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Public Debt, Wealth Inequality, and The Burden of Taxation

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August 2026

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Abstract

Public debt and wealth concentration have co-moved persistently across advanced economies and historical periods, defying standard theories of wealth inequality, particularly given that rising inequality has coincided with falling real interest rates in recent decades. I develop a stylized Diamond model with household heterogeneity and progressive taxation to formalize how public debt, through its tax burden, endogenously dictates tax progressivity and thereby affects the wealth distribution. In this framework, permanent debt shocks alter tax progressivity depending on the macroeconomic regime, with debt expansions increasing progressivity when interest rates are high but reducing it when interest rates are low. The resulting impact of public debt on wealth inequality is nonlinear in the overall level of the tax burden, disequalizing below a threshold and equalizing above it. Cross-country empirical evidence supports these predictions and shows that public debt is a quantitatively important, and often dominant, driver of postwar wealth inequality, with sizable effects transmitted primarily through the tax burden. These findings establish the distribution of the tax burden as a primary driver of long-run wealth inequality, and public debt as a central mediating channel through which structural shocks, such as population aging or artificial intelligence, propagate to the wealth distribution.

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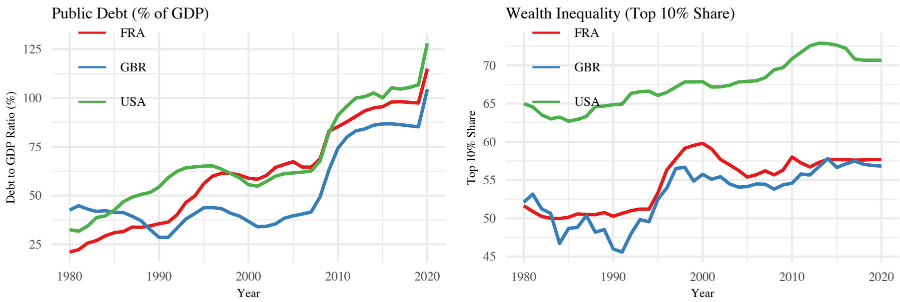
1 Introduction

The past four decades have witnessed a persistent co-movement between public indebtedness and wealth concentration across advanced economies—a historical pattern that has re-emerged in the modern era. Across several advanced economies, the top 10 percent wealth share has risen markedly since 1980, coinciding with a significant increase in public debt-to-GDP ratios. Figure 1 illustrates this pattern for the United States, France, and the United Kingdom. As advanced economies confront structural pressures that will likely sustain elevated debt levels—population aging, climate mitigation, AI-driven labor market transitions, and rising interest and defense expenditures[1]—this co-movement bears directly on the *intra*generational equity–efficiency trade-off, the social cost of debt sustainability, the feasibility of Pareto-improving debt policies, and the political economy of rising indebtedness.



Source: World Inequality Database and Jordà-Schularick-Taylor Macrohistory Database.

Figure 1: Public debt and wealth inequality comparison across selected countries, 1980–2020.

Despite this evidence, the long-run impact of public debt on wealth inequality—the most concentrated form of economic inequality—remains largely unexplored, although it has first-order implications for wealth accumulation. Its tax burden affects disposable income and, through general equilibrium effects, wages and interest rates—factors that determine households' ability to generate income, save, and accumulate wealth. Existing work in heterogeneous-agent macroeconomics has focused primarily on taxation and technological change as determinants of wealth inequality, yet it typically sets aside the direct role of government debt—an omission reflected even in leading surveys of the field[2]. Studies that focus more explicitly on the recent rise in wealth inequality either treat tax progressivity as an exogenous policy choice or attribute wealth concentration to differential asset returns; where public debt enters these frameworks, it plays only a minor role, mostly through the self-insurance channel (see Literature Review).

The literature therefore leaves largely unexplained the systematic co-movement between public debt and wealth inequality across economies while a unified theoretical explanation of the long-run dynamics of wealth inequality that holds across historical periods and institutional regimes remains elusive. The challenge is compounded by the fact that this increase in wealth inequality occurred during a prolonged period of low interest rates, an environment that, in principle, should have enabled the poor to catch up with the rich, particularly as public debt increasingly financed transfers, access to equity markets broadened, and credit constraints eased.

In this paper, I develop a conceptual framework that accounts for these developments and provides a unified explanation for the evolution of wealth inequality across countries and historical periods. I show that permanent public debt shocks—equivalently, debt sustainability or tax burden shocks—drive long-run changes in wealth inequality. In equilibrium, the tax burden is jointly determined by the level of debt and the macroeconomic regime, formally characterized by the dynamic efficiency condition, which reflects the gap between the long-run real interest rate (r) and the real growth rate (g). To satisfy the government's intertemporal budget constraint, a permanent increase in public debt induces endogenous adjustments in marginal tax rates—a channel I term *indirect redistribution*. Through this channel, public debt alters the degree of tax progressivity and the distribution of the tax burden across households, thereby determining both the sign and

[1] For example, in several advanced economies, rising debt-service costs have become an increasingly important component of public expenditure (IMF, 2025a,b, 2026).

[2] See De Nardi and Fella (2017); Benhabib and Bisin (2018); Achdou et al. (2022); Auclert et al. (2025).

magnitude of the resulting changes in wealth inequality.

In an $r > g$ regime, interest payments are high, the demand for revenue is large, and indirect redistribution is strong. Yet the crowding out of capital and the resulting higher returns disproportionately benefit richer households, dominating the redistributive effect of taxation and thereby amplifying wealth inequality. In an $r < g$ regime, by contrast, debt service is cheap, the demand for revenue declines, marginal tax rates fall, and indirect redistribution weakens, causing wealth inequality to rise once again. Public debt can therefore increase wealth inequality in both regimes, though the underlying transmission mechanisms differ. The interest rate is the dominant driver when $r > g$, and the decline in tax progressivity and weaker indirect redistribution when $r < g$. In both cases, however, the effects operate through the overall tax burden, and it is this common channel that links public debt to the strength of indirect redistribution. By extension, the effects could become nonlinear when the tax burden and the demand for revenues grow sufficiently high that indirect redistribution becomes too strong and wealth inequality declines. In the high interest rate regime ($r > g$), this can emerge because borrowing costs are high, while in the low interest rate regime ($r < g$), this can occur because the level of public debt is high.

To formalize these arguments, I present a stylized version of an otherwise standard Diamond (1965) model featuring ex-ante heterogeneous households that differ in their labor endowments and saving propensities. The model preserves Diamond's original focus on public debt as a deferred tax while embedding a realistic representation of the tax system that governs the distribution of the tax burden across households. For this purpose, I employ the affine tax specification of Heathcote et al. (2017) and the nonlinear form of Gouveia and Strauss (1994) to map overall tax revenues into individual tax liabilities. Together, these specifications characterize the feasible set of tax responses consistent with debt sustainability, describing how a given tax system transmits the tax burden of public debt through adjustments in tax intensity and changes in the curvature of the marginal tax schedule, each corresponding to a different component of the tax system. A permanent debt shock, through the resulting change in the tax burden, then scales the distributional implications of whichever component absorbs the adjustment.

In this framework, I show that a permanent public debt shock endogenously alters tax progressivity by shifting the marginal tax schedule in a direction determined by the macroeconomic regime. When $r > g$, the shift is upward and the tax system becomes more progressive; when $r < g$, the shift is downward and the system becomes less progressive. It is in this regime that differences in the ability to save matter most, since the decline in overall tax revenues and, subsequently, in marginal tax rates due to lower debt service costs allows wealthier households to retain an even larger fraction of their income relative to the poor, thereby amplifying wealth inequality. The post-1980 experience is a direct application of this mechanism. The transition from a high to a low interest rate environment lowered the tax burden of public debt, endogenously weakening the fiscal pressure that had sustained both high tax levels and strong indirect redistribution (i.e., high marginal tax rates) in the postwar period, thereby contributing to the subsequent rise in wealth inequality.

I provide the corresponding empirical support using the Blanchard and Quah (1989) approach to identify permanent debt shocks, examining the relationship between public debt and wealth inequality across three country case studies—the United States, France, and the United Kingdom—chosen for their long historical coverage, diverse fiscal institutions, and public debt series that satisfy the unit-root condition required for permanent shocks. I complement this analysis with the structural panel VAR approach of Pedroni (2013), which pools information across countries to exploit common dynamics and improve precision, especially under the Blanchard and Quah (1989) identification strategy, thereby addressing the bias–variance trade-off at long horizons (Li et al., 2024). I interpret these permanent debt shocks as permanent shifts in the tax burden and validate that interpretation by directly testing the transmission it requires. Diamond (1965) originated the notion of public debt as a deferred tax whereby, in the long run, it jointly crowds out capital, raises the return on capital, and lowers real wages. The empirical results provide strong support for this neoclassical transmission mechanism across the three country case studies and the structural panel VAR, validating the interpretation of public debt as a deferred tax and the equivalence between permanent debt shocks and tax burden shocks.

The baseline results document large disequalizing effects across the country case studies, though their magnitude varies. Quantitatively, a 74 percentage-point increase in the debt-to-GDP ratio—roughly the U.S. expansion since 1980, which I use as a representative shock—raises the top 10 percent wealth share by about 6 percentage points in the United States, 7 in the United Kingdom, and 20 in France, whereas the structural panel VAR yields a median effect of 2 percentage points across the sample of countries. Public debt nonetheless affects wealth inequality more via taxation than via general equilibrium effects, largely because the tax burden across countries in the sample is low. The capital-return channel is correspondingly weak, and the tax channel dominates, as the model predicts in the low-tax-burden regime (the $r < g$ case). Given the short sample, I further verify the robustness of the country-specific results using the BVAR approach of Giannone et al. (2015) and Antolin-Diaz and Surico (2025), yielding estimates that align with the baseline while exhibiting greater precision.

Across the three country case studies, these shocks emerge as a primary driver of postwar wealth inequality, accounting for a substantial share of the observed movements in top wealth shares during both the deleveraging period and the subsequent phase of public debt expansion. The identified permanent debt shocks stand as the single largest contributor in most countries and historical phases, at times accounting for the greater part of the decline in wealth concentration during deleveraging and for a comparably large share of the subsequent rise during the public debt expansion. Their contribution dominates that of shocks to capital returns and wages throughout, and typically that of wealth-specific factors as well, which also reflect rent-seeking or tax avoidance dynamics (Piketty et al., 2018; Saez and Zucman, 2019). This cross-country consistency demonstrates that the prominence of the debt channel is not an artifact of a specific institutional setting, but rather a robust feature across economies with distinct structural characteristics.

A separate specification then tests whether the post-1980 rise is instead driven by the secular decline in tax progressivity, measured using available series on average marginal tax rates by income group. Even when progressivity is ordered prior to public debt, and therefore granted first claim on any common variation, the debt shock accounts for close to half of the rise in the top 10 percent wealth share, while the progressivity shock accounts for only a small fraction of the increase.

To examine whether public debt generates nonlinear effects on wealth inequality through the endogenous adjustment of tax progressivity, particularly when the tax burden is high, I use the intensity of redistribution as a proxy for tax progressivity. Leveraging the small-sample properties of the panel SVAR approach of Pedroni (2013), I estimate the impact of permanent debt shocks on both redistribution and wealth inequality by splitting the sample of countries into low- and high-tax-burden groups. The estimates confirm the model's central prediction that a higher tax burden induces greater tax progressivity, systematically dampening the disequalizing impact of debt shocks. At a sufficiently high tax burden, this endogenous progressivity response dominates, ultimately reversing the sign so that public debt reduces wealth inequality.

These findings suggest that the distribution of the tax burden of public debt is a central driver of wealth inequality, with tax progressivity depending on the government's intertemporal budget constraint, which in turn is affected by the interest rate regime. The other mechanisms emphasized in the existing literature—including differential returns to capital, asset price revaluations, and declining tax progressivity (Kaymak and Poschke, 2016; Hubmer et al., 2021)—remain important determinants of long-run wealth inequality, but they share a common limitation. Each relies on a transmission channel that is either specific to historical episodes, such as sustained asset price appreciations, or treats changes in tax progressivity as exogenous without explaining their underlying cause. As a result, they cannot necessarily provide a unified explanation for the persistent co-movement between public debt and wealth inequality observed within countries, and its evolution across historical periods.

By contrast, this paper suggests that the post-1980 co-movement of lower marginal tax rates, weaker redistribution, and higher wealth concentration reflects the joint outcome of a single fiscal shock—a persistent decline in the tax burden of public debt. This shift gave governments the ability to permanently reduce the top marginal tax rate and, through a looser intertemporal budget constraint, lower the effective degree of tax progressivity, rendering the shift in tax progressivity an outcome rather than a cause. As such, permanent shifts in the tax system emanate from the government's intertemporal budget constraint. This result can also explain the widespread alignment across countries (and under different political ideologies) in permanently reducing marginal tax rates without necessarily requiring a change in redistribution preferences or related political-economy factors.

The paper's underlying argument, however, is broader than the post-1980 episode suggests. The model and the empirical analysis suggest that the reason public debt emerges as a central driver of wealth inequality is that the same structural forces that govern the secular macroeconomic equilibrium, and hence the interest rate regime, simultaneously determine debt sustainability—captured by the $r - g$ gap and interest payments—and, through this mediating channel, change the distribution of the tax burden. When such a shock—be it a productivity slowdown, demographic aging, a global shift in safe asset demand, or an AI-driven boom—permanently alters the interest rate regime, it concurrently loosens or tightens the government's intertemporal budget constraint, generating an endogenous incentive for permanent tax reforms. The degree of redistribution is therefore not determined solely by political ideology or exogenous institutional change, but also by the government's intertemporal budget constraint. Public debt is thus the primary channel through which a broad range of structural shocks is transmitted into permanent, post-tax shifts in the wealth distribution. Wealth inequality then depends less on capital returns at the top, as emphasized by Piketty (2014) and the related literature, than on the distribution of the tax burden of public debt, with the sign and magnitude of the $r - g$ gap determining how unevenly it falls across households.

Literature Review: The literature has long documented the rise in wealth inequality (Piketty, 2014). A prominent strand (Piketty and Zucman, 2014a; Saez and Zucman, 2016) takes the post-1980 decline in top marginal tax rates as given and traces its consequences for the distribution of wealth. Piketty et al. (2014) document a strong correlation between the decline in top marginal rates and the surge in top income shares since the mid-1970s, while Kaymak and Poschke (2016) and Hubmer et al. (2021) quantify the contribution of reduced tax progressivity to the rise in U.S. wealth concentration. Kindermann and Krueger (2022) reinforce the importance of this channel from a normative perspective, showing that high top marginal rates are optimal through their effect on the equilibrium wealth distribution, and Ferriere and Navarro (2024) study the broader macroeconomic implications for fiscal multipliers. These studies, however, do not rationalize the decline in top marginal rates itself. One plausible interpretation is that this decline reflects a shift in preferences for redistribution, as studied by Lindert (2004), Alesina and Angeletos (2005), and Bénabou and Tirole (2006). In contrast, this paper demonstrates that the secular decline in top marginal tax rates emerges endogenously from a falling tax burden of public debt, thereby providing a more consistent explanation for the synchronized reduction in tax progressivity across countries since the 1980s.

A related strand of the literature highlights the self-insurance role of government debt and concludes that higher public debt can reduce inequality by relaxing borrowing constraints.[3] This mechanism is difficult to reconcile with the empirical evidence. If public debt primarily operated through improved liquidity and self-insurance, one would expect declining wealth inequality in countries such as France, rising social mobility in the United States, or at least a positive relationship between public debt and redistribution across countries. None of these patterns appear in the data. The argument is even harder to reconcile with earlier historical episodes, where public debt primarily financed wars and the self-insurance channel was largely absent, yet public debt and wealth inequality continued to move together (Piketty, 2014).

Piketty's explanation for the dynamics of wealth concentration (Piketty, 2014; Piketty and Zucman, 2014a) rests on the $r > g$ mechanism and on the historical observation that public debt was predominantly held by capitalists rather than workers. While this characterization may have been appropriate for earlier institutional settings, it is less compelling in modern economies, where tax systems are more progressive, welfare states are larger, and public debt is increasingly held by workers through pension funds (Andritzky, 2012; Arslanalp and Tsuda, 2014). The deeper problem is that key features of the post-1980 period are difficult to reconcile with the $r > g$ narrative. Financial frictions have eased, redistribution has expanded, and persistently low interest rates have moved economies into an $r < g$ regime, reflecting dynamic inefficiency or excess savings(Geerolf, 2018; Blanchard, 2019; Bloise and Reichlin, 2023).

A related strand argues that low interest rates have raised asset valuations or helped entrepreneurs borrow cheaply, thereby disproportionately benefiting wealth holders.[4] While such effects may play a role, the empirical evidence I present suggests they are not the dominant mechanism. The valuation channel also carries an implausible implication—once interest rates have normalized, wealth inequality should fall sharply, a prediction at odds with observed trends.

Earlier contributions that assess the effect of public debt on wealth inequality typically presume that public debt is held by capitalists, so that debt issuance redistributes toward a narrow group of bondholders while taxes fall on the broader population.[5] This presumption rests on the same Ricardian logic as Piketty's $r > g$ mechanism and inherits its limitations. By contrast,

[3] See Aiyagari and McGrattan (1998); Floden (2001); Röhrs and Winter (2017).

[4] See Fernández-Villaverde and Levintal (2024); Gomez and Gouin-Bonenfant (2024); Greenwald et al. (2025).

[5] See Michel and Pestieau (1998, 1999); Mankiw (2000); Michel and Pestieau (2005); Bilbiie et al. (2013).

the present framework allows for an arbitrary ownership structure of public debt and is more empirically grounded, emphasizing crowding-out effects that violate Ricardian equivalence and subsuming the role of social security and pension systems, through which households can continually accumulate wealth even when individually credit constrained, as in Mankiw (2000) or Bilbiie et al. (2013).

The present analysis emphasizes instead a different transmission channel. Public debt crowds out physical capital, raising the marginal product of capital and lowering real wages. This generates a common driver of both capital income and labor income, so that wealth inequality is shaped less by the level of capital income itself than by heterogeneity in households' saving behavior and disposable income, consistent with Mian et al. (2020, 2021) and Auclert et al. (2023). The empirical results support this interpretation—lower interest rates are, if anything, associated with reductions in wealth inequality, while wage dynamics and disposable income play a more prominent role, in line with the quantitative exercise in Kaymak and Poschke (2016). More broadly, these findings challenge explanations that appeal to the $r > g$ mechanism or to valuation effects driven by low interest rates. By tying the trajectory of wealth inequality to the path of public debt, the present framework can account for rising wealth concentration even in environments where $r < g$—a case that has been particularly relevant since the 1980s and one that the existing literature struggles to reconcile with both the increase in wealth inequality and its co-movement with public debt across countries and historical episodes.

Relatedly, Maebayashi and Konishi (2021) show that wealth inequality can affect debt sustainability, generating a potential feedback loop between inequality and public debt. However, in the steady state of their AK framework, the amplification of wealth inequality through public debt rests on restrictive assumptions—most notably regressive taxation—under which factor prices remain fixed and distributional outcomes follow mechanically. Their reliance on heterogeneous bequest motives as the central transmission channel further limits the scope of the result, since this mechanism operates only in the $r > g$ regime, as discussed above. Beyond these restrictions, no such feedback loop is theoretically inevitable or empirically robust. Regime dependence and the redistribution channel introduce nonlinearities that break any fixed relationship between debt and inequality, so that the sign and magnitude of the effect depend on the indirect redistribution channel and macroeconomic environment rather than on intergenerational linkages alone.

To an extent, the results are closer in spirit to heterodox views—most notably modern monetary theory (Kelton, 2020)—which emphasize that high public debt levels are sustainable with redistribution, although the mechanism here remains neoclassical and is empirically more plausible. Redistribution attenuates but does not eliminate the effect of public debt on wealth inequality. Even under strongly progressive taxation, higher public debt still raises wealth concentration; triggering the nonlinearity that would reverse the distributional effect—that is, reaching debt levels high enough for public debt to reduce inequality—may require implausibly large debt accumulation. In practice, therefore, public debt and wealth inequality could move together regardless of the redistributive stance. A related nonlinearity logic underlies arguments such as those of Borissov and Kalk (2020), which link inequality to initial debt levels, yet such views struggle to account for the empirical co-movement observed since the 1980s, when countries with similarly low initial debt experienced rising inequality.

The paper also contributes to the empirical literature on the distributional effects of fiscal policy. Existing work has studied primarily income inequality at short horizons, tracing the effects of fiscal consolidation episodes (Ball et al., 2013; Woo et al., 2013; Agnello and Sousa, 2014) or of debt levels on income inequality (Salti, 2015). Prior empirical work on wealth inequality has focused predominantly on monetary policy and, to a lesser extent, fiscal policy.[6] This paper instead examines wealth rather than income inequality and estimates the long-run effects of permanent debt shocks rather than the short-run consequences of discrete consolidation episodes.

Other related work considers how global income inequality could raise debt levels through the insurance channel of Aiyagari (1994) and the higher demand for safe assets, but treats the resulting rise in debt as an optimal response to higher income inequality (Azzimonti et al., 2014). That framework, however, restricts the rise in debt to a single, optimal borrowing motive. In contrast, this paper treats public debt as a primitive, ensuring the theoretical mechanism remains robust to a variety of motives, including those driven by non-economic considerations such as national security (Fatás et al., 2019). Regardless of why debt accumulates, what ultimately matters is the resulting level of the tax burden, which governs debt sustainability and, according to recent

[6] See Colciago et al. (2019); Mumtaz and Theophilopoulou (2020); Bonifacio et al. (2021); El Herradi and Leroy (2021); Lenza and Slacalek (2024).

evidence, effectively dictates the government's fiscal stance (Chen et al., 2025; Eichengreen et al., 2026).

Finally, this paper also provides a new empirical evidence for the full transmission mechanism of the Diamond (1965) model, whereby public debt shocks operate as tax burden shocks. Prior work has either invoked these neoclassical assumptions indirectly—by studying the effect of public debt on growth[7] or by focusing on interest rates alone[8]—or has taken crowding out as given (Rachel and Summers, 2019). The empirical validation of the full transmission mechanism—from private capital to factor prices—provides direct support for the neoclassical assumptions underpinning a broad class of macroeconomic frameworks, from Aiyagari-type models to overlapping-generations models, and under which public debt can improve efficiency. In economies where competitive markets fail—whether through dynamic inefficiency[9] or market incompleteness[10]—public debt improves welfare because it crowds out capital, a mechanism that in turn requires the failure of Ricardian equivalence.[11] The empirical results suggest that when the tax burden is low—as under $r < g$—the mechanism that delivers these efficiency gains is relevant in practice, but the level of debt itself may constrain the feasibility of Pareto-optimal debt policies through the potentially significant distributional effects. The findings therefore bear directly on the equity–efficiency trade-off, an issue I take up in the concluding section.

Outline: The remainder of the paper is organized as follows. Section 2 documents the stylized facts linking public debt, taxation, and wealth concentration across advanced economies. Section 3 presents the theoretical framework and characterizes its key properties. Section 4 derives the main theoretical results. Section 5 details the empirical identification strategy and presents the main results. Section 6 discusses the broader implications of the findings in this paper, while Section 7 concludes. The Online Appendix provides supplementary empirical results and details on the data analysis underlying the stylized facts.

2 Stylized Facts

This section documents empirical regularities in the joint evolution of public debt, wealth inequality, and budgetary policy across advanced economies from 1950 to 2019 (see Online Appendix for data details). Figure 2 shows the relationship between public debt, interest payments, and the distribution of the tax burden between capital and labor, with the evidence broadly conforming to the predictions of Diamond (1965). Higher debt levels are associated with higher interest payments (Figure 2a). Economies with debt below 40 percent of GDP allocate approximately 1.4 percent of GDP to debt service; this rises to 2.9 percent in the 40–70 percent range, 3.5 percent in the 70–100 percent range, and exceeds 4 percent when debt surpasses 100 percent of GDP.

[7] See Kumar and Woo (2010); Reinhart and Rogoff (2010); Panizza and Presbitero (2013).

[8] See Elmendorf and Mankiw (1999); Gale and Orszag (2004); Engen and Hubbard (2005); Laubach (2009); Warnock and Warnock (2009); Furceri et al. (2025).

[9] See Diamond (1965); Abel et al. (1989); Geerolf (2018); Bloise and Reichlin (2023).

[10] See Geanakoplos and Polemarchakis (1986); Dávila et al. (2012); Gottardi et al. (2015).

[11] See Barro (1974); Bernheim (1987); Leiderman and Blejer (1988).

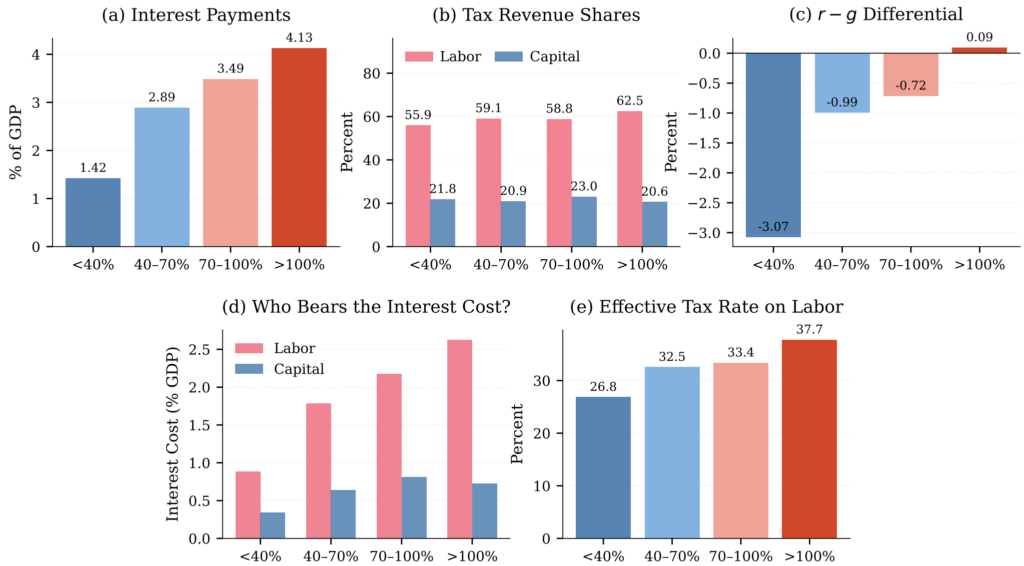


Figure 2: Interest Payments and Public Debt

Note: Advanced economies, 1950–2019. Averages are binned by public debt level.

Figure 2c shows that high debt levels are also associated with a higher tax burden, as defined by the $r - g$ differential. Governments in high-debt regimes must therefore dedicate an increasing share of revenues to servicing existing obligations or increase taxes. Labor income accounts for approximately 60 percent of tax revenues, a share that remains broadly stable across debt levels (Figure 2b). Yet the tax burden of public debt falls disproportionately on wage earners, and this disparity intensifies as debt rises, with wage earners bearing almost the entire burden at high debt levels (Figure 2d). The effective tax rate on labor rises across the same debt bins, from 26.8 percent when debt is below 40 percent of GDP to 32.5 percent in the 40–70 percent range, 33.4 percent in the 70–100 percent range, and 37.7 percent when debt exceeds 100 percent of GDP (Figure 2e), the mechanism underlying the growing labor share of the debt-service burden shown in panel (d).

These patterns are consistent with the sustainability view of fiscal policy (Eichengreen et al., 2026). Once interest payments are secured, governments can run primary deficits and accumulate debt, leading to permanent changes in debt levels. As Chen et al. (2025) document, a government's decision to run surpluses or deficits depends on its ability to ensure the continued servicing of public debt. This mechanism helps explain why long periods of either rising or declining debt are commonly observed and, by extension, why debt levels can undergo permanent shifts.

The distributional implications of this process are illustrated in Figure 3, which examines the relationship between public debt, wealth inequality, taxation, and redistribution. The positive co-movement between public debt and wealth inequality observed for the United States, France, and the United Kingdom in the introduction extends to most advanced economies in the sample. Panel (a) displays a monotonic relationship between public debt and wealth concentration. Economies with low debt levels (below 40 percent of GDP) exhibit average top 1 percent wealth shares of approximately 23 percent, rising to over 25 percent when debt is high (exceeding 100 percent of GDP). Panel (b) plots decade averages from 1950 to 2010 and shows that both variables declined during the postwar decades before rising sharply thereafter, with changes in public debt appearing to precede changes in wealth inequality. Following World War II, fiscal consolidation reduced wartime debt; from the mid-1970s onward, debt resumed its ascent, driven by welfare-state expansion and structural fiscal reforms.

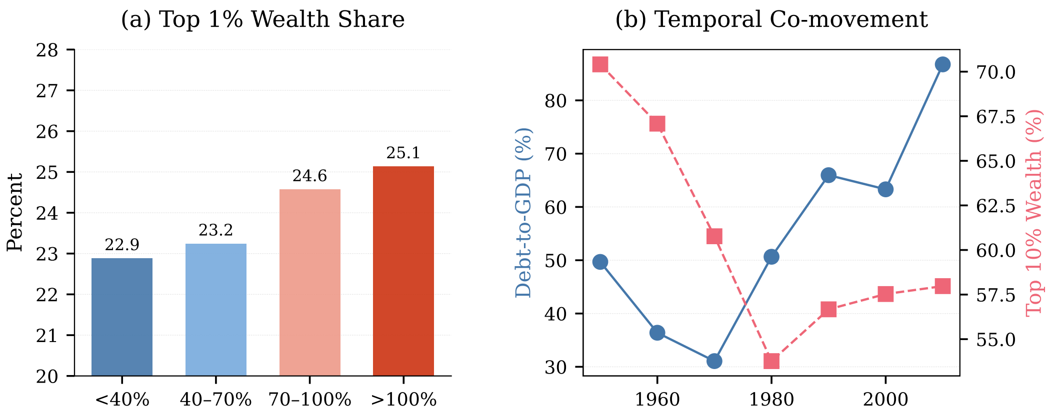


Figure 3: Public Debt and Wealth Inequality across Advanced Economies

Note: Advanced economies, 1950–2019. Panel (b) reports decade averages, 1950–2010. Source: World Inequality Database (wealth shares) and Jordà–Schularick–Taylor Macrohistory Database (public debt).

Turning to taxation and redistribution, Figure 4 documents two main patterns. First, public debt and top marginal tax rates are correlated, though the direction of that correlation depends on the macroeconomic regime. Before the 1980s, when interest rates were high, public debt and top marginal tax rates rose together. After the 1980s, the correlation turned negative, as higher debt levels coincided with lower top marginal tax rates. Second, redistribution, which in this case covers the period from 1975 onward—and therefore mostly the low interest rate period—remained largely invariant to debt levels. I formalize these patterns in Section 4, where I show how permanent public debt shocks shift the marginal tax schedule—and hence the degree of tax progressivity—and can weaken redistribution when interest rates are low.

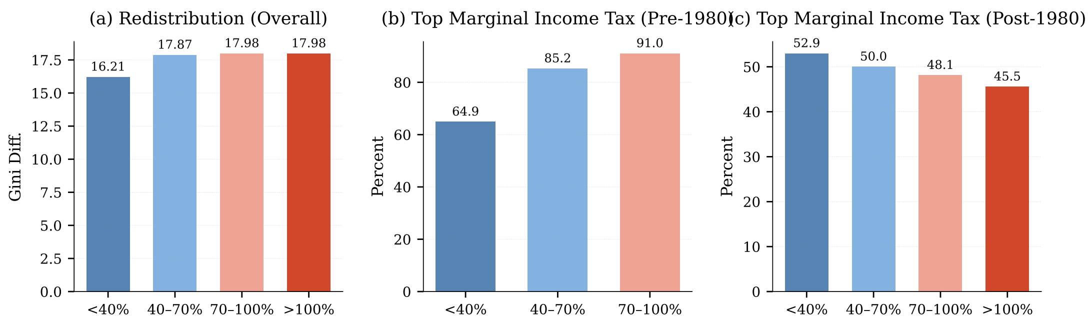


Figure 4: Public Debt, Redistribution, and Top Marginal Tax Rates

Note: Panels (b) and (c) cover France, Germany, Japan, the United States, and the United Kingdom, the countries with available top marginal income tax rate series in WID data. The redistribution panel (a) begins in 1975 and thus mostly captures the low interest rate period. Panel (b) omits the >100% debt bin due to missing pre-1980 tax-rate data at this debt level.

The overall picture that emerges is one of systematic co-movement between public debt and wealth inequality, linked to the distribution of the tax burden, with debt service falling disproportionately on wage earners. This co-movement is not a recent phenomenon. Piketty (2014) documented that the positive association between public debt and wealth inequality recurs across historical periods—a defining feature of nineteenth-century Britain and France. What is puzzling is how this pattern reappears in modern economies that differ substantially in institutional structure. Tax systems are more progressive, welfare states more developed, and public debt is held predominantly by workers through pension funds rather than by a distinct capitalist class. This recurrence across centuries and countries, despite these differences, suggests that a common factor is at work. The remainder of this paper traces that factor to the tax burden of public debt, developing a theoretical framework that rationalizes these stylized facts alongside supporting empirical evidence.

3 The Model

3.1 Households

Time is discrete $t = 0, 1 \ldots \infty$, the economy is as in Diamond (1965) and grows due to exogenous population growth, given by g. Population grows according to $N_t = (1+g)N_{t-1}$, where N_t is the size of the generation born in period t. This assumption captures the demographic changes that currently drive much of the long-term projections for both public debt and economic growth, as well as for interest rates. Households are indexed by i. Newborns are endowed with a productivity type, $l_i > 0, \forall i$. The distribution of these endowments is stationary, with a mean normalized to unity, $\frac{\sum_{i=1}^{N_t} l_i}{N_t} \to \mathbb{E}[l_i] = 1$.

Alvaredo et al. (2017) show that more than 50 percent of aggregate wealth in advanced economies originates from bequests, the distribution of which is highly skewed, as richer households have a greater ability to save and thus leave larger bequests (Benhabib and Bisin, 2018; De Nardi and Yang, 2014; Bossmann et al., 2007). To account for this empirical fact, while also giving a role to the interest rate in the wealth accumulation process, I assume that households have a "joy-of-giving" bequest motive[12], where the degree of altruism for each household type is given by $\delta_i < 1$ for all i, and that $\frac{\sum_{i=1}^{N_t} \delta_i}{N_t} \to \mathbb{E}[\delta_i] = \delta$. This assumption, combined with heterogeneity in disposable income, implies that richer households save a larger fraction of their income, consistent with the empirical evidence in Dynan et al. (2004), as well as the conventional wisdom.

The utility function is separable and homothetic.[13] The maximization problem of households is:

$$\max_{c_t^i, c_{t+1}^i, x_{t+1}^i} \quad V_t^i = U(c_t^i) + \beta U(c_{t+1}^i) + \delta_i U(x_{t+1}^i) \tag{1}$$

$$\text{s.t}$$

$$c_t^i + a_{t+1}^i = w_t l_i - \tau_t^i + x_t^i \tag{2}$$

$$c_{t+1}^i + (1+g)x_{t+1}^i = (1+r_{t+1})a_{t+1}^i \tag{3}$$

$$c_t^i > 0, \;\; c_{t+1}^i > 0, \;\; x_{t+1}^i > 0$$

where c_t^i, c_{t+1}^i are consumption levels in the first and second periods of life, respectively, whereas x_{t+1}^i denotes the bequests parents transfer to their children. The parameter $\beta < 1$ is the usual discount factor. Savings in period t are given by a_{t+1}^i. Savings are invested in two broad asset classes: physical capital and bonds. By standard arbitrage arguments, both assets pay the same returns r_t, while the wage rate is given by w_t. For simplicity, there is full depreciation of physical capital within each period[14].

Taxes are levied on labor income, with each household paying a tax τ_t^i. In most advanced economies, labor income is the dominant source of earnings for the vast majority of households, including those at the top of the income distribution (see Table 3 in Guner et al., 2014). Later in my analysis, I will introduce different tax functions that parameterize the tax system and hence calibrate the distribution of the tax burden of public debt among households. The model abstracts from capital or other taxes. The majority of households hold the bulk of their assets in pension accounts, while pension funds—which themselves manage a substantial amount of wealth, equal to more than a year's GDP—are usually tax-exempt (Saez and Zucman, 2014; OECD, 2017). Revenues from capital and bequest taxation are also negligible relative to labor income taxes (Bastagli et al., 2012). As a result, labor income remains the dominant and most reliable source of government revenue, even at the top of the income distribution. This is consistent with the evidence in Section 2 that the tax burden of public debt ultimately falls on labor income, as it is the primary source of revenues to pay for the service of public debt.

[12] Many recent studies view the "joy-of-giving" framework as a more realistic way to model intergenerational linkages. See, for example, Piketty and Zucman (2014b), Piketty and Saez (2013), Saez and Stantcheva (2018), or the empirical discussion in Altonji et al. (1997).

[13] See Bossmann et al. (2007); Dalgaard and Jensen (2009).

[14] This is not unrealistic for two-period OLG models, where a period typically equals 25–30 years. Even with a low depreciation rate, a substantial amount of physical capital is depreciated over this period.

The data show that social mobility has remained stagnant across many advanced economies.[15] This stagnation has occurred alongside a period of rapid financial innovation. To capture this stylized fact, I draw on a well-known result from neoclassical incomplete-markets theory indicating that social mobility remains constant as markets become more complete, for instance through financial innovation (Bertola et al., 2006). Consequently, the model abstracts from idiosyncratic shocks to labor and capital income and treats social mobility as fixed. Holding mobility constant sharpens the role of initial conditions, the "lottery at birth," allowing the analysis to focus more directly on the tax burden of public debt. In particular, this assumption highlights the interaction between debt and disposable income, alongside heterogeneity in household saving behavior, which traditionally distinguishes the rich from the poor.

As such, inequalities in this model are exogenously given, and the analysis abstracts from the question of what generated them in the first place. This departs from the more quantitatively oriented frameworks of ex-post heterogeneous agents in the tradition of Aiyagari (1994) and Huggett (1993), whose primary objective is to endogenously generate a skewed wealth distribution and, as such, explain why some households are rich while others are poor. Although these frameworks have been successful in explaining the skewed distribution of wealth, they still rely on the assumption of a given level of earnings inequality that propagates into wealth inequality. To better match the observed levels of wealth concentration, such models often need to incorporate a wider array of shocks or appeal to innate differences in preferences, market failures, or broader secular trends such as skill-biased technological change and occupational choices[16].

For the purposes of this paper, such issues play only a minimal role and are set aside. Public debt also operates differently here than in richer heterogeneous-agent settings, where it smooths consumption and relaxes liquidity constraints, effectively acting as insurance; there the central policy question is how much debt to issue to satisfy that demand (Aiyagari and McGrattan, 1998), and its distributional effects are largely trivial without ex-ante heterogeneity, since relaxing liquidity constraints renders households more alike and more Ricardian, and the wealth distribution more equal (Floden, 2001). The historical evidence in Section 2 and the recent positive co-movement between public debt and wealth inequality suggest that this insurance channel is not dominant. As Bhandari et al. (2017) establish formally, the key determinant of optimal public debt in Aiyagari-type frameworks is not insurance but the distribution of the tax burden. Such models also generate levels of social mobility that are extreme relative to the data, so their additional insurance mechanism appears to be of limited empirical relevance. Consistent with this, Huggett et al. (2011) find that variation in wage and wealth inequality is better explained by ex-ante heterogeneity—differences in preferences or saving ability—than by ex-post income shocks, which supports the emphasis here on initial conditions and innate characteristics.

In this sense, the approach taken here is closer to that of Piketty (2014, 2015), who seeks to explain how existing wealth inequality—regardless of its origins—can be amplified through factor-price dynamics and structural features of the economy, particularly the persistent divide between capitalists and workers. This interaction is also captured in the present framework, where capital owners are represented by the old generation and workers by the young, consistent with the broader logic of Piketty's analysis.

Proceeding with the model solution, homothetic preferences imply that plans are "proportional to wealth." Hence, the first-order conditions for savings and bequests are[17]:

$$a_{t+1}^i = S_{t+1}^i[w_t l_i - \tau_t^i + x_t^i] \equiv \mathcal{S}^i(D_t^i, r_{t+1}) \tag{4}$$

$$x_{t+1}^i = X_{t+1}^i(1 + r_{t+1})a_{t+1}^i \equiv X^i(r_{t+1}, a_{t+1}^i) \tag{5}$$

where S_{t+1}^i is the marginal propensity to save and X_{t+1}^i is the marginal propensity to bequeath. To distinguish these scalar propensities from the underlying behavioral relationships, the general savings and bequest functions are denoted $\mathcal{S}^i(D_t^i, r_{t+1})$ and $X^i(r_{t+1}, a_{t+1}^i)$, respectively. D_t^i is the disposable income of household i, while both functions depend on future interest rates. In the Online Appendix, I derive the general properties of the model, where I show that $0 < \mathcal{S}^i(D_t^i, r_{t+1}) < 1$ and $0 < \frac{1+g}{1+r_{t+1}} X^i(r_{t+1}, a_{t+1}^i) < 1$. That is, the marginal propensity to bequeath

[15]See Kopczuk et al. (2010); Chetty et al. (2014); Piketty (2014).

[16]See Krusell and Smith (1998), Cagetti and De Nardi (2006), and Benhabib et al. (2011); Benhabib and Bisin (2018)

[17]Note that bequests are always operative in this model due to the assumption of homothetic preferences. The first-order condition for consumption is omitted as it is not relevant for the analysis.

X^i_{t+1} is bounded by the "$r - g$ gap." Combining equations (4) and (5), the wealth accumulation process of households is:

$$a^i_{t+1} = S^i_{t+1} X^i_t (1 + r_t) a^i_t + S^i_{t+1} (w_t l_i - \tau^i_t) \tag{6}$$

According to equation (6), wealth in period $t + 1$ is the sum of two main components, namely how much households are able to save after taxes and the returns-inclusive wealth they have inherited. Equation (6) is the deterministic analogue of an otherwise standard wealth-accumulation process, which the literature typically employs to study wealth inequality. The law of motion describing this process usually takes the following form[18]:

$$a^i_{t+1} = \lambda^{1,i}_t a^i_t + \lambda^{2,i}_t$$

where $\lambda^{1,i}_t$ and $\lambda^{2,i}_t$ are generic, and possibly random, coefficients whose form depends on the assumptions of each model. The term $\lambda^{1,i}_t$ contributes multiplicatively, and hence governs the rate at which wealth accumulates, while $\lambda^{2,i}_t$ contributes additively, and thus relates to the scale of investment. According to the literature, the skewness of the wealth distribution is typically explained by the multiplicative term $\lambda^{1,i}_t$, while the additive term $\lambda^{2,i}_t$ is important for the overall level of wealth inequality[19]. In this model, $\lambda^{1,i}_t \equiv S^i_{t+1} X^i_t (1 + r_t)$ and $\lambda^{2,i}_t \equiv S^i_{t+1}(w_t l_i - \tau^i_t)$. Public debt, through both its direct and general equilibrium effects, influences not only the level of wealth inequality—via its effect on after-tax wages—but also the shape of the wealth distribution, particularly its tails, through its effect on interest income.

3.2 Production

The production side is standard neoclassical. A representative firm uses physical capital, K_t, and labor, L_t, to produce Y_t units of output. The market-clearing condition in labor markets implies $L_t = N_t$. The production function in its intensive form is $f(k_t)$, with $k_t \equiv \frac{K_t}{L_t}$. With full depreciation of capital, the first-order condition for profit maximization implies:

$$w_t = f(k_t) - f'(k_t) k_t \tag{7}$$

$$1 + r_t = f'(k_t) > 0 \qquad \text{with} \qquad f''(k_t) < 0 \tag{8}$$

where $f'(k_t) > 0$ is the marginal product of physical capital and $f''(k_t) = \frac{\partial^2 f(k_t)}{\partial k_t^2}$.

3.3 Public Debt as a Deferred Tax

The analysis focuses on the steady state. To close the model, I specify the government's budget constraint and then the tax functions used throughout. The government's budget constraint is:

$$B_{t+1} + \mathcal{T}_t = (1 + r_t) B_t + G_t, \tag{9}$$

where $\mathcal{T}_t$ denotes total revenues, B_{t+1} the government bonds issued in period t that mature in period $t+1$, and G_t government expenditures. The difference $PS_t \equiv \mathcal{T}_t - G_t$ is the primary surplus (or deficit). I focus on public debt as a tax burden—equivalently, an intergenerational transfer or deferred tax. To isolate this channel, I follow Diamond (1965), who first formalized this equivalence and established its theoretical foundations, demonstrating the Second Fundamental Welfare Theorem in a neoclassical growth model. Specifically, I normalize government expenditures to $G_t = 0$. Public debt grows exogenously at the population growth rate, $B_{t+1} = (1 + g) B_t$. This choice reflects a standard view that demographics drive the demand for public debt; long-run institutional projections point the same way.[20] It also fits the view that population size is the

[18] See, for example, Benhabib et al. (2011), Toda (2014), Piketty and Zucman (2014b), Bossmann et al. (2007), and Wan and Zhu (2012), among many others.

[19] For a recent survey of the wealth inequality literature, see Benhabib and Bisin (2018).

[20] See Kopecky and Taylor (2022) on the link between demographics, safe-asset demand, and public debt, together with the long-run projections of national fiscal councils such as the U.S. CBO or the U.K. OBR, and of international organizations. Abstracting from alternative sources of growth or from government spending entails no loss of generality here. Setting a

ultimate source of new ideas, and hence of total factor productivity, since the flow of ideas scales with the size of the population (Jones, 2022).

3.4 Steady State

This fiscal rule implies that the government runs persistent (here constant) deficits, substituting debt for taxes. In the long run, the government's intertemporal budget constraint, evaluated along the steady state and under the fiscal rule introduced above, takes the form[21]:

$$\tau = (r - g)b, \tag{10}$$

where τ denotes the level of tax revenue (per worker) compatible with the government's solvency constraint. Equation (10) describes the overall tax burden of public debt, which depends mechanically on both $r - g$ and the level of public debt b. In the model's steady state, the government's intertemporal budget constraint is assumed to bind, implying that the government always raises sufficient revenue to avoid default. When $r = g$, public debt is at its optimal level (the Golden Rule) and the tax burden is exactly zero. When $r \neq g$, the tax burden of public debt depends on whether the economy is dynamically efficient. Under dynamic inefficiency—when $r < g$—public debt can be sustained without requiring higher future taxation. By contrast, under dynamic efficiency—when $r > g$—public debt necessarily implies higher future taxes[22].

Historically, most advanced economies have operated in a dynamically efficient regime[23]. However, recent evidence suggests that dynamic inefficiency has become an empirically relevant phenomenon, driven by the secular decline in interest rates over recent decades[24]. This paper examines both regimes and their implications for wealth inequality following permanent public debt shocks. Rather than revisiting the well-understood normative aspects of dynamic efficiency, this study focuses on the positive relationship between public debt and wealth inequality, emphasizing how the $r - g$ gap determines the tax burden required to sustain public debt.

The analysis also abstracts from the wedge between the return on capital and the yield on public debt. Because the degree of dynamic efficiency—specifically the $r - g$ differential—is highly correlated with sovereign borrowing costs relative to economic growth, I use the terms 'dynamic efficiency condition" and "interest rate regime" interchangeably. While these concepts carry distinct normative implications for the optimal debt policies (Blanchard, 2019; Reis, 2021; Ball and Mankiw, 2023), this distinction does not alter the positive analysis pursued herein.

Tax Functions: To link the overall tax burden of public debt to its distribution across households, I employ two tax functions commonly used in the literature. The first follows Heathcote et al. (2017) and Bénabou (2002) (henceforth HSV) and is standard in heterogeneous-agent macroeconomics (Ferriere and Navarro, 2024; Bhandari et al., 2017). The second adopts the well-known Gouveia and Strauss (1994) (henceforth GS) specification. While less tractable than HSV, the GS formulation provides a more accurate representation of actual tax systems (Guner et al., 2014). It also introduces tax instruments absent from the HSV framework yet highly relevant in practice, and helps clarify the distinct role of marginal tax rates. As will be shown, the choice of specification—and thus the set of instruments available for taxing labor income—can meaningfully affect the results. The two tax functions take the following form.

Case 1: HSV specification. The net tax paid by household i is given by

$$\tau_i = \left(1 - \lambda \tilde{z}_i^{-\gamma}\right) z_i - T, \tag{11}$$

where $z_i = wl_i$ denotes labor income, T is a lump-sum transfer, and $\tilde{z}_i$ is the ratio of household i's gross labor income to the economy-wide average wage w. Following Guner et al. (2014), the

positive target for government spending, for example, would only affect the level of the tax burden, while letting output grow exogenously at the sum of technological progress and population growth would only change the normalization of variables, from per worker to per unit of output.

[21]See Escolano (2010); Acosta Ormaechea and Martinez (2021) for the exact derivations in the context of debt sustainability analysis.

[22]More formally, when $r > g$, the natural borrowing limit consistent with households' budget constraints is $\bar{b} = \frac{w_t l_{\min} + x_{\min}}{r_t - g}$, derived from the sufficient condition that the savings of the poorest household satisfy $a_{\min} > 0$.

[23]See Abel et al. (1989); Piketty (2014); Fischer (2017) and (Jordà, Knoll, Kuvshinov, Schularick, and Taylor, 2017).

[24]See Geerolf (2018); Blanchard (2019, 2023).

income-specific labor tax rate is

$$\tau_i^w = 1 - \lambda \tilde{z}_i^{-\gamma},$$

where $\lambda > 0$ governs the overall level of the tax schedule, with the average labor tax rate—or tax intensity—given by $\tau^\ell \equiv 1 - \lambda$. The parameter λ captures not only statutory taxes paid by households but also income-dependent transfers they may receive, which implies that households at the bottom of the wage distribution receive subsidies. Thus, a shift in λ implies a broad-based and more uniform change in taxation. The γ parameter indexes tax progressivity. The tax system is progressive when $0 < \gamma < 1$, becomes fully redistributive as $\gamma \to 1$, is flat when $\gamma = 0$, and is regressive when $\gamma < 0$.

Case 2: Gouveia–Strauss specification. The GS tax function is given by

$$\tau_i = \tau_0 \left(z_i - \left(z_i^{-\tau_1} + \tau_2 \right)^{-1/\tau_1} \right) - T, \tag{12}$$

where τ_0 scales the overall level of the tax schedule and is essentially the asymptotic top average tax rate, τ_1 governs progressivity, and τ_2 governs the curvature of the schedule. The terms z_i and T are defined as in the HSV case.

For convenience, I restate the government budget constraint here:

$$\tau = \frac{\sum^i \tau_i}{N} = (r-g)b \tag{13}$$

The right-hand side determines total revenue per capita; the left-hand side governs how the tax burden is distributed across households. I consider three possible tax adjustments: (a) the overall tax level λ, (b) a shift in the tax schedule via τ_0, and (c) the steepness of the marginal rate schedule τ_2. This yields three distinct cases:

$$\tau = \frac{\sum^i \tau_i}{N} = (r-g)b \Rightarrow \begin{cases} \lambda = \frac{w-(r-g)b-T}{\mathbb{E}[\tilde{z}_i^{-\gamma} z_i]} & \text{(Case 1)} \\ \tau_0 = \frac{(r-g)b+T}{E\left[\left(z_i - \left(z_i^{-\tau_1}+\tau_2\right)^{-1/\tau_1}\right)\right]} & \text{(Case 2)} \\ \tau_0 E\left[\left(z_i - \left(z_i^{-\tau_1} + \tau_2\right)^{-1/\tau_1}\right)\right] = (r-g)b + T & \text{(Case 3)} \end{cases} \tag{14}$$

where $\mathbb{E}[\bullet]$ denotes averages across the cross-section of households. The third case is solved numerically for τ_2.

The government budget constraint in (13) pins down the level of revenue required to service the debt, but not how that revenue is collected across households. The same per-capita requirement is consistent with many tax policies, and these differ sharply in how they distribute the tax burden across households. Together the two functions span a wider set of options to finance a given $(r-g)b$ than either does alone, with λ moving the level and τ_0 and τ_2 concentrating the tax burden at different points of the income distribution. These three adjustments, however, are not meant to represent specific policy levers a government would choose in practice, but rather broader tax configurations and policies that could affect the marginal tax schedule and households' disposable income in a way compatible with the government's intertemporal budget constraint, hence setting aside the political-economy process governing the selection of the tax instrument. Thus, equation (14) characterizes the feasible set of tax responses consistent with debt sustainability, describing how a given tax structure transmits the tax burden of public debt through its components, conditional on its existing design. A debt shock, through the additional revenue required for debt service, would then just scale the distributional implications emanating from a specific component of the tax system that has been adjusted.

As such, holding progressivity fixed—γ in the HSV case and τ_1 in the GS case—and letting the remaining tax parameters absorb the change in $(r-g)b$ isolates a tax burden shock from a progressivity shock. For instance, the HSV specification makes this experiment transparent, since it amounts to fixing γ and adjusting λ. The GS specification then shows whether the result survives when the same revenue is raised progressively rather than uniformly, through the τ_0-adjustment that loads the tax burden onto top earners or τ_2, which is more concentrated on the broader population ("middle class"). By extension, this clarifies whether, in the HSV λ-adjustment case, the net effect on wealth inequality is driven by a specific tax adjustment affecting the shape or curvature of the marginal tax schedule or by the changes in transfers at the bottom that this parameter conflates, and thus more clearly identifies the source behind the equilibrium distributional outcome. This separation proves central to the subsequent analysis and helps formalize the presence of nonlinearities. It also distinguishes the mechanism here from Hubmer et al. (2021) and Kaymak and Poschke (2016), who treat progressivity (a γ-shock) as purely exogenous. Here, by contrast, progressivity is held fixed while the realized distribution of the tax burden follows endogenously from the change in tax revenues in response to public debt shocks and the subsequent change in tax policies.

Macroeconomic Equilibrium: Using the first-order conditions and market-clearing conditions, in the steady state individual wealth is:

$$a_i = \Lambda_i(r) \cdot [wl_i - \tau_i] \tag{15}$$

where $\Lambda_i(r) < 1, \forall i$ is the household's composite marginal propensity to save, which incorporates the marginal propensity to bequeath. For example, with log utility this is: $\Lambda_i(r) = \left[\frac{(\beta+\delta_i)(1+g)}{(1+g)(1+\beta+\delta_i)-\delta_i(1+r)}\right]$.

Aggregating equation (15) across households and imposing financial-market clearing—which equates the aggregate demand for savings with its supply—gives the steady-state equilibrium condition:

$$(1+g)(k+b) = \Lambda(r) \cdot \big[w - (r-g)b\big], \tag{16}$$

where $\Lambda(r) = \frac{\sum_i \Lambda_i(r)}{N}$. Imposing the additional assumption that $\text{Cov}\big(S^i_{t+1}X^i_t, a^i_t\big) = 0$ yields:

$$\frac{\sum_i S^i_{t+1}X^i_t a^i_t}{N} = \left(\frac{\sum_i S^i_{t+1}X^i_t}{N}\right)\left(\frac{\sum_i a^i_t}{N}\right). \tag{17}$$

Formally, this assumption corresponds to treating $S^i_{t+1}X^i_t$ and a^i_t as uncorrelated across agents. In other words, it implies:

$$\mathbb{E}\big[S^i_{t+1}X^i_t \cdot a^i_t\big] = \mathbb{E}\big[S^i_{t+1}X^i_t\big]\,\mathbb{E}[a^i_t], \tag{18}$$

so that aggregate savings is just the product of the aggregate modified marginal propensity to save and aggregate assets. This is analogous to the conditional independence assumption made by Toda (2014) in the context of permanent income risk shocks.

Transmission Channels: Public debt influences wealth accumulation through three key channels: (a) the *interest rate channel*, (b) the *wage channel*, and (c) the *tax channel*. This decomposition is summarized in equation (19), which follows from the total differentiation of equation (15):

$$\frac{da_i}{db} = \underbrace{\frac{\partial a_i}{\partial r}\cdot\frac{dr}{db}}_{\text{Interest Rate Channel}} + \underbrace{\frac{\partial a_i}{\partial w}\cdot\frac{dw}{db}}_{\text{Wage Channel}} + \underbrace{\frac{\partial a_i}{\partial \tau_i}\cdot\frac{d\tau_i}{db}}_{\text{Tax Channel}} \tag{19}$$

The tax channel itself operates through three sub-mechanisms: (a) the *direct debt effect*, reflecting the higher interest payments required to service additional debt at a given interest rate; (b) the *debt service effect*, the indirect channel through which higher debt alters the tax burden via endogenous changes in interest rates; and (c) the *tax-base effect*, whereby changes in wages alter the tax base and thereby affect the level of taxation. Formally, the decomposition of the tax channel is given by:

$$\frac{d\tau_i}{db} = \underbrace{\frac{\partial \tau_i}{\partial b}}_{\text{Direct Debt Effect}} + \underbrace{\frac{\partial \tau_i}{\partial r}\cdot\frac{dr}{db}}_{\text{Debt Service Effect}} + \underbrace{\frac{\partial \tau_i}{\partial w}\cdot\frac{dw}{db}}_{\text{Tax-Base Effect}} \tag{20}$$

This decomposition can also be expressed differently by combining the net effects of interest rates, wages, and the direct effect of debt. Combining equations (20) and (19) yields:

$$\frac{da_i}{db} = \underbrace{\left[\frac{\partial a_i}{\partial r} + \frac{\partial a_i}{\partial \tau_i}\frac{\partial \tau_i}{\partial r}\right]\frac{dr}{db}}_{\text{Net Interest Rate Effect}} + \underbrace{\left[\frac{\partial a_i}{\partial w} + \frac{\partial a_i}{\partial \tau_i}\frac{\partial \tau_i}{\partial w}\right]\cdot\frac{dw}{db}}_{\text{Net Wage Effect}} + \underbrace{\frac{\partial a_i}{\partial \tau_i}\frac{\partial \tau_i}{\partial b}}_{\text{Direct Tax Effect}} \tag{21}$$

Interest rates play a dual role, affecting both the *slope* of wealth accumulation—shaping how quickly households build wealth relative to one another—and the *absolute* ability to save and invest, through their effect on the taxes needed to finance public debt. These two mechanisms operate through the partial effect of interest rates on individual wealth, $\frac{\partial a_i}{\partial r}$. The marginal propensity effect, given by $\frac{\partial \Lambda_i(r)}{\partial r}\cdot[z_i - \tau_i]\cdot\frac{dr}{db}$, primarily benefits households with higher disposable incomes. By contrast, the debt service effect, $\Lambda_i(r)\cdot b\cdot\frac{\partial \tau_i}{\partial r}$, scales uniformly across all households. This asymmetry inherently generates a bias toward amplifying wealth inequality, the magnitude of which depends on macroeconomic conditions, namely the $r-g$ differential and the extent of crowding out associated with higher public debt.

Wages, by contrast, affect wealth accumulation primarily through their impact on disposable income via two distinct channels. The first is a direct effect on individual earnings, and consequently on saving ability; the second is an indirect effect on the tax base, which influences government revenues and, by extension, the tax burden. The after-tax wage channel tends to reduce inequality. When higher public debt crowds out capital, wages decline uniformly across households. However, a progressive tax system mitigates these losses for low-productivity households while amplifying them for high-productivity households, thereby narrowing the wealth gap despite the decline in aggregate income.

Finally, the *direct tax effect* captures the mechanical response of taxation to rising public debt, driven solely by the increase in the quantity of debt. Consequently, it is the sole channel through which public debt can affect the distribution of wealth even when interest rates and wages do not adjust to permanent debt shocks, as is the case in small open economies where interest rates are determined globally.

4 Main Results

4.1 Calibration

To study the equilibrium effects of public debt, I calibrate the model using U.S. data from Piketty and Zucman (2014b) and Alvaredo et al. (2017), targeting average growth and the inheritance-to-wealth ratio for 1950–2010. For other macroeconomic aggregates, such as capital intensity and data on income and wealth inequality, the calibration relies on the World Inequality Database (WID) and the Penn World Table (PWT) datasets. Public debt is treated as an exogenous parameter, and the analysis therefore remains agnostic about the forces driving changes in debt levels. Such changes may arise from macroeconomic or broader social, economic, or political objectives, including national security. The model is first calibrated to an initial zero-debt steady state, then I compute counterfactual steady states across $b \in [0, 0.17]$, corresponding to debt ratios from 0 percent to 54 percent of GDP, with 54 percent being the 1950–2010 long-run average in the Jordà–Schularick–Taylor Macrohistory Database (Jordà, Schularick, and Taylor, 2017). Under $r < g$, the equilibrium remains well defined at substantially higher debt ratios, so Figures 10, 11, 13, and 15 extend the counterfactual range to about four times the $r > g$ maximum, or roughly 200 percent of GDP, to illustrate the nonlinearity discussed in Section 4.3.

Fundamentals and deep parameters. For the deep parameters and fundamentals, the calibration strategy follows the two-period OLG approach of de la Croix and Michel (2002). In particular, I assume a logarithmic utility function, which is consistent with the stylized fact that labor supply is inelastic over the long run (Prescott, 1986). Each period in the model corresponds to a timespan of 30 years[25]. In the sample, average real GDP growth is roughly 3.25 percent, implying

[25]A natural concern with two-period overlapping-generations models is that calibrating each period to 30 years prevents households from rebalancing their portfolios within a generation, calling into question the model's quantitative predictions. This concern would be decisive if the model were asked to generate predictions about wealth dynamics at high frequency, such as business cycle frequency. But that is not its role. The theoretical framework is designed to isolate the transmission mechanism from permanent tax burden shifts to wealth inequality and to derive the key comparative-static predictions. These predictions hinge on the intergenerational structure of the economy and the general-equilibrium effects of debt on factor prices, not on the frequency at which agents adjust their portfolios. The quantitative assessment is instead

$(1+g) = 2.61$. The discount factor β is calibrated to match the average real rate of return of 6.35 percent in the data, so that the gross return $1+r$ corresponds to approximately 6.341 in the model. To calibrate the average degree of altruism, I follow Dalgaard and Jensen (2009) and set this parameter to match the inheritance-to-wealth ratio, which equals approximately 0.53 for 1950–2010 according to Alvaredo et al. (2017). These targets jointly imply $\beta = 0.16$ and $\delta = 0.18$.

To study the implications of public borrowing for wealth inequality under $r < g$, I calibrate the model to match interest rate levels observed in the post-2010 period.[26] The calibration relies on the dataset of Blanchard (2019), in which the average real return equals approximately 1.46 percent per annum. To match this value, I set $\beta = 0.65$ and $\delta = 0.73$, keeping all remaining parameters identical to those in the baseline calibration. Under this configuration, the supply of savings is sufficiently strong that the equilibrium allocation implies $r < g$ in the steady state.

The production function is Cobb–Douglas: $y = Ak^{\alpha}$. The capital share parameter is set to $\alpha = \frac{1}{3}$, following the literature. The scaling parameter A is treated as a residual and is optimized to balance the government budget jointly with the model equilibrium. In the benchmark calibration this procedure gives $A = 9.76$. In the counterfactual analysis, A is held fixed and the tax parameters adjust to satisfy the government budget constraint at different debt levels. The results are therefore driven by the change in tax policy required to satisfy the budget constraint, rather than by A.

Income distribution and tax functions. The calibration targets a plausible distribution of the tax burden while capturing the skewness of the wealth distribution. To this end, I adopt a "Pareto–Aiyagari" strategy, where inequality arises from wage dispersion (Aiyagari, 1994). Labor productivity follows a lognormal–Pareto mixture, with a lognormal distribution below the 90th percentile and a Pareto tail above it. I calibrate the mixture weight, the dispersion of the lognormal component, and the Pareto tail index using a minimum-distance criterion, matching the simulated Gini coefficient and the top 10 and top 1 percent income shares to their empirical counterparts for 1950–2010 (a Gini of 0.50, a top 10 percent share of 0.38, and a top 1 percent share of 0.14). The model economy is populated by 10,000 households drawn from this fitted distribution, with average labor productivity normalized to one.

Household-specific δ_i parameters are then drawn from a wealth-weighted distribution that assigns higher δ_i to richer households, reflecting their greater saving and investment propensity. This calibration reproduces much of the observed wealth concentration and the long right tails of U.S. earnings and wealth distributions (Kuhn and Ríos-Rull, 2015). Wealth inequality is measured by the Gini coefficient, which draws on information beyond lower-order moments and is supplemented by top 10 percent wealth shares to measure concentration at the upper tail of the distribution.

For the tax system, I first calibrate the HSV specification and then calibrate the GS function by jointly optimizing τ_0, τ_1, and τ_2 to reproduce the average marginal and average tax rates implied by the HSV specification. This approach also updates the relatively outdated parameter values commonly used in the literature (e.g., Peterman and Sager, 2022) for the GS function. Transfers are set to the U.S. historical average of 9 percent of GDP. In the HSV specification, I fix $\gamma = 0.12$ following Ferriere and Navarro (2024) and set λ to reproduce an average labor tax rate of 28 percent, implying $\lambda = 0.63$. The resulting GS parameters are $\tau_0 = 0.71$, $\tau_1 = 0.30$, and $\tau_2 = 0.21$, with transfers equal to 0.91 in the model.

Despite its simplicity, the model produces results consistent with both the empirical evidence and the literature. In the zero-debt steady state, the economy is dynamically efficient ($r - g \approx 3\%$), consistent with the historical norm; the top 10 percent pay roughly 60 percent of total taxes, against 66 percent in the data (Guner et al., 2014); and wealth inequality and concentration equal 0.62 (Gini) and 0.46 (top 10 percent share), respectively, explaining approximately 76 percent and 68 percent of observed inequality and concentration in the WID data. Table 1 summarizes the calibrated parameters and the targeted and implied moments.

performed by the empirical analysis in Section 5, which tests the model's main predictions and estimates the effect of debt on wealth inequality directly.

[26]This period corresponds to when r^* declined substantially more than g^* in the Holston et al. (2017) dataset, marking the onset of a meaningful secular trend in $r < g$.

Table 1: Calibration

Parameter	Value	Moment	Data	Model
Generation length	30 years	Gini coefficient (income)	0.50	target
Annual growth rate	3.25%	Top 10% income share	38%	target
Growth factor, $(1+g)$	2.61	Top 1% income share	14%	target
Debt-to-GDP	54%	Inheritance-to-wealth ratio	0.53	target
Capital share, α	1/3	Transfers-to-GDP	9%	target
Productivity, A	9.76	Wealth Gini	0.82	0.62
Real rate of return, r $(r > g)$	6.35%	Top 10% wealth share	68%	46%
Real rate of return, r $(r < g)$	1.46%	Top 10% tax share	66%	60%
Discount factor, β $(r > g)$	0.16	Progressivity, γ (HSV)	0.12	
Altruism parameter, δ $(r > g)$	0.18	Tax intensity, λ (HSV)	0.63	
Discount factor, β $(r < g)$	0.65	Tax level, τ_0 (GS)	0.71	
Altruism parameter, δ $(r < g)$	0.73	Shape parameter, τ_1 (GS)	0.30	
		Curvature, τ_2 (GS)	0.21	

4.2 Normal Interest Rate Regime

This section and the next report the main findings. Their purpose is solely to uncover the properties and patterns that emerge from the link between debt service, the structural level of tax revenue required to fund it, and the implied distributional consequences across households. These properties then guide the subsequent empirical section, where I directly test the model's key predictions and empirically establish the magnitude of the distributional implications of public debt. I begin with the dynamically efficient case, in which the interest rate exceeds the growth rate ($r > g$). Figure 5 reports the effect of public debt on wealth inequality and concentration, with both series normalized to unity in the initial steady state to aid interpretation[27]. Public debt typically increases both wealth inequality and concentration, though the magnitude—and in some cases even the sign—of the effect depends critically on the tax policy employed. To understand why, I first examine the underlying mechanism before turning to each instrument in detail.

Specifically, whether public debt increases or decreases inequality depends on the relative strength of two opposing effects. Progressive taxation channels the additional tax burden toward higher earners, tending to narrow the wealth distribution. Higher capital returns, however, amplify the ability of wealthier households—who have higher marginal propensities to save and stronger intergenerational linkages—to accumulate wealth faster. Figure 5 illustrates these countervailing forces by comparing outcomes with and without bequest heterogeneity. Without bequest heterogeneity, public debt tends to reduce inequality, largely because of progressive taxation. Once capital returns are taken into account, however, progressivity alone proves insufficient to offset the general equilibrium effects of public debt, particularly the effect on interest rates. The capital returns channel more than offsets the disproportionate increase in the tax burden borne by richer households.

[27]This and subsequent figures convert the calibration from per-worker to per-output units—a transformation that is purely expositional. To do so, I use the identity $\frac{B}{L} = \frac{B}{Y}\frac{Y}{L}$.

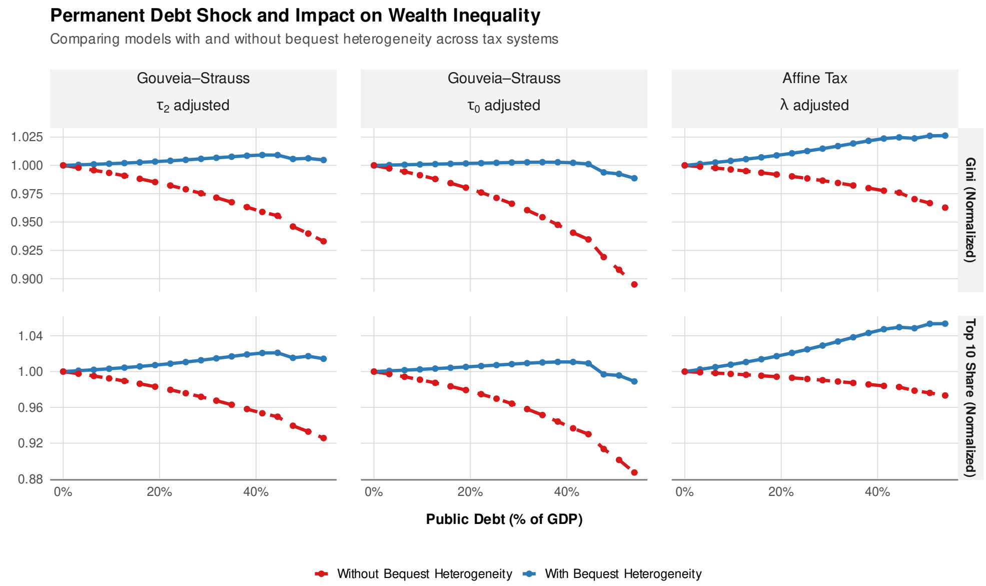


Figure 5: Public Debt and Wealth Inequality under $r > g$

The analysis above establishes the relevance of general equilibrium effects, and especially those operating through capital income. The latter, however, also affect interest payments and therefore the government's tax response, which then completes the full transmission mechanism and the equilibrium effects of public debt on wealth inequality. When $r > g$, rising interest costs force the government to generate additional revenue to satisfy its intertemporal budget constraint. Figure 6 reports the change in taxes as the economy moves from the baseline to a high-debt steady state. As fiscal pressure mounts from higher debt and interest costs, the government must reduce λ (raising labor tax intensity, $1 - \lambda$, by roughly 134 percent) or raise marginal tax rates—with τ_2 nearly doubling and τ_0 rising by roughly 60 percent in this illustrative case.

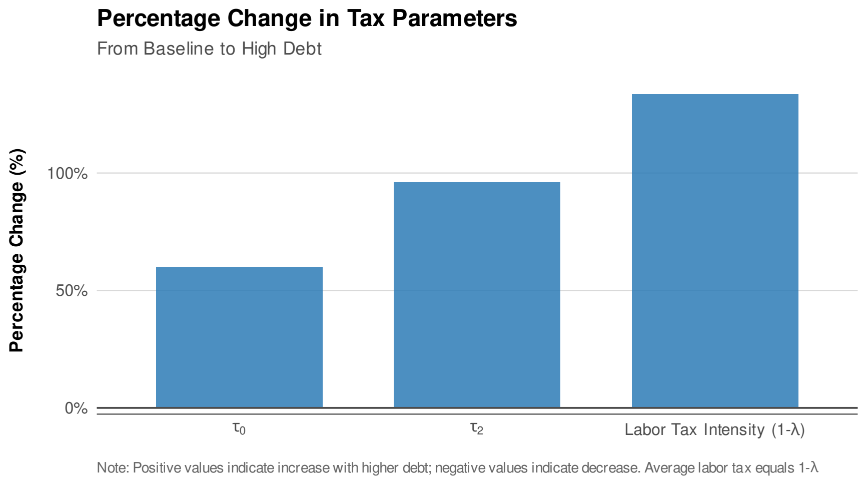


Figure 6: Adjustments in Tax Policies

Each tax instrument translates into a distinct shift in the marginal tax schedule, as illustrated in Figure 7. This is consistent with the earlier discussion, in which a debt shock effectively scales a specific component of the tax system. The λ-adjustment raises marginal tax rates uniformly across the income distribution, shifting the entire schedule upward. The remaining cases absorb the debt shock differently, concentrating the additional tax burden toward the middle or top of the distribution depending on the GS instrument. The τ_2-adjustment steepens the marginal tax schedule in the middle range, while the τ_0-adjustment concentrates the tax burden on high income households leaving the curvature unchanged.

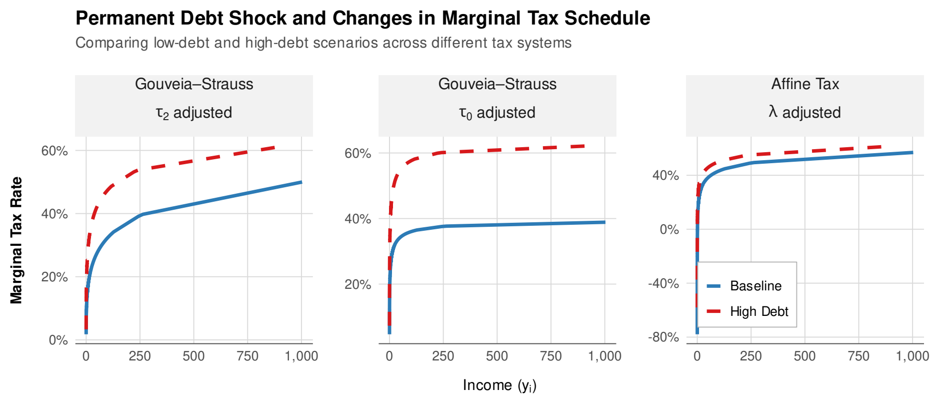


Figure 7: Public Debt and Marginal Tax Schedules under $r > g$

An implication of the preceding analysis is that public debt endogenously affects the effective progressivity of the tax system without any shift in social preferences for redistribution or any shock to tax progressivity—the shift in the marginal tax schedule is driven entirely by the government's need to maintain debt sustainability. Figure 8 illustrates this point by showing the change in the wealth-weighted average marginal tax rate (AMTR) and average tax rate (ATR), typically used to construct the index of tax progressivity (Heathcote et al., 2017; Ferriere and Navarro, 2024). The wealth-weighted average marginal tax rate can rise by 30 to 60 percent depending on which instrument adjusts. The GS instruments already imply a more progressive distribution of the tax burden, with either τ_0 or τ_2 raising marginal tax rates almost twice as much as in the λ case.

This not only identifies the source of the higher (relative to the GS instruments) disequalizing effect in the λ case—the insufficient increase in average marginal tax rates—but also shows that the shift at the top dominates changes at the bottom of the distribution, with the wealth-weighted average marginal tax rate rising by 33 percent while the wealth-weighted average tax rate rises by only 17.6 percent in this illustrative scenario. This implies that in this revenue-neutral case, where total revenue is fixed by the same debt-service term $(r-g)b$, broad-based tax adjustments are less progressive than simply raising marginal tax rates. Reproducing the distributional outcome of the GS case within the HSV specification would require a shift in γ—but such a shift conflates a progressivity shock with a tax burden shock.

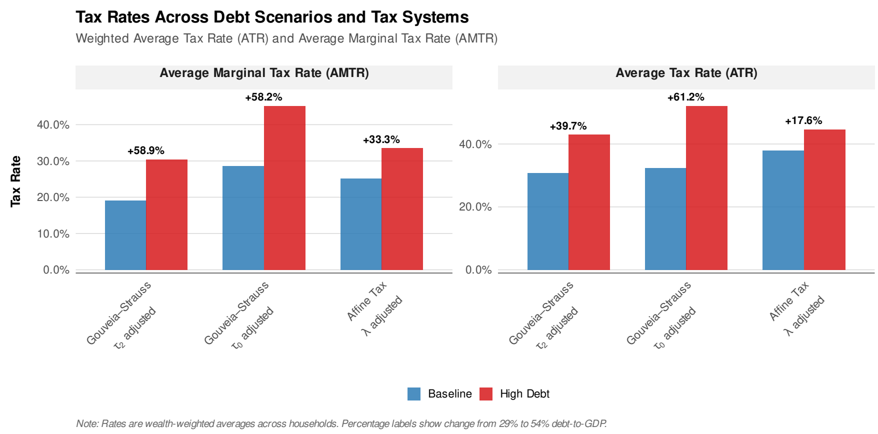


Figure 8: Average and Marginal Tax Rate Adjustments

The distributional outcome therefore depends on how large and how concentrated at the top the resulting increase in marginal rates is, which determines whether the tax response offsets the disequalizing pressure of higher capital returns and bequests. The same logic explains why this balance, and hence the relative ordering of the distributional effects, differs across tax instruments.

As Figure 5 shows, the λ-adjustment generates modest, but still sizable, disequalizing effects, with the Gini coefficient rising by close to 2.5 percent. Although marginal rates rise, they do so uniformly, making this adjustment less progressive than in the GS cases and allowing wealthier households to continue benefiting from higher capital returns. The τ_2-adjustment produces modest increases in inequality. The further steepening of the marginal rate schedule shifts the burden toward middle-income households, but since these households exhibit lower propensities to bequeath, amplification through intergenerational transfers is weaker. The τ_0-adjustment, by contrast, yields near-neutral effects on the Gini coefficient but slightly increases top wealth shares at lower debt levels. Because marginal tax rate adjustments shift the burden disproportionately toward high-income households, however, at high debt levels—where interest rates and hence the tax burden are higher—the disequalizing effects of public debt reverse, and wealth inequality declines. As a result, the relationship between public debt and wealth inequality is nonlinear in general, with distributional outcomes depending on how marginal tax rates adjust to fiscal pressure. Still, it is worth clarifying that tax progressivity does not always prevent the disequalizing effects of public debt; only once progressivity is sufficiently high does the effect reverse.

Overall, the key message of the preceding analysis is that when interest rates are high ($r > g$), higher public debt makes the tax system more progressive through a parallel upward shift in the marginal tax schedule, scaling its progressive component without any change in the index of tax progressivity, such as the parameter γ in the HSV tax specification. The interaction of public debt with an already progressive tax system is sufficient to endogenously change its effective progressivity and, by extension, scale redistribution. This is because richer households, facing higher marginal rates, absorb a disproportionate share of the additional tax burden—a share that, when large enough, can reverse the effect of debt on wealth inequality and generate the nonlinearities discussed earlier. When the curvature of the tax schedule is preserved, this channel can be especially powerful, as illustrated by the contrast between the λ and τ_0 instruments. I refer to this mechanism—the endogenous and permanent adjustment of marginal tax rates and, by extension, the subsequent change in tax progressivity—as *indirect redistribution*.

Its strength depends on the overall level of taxation, which in turn is determined by public debt and the $r - g$ gap, which together define the tax burden. When the tax burden is high, the absolute gap between what rich and poor households pay widens and indirect redistribution strengthens, so that the effective progressivity of the tax system rises with public debt. The τ_0-adjustment exploits this mechanism most effectively. By concentrating the additional tax burden on top earners, it strengthens indirect redistribution sufficiently to offset the disequalizing effects of higher capital returns and intergenerational transfers. This is best illustrated in Figure 9, which shows the change in wealth shares across the distribution. Under the λ-adjustment, the tax burden is spread across the middle and upper portions. Under the GS instruments, by contrast, marginal rates rise more steeply, and the τ_0-adjustment in particular concentrates the resulting tax burden on the top quintiles, shielding those at the bottom and containing the overall rise in inequality. The wealth shares of the rich fall while those at the bottom rise, evidencing this indirect form of redistribution and, by extension, of increased tax progressivity.

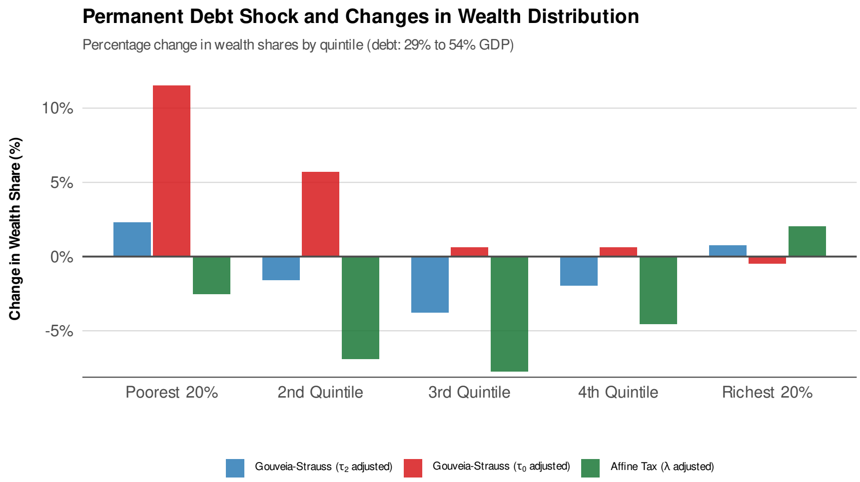


Figure 9: Distributional Effects Across Quintiles

4.3 Low Interest Rate Regime

The previous analysis assumed real long-term interest rates close to their historical averages. In contrast, recent increases in public debt have coincided with a persistent decline in the natural real interest rate (r^*), driven largely by the global saving glut. This downward trend, in place since the 1980s, has left many advanced economies dynamically inefficient.[28] This $r < g$ regime is likely to persist, keeping the tax burden of public debt relatively low. Indeed, recent evidence suggests that r^* has shown little sign of reverting across advanced economies (Davin and Ferreira, 2022; Cesa-Bianchi et al., 2022), that pandemics tend to intensify the global saving glut (Jordà et al., 2022), and that the structural forces underlying secular stagnation (such as population aging) remain largely intact (Blanchard, 2023). Empirical work on the structural determinants of the $r - g$ differential—here the average cost of servicing public debt relative to growth—confirms that a negative gap is the relevant baseline (Heylen et al., 2024). This makes $r < g$ the natural starting point not only for analyzing the distributional consequences of public debt but also for understanding its role as an amplifier of wealth inequality during the low interest rate period since the 1980s.

Figure 10 presents the relationship between public debt and wealth inequality for the $r < g$ case, while Figure 11 shows the corresponding tax responses, where higher public debt now implies lower taxes. As under $r > g$, public debt raises wealth inequality in every case. What changes is its magnitude and the channel through which it operates. The increase is markedly weaker, since reduced crowding out and lower returns mean that differences in the marginal propensity to save matter less for wealth accumulation. The bequest motive—and, by extension, capital returns—plays a smaller role as well, consistent with the earlier theoretical discussion. Weaker crowding out also dampens the response of factor prices, in line with prior work on the role of low returns in supporting debt sustainability and increasing fiscal space.[29] As a result, public debt exerts only a limited influence on borrowing costs and the associated tax burden, rendering a given level of debt more affordable and making a reduction in taxes more feasible. The underlying mechanics therefore reverse relative to $r > g$, with taxation and disposable income mattering more for wealth inequality than general equilibrium effects.

[28]See Geerolf (2018); Lunsford and West (2019); Furman and Summers (2020); Bloise and Reichlin (2023).
[29]See Blanchard (2019); Mehrotra and Sergeyev (2021); Reis (2021); Cao et al. (2024).

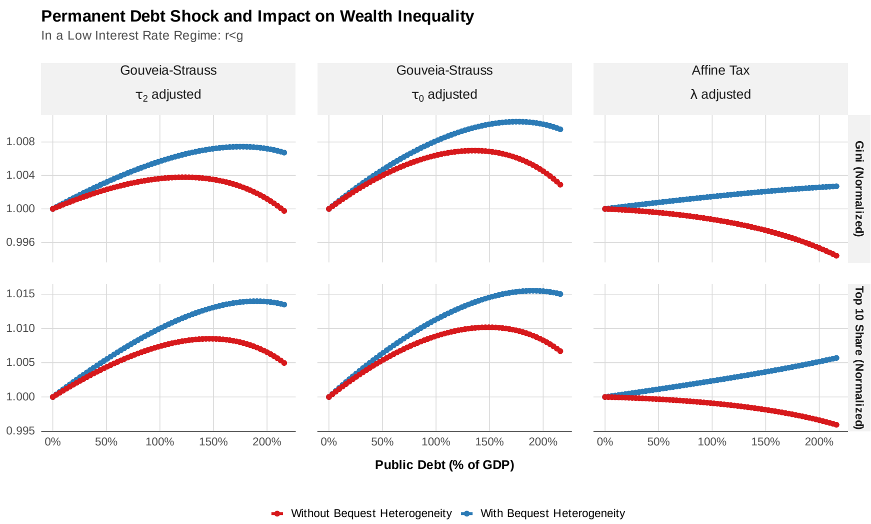


Figure 10: Public Debt and Wealth Inequality under $r < g$

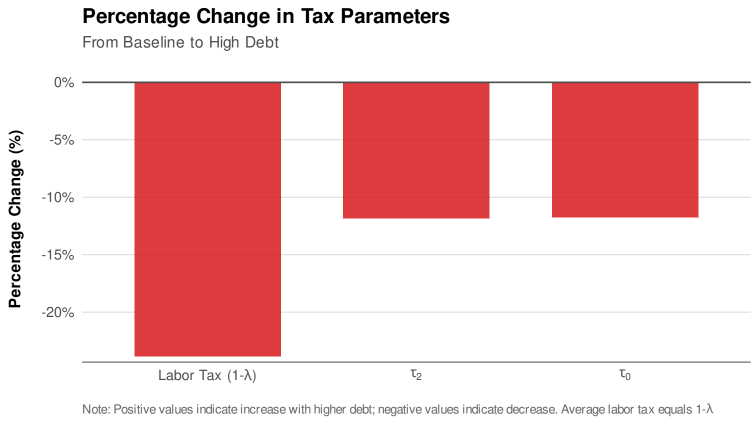
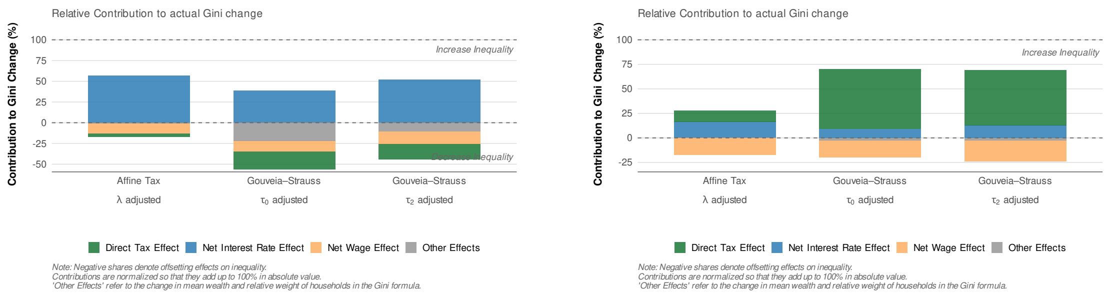


Figure 11: Adjustments in Tax Policies under $r < g$

The weaker disequalizing effect of public debt in this regime, relative to the $r > g$ case, constitutes the first important difference between the two regimes. In absolute terms, however, the quantitative effects of public debt are substantially understated in these illustrative cases. As discussed in Section 3, the model makes simplifying assumptions, mostly normalizations, about the remaining components of the government budget constraint to preserve tractability and transparency. For instance, the magnitude of the disequalizing effects depends substantially on the level of government spending, which also determines the structural revenues required to service public debt. With government spending, for example, the tax burden would be higher for a given interest rate regime and this in turn would imply stronger crowding out and a correspondingly stronger impact on wealth inequality. Equally relevant is the actual quantity of debt that needs to be serviced as this also determines the tax burden. Nonetheless, the model's main theoretical properties, qualitative patterns, and predictions hold across both regimes. Whether and by how much public debt raises inequality is ultimately an empirical question, which I take up in Section 5.

A second important difference between the regimes lies in the transmission channels. In the $r > g$ case, public debt affects inequality mainly through its effect on interest rates (i.e., the general equilibrium effects), whereas under $r < g$ it does so primarily through its direct effect on taxation. This point is best illustrated by decomposing the change in wealth inequality—as measured by the Gini coefficient—into the main drivers discussed in Section **??**. Figure 12 shows that under $r < g$, the dominant channel shifts from interest rates to the quantity of debt across all specifications, with the exception of broad-based λ-adjustments, which subsume the role of the transfer system. When focusing on τ_0- and τ_2-adjustments, the direct debt effect emerges as the dominant contributor, raising the disposable income of richer households and producing a net increase in inequality.

The receding role of interest rates is a direct implication of the low tax burden that prevails in the $r < g$ regime. This feature also allows the model to explain the relationship between public debt and wealth inequality in small open economies, where the interest rate is set globally and does not respond to domestic debt. When the interest rate is determined globally, borrowing rates lose their distributional relevance, and wealth inequality is driven instead by the level of public debt itself, with a more direct effect on the tax burden and indirect redistribution. This in turn rationalizes why taxation and redistribution become much more important in the low interest rate regime. They are also in the direct control of policymakers, as opposed to the high interest rate regime, where the prominence of general equilibrium effects makes it more difficult to control the distributional outcomes.



(a) Normal returns ($r > g$)

(b) Low returns ($r < g$)

Figure 12: Channel Contributions to Wealth Inequality Across Macroeconomic Regimes

Note: Contributions are assessed at the historical average level of public debt (54%).

Like the $r > g$ case, however, the relationship between public debt and wealth inequality is also nonlinear, as shown in Figure 10, but unlike the $r > g$ case, it is now driven by the level of public debt rather than by borrowing costs. When interest rates are low, the model's equilibrium supports debt levels four times higher than those it supports under $r > g$ in this illustrative example. At these elevated levels, crowding out pushes interest rates higher, so that differences in the bequest motive between richer and poorer households, and hence in their marginal propensities to consume, become more important. Their importance grows with the level of debt, as the widening gap between the cases with and without bequest heterogeneity shows. Servicing a larger stock of debt also raises the tax burden, and once the stock is large enough that debt service becomes expensive despite the low interest rate, the strengthening of indirect redistribution dominates the bequest channel and wealth inequality declines.

The third and perhaps most important difference between the two regimes is that public debt now makes the tax system *less progressive*. The nonlinearities tied to the marginal tax rates are present here as well, and they activate the indirect redistribution channel; the nonlinear response is driven mainly by the subsequent increase in the tax burden, which is governed by the large quantity of debt that must be serviced rather than by high interest costs.

The mechanics of the τ_0-, τ_2-, and λ-adjustment cases, however, are now reversed. These reversed mechanics are visible in Figure 13, which shows the corresponding shifts in the marginal tax schedules. Now, higher public debt shifts the marginal schedule down and hence reduces the progressivity of the tax system—with the argument symmetric to the $r > g$ case. A λ-adjustment lowers marginal rates broadly while simultaneously raising transfers (lump-sum), leaving the overall *shape* of the marginal tax schedule largely unchanged in this illustrative case. The τ_2-adjustment slightly flattens the schedule in the middle range, and the τ_0-adjustment reduces rates at the top. In all cases, the lower tax burden implies reductions in the AMTR and the ATR, *despite larger debt* (see Figure 14). The relative ordering of the adjustment cases also reverses, with broad-based adjustments now more progressive than the decline in marginal tax rates. This again illustrates that the indirect redistribution channel, operating through the endogenous response of marginal tax rates, is the most important feature of the relationship between public debt and wealth inequality. It matters all the more here, where general equilibrium effects play little role, so that disposable income—and after-tax wages in particular—carries much greater weight.

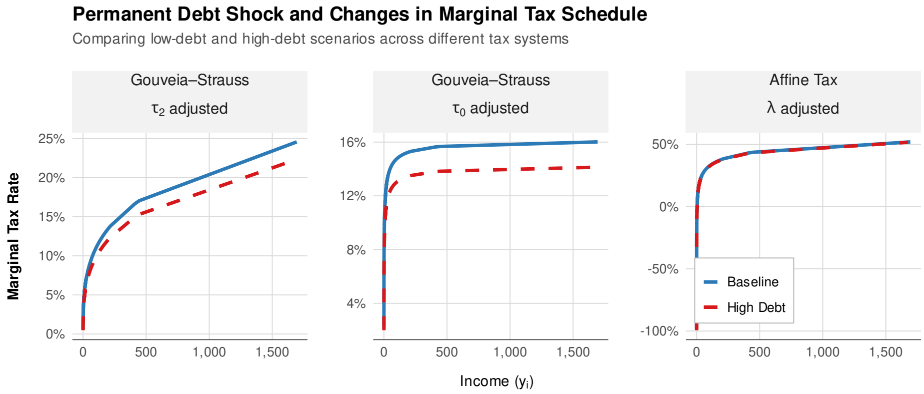


Figure 13: Public Debt and Marginal Tax Schedules under $r < g$

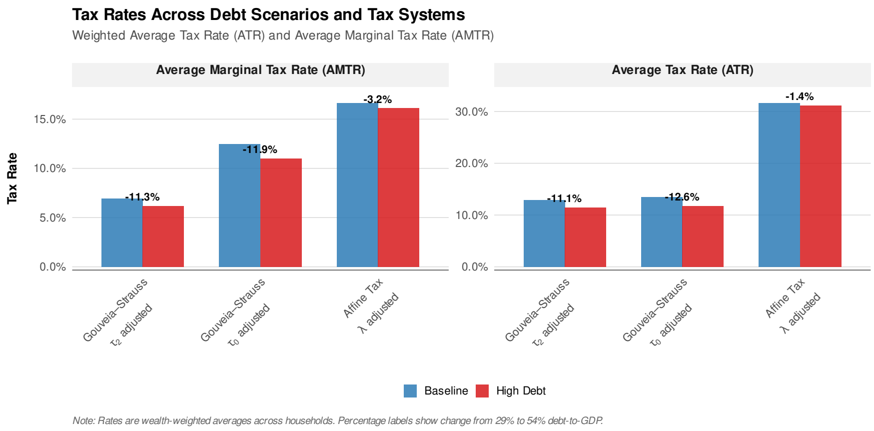


Figure 14: Average and Marginal Tax Rate Adjustments under $r < g$

This point is critical for understanding why inequality can still rise under $r < g$. It also helps explain the stylized facts in Section 2, where redistribution was invariant to debt levels when the tax burden of public debt was low. A sustained decline in the tax burden of public debt reduces the overall level of revenue on which indirect redistribution depends. When aggregate tax requirements are low, the progressive tax system—however progressive it may be—generates little indirect redistribution, because the tax revenues through which richer households would otherwise contribute disproportionately are themselves small. When aggregate tax requirements are high, by contrast, the absolute gap between what rich and poor households pay is large, and the redistributive effect is correspondingly strong. Under $r < g$, then, progressive taxation may remain formally intact even as indirect redistribution attenuates, because the lower tax burden shrinks the revenues through which it operates—that is, the distribution of the tax burden becomes more even, and hence less skewed toward the rich.

4.4 Public Debt, Declining Progressivity, and the Weakness of Redistribution

This channel is illustrated in Figure 15, which shows the relationship between public debt and redistribution for the relevant tax-adjustment cases when interest rates are low. The top row displays the level of redistribution, measured as the difference between pre-tax and post-tax income inequality (Gini coefficient), where positive values indicate that redistribution reduces post-tax inequality. The bottom row normalizes these values to the initial (no-debt) steady state, isolating the marginal effect of public debt on redistribution and thereby tracing how the intensity of redistribution, and consequently the progressivity of the tax system, evolves across debt levels.

In the λ-case, the level of redistribution is higher, largely because this adjustment subsumes the role of the transfer system, and its intensity rises with public debt. Under the GS case, by contrast, redistribution and its intensity decline initially and then increase once public debt has a meaningful effect on the tax burden and adjustments in marginal tax rates begin to strengthen indirect redistribution, thus reversing the earlier decline in redistribution and, by extension, the effect on wealth inequality (see also Figure 11).

Both cases nonetheless validate that the intensity of redistribution traces the degree of tax progressivity following a debt shock, with the GS cases showing a U-shaped relationship with public debt while the λ-case shows a monotonic one. The GS case makes the role of indirect redistribution most transparent, since it adjusts only the marginal tax rates and does not conflate the transfer system, unlike the λ-case. This implies that the potential nonlinear relationship between public debt and the intensity of redistribution is effectively attributed to changes in marginal tax rates rather than in the transfer system, consistent with the earlier discussion.

Finally, these patterns and predictions guide the empirical assessment in Section 5.7 of whether, as the model predicts, a higher tax burden raises the intensity of redistribution, and whether the relationship between public debt and wealth inequality is nonlinear.

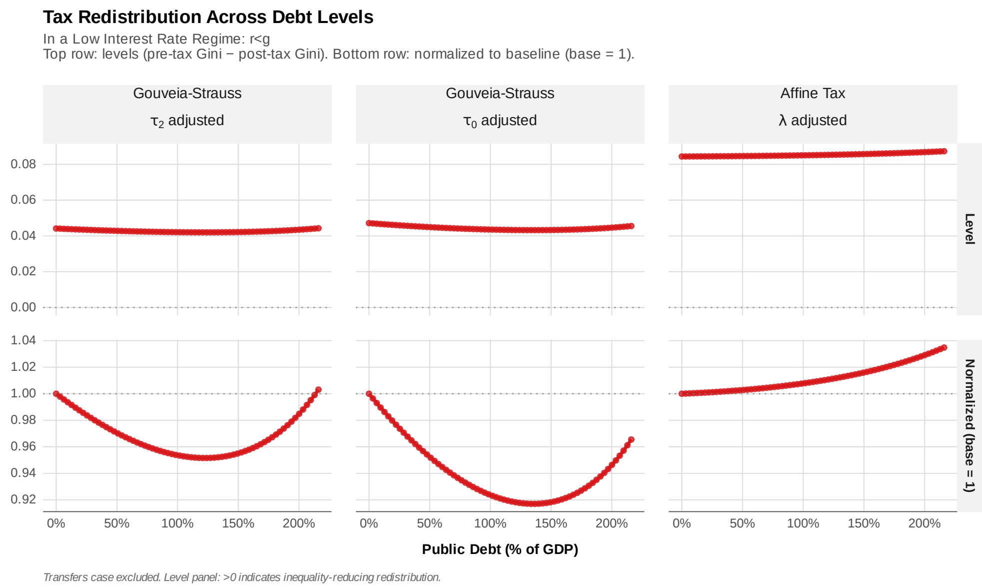


Figure 15: Tax Redistribution Across Debt Levels under $r < g$

This point about a lower degree of absolute redistribution can be shown more formally using the HSV specification as an example, where the effect of public debt on individual tax liability is:

$$\frac{d\tau^i}{db} = \tau^i \left[\underbrace{\frac{1}{b}}_{\text{Direct Debt Effect}} + \underbrace{\frac{1}{r-g}\frac{dr}{db}}_{\text{Debt Service Effect}} \underbrace{+ (1-\gamma)\frac{1}{w}\left(1 - \frac{\bar{l}^{-\gamma}}{l_i^{-\gamma}}\right)\frac{dw}{db}}_{\text{Tax-Base Effect}} \right], \tag{22}$$

where γ governs tax progressivity and $\bar{l}^{-\gamma} \equiv \frac{1}{N}\sum_i l_i^{-\gamma}$.

The third term in equation (22) shows that wage changes redistribute the tax burden differently across households depending on their labor endowment. Two households experiencing the same wage decline face different changes in their tax liabilities because of the $(1 - \bar{l}^{-\gamma}/l_i^{-\gamma})$ term. This channel therefore captures how the distribution of the tax burden shifts across households as the tax base contracts. The wage change is merely the trigger; the economically meaningful consequence is the redistribution of tax liabilities across the income distribution—that is, how a progressive system maps changes in the tax base into differentiated tax liabilities.

Under dynamic efficiency ($r > g$), all three terms in equation (22) typically reinforce one another for rich households (i.e., $l_i > \bar{l} \Rightarrow l_i^{-\gamma} < \bar{l}^{-\gamma}$), yielding an unambiguously higher tax burden from debt expansion. Under dynamic inefficiency ($r < g$), by contrast, the debt service effect reverses sign, generating the counterintuitive result that *higher* debt can *reduce* individual tax liabilities. For households with below-average labor endowments, both the direct debt effect and the tax-base effect work in their favor, potentially reducing the overall tax burden. The net outcome is therefore ambiguous, but the decomposition reveals a general pattern. Although the tax system remains progressive in the sense that richer households contribute more to revenues than poorer ones, the absolute redistributive efficacy of the system weakens as the tax base contracts.

This insight is illustrated more clearly in Figure 16, which repeats Figure 15 but makes the comparison with the $r > g$ case more explicit at debt levels that the $r > g$ equilibrium can sustain. Redistribution is stronger and increases monotonically with public debt under $r > g$, in contrast to the $r < g$ case, where it is weaker at all debt levels, suggesting that the degree of redistribution is a function of the government's intertemporal budget constraint and, by extension, the macroeconomic regime.

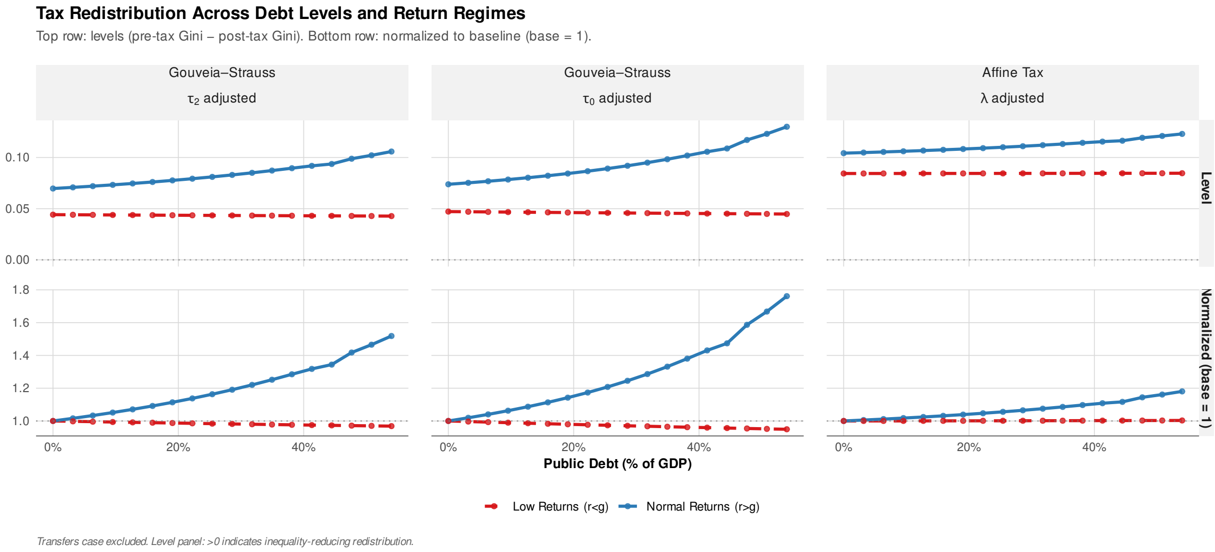


Figure 16: Comparison of Redistribution Across Macroeconomic Regimes

The intensity of redistribution as a function of public debt, shown in the bottom panel, also diverges across regimes. Under $r > g$, the effect of public debt on redistribution, and hence on tax progressivity, is substantially stronger than under the $r < g$ regime, though the magnitude of these regime effects depends on the tax adjustment mechanism. The Gouveia–Strauss specifications exhibit the steepest increases, as higher debt forces larger adjustments to marginal tax rates at the top of the distribution. Under $r < g$, by contrast, the effects are weaker and even declining at low debt levels, as discussed earlier.

This illustrates that redistribution is not solely the result of some political process or political ideology, but is also largely determined by the government's solvency condition, which in turn depends on the macroeconomic environment. This in turn explains permanent changes in the tax system or institutional reforms such as the tax reforms of the late 1980s and early 1990s observed across several advanced economies. It also reveals why a low interest rate regime can increase inequality following a debt expansion. As debt increases without triggering additional redistribution, differences in saving rates and in disposable income become more consequential, allowing wealthier households to accumulate greater wealth through larger investments.

4.5 The General Determination of the Distributional Patterns

The benchmark calibration assumes logarithmic utility and Cobb–Douglas production. This section relaxes both assumptions, adopting a CES utility function and a CES production function. Two structural considerations motivate the extension. The first is population aging. Carvalho et al. (2016) and Eggertsson et al. (2019) show that the saving channel is the dominant mechanism behind the secular decline in the natural rate of return—generating the $r < g$ environment central to the regime analysis in this paper—and that aging lowers the intertemporal elasticity of substitution $\frac{1}{\theta}$, raising the aggregate marginal propensity to save. Accordingly, higher θ corresponds to an aging economy in which aggregate saving is less responsive to interest rates, while lower θ corresponds to a younger economy in which saving is highly sensitive to interest rate movements. The second is AI-driven automation, which raises the capital share α and increases the intensity of capital relative to labor in the production function (Acemoglu and Restrepo, 2022; Moll et al., 2022).

The distributional effects of capital deepening also depend on the elasticity of substitution between capital and labor, σ, which I parameterize through $\rho = \frac{\sigma-1}{\sigma}$. There is no consensus on the value of σ, though it has been linked to wealth inequality through its effect on factor shares. Both Piketty (2014) and Karabarbounis (2024) attribute the decline in the labor share to capital deepening—an increase in capital per worker—implicitly relying on an elasticity of substitution greater than unity. However, a growing body of empirical evidence suggests that capital and labor are gross complements, with $\sigma < 1$ in most advanced economies (Oberfield and Raval, 2021; Antràs, 2004; Knoblach et al., 2019).

Together, θ, ρ, and α govern the sensitivity of wages and interest rates to the crowding out of private capital by public debt, which in turn shapes equilibrium factor prices, the tax burden, and fiscal policy responses. Since the empirical evidence on σ remains contested and the structural forces driving α operate independently of household saving behavior, a joint assessment across the three parameters is warranted to evaluate robustness, guide forward-looking policy design, and rationalize cross-country variation in the debt–inequality relationship. To save space, the specification of the model with CES preferences and CES production is provided in the Online Appendix.

4.5.1 Sensitivity to Preferences and Technology

Figure 17 presents outcomes across the full range of (θ, ρ, α) combinations that yield economically meaningful equilibria. The figure is organized in three panels to separate the role of production technology from household saving behavior. Panel (A) reports results for the $r > g$ regime across the joint parameter space. The dark shaded areas hold α fixed at its baseline value, while the overlaid gray areas incorporate variation in α; subplots (a) and (b) display shaded bands showing the range of outcomes across parameterizations and tax cases. Panel (B) shows results for the $r < g$ case but isolates the effects of θ and ρ by holding α fixed. Panel (C) incorporates variation in α and reports median values across all combinations, thereby enabling identification of the role of α in shifting the economy from the $r < g$ to the $r > g$ regime.

Several patterns emerge across the parameter space. First, identical aggregate effects of public debt produce qualitatively and quantitatively different distributional outcomes depending on the interest rate regime. In the $r > g$ regime, inequality typically rises, and the effects are orders of magnitude larger than under $r < g$. Second, the choice of fiscal instrument shapes the sign and scale of the distributional response, but the qualitative pattern identified in the previous section is preserved across specifications—only magnitudes differ. Third, under $r < g$, redistribution is generally weaker, and inequality tends to rise. These findings confirm that the baseline results are robust across a wide range of parameterizations. They also suggest that substantial cross-country variation in the debt–inequality relationship can be rationalized by differences in production technology, the aggregate responsiveness of household saving to interest rates, and institutional features of the tax system.

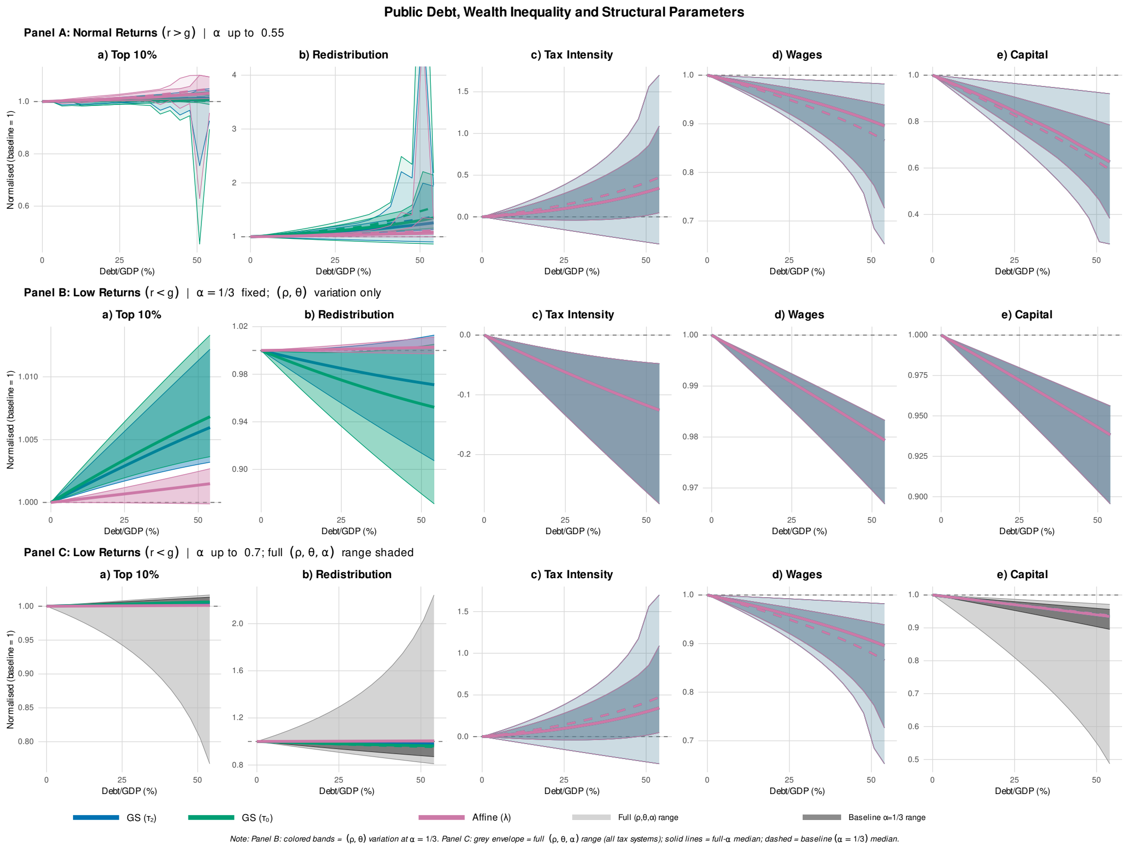


Figure 17: Effect of Public Debt on Wealth Inequality: Sensitivity Analysis Across Structural Parameters.

Note: The parameter space spans $\theta \in \{0.7, 1, 1.2, 2.0\}$, $\rho \in \{0.23, 0, -0.67\}$, and $\alpha \in [0.2, 0.7]$, encompassing specifications from more substitutable ($\rho = 0.23$) to Cobb–Douglas ($\rho = 0$) to limited factor substitutability ($\rho = -0.67$), and from most elastic ($\theta = 0.7$) to most inelastic ($\theta = 2.0$) savings responses. Panel (A) restricts α to $[0.2, 0.55]$ range: above $\alpha = 0.55$ the $r > g$ equilibrium no longer solves to an economically meaningful steady state, so no higher α values are available for that regime; Panel (C) reports the full $[0.2, 0.7]$ range because the $r < g$ equilibrium remains well defined throughout.

The more important insight, however, concerns the interaction between the $r < g$ regime and capital intensity α. Comparing Panels (B) and (C), the results change markedly once variation in α is introduced. Without the rise in α, public debt would typically amplify wealth inequality across different (θ, ρ) combinations. When α also shifts, however, a new steady state emerges in which public debt can reduce inequality.

Table 2 illustrates this interaction further through comparative statics. In the absence of public debt, an increase in α from 0.2 to 0.70 raises wealth concentration, consistent with the view that a higher capital share concentrates income among capital owners. The condition for a regime change is met when the economy features aging (higher θ) and factors of production are complements (negative ρ)—the two most empirically relevant cases for the future economy.

Under these fundamentals, an increase in debt can reduce wealth inequality, reversing the effects of automation or population aging through higher redistribution, which as discussed earlier can dominate Piketty's $r > g$ channel. The combined effects of AI and population aging could render public debt unsustainable under the empirically relevant case $\rho < 0$ ($\sigma < 1$), and the resulting demand for fiscal revenues could reverse the disequalizing effects of AI or population aging.

Table 2: Comparative Statics — Wealth Inequality and the Return-Growth Differential

α	θ	ρ	Top 10% Share $b=0$	Top 10% Share $b/y=54\%$	Top 10% Share Δ (pp)	$r-g$ $b=0$	$r-g$ $b/y=54\%$	$r-g$ Δ (pp)
0.20	0.7	−0.67	0.405	0.411	+0.53	−1.871	−1.820	+0.05
		0.00	0.405	0.409	+0.46	−1.563	−1.520	+0.04
		0.23	0.404	0.408	+0.42	−1.415	−1.377	+0.04
	1.0	−0.67	0.418	0.424	+0.59	−2.035	−1.995	+0.04
		0.00	0.419	0.424	+0.50	−1.634	−1.593	+0.04
		0.23	0.419	0.424	+0.45	−1.453	−1.415	+0.04
	1.2	−0.67	0.420	0.426	+0.62	−2.105	−2.071	+0.03
		0.00	0.422	0.427	+0.52	−1.666	−1.625	+0.04
		0.23	0.423	0.427	+0.47	−1.470	−1.432	+0.04
	2.0	−0.67	0.417	0.424	+0.64	−2.234	−2.216	+0.02
		0.00	0.422	0.427	+0.54	−1.733	−1.698	+0.04
		0.23	0.423	0.428	+0.49	−1.508	−1.471	+0.04
0.70	0.7	−0.67	0.412	0.411	−0.11	−0.111	0.000	+0.11
	1.0	−0.67	0.421	0.410	−1.15	+0.370	+0.640	+0.27
	1.2	−0.67	0.422	0.401	−2.10	+0.761	+1.299	+0.54

Notes. The table reports the top 10% wealth share and the return-growth differential $r-g$ under the Low Returns scenario, across values of the capital share α, the inverse of the intertemporal elasticity of substitution θ, and the elasticity of substitution between capital and labor, parameterized by ρ, at zero debt ($b=0$) and maximum debt ($b/y = 54\%$ of GDP). The column Δ denotes the change between the two debt levels, expressed in percentage points. Results are based on τ_2 adjustment for illustration; inequality outcomes vary across tax systems while $r-g$ is invariant to tax cases. Model solutions at $\alpha = 0.70$ are only available for $\rho = -0.67$.

5 Empirical Evidence

5.1 Data and Inference

This section assess empirically the impact of public debt on wealth inequality and evaluates model's predictions. Specifically, I use a panel dataset spanning 1950 to 2019 that combines macroeconomic and fiscal variables from the Jordà–Schularick–Taylor Macrohistory Database and the Global Macro Database (Müller et al., 2025), capital stock data from the IMF and the Penn World Tables, and wealth inequality measures from the World Inequality Database. The analysis employs the Blanchard and Quah (1989) identification strategy (BQ), relying on long-run restrictions to identify permanent debt shocks. I first present results from three country case studies—the United States, France, and the United Kingdom—selected for their long historical coverage, distinct fiscal institutions, and public debt series that satisfy the unit-root condition required for permanent shocks[30]. There, I also discuss the details of the identification strategy, the model specification, and the proposed method to interpret public debt shocks as tax burden shocks invoking the neoclassical assumptions of Diamond (1965).

To test the robustness of the results, the empirical analysis is also supplemented with the panel SVAR approach of Pedroni (2013), due to its favorable bias–variance trade-off and to overcome the challenge of data limitations and short samples—issues that I discuss shortly. Next, to evaluate the overall relevance of public debt as a driver of wealth inequality relative to other structural forces, I draw on the previous analysis to carry out a historical decomposition analysis. This provides a direct test of the consistency of the model's predictions across distinct historical episodes of both rising and falling wealth inequality, examining the three country case studies in turn. I then ask whether the post-1980 rise in wealth concentration is carried by the debt shock or by an autonomous decline in tax progressivity, and conclude this section by testing for nonlinear effects and providing some evidence about the endogenous relationship of public debt with tax progressivity, as captured by the observed intensity of redistribution. For this section, the Online Appendix provides the details about the sample used and its time-series properties, outlines more routine time-series procedures for the SVAR analysis, and presents further robustness checks using Bayesian techniques[31].

[30] This is not only a statistical requirement but also an economically meaningful one, given the permanent changes observed across countries since the 1980s, such as the rise in debt levels.

[31] As the SVAR application is standard, full technical specifications and details are deferred to the Online Appendix to conserve space.

Bias–Variance Trade-off. There is a long-standing debate regarding the optimal approach to inference under the bias–variance trade-off. Impulse responses are traditionally estimated using vector autoregressions or local projections, with the latter gaining popularity due to its simplicity and flexibility. Yet, as Li et al. (2024) show, neither strategy resolves this trade-off optimally. Local projections exhibit lower bias under misspecification but suffer from higher variance at long horizons, which is the primary focus of this paper. For the questions addressed here, several considerations favor a structural VAR framework. Although long-run identification can be implemented within the local projection framework via the two-step procedure of Jordà (2005), this approach identifies permanent shocks using a purely statistical criterion that maximizes explanatory power at an arbitrarily chosen horizon H. The Blanchard-Quah (BQ) strategy, by contrast, leverages the full information set of a VAR to separate permanent from transitory shocks. It relies on long-run restrictions derived analytically from the long-run impact matrix rather than being tied to an arbitrary finite horizon. This distinction is critical because, at any finite horizon, highly persistent but transitory dynamics are difficult to distinguish from genuinely permanent effects, a difficulty the BQ restriction is designed to resolve.

The variance cost, too, is not necessarily of secondary importance in this context. Bias is a primary concern, given the strong policy implications attached to the magnitude of public debt's effect on wealth inequality. Yet precision carries first-order consequences as well. The data available for questions of this kind consist predominantly of low-frequency observations whose effective sample spans are substantially shorter than those assumed in simulation studies, and this limitation is naturally inherited by the estimation framework. When confidence bands are wide, the resulting ambiguity itself becomes a barrier to credible inference. The tighter confidence intervals that the VAR delivers at long horizons, documented by Li et al. (2024), are therefore of at least comparable importance to the reduction in bias that local projections offer.

To address small-sample bias in the country case studies, estimation employs the bootstrap-after-bootstrap procedure of Kilian (1998), with wild bootstrap confidence intervals to accommodate conditional heteroskedasticity due to regime shifts. To complement this analysis and mitigate concerns about small-sample bias, I employ the structural panel VAR framework of Pedroni (2013), which delivers a favorable bias–variance trade-off particularly in the context of short samples and the BQ identification strategy. Pedroni (2013) shows that reliable estimation and inference remain feasible even when individual units have as few as $T = 20$ time-series observations, provided that cross-sectional information is exploited through common dynamics. The methodology decomposes shocks into common and idiosyncratic components, pooling information across countries to estimate common structural dynamics. This substantially reduces estimation uncertainty and bias relative to country-by-country BQ identification with limited time-series observations. The idiosyncratic component captures country-specific permanent shocks while inheriting precision gains from the jointly estimated common factor structure.

This decomposition is also well suited to the study of macroeconomic regimes. Common shocks capture global conditions such as the low interest rate environment that is associated with limited crowding-out effects (Blanchard, 2023)[32]. Idiosyncratic shocks instead isolate domestic factors, such as differences in tax systems, that contribute to country-specific debt dynamics. The favorable bias–variance trade-off in Pedroni's approach facilitates the estimation of regime-dependent effects. By splitting the sample according to cross-country heterogeneity in the $r - g$ differential, the analysis compares economies that have historically operated under different macroeconomic regimes. This sample split directly tests the model's predictions regarding redistribution and the nonlinearities tied to the service of public debt.

5.2 Identifying the Tax Burden Shock

To demonstrate this equivalence and interpret permanent public debt shocks as tax burden shocks, I rely on the framework of Diamond (1965), whose macroeconomic properties are replicated by the theoretical model presented in this paper. The Diamond model establishes the conditions under which public debt is a tax burden. These conditions rest on the neoclassical assumptions that, in the long run, public debt *jointly* crowds out capital, increases interest rates, and reduces real wages, predictions that immediately rule out Ricardian equivalence. To the best of my knowledge, this empirical exercise has not yet been explicitly pursued. While a large literature implicitly rejects Ricardian equivalence, it does not evaluate the complete general equi-

[32] Under more traditional identification strategies, evaluating these predictions systematically across countries with short time series would typically require imposing magnitude restrictions.

librium transmission mechanism of the Diamond model, which remains the primary framework for distinguishing between Ricardian neutrality and neoclassical crowding-out effects.

For the structural interpretation of the permanent debt shock as equivalent to a tax burden shock, one could in principle estimate a VAR system with debt ordered first, followed by capital, interest rates, wages, and wealth inequality, and impose the relevant neoclassical restrictions on capital, interest rates, and wages. However, such an approach would assume rather than prove the result. For this reason, the paper does not impose the Diamond transmission mechanism. It asks whether the data generate this transmission once a permanent debt shock has been identified using the canonical BQ approach, placing no structural restrictions on any macro variables, thereby allowing the data to freely determine the long-run effects of the identified public debt shock.

Consequently, the empirical VAR specification consists of five variables ordered to mirror the theoretical transmission mechanism, treating wealth inequality as the most endogenous variable. Public debt-to-GDP enters first, followed by private investment as a share of GDP, the real return on capital, real wages, and the top 10 percent wealth share[33]. Under BQ restrictions and this ordering, the permanent debt shock is identified as the only structural innovation with a non-zero long-run impact on the debt-to-GDP ratio. This "permanent debt shock" should be interpreted as a composite factor summarizing all forces that permanently shift the debt path, rather than a single primitive disturbance. These forces fall into two broad categories. The first comprises shocks that permanently alter primary balances, such as population aging. The second comprises shocks that could be transitory in their direct effect on $r - g$ but nonetheless produce permanent level effects on the debt ratio, as implied by the debt sustainability equation (10).

The question of what permanently shifts debt levels, however, is distinct from the question of how that shift transmits through the economy. Whatever its ultimate origin, any permanent increase in the debt-to-GDP ratio implies, through the Diamond mechanism, a permanent increase in the tax burden required to maintain fiscal solvency. It is through this channel that the shock operates as a tax burden shock, crowding out physical capital, raising its return, and decreasing real wages. The empirical analysis tests these predictions jointly, tracing the full transmission mechanism from the permanent debt shock through factor prices to the distribution of wealth[34].

The specification uses private investment rather than the private capital stock to test the crowding-out channel. The private capital stock would be the conceptually natural variable, but it cannot be observed directly and must instead be constructed from investment flows using the perpetual inventory method (PIM), which relies on assumptions about initial stocks, depreciation rates, and asset lifetimes, introducing substantial measurement error[35]. Private investment, by contrast, is recorded directly in national accounts with considerably greater reliability. It responds more immediately to changes in the cost of capital and aligns with how the crowding-out channel is typically tested in the empirical literature (Kumar and Woo, 2010).

[33]This ordering follows the sequential equilibrium of the model. In practice, fiscal decisions are also discretionary and precede private-sector outcomes within the period (Perotti et al., 2007), a further reason to order public debt first. The interest rate follows private capital, adjusting through $r = f'(k)$ once the capital stock is determined, while wages are ordered last among the factor prices because they are pinned down residually through the factor price frontier $dw/dr = -k$. Swapping the order of wages and the interest rate did not affect the results.

[34]The BQ long-run restrictions identify the permanent debt shock cleanly but leave the remaining shocks only partially identified in a structural sense. The second shock most naturally captures technology or productivity disturbances, though it may also absorb permanent shifts in capital income taxation or financial liberalization (Uhlig, 2004). The third shock could reflect global asset pricing forces or demographic shifts affecting the return on capital, while the fourth corresponds most closely to labor market structural forces—shifts in bargaining power, trade integration, or skill-biased technical change. This partial identification is a well-recognized feature of BQ systems. Galí (1999), Christiano et al. (2003), and Francis and Ramey (2005) all acknowledge that BQ-identified permanent shocks are best understood as composites rather than primitive structural disturbances. The non-debt shocks are therefore treated here as theoretically motivated but compositionally open, without affecting the primary identification of the permanent debt shock.

[35]The Penn World Tables, the standard source for historical macroeconomic series, do not decompose the aggregate capital stock into public and private components (Feenstra et al., 2015). The IMF's Investment and Capital Stock Dataset constructs such a decomposition by applying the PIM to investment flows, setting the initial capital stock to zero in 1860 for all countries and assuming 4 percent annual investment growth until the first observed data point (Kamps, 2006; Gupta et al., 2014). Depreciation rates, calibrated from historical data for the United States, Australia, and Canada only, are then applied uniformly within income groups, rising from 4.25 to 10.4 percent for private assets in high-income economies. The OECD (2001) *Measuring Capital* manual notes that estimates of average service lives are less well-grounded than most types of economic statistics published by statistical offices, and Berlemann and Wesselhöft (2014) show that even small shifts in assumed asset lifetimes produce wide swings in implied capital stock dynamics. In steady state, $K = I/\delta_K$, so the effects of public debt on private capital should be broadly similar to those on private investment up to a scaling constant, provided measurement error is not the binding concern.

Difference vs levels: The BQ strategy identifies permanent shocks through long-run restrictions on the structural moving-average representation of the system. Let $\mathbf{y}_t$ be the vector of the five endogenous variables—public debt-to-GDP, private investment as a share of GDP, the real return on capital, real wages, and the top 10 percent wealth share—ordered as above. In first differences the system is stationary and admits the representation $\Delta \mathbf{y}_t = C(L)\varepsilon_t$, with $C(L) = \Phi(L)^{-1}B$, where $\Phi(L)$ is the reduced-form autoregressive lag polynomial and B the contemporaneous impact matrix mapping the orthonormal structural shocks ε_t to the reduced-form innovations u_t, so that $u_t = B\varepsilon_t$ and $BB' = \Sigma_u$. The long-run impact matrix $C(1) = \Phi(1)^{-1}B$ collects the cumulative—hence permanent—effects of the structural shocks on the level of $\mathbf{y}_t$, and the identifying restriction requires it to be lower triangular. The canonical implementation, following Blanchard and Quah (1989), Galí (1999), and Francis and Ramey (2005), estimates the differenced system, where $\Phi(1) = I - A_1 - \cdots - A_p$ is well-conditioned and the long-run multiplier can be extracted reliably. Although Sims et al. (1990) show that a VAR in levels produces asymptotically consistent estimates even with unit roots, the finite-sample properties differ substantially. In levels, the autoregressive coefficient matrices sum to nearly the identity, leaving $\Phi(1)$ near-singular, and its inverse—the object required for BQ identification—is numerically unstable. Kilian and Lütkepohl (2017, Ch. 10) document that this near-singularity generates severe finite-sample distortions in the recovered structural parameters, particularly when the largest root of the VAR companion matrix is close to unity. Christiano et al. (2003) further demonstrate that levels-based long-run identification is fragile when the lag length is short relative to the persistence of the data, as the levels VAR effectively imposes incorrect zero restrictions on distant lags. Since annual macroeconomic data with roughly 60 observations per country impose tight constraints on feasible lag lengths, this concern applies directly to the present setting.

First differences are therefore adopted as the baseline specification for the BQ-identified SVAR throughout. This choice removes the unit root component, yields a better-conditioned long-run matrix, and preserves the long-run information needed for identification. Fundamentally, the validity of the BQ identification strategy requires that the debt-to-GDP ratio be non-stationary, ensuring the presence of permanent shocks that can be cleanly distinguished from transitory shocks with persistent effects. Unit root tests indicate that not only public debt but all variables in the VAR system are non-stationary in levels, satisfying this requirement (see Online Appendix for details). To ensure stationarity, all variables enter the VAR in percentage-point differences, except real wages, which enter in log differences. For France and the United Kingdom, where certain differenced series (particularly real wages) exhibit residual persistence consistent with $I(2)$ behavior in levels, further detrending is applied following the stationarity diagnostics described in the Online Appendix. As a robustness check, results are also presented from a Bayesian VAR in levels with the dummy-initial-observation prior of Sims (1993) and Sims and Zha (1998), which disciplines unit-root behavior through the prior rather than through data transformation. The consistency of the long-run multipliers across these specifications confirms that the findings are not driven by the choice of data transformation. This supplementary material is also provided in the Online Appendix.

Steady State: Given the focus on steady-state effects, the analysis reports the long-run impact of public debt on the level of each variable in the VAR system. For convenience, and with a slight abuse of terminology, these effects are referred to as long-run multipliers. Because the variables enter in differences under the BQ identification, these multipliers correspond to the ratio of the cumulative impulse response of each variable to the cumulative impulse response of debt, with inference obtained via bootstrapping. For ease of interpretation, the multipliers are scaled to the cumulative increase in public debt observed in the United States, which amounts to 74 percentage points[36]. This scaling ensures that the reported long-run effects reflect a historically meaningful debt shock, thereby presenting the results more intuitively and anchoring the subsequent discussion.

[36]Technically, the multipliers defined here do not strictly follow the standard convention used in the fiscal multiplier literature, which assesses multipliers in dollar terms (see, e.g., Ramey and Zubairy, 2018). For the purposes of this paper, that definition is not necessary; strictly speaking, the concept here captures long-run level effects, which for real wages maps to a semi-elasticity. For further discussion see Jordà (2005).

5.3 Long-Run Effects of Permanent Debt Shocks

Table 3 reports estimates from three country case studies—the United States, France, and the United Kingdom—alongside the panel median derived from the Pedroni (2013) panel SVAR approach and the decomposition of composite IRFs into common (global) and idiosyncratic (country-specific) components of the permanent public debt shock. Following standard practice in applied macroeconomics, the discussion of economically meaningful effects is anchored at the 68 percent confidence level.[37].

Table 3: Long-Run Multipliers: Response per 74pp Permanent Debt/GDP Increase

	Country Case Studies			Panel SVAR		
Variable	**USA**	**FRA**	**GBR**	**Composite**	**Common**	**Idiosyncratic**
Priv. Inv./GDP (pp)	-7.87**	-10.75***	-5.80***	-9.35***	-3.70***	-4.34***
Real Rate (pp)	2.60*	1.96	1.87*	0.88*	0.35*	0.38*
Real Wages (%)	-26.24***	-31.52*	-9.56*	-6.88*	-2.50*	-3.35*
Top 10% (pp)	6.09*	19.82*	7.65**	2.18**	0.94**	0.99**

*Notes: "pp" denotes percentage points; real wages are reported as percent semi-elasticities. All country VARs include a constant and one lag selected by BIC. Exogenous controls include a world current-account factor (USA, GBR) and a euro-area current-account factor interacted with a euro-crisis indicator (FRA). Structural break dummies account for shifts in public debt for the USA (post-1993), GBR (post-1979), and FRA (post-1999). In GBR and FRA, real wages are linearly detrended after first-differencing. Composite, common, and idiosyncratic multipliers are computed as independent panel medians across countries and bootstrap draws; because the median is non-additive, $M_{common} + M_{idio} \neq M_{composite}$ despite exact underlying per-draw decompositions. The idiosyncratic share of $M_{common} + M_{idio}$ ranges from 51 to 57 percent across variables. ***, **, and * denote that the 95%, 90%, and 68% confidence intervals exclude zero, respectively.*

Starting with the country-level results, Table 3 shows that permanent debt shocks increase wealth inequality across all three countries, with effects that are both statistically significant and quantitatively large. The differences in magnitudes align with theoretical predictions and partly reflect differences in tax systems. In France, for example, a 74 percentage-point increase in public debt raises wealth inequality by close to 20 percentage points over the long run, roughly three times the effect estimated for the United States and the United Kingdom. To gauge the magnitude of these effects, note that the top 10 percent wealth share rose by 5.68 percentage points between 1980 and 2019 in the U.S. data. A permanent debt shock of 74 percentage points, the benchmark used to evaluate the multipliers, implies an increase in U.S. wealth inequality of roughly 6 percentage points, slightly exceeding the entire observed historical rise. In France, the estimated effect is even larger, yet the observed historical increase in wealth concentration was comparatively muted (+6.15 percentage points over 1984–2019, against an implied multiplier of 19.82).

This suggests that much of the disequalizing effect of public debt was offset by institutional features of the French economy, particularly its higher tax progressivity, as the theoretical model predicts. In the United Kingdom, by contrast, the observed historical increase (+11.33 percentage points over 1991–2019) is roughly twice the U.S. figure and exceeds the multiplier-implied effect, underscoring how institutional differences shape the realized relationship between public debt and wealth concentration. This evidence reinforces the theoretical prediction that a progressive tax system does not eliminate the disequalizing effects of public debt unless progressivity is sufficiently high. A comparison across the three case studies, which differ in their degree of tax progressivity, validates this argument[38].

A permanent increase in public debt also crowds out private investment, reduces real wages, and raises interest rates, validating the core neoclassical predictions regarding the long-run general equilibrium effects of public debt and the transmission mechanism of the Diamond model, thereby supporting the interpretation of permanent debt shocks as tax burden shocks under the BQ

[37]See Sims and Zha (1999); Inoue and Kilian (2016, 2020)Sims and Zha (1999) recommend that one-standard-error intervals be the norm for reporting impulse response uncertainty. The 68 percent interval identifies effects that are distinguishable from zero with moderate confidence, providing a threshold for economic relevance that avoids the well-known power deficiencies of 95 percent tests in small-sample SVAR applications. As Sims and Zha argue, such intervals are the appropriate norm for structural impulse response analysis, where the object of interest is the shape and direction of the response rather than the rejection of a sharp null.

[38]Ultimately, the model explains this cross-country heterogeneity through differences in initial conditions, household preferences, and production primitives that shape general equilibrium dynamics alongside the degree of tax progressivity, highlighting how such structural differences manifest in empirical outcomes.

identification strategy. The investment response is strongest in France, where a 74 percentage-point increase in public debt reduces investment by about 10 percentage points, compared with approximately 8 percentage points in the United States and 6 percentage points in the United Kingdom, with all effects statistically significant. Interest rates also rise, though the responses are modest. The United States and the United Kingdom experience increases of 2.60 and 1.87 percentage points, respectively, both significant at the 68 percent level. In France, the response is positive but statistically insignificant, likely reflecting euro-area spillovers and monetary policy factors not captured by the single-country specification. These relatively small interest-rate effects are nonetheless consistent with the low tax burden of public debt over the sample period[39]. Finally, the impact on wages shows that a permanent 74 percentage-point increase in public debt reduces real wages by roughly 30 percent in the United States and France, and by about 10 percent in the United Kingdom.

To assess the robustness of these country-level results, the baseline model is re-estimated using Bayesian techniques in the spirit of Giannone et al. (2015) and Antolin-Diaz and Surico (2025). The baseline Bayesian long-run multipliers—obtained under optimal hyperparameters—are quantitatively close to the frequentist estimates in the United States and the United Kingdom, though notably larger in France. The top 10 percent wealth share response equals 6.04 percentage points in the United States (versus 6.09 in the frequentist specification), 8.67 in the United Kingdom (versus 7.65), and 29.49 in France (versus 19.82). The Bayesian estimates also carry uniformly stronger statistical significance, with the wealth inequality effect significant at the 95 percent level across all three countries. The private investment and real wage multipliers are similarly significant at the 95 percent level, validating the full neoclassical transmission mechanism. These findings remain robust to alternative priors, lag orders ranging from one to eight, alternative prior-based treatments of residual wage persistence in France and the United Kingdom, and hierarchical integration over hyperparameters following Giannone et al. (2015).

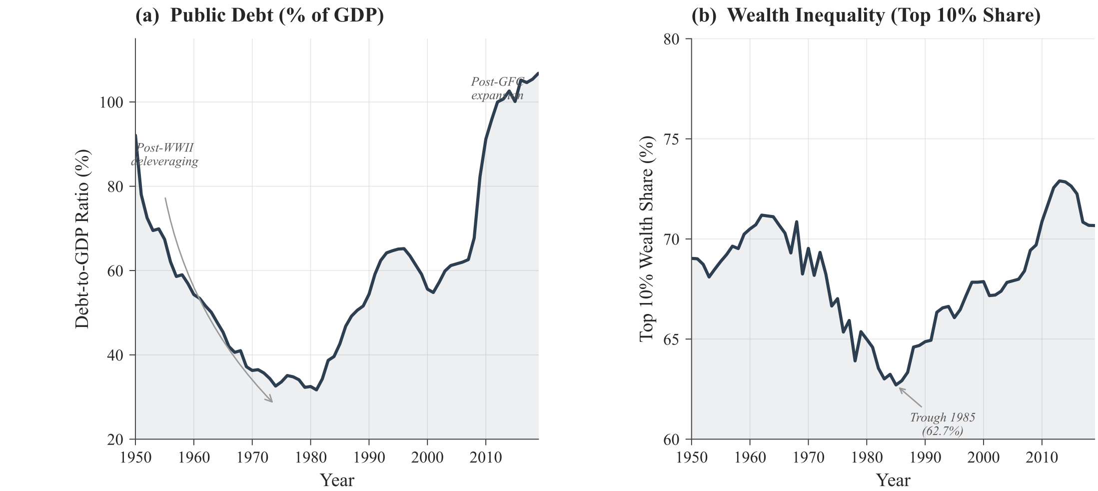
The panel estimates tell a similar story, yielding effects directionally consistent with the country-level results, with differences in magnitude reflecting cross-country heterogeneity. The typical increase in wealth inequality across advanced economies is roughly 2 percentage points, placing the standalone responses of the United States, France, and the United Kingdom at the upper end of the cross-country distribution. The panel results also shed light on the relative importance of global versus idiosyncratic components of the composite debt shock. Decomposing their respective contributions to the long-run multipliers across all variables, I find that the idiosyncratic component accounts for a modest majority of the estimated effect, ranging from 51 to 57 percent across variables. While the theoretical model treats the dominance of domestic factors as an implicit assumption, the panel evidence is broadly consistent with it, though the relative contributions reported in Table 3 are nearly balanced.

To save space, the underlying impulse response functions for both the individual case studies and the panel specifications, alongside the BVAR analysis with alternative model and prior specifications, are available in the supplementary material of the Online Appendix.

5.4 U.S. Public Debt and Wealth Inequality

The rise in wealth concentration after 1980 generated a large body of research, yet relatively little attention has been paid to the co-movement between public debt and wealth inequality. Section 2 showed that the United States conforms to the broader cross-country pattern. Figure 18 plots public debt and the top 10 percent wealth share for the United States. After the 1950s, public debt declined alongside wealth inequality, and both began rising again after 1980, with the increase in public debt preceding that in wealth inequality by at least five years.

[39] The effective interest rate–growth differential ($r^e - g$) equals -1.86% for France, -2.60% for the United States, and -1.32% for the United Kingdom; in real terms, -1.6%, -2.73%, and -1.64%, respectively.



Source: Jordà–Schularick–Taylor Macrohistory Database and World Inequality Database.

Figure 18: United States: Public Debt and Wealth Inequality in 1950–2019

I use the U.S. VAR model to decompose the cumulative change in wealth inequality before and after 1980[40]. Table 4 reports the results. Between 1963 and 1980, the top 10 percent wealth share declines by 3.63 percentage points, of which -2.67 percentage points, or just under three-quarters of the total decline, are attributable to debt shocks. After 1980, the pattern reverses. The top share rises by 5.68 percentage points, with debt shocks accounting for $+2.74$ percentage points, or roughly 48 percent of the increase. In both periods, debt shocks represent the single largest contributor to the observed change in wealth concentration.

Table 4: Shock Contributions to Top 10% Wealth Share – USA

	1963–1980		**1980–2019**	
	pp	Share (%)	pp	Share (%)
Debt/GDP	-2.67	+73.7	+2.74	+48.2
Priv. Inv./GDP	+0.04	-1.2	-0.08	-1.3
Real Interest Rate	-0.02	+0.6	-0.03	-0.5
Real Wages	-0.52	+14.3	+0.47	+8.3
Top 10%	-1.44	+39.7	+1.03	+18.1
Deterministic	+0.98	-27.1	+1.55	+27.3
Total Δ (pp)	-3.63		+5.68	

Note: Cumulative shock contributions from the historical decomposition of the 5-variable BQ-SVAR. Shares indicate each shock's proportion of the total level change.

Permanent shocks specific to wealth inequality constitute the second most important source of variation among the identified shocks, excluding the deterministic component. They account for -1.44 percentage points, or approximately 40 percent of the pre-1980 decline, and $+1.03$ percentage points, or about 18 percent of the post-1980 increase. These shocks likely capture forces that operate directly on the wealth distribution rather than through the macroeconomic channels emphasized in the model, including differences in portfolio composition, heterogeneous saving behavior, asset-price dynamics, inheritance, and rent-seeking behavior. Even after accounting for these factors, as well as the deterministic component of the model, debt shocks remain the dominant driver of the long-run evolution of wealth concentration.

The magnitude of the wealth inequality specific shocks is particularly informative in light of the

[40]The historical decomposition starts in 1963 rather than at the beginning of the 1950–2019 sample: the first-differenced series for the United States, France, and the United Kingdom begin in 1961, since private investment is available only from 1960 onward, and the one-period lag (selected by BIC) further shortens the usable estimation sample to 1963 onward. See the Online Appendix for the full data-construction and sample-coverage details.

literature that emphasizes the rent-seeking behavior of the rich via tax avoidance. This literature argues that the effective tax rates faced by the wealthiest households are substantially lower than implied by statutory tax schedules because of tax avoidance, tax evasion, and bargaining over top compensation, mechanisms that reduce realized tax progressivity and thereby contribute directly to wealth concentration[41].

In the model, progressive taxation acts as a countervailing force that partially offsets the disequalizing effects of public debt. If wealthy households face lower effective tax rates than those implied by the statutory schedule, this redistributive offset becomes weaker, allowing richer households to retain a larger fraction of their income and thus shifting more of the tax burden of public debt onto the rest of the population. Consequently, the contribution of debt shocks reported in Table 4 should be interpreted as a conservative estimate of the true effect of public debt on wealth concentration—understated, if anything, rather than overstated. At the same time, the historical decomposition already assigns avoidance and evasion a distinct structural channel, yet its contribution remains second to public debt in both subperiods.

The results therefore suggest that wealth-specific channels emphasized elsewhere in the literature are quantitatively important, but that they account for a smaller share of the long-run variation in wealth concentration than the debt shocks identified by the VAR. Because the estimated debt contribution is likely to understate the full disequalizing effect of public debt, the dominance of debt shocks in both subperiods strengthens the conclusion that changes in the tax burden associated with public debt have been a central force shaping the long-run evolution of wealth inequality in the United States.

The evidence in Table 4 also shows that other macroeconomic factors play a minor role; if anything, their effects on wealth inequality are essentially mediated through public debt, given that permanent debt shocks are composite structural shocks—an issue I discuss more extensively in subsequent sections. Private investment and interest rate shocks contribute negligibly, while real wage shocks account for roughly 14 percent and 8 percent of the observed change in wealth inequality across the two subperiods, respectively. This pattern is difficult to reconcile with theories that emphasize asset returns as the primary driver of wealth concentration,[42] and instead lends support to the view, shared by Mian et al. (2020) and Mian et al. (2021) as well as this paper, that disposable income and wage inequality are more important factors.

A structural scenario analysis in the tradition of Bernanke et al. (1997), as refined by Antolin-Diaz et al. (2021), further reinforces these findings. At each period t, I solve for the structural shock to a given variable that would hold it at zero, conditional on all other shocks realizing their historical values, and propagate this counterfactual through the companion form of the VAR. Table 5 reports the results of two experiments. Over the full sample, wage shocks increased wealth inequality. Without them, the top 10 percent share would have fallen by 0.41 percentage points instead of rising by 2.01. Interest rate shocks also increased inequality, albeit modestly; removing them lowers the cumulative rise from 2.01 to 1.78 percentage points. After 1980, the pattern shifts. Wage shocks continued to amplify inequality; removing them reduces the rise in the top 10 percent share from 5.68 to 4.97 percentage points. Interest rate shocks, however, mitigated inequality during this subperiod; without them, the top 10 percent share would have risen by 6.09 percentage points versus the observed 5.68, a dynamic consistent with falling real rates.

Table 5: Counterfactual Change in Top 10% Wealth Share (pp) – USA

	Full sample (1963-2019)			**1980–2019**		
Scenario	Actual	CF	Explained	Actual	CF	Explained
Real interest rate = 0	+2.01	+1.78	+0.23	+5.68	+6.09	-0.41
Wages = 0	+2.01	-0.41	+2.42	+5.68	+4.97	+0.71

Note: Each row shuts down the named channel and reports the counterfactual (CF) cumulative change in top 10% wealth share. "Explained" = Actual − CF. KL divergence (plausibility, following Antolin-Diaz et al. 2021): interest rate = 0.133, wages = 0.214, both well below the conventional threshold.

[41] See Piketty et al. (2014, 2018); Alstadsæter et al. (2019); Saez and Zucman (2020).

[42] See Fernández-Villaverde and Levintal (2024); Greenwald et al. (2025); Gomez and Gouin-Bonenfant (2024); Piketty (2014).

5.5 Public Debt and Wealth Inequality Beyond the United States

The sign of the debt channel is consistent across France and the United Kingdom—negative during deleveraging, positive during debt expansion—though which shock dominates in magnitude differs by country and subperiod. Table 6 replicates the historical decomposition exercise for both countries, with subperiod cutoffs chosen at the visible inflection points in each country's debt and wealth share series (1984 for France and 1991 for the United Kingdom)[43].

In France, permanent debt shocks account for 34 percent of the 15.9 percentage-point decline in the top 10 percent wealth share during the deleveraging phase, with private investment shocks contributing a comparable 27 percent. Over the subsequent expansion, the debt contribution of 6.21 percentage points slightly exceeds the total change of 6.15 percentage points, as the combined contribution of all other shocks and the deterministic component nets to a negligible -0.07 percentage points. In the United Kingdom, wealth-specific shocks dominate both subperiods of the historical decomposition, accounting for 40 percent of the 22.4 percentage-point decline before 1991 and 68 percent of the subsequent 11.3 percentage-point increase, compared with 26 percent and 51 percent, respectively, for debt shocks. The contribution of debt shocks nonetheless doubles between subperiods, mirroring the results for France, where debt shocks dominate throughout and increase further in magnitude during the phase of public debt expansion.

Table 6: Shock Contributions to Top 10% Wealth Share – France and United Kingdom

	France				**United Kingdom**			
	1963–1984		1984–2019		1963–1991		1991–2019	
	pp	Share (%)	pp	Share (%)	pp	Share (%)	pp	Share (%)
Debt/GDP	-5.41	+34.0	+6.21	+101.1	-5.70	+25.5	+5.75	+50.7
Priv. Inv./GDP	-4.32	+27.2	+3.50	+56.9	+0.51	-2.3	-0.31	-2.7
Real Interest Rate	-0.02	+0.1	+0.16	+2.7	-2.83	+12.7	+3.07	+27.1
Real Wages	-0.05	+0.3	+0.76	+12.4	-0.01	+0.0	-0.10	-0.9
Top 10%	-3.04	+19.1	+1.97	+32.1	-9.04	+40.4	+7.67	+67.7
Deterministic	-3.07	+19.3	-6.46	-105.1	-5.28	+23.6	-4.76	-42.0
Total Δ (pp)	-15.90		+6.15		-22.36		+11.33	

Note: Cumulative shock contributions from the historical decomposition of the 5-variable BQ-SVAR for France and the United Kingdom. Subperiod cutoffs (1984 for France, 1991 for the United Kingdom) are the inflection points in each country's debt-to-GDP and Top 10% wealth share time series. Shares indicate each shock's proportion of the total level change.

Taking stock of the evidence across all three countries, permanent debt shocks contribute negatively during deleveraging periods and positively during episodes of debt expansion. In France, the United Kingdom, and the United States alike, debt shocks account for a larger share of the movements in the top 10 percent wealth share than either real interest rate or real wage shocks in every subperiod examined. This dominance holds even in the United Kingdom, where the real interest rate channel is comparatively stronger. Consequently, debt shocks are not merely a central driver of wealth inequality; they dominate the traditional factor-price channels, particularly capital returns, which the literature frequently emphasizes as the primary engine of wealth concentration. Notably, this pattern persists across three institutionally and structurally distinct economies rather than being confined to the U.S. data alone.

This cross-country consistency demonstrates the broad importance of debt shocks, which emerge as the single most important driver in two of the three case studies. The same evidence establishes the relevance of the tax burden and supports the interpretation of permanent debt shocks as tax burden shocks, an interpretation that lets the analysis that follows proceed more parsimoniously. In turn, this points to the relevance of the indirect redistribution channel and endogenous shifts in tax progressivity, highlighting their precedence over pure macro factor channels. The next two subsections test this mechanism directly. I first show that public debt shocks explain wealth inequality shifts better than exogenous progressivity shocks, and then test for nonlinearities that evidence the indirect redistribution channel.

[43] the corresponding France and United Kingdom series, from which these cutoffs are read, are in the Online Appendix's.

5.6 Revisiting the Decline in Tax Progressivity

In the preceding two subsections, I provided empirical evidence that public debt serves as the dominant structural driver of long-run movements in wealth inequality in most cases, explaining much of the pre-1980 decline and post-1980 rise in concentration across the country case studies, while playing a central role in shaping wealth dynamics more broadly. Hubmer et al. (2021) treat the growth in wealth inequality after WWII, and especially after the 1980s, as the outcome of an exogenous shock to tax progressivity. By contrast, the model and the evidence suggest that the post-1980 co-movement of lower marginal tax rates, weaker redistribution, and higher wealth concentration reflects the joint outcome of a single fiscal shock—a persistent decline in the tax burden of public debt—which gave governments the ability to permanently reduce the top marginal tax rate and, through a looser intertemporal budget constraint, lower the effective degree of tax progressivity. Exogenous progressivity shifts are thus an outcome rather than a cause.

Across countries, if declining progressivity were the true primitive, it would have to originate in a shift in political preferences or in the rise of particular ideologies, such as Reaganism and Thatcherism. Countries that adopted market-oriented reforms, such as the United States and the United Kingdom, would be expected to diverge significantly from economies with strong social-democratic traditions and a continued focus on redistribution, such as France and much of continental Europe. Yet the data show otherwise. Although the levels of inequality and debt differ across countries, reflecting distinct institutional features, the direction of the post-1980 trends is common, with nearly all advanced economies experiencing a secular decline in real interest rates, a rising public debt-to-GDP ratio, and a reduction in top marginal tax rates. This was evident in the stylized facts presented in Section 2. The mechanism I develop traces this common movement to the global fall in r, which made debt more affordable and lowered the tax burden across advanced economies.

Within a single country, the exogenous view fares no better, since it cannot explain why lower taxes could be sustained for so long given the substantial expansion of public debt. Under this view, a political shock cuts top tax rates, eroding revenue and driving up deficits and debt. Lower taxes are thus the causal factor behind rising deficits—an issue long examined in the fiscal policy literature (Poterba et al., 1994; Auerbach, 1994). But this sequence cannot easily persist. A government structurally constrained by higher debt and lower revenue should eventually confront market discipline or be forced to raise taxes to preserve solvency, and the view cannot explain how so many countries sustained permanently higher debt-to-GDP ratios while maintaining permanently lower tax rates. In contrast, the mechanism I propose reverses this causal ordering, treating the permanent shift toward both higher public debt and lower taxes as a feature of a new macroeconomic environment. A decline in r lowers the cost of servicing any given debt, so the government can sustain the same—or even a larger—debt stock while raising less structural revenue. The resulting co-movement of higher debt and lower tax rates, which tracks the fall in r from the 1980s onward rather than arriving as an independent political event, reflects not a change in political preferences but an equilibrium response to a relaxed government budget constraint.

The exogenous progressivity view is more difficult to reconcile with the longer historical record, over which the macroeconomic regime itself varies. As shown earlier, the shift in the marginal tax schedule is not stable across regimes but changes sign with $r - g$. Under $r > g$, higher debt raises the required tax burden and shifts the marginal schedule upward, whereas under $r < g$ the same increase in debt lowers the burden and shifts the schedule down. Preferences for redistribution do not reverse when the interest rate regime turns, but the fiscal arithmetic does, and the exogenous view offers no account of why a given electorate would seek more redistribution through debt in one era and less in another. Under the mechanism developed here, the reversal is mechanical, and it is what the regime-dependence of the indirect redistribution channel predicts. None of this denies a role for political economy. The narrower claim is that much of the post-1980 decline in tax progressivity is an equilibrium response to a more affordable debt. Separating the two readings directly is difficult, since both imply the same post-1980 co-movement of debt, progressivity, and inequality.

To provide some evidence, I again use the BQ approach to assess whether the post-1980 rise in U.S. top wealth concentration is driven by the secular decline in tax progressivity or by the secular increase in public debt. I estimate a parsimonious three-variable SVAR on annual data for 1946–2012, the span over which the Mertens and Montiel Olea (2018) marginal rate series is available for the United States. The system comprises tax progressivity (P), the public debt-to-GDP ratio (b), and the top-10 percent wealth share (W). Progressivity is measured as the gap between the average marginal tax rate on the top 1 percent and that on the bottom 99 percent of the income distribution, constructed from the narrative-identified average marginal tax rate series of Mertens and Montiel Olea (2018). A narrowing of this gap represents a fall in the progressivity of the marginal tax rate schedule. Because the two leading hypotheses—progressivity as an exogenous primitive versus progressivity as an endogenous response to the tax burden of debt—imply the same post-1980 co-movement, I distinguish between them with two models where I reverse the order of public debt and progressivity. Model A orders progressivity first ($P \to b \to W$), restricting the debt shock to have no permanent effect on progressivity and thereby granting the progressivity shock first claim on any common variation. It is thus conservative for the debt channel. Model B reverses the ordering ($b \to P \to W$) and is correspondingly conservative for progressivity. For each, I report the historical decomposition of the post-1980 change in the wealth share (Table 7).

Table 7: U.S. Top-10% Wealth Share 1980–2012: Debt vs Progressivity

	Model A $P \to b \to W$		Model B $b \to P \to W$	
Structural shock	pp	% of rise	pp	% of rise
Debt shock	$+3.66$	$+48.3$	$+3.63$	$+47.9$
Progressivity shock	-0.02	-0.2	$+0.01$	$+0.2$
Inequality shock	$+2.17$	$+28.6$	$+2.17$	$+28.6$
Deterministic	$+1.76$	$+23.3$	$+1.76$	$+23.3$
Total (actual rise)	$+7.57$	100.0	$+7.57$	100.0

Notes: Shares of the realized change in the top-10% wealth share over 1980–2012 (actual $+7.57$ pp) attributable to each structural shock. Sample 1946–2012, the span over which the Mertens and Montiel Olea (2018) narrative-identified average marginal tax rate series — used to construct the progressivity gap P — is available for the United States, using a reduced-form VAR in first differences with the world current-account factor as an exogenous variable and one lag (based on BIC). Models differ in the causal ordering of progressivity (P) and public debt (b), with the top-10% wealth share (W) ordered last in both.

The two identifications deliver the same verdict, and the data do not support the view that an exogenous fall in progressivity raised wealth inequality. The co-movement is carried by the debt channel. Under Model A, where progressivity is ordered first, the debt shock accounts for 3.66 of the 7.57 percentage-point rise in the top-10 percent wealth share between 1980 and 2012, which is close to half, while the progressivity shock accounts for a negligible -0.2 percent. Reversing the ordering so that debt is ordered first (Model B) leaves the public debt shock again near 48 percent and the progressivity shock near 0.2 percent. The size of the debt share here is close both to what the historical decomposition attributes to the debt shock over 1980–2019 and to the earlier evidence, so a substantially different specification reaches the same conclusion. I read the evidence as indicative rather than decisive, given the limits of a recursive long-run scheme, but the evidence here hardly squares with the view that the post-1980 rise in wealth concentration was driven by an autonomous decline in tax progressivity. Next, therefore, I move on to empirically assessing the other hypothesis that stems from the model, that of the endogenous response of tax progressivity to the debt level and, by extension, the nonlinear relationship between public debt and wealth inequality.

5.7 Public Debt, Redistribution, and Wealth Inequality

This section evaluates the nonlinear relationship between public debt and wealth inequality that operates via the change in tax progressivity, equivalently, the degree of redistribution. Guided by the discussion in Section 4.4, I proxy tax progressivity with the intensity of redistribution, which I measure using the relative redistribution series from the SWIID database (Solt, 2020) for a panel of countries. This series is defined as the percentage reduction in market-income inequality, and hence is identical to the intensity of redistribution discussed in that section. This measure captures the realized outcome of the tax and transfer system, not an assumed configuration of policy instruments, and therefore proxies tax progressivity without relying on the specific composition of a tax policy.

To do so, I estimate a parsimonious four-variable panel SVAR, ordered as the public debt-to-GDP ratio, tax revenues as a share of GDP, redistribution, and the top 10 percent wealth share, following the model's mechanism. Because the redistribution series is available only from 1975 to 2018, providing at most 44 annual observations per country, and fewer for countries with shorter coverage and after first-differencing, I adopt Pedroni's approach, which, as discussed above, delivers credible inference with as few as $T = 20$ observations under BQ identification. The estimation uses the same data construction and country sample as in Section 5.1, and is described in detail in the Online Appendix.

To identify regimes, I split the sample according to each country's position in the cross-country distribution of $r - g$, the difference between the real effective interest rate on public debt and real GDP growth. I employ three grouping strategies to assess robustness. The first divides countries into quartiles of the $r - g$ distribution, yielding a low $r - g$ group (the bottom quartile), a middle group (the second and third quartiles), and a high $r - g$ group (the top quartile). The second compares the top quartile against the rest of the sample. The third splits countries at the cross-country median of $r - g$. For each grouping, I report composite impulse responses to a permanent public debt shock of 74 percentage points. Table 8 summarizes the results.

Table 8: Public Debt and Redistribution Across Macroeconomic Regimes

Splitting Strategy	**Group**	**Tax/GDP**	**Redistribution**	**Top 10%**	*N.C*	*Obs.*
Full Sample	All Countries	+2.142*	+1.941*	+0.826	16	704
Quartiles	Low $r-g$	-2.156	+0.443	+1.091*	4	140
	Middle $r-g$	+4.451*	+2.381	+3.279*	7	308
	High $r-g$	+3.826*	+3.952**	-2.600*	5	220
75/25 Split	Rest (Bottom 75%)	+1.358	+1.444	+1.864*	11	484
	High $r-g$ (Top 25%)	+3.826*	+3.952**	-2.600*	5	220
Median Split	Below Median	-0.123	+1.708*	+3.787***	8	352
	Above Median	+5.042**	+2.567*	-2.087*	8	352

Note: N.C = number of countries. *** 95% CI, ** 90% CI, * 68% CI excludes zero.
The Low $r-g$ group's estimation sample begins in 1985 rather than 1976 (as for the other groups), because World Inequality Database coverage of the top 10% wealth share begins later for Australia, Japan, and Portugal (and, to a lesser extent, Spain), the four countries in this quartile; this shorter window accounts for its lower observation count.

The results closely align with the model's predictions. A permanent increase in public debt generates a near-monotonic rise in tax revenues in most specifications, with the low interest-rate groups as the exception. Higher tax burdens, in turn, affect the magnitude of redistribution in a way that broadly tracks the revenue response. That taxes may respond differently to debt shocks is fully consistent with the theoretical prediction of the model and the government's intertemporal budget constraint. Specifically, tax revenues may increase or decrease following a debt shock depending on the macroeconomic regime and the level of public debt. This result follows directly from the government's intertemporal budget constraint, $\tau = (r - g)b$. Taking differentials yields

$$d\tau = b\, d(r - g) + (r - g)\, db,$$

implying that the overall tax response to a debt shock is inherently ambiguous and depends on the prevailing macroeconomic regime. Table 8 shows this clearly. Consistent with this mechanism, the effect of public debt on wealth inequality rises almost monotonically with the tax burden, with the sign reversing only once the tax burden becomes sufficiently high. This pattern is robust across alternative grouping strategies, indicating genuine regime dependence and reinforcing the paper's central argument.

In the full sample, a permanent increase in public debt raises the tax-to-GDP ratio by roughly 2 percentage points and, in turn, increases redistribution by approximately the same amount, causing wealth inequality to rise by about 1 percentage point. The weakness of redistribution, and its dependence on the macroeconomic regime, becomes clearer in the low interest rate regime. When the sample is split by tax burden into low, medium, and high groups, the low interest-rate case shows the tax-to-GDP ratio declining following a debt shock, though the estimate is statistically insignificant. This is consistent with limited fiscal pressure, so redistribution responds only weakly—roughly 1.5 percentage points below the full-sample estimate, though it remains positive. The estimated effect on wealth inequality is in fact larger than in the full sample and remains statistically significant. These findings also suggest that even when deficits are self-financed (Angeletos et al., 2024), they may carry non-negligible distributional consequences over the long run.

6 Further Discussion

6.1 Synthesis: Public Debt as a Mediating Channel

The overall message of the previous analysis is more general than it may initially appear and rests on the interpretation of the identified debt shocks as composite shocks. These shocks have a clear parallel to the dynamic efficiency condition, which serves as a summary statistic determining not only the efficiency of secular trends but also the level of borrowing costs. Even when average borrowing costs remain below the economy's growth rate, the magnitude of this gap still reflects the underlying dynamic efficiency condition. As such, the same structural forces that govern the secular macroeconomic equilibrium, and specifically the dynamic efficiency condition that sets the level and sign of the $r-g$ gap and hence the interest rate regime, simultaneously determine debt sustainability and, through it, the tax burden on households.

When such a shock, be it a productivity slowdown, population aging, a global shift in safe asset demand, or a combination of these factors, permanently alters the interest rate regime, it concurrently loosens or tightens the government's intertemporal budget constraint, generating an endogenous incentive for permanent tax reforms. The degree of redistribution is therefore not determined solely by political ideology or institutional features, as the cross-country evidence reveals, but also by the government's intertemporal budget constraint, expanding when fiscal space relaxes and contracting when it tightens. This interpretation provides a clear conceptual justification for the composite shocks identified in the empirical strategy, as they directly capture the net effect on the government's intertemporal budget constraint. It also explains why public debt emerges as the dominant force driving wealth inequality in the historical decompositions. Ultimately, these results demonstrate that public debt operates as a critical mediating channel in the macroeconomy, converting a broad range of structural shocks into permanent, post-tax shifts in the wealth distribution.

Building on this mechanism, the empirical evidence identifies the distribution of the tax burden as the primary determinant of long-term wealth inequality, generally outweighing traditional forces such as capital returns and latent factors like tax avoidance. This finding shifts the analytical focus toward the intercept component of the individual wealth accumulation process, rather than its slope, as the central driver of variations in wealth concentration both over time and across countries.

6.2 Reinterpreting Piketty's Law of Capitalism: From $r > g$ to $r - g$

The preceding analysis recasts Piketty's $r > g$ framework, the fundamental law of capitalism and the macroeconomic equivalent of the dynamic efficiency condition, from an autonomous driver of long-run inequality into a force whose direction and strength depend on the tax system, where both the sign and the level of the $r-g$ gap are critical. This nonlinearity implies that the interest payments on public debt can dominate the direct effect of $r > g$ on market prices, thereby dictating the evolution of wealth inequality. At a high tax burden, public debt reinforces the $r > g$ mechanism, amplifying wealth inequality through general equilibrium effects, particularly via capital returns. However, once the demand for tax revenue becomes sufficiently large, the resulting tax burden on top earners dominates. At this threshold, the $r > g$ mechanism is no longer sufficient to offset the equalizing effects of high marginal tax rates, and the dynamics of interest payments become the primary determinant of wealth inequality.

This suggests that wealth inequality may rise not primarily because higher interest rates increase returns at the top, as argued by Piketty (2014), but because they redistribute the tax burden unevenly. The apparent importance of $r > g$ as a driver of wealth inequality may therefore reflect the historically regressive structure of tax systems, under which an offsetting force—indirect redistribution—was largely absent, rather than the Ricardian equivalence mechanism invoked by Piketty. With indirect redistribution absent, no nonlinearity could arise in the relationship between public debt and wealth inequality and, by extension, in that between $r > g$ and wealth inequality. Consequently, $r > g$ appeared to be a powerful force behind rising wealth inequality because it was mostly reinforced by public debt, a positive co-movement that Piketty himself documented.

Nevertheless, unlike studies that argue $r > g$ is not a central force behind inequality[44], I argue that the mechanism can indeed be crucial, but only when mediated by public debt and when the tax system is insufficiently progressive. If the $r > g$ condition matters for inequality,

[44] See Acemoglu and Robinson (2015); Jones (2015); Krusell and Smith (2015); Mankiw (2015).

its disequalizing effects arise through this interaction with public debt, since the mechanism influences not only how much the rich earn but also how much can be taxed. The $r - g$ gap is therefore consistent with either rising or falling wealth inequality, depending on the evolution of public debt and the degree of tax progressivity, and such a mechanism can account for the post-1980 rise under the savings glut ($r < g$), which Piketty's $r > g$ cannot.

6.3 Broad Policy Implications and Directions for Future Research

The analysis in the main paper also carries several broad implications for the equity–efficiency trade-off, for fiscal sustainability given the fiscal pressures that structural shocks—such as the transition to an AI economy and population aging—place on public debt, and for the interaction between fiscal and monetary policy, each of which warrants further research. Below, I discuss the most immediate corollaries.

The Equity–Efficiency Trade-Off. In the Online Appendix, I show how this framework replicates the classic result of Diamond (1965), according to which public debt increases welfare when the economy is dynamically inefficient and thus suffers from excess savings. Combined with the findings of this paper, this result reveals an intergenerational–intragenerational trade-off—public debt improves intergenerational equity but may come at a greater cost in terms of intragenerational inequality, specifically wealth inequality. This result carries direct implications for the literature on the failure of competitive equilibria in market economies, which is typically concerned with allocating capital more efficiently over time. In that literature, public debt—through its ability to affect equilibrium allocations over time—is viewed as a key instrument for restoring efficiency and overcoming the inherent inability of competitive markets to deliver Pareto-optimal outcomes. Dynamic inefficiency, excess savings, and secular stagnation are all instances in which such interventions have been proposed.

This trade-off is acute in the current environment (IMF, 2026; Dabla-Norris and Valdés, 2026). The rise in public indebtedness is nevertheless an efficient response that has helped push interest rates up against the ultra-low interest rate regime and excess savings, and constitutes an essential countervailing force to the required increase in the natural rate of interest (IMF, 2023). Yet the optimal level of debt depends not only on the need to address the imbalance between the demand for and supply of liquidity in the global financial system, but also on the social cost that stabilizing public debt at such a level entails (IMF, 2017, 2024). The results of this paper suggest that Pareto-improving debt policies may be constrained in practice by their distributional consequences. Nonetheless, the paper also demonstrates that the relationship between public debt and wealth inequality is nonlinear and depends on the distribution of the tax burden; that is, this trade-off ceases to exist if the tax system is sufficiently progressive.

Fiscal Sustainability and Inequality. The postwar precedent of declining public debt and wealth inequality rested on a macroeconomic configuration that no longer applies. In the decades following World War II, economies were likely dynamically efficient (Abel et al., 1989), and as this paper suggests, the high marginal tax rates of that era were a natural byproduct of that environment. In a low-interest-rate environment, however, the combination of a lower tax burden and reduced tax progressivity implies that even prolonged debt adjustments need not replicate the equalizing effects observed postwar, potentially leaving the economy in its initial low-tax-burden regime. At a time of rising fiscal prudence (Cao et al., 2024; IMF, 2026), maintaining a given degree of redistribution would therefore require higher tax progressivity or increased transfers, even when borrowing costs remain persistently low relative to historical norms. Whereas postwar tax progressivity and redistribution were largely a byproduct of high debt service costs, they now depend more on explicit policy choices (IMF, 2017, 2024). The findings presented here suggest, however, that the incentive to raise top marginal rates would increase should borrowing costs permanently rise.

This, however, also bears on fiscal frameworks, whose purpose is to maintain fiscal sustainability. They typically target headline deficit and debt trajectories while remaining agnostic about the underlying mechanisms of adjustment with debt management is treated as distinct from redistribution policy (Eyraud et al., 2018). The analysis presented here indicates that the specific instruments employed to ensure fiscal sustainability are inherently distributionally non-neutral, and that the composition of fiscal consolidation—rather than merely its magnitude—shapes inequality outcomes (IMF, 2017, 2024, 2025a). This finding is consistent with Auerbach (2025) as well as empirical evidence on the distributional consequences of fiscal consolidation (Bastagli et al., 2012; Ball et al., 2013). How distributional objectives can be explicitly integrated into the architecture of fiscal frameworks remains a critical question that warrants further research.

AI, Automation, and the Fiscal Pressure Channel. As discussed before, the structural shocks shaping the economy are the same shocks that move the government's intertemporal budget constraint, altering the incentives for permanent tax reform and thereby establishing public debt as a key channel mediating post-tax wealth inequality. AI is one such structural change currently underway, and the sensitivity analysis in Section 4.5 reveals a few implications that merit emphasis. AI-driven automation, by raising the capital share, may interact with the indirect redistribution channel—mainly because a higher capital share in the steady state, combined with population aging and factor complementarity ($\sigma < 1$), can shift the secular equilibrium toward a high interest rate regime ($r > g$), affecting debt sustainability and the associated tax burden.

The analysis suggests that the distributional consequences of AI would be largely mediated by the fiscal channel identified here. Even if automation raises pre-tax wealth inequality, that trend may not persist on an after-tax basis once the structural tax burden adapts endogenously to both the level of public debt and the new interest rate regime driven by the AI economy. The long-run outlook for wealth concentration therefore depends on the evolution of public debt—a channel that the literature on AI and inequality has largely overlooked, and one whose importance may grow if the growth effects of AI prove different from current expectations (Cazzaniga et al., 2024; Acemoglu, 2025).

Fiscal and Monetary Policy Interaction. The analysis also carries implications for understanding the interaction between fiscal and monetary policy. By reducing the tax burden, unconventional monetary policies such as quantitative easing may weaken indirect redistribution through the progressive tax system, while quantitative tightening operates in reverse, raising the effective cost of public debt and increasing the associated tax burden. This observation suggests that the distributional effects of monetary policy may be more nuanced than typically assumed, once its interaction with fiscal policy is taken into account. Because unconventional monetary policy tools alter the effective progressivity of the tax system through this channel, the findings suggest that fiscal and monetary policies may warrant closer coordination than is typically assumed—consistent with evidence that closer interaction can improve macroeconomic outcomes while requiring safeguards for central bank credibility (Adrian et al., 2025; Corsetti and Melosi, 2026). Otherwise, imperfect coordination could unnecessarily increase the degree of redistribution or hinder the distributional objectives of fiscal policy.

7 Concluding Remarks

This paper argued that public debt, through the distribution of its tax burden, was a central driver of the long-run evolution of wealth inequality and explained changes in tax progressivity. The empirical evidence from the country case studies and the panel of advanced economies indicated that public debt typically increased wealth inequality, with effects that were often large and, in some cases, the most important source of variation driving wealth concentration after WWII. As the paper argued, this large variation could be explained by the fact that public debt acts as a mediating channel through which structural forces affected not only secular equilibrium and pre-tax inequality, but also debt sustainability, which in turn determines the scope for permanent tax changes and the distribution of the tax burden that governs the post-tax level of wealth inequality. The long-run evolution of wealth inequality therefore could not be understood independently of the fiscal conditions under which public debt is sustained or of the macroeconomic regime in which fiscal policy operates.

The analysis also implies that the distributional consequences of structural shocks, whether stemming from population aging, climate change, or artificial intelligence, depend critically on the macroeconomic regime and the resulting distribution of the tax burden. Looking ahead, if the tax burden of public debt remains low by historical standards, it will likely sustain or amplify wealth concentration. Conversely, a permanent shift in the interest rate regime would necessitate higher revenues to maintain debt sustainability. In such a scenario, the incentive for permanent tax increases would grow, elevating the distribution of the tax burden to a first-order policy concern. Because the design of these debt adjustments is not distributionally neutral, the mechanisms highlighted in Section 6.3 suggest several promising avenues for future research.

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