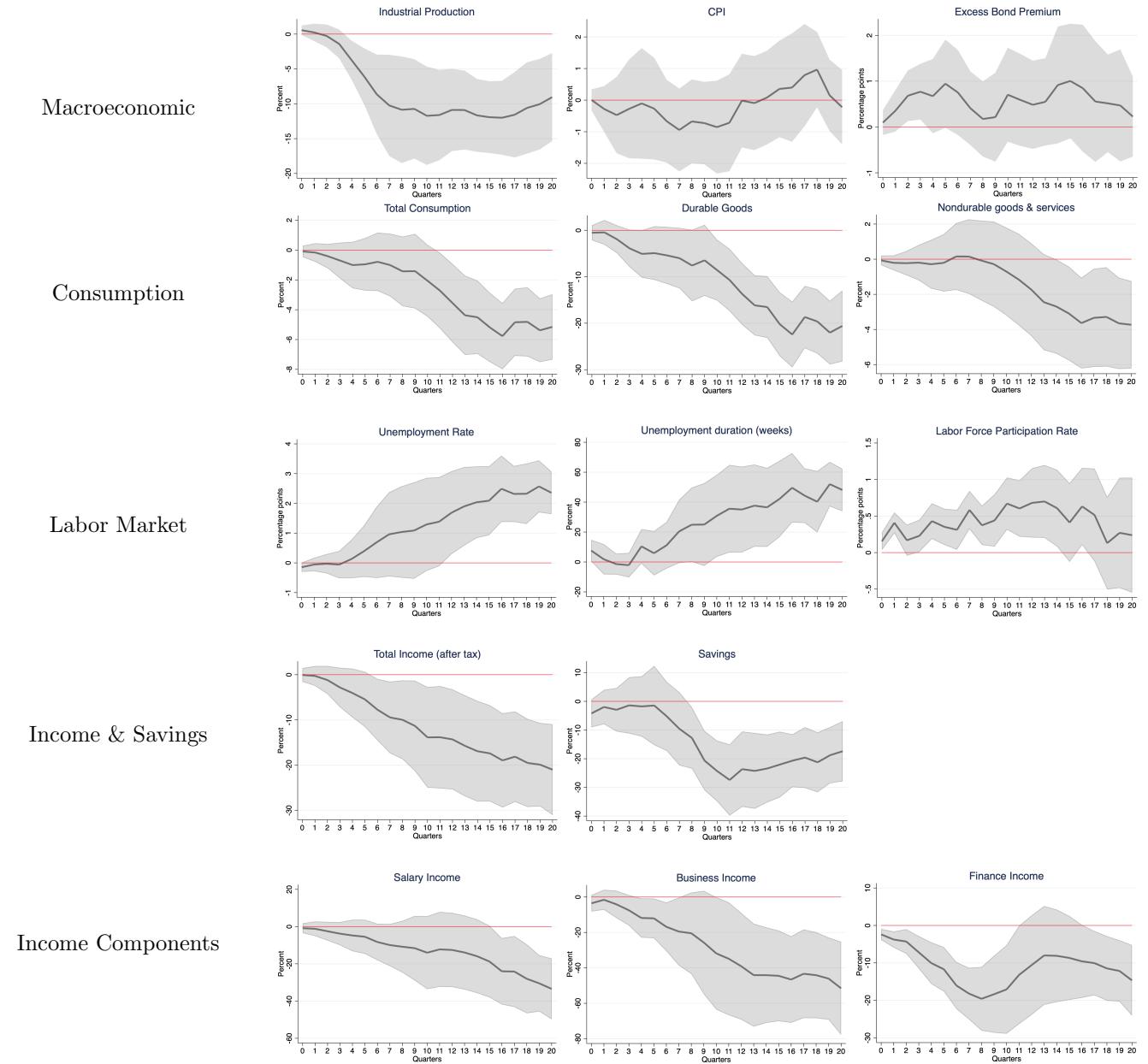
This section describes the data cleaning process for the Consumer Expenditure Survey (CE). The CE raw data files are available for download on the Bureau of Labor Statistics website. The expenditures data is aggregated from the MTAB files and the income data is constructed from the FMLI and MEMI files.

To create a quarterly expenditure series, expenditures are aggregated across months within the reported quarter. Observations are dropped if they report negative consumption on durable or nondurable goods and services. They are also dropped if they report negative net income data. I adjust for outliers by dropping households in the top or bottom 1% of expenditures in each quarter. This deletes about 3% of households. Since I am interested in studying how mortgage debt affects consumption, I also drop households that change their mortgage debt status during the year they are interviewed, following Cloyne, Ferreira, and Surico (2020). I only keep households whose head is white or black, given the small percentage of other race individuals in the sample. Following Cloyne, Ferreira, and Surico (2020), I also drop households whose heads are below 25 or over 75 years old, and keep households that were interviewed less than for their full survey period.

Categorization of consumption and income from the MTAB and MEMI CE files follows the classifications in Coibion et al. (2017). Data prior to 2004 are imputed according to Coibion et al. (2017) to account for CE imputations post-2004. Sample breaks and bracketed income values are also handled according to Coibion et al. (2017). The data are seasonally adjusted using a four quarter moving average.

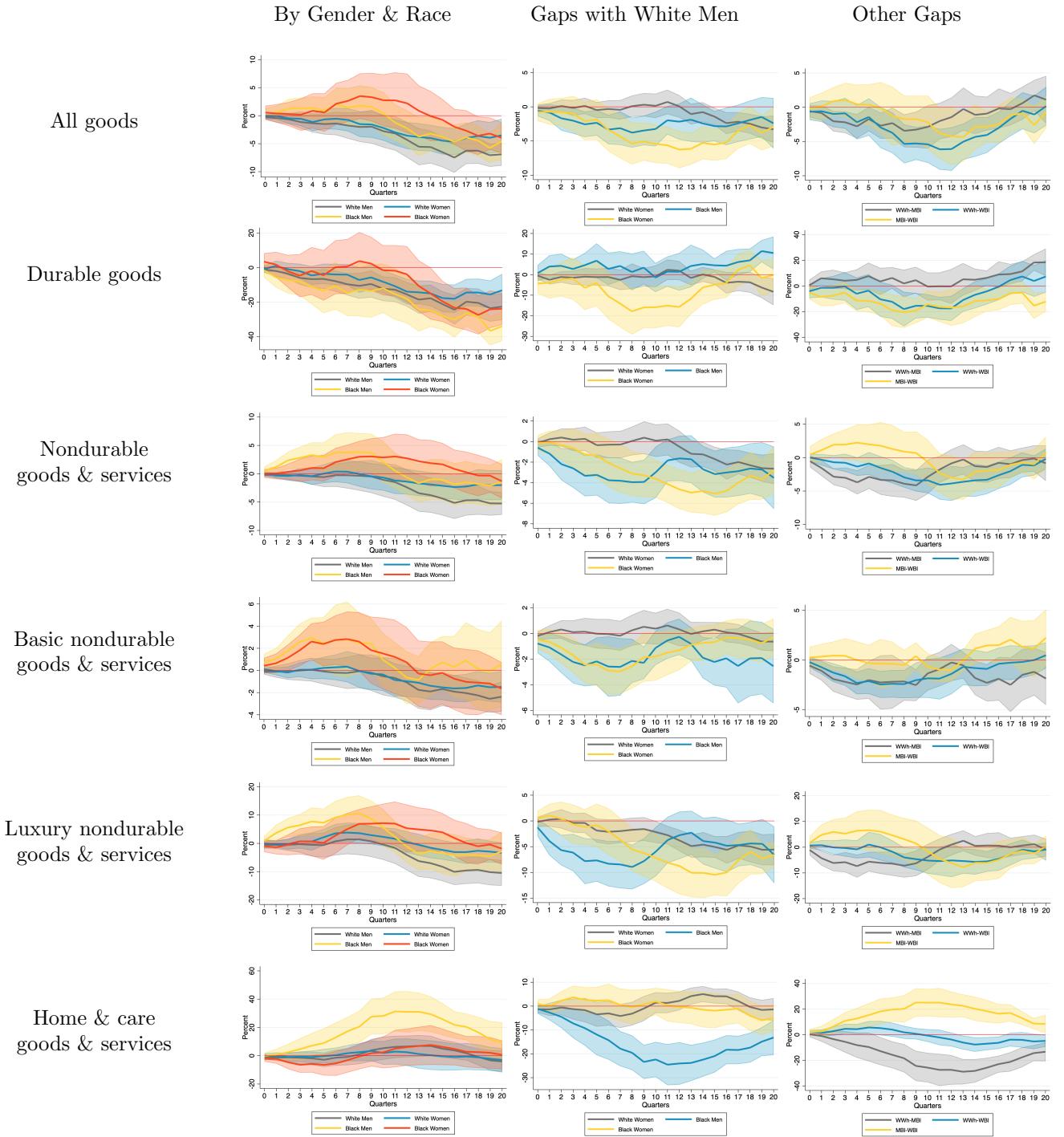
For comparability over time, expenditure and income variables are deflated by the CPI to 2019 prices. To control for differences in household size, I adjust expenditures by the OECD scale of effective household size following Coibion et al. (2017). All series are thus in real and per capita values. I additionally weight the series by the CE household weights.

B Appendix: Aggregate Outcomes



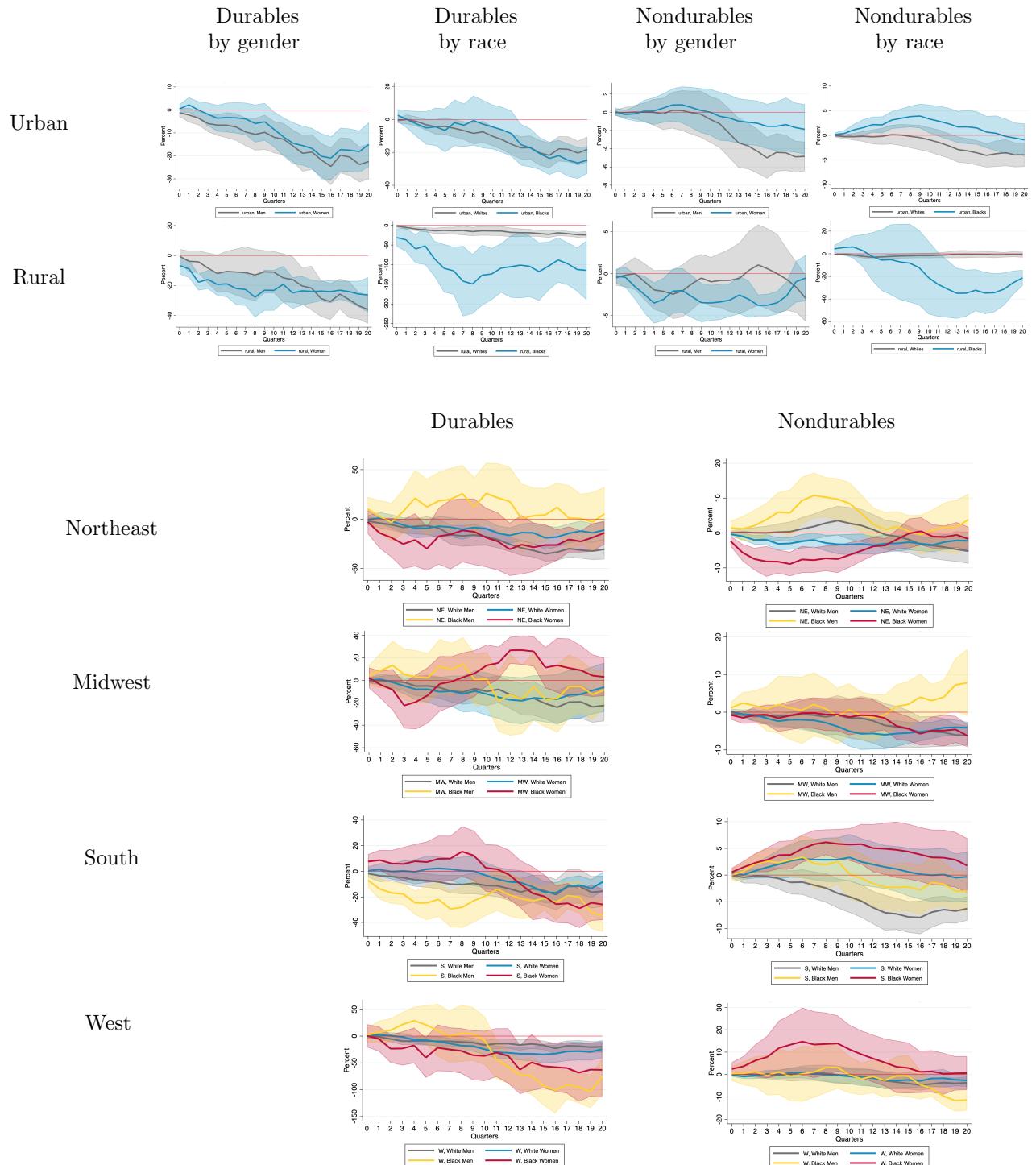
Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals.

C Appendix: Household Consumption Responses



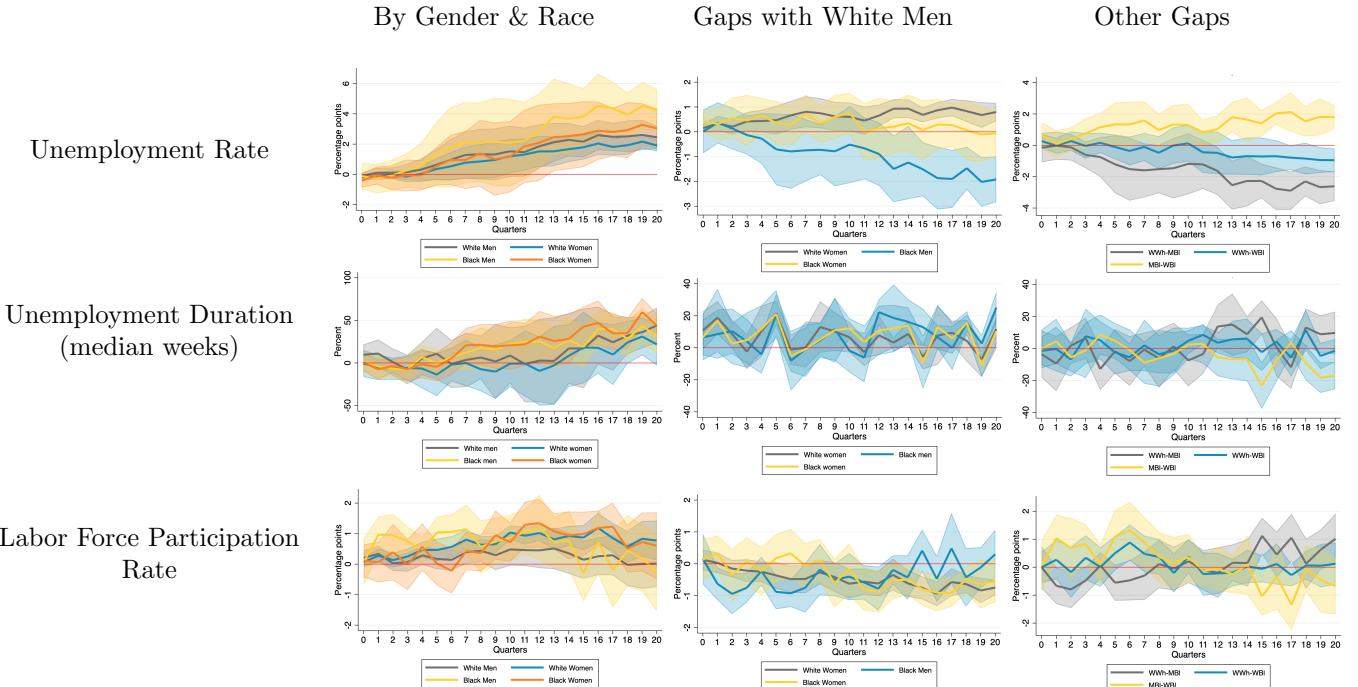
Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. Center column measures gaps between households headed by white men and others. Right column measures gaps between other households: those headed by white women (WWh), black men (MBl), and black women (WBl).

D Appendix: Household Consumption Responses & Geography

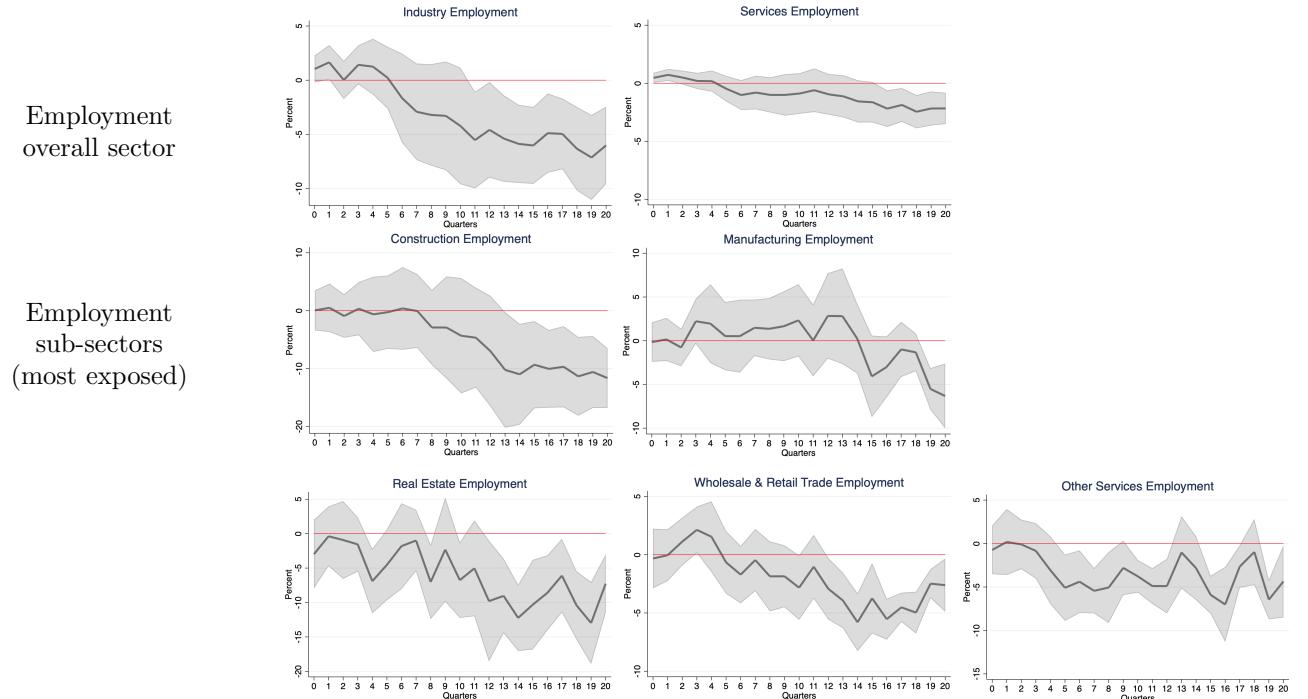


Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. Responses for the nine U.S. sub-regions are available upon request.

E Appendix: Labor Market Outcomes

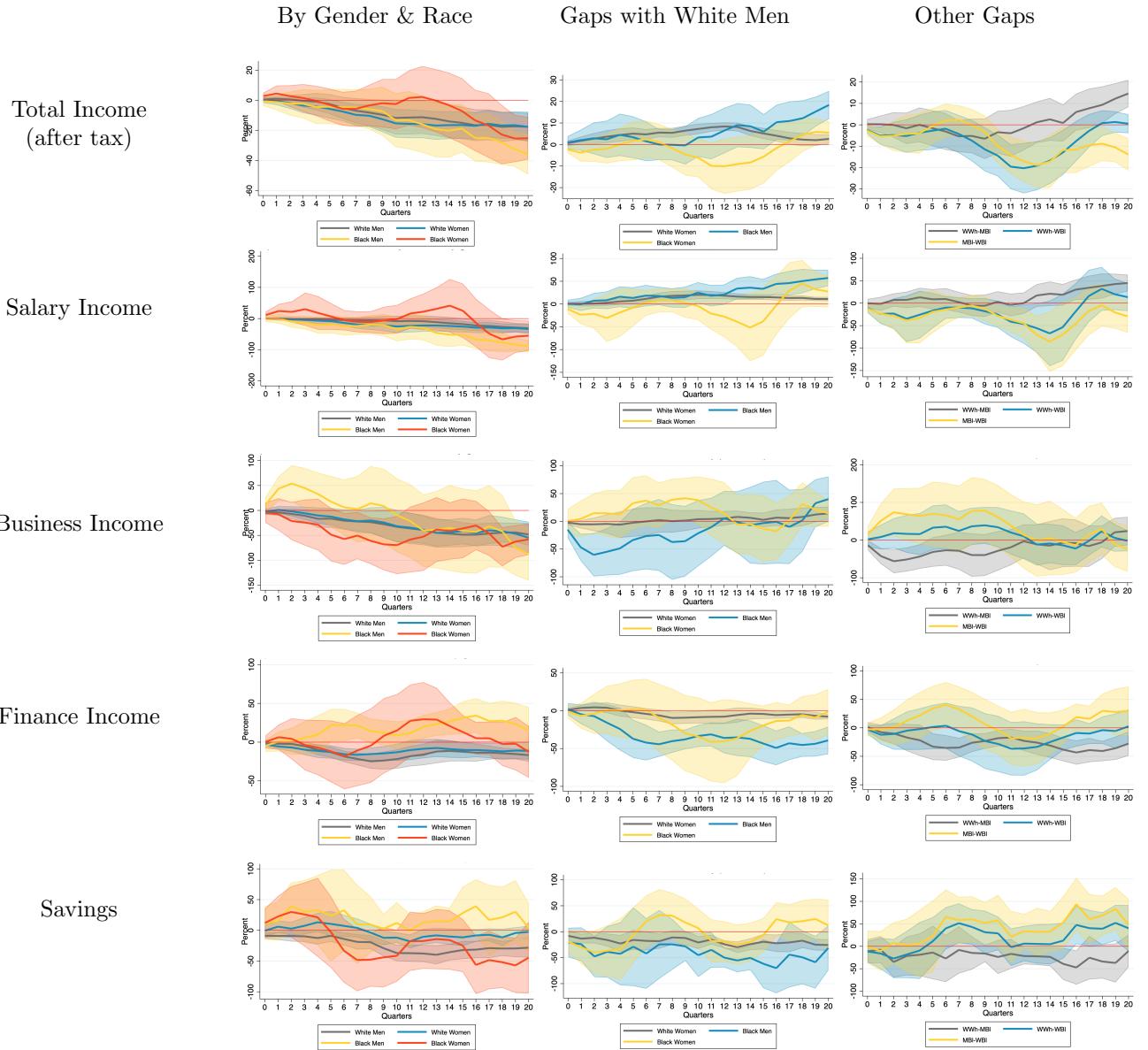


Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. Center column measures gaps between households headed by white men and others. Right column measures gaps between other households: those headed by white women (WWh), black men (MBI), and black women (WBI).



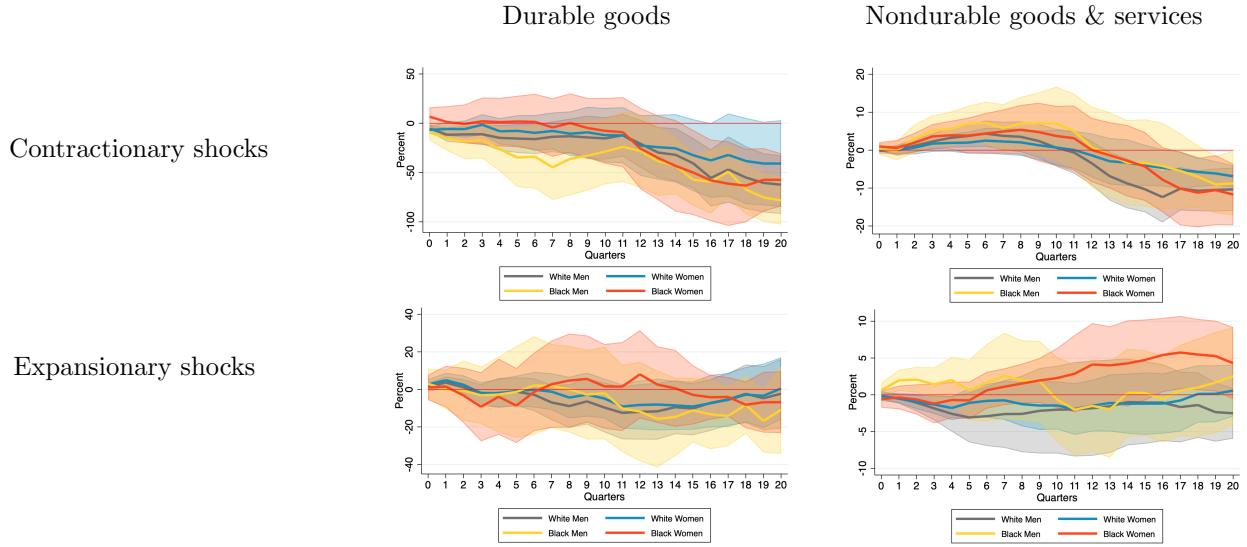
Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals.

F Appendix: Household Income & Savings Responses



Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. Center column measures gaps between households headed by white men and others. Right column measures gaps between other households: those headed by white women (WWh), black men (MBl), and black women (WBl).

G Appendix: Household Consumption Responses & Asymmetric Shocks



Note: Dark lines denote estimates of a one standard deviation monetary policy shock following equation (4).

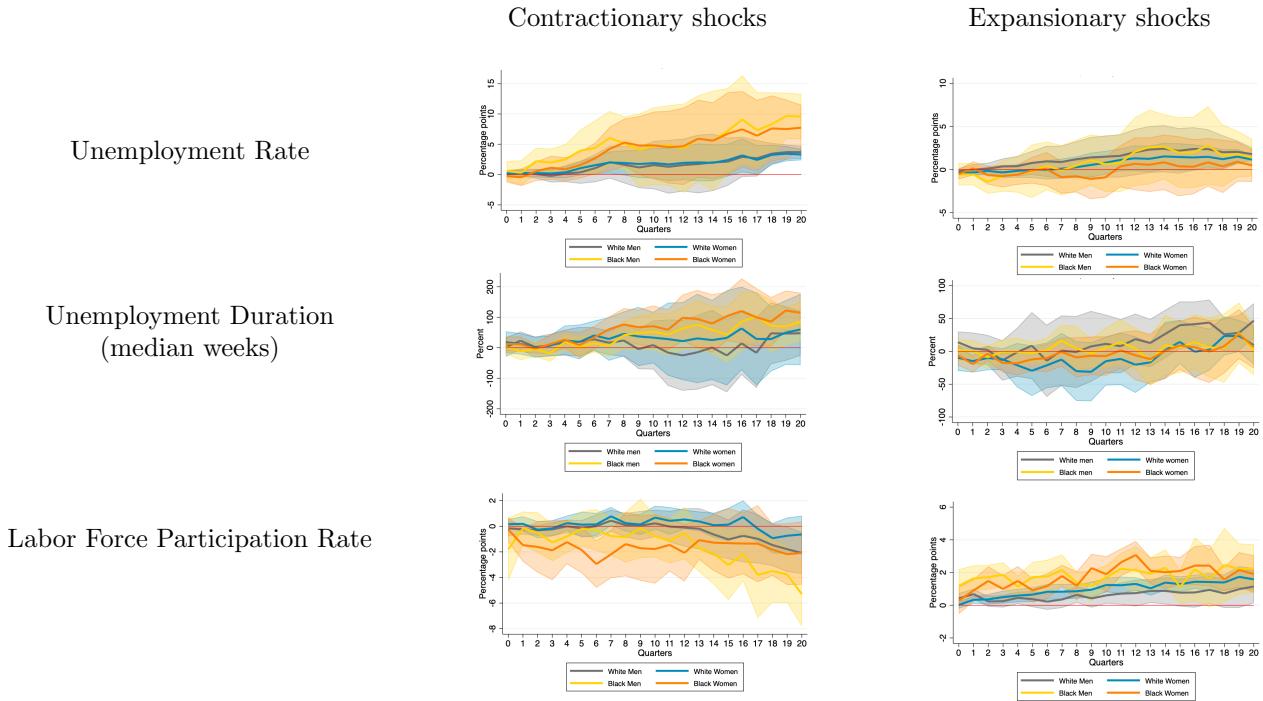
Shaded areas represent 90% confidence intervals.

Table: F-test of asymmetric monetary policy shocks on consumption

Consumption	Households headed by			
	White Men	White Women	Black Men	Black Women
Durable goods	5.524 (0.022)	1.418 (0.238)	7.771 (0.007)	6.534 (0.013)
Nondurable goods & services	2.290 (0.135)	6.930 (0.011)	2.207 (0.143)	6.104 (0.016)

Note: The table shows estimates of the F-test for the difference in effect between positive and negative monetary policy shocks on consumption. Estimates are based on equation (4) at 20 quarters. F-test significance level in parentheses.

H Appendix: Labor Market Outcomes & Asymmetric Shocks



Note: Dark lines denote estimates of a one standard deviation monetary policy shock following equation (4).

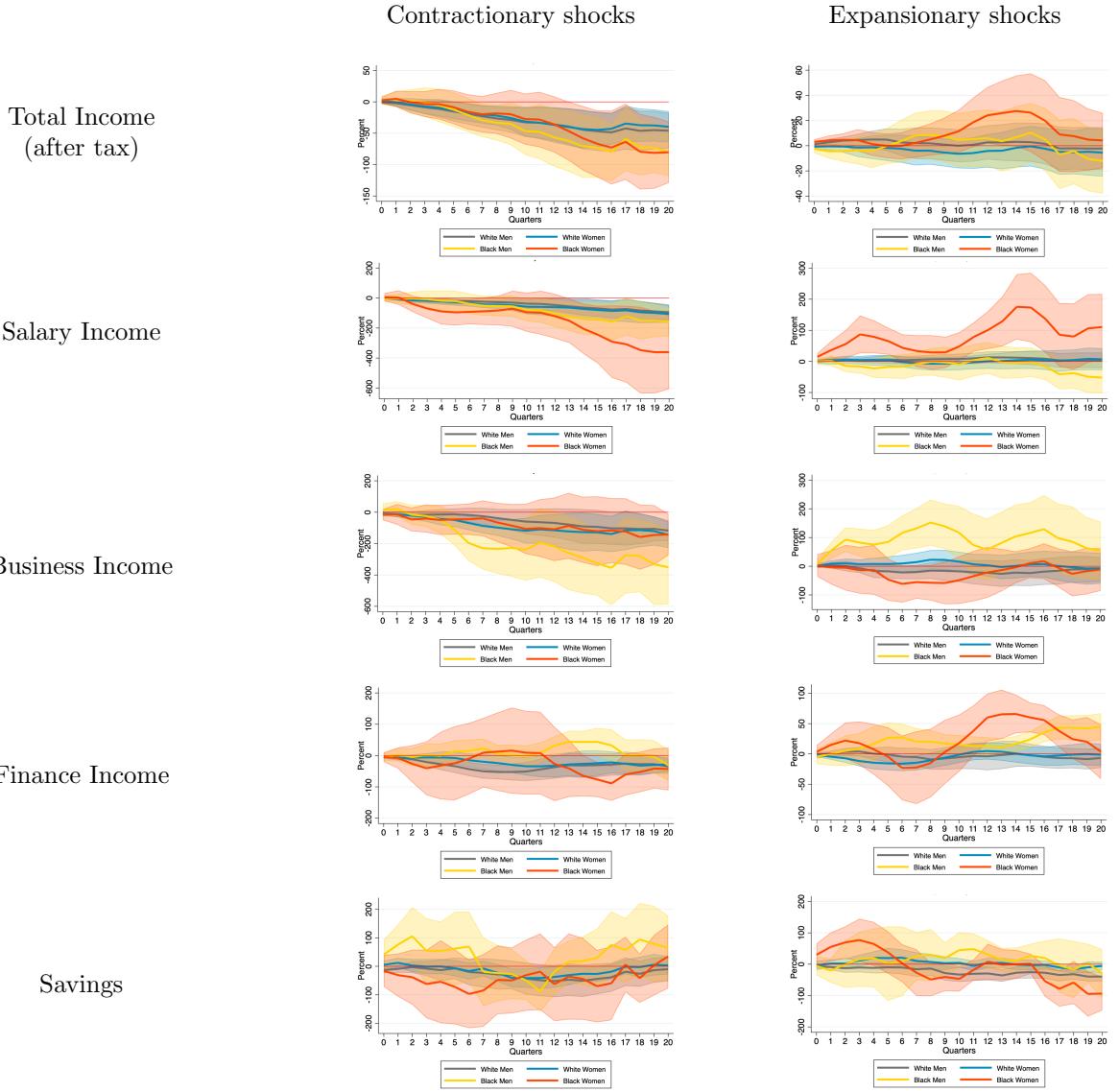
Shaded areas represent 90% confidence intervals.

Table: F-test of asymmetric monetary policy shocks on labor market outcomes

Outcome	Households headed by			
	White Men	White Women	Black Men	Black Women
Unemployment rate	7.099 (0.010)	7.823 (0.007)	9.206 (0.003)	6.191 (0.015)
Unemployment duration	0.000 (0.987)	0.357 (0.555)	2.229 (0.140)	3.921 (0.052)
Labor force participation rate	5.804 (0.019)	4.730 (0.033)	14.196 (0.000)	4.486 (0.038)

Note: The table shows estimates of the F-test for the difference in effect between positive and negative monetary policy shocks on labor market outcomes. Estimates are based on equation (4) at 20 quarters. F-test significance level in parentheses.

I Appendix: Household Income & Savings Responses & Asymmetric Shocks



Note: Dark lines denote estimates of a one standard deviation monetary policy shock following equation (4).

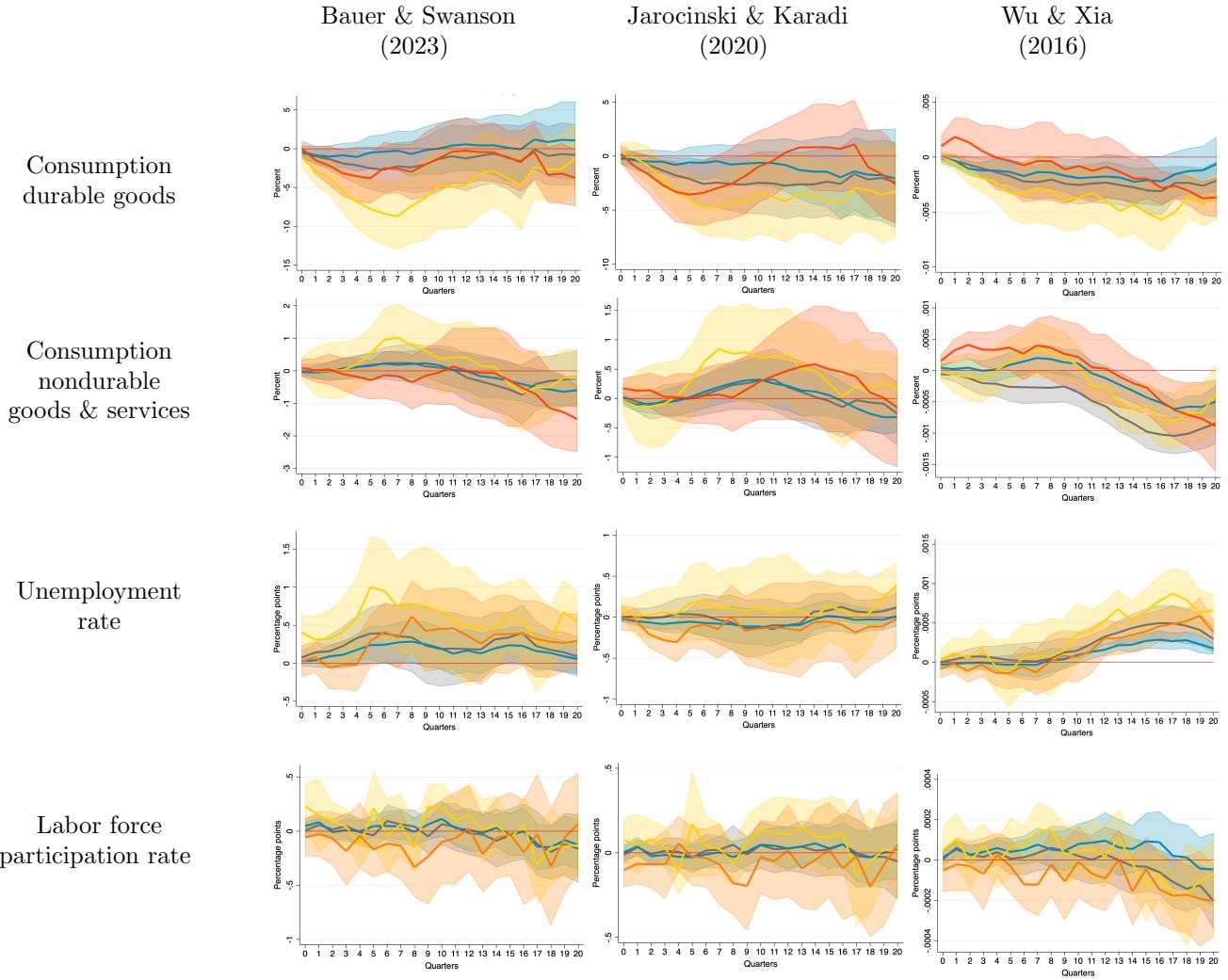
Shaded areas represent 90% confidence intervals.

Table: F-test of asymmetric monetary policy shocks on income and savings

Outcome	Households headed by			
	White Men	White Women	Black Men	Black Women
Total income (after tax)	3.244 (0.076)	2.075 (0.155)	4.092 (0.047)	5.369 (0.024)
Salary income	5.187 (0.026)	4.508 (0.038)	1.797 (0.185)	5.262 (0.025)
Business income	3.087 (0.084)	3.190 (0.079)	4.548 (0.037)	1.232 (0.271)
Finance income	1.572 (0.215)	1.533 (0.220)	7.657 (0.007)	0.779 (0.381)
Savings	0.978 (0.326)	0.128 (0.726)	0.841 (0.363)	3.455 (0.068)

Note: The table shows estimates of the F-test for the difference in effect between positive and negative monetary policy shocks on income and savings. Estimates are based on equation (4) at 20 quarters. F-test significance level in parentheses.

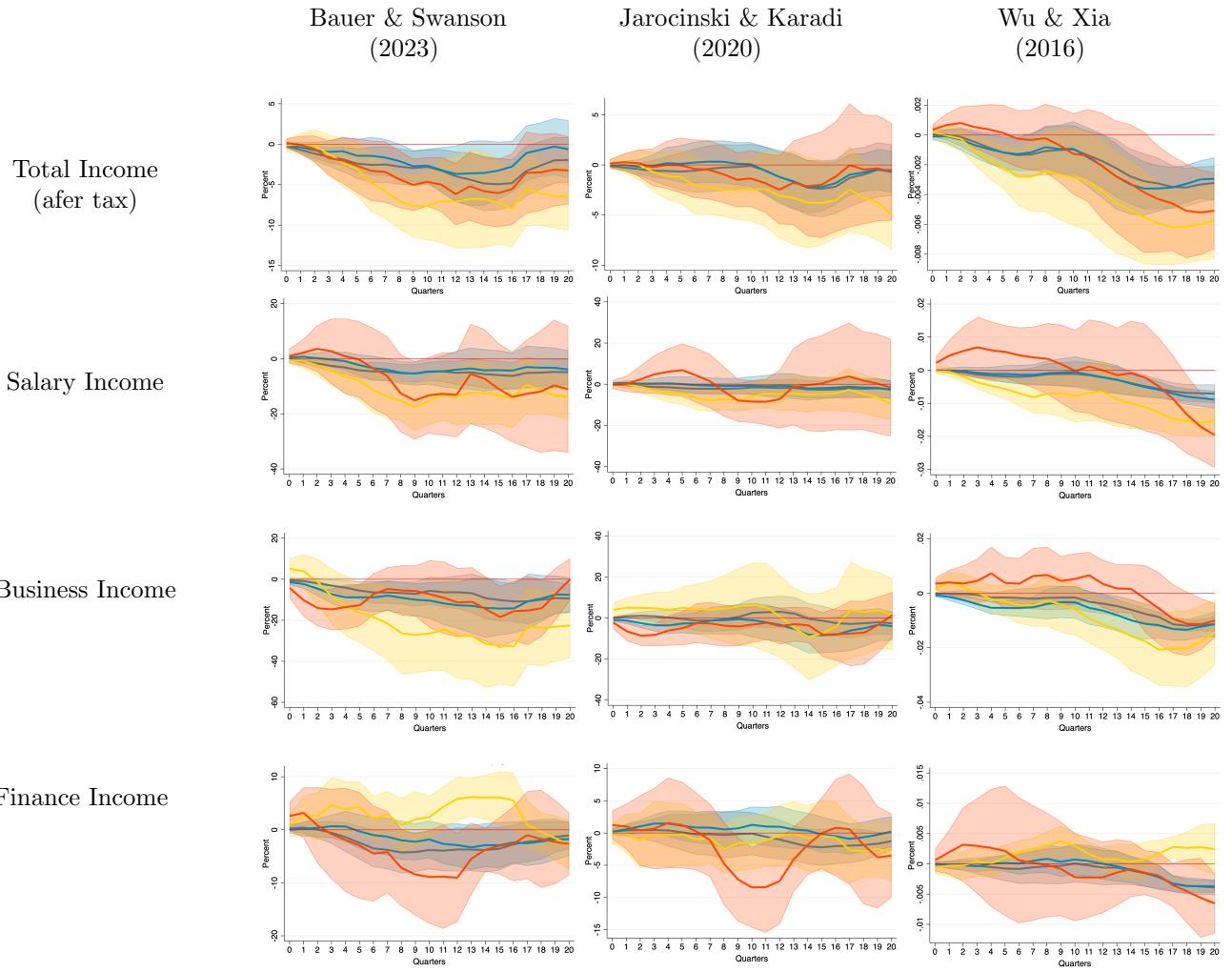
J Appendix: Household Consumption and Labor Market Responses to Alternative Monetary Policy Shock Series



Legend: White Men in grey; White Women in blue; Black Men in yellow; and Black Women in red

Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. These results are estimates of equation (3), substituting the *shock* variable with three alternative monetary policy shock series: the Bauer and Swanson (2023) orthogonalized monetary policy shocks; the Jarocinski and Karadi (2020) monetary policy median shocks; and the Wu and Xia (2016) shadow rates.

K Appendix: Household Income Responses to Alternative Monetary Policy Shock Series

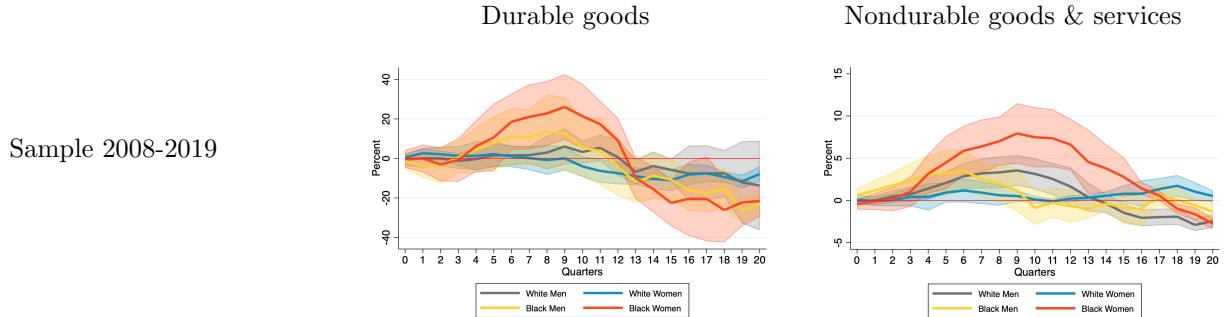


Legend: White Men in grey; White Women in blue; Black Men in yellow; and Black Women in red

Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals. These results are estimates of equation (3), substituting the *shock* variable with three alternative monetary policy shock series: the Bauer and Swanson (2023) orthogonalized monetary policy shocks; the Jarocinski and Karadi (2020) monetary policy median shocks; and the Wu and Xia (2016) shadow rates.

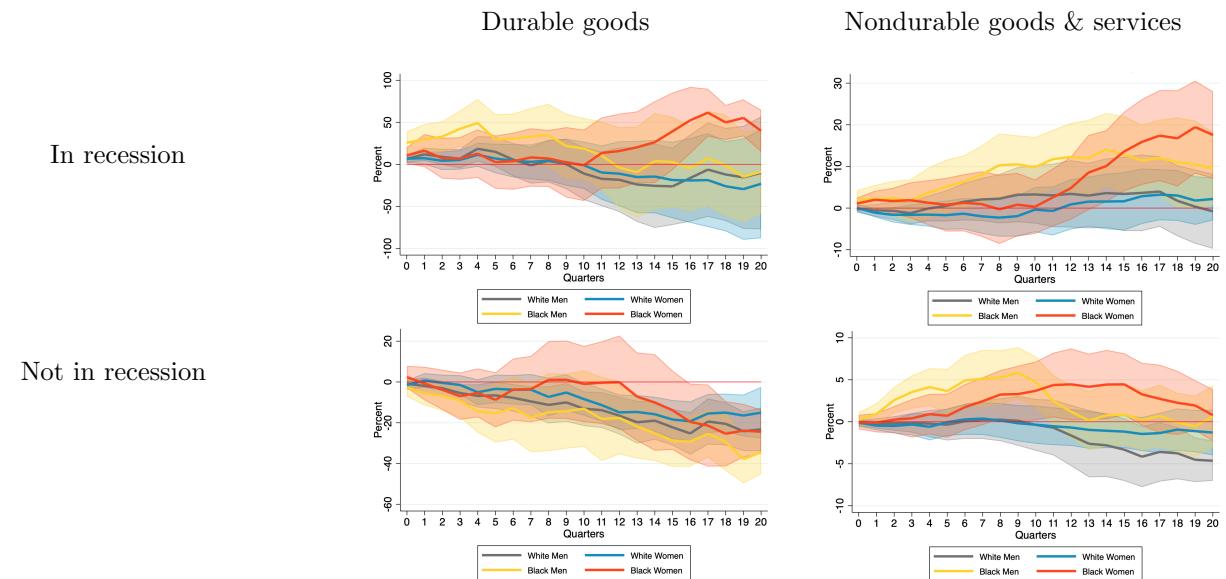
L Appendix: Household Consumption Responses & Time Cuts

First, I estimate consumption responses with the sample from 2008-2019. See Appendix C for the estimates of the full sample.



Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals.

I additionally test for whether the falls in consumption after a contractionary shock are driven by recessionary periods.



Note: Dark lines denote estimates of a one standard deviation contractionary monetary policy shock. Shaded areas represent 90% confidence intervals.