The Inequality Multiplier:

Market Inelasticity and the Persistence of Wealth Inequality

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Abstract

We study how recent changes in equity market macrostructure shape U.S. equity market capitalization, aggregate debt levels, and wealth inequality. Rising income inequality, combined with inelastic markets, drives persistent wealth disparities through asset price revaluation—a mechanism we term the "inequality multiplier." Using a general equilibrium model, we identify two channels: (i) the equity investment channel, where wealthy households' higher propensity to save amplifies equity price booms; and (ii) the borrowing channel, where increased indebtedness raises equity prices via rebalancing demand from financial intermediaries. Calibrating the model to U.S. data, we show that this multiplier makes wealth inequality self-perpetuating and drives a growing wedge between income and wealth inequality. The model replicates observed trends in equity prices, debt levels, and wealth concentration, revealing how asset market frictions drive inequality beyond existing explanations. The equity investment channel shapes long-run trends, while the borrowing channel explains short-run cycles in wealth inequality. Our findings link recent shifts in financial market structure to macroeconomic outcomes.

Keywords: Macro-Finance, Inequality, Inelastic Markets.

JEL Classification: E44, D31, E21, G23.

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1. Introduction

The past 40 years have witnessed an exponential and simultaneous increase in the value of equities, value of outstanding debt and wealth inequality in the United States. Since 1989, U.S. equity market capitalization has risen 22-fold, debt 7-fold, and the top 10% wealth share has risen 6 percentage points. Additionally, the increase in wealth inequality has significantly outpaced the increase in income inequality — wealth inequality widened more than six times faster than income inequality. Simultaneously, the market macro-structure — the structure of financial markets, institutional features and financial frictions — has transformed, exemplified by the rise in the share of equities owned by passive investors to c. 33%. Figure 1 puts the quantitative importance of these trends into perspective.

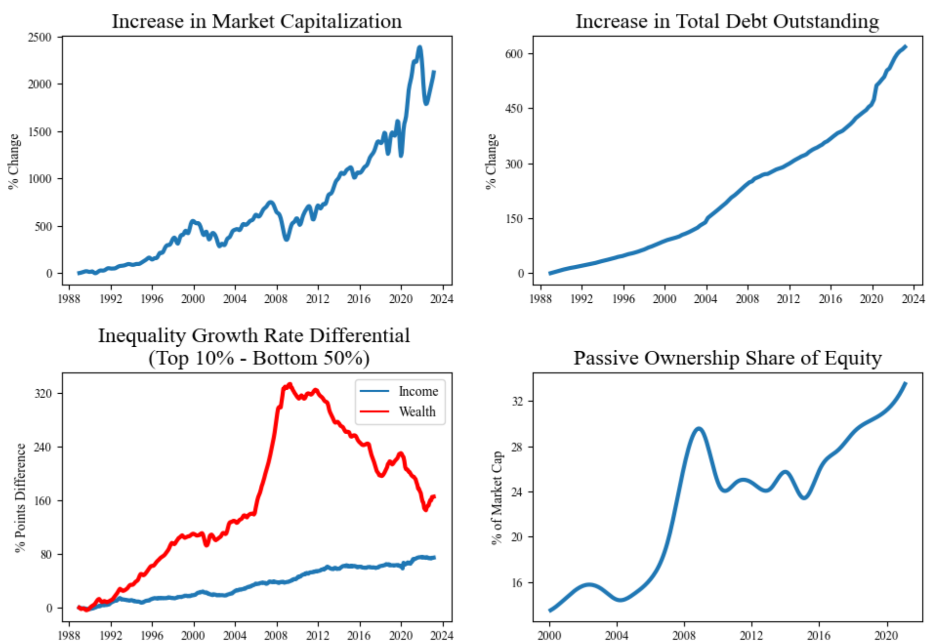


FIGURE 1. Simultaneous and quantitatively large increase in equity market value, total debt value (including household and federal debt), wealth and income inequality, and share of U.S. equities owned by passive investors.

Note: Increase in Wealth (Income) inequality calculated by taking the difference between the growth rate of average wealth (average factor income) of top 10 percentile and growth rate of average wealth (average factor income) of bottom 50 percentile. Wealth (and factor income) in January 1989 used as base year. Debt outstanding includes federal, household and business debt.

Source: Quarterly value of corporate equities (market capitalization) and value of debt from Flow of Funds data. Monthly top 10% and bottom 50% income and wealth growth from Blanchet et al. (2022). Passive ownership share from Chinco and Sammon (2024).

A large literature spanning macroeconomics, public economics and finance has made substantial progress in studying the driving forces behind these four trends in isolation. However, most theories do not account for the *simultaneous* increase in equity, debt, wealth inequality, and the divergence between wealth and income inequality. Theories related to return heterogeneity (such as Gomez

(2024)) attempt to link the increase in wealth inequality to the increase in equity market values due to return heterogeneity favoring the wealthy. However, these theories are unable to account for the simultaneous increase in total debt. Equally, theories which link wealth inequality to the increase in indebtedness of households at the bottom of the wealth distribution (such as Kumhof et al. (2015)) do not account for the large increase in equity value. Benhabib et al. (2017) show that models of income inequality cannot explain the much faster and larger increase in wealth inequality.

Crucially, these explanations do not take the the evolving market macro-structure into account. This is a shortcoming, because over the same time period, the macrostructure of financial markets has shifted substantially — for example, passive investing strategies have become more prominent. Haddad et al. (2024) show that the rise of passive investors has made equity markets more *inelastic*. This implies that the market's portfolio allocation between equity and debt becomes less responsive to price changes[1], and any change in quantity demanded has outsized price effects.

We argue that the four trends can be jointly explained by a combination of inelastic equity markets and heterogenous portfolio holdings of households across the wealth distribution (Figure A3). When a redistributive income shock (positive income shock to the rich, negative income shock to the poor) hits the economy, rich households save more through equity, while poor households borrow more to smooth consumption. In an inelastic equity market, increased demand for equities translates into higher equity prices, which increases the value of rich household portfolios given their relatively larger exposure to equity. Simultaneously, increased debt forces financial markets to bid up equity prices in order to maintain stable portfolio allocations, resulting in a decrease in poor household wealth and increase in rich household wealth. This leads to a simultaneous increase in equity prices, debt levels and wealth inequality, and a higher divergence between wealth and income inequality due to general equilibrium effects on equity prices.

To make this argument, we first develop an analytical model to demonstrate that, in the presence of limited access to equity markets and market inelasticity (through constrained intermediaries), equity prices depend on rich households' savings and poor households' borrowing. We demonstrate that income inequality translates into wealth inequality in the *cross-section*, through higher equity prices and debt levels. Then, inspired by Figure 1, we ask if increasing market inelasticity can explain the *dynamics* of wealth inequality, by developing a tractable quantitative model incorporating middle-class households and housing as an asset (given its outsized importance in middle-class portfolios) in addition to limited participation and financial intermediary frictions.

Through our analytical model, we uncover two novel channels which create such equity price increases — the *equity investment* channel and the *borrowing* channel. The equity investment channel shows that higher savings in equity by wealthy households (increased inflows) translates

[1]For inelastic investors, this split has hovered around the 70-30 mark based on our calculations in Appendix A, whereas Gabaix and Koijen (2021) estimate this split to be closer to the 80-20 mark.

into higher equity price booms when markets are more inelastic, resulting in larger increases in wealth inequality. The borrowing channel shows that any increase in debt requires a corresponding increase in equity values (market capitalization) to maintain a stable equity-debt split. This results in higher wealth inequality driven by a simultaneous increase and decrease in wealthy and non-wealthy net wealth positions. Crucially, we endogenize the savings demand by the wealthy and the borrowing demand by the non-wealthy based on their incomes.

In a dynamic setting, the increase in wealth of the wealthy households creates a second-order incentive to increase their savings when marginal propensities to save are increasing in income, leading to a second-order increase in equity prices. Moreover, the persistence of savings (or borrowing) inherits the persistence of (heterogeneous) household income shocks. When income shocks are even moderately persistent, this results in large and persistent increases in equity prices, which results in large and persistent increases in wealth inequality. By linking flows to heterogeneous household asset demand functions, we extend Gabaix and Koijen (2021) and provide a potential frame to think about the recent debate on the half-life of inflows on prices (Fuchs et al. (2023), Koijen and Yogo (2025)). Additionally, we find that wealth inequality is persistent, contrary to Cioffi (2021).

In a quantitative exercise, we find that our model is able to match the trends visible in Figure 1 — simultaneous increases in equity values, outstanding debt and wealth inequality. Moreover, our model is able to replicate the dynamics of wealth inequality better than existing models, crucially capturing the increasing divergence between the increase in wealth inequality and the increase in income inequality. We term this the *Inequality Multiplier* — a general equilibrium phenomenon where higher income inequality begets even higher wealth inequality. A decomposition exercise allows us to demonstrate that the equity investment channel matches the *trend* of wealth inequality dynamics, while the borrowing channel matches the *cycle* of wealth inequality dynamics.

We are among the first to propose a parsimonious model to explain the joint increase in equity prices, debt and the divergence between income and wealth inequality. Our theoretical contribution is to link market inelasticity with portfolio heterogeneity to give rise to the 'inequality multiplier' mechanism. Through our channels, we show that two seemingly opposing sides of the literature on wealth inequality — one which links increasing wealth inequality in the U.S. to return heterogeneity and portfolio decisions of the rich (Hubmer et al. (2021), Kuhn et al. (2020)) and another which links it to increased indebtedness of the poor (Rajan (2011), Mian et al. (2021b)) — exist in tandem but explain different features of wealth inequality. The former (akin to our equity investment channel) leads to long-run trend increases in wealth inequality, while the latter (akin to our borrowing channel) leads to large short- to medium-term deviations. We find that while wealth inequality has been rising steadily, the particularly large increase witnessed post-Global Financial Crisis can be explained by increased debt in financial markets.

If the inequality multiplier exists, why should we care? First, it offers a new mechanism to deepen our understanding of increasing wealth inequality, potentially helping in reconciling income-based explanations with the fast transition dynamics of wealth inequality. Second, it uncovers a hitherto overlooked downside to the change in the market structure of equities (such as the rise in passive investing) which has made equity markets more inelastic. While passive investing is broadly touted as being beneficial towards attracting less wealthy households into riskier asset classes and helping them diversify, it could also deepen wealth disparities. This novel, counterintuitive trade-off about the rise of passive investing deserves further study. Third, it posits that if policymakers desire to prevent further increases in wealth inequality, then they must utilise tools which address frictions related to financial market structure, such as limited equity market participation and overly constrained financial intermediaries. Additionally, the objective of reducing wealth inequality should distinguish between tackling short-term, cyclical inequality versus tackling long-term, trend inequality, given the two distinct channels at play behind each phenomenon.

Example. Consider a simple example to set intuition. Suppose a bottom 50% household is faced with a temporary negative income shock (such as an unemployment shock). In order to smooth consumption, they demand $1 of additional borrowing from the financial market. There is one aggregate financial intermediary in the market, who has a mandate to hold 80% of its capital ($100) in equities, and 20% in bonds. Excess demand for borrowing pushes up interest rates, incentivizing the intermediary to lend the additional dollar (holding an additional dollar worth of debt). In order to avoid violating their 80-20 mandate, the financial intermediary bids up the price of equity to $84, given supply of equity is relatively inelastic. As only top 10% household portfolios are exposed to equity, their wealth increases, driving up wealth inequality through the borrowing channel.

A similar argument is at play when the top 10% household receives a $1 positive income shock. Suppose they invest the dollar into the financial market. As equity issuance is fixed, the market cannot use this dollar to purchase more equity; instead, they invest in $1 worth of bonds. Once again, to avoid violating their mandate, the price of equity is bid up to $84. The excess supply of debt in the market reduces interest rates, incentivising the bottom 50% household to take on additional borrowing. Wealth inequality increases.

Outline of the Paper. Section 2 presents a three-period model that delivers the multiplier. Section 3 sets out a quantitative DSGE model. Section 4 calibrates and provides the empirical matching of moments. Section 5 analyses wealth inequality dynamics. Section 6 concludes.

1.1. Positioning in the Literature

Our paper contributes to two strands of literature: market macrostructure and wealth inequality. We propose a novel mechanism linking inelastic equity markets to faster transition dynamics and endogenous price dynamics. Below, we position our work within these literatures and highlight our contributions.

First, our paper builds on the growing literature on market macrostructure. While prior work, comprehensively discussed in Haddad and Muir (2025)[2] has focused on key asset market players and their effects on equilibrium pricing, to the best of our knowledge, we are the first to link market macrostructure to wealth inequality.

Second, our paper speaks to the large body of work linking income and wealth inequality with financial markets. We contribute to the discussion on capital-based and debt-based explanations of inequality. Work by Rajan (2011), Kumhof et al. (2015), Mian and Sufi (2015) and Mian et al. (2021b) emphasize the role of higher leverage taken by poorer households, financed by richer households, in explaining increases in wealth inequality, and creating financial instability. Meanwhile, work by Piketty (2014), Saez and Zucman (2016), De Nardi and Fella (2017) and Kuhn et al. (2020) instead attribute inequality to higher capital accumulation by rich or higher returns on rich investment. We contribute by demonstrating that both explanations work in tandem. Capital- or investment-based explanations capture low-frequency changes in wealth inequality (i.e., trend) while debt-based explanations explain high-frequency (i.e. cycle) changes in wealth inequality.

On the theoretical side, Gabaix et al. (2016) demonstrate that standard random growth models generate unrealistically slow transition dynamics, while Benhabib et al. (2011) show that wealth distributions exhibit fatter tails than income distributions. Our paper contributes by introducing market inelasticity as a mechanism that both accelerates wealth transitions and higher wealth concentration to the right of wealth distributions.

Several studies, such as Toda and Walsh (2020), Gomez (2024), Greenwald et al. (2021), Hubmer et al. (2021) and Cioffi (2021) examine the interaction between inequality and asset pricing. While their focus is to explain wealth inequality through abnormal equity returns, declining interest rates or heterogeneity in preferences, we show that market inelasticity can simultaneously generate declining equity premia, lower interest rates, self-reinforcing increases in portfolio revaluation, and higher and more persistent wealth inequality.

We contribute to the literature linking financial frictions and wealth inequality (Cagetti and De Nardi (2006), Fernández-Villaverde et al. (2023)). While previous studies focus on the role of financial constraints on households in determining access to assets, we complement this by linking financial leverage to non-wealthy households, showing that both the borrowing and investment channels contribute to rising wealth inequality.

Our modeling approach is closely related to Gabaix and Koijen (2021), who quantify the inelasticity of equity markets and show how flows (which they treat as exogenous) create large price impacts. We contribute by endogenizing capital flows, demonstrating that income distribution shapes inflows and outflows, thereby linking equity markets to wealth inequality. Additionally, this implies that

[2] Given Haddad and Muir (2025)'s well-thematized review of the literature, we do not cite all the relevant papers here. In fact, our discussion on *Why are Equity Markets Inelastic?,* has already conducted a review of the relevant literature

the persistence of flows inherits the persistence of income shocks, which has implications for the half-life of the price impact of flows. Our assumptions on households' access to different assets are informed by empirical work on inequality, especially Kuhn et al. (2020), which shows that asset price fluctuations significantly impact wealth distribution, creating a wedge between income and wealth inequality.

Our model also builds upon work which emphasizes the importance of higher marginal propensities to save among the wealthy (Carroll (1998), Carroll (2000), Dynan et al. (2004), Fagereng et al. (2023)). One modeling technique to match higher MPS of the wealthy is to incorporate bequest motives for the wealthy, as argued by Straub (2019) and Gaillard et al. (2023). We contribute by demonstrating that market inelasticity is crucial to capture dynamics of wealth inequality even beyond heterogeneous savings rates.

Overall, our paper bridges the market macrostructure and wealth inequality literatures by introducing inelasticity as a key driver of wealth concentration. Our findings highlight the role of financial frictions in amplifying inequality and challenge the view that wealth dynamics are mean-reverting, suggesting that policy interventions may be necessary to counteract these effects.

2. Three Period Model

We first set up a three-period model which establishes the mechanism and lays out key channels of interaction. The model is highly stylized but it is useful to isolate the links between inelasticity, asset prices and inequality. In addition, it provides us with some basic testable empirical predictions, which validate our setup before moving on to the fully specified quantitative model.

2.1. Environment and Timing

2.1.1. Environment

In our model, households interact with financial markets through a financial intermediary, whose portfolio allocation decisions are central to determining asset prices and wealth dynamics. There are two assets — risk-free debt and risky equity in fixed supply which pays a dividend. There are two types of households. The non-wealthy household receives labour income, which it can augment by borrowing through a financial intermediary which channels credit. The non-wealthy household is institutionally restricted from investing in equity (for example, due to tastes and preferences, margin requirements, higher risk aversion, or other institutional constraints as documented in Campbell (2006) or Vissing-Jørgensen (2002)). On the other hand, the wealthy household can invest in both equity and debt, but is restricted in doing so only via the financial intermediary, which serves as the conduit for its investments. In other words, the wealthy household chooses how much to save through the financial intermediary, which in turn chooses how much to invest in equity and debt. This stylistic setup captures the empirical regularities of limited participation in equity markets and increased financial intermediation.

The financial intermediary (say, a mutual fund) is subject to a portfolio constraint, which requires it to hold a fixed proportion of equities and bonds in its portfolio. This constraint limits the intermediary's ability to fully adjust its allocation in response to market conditions, introducing frictions in the transmission of financial flows. Fig. 2 illustrates this setup, capturing the interactions two households and the financial intermediary.

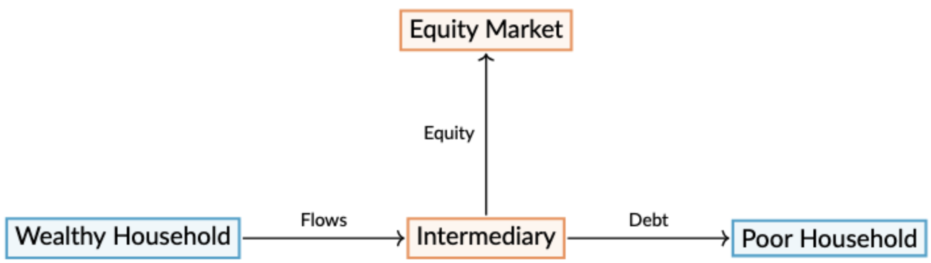


FIGURE 2. Environment

2.1.2. Timing

We analyze the model in a general equilibrium framework, with decisions and outcomes unfolding over three key periods. At $t = -1$, the financial intermediary optimally allocates its initial wealth between equities and bonds to maximize returns at $t = 1$, which consists of dividend income from equities and interest income from bonds. The equity position and bond position taken by the intermediary are assets of the wealthy household, while the non-wealthy household holds legacy debt equal to the intermediary's bond position. At this point, the intermediary is not subject to any portfolio constraints or mandates. Prices of assets are endogenously determined in a no-trade equilibrium.

At $t = 0$, both the wealthy and non-wealthy households solve a standard two-period consumption and savings problem. The wealthy household observes its labour income for the period and chooses how to allocate its resources between current consumption and investments, which it undertakes via the financial intermediary. Meanwhile, the non-wealthy household observes its labour income and decides how much to borrow from the intermediary to finance its current consumption. The wealth disparity between the two households arises initially from a negatively correlated endowment shock received by households $t = 0$. No additional issuance of equity takes place, hence the price of equity evolves to clear the market at the initial fixed supply of stock. These price changes result in portfolio revaluation effects, which influence the wealth of both households. However, because the wealthy household holds a larger share of equities, it benefits disproportionately from the increase in equity prices, further widening the wealth gap.

At $t = 1$, the financial intermediary unwinds its portfolio, and all profits from its holdings are rebated back to the wealthy household. The non-wealthy household pays down all of its debt. Fig. 3 provides an overview of this timeline and the sequence of events.

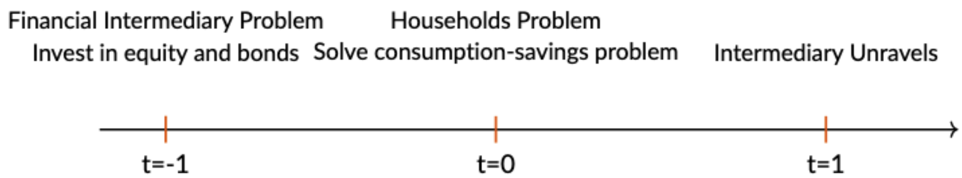


FIGURE 3. Timeline

2.2. Financial Intermediary

At time $t = -1$, given initial wealth W_{-1}, equity dividends D_1 and the two-period annualized interest rate $r_{f,-1}$, the representative financial intermediary chooses the fraction of its portfolio to be held in equity θ in order to maximise returns on final period wealth:

(1) $$\max_{\theta} \frac{1}{(1+r_{f,-1})^2}\left[\theta \frac{D_1}{p_{-1}} + (1-\theta)(1+r_{f,-1})^2\right]$$

Taking the first order condition with respect to θ yields the fundamental price of the asset at time $t = -1$:

(2) $$p_{-1} = \frac{D_1}{(1+r_{f,-1})^2}$$

θ should be interpreted as the aggregate weighted average portfolio share of equity of a continuum of financial intermediaries indexed by $i = 1, 2, \ldots I$, each of whom might have their own portfolio equity share θ_i arising from heterogenous micro-foundations. Each intermediary commands a share S_i of total equity holdings in the economy, $S_i \equiv \frac{pQ_i}{\sum_j pQ_j}$. Following Gabaix and Koijen (2021), we define the aggregate portfolio share of the representative financial intermediary as the equity-holdings weighted mean of individual portfolio equity shares:

(3) $$\theta \equiv \sum_i S_i \theta_i.$$

At $t = -1$, the following accounting identities (which describe portfolio holdings) must hold at the aggregate equity market level:

(4) $$\theta W_{-1} = p_{-1} Q_{-1}$$

$$(1-\theta)W_{-1} = B_{-1} \tag{5}$$

At time $t = 0$, the representative financial intermediary receives additional investment from the wealthy household F_0, and the equilibrium price of equity adjusts to p_0. However, it is not allowed to readjust θ due to frictions which we discuss below. Hence, its holdings at $t = 0$ follow these accounting identities:

$$\theta(p_0 Q_{-1} + B_{-1} + F_0) = p_0 Q_0(F_0) \tag{6}$$

$$(1-\theta)(p_0 Q_{-1} + B_{-1} + F_0) = B_0(F_0). \tag{7}$$

where $Q_0(F_0)$ represents new quantity of shares and $B_0(F_0)$ is the new quantity of bonds, both as functions of flows from the wealthy household. Wealth of the financial intermediary evolves as follows:

$$W_0 = p_0 Q_{-1} + B_{-1} + F_0 = p_0 Q_0 + B_0 \tag{8}$$

In other words, financial intermediary wealth can be written as (revalued) existing equity holdings plus existing bond holdings plus new inflows, or as value of new equity holdings plus new bond holdings. This identity implies that flows must account for new equity purchases plus new bond purchases:

$$F_0 = p_0(Q_0 - Q_{-1}) + (B_0 - B_{-1}). \tag{9}$$

At time $t = 0$, the financial intermediary's portfolio choice is subject to rigidity. This captures institutional mandates or the high costs of portfolio adjustment. For example, it might capture the idea that a mutual fund's investment committee decides upon a target equity allocation at the beginning of the quarter, and any deviation from target requires incurring costs to receive new approvals. While we do not take a specific stand on the underlying cause, we discuss several potential microfoundations for this rigidity in Appendix C. We revisit and relax this assumption in Section 3. We also consider the effects of adding in an arbitrageur in Appendix D.

2.3. Households

Non-Wealthy Household. At time $t = 0$, the non-wealthy household solves a standard 2-period consumption and savings problem. They maximise their lifetime utility over 2 periods by choosing consumption $\{c_0^P, c_1^P\}$ and additional borrowing B_0^P. The household receives exogenous earnings endowments $\{e_0^P, e_1^P\}$. Finally, the household has to pay back legacy debt $(1 + r_{f,-1})^2 B_{-1}$, where B_{-1} refers to the intermediary's holding of bonds at $t = -1$[3] and $r_{f,-1}$ is the annualized two-period

[3]Without loss of generality, this is assumed to be debt with a two-period maturity and no intermediate coupon payments.

interest rate applicable from $t = -1$ to $t = 1$. They solve:

$$\max_{c_0^P, c_1^P, B_0^P} u[c_0^P] + \beta u[c_1^P]$$

subject to

$$c_0^P \leq e_0^P + B_0^P \tag{10}$$

$$c_1^P + (1 + r_{f,-1})^2 B_{-1} + (1 + r_{f,0}) B_0^P \leq e_1^P \tag{11}$$

The Euler equation on borrowing for the non-wealthy household prices risk-free bonds.

Wealthy Household. At time $t = 0$, the wealthy household maximise lifetime utility by choosing consumption $\{c_0^R, c_1^R\}$ and how much additional investment to put in the financial intermediary F_0. We refer to their savings decision as *flows*. The household receives exogenous earnings endowments $\{e_0^R, e_1^R\}$ and at the end of period 1, the financial intermediary unravels and the household receives the dividends on equities $D_1 Q_0$ and the return on bonds $(1+\tilde{r}_{f,0})B_0$, where $\tilde{r}_{f,0}$ refers to the weighted average interest rate or the effective rate received. They solve:

$$\max_{c_0^R, c_1^R, F_0} u[c_0^R] + \beta u[c_1^R]$$

subject to:

$$c_0^R + F_0 \leq e_0^R \tag{12}$$

$$c_1^R \leq e_1^R + D_1 Q_0(F_0) + (1 + \tilde{r}_{f,0}) B_0(F_0) \tag{13}$$

where $1+\tilde{r}_{f,0} = (1+r_{f,-1})^2 \frac{B_{-1}}{B_0} + (1+r_{f,0}) \frac{B_0^P}{B_0}$. Importantly, the Euler equation of the wealthy household does not directly price equities; it only prices returns on investing in the financial intermediary.

In equilibrium, the equity market clears at an inelastically supplied amount of stock:

$$Q_{-1} = Q_0 = \bar{Q}. \tag{14}$$

The full definition of equilibrium is standard and relegated to Appendix F.1.

2.4. Qualitative Results

Under inelastic equity markets, what is the fundamental stock pricing equation? Imposing market clearing in equity markets yields the following Proposition, which establishes how the price of stock evolves from the fundamental price p_{-1} derived in Equation 2:

PROPOSITION 1. *(Equity Investment Channel) The price of the stock at time $t = 0$ is given by:*

$$p_0 = p_{-1} + \frac{\theta}{1-\theta}\frac{F_0}{Q_0}, \tag{15}$$

where p_{-1} is the fundamental price of the stock, and $\frac{\theta}{1-\theta}\frac{F_0}{Q_0}$ represents the non-fundamental component of the stock price.

PROOF. Appendix F □

This result demonstrates that for every \$1 of flow into the market, the value of stocks must increase by a factor of $\frac{\theta}{1-\theta} = \$4$, assuming an inelastic supply of stocks with $\theta = 0.8$. It would be useful to define $\frac{\theta}{1-\theta}$ as the *price impact* of flows for later use.

The initial price of equity, p_{-1}, reflects its fundamental value at $t = -1$. At $t = 0$, when capital flows into equity markets, the price of the stock is pushed higher, even in the absence of any changes to its fundamentals. This is a direct consequence of inelastic supply and the market's inability to absorb flows without price adjustments. This demonstrates the equity investment channel by which flows from the wealthy household lead to higher equity prices.

Another way to observe this is to note that incoming flows create additional demand for equity from the financial intermediary's perspective. However, due to fixed equity supply, there is no more equity to be purchased, and the entirety of the intermediary's excess demand must reflect in prices.

The borrowing channel can be demonstrated by tying the borrowing market and the price of equity together. Start by noting that flows (wealthy savings) is equal to non-wealthy household's borrowing. This leads to the following proposition:

PROPOSITION 2. *(Borrowing Channel) The level of flows is related to debt*

$$F_0 = B_0 - B_{-1}. \tag{16}$$

The price of equity is related to the amount of debt

$$p_0 = p_{-1} + \frac{\theta}{1-\theta}\frac{B_0^P}{Q_0}. \tag{17}$$

PROOF. Take

$$F_0 = p_0(Q_0 - Q_{-1}) + (B_0 - B_{-1})$$

and impose market clearing for equity $Q_0 = Q_{-1} = \overline{Q}$. □

Flows and household indebtedness are two sides of the same coin. In other words, savings by wealthy households has to equal borrowings by non-wealthy households. For every additional dollar of flows that comes in, there is no additional equity which can be purchased. Therefore, all flows must go towards new bond purchases. In equilibrium, new bond purchases are exactly equal to the demand for borrowing from non-wealthy households. However, because the bond position has now increased by a dollar, the value of equity holdings $p_0 Q_0$ needs to increase by the price multiplier. Therefore, borrowing by non-wealthy households has an impact on equity prices. The financial intermediary constraint, and more broadly inelastic markets, ties together borrowing and equity prices. This is a novel link between higher household indebtedness leading to higher equity prices in the presence of inelastic markets.

As stock prices are an increasing function of endogenously determined flows (or borrowing), what determines flows and borrowing? Assuming a log utility function, savings (flows) and borrowing are determined by endowments:

$$F_0 = B_0^P = \frac{e_1^P - \beta(1 + r_{f,0})e_0^P - (1 + r_{f,-1})^2 B_{-1}}{(1 + \beta)(1 + r_{f,0})} \tag{18}$$

Therefore, whenever the future level of absolute endowments of the non-wealthy is greater than the repayment of legacy debt and higher level of consumption, borrowing (and flows) are positive. This is in line with reality — while the income *share* of the non-wealthy has reduced, their income *levels* have increased over time, allowing them to sustain more debt.

In Appendix E.1, we show the dependence of equity prices on endowments more explicitly, provide conditions under which prices increase despite no change in fundamentals (dividends), and demonstrate how our model generates downward-sloping equity demand curves. In Appendix E.2, we derive the expression for price elasticity of demand for equities, making its dependence on θ clear.

Given prices are a decreasing function of quantity of equity, would the effects of additional flows disappear if we relax the assumption of fixed equity supply? In E.4, we show that extending the model to allow for an exogenous increase in equity supply dampens the price impact slightly, but for empirically-observed growth levels of equity supply and flows, the price impact is not fully unravelled.

Having established how equity prices evolve in our model, we now turn towards wealth inequality. The wealth position of the wealthy household at time $t = 0$ is simply their holdings of the mutual fund, i.e., $W_0^R = p_0 Q_0 + B_0$. This makes it clear that increases in equity prices and borrowing increase the wealth position of the wealthy, thereby increasing their wealth share in the economy. We relegate the definition of wealth shares and comparitive statics of the wealth share with respect to equity prices to Appendix E.5. Finally, in Appendix E.6, we consider how changes in income (endowments) effect equity prices and wealth inequality, finding that prices increase when current period wealthy income share increases. Our highly stylized yet highly tractable setup thus demonstrates how inelasticity of equity markets can generate a disconnect between income inequality and wealth inequality.

2.5. Reconciling Theoretical Predictions with Empirical Estimates

In this section, we use our stylized framework to derive an empirically testable prediction. We then compare the empirical counterpart of our prediction to estimates presented in prior studies. While this does not constitute proof for the validity of our model, it provides evidence of the veracity of our mechanism.

Recognizing that $Q_0 = Q_{-1}$ and $B_0^P = B_0 - B_{-1}$, we can reformulate Equation 17 as follows:

$$\frac{\Delta pQ}{\Delta B} = \frac{\text{Change in Market Value of Equity Holdings}}{\text{Change in Market Value of Bond Holdings}} = \underbrace{\frac{\theta}{1-\theta}}_{\text{Price Multiplier}} \tag{19}$$

We now evaluate how the model-implied price multiplier (representing the relative change in market values of equity and bond holdings for inelastic investors) compares to estimates from existing literature.

We collect quarterly data on the nominal value of equity and bond holdings for inelastic investors (Mutual Funds, Closed-end funds, ETFs, Government Retirement Funds and Insurance funds)[4] from the Federal Reserve's Financial Accounts of the United States Levels Tables (L.224 for Corporate Equities, L.208 for Debt Securities). Then, we take the first difference of both series and divide to find the ratio $\frac{\Delta pQ}{\Delta B}$. As this is a highly noisy measure, we first winsorize to remove the top and bottom decile of the measure, then filter using Hodrick-Prescott. We plot the trend component in blue in Figure 4. Note that this is equivalent to us plotting the trend analogue of our price multiplier in the data[5].

The empirical price multiplier aligns closely with the model-implied multipliers, as shown in Figure 4. Gabaix and Koijen (2021)'s estimate (orange line) corresponds to $\theta = 0.8$, which results in a price multiplier of 4. Meanwhile, Haddad et al. (2024) provide an estimate of $\theta = 0.64$ (green line), corresponding to a price multiplier of 1.78. The empirical estimate of the price multiplier for inelastic investors between 1998 and 2023 is remarkably well-bounded between the two model-implied multipliers. This is despite both GK and HHL using starkly different empirical strategies to

[4] We consciously choose a broader definition of inelastic investors to derive a more conservative estimate. We could instead choose to focus on a narrower group, excluding, for example, mutual funds with largely active mandates, and our results would be mechanically stronger as we limit focus to those who have explicitly stated stable equity-bond shares.

[5] The direct counterpart of the expression above would instead by a horizontal line representing the average price multiplier in the data of $\frac{\theta}{1-\theta} \approx 3$, which implies $\theta \approx 0.75$.

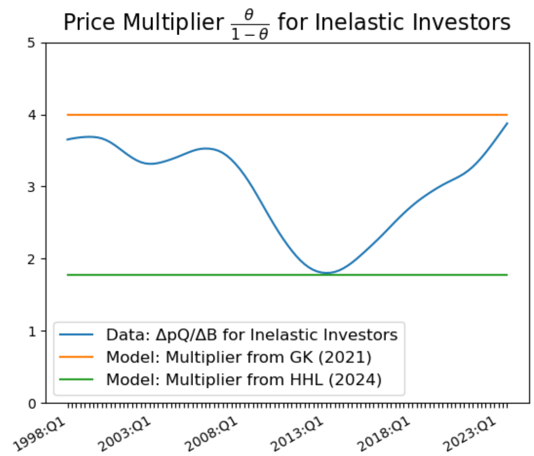


FIGURE 4. Comparison of the price multiplier derived from empirical data and the model, incorporating estimates from previous studies.

arrive at their estimates.

Notably, the estimate from Haddad et al. (2024) serves as a lower bound since their calculation of micro-elasticity is based on substituting within equities. However, our focus (as in Gabaix and Koijen (2021)) is the substitution between bonds and stocks — macro-elasticity. As bonds and stocks are less substitutable compared to two stocks within the broader equity asset class, macro-elasticity must be must be lower than micro-elasticity, implying a higher price multiplier. Consequently, Haddad et al. (2024)'s price multiplier estimate sets an empirically established lower bound.

This establishes two key points: 1) there exists a non-zero price multiplier for inelastic investors, implying that markets are indeed inelastic, demand curves are downward sloping, and equity prices respond to borrowing and flows; and 2) our highly stylized setup seems to be empirically relevant. This provides the first preliminary validation of the results discussed in this section.

3. Quantitative Model

In this section, we develop a tractable dynamic stochastic general equilibrium model to allow an analysis of the dynamics of wealth inequality over the long run. To match empirical evidence on heterogenous marginal propensities to save, we incorporate non-homothetic preferences for the wealthy household. We also relax the exogenous mandate assumption which restricts financial intermediaries' portfolio decisions by permitting them to deviate from their mandated target at a cost, allowing their optimisation to be much more flexible. In order to match quantitative properties which match the data, we add housing as a third asset class. We add a third type of household, the middle class, which is excluded from the equity markets (akin to non-wealthy households) but allowed to participate in the housing and bond markets.[6] To keep our analysis simple, we assume that households are static within types and cannot shift from one wealth group to another.[7]

In the dynamic setting, the divergence in income between top 10% households and the rest of the economy leads to significant differences in portfolio choices over time, further exacerbating inequality. Non-homothetic preferences play a central role here: as wealthier agents receive higher income endowments, they allocate more resources to risky assets. This, in turn, amplifies portfolio revaluation effects, to which wealthy agents have greater exposure compared to non-wealthy agents. Due to the presence of inelastic markets, this mechanism introduces a persistent component to wealth inequality.

3.1. Environment

The framework employs a perpetual youth model where agents face a probability of dying δ each period. Top 10% households discount future utility at rate ρ, while middle-class households discount future utility at ρ^M, with $\rho^M > \rho$. Households face uncertainty in their per-period, household-specific earnings, dividends on equity and dividends on housing (rental return).

There are three assets, risky equity, risky housing and risk-free debt. We continue to maintain the assumption that non-wealthy households cannot participate in equity markets but can borrow from debt markets. Additionally, we restrict non-wealthy households from investing in housing[8]. Wealthy households can participate in equity and bond markets through a financial intermediary. For tractability (and because housing is not a major component of wealthy household portfolios), we assume rich households don't invest in housing. The middle class can invest in housing and save (or borrow) in bonds, but cannot invest in equity. The financial intermediary, which continues to invest in equity and bonds only, is subject to a less rigid version of portfolio constraints relative to the three-period setup. This continues to ensure that equity markets are inelastic; however, this inelasticity is now allowed to vary over time. As noted before, the inclusion of an arbitrageur into our model does not significantly alter results (see Appendix D).

3.2. Financial Intermediary

The financial intermediary purchases bonds (or provides loans) to the non-wealthy household and can buy equity on behalf of the wealthy household. Each period, it pays out dividend and interest rate income back to the wealthy household, and receives flows (savings) from the wealthy

[6]The importance of housing to study asset prices and inequality has been emphasised in Kuhn et al. (2020), Piazzesi and Schneider (2016) and Cioffi (2021) among others. In addition to being a qualitatively different asset than equities or bonds, housing plays a key role in the portfolios of the middle class, defined as households in the 50-90th percentile of the wealth distribution. In fact, Kuhn et al. (2020) show that housing is *the* asset of the middle class.

[7]Kuhn et al. (2020) show that in the Panel Study of Income Dynamics (PSID) data, a relatively high share of households (>80%) remain within their respective wealth groups across time. Therefore, the 'synthetic' method of keeping households fixed within their respective wealth groups yields a good approximation of wealth dynamics.

[8]None of the mechanisms of our model change even if we allow Bottom 50% households to invest in housing.

household. The intermediary's objective is to maximize return on its assets under management (wealth) net of the cost of deviating from its target equity share θ^*:

$$\max_{\theta_t} \mathbb{E}_t \left[\beta(1 + r_t^{MF}) - \frac{\chi^{MF}}{2} \left(\frac{\theta_t - \theta^*}{\theta^*} \right)^2 \theta^* \right]$$

where β is the financial intermediary's discount factor, χ^{MF} parametrizes the cost of deviating from target, r_t is the risk-free return on bonds, and return on the financial intermediary's wealth (and return on equity) is:

$$1 + r_t^{MF} = \theta_t(1 + r_t^e) + (1 - \theta_t)(1 + r_t) \tag{20}$$

$$1 + r_t^e = \frac{D_{t+1} + p_{t+1}}{p_t}. \tag{21}$$

The intermediary's end-of-period t wealth is:

$$\tilde{W}_t = p_t Q_{t-1} + B_{t-1} + F_t = p_t Q_t + B_t. \tag{22}$$

and beginning-of-period $t + 1$ wealth is:

$$W_{t+1} = (1 + r_t^{MF})\tilde{W}_t = \underbrace{\frac{D_{t+1} + p_{t+1}}{p_t}}_{1+r_t^e} \theta_t \tilde{W}_t + (1 + r_t)(1 - \theta_t)\tilde{W}_t, \tag{23}$$

Finally, Equation 22 implies that flows are given by the following identity:

$$F_t = p_t(Q_t - Q_{t-1}) + (B_t - B_{t-1}) \tag{24}$$

Maximizing with respect to θ_t yields the following portfolio choice for the financial intermediary:

$$\theta_t = \theta^* \mathbb{E}_t \left[1 + \frac{\beta}{\chi^{MF}} (r_t^e - r_t) \right]. \tag{25}$$

The intermediary's portfolio decision regarding equity holdings is proportional to their equity allocation target θ^* and positively related to the equity premium. When the equity premium is high, the intermediary may choose to hold more equity, albeit at the cost of portfolio adjustment. As we shall see, this allows for time-varying market inelasticity.

3.3. Non-Wealthy Households

There is a representative non-wealthy household which chooses a stream of consumption and borrowing to maximize lifetime utility, subject to a budget constraint:

$$\max_{\{c_t^P, B_t^P\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \left[\frac{1}{1+\rho+\delta}\right]^t u[c_t^P]$$

subject to

$$c_t^P + (1+r_{t-1})B_{t-1}^P = e_t^P + B_t^P + T_t, \tag{26}$$

where T_t represents government transfers. Note that we do not assume non-homotheticity in the non-wealthy household's preferences because savings behavior towards the left of the wealth distribution is standard and approximated well by homothetic preferences.

3.4. Wealthy Households

We incorporate non-homothetic preferences for wealthy households by introducing utility over bequests in addition to the utility over consumption. Bequests are a significant factor in the aggregate economy and play a crucial role in explaining wealth inequality (De Nardi and Fella 2017). A key feature observed in empirical studies is that the saving rate of the rich exceeds that of the poor (Straub 2019; Mian et al. 2021b). We model bequests based on the seminal frameworks of De Nardi (2004) and Straub (2019), where bequests are treated as a luxury good. Non-homothetic preferences capture the idea that wealthier agents save a larger fraction of their income, either for bequests or other future expenditures. While the model does not require explicit enumeration of these expenditures, they may include items like college tuition, expensive medical treatments, or charitable giving (Benhabib and Bisin 2018).

The wealthy household chooses a stream of consumption and asset flows to maximize lifetime utility (utility over consumption plus the expected utility over bequests in case of death), subject to their budget constraint:

$$\max_{\{c_t^R, F_t\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \left[\frac{1}{1+\rho+\delta}\right]^t \left\{u[c_t^R] + \delta v[a_t^R]\right\} \tag{27}$$

subject to

$$c_t^R + F_t = e_t^R + D_t Q_{t-1}(F_{t-1}) + r_{t-1}B_{t-1}(F_{t-1}), \tag{28}$$

$$a_t^R = p_t Q_t + B_t. \tag{29}$$

As in the stylized model, the Euler equation of wealthy households (laid out in Appendix G.1) does not price equities directly. Moreover, it incorporates a non-standard term which captures non-homothetic preferences.

3.5. Middle Class Households

The middle class household chooses a stream of consumption, housing purchases and borrowing to maximize lifetime utility (utility over consumption plus the expected utility over bequests in case of death), subject to their budget constraint and a borrowing constraint which limits borrowing against the value of their housing assets in the spirit of Justiniano et al. (2019):

$$\max_{\{c_t^M, H_t^M, B_t^M\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \left[\frac{1}{1+\rho^M+\delta}\right]^t \left\{u[c_t^M] + \delta v[a_t^M]\right\} \tag{30}$$

subject to

$$c_t^R + p_t^H H_t^M + (1+r_{t-1})B_{t-1}^M = e_t^M + (D_t^H + p_t^H)H_{t-1}^M + B_t^M, \tag{31}$$

$$a_t^M = p_t^H H_t^M - B_t^M + \mho^M, \tag{32}$$

$$B_t^M \leq \tau p_t^H H_t^M. \tag{33}$$

where $\tau \in (0, \infty)$ represents the loan-to-value ratio. In equilibrium, we assume that housing is supplied inelastically at a level $\overline{H}$. We also assume that the binding constraint holds with equality in the steady state equilibrium.

3.6. Government

We assume that a government issues (exogenously determined) bonds to fund transfers to the non-wealthy household. Each period, the government maintains a balanced budget, such that new borrowing covers the cost of repaying interest and previous period borrowing plus transfers:

$$T_t = B_t^G - (1+r_{t-1})B_{t-1}^G \tag{34}$$

In the absence of household credit risk, bonds issued by the government and bonds issued by households are qualitatively equivalent. Therefore, government bonds are also purchased by the financial intermediary.

Finally, the definition of equilibrium is standard and similar to the three-period model.

DEFINITION 1. *An equilibrium comprises of choices* $\{c_t^R, c_t^P, c_t^M, F_t, B_t^P, B_t^M, B_t^G, H_t^M, \theta_t\}_{t=0}^{\infty}$*, quantities* $\{Q_t, B_t\}_{t=0}^{\infty}$*, prices* $\{p_t, p_t^H, r_t\}_{t=0}^{\infty}$ *and endowments* $\{\overline{Q}, \overline{H}, e_t^P, e_t^R, e_t^M, D_t, D_t^H\}_{t=0}^{\infty}$*, such that households are optimising, the financial intermediary is optimising, and all markets clear.*

3.7. Qualitative Results

Imposing equity market clearing, we can derive the price of equity. As seen in our three-period model, the price of equity is influenced by flows from the wealthy household and borrowing by the non-wealthy household:

PROPOSITION 3 (Price of Equity). *The price of equity depends on flows and borrowing:*

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{F_t + B_{t-1}}{Q_t}. \tag{35}$$

PROOF. Appendix F.7. □

We can re-write the equilibrium pricing equation by recursive substitution to yield:

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{\sum_{s=0}^{t} F_s}{Q_t}. \tag{36}$$

This is a *backward-looking* expression for equity prices, which relies on the history of flows from the wealthy household and the current portfolio allocations to equity made by the financial intermediary. We can also derive a *forward-looking* pricing equation, making the dependence of equity prices on dividends and discount rates explicit, in the following:

$$p_t = \mathbb{E}_t\left[\sum_{s=1}^{\infty} \frac{D_{t+s}}{\Pi_{j=s-1}^{\infty}(1+r^e_{t+j})}\right] \tag{37}$$

where $1 + r^e_t \equiv 1 + r_t + \frac{\chi^{MF}}{\beta}\left(\frac{\theta_t - \theta^*}{\theta^*}\right)$ represents the return on equity, which depends on time-varying equity premium captured by the last term. We relegate the proof for the two expressions above to Appendix F.8.

We can use the backward-looking expression to understand how past flows continue to effect present equity prices. Consider a flow which occurred at time 0. At time t, the price impact of the flow (the coefficient of F_0) is $\frac{\theta_t}{1-\theta_t}\frac{1}{Q_t}$. At time $t+1$, the price impact of the flow is $\frac{\theta_{t+1}}{1-\theta_{t+1}}\frac{1}{Q_{t+1}}$. In equilibrium, where $Q_t = Q_{t+1}$, does the impact of F_0 increase or reduce? This depends upon the difference in equity allocation $\theta_{t+1} - \theta_t$, which in turn depends upon the difference in equity premium over time. If premium at $t+1$ exceeds premium at t, past flows have a stronger impact on price. This implies that for a given flow in the past from wealthy households (say, due to a positive income shock), any future positive dividend shocks will both increase flows *and* increase the salience of past flows, pushing prices up higher[9].

The elasticity of demand for equities in this model is no longer time invariant, as equity demand

[9]It is easy to modify the model to include a 'half-life' of flows, but we choose not to include the modification to keep the model simple

by the financial intermediary responds to the endogenous evolution of equity premia. In Appendix E.3, we derive the expression for the time-varying Hicksian elasticity. Moreover, in Appendix E.7, we demonstrate how our model generates a negative relationship between change in top 10% wealth share and change in market elasticity over time.

4. Quantitative Analysis

4.1. Calibration

Having set up the model and characterized equilibrium, we are now in a position to calibrate functional forms and parameter values to match data.

4.1.1. Functional Forms

First, we follow Straub (2019) in calibrating the functional form for utility.

ASSUMPTION 1 (Functional form for utility). *We assume the following functional forms for the utility function over consumption and bequests:*

$$u[c] = \frac{c^{1-\sigma} - 1}{1 - \sigma} \tag{38}$$

$$v[a] = \frac{a^{1-\Sigma} - 1}{1 - \Sigma}. \tag{39}$$

We impose that $\Sigma < \sigma$ which implies non-homothetic preferences.

We assume that middle class households have a lower elasticity over income parameter $\sigma^M < \sigma$, as well as lower marginal utility of bequests such that $\Sigma^M < \Sigma$.

In Appendix G, we discuss how the above functional forms translate into non-homothetic preferences. We assume that earnings of the non-wealthy, wealthy, middle class, equity and housing dividends follow AR(1) processes with a given persistence, steady state values and standard deviations. These are also laid out in Appendix G.

4.1.2. Parameters

We report the calibrated values for exogenous parameters in table 1. Our main exercise simulates how the economy evolves from 1989 to 2023, assuming that the start and end points represent steady states. Therefore, we report two values for parameters which are time-varying.

We choose the household discount rate ρ so that steady state interest rate r matches the yield on 10Y U.S. Treasury Bonds in January 1989 and March 2023. We calibrate mortality rate δ to match U.S. mortality of 984.1 deaths per 100,000 population in 2022, sourced from the Center for Disease Control's National Vital Statistics System and reported in their FastStats publication.

TABLE 1. Calibration for quantitative model.

Parameter	Description	Value	Source
Consumption			
δ	Mortality rate	0.00984	CDC report
ρ^{1989}, ρ^{2023}	Household discount	0.0802, 0.0251	Target 10Y Treasury Yields
$\rho^{M,1989}, \rho^{M,2023}$	Middle Class discount	0.1402, 0.0752	Regularity Conditions
σ	Permanent Income Elasticity	4.1	Straub (2019)
σ^{M}	Permanent Income Elasticity	1.6	Straub (2019)
Σ	Non-homotheticity	2.87	Straub (2019)
Σ^{M}	Non-homotheticity	1.50	Regularity Conditions
Intermediary			
θ^{*}	Fund mandate target	0.84	Gabaix and Koijen (2019)
χ^{MF}	Fund adjustment cost	171	Empirical regressions
Equity & Housing			
$\bar{D}^{1989}, \bar{D}^{2023}$	Steady State Dividend	0.256, 0.714	Match Shiller Dividend Level
σ^{D}	St.Dev. of Dividend Process	0.15	Match Shiller Dividend Volatility
$\bar{D}^{H,1989}, \bar{D}^{H,2023}$	Steady State Housing Rents	0.001, 0.002	Match Price-Rent Ratio
$\sigma^{D^{H}}$	St.Dev. of Rental Process	0.01	Match Price-Rent Ratio Volatility
τ	Housing LTV Ratio	0.25	Match Price-Rent Ratio
Income Processes			
$\{\bar{e}^{P}, \bar{e}^{M}, \bar{e}^{R}\}^{1989}$	1989 Labour income shares	10.1, 46.3, 43.5	Blanchet et al. (2023)
$\{\bar{e}^{P}, \bar{e}^{M}, \bar{e}^{R}\}^{2023}$	2023 Labour income shares	7.9, 39.0, 53.0	Blanchet et al. (2023)
$\sigma^{P}, \sigma^{M}, \sigma^{R}$	St.Dev. of Income Processes	2.2, 7.3, 9.5	Δ Income Share (BSZ 2023)
Asset Holdings			
$\{\vartheta^{M}, \vartheta^{P}\}^{1989}$	Other Assets	9, 18	Match 1989 Wealth Share (BSZ 2023)
$\{\vartheta^{M}, \vartheta^{P}\}^{2023}$	Other Assets	8.5, 16	Match 2023 Wealth Share (BSZ 2023)
Govt. Borrowing			
$\bar{\alpha}^{1989}, \bar{\alpha}^{2023}$	Share of Govt. Borrowing	0.512, 0.609	Fed Flow of Funds

We calibrate the permanent income elasticity σ and σ^{M}, and the elasticity parameter on bequests Σ from Straub (2019). Specifically, we chose σ to match the average of elasticities across all age groups, while we chose σ^{M} to match the elasticity of the 65+ years cohort. Then, Σ is calibrated such that $\Sigma = \phi\sigma$ where $\phi = 0.699$ from Straub (2019). Finally, Σ^{M} and ρ^{M} are calibrated to obey a regularity condition for the existence of equilibrium, discussed in Appendix H.

The fund mandate target θ^{*} is calibrated to target the estimate of the price multiplier derived in Gabaix and Koijen (2021), in which they use a Granular Instrumental Variables strategy to esimate a price multiplier of 5.3, implying an equity share of 84%.

There is no appropriate calibrated value for χ^{MF} from the literature, therefore we rely on empirical estimates. Consider the expression for portfolio choice of the financial intermediary (Equation 25). We assume a financial intermediary discount rate β of 0.99, and $\theta^{*} = 0.84$ based on the discussion above. Next, we collect data on the quarterly equity premium in the U.S. $(r_t^{e} - r_t)$ and the time-varying equity share of portfolio for inelastic investors (θ_t). We regress the empirical equity share relative to the target $(\frac{\theta_t}{\theta^{*}})$ on the equity risk premium and a constant. The estimate of the coefficient on the risk premium helps us calculate an implied χ^{MF}, which is calibrated to 171.

We calibrate $\bar{D}$ to match the 1989 and 2023 dividend levels (in hundreds of dollars) from Shiller's online repository of stock market data used in Irrational Exuberance. Similarly, $\bar{D^H}$ and σ^{D^H} are calibrated to match the house price to rent ratio of 20, taken from Piazzesi and Schneider (2016).

We calibrate $\bar{e}^P$, $\bar{e}^M$ and $\bar{e}^R$ to match the 1989 and 2023 value for bottom 50%, middle 40% and top 10% share of income from Blanchet et al. (2022). Notably, $\bar{e}^R$ and $\bar{e}^M$ are calibrated after netting out the effect of dividend incomes, $\bar{D}\bar{Q}$ and $\bar{D^H}\bar{H}$. σ^P, σ^M and σ^R, which control the size of a one-time shock, are calibrated to match the respective fall and rise in income shares of -2.2 p.p., -7.3 p.p. and 9.5 p.p. respectively from 1989 to 2023.

Other Asset holdings $\mathcal{O}^M$ and $\mathcal{O}^P$ are a stand-in for asset holdings of the middle class and non-wealthy which ensure a positive net asset position. While a fuller model, allowing for all household types to optimize portfolios between the three asset types (with positive net wealth constraints) would endogenize these holdings, this would unnecessarily complicate the model, preventing analytical solutions. Crucially, this assumption only affects wealth share levels, not dynamics, ensuring that the model's results are not a product of this assumption. We calibrate these to match the 1989 and 2023 wealth shares of the top 10% and middle 50-90% from Blanchet et al. (2022).

We construct the government bond series by calibrating the share α_t of government borrowing as a fraction of total household and government borrowing in the U.S. from 1989 to 2023, i.e., $B_t^G = \alpha_t(B_t^P + B_t^M + B_t^G)$. Therefore, we calibrate steady state $\bar{\alpha}$ to match 1989 and 2023 shares, taken from the Fed's Flow of Funds Nonfinancial Debt series.

4.2. Can the model replicate observed trends?

Using income share and dividend shocks, can the model directionally match simultaneous trends shown in Figure 1? We focus here on the responses to income and dividend shocks of equity prices (or market capitalization), borrowing (total debt outstanding) and wealth vs. income inequality. We relegate the full set of impulse response functions (IRFs) for other macro-variables to Appendix I.

We show that the model is able to simultaneously generate higher equity prices, higher borrowing, higher wealth inequality, and greater and persistent divergence between wealth and income inequality.

We construct IRFs using a first-order perturbation approach. First, we identify the deterministic steady state. Then we construct a local approximation by linearizing the system around that point. This first-order perturbation approach translates each endogenous variable's response into a linear function of its past values and the exogenous shocks. By introducing a one-time shock, we then track how each variable responds over time relative to the steady state. This process reveals the model's core transmission mechanisms and the persistence of shocks.

4.2.1. Equity Prices: Inelastic vs. Elastic Markets

What is the difference between equity price responses to shocks in the economy under inelastic markets relative to the elastic pricing benchmark? In order to establish the appropriate elastic markets benchmark, we consider a version of our model in which the financial intermediary is not subject to costs of deviating from its target equity share. In this case (derived in Appendix F.4.2), the pricing function collapses to the version found in Lucas (1978), and depends only on the future stream of dividends. To further isolate the effect of equity investment, borrowing and dividend flow on equity prices, we consider a special case of our model where there is no middle class and no housing.[10]

We take the equity price in our baseline model and the equity price in a Lucas benchmark model, and consider three shocks — a positive income shock to wealthy households, a negative income shock to non-wealthy households, and a positive equity dividend shock. In Figure 5, we study how price responses differ between the baseline and benchmark economies. In each panel, we plot the impulse response of equity prices in both models. We shade in green the price increase (if any) of the inelastic markets model relative to benchmark, and red vice-versa.

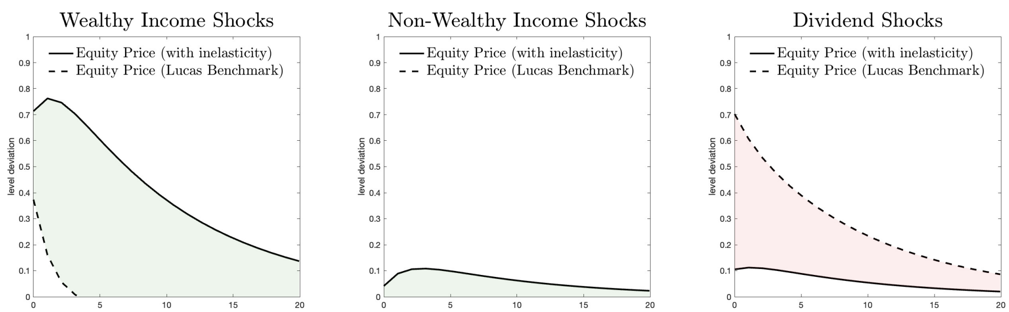


FIGURE 5. Panel A shows equity price IRF in response to a positive labour share shock to the top 10%. Panel B shows equity price IRF in response to a negative labour share shock to the bottom 50%. Panel C shows equity price IRF in response to a positive equity dividend shock.

Equity price in the elastic benchmark does not react to non-wealthy income shocks, and deviates slightly in the case of wealthy income shocks (through the channel of lower interest rates). However, in the inelastic economy, price responds very strongly to wealthy income shocks, demonstrating the equity investment channel. Price also react to non-wealthy income shocks through the borrowing channel. Therefore, the distribution of income shocks matters for equity prices.

While inelasticity in equity markets results in highly magnified price responses to distributional shocks in the economy, it dampens the sensitivity of equity prices to dividend changes. This hints

[10]This is to ensure that the interest rate response is free from confounding factors including the middle class' borrowing constraint and their non-homothetic preferences. In Appendix I.2, we present the result of the same exercise from the full model. We find that while price responses to non-wealthy and dividend shocks are qualitatively same, equity prices in the elastic benchmark respond much more strongly on impact to wealthy shocks. However, the inelastic markets price response is much more persistent, with effects lasting more than 20 periods, as opposed to 8 periods.

towards the idea that the excess volatility in equity prices might occur due to volatility in income and endowments, even in the absence of meaningfully volatile dividend changes.

4.2.2. Debt: Inelastic vs. Elastic Markets

Next, we study the difference between borrowing responses under inelastic markets relative to elastic markets. The appropriate elastic markets benchmark now is a version of our model where the rich can directly invest in equities and bonds, bypassing the financial intermediary. This ensures that both bonds and equities are priced using the wealthy household's Euler equation, assuming an adjustment cost of holding bonds for the wealthy. We will also return to this elastic markets benchmark in Section 5.

In Figure 6, we plot the impulse response of total debt in both models. We shade in green the higher borrowing (if any) of the inelastic markets model relative to benchmark, and red vice-versa.

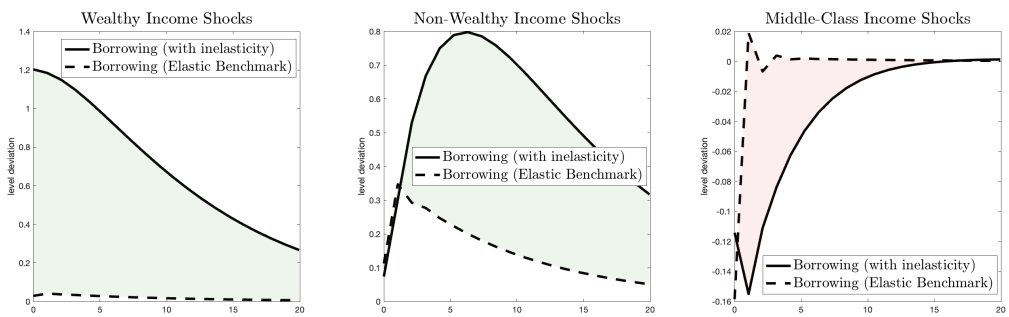


FIGURE 6. Panel A shows total bonds IRF in response to a positive labour share shock to the top 10%. Panel B shows total bonds IRF in response to a negative labour share shock to the bottom 50%. Panel C shows total bonds IRF in response to a negative middle-class household income shock.

Clearly, inelasticity implies that the effects of wealthy and non-wealthy income shocks on borrowing are significantly larger and more persistent. In an elastic markets model, a positive wealthy income shock will result in a (very small) increase in demand for bonds, with a higher proportion being invested in equity. A negative non-wealthy shock will generate more borrowing from the non-wealthy, but this mean reverts quickly as there is no intermediary having to hold increased bonds in order to maintain its mandate. In the case of a negative middle class income shock, the binding borrowing constraint of the household forces lower borrowing. In an inelastic market, however, this lower borrowing persists for longer as the financial intermediary's bond portfolio takes longer to recover its steady state value.

Therefore, inelasticity generates magnified borrowing responses at the same time as it generates magnified equity price responses.

4.2.3. The Inequality Multiplier

As argued in Benhabib et al. (2017) among others, models of earnings inequality fail to match the dynamics of top wealth inequality. In the workhorse Aiyagari-Bewley models, the properties of the labour earnings distribution fed into the model are inherited one-to-one by the wealth distribution. In the data, however, wealth inequality has increased more than income inequality (see Figure 1). What explains this wedge? Do inelastic markets generate a wedge between top 10% income and wealth shares? In this exercise, we consider the effect of a one-off household income shock on income and wealth inequality, measured by top 10% shares.

We find that inelastic markets amplify the effect of increases in income inequality, causing much larger increases in wealth inequality. We term this magnifying effect of inelastic markets as the *Inequality Multiplier*.

In Figure 7, we plot top 10% income and wealth share impulse responses to labour income shocks to different household types. To ensure comparability, we consider equisized shocks to all three households (positive for top 10%, negative for middle 40% and bottom 50%). If the top 10% wealth share response is more pronounced than the top 10% income share response, we shade the difference in red, and green vice-versa.

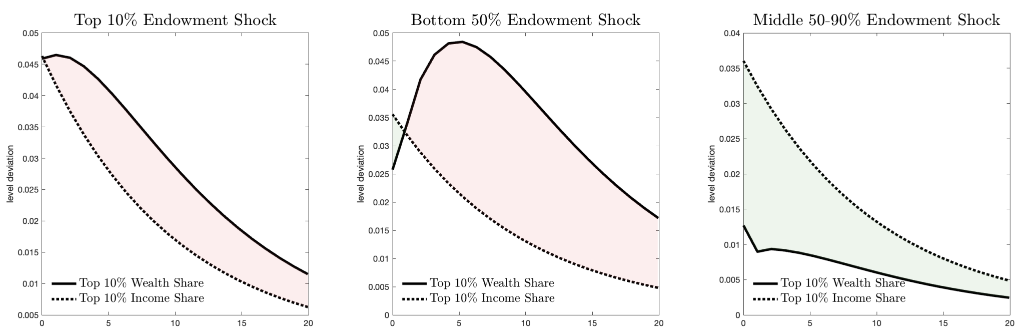


FIGURE 7. Panel A shows the income and wealth share IRFs in response to a positive labour share shock to the top 10%. Panel B shows income and wealth share IRFs in response to a negative labour share shock to the bottom 50%. Panel C shows income and wealth share IRFs in response to a negative labour share shock to the middle class, 50-90%.

When the income share of the wealthy increases, their wealth share rises more relative to steady state and remains persistently high, driven by the portfolio revaluation channel. Initially, the gap between the income share and wealth share widens during the first few periods. This is because the initial increase in wealth for the top 10% households prompts them to save a larger fraction of their wealth, consistent with non-homothetic preferences. This additional saving triggers further rounds of portfolio revaluation effects, ultimately amplifying the wealth share of the top 10%.

The effect of a drop in income share of the non-wealthy on wealth share of the wealthy is larger in magnitude and more persistent. Even though the response of wealth inequality is relatively muted on impact, the additional borrowing demanded by non-wealthy households over subsequent periods to smooth consumption in the face of an endowment shock pushes up the portfolio value of the wealthy through the borrowing channel.

In the case of a negative middle class income share shock, however, wealth inequality effects are not as pronounced, and remains lower than the income share response. This is consistent with our findings in Appendix I, where middle class shocks have a more muted response on equity prices due to aggregate borrowing not responding much.

We conclude that the inequality multiplier is a promising explanation to explain the wedge between top income shares and top wealth shares. Income share changes cause larger and persistent changes in portfolio values of the wealthy, a novel channel which does not exist in canonical heterogenous agent models.

In sum, the model performs much better than an elastic markets benchmark in simultaneously matching higher market capitalization, higher total debt and greater divergence between wealth and income inequality. In Appendix J, we extend the one-time shock analysis to a fully simulated model under perfect foresight with expectation errors (see Section 5.2) to demonstrate the model's long term performance on matching the three empirical trends.

5. Dynamics of Wealth Inequality

One of the key contributions of Straub (2019), Benhabib et al. (2017) and Mian et al. (2021b), among others, is to demonstrate the importance of including non-homothetic, wealth-dependent preferences in order to match the dynamics of top wealth inequality. Our model borrows non-homothetic preferences but in addition includes inelasticity in asset markets. Does the inelastic markets model help improve our ability to match the dynamics of wealth inequality? What is the relative importance of the equity investment channel and the borrowing channel?

5.1. Counterfactual Simulations under Perfect Foresight

First, we conduct deterministic simulations, i.e., where agents have perfect foresight. We initialise the economy in January 1989 and feed in the realised income share of the top 10%, middle 50-90% and the bottom 50%, along with the realised equity dividend, housing dividend and government borrowing processes. We assume that all agents have perfect foresight over their future realisations of labour and dividend income, until March 2023, at which point we assume the economy hits steady state. We then trace how wealth inequality (measured by top 10% wealth share and middle 40% wealth share), an un-targeted moment, evolves under our model.

With agents correctly anticipating all future shocks to their income, we numerically solve for the sequence of endogenous variables that satisfies the model's non-linear equations at every point in time, employing a Newton algorithm. By imposing terminal conditions (the steady state at March

2023), the solver enforces consistency between the start and end of the simulation horizon. As a result, we can analyze how the economy's variables evolve under fully anticipated shocks.[11]

To study the contribution of inelastic asset markets in explaining wealth inequality, we conduct two counterfactual exercises. In the first exercise, we switch of inelastic markets and impose homothetic preferences. Practically, this is equivalent to allowing wealthy households to invest in equities and bonds directly, bypassing the financial intermediary's constraints[12], and setting the marginal utility of bequests equal to the marginal utility of consumption. In the second exercise, we add back non-homothetic preferences, but retain elastic asset markets. Given the work of Straub (2019), Mian et al. (2021a) and Gaillard et al. (2023) who have already shown the importance of non-homotheticity in matching dynamics of wealth inequality, we argue that the second exercise provides the true benchmark against which the inelastic markets model needs to be compared.

Figure 8 plots the empirical wealth shares and simulated wealth shares under i) elastic markets with homothetic preferences; ii) elastic markets with non-homoethetic preferences; and iii) inelastic markets and non-homothetic preferences.

Under perfect foresight, our model is able to replicate the path of top 10% and middle 40% wealth shares with a high degree of precision relative to the elastic markets benchmark. First, as in the literature, we demonstrate that if preferences are homothetic, marginal propensity to save for the wealthy is invariant to wealth levels, and wealth inequality does not change.

Second, the elastic markets benchmark, while being able to match the directional change in wealth inequality as noted in previous studies, over(under)-shoots wealth shares in 2023. Moreover, its adjustment dynamics are too rapid, and most of the action is concentrated in a large jump at $t = 1$.

On the other hand, the inelastic markets model performs much better in matching the dynamics of wealth inequality. Why does inelasticity prevent the model from experiencing a large jump at the beginning? When the wealthy foresee higher future endowments, their demand for saving increases (due to higher substitution effect), augmented further by their bequest motive. However, non-wealthy and middle class households foresee falling income, implying that rates need to adjust downwards to incentivise borrowing. This can happen freely in elastic markets, leading to the large first period jump. However, inelasticity adds market frictions which make rate adjustments

[11]The alternative approach we could have taken is to use the extended path algorithm proposed by Fair and Taylor (1983) and utilised in Afrouzi et al. (2024), among others. Here, we solve the model under rational expectations. We start with an initial guess for the path of future shocks and endogenous variables, solve forward using a perfect foresight solver, and then updates the guess based on those results. This procedure continues until the path of shocks and variables is consistent with the rational expectations equilibrium. Consequently, it can capture non-linear dynamics without relying on approximate linearization methods.

[12]In order to pin down portfolio shares, we assume a quadratic adjustment cost parametrised by $\chi^R = 1$ for the wealthy household's bond holdings. Therefore, the only changes in the model are the removal of the financial intermediary's portfolio optimisation problem and the pricing function, and introduction of the wealthy household's Euler equation over equities and bonds.

FIGURE 8. Dynamics of Wealth Inequality: Perfect Foresight

Note: The perfect foresight simulation initalises the economy at the January 1989 level of labour income shares and dividends. Then, agents are provided with the full realisation of income shares from January 1989 to March 2023, and the model is simulated in a deterministic simulation. The figure plots percentage deviation of wealth shares relative to its 1989 level. Empirical income and wealth share data is taken from Realtime Inequality at the Household level (Blanchet, Saez and Zucman).

more sluggish, and not all demand for additional bonds can be cleared. Therefore, the increase in portfolio values of the wealthy is more gradual. Therefore, the modelling of inelasticity in asset markets is crucial to matching wealth inequality dynamics, beyond non-homothetic preferences.

The inelastic markets model struggles to match the rapid increase (rapid decrease) in top 10% wealth shares (middle 40% wealth shares) seen in the post-Global Financial Crisis (GFC) years (2008-2015), followed by a rapid reversal post-2016. Next, we turn to exploring potential explanations for this phenomenon.

5.2. What drives the wealth inequality increase post-GFC?

Why does our model perform remarkably well from 1989 to 2008, but struggles post-2008? Our hypothesis is that in its current form, the simulation fails to capture the large increase in debt levels (primarily due to higher government borrowing) post-2008, which exacerbates wealth inequality through the borrowing channel.

The perfect foresight simulation suffers from the drawback that it mechanically kills incentives for middle-class and non-wealthy households to increase their leverage. As households perfectly observe their stream of falling income shares, they substitute consumption for borrowing. Therefore, while perfect foresight captures the equity investment channel, it does not account for the borrowing channel.

To remedy this, we simulate an economy where agents have perfect foresight over the *trend* in their income shares, but can make expectation errors (i.e., face unexpected shocks) about the *cyclical* deviations of their income shares. Specifically, we continue to assume that from 1989-2008, households perfectly foresee their income share realisations. The 2008 GFC acts as an unexpected shock. Post-2008, households cannot perfectly foresee income share realisations. Instead, they expect their income shares will be equal to a smoothed trend which captures low-frequency movements.[13] Then, each period, the actual income share realises, causing households to be shocked. In other words, households receive a series of MIT shocks relative to the expected trend of income shares. Households continue to fully foresee the paths of equity and housing dividends, as well as government borrowing.

Figure 9 plots the empirical wealth shares and simulated wealth shares. The simulation without MIT shocks reproduces the dynamics obtained in Figure 8. The simulation with MIT shocks features households getting hit with MIT shocks post-2008.

FIGURE 9. Dynamics of Wealth Inequality: Perfect Foresight with Expectation Errors post-2008

Note: The perfect foresight simulation initalises the economy at the January 1989 level of labour income shares and dividends. Then, agents are provided with the full realisation of income shares from January 1989 to December 2007. From January 2008, agents expect income shares to follow a smoothed trend. Each period, they make expectation 'errors' equivalent to the deviation of the actual income share relative to the trend. The figure plots percentage deviation of wealth shares relative to its 1989 level.

The model is now able to match the large increase in wealth inequality observed post-2008. This is because of the borrowing channel being re-activated — middle class and non-wealthy households are constantly shocked on the downside, which motivates them to increase borrowing, because they expect labour income shares to revert to a higher trend level next period. Moreover, government borrowing in this period also rises rapidly, pushing up the supply of bonds. This pushes up borrowing and equity prices, leading to larger increases in wealth inequality. The model

[13]We fit a smooth, non-linear trend to the series using a penalized smoothing technique, with a large smoothing parameter to ensure that the trend reflects the broader, long-term evolution of the series. Technically, the procedure follows a standard approach of penalizing the second difference of the fitted trend, as in Hodrick and Prescott (1997). We implement this procedure using a higher-than-usual smoothing parameter ($\lambda = 1,000,000$) to focus on long-run behavior rather than business-cycle variation.

also manages to replicate the large drop in interest rates when the crisis hits, as well as large deleveraging by bottom 50% households in the years following the crisis.

We conclude that the post-GFC wealth inequality boom can be largely attributed to higher borrowing leading to higher equity prices (the borrowing channel). The assumption of what information sets are available to households is critical to determine saving and borrowing dynamics — perfect foresight leads to long-term movements, while period-by-period uncertainty (rational expectations) creates short-term fluctuations. This naturally leads us to the question — what is the relative importance of the equity investment channel versus the borrowing channel? Our hypothesis from visually observing Figure 8 is that the equity investment channel explains low-frequency, trend movements, while the borrowing channel explains high-frequency, cyclical movements.

5.3. Equity Investment vs. Borrowing Channel

In the previous exercise, we demonstrated that the borrowing channel is particularly important in explaining the large, off-trend increase in wealth inequality following the Global Financial Crisis. In our next exercise, we dive deeper into the channels which drive wealth inequality. Quantitatively, which channel is more important? Which aspect of wealth inequality dynamics does each channel capture?

To answer this question, we consider the following two counterfactual exercises, which decompose the total increase in wealth inequality into components related to the equity investment channel and the borrowing channel. To isolate the equity investment channel, we simulate a version of the model (with MIT shocks) where the income share of top 10% households and equity dividends continue to follow the empirical paths, but income shares of middle 40% and bottom 50% as well as housing dividends are set to remain constant and equal to their 1989 levels. Then, to isolate the borrowing channel, we simulate a model where incomes shares of middle 40% and bottom 50% and housing dividends follow their respective empirical paths, but top 10% income share and equity dividends remain at their 1989 levels.

Figure 10 plots the simulation with MIT shocks from Figure 9, the simulation with only top 10% income and equity dividend shocks active (only equity investment channel), and the simulation with only middle 40%, bottom 50% income and housing dividend shocks active (only borrowing channel).

A stark picture emerges from the decomposition exercise — the equity investment channel explains the *trend* component of wealth inequality, while the borrowing channel explains the *cyclical* component of wealth inequality.

The equity investment series closely matches the perfect foresight simulation from Figure 8, once again indicating that when agents have perfect foresight, they are disincentivised to borrow, so all equity price increase comes from higher savings by the rich. The equity investment channel

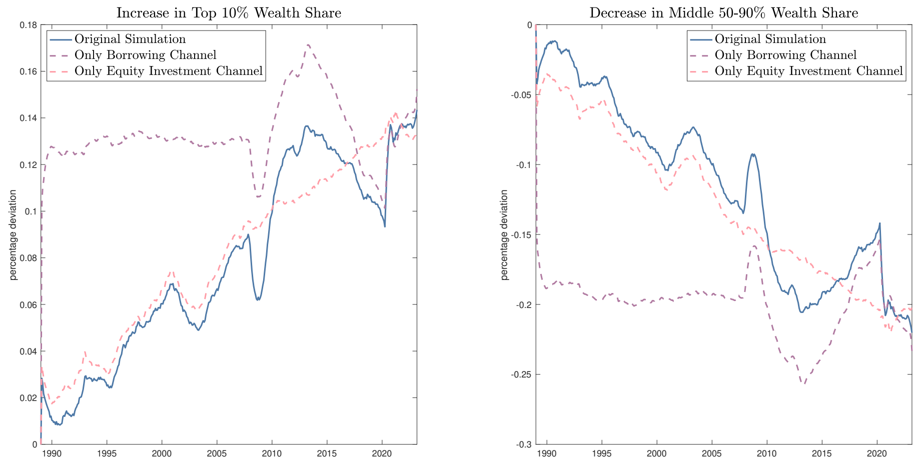


FIGURE 10. Dynamics of Wealth Inequality: Decomposition into Channels

Note: The figure plots percentage deviation of wealth shares relative to its 1989 level.

replicates the low-frequency component of wealth inequality with remarkable precision, but misses the large off-trend increase (and subsequent decrease) post-2008. This is where the borrowing channel comes in. By itself, and without MIT shocks, the borrowing channel would predict a constant path for wealth inequality. However, in the post-2008 era, the large build-up in government and household debt translates into a large increase in wealth inequality on the business cycle frequency. Jointly, both channels can successfully replicate the full dynamics of wealth inequality, including low-frequency and high-frequency components.

What is the implication of this result? It suggests that both debt-based explanations of wealth inequality (which posit that a build-up in household debt exacerbates inequality)[14] and investment-based explanations (which attribute inequality to higher capital accumulation by rich or higher returns on rich investments)[15] work in tandem. From a policymaker's perspective, it suggests that the policy prerogative differs based on if the objective is to tackle long-run increase in inequality, short-to medium-run implications of inequality (such as on financial stability), or both[16].

[14] Examples include Rajan (2011), Kumhof et al. (2015), Mian and Sufi (2015), Mian et al. (2021b)

[15] Examples include Piketty (2014), Saez and Zucman (2016), De Nardi and Fella (2017), Kuhn et al. (2020)

[16] If the long-run increase in inequality is the concern, it is more crucial for policy to target the investment-based channel, such as through higher asset market participation, taxes on unrealised capital gains, or wealth taxes on bequests. If the short- to medium-run implications of inequality on financial stability is the concern, policy should target borrowing-based channels, such as through leverage restrictions on households, higher loan-to-value ratios, or reduced bond demand from intermediaries. If both effects are a concern, policymakers should look to regulate inelastic financial intermediaries better to alleviate the effects of higher inelasticity, through, for example, ensuring that financial regulation does not impose a high degree of portfolio rigidity.

6. Conclusion

This paper examines how changes in the macrostructure of equity markets interact with rising income inequality to produce persistent shifts in wealth distribution. We develop a quantitative general equilibrium model with heterogeneous households, constrained financial intermediaries, and inelastic equity supply. In this environment, even transitory income shocks induce lasting asset price responses that disproportionately benefit wealthier households—an amplification mechanism we call the inequality multiplier. It operates through two channels: the equity investment channel, where high-income households' greater saving rates generate sustained equity inflows and price appreciation; and the borrowing channel, where increased debt compels intermediaries to rebalance toward equities, further raising prices. Calibrated to U.S. data from 1989–2023, the model replicates the concurrent rise in equity valuations, aggregate debt, and wealth inequality—improving on benchmarks relying only on return heterogeneity or non-homothetic preferences. The investment channel explains long-run trend inequality, while the borrowing channel drives shorter-run cycles, suggesting that policy responses must target both structural and cyclical forces. A further contribution is to endogenize capital flows via household saving and borrowing decisions, rather than imposing them exogenously. This feature implies that flow persistence is inherited from income shocks, generating durable price and distributional effects even when fundamentals revert. Overall, the model links asset market frictions to macro-distributional dynamics and highlights new avenues for financial and fiscal policy design.

Implications and Open Questions. Our findings challenge the canonical view that wealth inequality dynamics are primarily driven by stochastic income or return processes and are inherently mean-reverting. Instead, we show that frictions in financial market structure—especially reduced market elasticity arising from passive investing and intermediary mandates—play a central role in propagating and amplifying inequality over both short and long horizons. This has first-order implications for policy design. Our results suggest that increasing equity participation among lower-wealth households, regulating leverage and portfolio rigidity among intermediaries, or directly targeting asset revaluation through capital or wealth taxation may be effective tools to mitigate inequality. Moreover, the framework highlights a novel trade-off in financial innovation: while passive investing improves access and lowers costs, it also reduces price responsiveness, thereby exacerbating wealth concentration. Ongoing work will extend the model to incorporate heterogeneous arbitrage capacity, cross-country market structures, and optimal fiscal instruments—including dynamic redistribution via transfers, taxes, and public debt issuance.

References

Acemoglu, Daron, and Pascual Restrepo. 2020. "Robots and Jobs: Evidence from US Labor Markets." *Journal of Political Economy* 128 (6): 2188 – 2244. https://EconPapers.repec.org/RePEc:ucp:jpolec:doi:10.1086/705716.

Adrian, Tobias, and Hyun Song Shin. 2010. "Liquidity and leverage." *Journal of financial intermediation* 19 (3): 418–437.

Afrouzi, Hassan, Andres Blanco, Andres Drenik, and Erik Hurst. 2024. "A Theory of How Workers Keep Up with Inflation.", National Bureau of Economic Research.

Autor, David, David Dorn, and Gordon Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121–68. https://EconPapers.repec.org/RePEc:aea:aecrev:v:103:y:2013:i:6:p:2121-68.

Barkai, Simcha. 2020. "Declining Labor and Capital Shares." *Journal of Finance* 75 (5): 2421–2463. https://EconPapers.repec.org/RePEc:bla:jfinan:v:75:y:2020:i:5:p:2421-2463.

Basak, Suleyman, and Anna Pavlova. 2013. "Asset prices and institutional investors." *American Economic Review* 103 (5): 1728–1758.

Benhabib, Jess, and Alberto Bisin. 2018. "Skewed Wealth Distributions: Theory and Empirics." *Journal of Economic Literature* 56 (4): 1261–1291. https://ideas.repec.org/a/aea/jeclit/v56y2018i4p1261-91.html.

Benhabib, Jess, Alberto Bisin, and Mi Luo. 2017. "Earnings inequality and other determinants of wealth inequality." *American Economic Review* 107 (5): 593–597.

Benhabib, Jess, Alberto Bisin, and Shenghao Zhu. 2011. "The Distribution of Wealth and Fiscal Policy in Economies With Finitely Lived Agents." *Econometrica* 79 (1). https://doi.org/10.3982/ECTA8416.

Blanchet, Thomas, Emmanuel Saez, and Gabriel Zucman. 2022. "Real-time inequality.", National Bureau of Economic Research.

Brunnermeier, Markus K, and Yuliy Sannikov. 2014. "A macroeconomic model with a financial sector." *American Economic Review* 104 (2): 379–421.

Cagetti, Marco, and Mariacristina De Nardi. 2006. "Entrepreneurship, frictions, and wealth." *Journal of political Economy* 114 (5): 835–870.

Campbell, John. 2006. "Household Finance.". https://EconPapers.repec.org/RePEc:hrv:faseco:3157877.

Carroll, Christopher D. 1998. "Why do the rich save so much?".

Carroll, Christopher D. 2000. "Portfolios of the Rich."

Chen, Han, Vasco Cúrdia, and Andrea Ferrero. 2012. "The macroeconomic effects of large-scale asset purchase programmes." *The economic journal* 122 (564): F289–F315.

Chinco, Alex, and Marco Sammon. 2024. "The passive ownership share is double what you think it is." *Journal of Financial Economics* 157 (C). https://ideas.repec.org/a/eee/jfinec/v157y2024ics0304405x24000837.html.

Cioffi, Riccardo A. 2021. "Heterogeneous Risk Exposure and the Dynamics of Wealth Inequality." *Working paper*.

De Loecker, Jan, Jan Eeckhout, and Gabriel Unger. 2020. "The Rise of Market Power and the Macroeconomic Implications." *The Quarterly Journal of Economics* 135 (2): 561–644. https://EconPapers.repec.org/RePEc:oup:qjecon:v:135:y:2020:i:2:p:561-644.

De Nardi, Mariacristina. 2004. "Wealth Inequality and Intergenerational Links." *The Review of Economic Stud-*

ies 71 (3): 743–768. https://EconPapers.repec.org/RePEc:oup:restud:v:71:y:2004:i:3:p:743-768.

De Nardi, Mariacristina, and Giulio Fella. 2017. "Saving and Wealth Inequality." *Review of Economic Dynamics* 26: 280–300. https://ideas.repec.org/a/red/issued/16-340.html.

Du, Wenxin, Benjamin Hébert, and Amy Wang Huber. 2023. "Are intermediary constraints priced?" *The Review of Financial Studies* 36 (4): 1464–1507.

Duffie, Darrell. 2010. "Presidential address: Asset price dynamics with slow-moving capital." *The Journal of finance* 65 (4): 1237–1267.

Dynan, Karen E., Jonathan Skinner, and Stephen Zeldes. 2004. "Do the Rich Save More?" *Journal of Political Economy* 112 (2): 397–444.

Fagereng, Andreas, Matthieu Gomez, Martin Blomhoff Holm, Benjamin Moll, and Gisle Natvik. 2023. "Asset-Price Redistribution." *Working paper*. https://benjaminmoll.com/wp-content/uploads/2022/07/APR.pdf.

Fair, Ray, and John Taylor. 1983. "Solution and Maximum Likelihood Estimation of Dynamic Nonlinear Rational Expectations Models." *Econometrica* 51 (4): 1169–85. https://EconPapers.repec.org/RePEc:ecm:emetrp:v:51:y:1983:i:4:p:1169-85.

Fernández-Villaverde, Jesús, Samuel Hurtado, and Galo Nuno. 2023. "Financial frictions and the wealth distribution." *Econometrica* 91 (3): 869–901.

Fuchs, William, Satoshi Fukuda, and Daniel Neuhann. 2023. "Demand-system asset pricing: Theoretical foundations." *Available at SSRN 4672473*.

Gabaix, Xavier, and Ralph S. J. Koijen. 2021. "In Search of the Origins of Financial Fluctuations: The Inelastic Markets Hypothesis." *Working paper*. https://doi.org/10.3386/w28967.

Gabaix, Xavier, Jean-Michel Lasry, Pierre-Louis Lions, and Benjamin Moll. 2016. "The Dynamics of Inequality." *Econometrica* 84 (6). https://doi.org/10.3982/ECTA13569.

Gaillard, Alexandre, Christian Hellwig, Philipp Wangner, and Nicolas Werquin. 2023. "Consumption, wealth, and income inequality: A tale of tails."

Gârleanu, Nicolae, and Lasse Heje Pedersen. 2018. "Efficiently inefficient markets for assets and asset management." *The Journal of Finance* 73 (4): 1663–1712.

Gomez, Matthieu. 2024. "Wealth Inequality and Asset Prices.", Columbia University working paper.

Greenwald, Daniel L, Matteo Leombroni, Hanno Lustig, and Stijn Van Nieuwerburgh. 2021. "Financial and total wealth inequality with declining interest rates.", National Bureau of Economic Research.

Grossman, Sanford, and Robert Shiller. 1981. "The Determinants of the Variability of Stock Market Prices." *American Economic Review* 71 (2): 222–27. https://EconPapers.repec.org/RePEc:aea:aecrev:v:71:y:1981:i:2:p:222-27.

Haddad, Valentin, Paul Huebner, and Erik Loualiche. 2024. "How Competitive is the Stock Market? Theory, Evidence from Portfolios, and Implications for the Rise of Passive Investing." *Working paper*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3821263.

Haddad, Valentin, and Tyler Muir. 2021. "Do intermediaries matter for aggregate asset prices?" *The Journal of Finance* 76 (6): 2719–2761.

Haddad, Valentin, and Tyler Muir. 2025. "Market Macrostructure: Institutions and Asset Prices.", National Bureau of Economic Research.

He, Zhiguo, and Arvind Krishnamurthy. 2013. "Intermediary asset pricing." *American Economic Review* 103 (2): 732–770.

He, Zhiguo, and Arvind Krishnamurthy. 2018. "Intermediary asset pricing and the financial crisis." *Annual*

Review of Financial Economics 10 (1): 173–197.

He, Zhiguo, and Wei Xiong. 2013. "Delegated asset management, investment mandates, and capital immobility." *Journal of Financial Economics* 107 (2): 239–258.

Hubmer, Joachim, Per Krusell, and Anthony A Smith Jr. 2021. "Sources of US wealth inequality: Past, present, and future." *NBER Macroeconomics Annual* 35 (1): 391–455.

Justiniano, Alejandro, Giorgio E Primiceri, and Andrea Tambalotti. 2019. "Credit supply and the housing boom." *Journal of political economy* 127 (3): 1317–1350.

Kacperczyk, Marcin, Stijn Van Nieuwerburgh, and Laura Veldkamp. 2016. "A rational theory of mutual funds' attention allocation." *Econometrica* 84 (2): 571–626.

Kaplan, Greg, Benjamin Moll, and Giovanni L Violante. 2018. "Monetary policy according to HANK." *American Economic Review* 108 (3): 697–743.

Katz, Lawrence F., and Kevin M. Murphy. 1992. "Changes in Relative Wages, 1963–1987: Supply and Demand Factors." *The Quarterly Journal of Economics* 107 (1): 35–78. https://ideas.repec.org/a/oup/qjecon/v107y1992i1p35-78..html.

Kiyotaki, Nobuhiro, and John Moore. 1997. "Credit cycles." *Journal of political economy* 105 (2): 211–248.

Koijen, Ralph SJ, and Motohiro Yogo. 2025. "On the Theory and Econometrics of (Demand System) Asset Pricing." *Available at SSRN 5274709*.

Kuhn, Moritz, Moritz Schularick, and Ulrike I. Steins. 2020. "Income and Wealth Inequality in America, 1949–2016." *Journal of Political Economy* 128: 3469—-3519. https://doi.org/10.1086/708815.

Kumhof, Michael, Romain Rancière, and Pablo Winant. 2015. "Inequality, leverage, and crises." *American economic review* 105 (3): 1217–1245.

Lucas, Robert. 1978. "Asset Prices in an Exchange Economy." *Econometrica* 46 (6): 1429–45. https://EconPapers.repec.org/RePEc:ecm:emetrp:v:46:y:1978:i:6:p:1429-45.

Mian, Atif, Ludwig Straub, and Amir Sufi. 2021a. "Indebted demand." *The Quarterly Journal of Economics* 136 (4): 2243–2307.

Mian, Atif, Ludwig Straub, and Amir Sufi. 2021b. "The Saving Glut of the Rich." *Working paper*. https://www.nber.org/papers/w26941.

Mian, Atif, and Amir Sufi. 2015. *House of debt: How they (and you) caused the Great Recession, and how we can prevent it from happening again*.: University of Chicago Press.

Pavlova, Anna, and Taisiya Sikorskaya. 2023. "Benchmarking intensity." *The Review of Financial Studies* 36 (3): 859–903.

Piazzesi, Monika, and Martin Schneider. 2016. "Housing and macroeconomics." *Handbook of macroeconomics* 2: 1547–1640.

Piketty, Thomas. 2014. *Capital in the twenty-first century*.: Harvard University Press.

Rajan, Raghuram G. 2011. "Fault lines: How hidden fractures still threaten the world economy." *Princeton University press*.

Saez, Emmanuel, and Gabriel Zucman. 2016. "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data." *The Quarterly Journal of Economics* 131 (2): 519–578. https://doi.org/10.1093/qje/qjw004.

Stansbury, Anna, and Lawrence H. Summers. 2020. "The Declining Worker Power Hypothesis: An Explanation for the Recent Evolution of the American Economy." *Brookings Papers on Economic Activity* 51 (1 (Spring): 1–96. https://ideas.repec.org/a/bin/bpeajo/v51y2020i2020-01p1-96.html.

Straub, Luwdig. 2019. "Consumption, Savings, and the Distribution of Permanent Income." *Working paper*.

https://scholar.harvard.edu/files/straub/files/cons_ineq_rates.pdf.

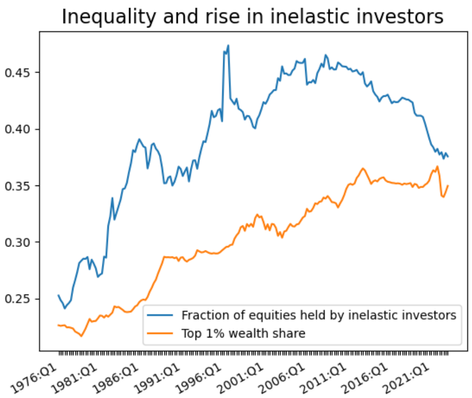
Toda, Alexis Akira, and Kieran James Walsh. 2020. "The equity premium and the one percent." *The Review of Financial Studies* 33 (8): 3583–3623.

Vayanos, Dimitri, and Jean-Luc Vila. 2021. "A preferred-habitat model of the term structure of interest rates." *Econometrica* 89 (1): 77–112.

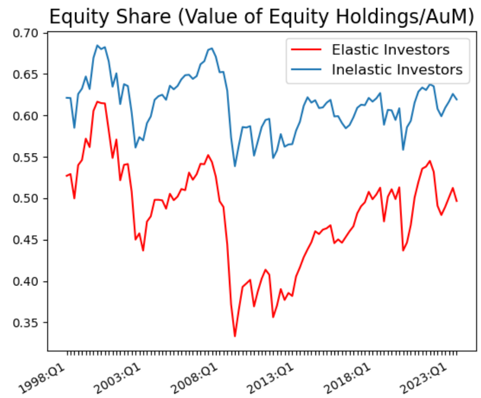
Vissing-Jørgensen, Annette. 2002. "Limited asset market participation and the elasticity of intertemporal substitution." *Journal of political Economy* 110 (4): 825–853.

Appendix A. Inelastic Investors

As shown in Figure A1A, the share of wealth held by the top 1% in the United States has risen from below 25% in 1976 to 35% in 2021 (Saez and Zucman (2016)). Over the same period, the fraction of the total U.S. equity market held by institutional investment funds (such as Mutual Funds, ETFs, and Insurance funds) has risen from 25% to 40%. These investors are characterized by a relatively low price elasticity of demand for equity (or inelasticity), which leads to a relatively more stable equity share compared to their elastic counterparts (such as hedge funds and households) over the business cycle (Figure A1B). The growing presence of inelastic investors makes the aggregate demand curve in equity markets more inelastic over time, implying that changes in household or institutional equity demand move asset prices.



A. Rise in inequality and inelastic investors



B. Portfolio behaviour of investors

FIGURE A1. Panel A shows the wealth share of the top 1% households in the U.S. The wealth share has risen from around 23% up to 35%. Panel B shows the holdings of inelastic investors as a share of the total market cap of equities. This has risen from 25% to over 35%.

Source: Authors' calculation from Flow of Funds Data and Saez and Zucman (2016). Inelastic Investors include Mutual Funds, Closed-end funds, ETFs, Government Retirement Funds, Insurance funds.

To make this point more clearly, Figure A2 plots the cross-correlation between the change in top 10% (or top 1%) wealth share against a measure of the change in the macro-market elasticity[17] over time in the U.S. Each point represents a quarter between 1990 and 2021. Both plots demonstrate that over the past three decades, as market elasticity has reduced, wealth inequality has increased. The purpose of this paper is to understand to what extent can inelastic markets explain the increase in wealth inequality.

[17]The measure of elasticity is derived from Gabaix and Koijen (2021) and constructed by dividing the value of equity holdings of inelastic investors (PQ) by the value of their debt holdings (B). We motivate this measure of elasticity further in our model.

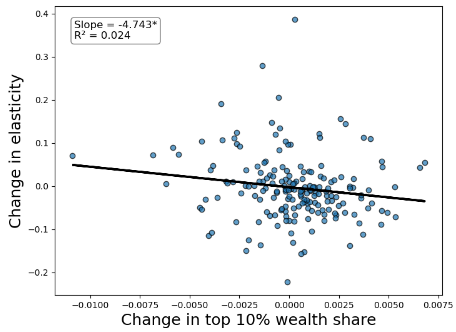


FIGURE A2. Panel A shows a significant negative correlation between the change in top 10% wealth share between 1990 and 2021 and change in market elasticity. Panel B shows a larger negative correlation between the change in top 1% wealth share and change in market elasticity.

Note: Inelastic Investors include Mutual Funds, Closed-end funds, ETFs, Government Retirement Funds, Insurance funds. In Appendix A, we plot the actual time series for the share of equities held by inelastic investors, and how inelastic investors are characterised by more stable equity portfolio shares relative to their elastic counterparts.

Source: Quarterly top 10% and top 1% wealth shares from Saez and Zucman (2016) and PQ/B from flow of funds data (between 1990 and 2021).

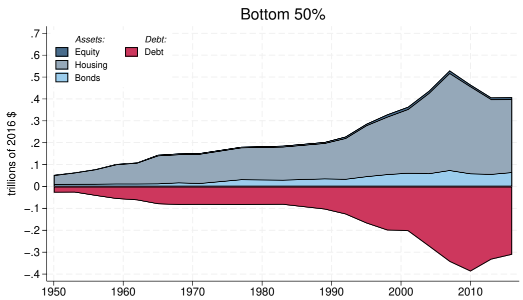
Appendix B. Portfolio Heterogeneity

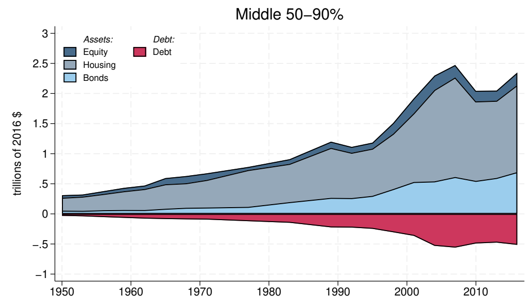
Ex-ante, why should equity market inelasticity matter for wealth inequality? The link is portfolio heterogeneity. The composition of household portfolios (including the amount of borrowing) differs systematically along the wealth distribution, with wealthy (top 10%) household portfolios dominated by equity (Figure A3C), and non-wealthy (bottom 50%) household portfolios by borrowing (Figure A3A). Due to this portfolio heterogeneity, equity price increases (induced by higher inelasticity) cause large increases in the share of wealth held by wealthy households.

Appendix C. Micro-foundations for Market Inelasticity

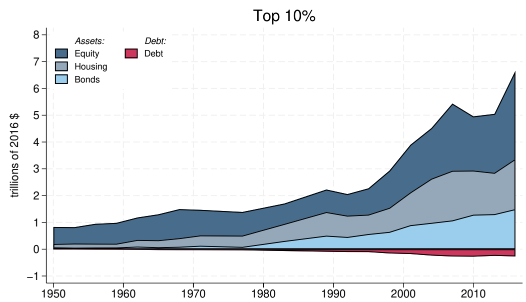
Institutional constraints and mandates contribute significantly, as shown by Chinco and Sammon (2024). For example, mutual funds, which own 22% of U.S. equities, and ETFs, which own 6.4%, are routinely subject to explicit or implicit investment mandates which reduce their ability to exercise discretion in day-to-day portfolio allocation. He and Xiong (2013) use an agency-based model to argue that tight investment mandates are justified for most fund managers except those with exceptional talents, using this to argue for why we empirically observe the use of stringent investment mandates.

Other micro-foundations include the transactional costs of moving wealth between liquid and illiquid assets in Kaplan et al. (2018), which reduces the ability of households to seamlessly adjust portfolio shares invested in different asset classes. Slow-moving capital in Duffie (2010) (due to institutional impediments to trade such as search costs, time to raise capital or investor inattention)





A. Aggregate Bottom 50% Portfolio Positions **B.** Aggregate Middle 50-90% Portfolio Positions



C. Aggregate Top 10% Portfolio Positions

FIGURE A3. Panel A shows bottom 50% households' aggregate portfolio holdings, with large increases in indebtedness. Panel B shows aggregate portfolio holdings of the middle 50-90% — housing is *the* asset of the middle class. Panel C shows aggregate portfolio holdings of the top 10%, dominated by equity holdings.

Source: Authors' calculation using Kuhn, Schularick and Steins, JPE 2020 and FRED. All portfolio components and wealth levels are shown in trillions of dollars (2016 dollars).

can generate sharp price reactions in the short- to medium-run. Preferred habitat investors in Vayanos and Vila (2021) and Chen et al. (2012) create limits to arbitrage, thereby implying that asset markets are not fully elastic. More generally, behavioral frictions such as inattention may also help explain limited ability of investors to absorb large flows into and out of asset markets.

Haddad and Muir (2021) use time-varying risk aversion of financial intermediaries along with costly direct investment in asset markets by households to show that the elasticity of household asset demand to asset prices is decreasing in the risk aversion of financial intermediaries as well as the cost of direct investment, generating inelastic demand curves. In a similar vein, He and Krishnamurthy (2018) review approaches under which institutional frictions such as equity capital constraints (He and Krishnamurthy (2013)), endogenous borrowing constraints (Brunnermeier and Sannikov (2014)), value-at-risk regulations (Adrian and Shin (2010)) and leverage regulations (Du et al. (2023)) create downward sloping demand curves for assets, specifically for large and well-regulated financial intermediaries such as commercial banks, investment banks and hedge funds.

These results carry over to other financial institutions such as mutual funds and asset managers, focusing in turn on skills of mutual fund managers (Kacperczyk et al. (2016)), limits to information acquisition (Gârleanu and Pedersen (2018)) and benchmarking considerations (Basak and Pavlova (2013), Pavlova and Sikorskaya (2023)), all of which result in the reduced ability (or appetite) of asset managers to adjust portfolios frequently and rapidly, thereby generating inelasticity in asset markets.

A natural question is why macro-arbitrageurs have not emerged to take advantage of all the above frictions, thereby offsetting the inelasticity generated due to these frictions. Gabaix and Koijen (2021) document limited size and influence of arbitrageurs, showing that they account for less than 5% of the overall equity market holdings. They also note that hedge funds seem to respond to crisis episodes by selling assets rather than buying, the transfer of equity risk across different types of investors is minimal, and households' equity share has shown little variation over time. Finally, Haddad et al. (2024) highlight that competitive strategic response of investors to other investors reducing their elasticity of demand is limited, further contributing to market inelasticity. These suggest that forces which might offset market inelasticity are limited.

Taken together, there is ample evidence for the inelasticity of equity markets, which we take as given. For ease of modelling, we introduce inelasticity through investment mandates. However, any of the above features could be incorporated to generate qualitatively similar results.

Appendix D. Model with Arbitrageur

In the baseline model, we have assumed that there is no unrestricted arbitrageur in the model to drive prices back towards fundamental prices. In this section, we relax this assumption to note how the presence of an arbitrageur modifies results. As we shall see, the unrestricted arbitrageur attenuates but does not remove the inelasticity channel unless its risk capacity is implausibly large.

At time period t, the financial intermediary is restricted in its portfolio choice. Assume that there exists an arbitrageur at t with wealth W_t^A who can invest in equities and bonds. It chooses the number of equity shares to invest, q_t^A (and corresponding bond holdings $W_t^A - q_t A$) to maximise CARA utility on next-period wealth:

$$\max_{q_t^A} \Big[- \exp(-\gamma W_{t+1}^A) \Big],$$

where γ is the arbitrageur's risk preference parameter, and next-period wealth is:

$$W_{t+1}^A = q_t^A (D_{t+1} + p_{t+1}) + (W_t^A - q_t^A)(1 + r_t) - [q_t^A p_t + (W_t^A - q_t^A)](1 + r_t),$$

where the last bracket represents the cost of financing the position at the risk-free rate. Re-arranging, this gives us next period wealth:

$$W_{t+1}^A = q_t^A(D_{t+1} + p_{t+1} - (1 + r_t)p_t).$$

Write the equity premium as:

$$\pi_{t+1} \equiv r_t^e - r_t = \frac{D_{t+1} + p_{t+1}}{p_t} - (1 + r_t).$$

Note that the equity premium is a function of the model's state variables, defined by the vector $S_t = (D_t, e_t^R, e_t^P)$, which are all normally distributed. Therefore, equity premium is conditionally normal,

$$(\pi_{t+1}|\mathcal{F}_t) \sim \mathcal{N}(\mu_t(S_t), \sigma_t^2(S_t)),$$

where $\mathcal{F}_t$ is the σ-algebra generated the history of state vectors, and where we make the dependence of the conditional mean and variance of the equity premium on the state vector explicit.

Given CARA utility and normality of returns, the arbitrageur's maximisation function can be re-written as:

$$\max_{q_t^A} q_t^A p_t \mu_t - \frac{1}{2}\gamma(q_t^A)^2 p_t^2 \sigma_t^2,$$

resulting in the familiar first-order condition:

$$q_t^A = \frac{\mu_t}{\gamma p_t \sigma_t^2}.$$

In general, the expected equity premium $\mu_t = \mathbb{E}(\pi_{t+1})$ is non-zero because prices deviate from their Lucas benchmark levels (see F.4). Call the Lucas price as fundamental price, denoted by $p_t^f \equiv \mathbb{E}\left[\frac{D_{t+1}+p_{t+1}^f}{1+r_t}\right]$. Then, expected equity premium is:

$$\mu_t = (1 + r_t)\left(\frac{p_t^f - p_t}{p_t}\right) + \underbrace{\mathbb{E}\left[\frac{p_{t+1} - p_{t+1}^f}{p_t}\right]}_{\lambda_t(\text{Expected Future Mis-pricing})},$$

and the arbitrageur's demand is:

$$q_t^A = \frac{(1 + r_t)(p_t^f - p_t) + \lambda_t p_t}{\gamma p_t^2 \sigma_t^2}.$$

Meanwhile, the constrained financial intermediary's demand is (as before):

$$q_t^{MF} = \frac{\theta_t W_t}{p_t}.$$

Imposing market clearing:

$$Q = q_t^{MF} + q_t^A = \frac{\theta_t W_t}{p_t} + q_t^A \implies p_t = \frac{\theta_t W_t}{Q - q_t^A}.$$

Without first explicitly solving for p_t after plugging in for q_t^A, we can immediately see that price in this model is:

$$p_t = \underbrace{\frac{\theta_t}{1-\theta_t}\frac{B_{t-1}+F_t}{Q_t}}_{\text{Price with no arbitrageur}} \quad \frac{1}{1-\kappa_t},$$

where we have used that $W_t = \frac{B_t}{1-\theta_t}$ and $F_t = B_t - B_{t-1}$, and define κ_t to be the *arbitrage capacity share* of the arbitrageur:

$$\kappa_t \equiv \frac{q_t^A}{Q_t} = \frac{(1+r_t)(p_t^f - p_t) + \lambda_t p_t}{\gamma Q p_t^2 \sigma_t^2}.$$

Contrast this to the pricing function in the original model (Equation 35). Intuitively, the sign of κ_t is the opposite of current mis-pricing (assuming for simplicity that $\lambda_t \approx 0$). When positive flows push prices beyond fundamentals, arbitrageurs should sell, yielding $\kappa_t < 0$, which dampens the effect of flows on price (and vice-versa). The degree of the arbitrageur's stabilization capability depends upon the size of κ_t. As $|\kappa_t| \uparrow$, any price deviations are aggresively corrected. As $\kappa \to 0$, we recover the restricted intermediary model. In general, therefore, as long as κ is relatively small (for example, Gabaix and Koijen (2021) suggest that natural arbitrageurs such as hedge funds hold c.5% of the equity market, implying $\kappa \approx 0.05$), the effect of flows should be attenuated but not fully removed. Moreover, κ_t is inversely proportional to γ; as the arbitrageur's risk aversion increases, their arbitrage capacity falls. Only if the arbitrageur's risk-bearing capacity is implausibly large (very small γ) does κ become large enough to remove the effect of flows on prices — this does not seem to be empirically valid.

Let us also derive a closed-form solution for price which makes the link between κ_t and the arbitrageur's risk-bearing capacity clear. Rewriting the market clearing condition:

$$Q = \frac{\theta_t W_t}{p_t} + \frac{(1+r_t)(p_t^f - p_t) + \lambda_t p_t}{\gamma p_t^2 \sigma_t^2}.$$

Cross-multiplying, applying the quadratic formula and considering the positive root gives us the following pricing function:

$$p_t = \frac{\gamma \sigma_t^2 \theta_t W_t - (1 + r_t - \lambda_t) + \sqrt{\left[\gamma \sigma_t^2 \theta_t W_t - (1 + r_t - \lambda_t)\right]^2 + 4\gamma \sigma_t^2 Q (1+r_t) p_t^f}}{2\gamma \sigma_t^2 Q}.$$

When there is no arbitrageur, $\gamma \to \infty$, and $p_t = \frac{\theta_t W_t}{Q}$, exactly as in the original model. When there is unlimited arbitrage, $\gamma \to 0$, and $p_t = \frac{(1+r_t)p_t^f}{1+r_t-\lambda_t}$, which, for $\lambda_t \approx 0$, gives $p_t = p_t^f$; arbitrageurs drive prices to fundamentals. However, it requires implausibly high risk-bearing capacity in arbitrageurs to fully attenuate the affects of flows on price. With realistic calibrations of arbitrageur's capacity (κ = 5%), the model and our qualitative findings continue to hold, while our quantitative findings are dampened very slightly.

Appendix E. Additional Qualitative Results

E.1. Price Decomposition and Downward-sloping Demand

As equity prices depend upon flows (or borrowing), which in turn depend upon endowments, we can derive an expression which makes the fundamental drivers of prices explicit. Using the derived value for borrowing from 18:

PROPOSITION A1. *The price of equity depends on dividends, the income distribution, equity shares outstanding, and the financial intermediary constraint:*

$$p_0 = \frac{\beta}{1+\beta}\left[\frac{D_1}{(1+r_{f,-1})^2}\right] + \frac{1}{1+\beta}\left[\frac{1}{Q}\frac{\theta}{1-\theta}\left\{\frac{e_1^P - \frac{c_1^P}{c_0^P}e_0^P}{1+r_{f,0}}\right\}\right]. \tag{A1}$$

PROOF. Appendix F.5. □

This expression illustrates the critical role of income distribution in determining equity prices. Specifically, the heterogeneity in agents' endowments and consumption decisions directly impacts the pricing mechanism. This result deviates from Grossman and Shiller (1981), who argue that heterogeneity has no effect on equity prices. By incorporating heterogeneity into the model, we show that the distribution of income plays a non-trivial role in shaping market outcomes.

Unlike models such as Kiyotaki and Moore (1997) where one type of households is incentivised to borrow due to differing discount rates or preferences, we assume the same level of patience and preferences across both households. Instead, we establish conditions on endowments of non-wealthy households which lead them to borrow a positive amount of debt. Quite intuitively, this turns out to be the following condition:

$$e_1^P - \frac{c_1^P}{c_0^P}e_0^P > 0 \Leftrightarrow \frac{e_1^P}{e_0^P} > \beta(1+r_{f,0})$$

where we substitute for $\frac{c_1^P}{c_0^P}$ using the Euler Equation for non-wealthy households, $\beta\frac{u'[c_1^P]}{u'[c_0^P]}(1+r_{f,0}) = 1$. Therefore, whenever the growth in the level of absolute endowments of the non-wealthy is greater than the growth rate of consumption (i.e. endowments are enough to cover repayment of debt), the non-wealthy borrow a positive amount. This is in line with reality — while the income *share* of the bottom 50% has reduced, their income *levels* have increased over time, allowing them to sustain more debt.

The proposition also highlights the influence of market structure. A lower quantity of equity shares outstanding leads to a higher price impact for a given level of flow, while a higher inelasticity parameter, θ, amplifies price movements further.

In Fig. A4, we compare the demand curve implied by our model with a benchmark elastic demand curve derived from Lucas (1978). Under perfectly elastic demand, the curve is flat, indicating that even small price changes not justified by fundamentals lead to substantial adjustments in portfolio holdings. However, the demand curve from our model is downward-sloping, reflecting the inelastic nature of the market. This demonstrates that price adjustments are required to absorb flows, even in the absence of fundamental changes.

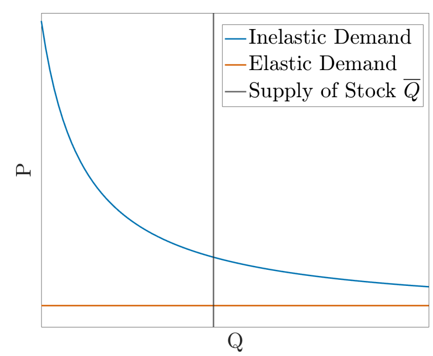


FIGURE A4. Inelastic demand curve ($\xi = 0.2$) versus elastic demand curve.

E.2. Elasticity in Three-Period Model

Note that the first derivative of equity price with respect to quantity is negative, $\frac{\partial p_0}{\partial Q_0} < 0$. This demonstrates that inelastic markets inherently generate downward-sloping demand curves, as price movements are required to balance supply and demand. In such a system, what determines the elasticity of demand for equities? Consider the following proposition:

PROPOSITION A2. *The (signed) price elasticity of demand for equities ξ is determined by the (fixed) fraction of portfolio held by the financial intermediary in equities, θ:*

$$\xi = 1 - \theta. \tag{A2}$$

PROOF. Appendix F. □

This shows that as θ increases, the market becomes more inelastic (less elastic), and the price impact $\frac{\theta}{1-\theta}$ increases — every additional dollar of flows or borrowing has a larger impact on equity prices. Our assumed choice of $\theta = 0.8$ implies $\xi = 0.2$.

As an aside, note that when $\theta = 0$, $p_0 = p_{-1}$. However, this does not represent a Lucas-style asset pricing model because i) price does not evolve from $t = -1$ to $t = 0$ despite discount rates changing, and ii) elasticity is $\xi = 1$ which does not represent the perfectly elastic demand implied in the Lucas model ($\xi = \infty$). We discuss how the Lucas model can be derived as a special case of our model in Appendix F.4, where the proof relies on the ability of the financial intermediary to re-optimise and choose θ at $t = 0$, taking into account flows from the wealthy household.

E.3. Elasticity in Infinite-Period Model

In the quantitative model, elasticity of demand for the stock is time-varying. We can derive the aggregate (signed) time-varying Hicksian elasticity of demand for stock as follows:

$$\xi_t = (1 - \theta^*) - \frac{\beta}{\chi^{MF}}\left[\theta^* \underbrace{(r^e_{t-1} - r_{t-1})}_{\text{Equity Premium}} - \left\{\frac{D}{p} - 1\right\}\right]. \tag{A3}$$

PROOF. Appendix F.9. □

where $\frac{D}{p}$ is the average dividend-price ratio. As the equity premium increases, the intermediary demands more equity, driving unsigned elasticity up in the subsequent period. Similarly, as the cost of adjustment χ^{MF} increases, the unsigned elasticity decreases with the intermediary finding it more costly to deviate from target. The limiting case of $\chi^{MF} \to \infty$ (or $\beta \to 0$) gets us back to the tight mandate condition and corresponding elasticity of the three-period model.

E.4. Exogenous Increase in Equity Supply

In our baseline model, we have assumed that the supply of equities remains constant at $\bar{Q}$ in both time periods $t = -1$ and $t = 0$. What happens when we relax this assumption, and allow the supply of stock at $t = 0$ to exogenously differ from $t = -1$? Formally, assume that supply of stock changes exogenously by δ_q%. What happens to price of the stock, and how does price depend upon the change in supply? This is formalised in the following proposition:

PROPOSITION A3. *The price of the stock at time $t = 0$, when quantity supplied is $Q_0 = Q_{-1}(1 + \delta_q)$, is given by:*

$$p_0 = \left(\frac{1 - \theta}{1 - \theta + \delta_q}\right)\left[p_{-1} + \frac{\theta}{1 - \theta}\frac{F_0}{Q_{-1}}\right], \tag{A4}$$

PROOF. Appendix F □

Clearly, $\frac{\partial p_0}{\partial \delta_q} < 0$; when exogenous supply of stock increases, equity prices are lower and vice versa. Simultaneously, the price multiplier $\frac{\theta}{1-\theta+\delta_q}$ is dampened (for $\delta_q > 0$) relative to the constant supply case. However, short of setting $\theta = 0$, equity prices continue to remain sensitive to flows. Moreover, in Appendix F.6, we derive the condition on share issuance which ensures that the effect of flows is not fully negated, and do a brief back-of-the-envelope calculation to verify that this condition holds. Together, this suggests that the assumption of constant supply of stock is without loss of generality and does not drive our qualitative results.

Note that Proposition 2 no longer holds with equality. Intuitively, when the supply of stock increases, a part of every additional dollar of flows into the financial intermediary must now go towards financing the purchase of new stocks, and the rest towards the purchase of new bonds. As bonds do not need to accommodate all flows any longer, the tight link between B_0^P and F_0 is broken. Some of the financial intermediary's excess demand for equities can be fulfilled through an adjustment in quantities, hence the impact on prices is lower. The following corollary re-derives the link between equity prices and borrowing:

COROLLARY A1. *The relationship between the price of equity and the amount of debt when quantity supplied of equities changes by δ_q is:*

$$p_0 = \left(\frac{1}{1+\delta_q}\right)\left[p_{-1} + \frac{\theta}{1-\theta}\frac{B_0^P}{Q_{-1}}\right]. \tag{A5}$$

PROOF. Substitute

$$F_0 = p_0(Q_0 - Q_{-1}) + (B_0 - B_{-1})$$

into Equation A4 and solve for p_0. □

Hence, as δ_q rises, the equity price impact of higher household indebtedness is lower.

E.5. Wealth Inequality

We first define the wealth of households and define our preferred measure of wealth inequality:

DEFINITION A1. *The period t wealth, for $t \in \{-1, 0\}$, is defined as:*

- *Wealthy Household:* $W_t^R \equiv p_t Q_t + B_t$,
- *Non-Wealthy Household:* $W_t^P \equiv \mathcal{O}^P - B_t, \quad \mathcal{O}^P > B_t$.

The period t wealth share, for $t \in \{-1, 0\}$, is defined as:

- *Wealthy Household:* $\eta_t^R \equiv \frac{W_t^R}{W_t^R + W_t^P}$,
- *Non-Wealthy Household:* $\eta_t^P \equiv \frac{W_t^P}{W_t^R + W_t^P}$.

A few points are in order here. First, why do we consider the wealth position in periods $t \in \{-1, 0\}$ only? These are the wealth positions of relevance to understand the impact of inelastic markets — if we consider the wealth position at $t = 1$, it would trivially equal the income of each household type. However, the evolution of the wealth share from $t = -1$ to $t = 0$ depends on the evolution of equity price, which is impacted by inelastic markets.

Second, we assume that the non-wealthy household owns non-marketable assets worth $\mho^P$. These might consist of houses being used as primary residence or other illiquid assets which cannot be freely disposed. We make this assumption (along with constraining borrowing to be lower than the value of these assets) to ensure that non-wealthy households do not die in debt or have negative wealth positions (and negative wealth shares).

What, then, is the impact of equity price rises on wealth inequality? Consider the following proposition:

PROPOSITION A4. *The wealthy household share is increasing in equity prices:*

$$\frac{\partial(\eta_0^R - \eta_{-1}^R)}{\partial p_0} < 0 \tag{A6}$$

PROOF. Substitute for the definitions of wealth shares and take the first-order condition with respect to p_0. This yields:

$$\frac{\partial(\eta_0^R - \eta_{-1}^R)}{\partial p_0} = \frac{Q_0(\mho^P - B_0)}{(p_0 Q_0 + \mho^P)^2}$$

which is positive when $\mho^P > B_0$, hence true by assumption. □

Therefore, by invoking the pricing equation, the wealthy household wealth share goes up whenever flows or borrowing is higher, θ is higher, Q_0 is lower, or fundamental price p_{-1} is higher. This establishes a novel link between wealth inequality and the inelasticity of markets.

E.6. Comparative Statics on Income

We turn to studying the effect of changing wealthy and non-wealthy income (endowment) on equity prices and wealth inequality. Our aim is to study the relationship between income inequality and wealth inequality. As it is no longer possible to derive closed-form analytical solutions for prices with respect to income shares, we rely on numerical simulations.

We choose the following parameter values to run the simulation: log utility, Dividend $D_1 = 2$, elasticity parameter / share of equity in intermediary portfolio $\theta = 0.8$, discount factor $\beta = 0.99$, pre-period financial intermediary wealth $W_{-1} = 5$ and equity supply $\bar{Q} = 10$. We calibrate endowments to maintain a flat top 10% income share of 80%, with $\{e_0^P, e_0^R\} = \{2, 8\}$ and $\{e_1^P, e_1^R\} = \{8, 12\}$.

We first define our measure of income inequality:

DEFINITION A2. *The period t income, for $t \in \{0, 1\}$, is defined as:*

- *Wealthy Household:* $I_t^R \equiv e_t^R + \mathbb{1}_{t=1} D_1 Q_t$
- *Non-Wealthy Household:* $I_t^P \equiv e_t^P$

The period t income share, for $t \in \{0, 1\}$, is defined as:

- *Wealthy Household:* $\mathfrak{I}_t^R \equiv \frac{I_t^R}{I_t^R + I_t^P}$
- *Non-Wealthy Household:* $\mathfrak{I}_t^P \equiv \frac{I_t^P}{I_t^R + I_t^P}$

We study the impact on prices of varying individual incomes. We summarize these in the following:

PROPOSITION A5. *The partial derivatives of equity price with respect to endowments are:*

- *If $t = 0$ endowment of non-wealthy household increases, their demand for borrowing falls, hence prices decrease.*

$$\frac{\partial p_0}{\partial e_0^P} < 0$$

- *If $t = 1$ endowment of non-wealthy household increases, their demand for borrowing increases due to higher ability to repay debt, hence prices increase.*

$$\frac{\partial p_0}{\partial e_1^P} > 0$$

- *If $t = 0$ endowment of wealthy household increases, their demand for savings increases, hence flows increase and prices increase.*

$$\frac{\partial p_0}{\partial e_0^R} > 0$$

- *If $t = 1$ endowment of wealthy household increases, their demand for savings falls, hence flows fall and prices decrease.*

$$\frac{\partial p_0}{\partial e_1^R} < 0$$

Given these results, we need to study how changing relative endowments effects prices. We find the following relationships, demonstrating that the effect of changing wealthy endowments dominates the opposite effect of changing non-wealthy endowments:

PROPOSITION A6. *The distribution of income matters for equity prices. Prices increase when current period wealthy income share increases.*

$$\frac{\partial p_0}{\partial \mathfrak{I}_0^R} > 0$$

Finally, let us explore the relationship between income inequality and wealth inequality over time. As discussed above, endowments are calibrated such that $\mathcal{I}_0^R = \mathcal{I}_1^R = 0.8$. Under this calibration, we find that the top 10% wealth share *increases* from 0.625 to 0.644, a 3% increase. When we calibrate endowments such that top 10% income share falls from 0.8 to 0.75, top 10% wealth share *increases* from 0.625 to 0.7, a 12% increase. Intuitively, this happens because both the equity investment and borrowing channels kick in — a decrease in relative income for wealthy households prompts higher savings / flows into the financial intermediary, and an increase in relative income for non-wealthy household also prompts higher borrowing from the financial intermediary. Under inelastic markets, equilibrium forces kick in to ensure that the target portfolio allocation is maintained — this results in large equity price increases, which exacerbates wealth inequality.

E.7. Correlation between Wealth Inequality and Elasticity

Here, we re-establish the definition of wealth inequality for the quantitative model. To derive an empirically testable and tractable prediction, we consider a special case of the model without middle class households and housing assets. Under this scenario, the top 10% wealth share in the economy is given by:

$$\eta_t^R = \frac{W_t^R}{W_t^R + W_t^P} = \frac{p_t Q_t + B_t}{p_t Q_t}. \tag{A7}$$

where we drop the assumption of other illiquid assets held by non-wealthy households for simplicity.

In the three-period model, we established the relationship between equity price and wealth inequality. We now derive the relationship between elasticity and wealth inequality:

PROPOSITION A7. *The change in top 10% wealth inequality is negatively related with the change in the inverse of the price multiplier. As markets become more inelastic between t and $t+1$, the inverse of the price multiplier decreases, implying a negative difference.*

$$\eta_{t+1}^R - \eta_t^R = \underbrace{\frac{1-\theta_{t+1}}{\theta_{t+1}} - \frac{1-\theta_t}{\theta_t}}_{<0} \tag{A8}$$

PROOF. Writing $p_t Q_t = \theta_t \tilde{W}_t$ and $B_t = (1-\theta_t)\tilde{W}_t$, we get:

$$\eta_{t+1}^R - \eta_t^R = \frac{p_{t+1}Q_{t+1} + B_{t+1}}{p_{t+1}Q_{t+1}} - \frac{p_t Q_t + B_t}{p_t Q_t} = 1 + \frac{B_{t+1}}{p_{t+1}Q_{t+1}} - 1 - \frac{B_t}{p_t Q_t} = \frac{1-\theta_{t+1}}{\theta_{t+1}} - \frac{1-\theta_t}{\theta_t}$$

□

Intuitively, as markets become more inelastic, the price multiplier is larger, resulting in larger equity price changes and consequently higher increases in top 10% wealth positions (and shares).

This proposition offers us an empirically testable prediction of the model — the change in top 10% wealth share and the change in the value of bond holdings relative to equity holdings of inelastic investors ($\Delta \frac{B}{pQ}$) should be negatively correlated. This is indeed verified in the data, as we observed in the empirical motivation of the paper (Fig. A2). Our model therefore generates the result that as the change in the inverse of the price multiplier falls (and markets become more inelastic), the top 10% wealth share increases, as seen in the data.

Appendix F. Omitted Proofs

F.1. Equilibrium Definition

Formal equilibrium in the three-period model is defined as:

DEFINITION A3. *An equilibrium are choices* $\{c_0^R, c_1^R, F_0, c_0^P, c_1^P, B_0^P, \theta\}$, *quantities* $\{Q_0, B_0\}$, *prices* $\{p_{-1}, p_0, r_{f,-1}, r_{f,0}\}$, *and endowments* $\{Q_{-1}, B_{-1}, W_{-1}, e_0^R, e_1^R, e_0^P, e_1^P, D_1\}$, *such that households are optimising, the financial intermediary is optimising, and all markets clear:*

- Equity market clears at an inelastically supplied amount of stocks:

$$Q_{-1} = Q_0 = \bar{Q}. \tag{A9}$$

- Bond market clears:

$$B_0 = B_0^P + B_{-1}. \tag{A10}$$

- Consumption market clears at $t = 0$ and $t = 1$:

$$c_0^R + c_0^P = e_0^R + e_0^P, \tag{A11}$$

$$c_1^R + c_1^P = e_1^R + e_1^P + D_1 Q_0. \tag{A12}$$

F.2. Proposition 1

PROOF. The market clearing condition for equities at $t = 0$ (in deviations) is:

$$\frac{Q_0 - Q_{-1}}{Q_{-1}} = 0$$

Substituting from 6, $Q_0 = \frac{\theta}{p_0}(p_0 Q_{-1} + B_{-1} + F_0)$.

$$\frac{\theta}{p_0 Q_{-1}}(p_0 Q_{-1} + B_{-1} + F_0) = 1$$

$$\theta + \frac{\theta B_{-1}}{p_0 Q_{-1}} + \frac{\theta F_0}{p_0 Q_{-1}} = 1$$

Using $B_{-1} = (1-\theta)W_{-1}$ and $Q_{-1} = \frac{\theta W_{-1}}{p_{-1}}$,

$$\theta + \frac{(1-\theta)p_{-1}}{p_0} + \frac{\theta F_0}{p_0 Q_{-1}} = 1$$
$$\theta p_0 + (1-\theta)p_{-1} + \frac{\theta F_0}{Q_{-1}} = p_0$$
$$(1-\theta)p_{-1} + \frac{\theta F_0}{Q_{-1}} = p_0(1-\theta)$$
$$p_{-1} + \frac{\theta}{1-\theta}\frac{F_0}{Q_{-1}} = p_0$$

Imposing market clearing $Q_{-1} = Q_0$ yields the desired result. □

F.3. Proposition A2

Combining Equations 6 and 8, quantity of equity demanded at $t = 0$ can be expressed as:

$$Q_0 = \frac{\theta W_0}{p_0}$$

Taking logs and first-differencing:

$$\ln Q_0 = \ln\theta + \ln W_0 - \ln p_0$$
$$\Delta \ln Q = \Delta\ln\theta + \Delta\ln W - \Delta\ln p$$

Using a first-order Taylor approximation, $\Delta\ln W \approx \frac{W_0 - W_{-1}}{W_{-1}} = \frac{p_{-1}Q_{-1}}{W_{-1}} \times \frac{\Delta p}{p_{-1}} + \frac{F_0}{W_{-1}} = \theta\Delta\ln p + \frac{F_0}{W_{-1}}$. Noting that $\Delta\ln\theta = 0$ and substituting for $\Delta\ln W$:

$$\Delta\ln Q = \theta\Delta\ln p + \frac{F_0}{W_{-1}} - \Delta\ln p$$
$$\Delta\ln Q = (\theta - 1)\Delta\ln p + \frac{F_0}{W_{-1}}$$

Finally, computing signed elasticity as:

$$\xi = -\frac{\partial\Delta\ln Q}{\partial\Delta\ln p} = 1 - \theta.$$

gives the derived expression.

F.4. Derivation of the Lucas Model

F.4.1. Three-Period Lucas Model

At time $t = 0$, let the financial intermediary chooses its fraction of portfolio to be held in stock θ in order to maximise returns on final period wealth. The financial intermediary solves:

$$\max_{\theta} \frac{1}{(1+r_{f,0})}\left[\theta \frac{D_1}{p_0} + (1-\theta)(1+r_{f,0})\right] \tag{A13}$$

Taking the first-order condition and imposing market clearing (no trade), the fundamental price of the stock is:

$$p_0 = \frac{D_1}{(1+r_{f,0})} \tag{A14}$$

Hence, the Lucas model is nested in our model as a special case, where the financial intermediary is allowed to readjust its portfolio holdings at $t = 0$.

F.4.2. Elastic Benchmark in the Quantitative Model

The appropriate elastic markets benchmark of our inelastic quantitiative model is a version of our model in which the financial intermediary is not subject to costs of deviating from its target equity share. The intermediary now solves:

$$\max_{\theta_t} \beta \mathbb{E}_0 \left[\theta_t \left\{\frac{D_{t+1} + p_{t+1}}{p_t}\right\} + (1-\theta_t)(1+r_t)\right]$$

The first-order condition with respect to θ yields the following price function:

$$p_t = \mathbb{E}\left[\frac{D_{t+1} + p_{t+1}}{1+r_t}\right]$$

This is the well-established Lucas (1978) result, where price of an asset depends upon its future discounted stream of dividends. Note that this is the only change compared to the baseline model.

F.5. Proposition A1

PROOF. Note that the proof assumes a log utility function. Start with the price of equity as a function of borrowing by non-wealthy households, Equation 17:

$$p_0 = p_{-1} + \frac{\theta}{1-\theta}\frac{B_0^P}{Q_0}$$

Use budget constraint of the non-wealthy, Equation 10 to write $B_0^P = c_0^P - e_0^P$. Combining $t = 0$ and $t = 1$ budget constraint yields the following intertemporal budget constraint:

$$c_0^P + \frac{c_1^P}{1 + r_{f,0}} + \frac{(1 + r_{f,-1})^2 B_{-1}}{1 + r_{f,0}} = e_0^P + \frac{e_1^P}{1 + r_{f,0}}$$

Under log utility, the non-wealthy Euler equation yields that $c_1^P = \beta(1 + r_{f,0})c_0^P$. Substituting and cross-multiplying:

$$c_0^P = \frac{1}{1+\beta}\left(e_0^P + \frac{e_1^P - (1 + r_{f,-1})^2 B_{-1}}{1 + r_{f,0}}\right)$$

Substituting into the pricing equation yields:

$$p_0 = p_{-1} + \frac{\theta}{1-\theta}\frac{1}{Q_0}\left(\frac{e_1^P}{(1+\beta)(1+r_{f,0})} - \frac{\beta}{1+\beta}e_0^P\right) - \frac{\theta}{1-\theta}\frac{1}{Q_0}\left(\frac{(1+r_{f,-1})^2 B_{-1}}{(1+\beta)(1+r_{f,0})}\right)$$

Substituting $p_{-1} = \frac{D_1}{(1+r_{f,-1})^2}$, $\frac{B_{-1}}{1-\theta} = W_{-1} = \frac{p_{-1}Q_{-1}}{\theta}$ from Equations 2 and 4, we obtain:

$$\begin{aligned} p_0 &= p_{-1}\left(1 - \frac{(1+r_{f,-1})^2}{(1+\beta)(1+r_{f,0})}\right) + \frac{\theta}{1-\theta}\frac{1}{Q_0}\left(\frac{e_1^P}{(1+\beta)(1+r_{f,0})} - \frac{\beta}{1+\beta}e_0^P\right) \\ &= \frac{D_1}{(1+r_{f,-1})^2}\left(1 - \frac{(1+r_{f,-1})^2}{(1+\beta)(1+r_{f,0})}\right) + \frac{\theta}{1-\theta}\frac{1}{Q_0}\frac{1}{1+\beta}\left(\frac{e_1^P}{1+r_{f,0}} - \beta e_0^P\right) \end{aligned}$$

Invoking the expectations hypothesis, $(1 + r_{f,-1})^2 = (1 + r_{f,-1\to 0})(1 + r_{f,0})$. However, $r_{f,-1\to 0} = 0$ in equilibrium as no agents can buy or sell risk-free contracts from $t = -1$ to $t = 0$. Therefore, $(1 + r_{f,-1})^2 = (1 + r_{f,0})$. Then, substituting and rearranging, we obtain the final outcome:

$$p_0 = \frac{\beta}{1-\beta}\frac{D_1}{(1+r_{f,-1})^2} + \frac{1}{1+\beta}\frac{\theta}{1-\theta}\frac{1}{Q_0}\left(\frac{e_1^P}{1+r_{f,0}} - \beta e_0^P\right)$$

$\square$

F.6. Proposition A3

PROOF. The market clearing condition for equities at $t = 0$ (in deviations) is:

$$\frac{Q_0 - Q_{-1}}{Q_{-1}} = \delta_q$$

Substituting from 6, $Q_0 = \frac{\theta}{p_0}(p_0 Q_{-1} + B_{-1} + F_0)$.

$$\frac{\theta}{p_0 Q_{-1}}(p_0 Q_{-1} + B_{-1} + F_0) = 1 + \delta_q$$

$$\theta + \frac{\theta B_{-1}}{p_0 Q_{-1}} + \frac{\theta F_0}{p_0 Q_{-1}} = 1 + \delta_q$$

Using $B_{-1} = (1-\theta)W_{-1}$ and $Q_{-1} = \frac{\theta W_{-1}}{p_{-1}}$,

$$\begin{aligned}
\theta + \frac{(1-\theta)p_{-1}}{p_0} + \frac{\theta F_0}{p_0 Q_{-1}} &= 1 + \delta_q \\
\theta p_0 + (1-\theta)p_{-1} + \frac{\theta F_0}{Q_{-1}} &= p_0(1+\delta_q) \\
(1-\theta)p_{-1} + \frac{\theta F_0}{Q_{-1}} &= p_0(1-\theta+\delta_q) \\
\frac{1-\theta}{1-\theta+\delta_q}p_{-1} + \frac{\theta}{1-\theta+\delta_q}\frac{F_0}{Q_{-1}} &= p_0
\end{aligned}$$

□

F.6.1. Condition for Flows to Matter

Under exogenous share issuance, the percentage change in prices is:

$$\frac{p_0 - p_{-1}}{p_{-1}} = \frac{\frac{\theta F_0}{p_{-1}Q_{-1}} - \delta_q}{1-\theta+\delta_q}$$

Therefore the condition for $\Delta p > 0$ is:

$$\frac{p_0 - p_{-1}}{p_{-1}} > 0 \impliedby \delta_q < \frac{\theta F_0}{p_{-1}Q_{-1}}$$

From 4, we know that $p_{-1}Q_{-1} = \theta W_{-1}$. Hence, writing flows as a proportion of total AuM of the financial intermediary as f, the condition is:

$$\delta_q < f$$

The condition states that as long as the percentage increase in equity issuance is less than flows as as percentage of wealth, equity prices rise in response to positive flows. Using flow of funds data, we find that $f \approx 2\%$ per quarter. Using data on U.S. Equity issuances from SIFMA, we find that $\delta_q \approx 0.2\%$ per quarter. We conclude, therefore, that share issuances are not high enough to negate the effect of positive flows on equity prices.

F.7. Proposition 3

PROOF. The mandate condition states that:

$$p_t = \frac{\theta_t W_t}{Q_t}$$

Utilising the mandate condition on bonds, i.e. $(1-\theta_t)W_t = B_t$, we get:

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{B_t}{Q_t}$$

Finally, flows are given by Equation 24. Imposing market clearing in equities, $Q_t = \overline{Q}$, yields:

$$F_t = B_t - B_{t-1}$$

Substituting for B_t, we get the desired result:

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{F_t + B_{t-1}}{Q_t}$$

□

F.8. Backward and Forward-Looking Pricing Function

In the following, we show how to derive the backward-looking version of the pricing function:

PROOF. Start with the expression for equity prices:

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{F_t + B_{t-1}}{Q_t}$$

Flows are given by Equation 24. Imposing market clearing in equities, $Q_t = \overline{Q}$, yields:

$$F_t + B_{t-1} = B_t$$

Moving back one period yields:

$$F_{t-1} + B_{t-2} = B_{t-1}$$

Substitute B_{t-1} from the second expression into the first:

$$F_t + F_{t-1} + B_{t-2} = B_t$$

In the limit as t goes to 0, B_t is simply the sum of all flows from 0 to t. Hence, price is:

$$p_t = \frac{\theta_t}{1-\theta_t}\frac{\sum_{s=0}^{t} F_t}{Q_t}$$

□

Next, we derive the forward-looking version of the pricing function:

PROOF. Begin with the portfolio choice for the financial intermediary, Equation 25:

$$\theta_t = \theta^*\left(1 + \frac{\beta}{\chi^{MF}}(r_t^e - r_t)\right).$$

Substitute in the definition of r_t^e, and invert:

$$\begin{aligned}
\frac{\chi^{MF}}{\beta}\frac{\theta_t - \theta^*}{\theta^*} &= \frac{D_{t+1} + p_{t+1}}{p_t} - 1 - r_t \\
\frac{\chi^{MF}}{\beta}\frac{\theta_t - \theta^*}{\theta^*} + (1 + r_t) &= \frac{D_{t+1} + p_{t+1}}{p_t} \\
p_t &= \frac{D_{t+1} + p_{t+1}}{1 + r_t + \frac{\chi^{MF}}{\beta}\frac{\theta_t - \theta^*}{\theta^*}}
\end{aligned}$$

Similarly, for $t+1$:

$$p_{t+1} = \frac{D_{t+2} + p_{t+2}}{1 + r_{t+1} + \frac{\chi^{MF}}{\beta}\frac{\theta_{t+1} - \theta^*}{\theta^*}}$$

Note that the discount rate $1 + r_t + \frac{\chi^{MF}}{\beta}\frac{\theta_{t+1} - \theta^*}{\theta^*}$ is nothing but the return on equity, $1 + r_t^e$. Then, substituting in the expression for p_{t+1} into p_t, we get:

$$\begin{aligned}
p_t &= \frac{D_{t+1} + \frac{D_{t+2} + p_{t+2}}{1 + r_{t+1}^e}}{1 + r_t^e} \\
&= \frac{D_{t+1}}{1 + r_t^e} + \frac{D_{t+2}}{(1 + r_t^e)(1 + r_{t+1}^e)} + \cdots + \frac{D_{t+n}}{(1 + r_t^e)(1 + r_{t+1}^e)\cdots(1 + r_{t+n}^e)} + \cdots \\
&= \sum_{s=1}^{\infty} \frac{D_{t+s}}{\prod_{j=s-1}^{\infty}(1 + r_{t+j}^e)}
\end{aligned}$$

□

F.9. Elasticity in the Quantitative Model

PROOF. Start with an inverted version of financial intermediary's portfolio choice, Equation 25:

$$\frac{\theta_t - \theta^*}{\theta^*} = \frac{\beta}{\chi^{MF}}\left(\frac{D_{t+1} + p_{t+1} - p_t}{p_t} - r_t\right) = \Delta \ln \theta_t$$

This is equivalent to the first-order Taylor expansion of θ_t around θ^*. Consider the term on the right-hand side within brackets, i.e. the equity premium π_t, which can be rewritten as:

$$\pi_t = \frac{D_{t+1}}{p_t} + \Delta \ln p_t - r_t$$

Consider the percentage change in the dividend-price ratio, i.e. $\Delta \ln \frac{D_{t+1}}{p_t}$. Express the percentage log deviation of dividends as $\tilde{d}$ and the percentage log deviation of prices as $\tilde{p}$. Then, $\Delta \ln \frac{D_{t+1}}{p_t} = \tilde{d} - \tilde{p}$. Next, consider a first-order Taylor approximation of $\Delta \ln \frac{D_{t+1}}{p_t}$ around some baseline dividend-price ratio $\frac{D}{p}$:

$$\begin{aligned}
\Delta \ln \frac{D_{t+1}}{p_t} &= \frac{\frac{D_{t+1}}{p_t} - \frac{D}{p}}{\frac{D}{p}} \\
\tilde{d} - \tilde{p} &= \frac{\frac{D_{t+1}}{p_t}}{\frac{D}{p}} - 1 \\
\frac{D_{t+1}}{p_t} &= (\tilde{d} - \tilde{p} + 1)\frac{D}{p}
\end{aligned}$$

Substituting into π_t:

$$\pi_t = (1 + \tilde{d})\frac{D}{p} + \tilde{p}(1 - \frac{D}{p}) - r_t$$

Go back to the mandate equation and invert to find quantity demanded:

$$Q_t = \frac{\theta_t W_t}{p_t}$$

Taking logs and first differencing:

$$\begin{aligned}
\Delta \ln Q_t &= \Delta \ln \theta_t + \Delta \ln W_t - \Delta \ln p_t \\
q_t &= \Delta \ln \theta_t + \left(\frac{p_{t-1} Q_{t-1}}{W_{t-1}} \frac{\Delta p_t}{p_{t-1}} + \underbrace{\frac{F_t}{W_{t-1}}}_{f_t} \right) - \tilde{p} \\
q_t &= \Delta \ln \theta_t + \theta_{t-1}\tilde{p} + f_t - \tilde{p}
\end{aligned}$$

Substituting from π_t and $\Delta \ln \theta_t$:

$$q_t = \frac{\beta}{\chi^{MF}}\left((1 + \tilde{d})\frac{D}{p} + \tilde{p}(1 - \frac{D}{p}) - r_t \right) + \tilde{p}(\theta_{t-1} - 1) + f_t$$

Finally, to find the elasticity, take the derivative of q_t with respect to $\tilde{p}$:

$$\xi_t \equiv \frac{\partial q_t}{\partial \tilde{p}} = \frac{\beta}{\chi^{MF}}(1 - \frac{D}{p}) + (\theta_{t-1} - 1)$$

Substituting in the value of θ_{t-1} yields the desired proposition for unsigned elasticity:

$$\xi_t = (\theta^* - 1) + \frac{\beta}{\chi^{MF}}\left[\theta^*(r^e_{t-1} - r_{t-1}) - \left\{ \frac{D}{p} - 1 \right\} \right].$$

□

Appendix G. Non-Homothetic Preferences and Calibration of Exogenous Processes

G.1. Euler Equations

The Euler equation for the non-wealthy household with respect to borrowing B_t^P is:

$$\mathbb{E}_t\left[\frac{1}{1+\rho+\delta}\frac{u'(c_{t+1}^P)}{u'(c_t^P)}\right]=\frac{1}{1+r_t}. \tag{A15}$$

The Euler equation for the wealthy household with respect to flows F_t is given by:

$$\mathbb{E}_t\left[\delta\frac{\nu'(a_t^R)}{u'(c_t^R)}+\frac{1}{1+\rho+\delta}\frac{u'(c_{t+1}^R)}{u'(c_t^R)}\left(\frac{D_{t+1}}{p_t}+r_t\right)\right]=1. \tag{A16}$$

Denoting the Lagrangian multiplier on the borrowing constraint with μ_t, the Euler equation with respect to housing investment H_t^M is given by:

$$\mathbb{E}_t\left[\delta\frac{\nu'(a_t^M)}{u'(c_t^M)}+\frac{1}{1+\rho^M+\delta}\frac{u'(c_{t+1}^M)}{u'(c_t^M)}\left(\frac{D_{t+1}^H+p_{t+1}^H}{p_t^H}\right)+\frac{\tau\mu_t}{u'(c_t^M)}\right]=1. \tag{A17}$$

The Euler equation with respect to borrowing B_t^M is given by:

$$\mathbb{E}_t\left[\delta\frac{\nu'(a_t^M)}{u'(c_t^M)}+\frac{1}{1+\rho^M+\delta}\frac{u'(c_{t+1}^M)}{u'(c_t^M)}(1+r_t)+\frac{\mu_t}{u'(c_t^M)}\right]=1. \tag{A18}$$

G.2. Non-Homothetic Preferences

In our calibration, we choose the following functional forms to represent non-homothetic preferences:

$$u[c]=\frac{c^{1-\sigma}-1}{1-\sigma}$$
$$\nu[a]=\frac{a^{1-\Sigma}-1}{1-\Sigma}.$$

To observe how the above functional forms translate into non-homothetic preferences, define $\zeta(a)$ to be the marginal utility of function ν relative to the marginal utility of function u:

$$\zeta(a)=\frac{\nu'(a)}{u'(a)}=a^{\sigma-\Sigma}, \tag{A19}$$

As explained in Mian et al. (2021b), when $\Sigma = \sigma$ (as in the case for log utility), $\zeta(a)$ is constant and utility is homothetic as the marginal utility of bequests and marginal utility of consumption are proportional. When $\zeta(a)$ is increasing, the marginal utility of bequests decays more slowly compared to the marginal utility of consumption, implying that wealthier agents have a stronger desire to save. This gives rise to non-homothetic preferences.

G.3. Exogenous Processes

Earnings of the non-wealthy, wealthy, middle class, equity and housing dividends follow AR(1) processes with persistence $\rho^P, \rho^R, \rho^M, \rho^D, \rho^{D^H}$ respectively, with i.i.d. normal errors whose standard deviations are $\sigma^P, \sigma^R, \sigma^M, \sigma^D, \sigma^{D^H}$ respectively:

$$e_t^P = (1-\rho^P)\bar{e}^P + \rho^P e_{t-1}^P + \epsilon_t^P, \tag{A20}$$

$$e_t^R = (1-\rho^R)\bar{e}^R + \rho^R e_{t-1}^R + \epsilon_t^R, \tag{A21}$$

$$e_t^M = (1-\rho^M)\bar{e}^M + \rho^M e_{t-1}^M + \epsilon_t^M, \tag{A22}$$

$$D_t = (1-\rho^D)\overline{D} + \rho^D D_{t-1} + \epsilon_t^D, \tag{A23}$$

$$D_t^H = (1-\rho^{D^H})\overline{D^H} + \rho^{D^H} D_{t-1}^H + \epsilon_t^{D^H}. \tag{A24}$$

where $\bar{e}^P, \bar{e}^R, \bar{e}^M, \bar{D}, \bar{D^H}$ represent steady state values for each series.

Appendix H. Regularity Condition on Middle-Class Elasticities

In this section, we briefly detail the conditions we need to lay down on σ^M, Σ^M and ρ^M to ensure the existence of steady-state equilibrium.

In steady state, the Euler equation of the middle class household on bonds can be written as the following, inverting for μ^M:

$$\mu^M = (c^M)^{-\sigma^M}\left(1 - \frac{1+r}{1+\rho^M+\delta}\right) - \delta(a^M)^{-\Sigma^M}$$

Under the Kuhn-Tucker conditions, equilibrium requires that the Lagrangian multiplier $\mu^M \geq 0$, and the complementary slackness condition on the borrowing constraint holds, i.e. $\mu^M(B^M - \tau p^H H^M) = 0$. We need to ensure that $\mu^M \geq 0$ for equilibrium to exist. Therefore:

$$\begin{aligned} \mu^M &\geq 0 \\ \left(1 - \frac{1+r}{1+\rho^M+\delta}\right) &\geq \delta\frac{(c^M)^{\sigma^M}}{(a^M)^{\Sigma^M}} \\ \frac{(c^M)^{\sigma^M}}{(a^M)^{\Sigma^M}} &\leq \frac{\rho^M - \rho}{\delta(1+\rho^M+\delta)} \end{aligned}$$

where the final step follows from the steady state value of $r = \rho + \delta$. Taking logs:

$$\sigma^M \log(c^M) - \Sigma^M \log(a^M) \leq \log\left(\frac{\rho^M - \rho}{\delta(1 + \rho^M + \delta)}\right)$$

$$\sigma^M \log(c^M) - \log\left(\frac{\rho^M - \rho}{\delta(1 + \rho^M + \delta)}\right) \leq \Sigma^M \log(a^M)$$

$$\frac{1}{\log(a^M)}\left[\sigma^M \log(c^M) - \log\left(\frac{\rho^M - \rho}{\delta(1 + \rho^M + \delta)}\right)\right] \leq \Sigma^M$$

In order to ensure non-homothetic behaviour where marginal utility on bequests increases with increasing wealth, we must also impose $\Sigma^M < \sigma^M$. Hence, the full regularity condition reads:

$$\frac{1}{\log(a^M)}\left[\sigma^M \log(c^M) - \log\left(\frac{\rho^M - \rho}{\delta(1 + \rho^M + \delta)}\right)\right] \leq \Sigma^M < \sigma^M$$

Therefore, we calibrate parameters $\rho^M, \sigma^M, \Sigma^M$ to ensure this condition is satisfied, which requires choosing ρ^M to be significantly different than ρ.

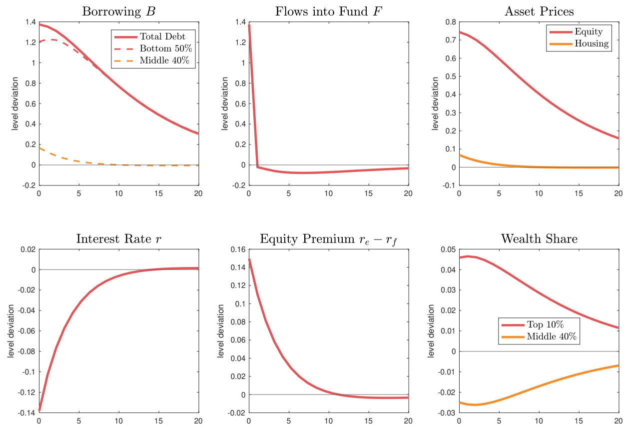
Appendix I. Impulse Response Functions

What are the directional effects of income share shocks? Here, we examine how macro-variables evolve in the presence of inelastic markets under the broader trends in labour shares observed over the past few decades. The past three decades have witness increasing top 10% labour income shares, at the expense of falling labour income shares of the rest of the 90%. An active literature has sought to establish micro-foundations for the drivers of labour share divergence. Several factors can drive divergence in income between the rich and the poor, including returns to education (Katz and Murphy 1992), automation (Acemoglu and Restrepo 2020), globalization (Autor et al. 2013), declining market power of workers (Stansbury and Summers 2020), rising market power of firms (De Loecker et al. 2020), and increasing profit share (Barkai 2020).

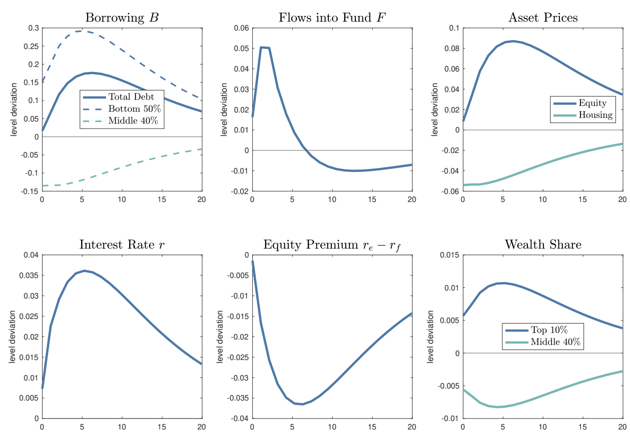
Our experiment considers three scenarios. In the first scenario, the wealthy household gets a positive income share shock which comprises of correlated positive shocks to labor income (endowment) and dividend income. In the second scenario, non-wealthy households get a negative labor income (endowment) shock. In the third scenario, middle class households get a negative labor income (endowment) shock, correlated with a positive housing dividend shock. In the third scenario, we allow for the borrowing constraint on middle class households to be occasionally binding. The results of the experiments are plotted in Figure A5.

Positive Top 10% Income Shock. In Figure A5A, we simulate a simultaneous positive MIT shock to the labor share for the top 10% and a positive MIT shock to equity dividends. The results indicate that the wealthy want to save more — flows into the financial intermediary increase, which leads to increased bond holdings. Both non-wealthy and middle class households increase borrowing

A. Positive labour share shock for top 10%



B. Negative labour share shock to bottom 50%



C. Negative labour share shock to middle 50-90%

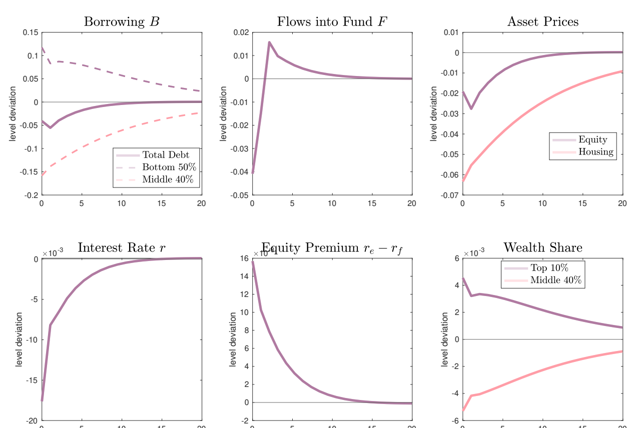


FIGURE A5. Panel A shows the IRFs in response to a positive labour share shock to the top 10%. Panel B shows IRFs in response to a negative labour share shock to the bottom 50%. Panel C shows IRFs in response to a negative labour share shock to the middle class, 50-90%.

through the savings market, though non-wealthy households increase their borrowing more. The increased savings by the rich lead to a decline in interest rates. Due to inelastic markets, equity prices rise persistently above their steady-state levels. As a consequence of rates falling and higher dividends, the equity premium rises. As middle class households' borrowing constraint binds, they demand more housing, pushing up house prices slightly. The revaluation of the top 10% portfolio drives an increase in the wealth share of the top 10%. The increase is large enough to counteract the slight increase in middle class portfolio values — their wealth share (along with bottom 50% wealth share) drops. The results show the *equity investment channel* in action.

Negative Bottom 50% Income Shock. In Figure A5B, we examine a negative MIT shock to the labor share for the bottom 50%. Here, borrowing by the bottom 50% rises, part of which is provided by more savings from the middle class household. Therefore, net borrowing of the financial intermediary rises modestly upon impact, but steadily increases over time. The top 10% are incentivised to increase their flows into the intermediary, while middle class households are incentivised to save instead of borrow in the risk-free bond due to the rise in interest rates (due to higher borrowing demand from non-wealthy). Similar to the positive shock, inelastic markets cause equity prices to rise persistently above steady-state levels. The combination of increased borrowing by the bottom 50% and the revaluation of the top 10% portfolio results in a higher wealth share for the top 10%. The middle class sells part of their housing to transfer wealth to the bond, which results in lower house prices and lower middle class wealth share. These results show the *borrowing channel* in action.

Negative Middle 50-90% Income Shock. In Figure A5C, we simulate a simultaneous negative MIT shock to the labor share for the middle class and a positive MIT shock to housing dividends (rental income). On impact, middle income households reduce their demand for housing, which reduces house prices. As the borrowing constraint continues to bind, this translates into lower borrowing by the middle class, which pushes down interest rates. This incentivises bottom 50% households to step in to borrow, which implies that total borrowings fall marginally. Reduced aggregate borrowings imply outflows from the financial intermediary, hence equity prices are lower. However, the fall in house prices is larger than the fall in equity prices, implying that the wealth share of the middle class reduces and remains persistently below the top 10% wealth share.

In summary, under inelastic markets, shocks to income inequality translates into wealth inequality through both the equity investment and the borrowing channel. The increase in savings by the top 10% and the increase in borrowing by middle class and non-wealthy households boosts equity valuations, and thereby increase the wealth of the wealthy due to portfolio heterogeneity.

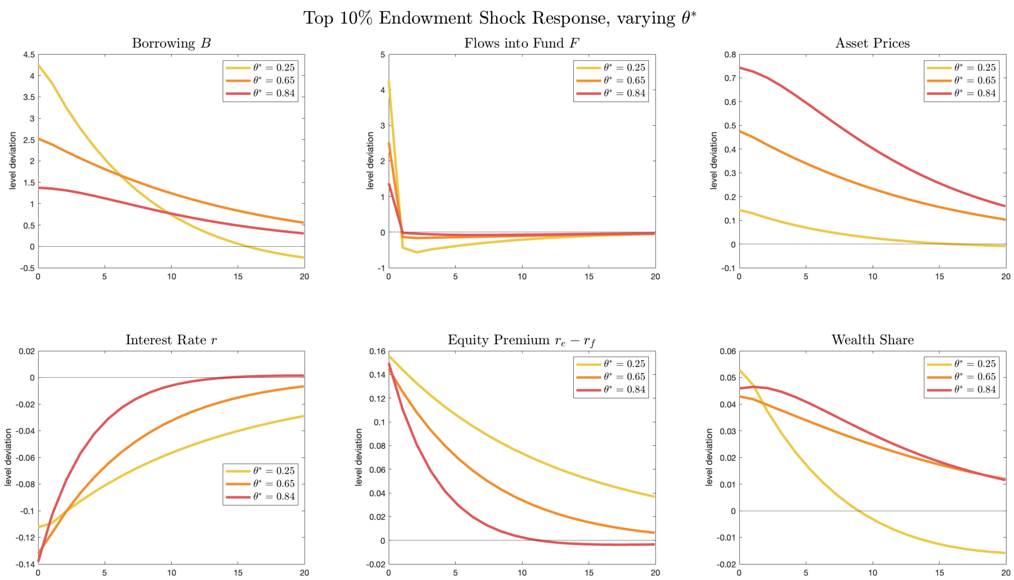
I.1. IRFs under Different Elasticities

How much do the impulse response functions depend upon the level of inelasticity in the model, controlled by varying the parameters θ^* and χ^{MF}? Intuitively, reducing χ^{MF} is equivalent to reducing inelasticity in the model. Similarly, increasing θ^* implies that the borrowing response will be dampened as demand for bonds will be lower. In Figures A6 and A7, we consider our variables of interest while varying θ^* and χ^{MF}. The results are qualitatively similar, which gives us confidence that our specific calibration choices are not driving our results. Nonetheless, there are some interesting outcomes which we discuss next.

In Figures A6A and A7A, we consider the effects of a positive top 10% labour share shock and negative bottom 50% labour share shock, while varying θ^* to take three values, 0.25, 0.65, and our calibrated case, 0.84. With lower target allocations, a positive wealthy labour share shock results in larger borrowing and flows responses. However, the impact on equity prices is lower, following from the pricing equation 15. The fall in interest rates (and increase in equity premia) are more persistent. The increase in wealth share also continues to be persistent, but the impact of the flows channel is reduced. With a negative bottom 50% labour share shock, the effects are much more pronounced and persistent. This is because with a lower θ^*, the borrowing channel is much more prominent, resulting in large increases in wealth shares driven both by more persistent (but smaller) asset price increases, and higher bond holdings.

In Figures A6B and A1A, we consider the effects of a positive top 10% labour share shock and negative bottom 50% labour share shock, while varying χ^{MF} to take three values, 1, 20, and our calibrated case, 171. When adjustment costs are low at $\chi^{MF} = 1$, it is unsurprising that borrowing and flow responses are smaller. However, perhaps counterintuitvely, equity price increases are *higher* — the fund is able to adjust quickly to increases in equity premia, and their higher demand pushes up asset prices more. Most interestingly, in the case of the negative bottom 50% shock, lower adjustment costs result in *falling* equity prices. This is because the fund is agile enough to reduce their equity allocation in the face of lower equity premium, despite higher flows, which is instead allocated to higher borrowing. Quantitatively, the difference in effects when $\chi^{MF} = 20$ and $\chi^{MF} = 171$ is very small. Therefore, the response of endogenous variables to increasing χ^{MF} is a concave function.

A. Positive labour share shock for top 10% - Varying θ^*



B. Positive labour share shock for top 10% - Varying χ^{MF}

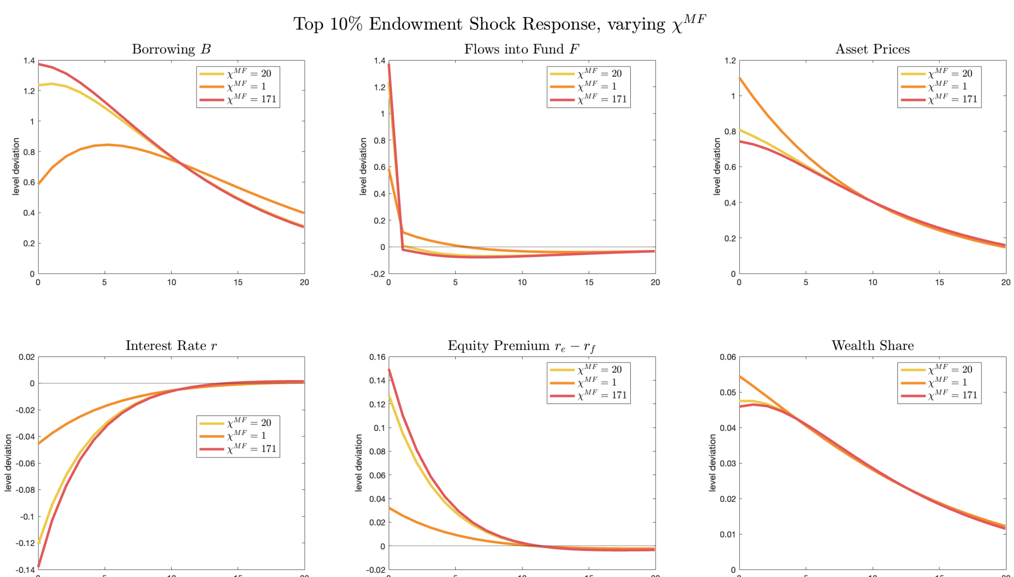
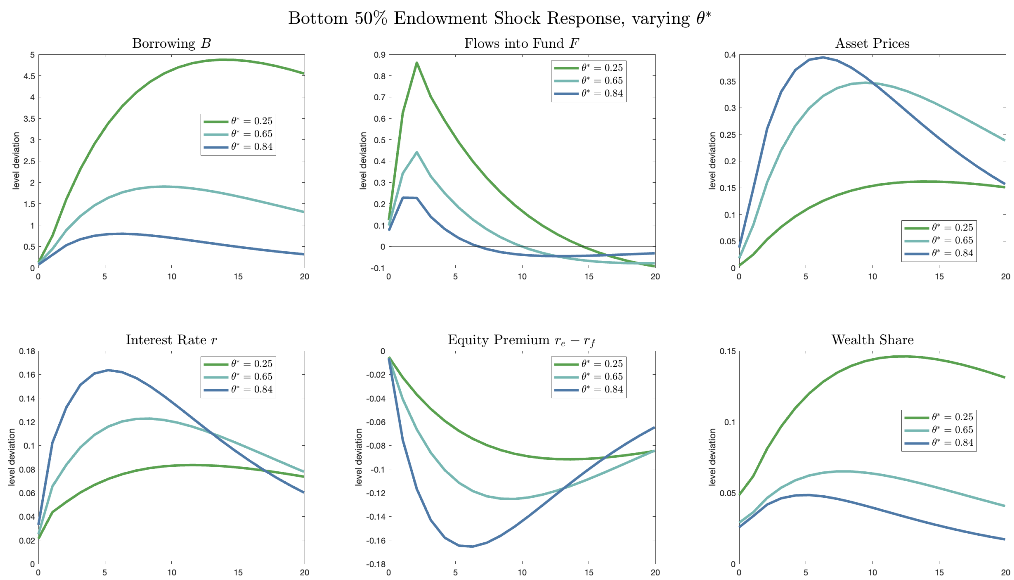


FIGURE A6. Both panels shows the IRFs in response to a positive labour share shock to the top 10%. Panel A shows how IRFs vary as θ^* varies. Panel B shows how IRFs vary as χ^{MF} varies.

A. Negative labour share shock for bottom 50% - Varying θ*



B. Negative labour share shock for bottom 50% - Varying χ^{MF}

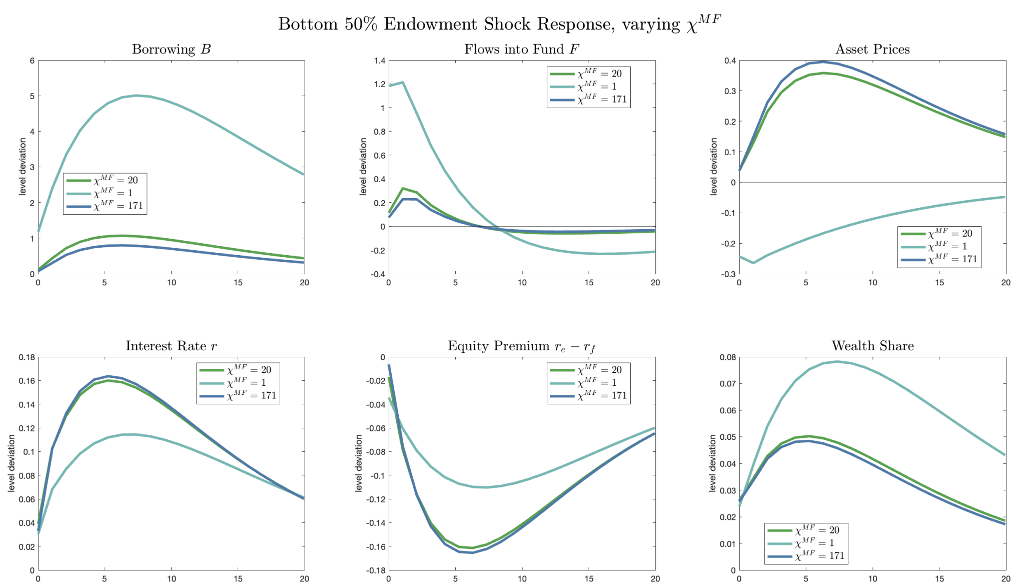


FIGURE A7. Both panels shows the IRFs in response to a positive labour share shock to the top 10%. Panel A shows how IRFs vary as θ* varies. Panel B shows how IRFs vary as χ^{MF} varies.

I.2. Equity Prices: Inelastic vs. Elastic Markets: Full Model

Figure A8 plots the response of equity prices to labour share shocks and dividend shocks in a model with middle class households and housing.

Negative non-wealthy income shocks continue to not matter in the elastic markets model, while prices respond much more in the inelastic markets model compared to the case with no middle class households. Positive dividend shocks continue to have a muted impact in the inelastic markets model.

The biggest difference is in the response of prices to a positive wealthy income shock. The interest rate decrease is bigger in the model with middle class, which leads to a much larger price impact in the elastic markets model upon impact. This is because in this model, due to middle class households being borrowing constrained, higher equity investment from the rich cannot be fully accommodated by frictionlessly increasing borrowing. The capacity of the non-wealthy household to borrow more is also limited (their endowments are lower than in the case without middle class). Therefore, interest rates need to fall more to induce non-wealthy households to borrow.

However, the elastic markets model cannot produce high persistence. The effect on prices reverts to steady state in eight periods, while in the inelastic markets model, the effect remains persistent for more than twenty periods, implying that the overall impact on wealth inequality over time is larger under inelastic markets.

We thus conclude that equity price responses under inelastic and elastic markets are qualitatively and quantitatively different, resulting in very different outcomes for wealth inequality.

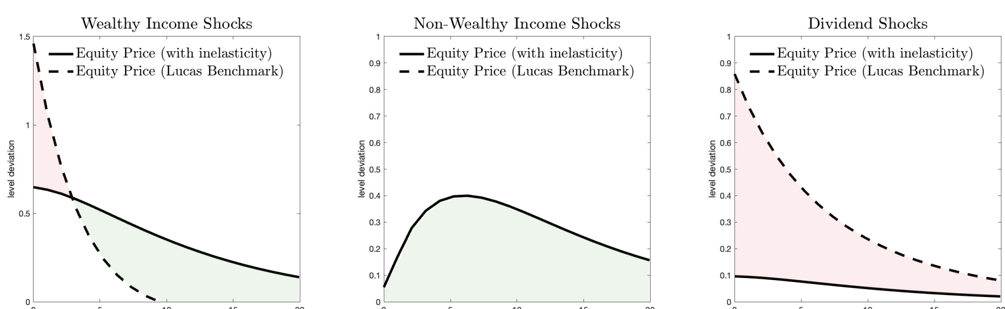


FIGURE A8. Panel A shows equity price IRF in response to a positive labour share shock to the top 10%. Panel B shows equity price IRF in response to a negative labour share shock to the bottom 50%. Panel C shows equity price IRF in response to a positive equity dividend shock.

Appendix J. Simulation: Market Capitalization, Total Debt, Divergence in Inequality

In Section 4.2, we demonstrated that the model can simultaneously match rising equity prices, rising total debt, and increasing divergence between income and wealth inequality in response to income and dividend shocks. How does our model perform in matching these three trends in a longer horizon simulation, rather than in a one-time shock exercise?

In Figure A9, we plot the growth rate of market capitalization, the growth rate of total debt outstanding, and the differential (between top 10% and bottom 50%) of growth rates of income and wealth, under a perfect foresight simulation with expectation errors post-2008.

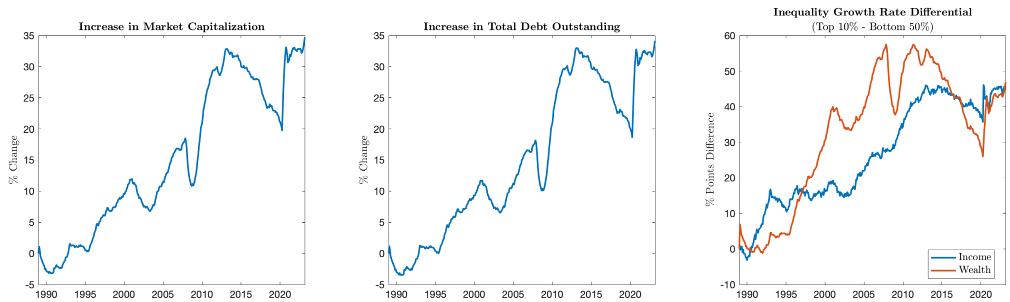


FIGURE A9. Dynamics of pQ, b and Inequality: Perfect Foresight with Expectation Errors post-2008

Note: The perfect foresight simulation initalises the economy at the January 1989 level of labour income shares and dividends. Then, agents are provided with the full realisation of income shares from January 1989 to December 2007. From January 2008, agents expect income shares to follow a smoothed trend. Each period, they make expectation 'errors' equivalent to the deviation of the actual income share relative to the trend. The figure plots percentage deviation of wealth shares relative to its 1989 level.

As expected from the IRF exercise, the model simulation does well in replicating the large increase in market capitalization as well as in total debt outstanding. In fact, the two series inherit each other's dynamics given the simplified structure of our model. Crucially, the model is also able to capture the faster increase in the wealth growth rate differential relative to the income growth rate differential — the simulated version of the Inequality Multiplier.

However, the model does not perform well in quantitatively matching the magnitude of increase in market cap, debt, and wealth growth rate differential. This is unsurprising given that the model focuses on the mechanism of inelastic markets at the cost of not considering other factors which drive equity market capitalization or debt, such as the endogenous decision of governments to issue more debt, company decision to list on equity markets, evolution of corporate profits etc. We conclude that the mechanism of inelastic markets delivers us qualitatively correct trends, and can quantitatively explain part of the magnitude of increase across the three measures.

Appendix K. Note: Elasticities

We review some concepts from Microeconomics and Koijen and Yogo (2025). Suppose we had one fund with a mandate to hold θ of equities. Then their holdings of shares Q is

$$Q = \theta \frac{W}{P},$$

where W is the funds wealth and P is price of equity. Suppose there is a small movement in the price P. We can take logs

$$\log(Q) = \log(\theta W) - \log(P).$$

The price effect (Marshallian) effect says that *holding W constant*, a 1% rise in the price makes the fund want 1% fewer shares as the denominator P got bigger. The *uncompensated* Marshallian elasticity is

$$\left.\frac{\partial \log(Q)}{\partial \log(P)}\right|_W = -1.$$

This is also known as the *price effect*.

The *wealth effect* says that because of θ, a 1% price increase also raises the fund's wealth by θ %. The mandate reinvests that extra wealth into the stock

$$\frac{\partial \log(W)}{\partial \log(P)} = \theta.$$

The Hicksian elasticity is the sum of the two

$$\frac{\partial \log(Q)}{\partial \log(P)} = -1 + \theta. \tag{A25}$$

So the unsigned Hicksian elasticity only reports the magnitudes whilst the signed gives the negative sign.

Signed Hicksian elasticity :	$\varepsilon^H_{i,\text{signed}} = -(1-\theta_i)$
Unsigned Hicksian elasticity :	$\lvert\varepsilon^H_i\rvert = \zeta_i = 1-\theta_i$