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Quantitative easing impact on financial wealth distribution

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ABSTRACT

This paper presents a novel two-stage framework to examine the impact of Quantitative Easing (QE) on the distribution of household financial wealth in the UK and the US. In the first stage, robust econometric methods are used to estimate the effect of QE on domestic bond and equity markets via the Portfolio Balance Channel. In the second stage, it documents that equity market returns affect the growth of financial wealth differently across wealth deciles. It is shown that QE implemented between 2009 and 2012 coincided with a pronounced divergence in financial-wealth outcomes in the United States. During this period, the Top 1% of the financial wealth cohort consistently outperformed aggregate growth in financial wealth, whereas the Bottom 50% experienced persistent relative losses. Importantly, these effects do not self-correct after QE ends, suggesting that QE-induced wealth redistribution may be long-lasting. The UK exhibits similar patterns, though data limitations restrict the strength of causal inference. The paper contributes to the existing literature in three ways. First, it provides a transparent two-stage framework that clarifies the sequential link between QE, asset prices, and the distribution of financial wealth. Second, it shows that commonly used aggregate inequality measures can mask substantial distributional shifts concentrated at the top of the wealth distribution. Third, it demonstrates that the policy relevance of wealth-distribution effects is a potentially important yet under-acknowledged side effect of unconventional monetary policy.

1. Introduction

Over the past two decades, Quantitative Easing (QE) has become a central instrument of unconventional monetary policy, deployed in response to major economic disruptions such as the Global Financial Crisis and the Covid-19 pandemic (Fatouh et al., 2021). While a large literature evaluates QE's effectiveness in stabilizing output, inflation, and financial markets, far less attention has been paid to its longer-term implications for the distribution of financial wealth (Rashid et al., 2022). This omission is notable, given that QE operates primarily through asset-price channels that disproportionately affect households with significant holdings of financial assets (Bonifacio et al., 2022; De Luigi et al., 2023).

This paper investigates whether QE has systematically distorted the distribution of financial wealth in the United States and the United Kingdom. More precisely, the paper addresses three related questions. First, does QE generate abnormal equity-market returns via the Portfolio Balance Channel (PBC)? Second, do these asset-price effects translate into differential financial-wealth growth across

The order of the authors was selected at random, and the contributions of all authors are equal.

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household wealth groups? Third, are these distributional effects transitory, or do they persist beyond the active QE period?

To address these questions, the paper introduces a novel two-stage approach whose first stage mirrors the mechanism by which the monetary authority influences portfolio allocation, and whose second stage evaluates how those portfolios shape the distribution of financial wealth.

The first stage evaluates the effects of QE shocks on bond yields, equity returns, and the equity risk premium (ERP) using a vector autoregressive model. Unlike much of the existing literature, we place strong emphasis on robustness, employing multiple lag-selection criteria, alternative impulse-response estimators, and several methods for constructing confidence bands for impulse responses. This stage establishes the strength, timing, and persistence of the portfolio balance channel in each country. The estimated model provides the basis for reliable forecasts of the PBC's effect on equity market returns. This approach first establishes the strength of the PBC, hence the effect on equity market returns, by using advanced quantitative methods with a more parsimonious model that improves upon the robustness of Shah et al. (2019) and Joyce et al. (2011). It also evaluates the PBC's transmission strength in specific jurisdictions, which may explain why some studies yield inconsistent results.

The second stage uses equity market returns to assess the effect on the distribution of financial wealth by comparing the relative growth rates of wealth cohorts within the overall financial wealth portfolio. That is, it estimates the impact of QE and non-QE equity market returns on the distribution of financial wealth by comparing the performance of the wealthiest cohort with that of other cohorts and contrasting QE and non-QE periods. This is based on the conjecture that, if factors such as income or government policy play no role in generating financial wealth, then there should be little or no observable difference in wealth distribution between periods with and without QE. Alternatively, there should be a marked difference in the relative growth rates of each cohort's financial wealth. If Unconventional Monetary Policy (UMP) distorts wealth distribution, then a counter-policy should ameliorate the financial security of all households, or at least not worsen it relative to the initial period preceding the introduction of QE.

The remainder of the paper is structured as follows: Section 2 reviews the literature on QE and wealth distribution. Section 3 discusses the evolution of the QE transmission channels. Section 4 details the first-stage methodology and presents estimates of QE effects on equity markets. Section 5 examines the distributional implications. Section 6 discusses the results, and Section 7 concludes with policy implications.

2. Literature review

The effectiveness of QE is a contested subject in the academic literature. Ikeda et al. (2024) identify long-run delayed effects on wealth in Japan and the US using a Dynamic Stochastic General Equilibrium (DSGE) model. This finding contrasts with the results obtained by Weale and Wieladek (2022) and Lenza and Slacalek (2024) who, while applying the vector autoregressive (VAR) modeling, did not find any significant evidence of QE effects on wealth for the UK and the US. Note that financial wealth is a component of the total household wealth portfolio, and measures such as GINI coefficients (and similar proxies) that aggregate wealth may not provide an adequate picture of the transmission mechanism (Lenza & Slacalek, 2024). The disparity between long-run and short-run effects may elucidate this divergence as well as the aggregation of all wealth (Siami Namini, 2022). The link between QE and wealth outcomes is not direct but operates through several sequential processes with differing timeframes, creating longer-term effects that VAR modeling may not capture properly.

Another contention is that QE influences income inequality, which eventually translates into wealth inequality. For there to be a change in income distribution between high- and low-income earners, then some factor such as relative growth rates of income from labor, corporate distributions, interest income or income-related taxation policy changes would need to be evident. Many studies found little or no evidence that income or interest rates significantly influence wealth inequality during or immediately after the QE periods (Domanski et al., 2016). More broadly, research suggests that equity-market movement is the dominant driver of wealth inequality, especially financial wealth inequality, more so than interest income, labor income, or inflation (Attílio, 2024; Evgenidis & Fasianos, 2021).

Often, inequality is measured using Gini coefficients, but this aggregation can obscure the dynamics of wealth distribution (De Luigi et al., 2023). Some may question the direct link between stock market performance and financial wealth. Nevertheless, financial wealth is concentrated among the top 10% in the UK and the top 1% of the US wealth cohorts. When equity returns rise, those holding equity see their financial wealth grow (Favilukis, 2013). This pattern has persisted over the 30 years preceding the financial crisis. If these returns are abnormal, the benefits flow disproportionately to equity holders. Aggregate measures such as the Gini coefficient can mask the significant impact of financial markets, since most households hold a large share of their wealth in relatively illiquid assets. What appear to be small shifts in Gini coefficients can represent substantial gains for the financially wealthy. Advani et al. (2020) provides a broader discussion on the wealth composition and distribution amongst high-wealth households.

A prevailing consensus in the literature suggests that the immediacy of the response to a crisis yields the most substantial effects, whereas prolonged QE implementation has minimal or negligible impact (Martin & Milas, 2013; Danielli et al., 2021; Fatouh et al., 2021; Rashid et al., 2022). This consensus stands in opposition to the findings of Siami Namini (2022); Ikeda et al. (2024) and Weale and Wieladek (2022). One explanation for this discrepancy lies in differences in economic structures, fiscal policies, and spillover effects, which shape the short- and long-run impacts of QE across countries. Spillover effects play crucial roles in determining the short-run and long-run impacts of QE. For instance, the efficacy of QE in Euro-Area countries depends on fiscal policy and economic structure rather than on any uniform approach (De Luigi et al., 2023; Lenza & Slacalek, 2024).

The relative strength of the various transmission channels across different jurisdictions and time periods indicates that no universal rule or policy can reliably predict the effects of QE or other types of UMP (Busetto et al., 2022; Joyce et al., 2012; Shah et al., 2019). Each country has many different characteristics that can strengthen or weaken any particular effect, particularly with the monetary policy transmission channels (Papadamou et al., 2020; Lenza & Slacalek, 2024). Therefore, the impact of QE on financial wealth will vary depending on the strength of these transmission channels and the policy type used in its implementation.

QE involves costs and complications for central banks. It addresses a binding zero lower bound by mimicking a negative interest rate and expanding the central bank's balance sheet, that is a −2% rate approximates a 25% balance sheet increase (Sims & Wu, 2021). However, central banks are reluctant to continue these expansionary measures and will gradually normalize their balance sheets. Without normalization, there is a risk of deeper future recessions and reduced effectiveness of negative rate policies. Conversely, the unwinding process could suppress growth and create recessionary pressures, particularly during weak recovery periods.

Another cost associated with QE is the potential for medium-term inflation, particularly apparent in many economies in the post-Covid period. While QE counters the deflationary pressures of a recessionary shock and associated uncertainty (Busetto et al., 2022), the rapid and sustained monetary expansion can create inflationary pressures during recovery, necessitating substantial interest rate increases (Goodhart et al., 2023). These inflationary pressures and corresponding interest rate rises are likely to increase the default risk for households and businesses, thereby exerting pressure on commercial banks. Consequently, QE may amplify economic volatility rather than mitigate it.

To summarize, most studies find that PBC has the greatest influence across all channels. Even where the literature is ambiguous about the link between QE and inequality, the effect is more pronounced through equity markets. Also, the structure, scale and nature of the economy and markets influence the strength of any policy transmission to the real economy and wealth. Many current models rely on single-stage processes that map QE events onto inequality measures. This two-stage process overcomes many of the limitations of trying to squeeze two distinct sequential processes into a single stage. If there are changes in the distribution of financial wealth, they are the consequence of market movements induced by the central banks. The contribution here is that we calibrate the effects of the first three QE events on relative financial wealth outperformance and underperformance relative to the mean of the wealthiest-to-bottom-50 % cohort. Furthermore, contrasting periods of non-QE policies with QE periods affirms where QE could influence financial wealth distributional inequality.

QE is a tool for exceptional circumstances rather than a conventional policy, especially given its potential collateral effects. Initial rounds of QE may have mitigated the 2008 financial crisis, but they also risk amplifying a subsequent overshooting and setting the stage for another downturn (Martin & Milas, 2013; Weale & Wieladek, 2022). The downsides include undue asset price inflation and possible excessive risk-taking, which can lead to market instability. Combined with broader economic inflation, this may result in rapid U-turns in monetary policy, causing both economic and political instability.

3. Transmission channels

While the income-inequality effects of QE are well documented, comparatively little attention has been paid to its effects on the

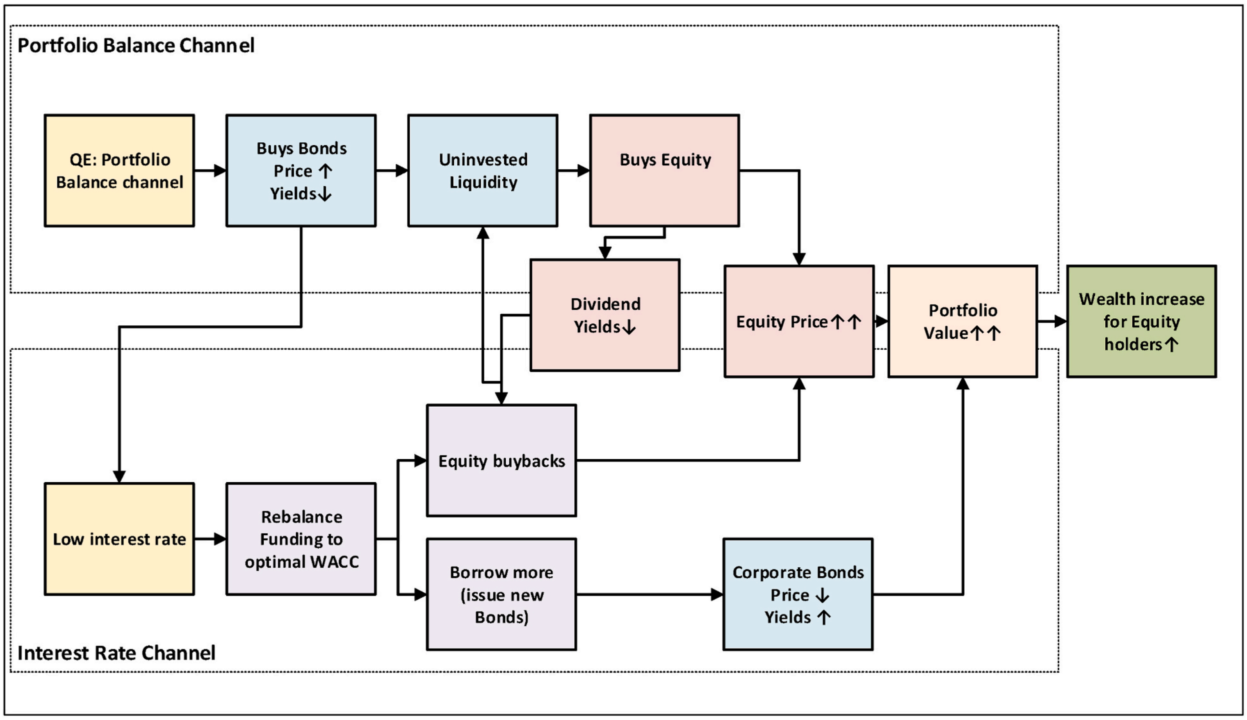

Fig. 1. The Unconventional Monetary Policy transmission mechanism for Portfolio Balance and Interest Rate Channels. Adapted and simplified from the Bank of England and Federal Reserve.

distribution of financial wealth. The concentration of wealth has political, social and economic implications that we address here. Households with substantial financial wealth may exert disproportionate influence on economic policy, particularly on taxation and redistribution (Scheve & Stasavage, 2017). Evidence for the United States suggests that the wealthiest 1% of households are politically active and often support policy preferences through organized advocacy and intermediary institutions (Page et al., 2013). Consequently, policy outcomes may reflect the preferences of asset-holding groups more strongly than those of the broader population. In this context, changes in asset prices induced by monetary policy may have implications not only for wealth distribution but also for the policy environment in which redistribution is determined.

Moreover, many in the working and middle classes see their income and wealth stagnate, while the wealthiest see unprecedented gains. For example, in 2021, the top 10% in the US held 87% of total wealth, whereas in the UK, the top 10% held 58% (Danielli et al., 2021). High-wealth households tend to hold a significant share of their wealth in financial assets, mainly equities (Advani et al., 2020). Consequently, such equity gains would reflect gains in financial wealth for equity holders. Hence, is there evidence that QE policy eventually distorts the distribution of financial wealth through equity holdings?

Fig. 1 illustrates the two main tenets of UMP, namely the Portfolio Balance Channel (PBC) and the Interest Rate Channel. These two channels interact through Open Market Operations and Asset Purchase Programmes, increasing bond prices and reducing yields (interest rates), thereby altering the balance of portfolio returns and corporate funding capital costs. Additionally, QE aims to promote financial institutional lending (supply) by creating excess liquidity and stability during and after periods of instability. The low-interest-rate policy is intended to increase borrowing demand by firms and households, thereby stimulating economic activity. Central banks achieve this by purchasing a range of financial assets, mainly bonds, from institutions, thereby creating excess reserves and increasing liquidity (Busetto et al., 2022). The reduction in bond market yields pushes investors toward riskier equities, inflating share prices and reflecting this in market indices. This rise in asset prices and yield reduction encourages investors to seek even riskier investments through the PBC.

Sovereign (or Treasury) bond purchases reduce the base interest rate, thereby further stimulating lending and borrowing. A prolonged period of low interest rates prompts firms to rebalance their capital structure toward debt rather than equity. Lending to firms and households enhances equity and property values for asset holders (Wolff, 2017). These PBC effects depend on the economic structure, equity and bond markets, and agents' willingness to change portfolio preferences (Busetto et al., 2022; Joyce et al., 2011, 2012; Shah et al., 2019). The differential effects between the PBC and IRC with rising bond prices show that the PBC effect is much stronger on wealth distribution through equity prices rather than the Interest Rate Channel (Domanski et al., 2016; Colciago et al., 2019).

Household wealth acts as a buffer during downturns. Those with more liquid financial wealth can better tolerate adverse events, whereas lower socio-economic groups, whose wealth is mostly in illiquid property, debt, and small pensions, are more vulnerable. These groups risk losing a substantial share of their wealth in a downturn and are unlikely to recover quickly, resulting in long-term detrimental social impacts (Otker-Robe & Podpiera, 2013). If there is a linkage between QE interventions and adverse impacts on financial wealth distribution, it has important ramifications for UMP deployment and mitigation strategies to combat these adverse effects (Cui & Sterk, 2021).

UMP is a strategic intervention employed by governments and central banks to mitigate the consequences of economic crises. This paper finds that it may inadvertently intensify financial wealth inequality while simultaneously mitigating certain crisis effects. When this inequality intersects with adverse income and wealth distribution, the resulting disparity and economic entrapment have the potential to incite political unrest, a scenario that governments are generally keen to avoid.

4. Impact of QE on equity markets

4.1. Methodology

The first stage examines how stock markets respond to QE shocks by estimating impulse response (IR) functions for both the UK and the US. This follows Shah et al. (2019) and this method strengthens robustness by applying a broad set of checks and comparing multiple model specifications to validate estimates and confidence intervals.

Following Sharpe (1963), the ERP at time-period t ($t = 1, \ldots, T$) is defined as the difference between returns on equity and risk-free returns, that is

$$\rho_t^{EQ} = r_t^{EQ} - r_t^F, \quad t = 1, \ldots, T, \tag{1}$$

where T is the period of observation, r_t^{EQ} denotes returns on equity, r_t^F denotes returns on a risk-free asset, usually sovereign bonds, and ρ_h^{EQ} is the ERP. Joyce et al. (2011) provides the approach for estimating the response of the ERP to a QE shock at time horizon h, $\widetilde{\rho}_h^{EQ}$, using a VAR model by calculating the impulse response (IR) functions for the equity and the risk-free assets over the two-year time horizon, as

$$\widetilde{\rho}_h^{EQ} = IR_h^{EQ} - IR_h^F, \quad h = 1, \ldots, 24\,, \tag{2}$$

where IR_h^{EQ} and IR_h^F are the corresponding IR functions of the equity and risk-free assets. To estimate the response of the ERP in equation (2) using this methodology, we estimate three-variable VAR models for the UK and the US. The variables are sovereign bond shares (gilts in the UK and Treasuries in the US), equity returns, and sovereign bond returns. We then compute IR functions, modeled as response to a one-standard-deviation innovation in government bond purchases (see more details on VAR estimation in Section 4.3).

The change of the estimated response in ERP over time provides the basis for further quantification of the effects of QE shocks using Inkinen et al. (2010) methodology. The estimated marginal effects of first differences of ERP, that is $\Delta\rho_t^{EQ}$, on risk-free returns for each QE period s ($s = 1, \ldots, 4$, see Section 4.2), denoted further as $\widehat{\beta}_s$, can be recovered from the estimates of the following regression equation:

$$r_t^{EQ} = \beta_0 + \beta\Delta\rho_t^{EQ} + \sum_{s=1}^{4}\gamma_s\Delta\rho_t^{EQ}D_{st} + u_t, \quad t = 1, \ldots, T, \tag{3}$$

where u_t is a weakly dependent error term, $D_{st} = 1$ for the duration of the sth QE period and zero otherwise. The estimated coefficients $\widehat{\beta}_s$ can be recovered as $\widehat{\beta}_s = \widehat{\beta} + \widehat{\gamma}_s$, where $\widehat{\beta}, \ \widehat{\gamma}$ are the OLS estimates of the parameters in (3) obtained under the assumption of weak dependence.

Neely et al. (2014) propose a method to recover the ERP following the s-th QE shock over a horizon h (see Section 4.2), yielding the corresponding expected estimated $ERP_{s,h}$ as follows:

$$ERP_{s,h} = \widetilde{\rho}_h^{EQ}.S_{QE,s}.\widehat{\beta}_s, \ \ h = 1, \ldots, 24, \ \ s = 1, \ldots, 4, \tag{4}$$

where $\widetilde{\rho}_h^{EQ}$ is derived from equation (2), $\widehat{\beta}_s$ is the estimated coefficient for the inter-period change in ERP[1] and $S_{QE,s}$ is the scaling factor (see Online Supplementary Materials for description and Table A1 for magnitudes of $S_{QE,s}$). The scaling factor adjusts ERP to reflect the relative size of each QE programme. As a result, ERP estimates vary with the market's value and the amount of government securities outstanding in each period. It is calculated based on the ratio of QE market value to treasury securities, reflecting the proportions of each period's effect.

4.2. Data and pre-testing

This study uses monthly data for the UK and the US from January 2000 to January 2022 (265 observations). We define four QE periods, labelled QE1–QE4, in the following date ranges. For the US: QE1 (2008–2010), QE2 (2010–2011), QE3 (2012–2014), and QE4 (2020–2021). For the UK: QE1 (2009–2010), QE2 (2011–2012), QE3 (2012), and QE4 (2020–2021). The Bank of England's post-Brexit asset purchases in 2016 were not designated as a QE round; they involved additional gilt purchases (around £70 billion) to support market functioning. For simplicity and consistency with US episode numbering, we do not treat 2016 as a separate QE round.

The UK dataset includes gilts as the risk-free asset, FTSE equity returns, and gilt returns. Similarly, the US dataset comprises US Treasury shares as the risk-free asset, S&P500 equity returns, and Treasury bond returns. Data sourcing is through REFINITIV *Datastream*.[2]

Unit root tests are run to confirm stationarity of the data. These tests are the feasible point optimal test (PT), modified PT (MPT), GLS-detrended ADF, Phillips-Perron Za test and modified Za (MZA) that allow up to three structural breaks under the null (Ng & Perron, 2001; Perron & Qu, 2007) and MSB and MZT tests (Carrion-i-Silvestre et al., 2009). The 28 sets of test results, with discussion, are in Online Supplementary Materials, Table A2. In summary, equity and bond returns are mostly stationary, therefore treated as stationary. Both UK gilt shares and US Treasury shares are nonstationary and were detrended by using Hodrick-Prescott (HP) filter. Detrending of a nonstationary time series by the HP filter is criticized, see e.g. Hamilton (2018). However, the method has obtained strong support based on recent simulation and empirical evidence (see, e.g., Franke et al., 2025; Schüler, 2024). To assess the robustness of the empirical analysis, we also employed the Hamilton filter to detrend UK gilt shares and U.S. Treasury shares. The resulting estimates are very similar to those obtained using the HP filter and are available in Online Supplementary Materials, Figs. A3 and A4.

For each country, a three-variable VAR model (see Section 4.1) was estimated by multivariate least squares (which equates to maximum likelihood estimation, see Lütkepohl et al. (2015)) for the full time period from January 2000 to January 2022. The robustness of the empirical results was assessed using several alternative approaches to lag selection and impulse response analysis. In particular, the Akaike Information Criterion (AIC), the modified AIC (Hurvich & Tsai, 1993), the Schwarz Bayesian Information Criterion (SBIC), and the Hosking criterion (Hosking, 1980; Hatemi-J, 2004) were used for lag selection. In addition, impulse response functions (IRFs) and confidence bands were computed using orthogonalized IRFs with Lütkepohl and Bonferroni bands (Lütkepohl, 1990; Lütkepohl et al., 2015), bootstrap bands (1000 replications) with and without the Kilian correction (Kilian, 1998; Kilian & Kim, 2011), and Jordà's local projection method (Jordà, 2005; Jordà & Marcellino, 2010). In total, these choices yield sixteen combinations, all producing broadly consistent results. The empirical results presented later in the paper are for the VAR models with the number of lags selected by the modified AIC criterion. The IRFs confidence bands shown on the plots are obtained via bootstrapping with the Kilian correction.

[1] The 1% change in ERP is scaled to the purchases by the Federal Reserve for a more accurate estimation. Because stock indices are usually quoted in price returns, applying the price index rather than the total return index, circumvents the drawback of having to disentangle the return in terms of capital gains from other cash distributions (Brealey et al., 2008).

[2] https://solutions.refinitiv.com/datastream. Detailed description of data preparation and provisional calculations are available upon request.

4.3. Validating the theory of the portfolio balance channel

Fig. 2 displays the computed IRs with positive QE shock[3] results for the UK (left) and the US (right) from VAR model estimations using two (UK) and one (US) lags, respectively.[4] Equity returns are in panels a, b, sovereign bond returns (UK gilts and US Treasury securities) in panels c, d, and the ERP estimates in panels e, f. The results reinforce PBC theory for both the US and the UK in that IRs are positive for equity returns (panels a, b) and negative for sovereign bond returns (panels c, d).

For both economies, QE shocks are associated with similar responses in equity and government bond returns in terms of direction and persistence. In the UK, the response in equity returns appears slightly more muted than in the US, while responses in gilt and Treasury returns show greater similarity. As a result, the estimated response of the ERP is more pronounced in the US than in the UK, consistent with earlier findings (e.g., Joyce et al., 2011) and suggesting a stronger PBC transmission in the US than in the UK.

4.4. Evaluation of response to QE4

QE4 was launched in 2020 in response to the economic disruption caused by the Covid-19 pandemic. The central bank's response was to ensure plentiful liquidity to lubricate the financial system and prevent a collapse in the stock market.

Fig. 3 shows the expected estimated ERP, see (4), in response to four QE shocks. A negative ERP response to a QE shock reduces the stock market's ERP, which encourages investment in risky assets (Bredin et al., 2007; Poshakwale & Chandorkar, 2016). The relative size and strength of the US market and PBC mean that the IR effects are much longer lasting than in the UK. Furthermore, the QE4's size (more than double the sum of the previous three events) possibly created a positive ERP impulse response in the stock market when combined with the other fiscal interventions.

The expected effects of the QE shock on the annual equity returns in h periods after the shock can now be evaluated as:

$$r_{s,h}^{EQ} = \widehat{\beta}_s ERP_{s,h}, \quad h = 1, \dots, 24; \quad s = 1, \dots, 4, \tag{5}$$

where $ERP_{s,h}$ is defined by (4), and $\widehat{\beta}_s$ is estimated in (3). Table 1 shows differences in estimated equity-market returns in response to the QE shocks, where the responses are calculated based on (5) for the full magnitude of QE purchases in each episode. In both the UK and the US, estimated equity-return responses are positive, showing that the QE policy resulted, on average, in higher equity returns. The effect is noticeably larger in the US than in the UK, indicating stronger PBC transmission in the US. This is consistent with the established link between the QE expansions and increases in domestic equity-market returns documented in the literature (Laopodis, 2013; Shah et al., 2019).

The results shown in Fig. 3 and Table 1 are obtained under the assumption that, in each QE period, there was only one QE shock. In practice, QE was conducted through a sequence of operations over time, which may have dampened market responses. For this reason, the "single shock" scenario should be interpreted as an upper-bound case. However, the full amount of asset purchases might not be implemented immediately. In the UK, the Bank of England announced the activation of up to £200 billion in asset purchases during the QE4 period. However, the full amount of the QE4 was implemented in two stages. The first amount of £100 billion was released in March 2020, then increased to £200 billion within 3 months. The same logic applies to the US, whereas the Federal Reserve activated the first amount of $500 billion in March 2020 and increased it to $1000 billion.

To provide a more realistic assessment of the estimated equity-market returns at each stage of QE4, and based on the results in Table 1, Table 2 summarizes, for both countries, the average and maximum responses in the estimated equity-market returns over a 24-month horizon after the shock.

There are two observations from Table 2. The FTSE 100 response is larger and more persistent than the S&P 500 response over the forecast horizon. This results in higher average and maximum responses for the UK. In particular, our results imply that a £200 billion UK QE4 programme generated, on average, a 7.47% increase in FTSE 100 returns. By contrast, a $1000 billion US QE4 programme shows a smaller 0.68% increase in the S&P 500. For the US, the results for the QE4 show a positive estimated coefficient $\widehat{\beta}_s$ (detailed results are available upon request), which reduces the effect on ERP. Overall, these results are consistent with the conjecture that the relative scale of the purchase programme, measured against the size of the underlying market, matters for the strength of response in ERP.

Using the same approach, the expected estimated ERP series shown in Fig. 3 can be adjusted to reflect the staged implementation of QE4 (calculations are available upon request). In the US, the effects of QE4 shock last over seven periods and decline linearly from 9.1% in horizon $h = 1$ to 3.3% in period $h = 7$ under the $500 billion scenario, and from 18.2% to 6.6% under the $1000 billion scenario. In the United Kingdom, the corresponding adjustments are negative and last for two periods: the maximum change is −24.4% in period $h = 1$ under the £100 billion scenario, and −48.9% under the £200 billion scenario. Relative to the US, the smaller and short-lived adjustments in the UK series are consistent with a weaker association between QE4 shocks and the ERP as measured in this framework.

[3] That is a negative shock to sovereign bond (UK gilts and US Treasury securities) asset share. QE removes bonds from the market reducing bonds as a proportion of the total assets and increase the price thus lowering the yield.

[4] The corrected AIC criterion indicates two lags for the UK VAR model and 1 lag for the US VAR model.

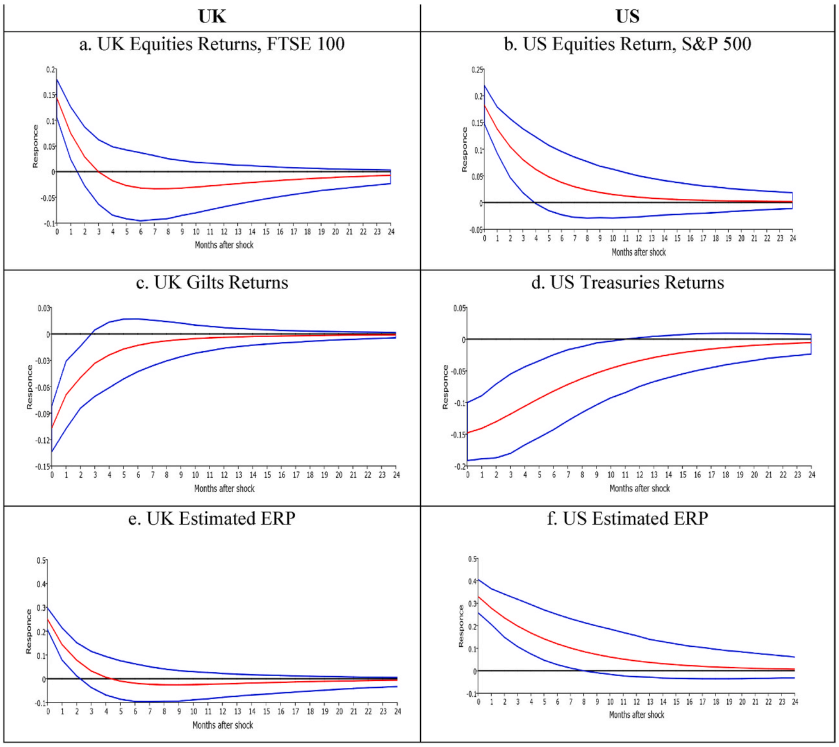

Fig. 2. IRs and estimated ERP for one standard deviation negative shock to the gilt asset share (for the UK – left panel) and treasuries share (for the US- right panel) that reflects QE event, that is a large-scale asset purchase. The red line represents the mean, and the blue lines represent the 90% confidence intervals. The vertical axis represents the magnitude of the response; the horizontal axis is the number of months after the shock.

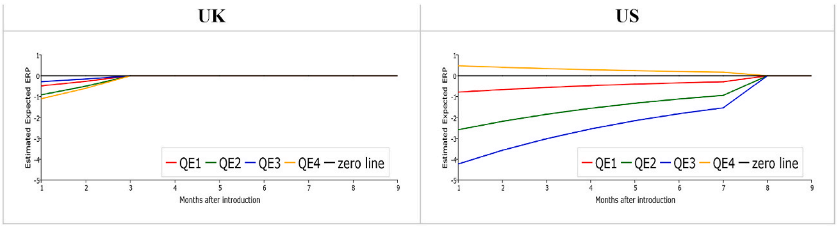

Fig. 3. Expected estimated ERP in response to QE shocks in the UK (left panel) and the US (right panel). The plots are QE1 in red, QE2 in green, QE3 in blue and QE4 in yellow. The vertical axis represents the magnitude of the Estimated Expected ERP, and the horizontal axis shows months after shock (introduction of the corresponding QE).

Table 1

Estimated equity-market returns for the UK (left panel) and the US (right panel) in response to the total amount of QE purchases in the respective QE episodes (see the Online Supplementary Materials for detailed calculations).

QE period	UK	Response in FTSE 100		US	Response in S&P 500	
	Size of QE	Mean response	Maximum response	Size of QE	Estimated Mean response	Maximum response
1	£200bn	0.48%	7.40%	$300bn	4.11%	22.11%
2	£175bn	1.87%	29.00%	$600bn	11.36%	126.32%
3	£70bn	0.44%	6.86%	$755bn	56.80%	305.37%
4	£450bn	1.08%	16.82%	$2655bn	0.34%	1.82%
Cumulative Rise		**3.88%**	**60.06%**		**72.61%**	**455.61%**

Table 2
Estimated equity-market returns for the UK (left panel) and the US (right panel) in response to the partial purchase during the Covid QE4 period (see the Online Supplementary Materials for detailed calculations).

UK	Response in FTSE 100		US	Response in S&P 500	
QE4 partial asset purchase	Mean response	Maximum response	QE 4 partial asset purchase	Estimated Mean response	Maximum response
£100bn	0.24%	3.74%	$500bn	0.03%	0.34%
£200bn	0.48%	7.47%	$1000bn	0.13%	0.68%

It is worth noting that the VAR models applied here are linear in variables. This may not fully capture the diminishing marginal effect of additional government bond purchases on stock prices, which diminishes with larger purchase volumes. In this case, a nonlinear approach may be preferable, as it may be less likely to overestimate the reaction of stock returns to shocks.

5. Impact of equity markets on financial wealth distribution

The second stage of the methodology applied here examines the relationship between equity market returns and changes in the distribution of financial wealth across wealth cohorts by contrasting the relative performance of each cohort in both non-QE and QE periods. If equity returns have little or no impact on equity holders, namely the top deciles of the wealth distribution in both the US and UK, then we should observe relatively little difference between the non-QE periods and the subsequent QE periods. The population in the lower deciles of the wealth distribution, particularly deciles 1 to 5, rely on interest-bearing retail financial products that are tied to official bank rates (Cui & Sterk, 2021; Wolff, 2017).

The data source for the US is the Federal Reserve's Distributional Financial Accounts[5], spanning from 1989 onwards and segmented by wealth percentile on a quarterly basis. The UK Office for National Statistics (ONS) provides Aggregate Household Wealth by deciles, starting from July 2006, on a biennial basis. However, the UK's dataset, while segmented by wealth decile, lacks the historical depth necessary for comparison with periods preceding the implementation of QE. The relatively low frequency of UK data limits the reliability of the statistical analyses. Because the UK series can be used only to compare movements across deciles from 2006 onwards, much of the empirical analysis relies on US data for statistical inference.

5.1. *UK financial wealth dynamics*

Table 3 reports each decile's financial wealth portfolio growth rate from a 2008-10 baseline.

Up to 2016-18 period, only the 3-rd and 10-th deciles of portfolios were above the mean. In the 2008–2010 baseline period (not shown in Table 3), the 3rd decile's portfolio accounted for 0.34% of total financial wealth, whereas the 10th decile accounted for 54.7%. This means that deciles 1, 2 and 4 to 9 have all growth below the mean (which is referred to further on as underperformance), until 2016-18 indicating a change in wealth distribution. Until 2016–2018, the 10th decile held around 65% of total financial wealth, consistent with sustained relative growth above the mean (i.e., outperformance further on) over the preceding decade. Over the same period, the 1st and 2nd deciles exhibited negative or near-zero portfolio growth, indicating that the lower deciles had become poorer in financial-wealth terms. The 2018-20 reporting column partially covers the Covid period (end March 2020), where equity markets fell significantly. The effect is most evident in the 10th decile's portfolio, as equity prices declined sharply by March 2020.

Fig. 4 illustrates the deciles' portfolios of financial assets. If deviations from the mean growth rate were small, portfolio growth would be broadly similar across deciles. This would imply little additional change in the distribution of financial wealth. The evidence does not suggest uniformly small deviations: most decile portfolios record growth below the mean, whereas the 10th decile and, in some periods, the 3rd decile (not shown in Fig. 4), exhibit growth above the mean.

Wealth growth for the cohort in the 10th decile remains persistently above the average growth rate in 2009–2020, alongside the strong cumulative increase in the FTSE All-Share index over the same period (approximately 95%). This is consistent with Mumtaz and Theophilopoulou (2020) findings, that financial-wealth gains are skewed toward middle- and high-wealth households. However, Table 3 indicates that the wealth growth of cohorts in deciles 5–9 is below average, suggesting that the gains in wealth are concentrated predominantly among the top-wealth cohort.

This part of the analysis faces several challenges. Establishing a causal link between QE and wealth distribution and growth without a historical comparison is problematic. The unavailability of data prior to 2008 and its infrequency limit statistical analysis. Therefore, to enable comparison with the US, the above deciles are grouped into cohorts: Bottom 50% (deciles 1-5), Next 40% (deciles 6-9), and Top 10% (decile 10). Note, the Top 1% is not available in the UK for this reporting period. Table 4 reports the UK financial wealth portfolio's outperformance or underperformance (that is, deviation from the mean) using US Style cohorts. The Top 10% were the overall outperformers in financial wealth in the UK over the other 90%, except for the 2018-20 (see the last column of Table 4), where

[5] Source: US Survey of Consumer Finances and Financial accounts of the United States via the Federal Reserve of St Louis FRED database or https://www.federalreserve.gov/releases/z1/.

Table 3
UK financial wealth growth rate by decile and the overall mean growth rate for each ONS reporting period using 2008-10as the baseline. The columns 2014-16 represent a reporting period change by the ONS. From 2006 to 2016 reporting was from July to June biennially and from 2014 to date reporting was from April to March biennially. Therefore, the transition period 2014-16 has two representations by the ONS. Source: ONS Wealth Survey, Table 2.2.[6]

Decile	2010-12 Jul-Jun	2012-14 Jul-Jun	2014-16 Jul-Jun	2014-16 Apr-Mar	2016-18 Apr-Mar	2018-20 Apr-Mar
1st	−27%	−6%	−39%	−36%	−43%	−35%
2nd	9%	0%	0%	0%	0%	0%
3rd	−61%	−2%	26%	43%	99%	151%
4th	−2%	8%	18%	6%	30%	45%
5th	−2%	11%	21%	24%	36%	79%
6th	−8%	3%	25%	20%	45%	49%
7th	−7%	11%	26%	26%	46%	57%
8th	4%	21%	43%	40%	54%	57%
9th	2%	14%	24%	21%	45%	67%
10th	37%	67%	101%	93%	132%	88%
Mean	**20%**	**43%**	**68%**	**63%**	**94%**	**76%**

6 https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth.

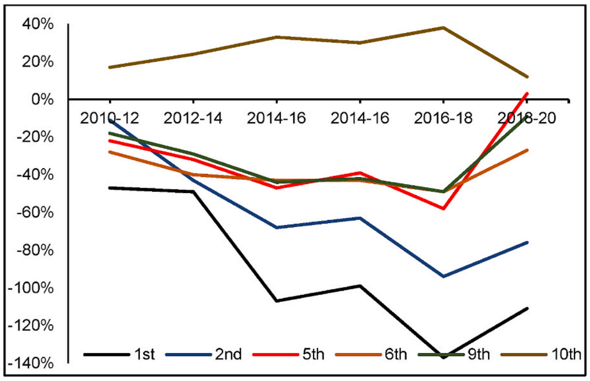

Fig. 4. UK financial wealth deciles asset portfolio cumulative performance compared to the mean using the 2008-10 baseline. This reports the deviation from the mean financial wealth of each decile's portfolio growth rate. Source: ONS Wealth Survey.[7]

7 https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth.

Covid-19 pandemic crash had a significant impact on equity markets in the first two quarters of 2020. Note that the Top 10% hold roughly 55–58% of total financial wealth, while the Bottom 50% hold about 4%. This means that financial wealth became increasingly concentrated within the Top 10% between 2010 and 2018 in the UK. This was with this group's wealth growing faster than that of any other group.

Table 4
Reports the UK financial wealth portfolio's outperformance or underperformance using US style population classification as cohorts. Bottom 50% maps to deciles 1-5, Next 40% to deciles 6-9 and Top 10% to decile 10. The baseline is 2008-10. The columns 2014-16 represent a reporting period change by the ONS. From 2006 to 2016 reporting was from July to June biennially and from 2014 to date reporting was from April to March biennially, therefore the transition period 2014-16 has two representations by the ONS. ONS Wealth Survey.[8]

Cohort	2010-12 Jul-Jun	2012-14 Jul-Jun	2014-16 Jul-Jun	2014-16 Apr-Mar	2016-18 Apr-Mar	2018-20 Apr-Mar
Bottom 50%	−35.57%	−28.02%	−46.32%	−40.18%	−48.76%	18.04%
Next 40%	−19.97%	−28.59%	−38.79%	−35.71%	−46.15%	−15.59%
Top 10%	17.07%	24.02%	32.72%	29.99%	38.79%	11.74%

8 https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth.

5.2. US financial wealth dynamics

The Federal Reserve provides a quarterly wealth dataset that starts in 1989 providing a more comprehensive view of US wealth data[9]. It amalgamates the deciles into Cohorts: Bottom 50% (deciles 1-5), Next 40% (deciles 6-9) and splits decile 10 into Next 9% (the 90-99% of the distribution), Remaining Top 1% (the top 1% of the distribution) and TopPt1 (0.1%) in increasing order of wealth per household. This analysis combines the remaining Top 1% and TopPt1 (the top 0.1%) into the Top 1% cohort. Merging the Federal Reserve US wealth categories "Corporate equities and mutual fund shares" and "private businesses" together is concordant with ONS definition of financial. This analysis refers to this merger as "financial wealth" for consistency. The dataset's quarterly data are converted to annual data by averaging the year's wealth.

Table 5 sets out the percentage shares of each cohort's financial wealth portfolio at the turning points of 1990, 2000, 2009, 2015 and 2020, the later three being the QE turning points. Between 1990 and 2009, wealth distribution remained stable across the cohorts. Of particular interest are the Top 1% which experienced less than 2% increase in share of wealth before 2009 and the Bottom 50% which showed less than 0.2% increase. This demonstrates a relatively stable distribution during this period.

After 2009, distributional stability broke down, the Top 1% cohort increases its portfolio wealth share by nearly 23%, whereas the Bottom 50% cohort loses out with a decreasing share of wealth by nearly 50%. Most of this change occurred between 2009 and 2015 inclusive. This coincides with the first three QEs periods and low interest rates (that is UMP discussed previously). A plausible interpretation is that QE transmits to equity prices through the PBC (see Fig. 1) and is therefore reflected most strongly in the cohorts that hold the largest share of privately held equity, which is the Top 1%.

Table 5 shows that the Top 1%'s share of financial wealth rose from around 45% to around 52% during QE1–QE3 (2009–2015), while the shares of other cohorts declined. This shift is consistent with evidence in the literature on the distributional implications of US QE (Papadamou et al., 2020; Attílio, 2024). In the subsequent period, accommodative policy conditions, including low interest rates, persisted until 2018, while the 2017 tax changes did not coincide with a clear additional reallocation in cohort wealth shares. Batty et al. (2021) identify distributional changes in wealth during the Covid-19 period, however they caution against attributing these outcomes directly to the Federal Reserve's UMP interventions.

Focusing only on the periods that precede and follow QE can miss long-run patterns of stability and instability in the wealth distribution that may reflect not only the effects of QE itself but also broader economic forces. This study addresses this issue by comparing cohort outcomes across the pre-QE, intervening non-QE, and QE periods. Systematic differences in cohort outperformance or underperformance between QE and non-QE periods are consistent with QE being associated with these distributional patterns. Extending the sample back to the 1990s captures a wide set of conventional policy regimes and major shocks. These include the dot-com downturn and the savings and loans crisis. Comparing periods within countries also helps hold constant many time-invariant structural factors linked to financial wealth inequality.

Policy tends to influence wealth distribution only gradually, with its effects accumulating over extended horizons. Therefore, to capture pre-QE and long-run dynamics, it is useful to establish baseline wealth levels at decadal intervals and to set additional baselines at the start and end of QE periods to identify changes associated with policy regimes. This strategy would allow us to reveal the long-run impacts of policy on wealth distribution, as relying solely on annual growth rates could obscure persistent long-run effects and conflate them with short-term fluctuations. As wealth is typically held over extended periods and wealth holders are primarily concerned with long-run outcomes, the approach taken is to define baseline wealth stocks for aggregate financial wealth, then evaluate subsequent changes relative to these benchmarks for each wealth cohort. The baselines are 1989, 1999, 2009, 2015 for the periods pre-QE: 1990-1999 and 2000-2009, during QE: 2010-2015, and post-QE3 period of 2016-2020 respectively.

To analyse cohorts' performance, we define a cohort's c, $c \in \{\text{Bottom 50\%},\ \text{Next 40\%},\ \text{Next 9\%},\ \text{Top 1\%}\}$, cumulative growth

9 Source: US Survey of Consumer Finances and Financial accounts of the United States via the Federal Reserve of St Louis FRED database or https://www.federalreserve.gov/releases/z1/.

Table 5
US distribution of financial wealth in 10-year periods. The inclusion of 2009 is to illustrate the start of QE interventions, 2015 the end of QE3 and 2020 for the end of the decade. Source: Federal Reserve.

Cohort	1990	2000	2009	2015	2020
Bottom 50%	1.58%	1.45%	1.76%	0.90%	0.80%
Next 40%	18.34%	17.95%	16.46%	12.84%	11.89%
Next 9%	36.89%	34.39%	36.85%	34.49%	34.43%
Top 1%	43.19%	46.21%	44.92%	51.77%	52.88%

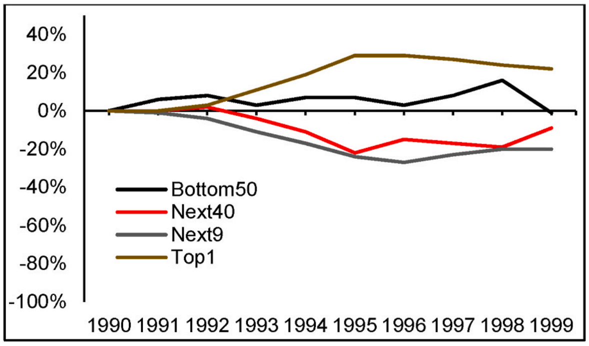

Fig. 5. 1989 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the pre-QE period 1990-1999.

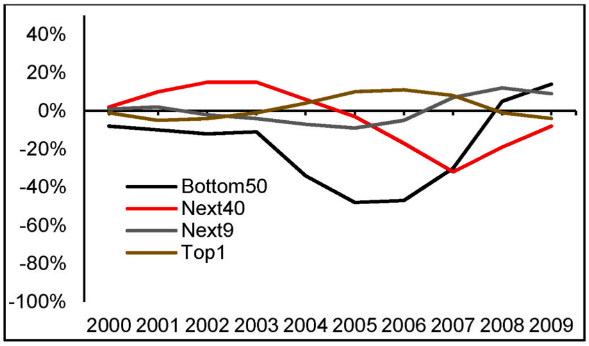

Fig. 6. 1999 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the pre-QE period 2000-2009.

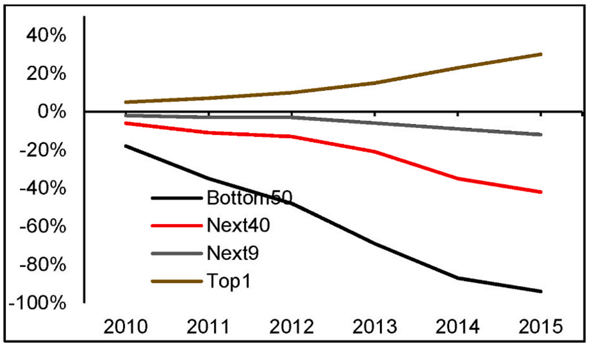

Fig. 7. 2009 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the QE period 2010-2015.

from baseline period b ($b = 1989, 1999, 2009, 2015$) at time period (year) t as

$$r_{c,b,t} = \frac{A_{c,t}}{A_{c,b}} - 1\,, \tag{6}$$

where $A_{c,t}$ denotes cohort c's financial asset at time period t, and $A_{c,b}$ stands for the financial asset for the same cohort at the baseline

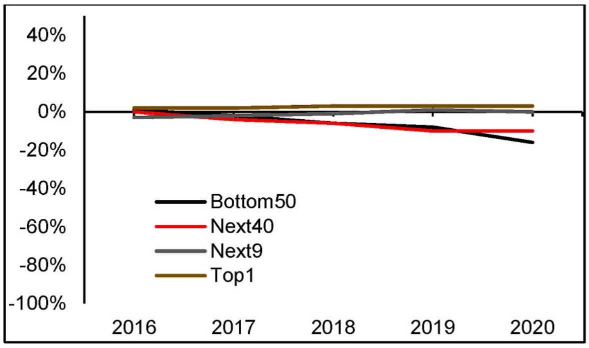

Fig. 8. 2015 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the post-QE period 2016-2020.

period b. Denote similarly by $A_{a,b}$ and $A_{a,t}$ the total (aggregate) financial assets at the baseline period b and time period t, respectively.

To measure cohorts out- or underperformance relative to the aggregate growth within each period, we define the cohort's cumulative deviation from the mean, $d_{c,b,t}$, as

$$d_{c,b,t} = r_{c,b,t} - \bar{r}_{a,b,t} \,, \tag{7}$$

where $\bar{r}_{a,b,t}$ is an aggregate mean cumulative growth defined as:

$$\bar{r}_{a,b,t} = \frac{A_{a,t}}{A_{a,b}} - 1 \,. \tag{8}$$

If the cohorts' portfolios deviations from the mean remain close to zero throughout the whole period, this suggests that financial wealth distribution remains broadly stable. If, however, a cohort's portfolio outperforms the aggregate over a given baseline period, that is $d_{c,b,t} > 0$, this implies that the cohort's share of total financial wealth is increasing. Conversely, underperformance, $d_{c,b,t} < 0$, indicates a declining wealth share.

Figs. 5–8 plot the deviations $d_{c,b,t}$ of each wealth cohort's portfolio growth from the mean financial-wealth growth rate for 1990–1999 (baseline 1989), 2000–2009 (baseline 1999), 2010–2015 (baseline 2009), and 2016–2020 (baseline 2015). In the 1990s and 2000s (Figs. 5–6), deviations remain relatively small and do not display sustained divergence across cohorts. Consistent with Table 5, the Bottom 50% and Top 1% end each decade close to their initial relative positions, suggesting limited net change in wealth shares over these periods.

Fig. 8 shows that cohort divergence in the post-QE3 period (2016–2020, baseline 2015) was substantially less than during the preceding QE period (Fig. 7). The Bottom 50% and Next 40% cohorts (deciles 1–9) remain below the mean growth rate, but the magnitude of underperformance is smaller than in 2010–2015. The Top 1% and Next 9% cohorts (together comprising decile 10) exhibit only modest positive deviations. Overall, the post-QE3 period is characterized by a relative stabilization of cohort deviations following the sharp divergence observed during QE.

In contrast to the QE1–QE3 period (Fig. 7), Fig. 8 indicates substantially less cohort divergence than in the preceding QE period (Fig. 7). The Bottom 50% and Next 40% cohorts (deciles 1–9) continue to underperform the mean, but the magnitude of their deviations is smaller than in 2010–2015. The Top 1% and Next 9% cohorts (together corresponding to decile 10) recorded only modest positive deviations. Overall, the post-QE3 period is characterized by a relative stabilization of cohort outcomes following the sharp dispersion observed during QE.

Following the analysis of cohort deviations in Figs. 5–8, the next step is to characterize how each cohort's quarterly wealth portfolio returns co-move with equity market returns over the same periods. To capture the average sensitivity of cohort wealth returns to market movements, while allowing this sensitivity to vary with the magnitude of market returns and capturing potential nonlinearities arising from portfolio composition, leverage, and valuation effects, we approximate each cohort's quarterly wealth-portfolio return as a quadratic function of contemporaneous S&P 500 returns. This can be interpreted as a reduced form measure of heterogeneous exposure to aggregate equity risk across the wealth distribution.

Quarterly returns for all cohorts and the equity market were computed as the averages of monthly returns[10]. Aggregating to the quarterly frequency reduces the influence of timing mismatches in asset valuation updates (mark-to-market effects), short-term market volatility, and temporary portfolio composition changes. Table 6 reports the coefficients of a quadratic approximation of quarterly cohorts' wealth returns by quarterly equity-market returns, that is, of:

$$r_{c,q} \approx \alpha_0 + \alpha_1 r_{e,q} + \alpha_2 r_{e,q}^2 \,, \tag{9}$$

[10] Equity-market quarterly returns were also computed as compounded returns. The results using compounded returns are very similar to those reported in Table 6, confirming the robustness of the analysis. Additional outputs are available on request.

Table 6
Quadratic approximation of quarterly cohorts' wealth returns by quarterly equity-market returns. Rows show approximated coefficients defined in (9) for two wealth cohorts, Bottom 50% and Top 1% and four subperiods that cover the two decades prior to QE and then the QE period, followed by the post-QE period.

Period		1990-1999		2000-2009		2010-2015		2016-2020	
Cohort		Bottom 50%	Top 1%	Bottom 50%	Top 1%	Bottom 50%	Top 1%	Bottom 50%	Top 1%
App.	α_2	−0.541	−2.508	−0.602	0.417	−3.991	−2.019	−8.0164	−7.320
Coeff..	α_1	0.288	0.693	0.313	0.877	0.577	0.934	0.7151	1.168
	α_0	0.019	0.012	0.013	0.007	0.007	0.010	0.0211	0.016

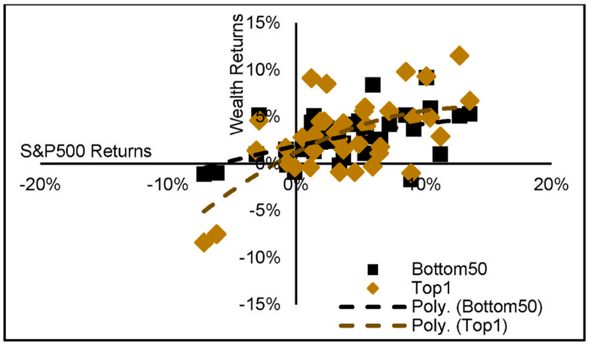

Fig. 9. 1990-1999 period. Cohorts Top 1% and Bottom 50% financial wealth portfolio returns respond to equity market returns on a quarterly basis.

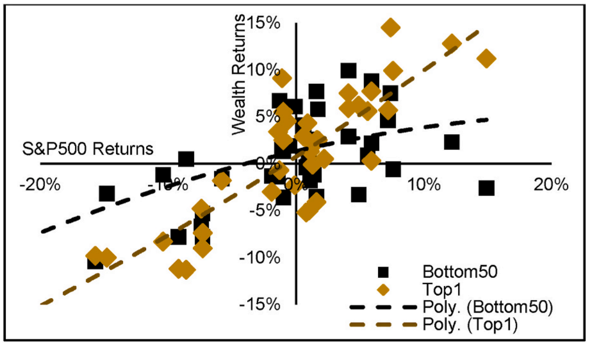

Fig. 10. 2000-2009 period. Cohorts Top 1% and Bottom 50% financial wealth portfolio returns respond to equity market returns on a quarterly basis.

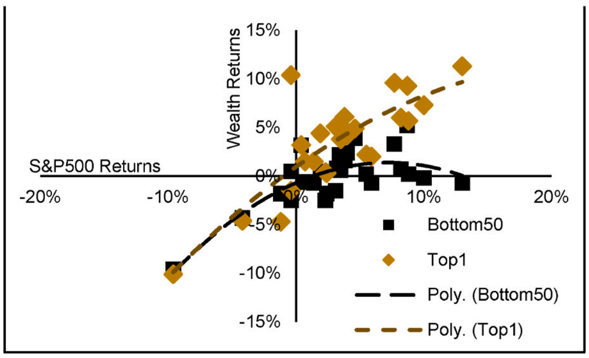

Fig. 11. 2010-2015 period. Cohorts Top 1% and Bottom 50% financial wealth portfolio returns respond to equity market returns on a quarterly basis.

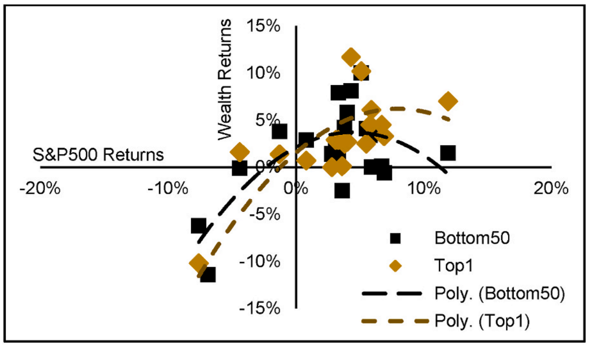

Fig. 12. 2016-2020 period. Cohorts Top 1% and Bottom 50% financial wealth portfolio returns respond to equity market returns on a quarterly basis.

where $r_{c,q}$ denotes quarterly wealth returns for cohort c (Top 1% or Bottom 50%) in time period (measure quarterly) q, and $r_{e,q}$ denotes equity return at quarter q. The approximation is done separately for four subperiods 1990–1999, 2000–2009, 2010–2015, and 2016–2020.

The coefficients on the linear term in (9) progressively increase in every period from the 1990's through the 2020s, possibly implying an overall increasing sensitivity of financial wealth portfolios to equity market returns. However, the main difference is that the Top 1% cohort's portfolio is about twice as sensitive to market movements as the Bottom 50% affirms most of the privately held equity is concentrated in the Top 1%.

Predominantly negative coefficients for the quadratic term across periods and cohorts indicate a concave relationship between equity-market returns and cohort wealth returns; that is, the marginal response of wealth returns to market returns declines as market movements become larger. The positive coefficient for the quadratic term for the Top 1% in 2000–2009 is noteworthy, as it indicates the strong sensitivity of Top 1% wealth returns to large market movements in that subperiod. This can be interpreted as a subperiod-specific nonlinearity rather than a general feature of the relationship. More broadly, the quadratic fit is a descriptive summary that imposes symmetric nonlinearity, combining responses to large positive and negative market returns in a single term rather than allowing for asymmetric or regime-dependent effects.

Figs. 9–12 present graphical evidence of the approximation of the relationship between equity market returns and cohort-level financial wealth portfolio returns. For the 1990 – 1999 period (Fig. 9), the returns performance of the Bottom 50% wealth portfolio broadly tracks the Top 1%, indicating alignment between the two groups. A key distinction, however, is that the Top 1% appears substantially more sensitive to market movements, exhibiting stronger co-movement in both upturns and downturns. By contrast, the Bottom 50% displayed a weaker association with equity market returns, as reflected in the flatter fitted slope. This pattern is consistent with the limited divergence in cohort portfolios observed in Fig. 5 and with only modest changes in each cohort's wealth share over the decade (see Table 5, columns “1990” and “2000”).

The subsequent period, 2000 – 2009 (Fig. 10), spanned a notably more turbulent equity market environment, characterized by pronounced volatility and several boom–bust cycles. The Bottom 50% wealth portfolio exhibits a weaker co-movement with equity market returns than the Top 1%, whose returns track equity market movements more closely. Deviations between cohort returns occur intermittently and are short-lived is illustrated in Fig. 6. Despite these differences in market sensitivity, cohort wealth shares change little over the period (Table 5, columns “2000” and “2009”).

Fig. 11 presents a graphical analysis of the next period (2010 – 2015). Relative to earlier sub-periods, the relationship between the Bottom 50% portfolio returns and the equity market becomes concave and shifts downward. The Top 1% relationship exhibits only mild curvature and remains closely linearly aligned with equity market returns. Fig. 7 shows that the Top 1% outperformed the other cohorts over this interval. Consistent with this, Table 5 (columns “2009” and “2015”) shows a widening divergence in cohort wealth shares.

Finally, Fig. 12 shows a relationship for the period of 2016 - 2020, that differs from earlier sub-periods. This period coincided with the gradual normalization of monetary policy and persistently low interest rates for much of the period. In Table 6 (column “2016–2020”), the estimated quadratic term indicates a more pronounced nonlinear association between equity market returns and portfolio returns for both the Top 1% and the Bottom 50%. Fig. 12 suggests increased convexity in the Top 1% relationship and an upward shift in the Bottom 50% relationship in the latter part of this period. Over this interval, the Top 1% portfolio returns remained higher than the Bottom 50%. However, the gap was smaller than between 2009 and 2015. Consistent with this, Fig. 8 shows more limited divergence, and Table 5 (columns “2015” and “2020”) indicates only minimal changes in cohort wealth shares. The final year of the period (2020) is marked by substantial losses across cohorts at the onset of Covid-19, alongside renewed monetary policy interventions, as discussed later.

The results show that cohort financial wealth outcomes widened between 2010 and 2015, coinciding with large-scale asset purchases and very low interest rates. The pattern is consistent with transmission through the strong US PBC in the 2010's. Other factors, including fiscal policy, may also have contributed, however, Section 4.3 indicates that the PBC appears particularly strong in this period. Equity market gains are reflected more strongly in the Top 1% cohort's portfolio returns. In contrast, the Bottom 50% recorded

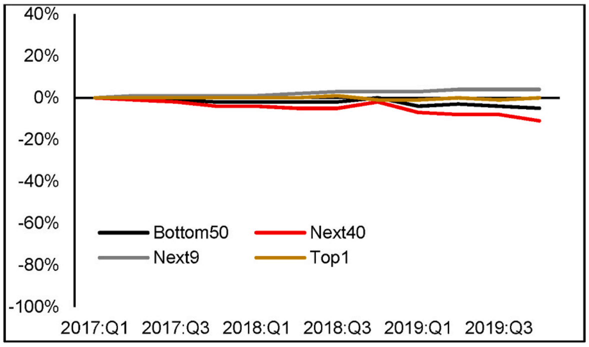

Fig. 13. 2016 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the pre-Covid (2017-2019) period.

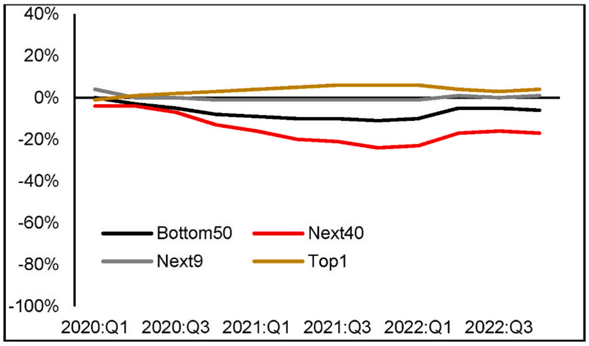

Fig. 14. 2020 baseline. Cumulative deviation in financial wealth growth rates by wealth cohort in the Covid QE (2020-2022) period.

Table 7
The US percentage financial wealth share prior to, during and at the end of the Covid period. Q1 and Q4 stand for the first and fourth quarter of the corresponding years. Source: Federal Reserve Wealth Survey.

	2017:Q1	2019:Q4	2022:Q1	2022:Q4
Top 1%	52.70%	52.70%	53.90%	53.40%
Next 9%	33.70%	34.80%	34.90%	35.10%
Next 40%	12.60%	11.60%	10.40%	10.70%
Bottom 50%	0.90%	0.90%	0.80%	0.90%

weaker gains, alongside a widening cohort wealth share. Before the financial crisis, despite high market volatility, wealth shares changed relatively little. After net asset purchases ended and balance-sheet normalization began in 2016, cohort wealth shares narrowed relative to the QE period. However, nonlinear return patterns persist into the Covid-19 period, which is examined next.

5.3. Covid-19 QE4 impacts on financial wealth distribution in the US

The Covid-19 pandemic saw central banks and Governments introduce a range of unconventional fiscal and monetary policies for a short period to mitigate the consequences of the collapse in aggregate demand. The Federal Reserve introduced another round of QE (referred to as QE4 in this paper) combined with low interest rates. This exogenous shock differs fundamentally from the shock generated within the financial system that preceded the 2008 crisis. The key question is whether QE 4 and low-interest-rates have the same effects on financial wealth shares (in percentage terms) compared to QE1-3 as illustrated in Section 5.2? To address this, the analysis applies the same methodology from Section 5.2 with minor adjustments: the preceding period is redefined, and no post-period is included.

Figs. 13 and 14 illustrate financial wealth divergence in the pre-Covid period (2017:Q1-2019:Q4 with a 2016:Q4 baseline)[11] and during Covid-19 (2020:Q1-2022Q4 with a 2019:Q4 baseline). In the pre-Covid period, the Bottom 50% and Next 40% cohorts underperform, while the Top 1% outperforms the mean cumulative growth rate (see Section 5.2). Despite this pattern, there is only

[11] This period overlaps with the period considered in the previous analysis (2016–2020, with 2015 as the baseline). To ensure consistency when comparing the pre-Covid and Covid periods, we focus on the three years preceding Covid and the three years during Covid period.

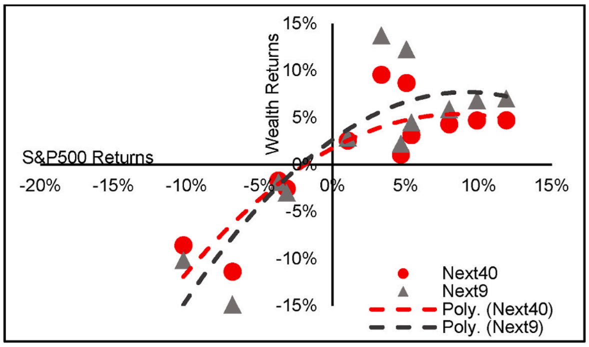

Fig. 15. Covid (2020-2022) period. How financial wealth returns responds to equity market returns on a quarter the Next 40% and Next 9% cohorts.

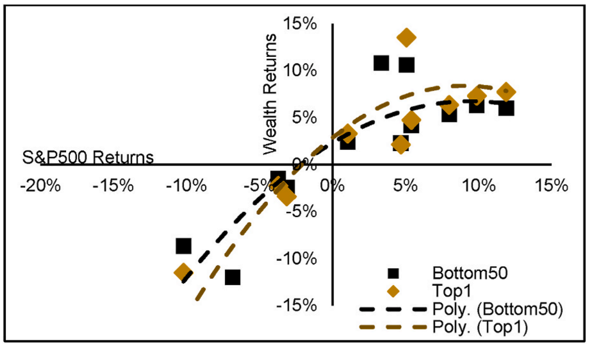

Fig. 16. Covid (2020-2022) period. How financial wealth returns responds to equity market returns on a quarterly basis for the Bottom 50% and Top 1% cohorts.

minimal change in percentage wealth shares across cohorts. The QE4 period (Fig. 14) shows limited divergence, with the Top 1% outperforming and the Bottom 50% and Next 40% underperforming until 2022:Q1, effectively the end of Covid-19 period. Notably, the Next 40% cohorts (deciles 6–9) continued to underperform other cohorts. By the end of 2022, the divergence in growth rates moderates and appears to return to the pre-Covid pattern. Consistent with this, QE4 is associated with little change in percentage wealth shares relative to the baseline pattern (see Table 7).

The relationship between equity market returns and the transmission to financial wealth returns in the QE4 Covid period is explored and illustrated in (see Fig. 12 for the pre-Covid period for comparison). As discussed above, the pre-Covid period reflects a return toward normality, with pronounced convexity in the portfolio return relationships for both the Top 1% and Bottom 50% cohorts. Fig. 15 indicates that this pattern persists, though with reduced convexity in both cohorts. Fig. 16 shows that similar dynamics are also present for the intermediate wealth cohorts (Next 40% and Next 9%), which exhibit broadly comparable responses to equity market returns. These similarities in cohort-level return responses may help explain why the divergence between cohorts is smaller during the Covid period (2020–2022) than during the earlier QE period (2010–2015).

6. Discussion

The increasing concentration of wealth and its attendant socio-political risks present a growing challenge for policymakers. Quantitative easing has been the instrument of choice for central banks confronting major crises, particularly since the 2008 financial crisis and the Covid-19 pandemic. Our findings contribute to the debate on QE's efficacy and side effects by demonstrating that these policies have systematically exacerbated financial wealth inequality in the US and UK, primarily through the PBC.

This paper advances a method that combines both quantitative and qualitative analysis in a two-stage process that illustrates how QE distorts financial wealth distribution through the PBC and interest rates. It contrasts non-QE 'conventional' policy periods with QE 'unconventional' policy periods to show how QE changes bond and equity prices, and how those equity prices affect wealth distribution. It also shows how the PBC's relative transmission strength affects equity markets. Then, when combined with low interest rates, the way different financial wealth cohorts respond to equity markets changes, thereby affecting each cohort's wealth share.

This paper shows that the dynamics of wealth distribution during the QE1 to QE3 era (2009-2015) fundamentally differ from those of preceding decades. The first three rounds of QE disproportionately concentrated financial wealth in the Top 1% cohort, primarily at the expense of the Bottom 50% cohort. This significant redistributive effect underscores the need for explicit mitigation strategies when using such policies. Our results align with the literature highlighting QE's distributional impact on inequality (Batty et al., 2021;

Bonifacio et al., 2022; Domanski et al., 2016; Evgenidis & Fasianos, 2021; Mumtaz & Surico, 2008). Moreover, the 2009-2015 QE1 to QE3 effect on financial wealth was neither temporary nor necessarily short-term for the Top 1% cohort, reinforcing the findings of Batty et al. (2021).

The distributional patterns across cohorts observed during QE subperiods are consistent with a limited role for interest rates in shaping outcomes, in line with the related literature (e.g. Domanski et al., 2016). During 2010–2015, when QE was active, wealth divergence was evident. In 2016–2020, with interest rates remaining low but net asset purchases having ended, distributional patterns moved partly back towards pre-QE dynamics, without reversing the Top 1% cohort's earlier gains.

The financial wealth distribution effect of QE4 (Covid-19) was more muted than QE1 to QE3 for the US. This may be attributed to a combination of weaker PBC transmission, more aggressive concurrent fiscal policy, the relatively short period over which it operated, and the potential for market acclimatization to central bank interventions, echoing the Lucas Critique. The nature of the shock, which, in essence, is an exogenous pandemic that first crippled aggregate demand and then aggregate supply, versus that of an endogenous financial crisis, may also explain the differential in market response and hence the more limited effects on financial wealth distribution.

7. Conclusions

Over the past two decades, Quantitative Easing has become a cornerstone of crisis response in major economies. This paper reassesses its effectiveness and consequences by employing a robust two-stage framework to disentangle QE's impact on financial markets and, ultimately, on the distribution of household financial wealth.

Methodologically, our approach addresses a key limitation in the literature. Standard models, including DSGE frameworks with representative agents, struggle to capture how monetary policy transmits through sequential stages and how heterogeneous portfolio composition across cohorts shapes distributional outcomes. By separating the analysis into two distinct stages, we provide a clearer picture of how central bank actions ultimately translate into capital gains for equity holders. The comparison between QE and non-QE periods further confirms this effect, revealing no improvement for lower-wealth groups after QE interventions have ceased.

Our primary conclusion is that QE, particularly the 2009-2012 interventions in the US, significantly increased financial wealth concentration among the Top 1% cohort. QE generated outsized capital gains for the wealthiest households, who hold most of the financial assets, by boosting equity prices via the PBC. The US Top 1% cohort substantially increased their share of financial wealth (nearly a quarter), while the Bottom 50% saw a significant decline (approximately half). Evidence points to a similar dynamic in the UK, where Decile 10 made the most gains through the 2010-2020 period, although any analysis and conclusion on UK wealth dynamics is constrained by material data limitations. However, this conclusion supports that of Mumtaz and Theophilopoulou (2020) and Evgenidis and Fasianos (2021), who use different methods and data to come to quite similar conclusions. The 2020 QE4 intervention followed a more muted pattern and quickly returned to more normal dynamics once QE4 finished.

These findings cast doubt on the continued use of QE as a standard crisis-fighting tool without substantial amendment to policy settings. With its benefits for financial stability and growth being questioned and its adverse distributional effects now more clearly demonstrated, the policy carries significant political and social risks. The experience of Japan and the diminished market response to later QE rounds suggest that its effectiveness may be waning.

Therefore, we argue that the era of QE as a go-to policy may need reconsideration. If deployed in future crises, it must be accompanied by deliberate and robust fiscal or regulatory measures to counteract its inequality-enhancing effects. Failing to do so risks cementing a monetary policy legacy that stabilizes markets at the expense of deepening societal divisions. This is a trade-off that may ultimately undermine the long-term stability it seeks to preserve.

Credit author statement

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Declaration of competing interest

We have no conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iref.2026.105291.

Data availability

Data will be made available on request.

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