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# Unconventional monetary policy and wealth inequality: evidence from the US

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## Abstract

We analyze the effect of unconventional monetary policy (UMP) on the distribution of wealth in the United States between 2007 and mid-2022. We find that UMP increases the net wealth of the upper percentiles relative to the bottom 50% percentile. However, UMP is estimated to affect the wealthiest's overall asset holdings less than their net wealth, highlighting the importance of future research into the liability side. On the asset side UMP induces a significant portfolio rebalancing. The wealthiest's relative gain is not restricted solely to holdings in equities and funds, but also to holdings in real estate and pension entitlements.

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# 1. Introduction

In the immediate aftermath of the Great Recession, a debate was sparked as to whether unconventional monetary policy (UMP) generally – and thus quantitative easing (QE) in particular – also affected the distribution of income and wealth as a byproduct. Starting with an initial note by White (2012), one specific question that has been asked is whether a "reverse Robin Hood" (Casiraghi et al. 2018) is at work that shifts income- and wealth distributions in favor of the upper percentiles while the remaining lose out relatively.

Several studies have considered the effects of UMP on income inequality. Mumtaz and Theophilopoulou (2017) conclude for the UK that QE increased income inequality, and Guerello (2018) finds similar evidence in the eurozone. Saiki and Frost (2014 and 2020) and Inui (2017) show that UMP increased income inequality in Japan. Montecino and Epstein (2015) find a modest impact in the US.

The effects of UMP on wealth inequality have also been debated more recently. Albert et al. (2019), focusing on stock pricing within the portfolio channel, conclude that UMP had a bigger impact in the US than in the eurozone. Evgenidis and Fasanios (2021) as well as Mumtaz and Theophilopoulou (2020) find that UMP increased wealth inequality in the UK. While both firstly consider effect heterogeneity in terms of population percentiles, the latter also demonstrate that analyzing wealth components in particular is important when it comes to understanding the transmission mechanisms of UMP shocks. Mumtaz and Theophilopoulou (2020) conclude that induced real estate price increases have benefited the middle class in the UK, while increases in financial wealth merely act in favor of the wealthiest. For the US, Albert et al. (2020) estimate that the effects on real estate do not offset those on stock prices that benefit the wealthiest. In a similar vein, Albert et al. (2022) highlight the fact that increases in stock prices have increased wealth inequality, while rising valuations in housing and retirement accounts have had a decreasing effect on wealth inequality. We estimate structural vector autoregressive (SVAR) models to explicitly determine the effect of US UMP in terms of QE on the distribution of wealth.

Unlike Albert et al. (2020 and 2022), we focus on quantitative monetary policy measures while considering possible heterogeneity in the responses to UMP, both in terms of population percentiles and wealth components. Using explicit data on the distribution of wealth instead of inferring them from asset price indicators as Albert et al. (2019) do, we find evidence that wealth inequality is significantly affected via the portfolio composition channel. We conclude that the upper percentiles gain wealth relatively to the lower ones in many asset categories. Importantly, the upper percentiles are estimated not only to benefit mostly in terms of stock holdings, but also overwhelmingly in real estate and pension entitlements.

The rest of this paper is structured as follows: Section 2 introduces the data and the SVAR analysis. Section 3 presents key results and a robustness check. Section 4 concludes.

## 2. Data and Methodology

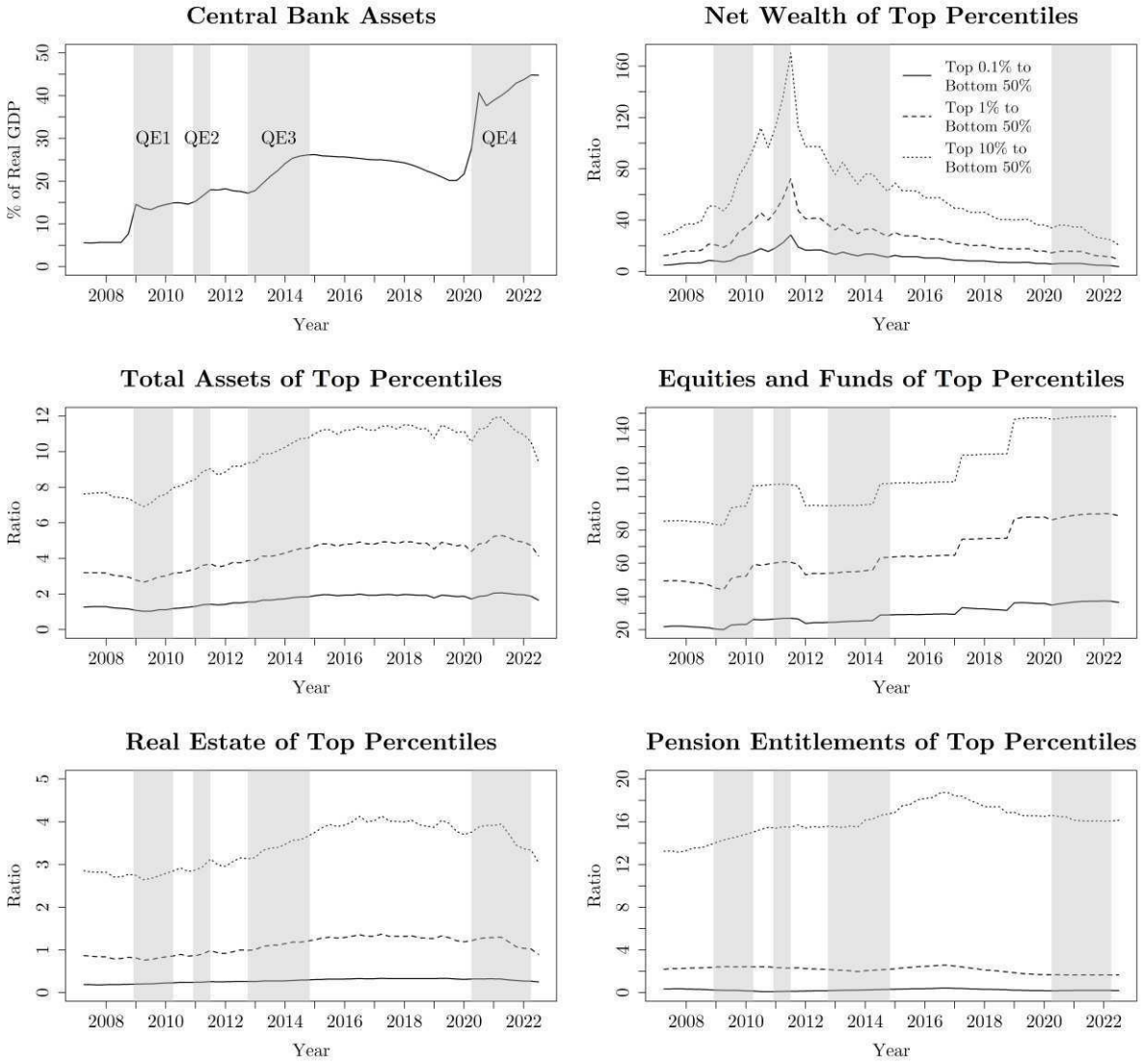
In order to identify the effects of UMP – and its dominant form of QE in particular – on different categories of wealth in the US, we use quarterly Federal Reserve (Fed) wealth percentile data (Fed 2023a) covering the period 2007 to mid-2022. We calculate the top 0.1%, 1%, and 10% percentiles of the distributions of net wealth and its categories *overall assets, real estate*, *corporate equities and funds*, and *pension entitlements*. We further divide these percentiles by the bottom 50% percentile. This enables us to directly assess changes in the portfolio distribution of the wealthiest share of the population compared to the lower half in response to UMP. In fact, concerning net wealth, the bottom 50% percentile only holds 2.7% of total net wealth in mid-2022 (compared to 2.1% in the first quarter of 2007). Thus, even the large share of US population represented by the bottom 50% percentile can be regarded to be largely unwealthy in comparison to those in the higher percentiles.

To model central bank activity in terms of UMP, we use the Fed's central bank assets relative to real US GDP retrieved from the Fed (2023b) and the US Bureau of Economic Analysis (BEA 2023). Concerning conventional monetary policy, we use the BEA (2023) real GDP data and the trimmed mean personal consumption expenditure (PCE) inflation rate (Fed 2023c). All the data except the PCE inflation rate enter the modeling in logarithmic differences to circumvent the unit root problem.[1]

Figure 1 shows the developments of central bank assets to real GDP and the ratios of net wealth and its main components as described in the above. During QE1 and QE2 conducted by the Fed, the relative net wealth of the upper percentiles compared to the bottom 50% percentile increases strongly and then steadily decreases again very smoothly, including the whole QE3 and QE4 periods. Although they accumulate assets after the Great Financial Crisis, the upper percentiles nevertheless become relatively more indebted over time, reducing the relative net wealth of the wealthiest (see Fed 2023a in this regard).

[1] All the transformed data are stationary in first differences. We conduct augmented Dickey Fuller tests and conclude that the null hypothesis of a unit root can be rejected at the 5% level for all series, except for growth in pension entitlements of the top 10% to the bottom 50% of the US population. However, the p value in this case is 0.0509 so that we regard the series as stationary. We use the trimmed mean PCE inflation rate as a proxy for inflation since the more common PCE inflation rate excluding food and energy is clearly nonstationary in the sample period.

**Figure 1:** Variables used in the analysis. QE dates are retrieved from the Fed (2023d). The Fed already increased purchases in the direct aftermath of the Financial Crisis, i.e., before the official start of QE1 in November 2008. The same is true for QE4.




We estimate SVAR models for each, that is net wealth and the individual wealth components, using all the ratios depicted in Figure 1. We use the following vectors $y$ of endogenous variables:

$$y_t = [Y_t, \pi_t, CBA_t, wealth_t]^T, \tag{1}$$

where $Y_t$ is real GDP growth, $\pi_t$ is the trimmed mean PCE inflation rate, $CBA_t$ is growth in central bank assets relative to real GDP, $wealth_t$ is the placeholder for growth in each wealth component variable described in the above, and $T$ is the transpose operator. Following the notation used in Kilian and Lütkepohl (2017), we estimate SVAR models according to

$$B_0 y_t = B_1 y_{t-1} + \cdots + B_p y_{t-p} + w_t, \tag{2}$$

where $p$ is the lag order, $w_t$ are the structural errors, $B_i$ $(i = 0, \dots, p)$ are matrices of model coefficients, and $B_0$ in particular contains the short-term restrictions of the SVAR models set by a Cholesky ordering satisfying

$$B_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 \\ b_{41} & b_{42} & b_{43} & 1 \end{bmatrix}. \quad (3)$$

As regards the restrictions in (3), we to a large extent rely on Saiki and Frost (2014). Like them, we assume that the central bank's policy is to take current real GDP growth and inflation into account. However, the wealth measures are assumed not to affect all the other variables in the short run, i.e., in the same quarter. Nevertheless, lagged wealth has an impact on the other endogenous variables. The SVAR thus assumes that $Y_t$, $\pi_t$, and $CBA_t$ immediately impact the wealth measures. Given a QE UMP shock by means of an increase in $CBA_t$, wealth effects can emerge without a time lag, and that is expected to be particularly true for liquid assets. The autoregressive lag orders are selected to be two for all models according to the Bayesian Information Criterion.

# 3. Results

## 3.1 Key Findings

Figure 2 gives the results of an impulse response analysis based on the estimated SVAR models. We report two key results. First, in relation to net wealth, we find a significant impact of UMP in terms of QE. The cumulative change in growth after a one standard deviation UMP shock is about 0.15% after eight quarters for all ratios. That is, the upper percentiles (10%, 1%, and 0.1%) gain relative to the bottom 50% percentile in terms of net wealth. UMP is thus estimated not to be neutral and indeed affects the distribution of wealth. Second, as regards holdings in overall assets, the upper percentiles gain less in terms of assets than they do in terms of net wealth. Although they do gain statistically in terms of overall assets relative to the bottom 50% in the first five quarters of an UMP shock, this result turns out to become insignificant afterward at the 95% confidence level.

We therefore conclude that the liability side of wealth distribution – that has to date been ignored by research – may play an important role in the US. This should be further investigated in future research. If the upper percentiles gain relatively in terms of net wealth while their overall asset holdings stagnate to some extent, it seems plausible that the upper percentiles become relatively less indebted via UMP. In turn, the lower 50% percentile becomes relatively more indebted. To that extent, the impulse response analysis is thus consistent with the development of net wealth from the start of the Great Financial Crisis up to mid-2011, as depicted in Figure 1. However, in

total, the upper percentiles have become relatively less wealthy since around mid-2011, and thus also during QE3 and QE4. Therefore, if UMP actually increases the relative net wealth of the wealthiest, then other unobserved factors besides UMP are at work since mid-2011 that make the upper percentiles relatively more indebted again.

While the relative gains of UMP for the upper percentiles relative to the bottom 50% in overall assets are rather small (the upper 1% and 0.1% face a relative cumulative gain of almost zero after eight quarters), UMP nevertheless works significantly through portfolio rebalancing. Since we can disentangle the portfolio channel into holdings in real estate, equities and funds, and pension entitlements, we can identify in which asset categories the wealthiest population percentiles in fact benefit most. Our results call into question the widely-held belief that increasing asset values in real estate and pension entitlements are especially beneficial for the middle class. In fact, the higher the considered wealth percentile, the larger the UMP effects on holdings in real estate and in pension entitlements. Concerning real estate, the cumulative response for the wealthiest 0.1% percentile is continuously significant during eight quarters after an UMP shock. Moreover, we identify the wealthiest 0.1% to actually gain most in terms of pension entitlements; more than the upper 10% and 1% do relatively to the bottom 50%. Actually, concerning the upper 10% percentile, UMP cumulatively affects holdings in equities and funds approximately as much as holdings in real estate and pension entitlements. This result is quite astonishing and in contrast to Albert et al. (2022) where the wealthiest 10% actually gain most via stock holdings and the impact on real estate is practically zero.

## 3.2 Robustness Checks

We checked the robustness of our estimates by altering the variable of UMP. Instead of applying central bank assets relative to real GDP in (1), we use the monetary base (see Fed 2023e) as UMP variable as in Saiki and Frost (2020). The impulse responses are depicted in Figure 3. The overall result is not changed by altering the UMP variable. In fact, the influence of UMP on net wealth of the upper percentiles is estimated to be slightly higher. The estimated cumulative effects remain statistically significant and coincide with the 0.15% change in growth after eight quarters in the baseline specification. However, cumulative changes in the holdings of overall assets become more pronounced for the upper 1% and 0.1% percentiles but remain statistically insignificant, highlighting the potential importance of the liability side of the wealth distribution. The overall rebalancing in assets remains stable: The cumulative effects for real estate are now even slightly higher than those for equities and funds for the wealthiest 0.1%. The UMP effects on pension entitlements remain statistically significant for all upper percentiles and also remain the most pronounced when the upper 0.1% percentile is considered. As in the baseline model, UMP shocks

**Figure 2:** Estimated cumulative impulse response functions after a positive one standard deviation UMP shock in central bank assets relative to real GDP. 95% bootstrapped confidence intervals are depicted as shaded grey areas. Each column considers one wealth component regarding the top 10%, 1% and 0.1% percentiles of the US wealth distribution relatively to the bottom 50%.

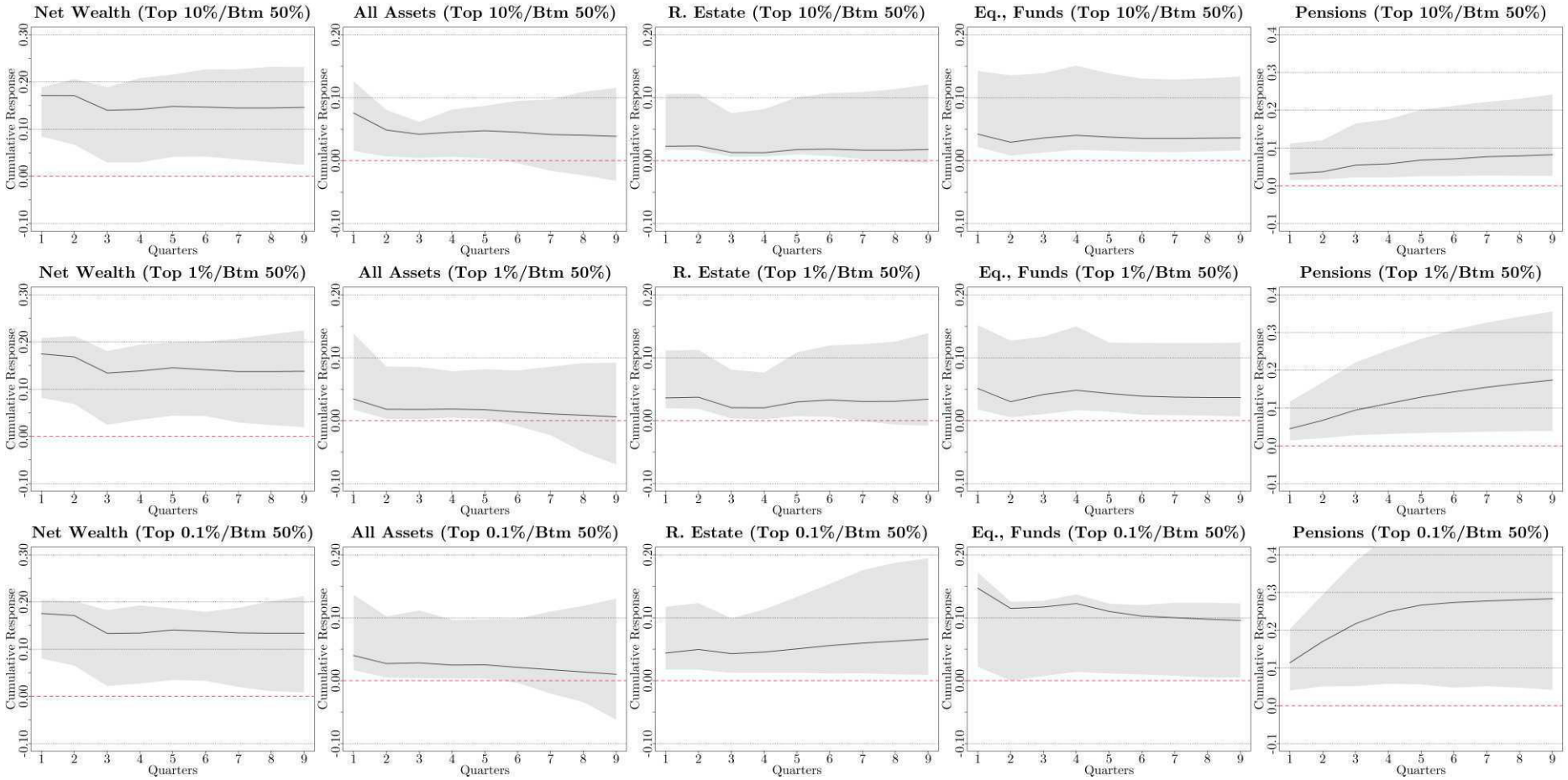
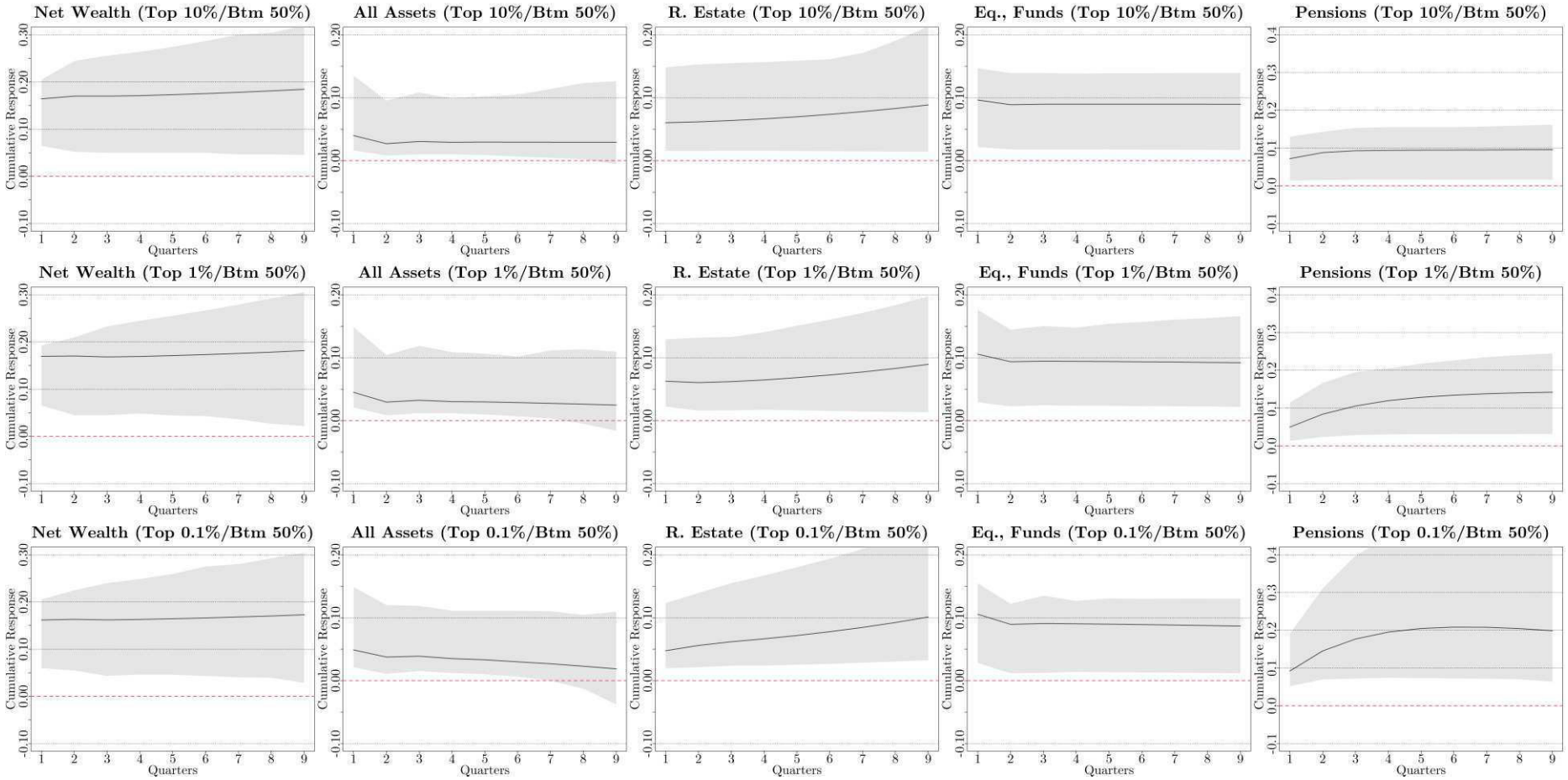


**Figure 3** Estimated cumulative impulse response functions after a positive one standard deviation UMP shock in the monetary base. 95% bootstrapped confidence intervals are depicted as shaded grey areas. Each column considers one wealth component regarding the top 10%, 1% and 0.1% percentiles of the US wealth distribution relatively to the bottom 50%.



do not primarily affect asset holdings of the wealthiest by means of changes in holdings in equities and funds, but also significantly via real estate and pension entitlements.

# 4. Conclusion

We estimate SVAR models to determine the impact of UMP shocks on the wealth distribution in the US between 2007 and mid-2022. We find that UMP has significant impacts on the distribution of wealth by regarding the top 0.1%, 1%, and 10% percentiles relative to the bottom 50% percentile. UMP is estimated to increase the relative net wealth of the upper percentiles in the US. However, future research should shed more light on the liability side of the wealth distribution. Although QE seems, ultimately, to affect overall asset holdings by the upper percentiles less than it does net wealth, it nevertheless induces a significant portfolio rebalancing by the wealthiest share of the US population. In contrast to the commonly held view, we find UMP shocks to not only benefit the upper percentiles according to relative gains in holdings of equites and funds, but also in terms of real estate and pension entitlements. This is astonishing, since these assets have so far largely been held to benefit the middle class.

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