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CREDIT EXPANSION AND INEQUALITY: WHEN DOES IT HELP AND WHEN DOES IT HURT?

Kredi Genişlemesi ve Eşitsizlik: Ne Zaman Fayda Sağlar, Ne Zaman Zarar Verir?

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Abstract

This paper investigates the heterogeneous effects of credit expansion on income inequality by focusing on the efficiency of financial intermediation, captured by a productivity parameter in the theoretical model and proxied by overhead cost in the empirical analysis. Building on a general equilibrium model with an explicit banking sector, the study proposes that the inequality-reducing effects of credit expansion depend critically on how efficiently banks transform deposits into loans. Using a panel dataset covering 139 countries (75 high- and upper-middle-income and 64 low- and lower-middle-income) between 2000 and 2019, the empirical strategy explores whether the impact of financial development, measured as the ratio of bank credit to deposits, varies by banking system effectiveness, proxied by low overhead cost. Fixed-effects and two-stage least squares estimates for high- and upper-middle-income countries reveal that credit expansion reduces inequality only when overhead costs are low. The results for the full sample and low- and lower-middle-income countries are statistically insignificant, with the latter group showing a reversed and imprecise relationship. The findings support the hypothesis that financial development alone cannot improve distributional outcomes. Instead, it must be supported by efficient intermediation to ensure broader access to credit and reduce inequality.

Keywords:
Financial Development, Income Inequality, Banking Efficiency, Credit-to-Deposit Ratio, Overhead Costs, General Equilibrium Models.

JEL Codes:
O16, D31, G21, D58, C33.

Öz

Bu çalışma, kredi genişlemesinin gelir eşitsizliği üzerindeki heterojen etkilerini, finansal aracılığın etkinliğine odaklanarak incelemektedir. Teorik modelde üretkenlik parametresiyle temsil edilen ve ampirik analizde işlem maliyetleri ile ölçülen finansal aracı etkinliği, bankaların mevduatları krediye dönüştürme verimliliğini yansıtmaktadır. Bu çalışma, bankacılık faaliyetlerini ekonomik üretimin bir parçası olarak ele alan bir genel denge modeline dayanmakta ve kredi genişlemesinin eşitsizliği azaltıcı etkilerinin, bankaların mevduatları ne kadar verimli şekilde krediye dönüştürdüğüne bağlı olduğunu öne sürmektedir. Çalışmada, 2000–2019 dönemine ait ve 75'i yüksek ve üst-orta gelirli, 64'ü ise düşük ve alt-orta gelirli olmak üzere toplam 139 ülkeyi kapsayan panel veri seti kullanılmaktadır. Analizde, banka kredilerinin mevduata oranı ile ölçülen finansal gelişmenin etkisinin, düşük işlem maliyetiyle temsil edilen bankacılık sisteminin etkinliğine bağlı olup olmadığı test edilmektedir. Sabit etkiler ve iki aşamalı en küçük kareler tahminleri, yüksek ve üst-orta gelirli ülkelerde kredi genişlemesinin yalnızca işlem maliyetleri düşük olduğunda eşitsizliği azalttığını ortaya koymaktadır. Tüm örneklem ile düşük ve alt-orta gelirli ülkeler için elde edilen sonuçlar istatistiksel olarak anlamlı değildir. Ayrıca, düşük gelirli ülkelerde ilişkinin yönü tersine dönmekte, ancak bu sonuçlar istatistiksel olarak belirsizliğini korumaktadır. Bulgular, finansal gelişmenin tek başına dağılım sonuçlarını iyileştiremeyeceğini, bunun için etkin bir aracılık süreciyle desteklenmesi gerektiğini göstermektedir.

Anahtar Kelimeler:
Finansal Gelişme, Gelir Eşitsizliği, Bankacılık Etkinliği, Kredi/Mevduat Oranı, İşlem Maliyetleri, Genel Denge Modelleri.

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1. Introduction

The challenge of reducing economic inequality has long occupied economists and policymakers, yet the effectiveness of direct redistributive tools remains contested. Atkinson (2015) offers a striking example to illustrate this point. Even in a simplified world with proportional taxes and uniform transfers, a significant reduction in inequality would require an unrealistically large increase in the tax rate. Specifically, to reduce the Gini coefficient by one point, the tax rate must rise by 1.6 percentage points, raising doubts about the practical reach of daily, direct instruments in combating inequality (Atkinson, 2015: 5-6). This insight invites a broader question: if taxation and transfers are often blunt tools, can deeper structural features of the economy play a greater role?

One such structural domain is the financial system, which governs the allocation of resources across individuals. Whether through savings, credit, or inherited wealth, households inevitably interact with finance as depositors, borrowers, or asset holders. Galor and Zeira (1993) emphasize that access to capital is decisive in shaping long-run income and wealth dynamics, especially when conditioned by initial endowments. In their model, imperfections in capital markets create self-reinforcing inequality: those with early access to finance invest, accumulate, and transmit wealth, while the excluded fall further behind. This formulation highlights a critical duality: finance can serve as a mechanism of opportunity or exclusion, depending on how access to it is structured. Within this dual potential, financial intermediation emerges not merely as a technical process but as a channel through which inequality is reproduced or mitigated over time.

This dual potential of finance has long occupied scholars. Greenwood and Jovanovic (1990), building on Goldsmith (1969), propose the Financial Kuznets Curve hypothesis: in the early stages of development, only the wealthy can access financial services, reaping the returns of credit and investment. Over time, as access broadens, these benefits eventually diffuse, producing a trickle-down effect that reduces inequality. Central to this view is the notion that funds naturally flow to the "best users," who initially have capital, education, and connections. But this raises a critical question: must the best users always be the already-privileged? Or can financial systems be structured to allow talent and opportunity, regardless of initial wealth, to drive allocation? In this broader view, financial inclusiveness implies that the best user may emerge from any layer of society, provided that the system is efficient and accessible (Rajan and Zingales, 2003).

The contribution of the paper lies not in inclusion per se but in intermediation efficiency. Consistent with our theoretical framework adapted from Gillman (2011), it focuses on the cost structure of intermediation as the mechanism through which financial development in the form of credit expansion can affect inequality. In the model, the intermediation cost is endogenized by a sectoral productivity parameter that governs how efficiently deposits are transformed into credit. As productivity rises, interest rate spreads narrow, improving the allocation efficiency of credit. This mechanism is analytically distinct from long-run diffusion or "trickle-down" narratives: it operates through productivity-driven intermediation efficiency. Our empirical work is designed to capture this efficiency–inequality channel, without making claims about direct inclusion. Instead of placing inclusion at the center, we treat it as a downstream outcome of intermediation efficiency.

A large and diverse body of research has investigated the relationship between financial development and income inequality. While findings differ, many studies highlight the potential of finance to promote inclusion and upward mobility by expanding access to credit and investment opportunities (Banerjee and Newman, 1993; Beck et al., 2007; Demirguc-Kunt and Levine, 2009). While emphasizing these positive channels, Clarke et al. (2006) caution that financial systems often remain skewed toward the already wealthy, thereby limiting their equalizing potential. This concern directly echoes the theoretical tension in the best-user allocation debate, namely, that if financial systems disproportionately serve those with existing wealth, education, or networks, the presumed efficiency may mask structural exclusion.

Other research explicitly links financial development to rising inequality. Jauch and Watzka (2016), using data from 138 countries over 1960–2008, find that financial development tends to exacerbate income disparities, particularly when access is uneven. Some scholars go further, arguing that financial expansion may itself emerge as a response to growing inequality, allowing lower-income households to sustain consumption through debt, thereby concealing structural imbalances, until crisis ensues (Rajan, 2010; Kumhof and Rancière, 2010). These insights reinforce the risks of a system that allocates credit based not on productive potential, but on inherited advantage — a key critique of unqualified trickle-down narratives.

More recent contributions adopt a conditional perspective, suggesting that the distributive consequences of finance depend heavily on institutional quality and financial system design. For instance, de Haan and Sturm (2017), using a broad sample of 121 countries, find a robust positive association between finance and inequality. Denk and Cournède (2015) report similar findings for OECD countries. By contrast, Baiardi and Morana (2016), focusing on the euro area, do not reject the Financial Kuznets Curve hypothesis, implying that finance may reduce inequality in contexts with more developed institutions. Using instrumental variable dynamic panel models for 48 middle- and high-income countries over 1996–2014, Perugini and Tekin (2022) find that financial development is, on average, associated with higher inequality. The effect weakens where governance is stronger, namely, tighter control of corruption, better regulatory quality, greater political stability, and stronger rule of law. In contrast, political voice/accountability and government effectiveness show no mediating role. To emphasize the institutional foundations of financial development, Chisadza and Biyase (2023) use the IMF's broad Financial Development Index. The index aggregates depth, access, and efficiency across financial institutions and markets. They document heterogeneity in the finance–inequality nexus across development groups (advanced, emerging, and least developed) from 1980 to 2009. Related to our conditional approach, Lee et al. (2020) condition the impact of finance on inequality. Using a panel smooth transition regression for 37 countries (2001–2015), Lee et al. (2020) find that financial development itself is inequality-increasing at low levels, with the adverse effect diminishing as the system becomes more developed.

Collectively, these studies demonstrate that the finance–inequality nexus cannot be fully understood without attending to underlying structural mechanisms. In this respect, the existing literature aligns with the broader perspective adopted in this paper. Each contribution offers a distinct lens, whether emphasizing access, institutions, or systemic risk. What sets this study apart is its effort to operationalize a specific structural channel through which finance may influence inequality: the internal productivity of the banking sector. By focusing on intermediation costs as a measurable proxy for sectoral efficiency, the analysis highlights how the economic burden of transforming deposits into credit can shape the inclusiveness of

financial development, enabling broader access to credit and fostering more equitable outcomes. To investigate this channel empirically, the paper employs a panel regression framework covering 139 countries from 2000 to 2019.

The empirical strategy mirrors the theoretical framework by testing whether the distributional impact of financial development depends on the productivity of the banking sector. While the theoretical model introduces a sectoral productivity parameter A_F, which determines the cost of transforming deposits into credit, this variable is not directly observable in empirical data. To address this, the analysis employs an interaction model in which the effect of the credit-to-deposit ratio (used as a proxy for the intensity of financial development) is conditioned on bank overhead costs (used as a proxy for intermediation inefficiency). This specification allows for testing whether the equity effects of financial development vary systematically with the structural quality of the banking system. The fixed effects results support the theoretical prediction that the equity effect of financial development depends on banking sector efficiency. In high- and upper-middle-income countries, a higher credit-to-deposit ratio is associated with a statistically significant reduction in income inequality, but only when bank overhead costs are low. This relationship is captured through an interaction term between the credit-to-deposit ratio and overhead cost, which serves as a proxy for intermediation inefficiency. No meaningful effects are found for the full sample or low- and lower-middle-income countries. These findings suggest that financial deepening alone may fail to yield progressive distributional outcomes without a structurally sound banking system. While instrumental variable estimates offer directional consistency, their statistical weakness warrants cautious interpretation.

The remainder of the paper is structured as follows. Section 2 outlines the theoretical model, highlighting the role of banking sector productivity in shaping distributional outcomes. Section 3 covers the empirical design, including data, variables, estimation strategy, and key findings. Section 4 concludes with a discussion of policy implications.

2. The Theoretical Model

The model structure builds on the general equilibrium framework developed by Gillman and his co-authors (Gillman and Nakov, 2004; Benk et al., 2005; Gillman and Kejak, 2005, 2011; Gillman, 2021), and presented in textbook form in Gillman (2011). For consistency and clarity, the notation and setup presented here follow his textbook exposition (Gillman, 2011). This model introduces a banking sector as a third productive entity alongside households and firms. By integrating financial intermediation into the model, it becomes possible to analyze how the productivity of the banking sector, represented by a technological efficiency parameter A_F affects macroeconomic allocations and, critically, income inequality.

Unlike traditional Ramsey–Cass–Koopmans models, where households implicitly invest their savings directly into capital accumulation without the mediation of financial institutions (Ramsey, 1928; Koopmans, 1963; Cass, 1965), this model assumes that all savings must flow through the banking system. The banking sector uses labor and deposits to produce loans. This transformation mechanism introduces a wedge between deposit and loan rates, the size of which depends on the efficiency of intermediation. Through this mechanism, changes in “A_F”

influence the distribution of income via their impact on wages, capital allocation, and labor segmentation between banking and goods production.

2.1. Consumer Problem

The model adopts a representative agent framework in which the household derives utility from both consumption and leisure, while making intertemporal decisions regarding savings and labor supply. As noted earlier, the key departure from traditional models lies in the presence of a financial intermediary: households cannot directly invest in capital. Still, they must instead deposit their savings into the banking sector, which then allocates these funds to productive investment. However, the introduction of a third productive entity, the bank, requires households to divide their labor not just between leisure and work, but also across two production sectors: goods and finance. Specifically, a portion of labor is allocated to the banking sector, which uses both labor and deposits to generate loans. This dual allocation of labor introduces a structural wedge between loan and deposit rates.

The agent's recursive utility function takes the standard form:

$$V(k_t^s) = \underset{c_t^d,\, x_t,\, l_t^s,\, k_{t+1}^s}{\text{Max}} \; u\left(c_t^d,\, x_t\right) + \beta V(k_{t+1}^s) \tag{1}$$

In the above equation, $V(k_t^s)$ describes the maximum utility that can be obtained given the state of capital investment at time t. c_t^d represents the consumer's demand for consumption goods. x_t denotes leisure, reflecting the consumer's choice between work and free time. l_t^s represents the labor supplied to both the financial intermediary and the firm. β is the discount factor, capturing the time preference of the consumer — a higher value of β indicates greater relative importance placed on future utility. Lastly, k_{t+1}^s is the next period's capital investment, determined endogenously by the consumer's choices.

However, when financial intermediation is introduced, capital investment is no longer a direct choice variable. Instead, consumers choose how much to deposit at the bank, d_{t+1}, which becomes the state variable. The bank then transforms these deposits into loans for the firm. The consumer receives a return of $d_t\left(1 + R_t^d\right)$ on current deposits, and supplies labor to the firm and the bank. Time is allocated between leisure x_t, work at the firm, and work at the bank, such that:

$$l_t^s + l_{Ft}^s + x_t = 1$$

This leads to the consumption function:

$$c_t = w_t(1 - x_t) - d_{t+1} + d_t\left(1 + R_t^d\right) \tag{2}$$

Substituting into the utility function, the recursive problem becomes:

$$V(d_t) = \underset{x_t,\, d_{t+1}}{Max} \; ln\left[w_t(1 - x_t) - d_{t+1} + d_t\left(1 + R_t^d\right)\right] + \alpha \, ln \, x_t + \beta V(d_{t+1}) \tag{3}$$

Equation (3) captures how banking-sector intermediation reconfigures the consumer's dynamic optimization problem. It incorporates labor allocation to the banking sector, the substitution between present and future consumption via deposits, and the indirect role of financial productivity A_F through its impact on the deposit rate R_t^d, as will be shown in later sections.

The first order conditions for labor x_t and deposits d_{t+1} are respectively expressed as:

$$w_t = \frac{\alpha c_t}{x_t},\ \frac{1}{c_t^d} = \beta \frac{\partial V(\ d_{t+1})}{\partial\ d_{t+1}}$$

2.2. Goods Producer Problem

The firm operates under a Cobb-Douglas production technology and finances all capital investment via loans from the banking sector. Let A_G denote total factor productivity in goods production, l_t labor input, k_t the capital stock, and δ_k the depreciation rate of capital. Firms rent capital at the loan interest rate R_t^q, and pay a real wage w_t for labor.

The firm's profit at time t is given by:

$$\Pi_t = A_G l_t^{\gamma} k_t^{1-\gamma} - w_t l_t - k_{t+1} + k_t(1-\delta_k) + q_{t+1} - q_t\left(1 + R_t^q\right) \tag{4}$$

Here, q_t represents bank loans. New capital investment $i_t = k_{t+1} - k_t$ is financed entirely by new borrowing, so:

$$i_t = q_{t+1} - q_t \text{ and } k_t = q_t$$

Substituting these conditions into the profit function and focusing on the static optimization problem, the firm chooses labor l_t and capital k_t to maximize:

$$\underset{l_t,k_t}{Max}\ \Pi_t = A_G l_t^{\gamma} k_t^{1-\gamma} - w_t l_t - k_{t+1} + k_t\left(R_t^q + \delta_k\right) \tag{5}$$

The first-order conditions yield the standard efficiency conditions for input use:

$$(1-\gamma)A_G\left(\frac{l_t}{k_t}\right)^{\gamma} = R_t^q + \delta_k, w_t = \gamma A_G\left(\frac{l_t}{k_t}\right)^{\gamma-1}$$

The first-order conditions link the firm's optimal input decisions to the loan rate and wage, respectively. The interest rate on loans R_t^q, in turn, will depend on banking productivity, as discussed in the next section. This linkage forms the transmission channel from banking-sector efficiency to factor prices and, ultimately, income distribution.

2.3. Bank Profit Optimization Problem

The bank transforms deposits d_t with labor l_{Ft} into loans q_t via a Cobb-Douglas technology with a productivity parameter $A_F \in [0, \infty)$:

$$q_t = A_F(l_{Ft})^K d_t^{1-K},\ K \in [0,1) \tag{6}$$

This expression reflects the efficiency of the banking sector in converting household savings into productive investment. As A_F increases, the same amount of labor and deposits can generate a larger volume of loans. In the extreme case of $K = 0$, the entire intermediation burden falls on deposits, and A_F becomes a direct multiplier of banking capacity:

$$q_t = A_F d_t$$

The bank earns income from loan repayments $q_t\left(1 + R_t^q\right)$ and incoming deposits d_{t+1}, while incurring costs for issuing new loans q_{t+1}, repaying depositors $d_t\left(1 + R_t^d\right)$, and paying wages $w_t l_{Ft}$. The profit at the time t is given by:

$$\Pi_{Ft} = -q_{t+1} + q_t\left(1 + R_t^q\right) + d_{t+1} - d_t\left(1 + R_t^d\right) - w_t l_{Ft} \quad (7)$$

In equilibrium, all bank profits are returned to depositors as dividends, implying zero residual profit:

$$\Pi_{Ft} = 0$$

The bank maximizes the present discounted value of profits, subject to its production function. Defining λ_t as the shadow value of loans (the marginal cost of producing one more unit of q_t), the first-order condition with respect to labor gives:

$$\lambda_t = \frac{w_t}{KA_F\left(\frac{l_{Ft}}{d_t}\right)^{K-1}}$$

Combining this with the envelope conditions on the interest rate differential, the shadow cost can also be expressed as:

$$\lambda_t = \frac{R_t^q - R_t^d}{1 - (1-K)A_F\left(\frac{l_{Ft}}{d_t}\right)^{K}}$$

The above equations allow us to solve for the labor-to-deposit ratio in equilibrium:

$$\frac{w_t}{KA_F\left(\frac{l_{Ft}}{d_t}\right)^{K-1}} = \frac{R_t^q - R_t^d}{1 - (1-K)A_F\left(\frac{l_{Ft}}{d_t}\right)^{K}} \quad (8)$$

This condition illustrates a central mechanism of the model: the interest rate spread $R_t^q - R_t^d$, which reflects the cost of transforming deposits into credit, is directly determined by the productivity of the banking sector, A_F. As A_F increases, less labor is required per unit of deposit, lowering the marginal cost of credit creation. This leads to a smaller interest rate wedge, thereby reducing borrowing costs for firms and expanding the scope of lending across a broader range of borrowers**.** It also implies improved conditions for depositors, who benefit from higher returns or reduced frictions in formal savings. In this way, improvements in intermediation productivity may indirectly foster financial inclusion by enabling a wider set of agents to participate in credit and savings markets.

2.4. Aggregate Demand and Aggregate Supply with Banking

To close the model, this subsection derives the aggregate supply and aggregate demand conditions under the presence of a banking sector. Banking sector productivity influences equilibrium in both goods and labor markets by shaping the wage rate w_t and the capital stock k_t. Under the assumption of balanced growth, the presence of financial intermediation modifies intertemporal consumption decisions by replacing the standard interest rate with the deposit rate R_t^d.

Rewriting under a constant growth rate g, with $g = \frac{d_{t+1} - d_t}{d_t}$ equation (2) becomes

$$c_t = w_t(1 - x_t) + d_t\left(R_t^d - g\right)$$

Since deposits equal capital in equilibrium $k_t = d_t$, and using the intertemporal Ramsey (1928) condition:

$$1 + g = \frac{1 + R_t^d}{1 + \rho} \;\Rightarrow\; R_t^d - g = \rho(1 + g)$$

Substituting the above expression back into the consumption function:

$$c_t = w_t(1 - x_t) + \rho(1 + g)k_t$$

We know that the intratemporal condition from utility maximization implies:

$$w_t = \frac{\alpha c_t}{x_t} \;\Rightarrow\; x_t = \frac{\alpha c_t}{w_t}$$

The final form of the consumption function can be expressed as follows.

$$c_t = \frac{1}{1 + \alpha}[w_t + \rho(1 + g)k_t]$$

Aggregate demand adds the investment to the consumption given the investment $i_t = (g + \delta_k)k_t$ because we know that $k_{t+1} = k_t(1 - \delta_k) + i_t$ and $\frac{k_{t+1} - k_t}{k_t} = g$.

$$y_t^d = \frac{1}{1 + \alpha}\{w_t + [\rho(1 + g) + (g + \delta_k)(1 + \alpha)]k_t\} \tag{9}$$

On the supply side, the firm maximizes profit, and the equilibrium condition is that the real wage equals its marginal product.

$$w_t = \gamma A_G (l_t)^{\gamma - 1}(k_t)^{1 - \gamma} \;\Rightarrow\; l_t = \left(\frac{\gamma A_G}{w_t}\right)^{\frac{1}{1 - \gamma}} k_t$$

This can be substituted into the production function to derive the aggregate supply.

$$y_t^S = {A_G}^{\frac{1}{1 - \gamma}} \left(\frac{\gamma}{w_t}\right)^{\frac{\gamma}{1 - \gamma}} k_t \tag{10}$$

2.5. Solving for Equilibrium Capital

Having established the general equilibrium structure of the model, we now derive the closed-form solution for the equilibrium capital stock k_t to analyze its dependence on financial sector productivity A_F. To analyze the relationship between banking productivity and capital accumulation, it is useful to express equilibrium conditions in terms of the capital–labor ratio $\frac{l_t}{k_t}$. This ratio naturally emerges in both the firm’s first-order conditions (through wages and the marginal product of capital) and in the bank’s cost structure (through labor demand for intermediation). By solving for $\frac{l_t}{k_t}$ as a function of model parameters, we can subsequently derive an expression for the capital stock k_t that explicitly incorporates the role of financial sector efficiency A_F. This two-step structure clarifies the transmission mechanism from banking productivity to macroeconomic allocations.

To isolate the role of banking efficiency in equilibrium, we simplify the model by assuming a zero growth rate $g = 0$. Under this condition, the intertemporal condition implies that the deposit interest rate equals the subjective rate of discount $R_t^d = \rho$.

$$y_t^d = \frac{1}{1 + \alpha}\{w_t + [\rho + \delta_k(1 + \alpha)]k_t\}$$

To determine the equilibrium, we equate the loan rate implied by the goods-producing firm’s optimization condition with that derived from the banking sector. Recall from the bank's

production function that when deposits equal loans $q_t = d_t$ the labor requirement per unit of deposits is given by $\frac{l_{Ft}}{d_t} = \frac{1}{(A_F)^{\frac{1}{K}}}$. Substituting this into equation (8), the interest rate differential is solved as a simple function of the wage rate w_t and the productivity factor A_F that is $R_t^q - R_t^d = \frac{w_t}{(A_F)^{\frac{1}{K}}}$). However, the loan rate R_t^q can also be derived from the firm's optimal capital demand condition, linking it to the capital–labor ratio and technology parameters. Equating these two expressions allows us to solve for the equilibrium ratio $\frac{l_t}{k_t}$ in terms of exogenous variables.

$$(1-\gamma)A_G\left(\frac{l_t}{k_t}\right)^{\gamma} - \delta_k = R_t^q = R_t^d + \frac{w_t}{(A_F)^{\frac{1}{K}}}$$

Since $R_t^d = \rho$, the equilibrium, the above equilibrium condition gives an implicit solution for $\frac{l_t}{k_t}$ in terms of given parameters:c

$$(1-\gamma)A_G\left(\frac{l_t}{k_t}\right)^{\gamma} - \delta_k = \rho + \frac{\gamma A_G\left(\frac{l_t}{k_t}\right)^{\gamma-1}}{(A_F)^{\frac{1}{K}}}$$

This condition implicitly determines the equilibrium capital–labor ratio $\frac{l_t}{k_t}$, given parameters A_G, A_F, ρ, and δ_k.

To derive the equilibrium level of capital k_t, we rely on three key relationships: the time constraint, the deposit–loan equality $q_t = d_t = k_t$, and the leisure choice implied by the intratemporal optimality condition. The total time endowment is allocated across goods production, banking labor, and leisure ($1 = l_t + l_{Ft} + x_t$).

From the banking technology, the labor required to transform deposits into loans and from intratemporal condition the leisure can be expressed with the following equations:

$$l_{Ft} = \frac{k_t}{(A_F)^{\frac{1}{K}}} \text{ and } x_t = \frac{\alpha c_t}{w_t} = \frac{\alpha}{1+\alpha}\left[1 + \frac{\rho k_t}{w_t}\right]$$

Substituting both expressions into the time constraint after this using the equation $w_t = \gamma A_G\left(\frac{l_t}{k_t}\right)^{\gamma-1}$ and solving for k_t yields:

$$k_t = \left[\frac{\alpha\rho\left(\frac{l_t}{k_t}\right)^{1-\gamma}}{\gamma A_G} + (1+\alpha)\frac{l_t}{k_t} + \frac{(1+\alpha)}{(A_F)^{\frac{1}{K}}}\right]^{-1} \quad (11)$$

For analytical simplicity, we evaluate the partial effect of banking productivity A_F on the capital stock k_t while holding the capital–labor ratio $\frac{l_t}{k_t}$ constant. This allows us to isolate the direct influence of A_F through the intermediation cost term. However, in equilibrium, $\frac{l_t}{k_t}$ is itself implicitly determined by the system and also depends on A_F, as shown earlier.

While the ratio $\frac{l_t}{k_t}$ is introduced here as a technical tool to solve the equilibrium, it can also be interpreted as a structural indicator of factor intensity. Since this ratio shapes income distribution between capital and labor, and the ratio itself is endogenous to banking productivity

A_F, the model implies that improvements in financial intermediation may shift the balance of income away from labor and toward capital. This channel offers an additional mechanism linking financial development to inequality.

Equation (11) expresses the capital stock k_t as a decreasing function of banking productivity A_F. As A_F rises, the labor required to produce loans falls, freeing up more labor for goods production and increasing the return to capital. This makes the system more efficient overall, allowing for higher capital accumulation and output. Conversely, lower A_F increases intermediation costs and depresses equilibrium k_t, which, as will be shown in the next section, widens inequality through both wage and capital income channels.

2.6. Financial Development and Income Inequality

To formally examine how improvements in financial intermediation affect income inequality, we extend the baseline model by introducing heterogeneity in labor income. Building on the framework of Elgin et al. (2013), and conceptually related to the mean–median approach of Meltzer and Richard (1981), we consider a stylized economy with two representative agents who differ only in their wage levels. Agent 1 earns a lower wage w_{t_1} Agent 2 receives a higher wage w_{t_2}, with $w_{t_2} > w_{t_1}$. Both agents have symmetric access to capital, which is financed and allocated equally in per-capita terms. This setup isolates the effect of wage dispersion on inequality while holding capital distribution constant, allowing us to focus on the role of banking sector productivity in shaping income differentials.

The after-tax, after-transfer income for agent i is defined as:

$$y_t^*(w_{t_i}, k_t) = \frac{1}{1+\alpha}\{w_{t_i} + [\rho + \delta_k(1+\alpha)]k_t\},\ \ i = 1,2$$

Taking the ratio of the high-wage to low-wage individuals' income:

$$\frac{y_t^*(w_{t_2}, k_t)}{y_t^*(w_{t_1}, k_t)} = \frac{w_{t_2} + \rho k_t + \delta_k k_t + \alpha\delta_k k_t}{w_{t_1} + \rho k_t + \delta_k k_t + \alpha\delta_k k_t} \tag{12}$$

Differentiating with respect to the capital stock k_t:

$$\frac{\partial}{\partial k_t}\left(\frac{y_t^*(w_{t_2}, k_t)}{y_t^*(w_{t_1}, k_t)}\right) = \frac{(\rho + \delta_k + \alpha\delta_k)(w_{t_1} - w_{t_2})}{(w_{t_1} + \rho k_t + \delta_k k_t + \alpha\delta_k k_t)^2} < 0 \tag{13}$$

This expression shows that, as capital increases, the income ratio between the rich and poor declines. In other words, greater capital accumulation reduces income inequality, provided capital is evenly distributed across agents.

Since earlier results showed that banking productivity A_F positively affects capital accumulation:

$$\frac{\partial k_t}{\partial A_F} > 0$$

It follows that:

$$\frac{\partial}{\partial A_F}\left(\frac{y_t^*(w_{t_2}, k_t)}{y_t^*(w_{t_1}, k_t)}\right) = \frac{\partial}{\partial k_t}\left(\frac{y_t^*(w_{t_2}, k_t)}{y_t^*(w_{t_1}, k_t)}\right) \times \frac{\partial k_t}{\partial A_F} < 0 \tag{14}$$

This final result demonstrates the central mechanism of the model: an increase in financial sector productivity A_F reduces income inequality through its positive effect on the

capital stock k_t. This occurs not by direct redistribution, but by improving access to capital accumulation for all agents, which narrows the relative income gap between low-wage and high-wage individuals.

3. Data, Methodology, and Empirical Results

The empirical analysis draws on a comprehensive unbalanced panel dataset integrating information from the Standardized World Income Inequality Database (Solt, 2020), the Penn World Table version 10.0 (Feenstra et al., 2015), and the World Bank's Global Financial Development Database (Čihák et al., 2012). The initial aim was to include all available countries to ensure maximum cross-country representativeness. However, following the approach of Mankiw et al. (1992), major oil-exporting economies were excluded due to their structurally distinct macroeconomic dynamics. Additionally, countries with populations below one million in 2019 were omitted to avoid small-country biases. After further harmonization of the three datasets, 33 countries were dropped due to missing values or inconsistent coverage, resulting in a final sample of 139 countries spanning the 2000–2019 period. The time frame is also dictated by the availability of bank overhead cost data, which is only consistently reported from 2000 onward.

Table 1. Variables Descriptions and Sources

Variable	Description	Source
Main Variables		
Gini Disposable	Gini coefficient using (after-tax, after-transfer) household income.	SWIID
Bank credit to bank deposits	It reflects the proportion of total deposits used by domestic money banks to finance private sector credit, comprising demand, time, and savings accounts.	GFDD-WB
Bank overhead costs to total assets (%)	It measures a bank's operating expenses relative to the total value of its assets, such as loans, cash, real estate, and intangibles.	GFDD-WB
Interaction Term	Interaction between the credit-to-deposit ratio and bank overhead cost. Measures whether the impact of financial development on inequality varies with banking sector efficiency.	The author's calculation based on GFDD
Control Variables		
Real GDP per Capita	Real GDP per capita based on expenditure-side real GDP at chained PPPs (mil. 2017 US$) divided by population.	PWT 10.01
Inflation	Annual percentage change in consumer prices, measured by the CPI using the Laspeyres formula.	WDI
Gov. Consumption	Measures government consumption as a share of GDP, reflecting public sector expenditure on goods and services.	PWT 10.01
Instrumental Variables		
Latitude	A country's geographic latitude, typically expressed in degrees north or south of the equator.	DSPL*
British Legal Origin	A binary (dummy) variable indicating whether a country's legal system is based on British common law. It takes the value one if the country has a British legal origin and zero otherwise.	LaPorta et al. (1999)

Note: The DataSet Publishing Language (DSPL).

The country sample is further categorized using the World Bank’s income classification. Of the 139 countries, 75 are classified as high- and upper-middle-income economies, while the remaining 64 belong to the low- and lower-middle-income groups. This distinction is important for examining heterogeneous effects across development levels. Table 1 presents detailed descriptions and sources of all variables used in the empirical analysis, including the main explanatory variables, control variables, and instrumental variables.

The primary proxy for intermediation intensity is taken to be the credit-to-deposit ratio, interacted with bank overhead costs to capture cost efficiency. While these measures are aligned with the model’s efficiency channel, financial inclusion is not observed; consequently, claims about who gains access or by how much cannot be made. More distributional evidence would be obtained from inclusion-oriented datasets. For example, household-level indicators on account ownership, saving, borrowing, and digital payments with breakdowns by gender, age, rural residence, and income groups are provided by the World Bank’s Global Findex Database (Demirguc-Kunt et al., 2022); similarly, counts of bank branches and ATMs per 100,000 adults and the number of deposit and loan accounts are reported by the IMF’s Financial Access Survey (IMF, 2025). However, their scope and timing are not compatible with the 2000–2019 panel employed here. For this reason, these proxies are retained to operationalize the theoretical mechanism, and all estimates are interpreted as efficiency–inequality links rather than direct inclusion effects.

The empirical model includes three standard control variables to account for structural factors that may independently influence income inequality. Real GDP per capita, measured in constant international dollars, captures differences in living standards and overall development (Li et al., 1998; Barro, 2000; Clarke et al., 2006). Inflation is included to control for the redistributive effects of price instability, which disproportionately harm lower-income households (Easterly and Fischer, 2001; Li and Zou, 2002; Beck et al., 2007). Government consumption as a share of GDP is used as a proxy for the redistributive role of the state (Perotti, 1996; Jauch and Watzka, 2016). These variables follow the empirical design of Jauch and Watzka (2016), allowing for comparability while ensuring that fiscal or macroeconomic distortions do not confound the estimated financial effects.

As instruments, British legal origin dummies are included following Nikoloski (2013) and de Haan and Strum (2017), although their exogeneity is contested in some literature (Jauch and Watzka, 2016). Latitude is also used as an instrument based on Acemoglu et al. (2001) and Kappel (2010), reflecting historical-geographic variation that plausibly affects financial development but not inequality directly.

Table 2 presents summary statistics for the full sample of countries from 2000 to 2019. The average Gini coefficient of disposable income is approximately 38.825, with a wide range between 22.6 and 65.1, highlighting substantial variation in income inequality across countries and over time. The average credit-to-deposit ratio is close to 1 (0.997), indicating that, on average, banks are lending out a substantial share of their deposits. However, there is considerable dispersion (minimum 0.107 and maximum 8.980). Bank overhead costs average about 3.901 percent of total assets, again with notable variation across countries. Real GDP per capita averages around 15,665 USD, but with a significant standard deviation, reflecting the diversity of economic development levels across the sample. Inflation exhibits a mean of 6.6 percent annually, although its minimum value of -16.86 percent (observed in Lesotho in 2009)

reflects episodes of deflation. Overall, deflation is present in 164 observations, typically corresponding to periods of economic crisis or recession. This pattern is consistent with the diverse set of economies in the sample, some of which experienced severe macroeconomic instability during the study period. Episodes of deflation were observed not only in underdeveloped countries, particularly in parts of Africa, but also in advanced economies following the 2008 global financial crisis, including the United States, Japan, Switzerland, Sweden, and Ireland. Government consumption also shows wide variability, as expected in a heterogeneous set of countries. The descriptive statistics indicate substantial cross-country heterogeneity, which suggests using fixed effects in the empirical estimation.

Table 2. Summary Statistics – Full Sample

Variables	Observations	Mean	Std. Dev.	Min	Max
Gini Index (Disposable Income)	2563	38.825	8.201	22.600	65.100
Credit-to-Deposit Ratio	2601	0.997	0.680	0.107	8.980
Bank Overhead Cost (%)	2434	3.901	3.289	0.050	84.340
GDP per Capita (in USD)	2780	15664.650	16475.950	251.320	102354.000
Inflation Rate (Annual %)	2638	6.604	17.762	-16.860	513.910
Government Consumption (%)	2780	17.604	7.145	0.520	53.840
Latitude	2780	20.250	25.352	-40.900	61.920
Legal Origins U.K.	2700	0.259	0.438	0.000	1.000

Table 3 presents the correlation matrix for the subset of high- and upper-middle-income countries, which is the primary focus of the empirical analysis. The credit-to-deposit ratio is negatively but modestly correlated with inequality (-0.12), while bank overhead costs are positively correlated with inequality (0.24). Notably, real GDP per capita is strongly negatively correlated with inequality (-0.51), consistent with expectations that wealthier countries tend to have lower inequality levels. Government consumption is negatively associated with inequality (-0.27), suggesting that larger public sectors may contribute to mitigating income disparities through redistribution. Inflation displays a weak positive correlation with inequality (0.07), consistent with the idea that price instability can exacerbate income gaps, although the effect appears relatively limited in this context. Finally, it should be noted that latitude and legal origin, while reported in the correlation matrix, serve as instruments in the two-stage least squares (2SLS) estimations used for addressing endogeneity concerns. Their interpretation falls outside the baseline analysis presented here.

Table 3. Correlation Matrix – High and Upper-Middle Income Countries

	Gini	Cred/Dep	Bank O.	GDP p.c.	Inflation	Gov. C.	Latitude	Legal O.
Gini	1.00							
Cred/Dep	-0.12***	1.00						
Bank O.	0.24***	-0.12***	1.00					
GDP p. c.	-0.51***	0.11***	-0.38***	1.00				
Inflation	0.07**	-0.03	0.30***	-0.23***	1.00			
Gov. C.	-0.27***	0.02	-0.01	-0.22***	0.05*	1.00		
Latitude	-0.70***	0.16***	-0.15***	0.29***	-0.05*	0.31***	1.00	
Legal O.	0.27***	-0.18***	-0.12***	0.25***	-0.07**	-0.16***	-0.31***	1.00

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively.

While the correlation matrix offers preliminary insight into the relationships among variables, it is essential to note its limitations. Pairwise correlations capture only simple linear associations and do not fully reveal the potential for multicollinearity among regressors in a multivariate context. Moreover, some degree of correlation between explanatory variables is conceptually expected, given that financial development and banking sector efficiency are intertwined phenomena. Since the primary objective of this analysis is to examine the theoretical mechanisms developed in Section 2 empirically, rather than to achieve statistical orthogonality between regressors, formal multicollinearity diagnostics are not emphasized, the empirical strategy remains focused on testing the theoretically motivated interactions and dynamics using real-world data, where perfect independence of variables is neither expected nor necessary.

The empirical specification is directly informed by the theoretical model developed in the previous section. In that model, banking sector productivity is captured by the parameter A_F, which governs the bank's ability to convert deposits into loans. A decline in A_F raises the shadow cost of financial intermediation, increasing the wedge between the loan rate R_t^q and the deposit rate R_t^d. This mechanism is formalized in the equilibrium condition stated in equation (8).

The relationship in the equation implies that the efficiency of transforming deposits into loans (i.e., the credit/deposit ratio) is conditional on the intermediation cost structure, particularly the labor and operational burden required to produce loans. In the empirical model, this theoretical insight motivates the interaction term between the credit-to-deposit ratio and bank overhead costs. It captures the idea that the effect of financial development on income inequality is not uniform, but depends on the underlying efficiency of the banking sector. When bank overhead costs are high, when transforming deposits into loans is more costly, credit expansion may exacerbate inequality rather than reduce it. So the baseline regression is specified as:

$$Gini_{i,t} = \alpha + \beta_1 \, ln(Cred/Dep)_{i,t} + \beta_2 Over_{i,t} + \beta_3 \big(ln(Cred/Dep)_{i,t} \times Over_{i,t}\big) + \beta_j X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (15)$$

The empirical model builds directly on the theoretical framework by examining how credit expansion interacts with banking sector efficiency to influence income inequality. The dependent variable is the Gini coefficient of disposable income. The primary explanatory variable is the logarithm of the credit-to-deposit ratio, which captures the extent to which domestic deposits are transformed into private sector credit, reflecting the scale of financial intermediation. To proxy for the efficiency of this intermediation process, we include bank overhead costs (as a share of total assets), which represent operational frictions and resource use within the banking system. The key variable of interest is the interaction term between credit/deposit ratio and overhead cost, which is motivated directly by the theoretical model: it captures how the impact of financial development on inequality depends on the costliness of financial intermediation.

Control variables include the real GDP per capita logarithm, government consumption (as a share of GDP), and inflation, reflecting standard economic and institutional factors affecting inequality. To estimate the model, we rely primarily on the fixed effects (FE) estimator, which is particularly appropriate in the context of this panel dataset (Jauch and Watzka, 2016; de Haan

and Strum, 2017). FE estimation controls for all unobserved, time-invariant country-specific (μ_i) characteristics, such as institutional structures, geography, or colonial legacy, that may otherwise confound the relationship between financial development and inequality. This approach focuses on within-country variation over time, that is, how financial development and banking efficiency changes affect inequality in a given country. This closely mirrors the theoretical model, which does not compare countries to one another but analyzes how financial intermediation shapes inequality dynamics within an economy. While pooled OLS results are included for reference, the fixed effects estimator is foregrounded due to its stronger theoretical and econometric fit. Time-fixed effects (λ_t) are included via year dummies to absorb global shocks that are common to all countries.

Endogeneity is a primary concern in the finance–inequality nexus. Clarke et al. (2006) note that ordinary least squares (and random-effects) estimates can be biased because they do not accommodate reverse causality, the possibility that inequality itself shapes the provision and scale of financial intermediation. To illustrate this concern, Clarke et al. (2006) draw on Greenwood and Jovanovic (1990), in which the initial distribution of wealth determines who can join financial-intermediary coalitions and thus the size of the financial sector. Beck et al. (2007) likewise argue that changes in poverty and inequality feed back into finance by increasing demand for financial services and by generating political pressure for more efficient, market-based intermediation. In light of these channels, an instrumental-variables strategy is warranted to purge endogenous feedback between distributional outcomes and financial development. Following Jauch and Watzka (2016), we therefore employ a 2SLS, controlling for country-specific and time-fixed effects, as an identification step, complementing the fixed-effects baseline, to isolate exogenous variation in intermediation and obtain estimates that are not driven by reverse causality. As mentioned, the instrument set includes the natural log of latitude and a British legal origin dummy, commonly used in earlier studies on finance and inequality (Kappel, 2010; Nikoloski, 2013; de Haan and Sturm, 2017). We additionally construct interaction-specific instruments by interacting these exogenous variables with bank overhead cost to account for the endogeneity of the interaction term in our model. Furthermore, in light of Jauch and Watzka (2016), we also include lagged values of the Gini index as instruments. The model passes standard identification and overidentification tests, including the Hansen J test ($p = 0.17$), supporting the validity of the instruments. Although the Kleibergen-Paap rk Wald F-statistic (3.73) falls below conventional thresholds, suggesting potential weak instrument bias, the overall results remain robust and directionally consistent with the fixed effects estimates. Accordingly, we report the 2SLS estimates alongside our main results to strengthen causal interpretation (see also Clarke et al., 2006 for the use of a 2SLS approach in analyzing the nexus between financial development and income inequality).

Table 4 presents the baseline regression results for the subset of high- and upper-middle-income countries, comparing pooled OLS, fixed effects (FE), and two-stage least squares (2SLS) estimators across progressively controlled specifications. Columns (1) – (3) show pooled OLS results, Columns (4) – (6) display fixed effects estimates, which are preferred for accounting for time-invariant country-specific heterogeneity. At the same time, Column (7) reports 2SLS estimates that address potential endogeneity in the credit-to-deposit ratio and its interaction with banking sector overhead costs.

Table 4. Baseline Regression Results: High and Upper-Middle Income Countries

Dependent Variable: Gini Index (Disposable Income, post-tax, post-transfer)							
	POLS (1)	**POLS (2)**	**POLS (3)**	**FE (4)**	**FE (5)**	**FE (6)**	**2SLS (7)**
ln(Credit/Deposit)	-2.269***	-3.580***	-2.532***	-0.640	-1.022*	-0.877*	-75.225***
	(0.556)	(0.839)	(0.483)	(0.443)	(0.598)	(0.462)	(26.592)
Bank Overhead Cost		0.506**	0.034		0.034	0.025	-1.048**
		(0.215)	(0.035)		(0.027)	(0.016)	(0.457)
Interaction Term		0.539*	0.598***		0.120	0.144*	13.116**
		(0.287)	(0.189)		(0.105)	(0.084)	(5.260)
ln(GDP per capita)			-7.316***			-3.701***	-0.746
			(0.333)			(0.797)	(3.338)
Inflation			-0.018			0.012	-0.121
			(0.028)			(0.017)	(0.114)
Government Cons.			-0.553***			-0.069	-0.158
			(0.030)			(0.055)	(0.250)
Constant	38.880***	36.120***	117.20***	35.660***	35.340***	74.450***	—
	(1.340)	(1.600)	(3.609)	(0.252)	(0.254)	(8.322)	—
Observations	1,325	1,273	1,241	1,325	1,273	1,241	997
R-squared	0.025	0.081	0.438	0.127	0.137	0.246	—
KP rk LM (p-val)	—	—	—	—	—	—	0.005
KP rk Wald F-stat	—	—	—	—	—	—	3.73
St.-Yogo 10% C.V.	—	—	—	—	—	—	13.43
Hansen J (p-value)	—	—	—	—	—	—	0.175
Number of countries	—	—	—	72	71	70	56

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively. Standard errors in parentheses. All estimations with time dummies and robust standard errors. 2SLS diagnostics include the Kleibergen-Paap rk LM statistic (KP rk LM (p-val)), the Kleibergen-Paap rk Wald F statistic (KP rk Wald F-stat), the Stock-Yogo 10% critical value (St.-Yogo 10% C.V.), and the Hansen J statistic (Hansen J p-value).

Focusing on Column (6), which includes full controls (real GDP per capita, inflation, and government consumption) along with country and year fixed effects, several key findings emerge. Firstly, the coefficient on *ln(Credit/Deposit)* is negative and statistically significant at the 10 percent level. This suggests that, holding other factors constant, greater credit expansion relative to deposits is associated with lower income inequality. However, the magnitude is smaller than in the pooled OLS estimates, reflecting the more conservative nature of the FE estimator. Secondly, *Bank overhead cost* alone has a small and statistically insignificant effect on inequality, indicating that variations in banking sector operating costs do not directly impact inequality once other controls are included. Thirdly, the *interaction term* between credit/deposit ratio and bank overhead cost is positive and statistically significant at the 10 percent level, implying that the inequality-reducing effect of credit expansion weakens as bank overhead costs increase. This finding supports the theoretical model's prediction that the benefits of financial development for income distribution are conditional on the efficiency of the banking sector. Lastly, among the control variables, *real GDP per capita* continues to have a strong and negative relationship with inequality, consistent with the notion that higher income levels are

associated with lower inequality. Inflation is insignificant, while government consumption loses statistical significance once fixed effects are introduced.

Column (7) reports 2SLS estimates for the specification with *ln(Credit/Deposit)* interacted with *bank overhead cost*. Signs remain broadly consistent with the fixed-effects results in Column (6). Interpreted through the interaction, the marginal effect of credit expansion is attenuated/near zero at lower overhead. Still, it turns positive under high-overhead regimes (e.g., evaluated at upper-tail values of overhead), indicating that credit deepening can be inequality-increasing when intermediation is inefficient. But this pattern should be read cautiously, given weak identification (KP rk F = 3.73, below Stock–Yogo thresholds).

Overall, the results in Columns (6) and (7) align closely with the theoretical framework: credit expansion can reduce inequality, but only when financial intermediation operates efficiently. A significant interaction effect highlights the critical role of banking sector costs in mediating the inequality effects of financial development.

Tables A1 and A2, in Appendix 1, present the baseline regression results for the full sample and the subsample of low- and lower-middle-income countries, respectively. In contrast to the findings for high- and upper-middle-income countries, the relationships between credit expansion, banking sector efficiency, and inequality are notably weaker and less consistent in these samples. In the full sample, the interaction term remains positive and statistically significant in the fixed effects model, although other coefficients become weaker or lose significance. The key coefficients for low- and lower-middle-income countries are generally insignificant or unstable across specifications. Moreover, in both cases, the 2SLS estimates raise serious concerns due to weak identification and overidentification failures, limiting the reliability of IV-based inference for these groups. See Tables A1 and A2 in Appendix 1 for more information.

We also estimated the empirical model using mean-centered versions of the loan-to-deposit ratio and bank overhead cost, and report the results in Appendix 2, Table A3. Centering assesses the main effects at realistic values (the sample mean) and reduces unnecessary collinearity between the interaction and its components, without altering the slope of the interaction. The centered fixed-effect and 2SLS estimates closely mirror Table 4 in sign, magnitude, and significance and do not change our main results. We discussed mean-centered analysis in detail in Appendix 2.

These results suggest that the theoretical mechanism proposed in Section 2, whereby efficient financial intermediation amplifies the inequality-reducing effects of credit expansion, is more applicable to economies with more developed financial systems and stronger institutional frameworks. In contrast, in countries with underdeveloped financial sectors and weaker governance structures, the dynamics described by the model appear less relevant or may be overwhelmed by other structural factors not captured in the current framework.

The regression results presented in Table 4 indicate a negative relationship between credit expansion and income inequality in high- and upper-middle-income countries. To visually illustrate this finding, Figure 1 presents a binned scatter plot of the demeaned logarithm of the credit-to-deposit ratio against the demeaned Gini coefficient. This technique, popularized by Chetty et al. (2014), summarizes the relationship between two variables by partitioning the independent variable into intervals (“bins”) and plotting the mean of the dependent variable

within each bin. By using demeaned values, the figure effectively captures within-country variation, analogous to a fixed effects framework. Our approach also draws on de Haan and Sturm (2017), who employ a similar strategy to examine the link between financial development and inequality using country-demeaned trends. The observed downward-sloping trend line aligns with the regression results, indicating that higher levels of credit-to-deposit ratio are associated with lower income inequality within countries. See Appendix 1, Figures A1 and A2 for the binned scatter plots of the other groups.

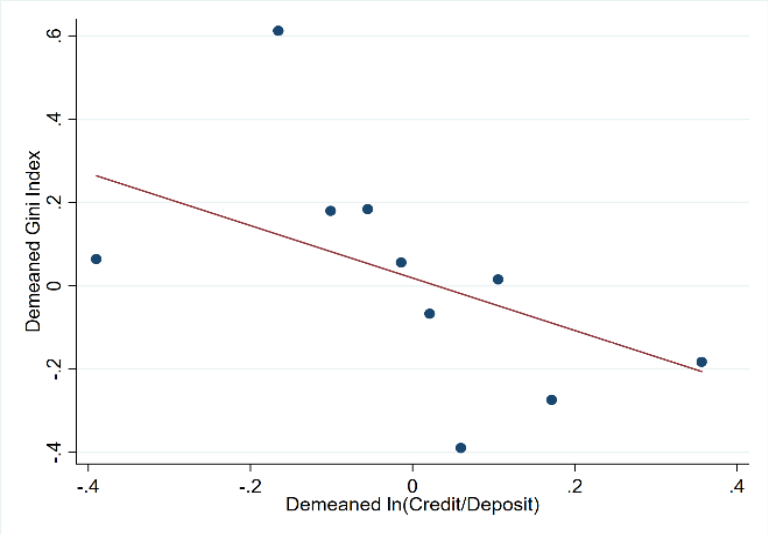

Figure 1. Binned Scatter Plot of ln(Credit/Deposit) and Income Inequality-High and Upper Middle-Income Countries

While Figure 1 depicts a simple negative association between credit expansion and inequality, Figure 2 shows that this relationship is conditional on banking efficiency. The marginal effect of credit expansion depends critically on bank overhead costs, emphasizing the importance of the interaction term in the theoretical and empirical analysis.

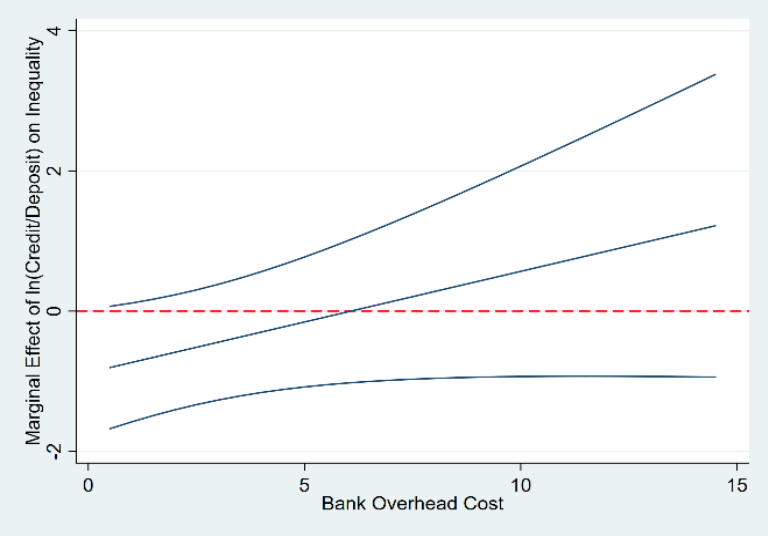

Figure 2. Marginal Effect of ln(Credit/Deposit) across Bank Overhead Cost-High and Upper Middle-Income Countries

Figure 2 illustrates the marginal effect of the logarithm of the credit-to-deposit ratio on income inequality across different levels of bank overhead costs for high- and upper-middle-income countries. The marginal effects are computed based on the interaction model and plotted following the guidance of Brambor et al. (2006), which emphasizes visualizing and interpreting interaction terms in regression analysis. The results show that the marginal effect is negative and statistically significant when overhead costs are low, indicating that credit expansion reduces inequality in contexts of high banking sector efficiency. However, as overhead costs increase, the marginal effect diminishes and eventually turns positive, suggesting that financial development may exacerbate inequality in inefficient financial systems. This pattern aligns closely with the theoretical predictions discussed in Section 2. Marginal effect plots for the remaining samples are presented in Appendix 1, Figures A3 and A4.

The linear interaction between the credit-to-deposit ratio and bank overhead forces the conditional effect of credit on inequality to vary linearly (and symmetrically) with overhead, and therefore cannot capture threshold-type regime shifts. To probe potential nonlinearity more directly, beyond the marginal-effects evidence in Figure 2, we implement a simple regime-type check: each year, we divide countries at the cross-sectional median of bank overhead and allow the credit slope to differ between low- and high-overhead regimes. This design approximates a threshold while preserving observations in our unbalanced panel. The exercise, reported in Appendix 3 (Table A4), does not yield robust or statistically meaningful differences in the credit–inequality slope across regimes, so we present it as complementary evidence rather than a core result. Figure 2 provides an informative visualization of conditional marginal effects; credit's equalizing impact attenuates as overhead rises, offering partial evidence of nonlinear behavior even though it does not estimate a structural threshold.

Overall, the empirical results support the theoretical model developed in Section 2. Credit expansion, measured by the credit-to-deposit ratio, is associated with lower income inequality in high- and upper-middle-income countries. Still, this effect is conditional on the efficiency of the banking sector, as captured by overhead costs. Visual analyses and marginal effect plots further reinforce these findings. These results highlight the critical role of banking sector quality in shaping the distributional consequences of financial development across countries.

4. Conclusion

This study reexamines the relationship between financial development and income inequality from a new perspective, focusing on the efficiency of financial intermediation rather than traditional volume-based measures of financial activity. Inspired by Gillman (2011), who modeled the productivity of financial intermediaries in converting deposits into loans, the analysis emphasizes that inefficiencies in banking create additional costs that can affect the distributional outcomes of financial development. Using the credit-to-deposit ratio as a proxy for the depth and activeness of banking sector intermediation, this study proposes that the impact of financial development on inequality critically depends on the efficiency with which deposits are transformed into credit.

The empirical analysis provides strong support for the theoretical framework developed in this study. Drawing on panel data from 139 countries for the period 2000–2019, the study examines the relationship between credit expansion, measured by the credit-to-deposit ratio, and

income inequality. However, the main findings apply specifically to high- and upper-middle-income countries. In this group, fixed effects and 2SLS estimations show that credit expansion reduces inequality only when banking sector efficiency is sufficiently high, as proxied by low overhead costs. As banking inefficiencies increase, this inequality-reducing effect weakens and eventually reverses. For the full sample and for low- and lower-middle-income countries, the results are statistically insignificant. These findings emphasize that financial development should not be narrowly equated with credit expansion alone. True financial development encompasses not only the quantity of credit but also the quality and efficiency of financial intermediation. A financial system that expands credit without ensuring efficient and equitable allocation may fail to deliver broad-based economic and social benefits.

This study contributes to the literature on finance and inequality by highlighting the conditional nature of the relationship between financial development and income distribution. By modeling and empirically testing how the efficiency of deposit-to-loan intermediation conditions the inequality effects of credit expansion, the analysis clarifies why financial deepening can fail to deliver broad-based social benefits. Using the credit-to-deposit ratio interacted with bank overhead costs provides an institutionally grounded and more nuanced empirical strategy than traditional volume-based indicators. In doing so, the study bridges theoretical modeling with empirical testing and shifts attention from aggregate depth to the structural quality of intermediation and its distributional implications. By identifying the credit–efficiency conditions under which deepening helps or hurts, the paper offers a coherent explanation for the mixed findings in the literature without relying solely on aggregate depth.

As a scope condition implied by our theoretical framework, the analysis centers on the efficiency dimension of financial intermediation rather than inclusion per se, treating inclusion indirectly through intermediation efficiency. The results indicate that efficiency gains, achieved through lower intermediation costs and narrower spreads, are plausibly connected to broader access; inclusion is more likely to be expanded indirectly in more efficient systems. No claim is made that inclusion is measured directly. Addressing distributional questions, such as which population segments gain how much access, would require inclusion-oriented datasets (e.g., Global Findex; IMF Financial Access Survey), the scope and timing of which are not compatible with our panel. Accordingly, the efficiency–inequality channel is quantified herein; examination of the access margin is left to future work. In addition to this scope condition, it is crucial to recognize the deeper historical and conceptual limitations of the analysis in this paper. The empirical strategy relies on relatively recent data on banking sector costs, limiting the ability to trace the relationship between financial intermediation and inequality across earlier historical periods. Moreover, financial development after 1980 unfolded in a world where the state’s role in economic life was diminishing, as emphasized by Piketty and Zucman (2014). Examining financial development without simultaneously considering the evolution of the state’s role may obscure key dynamics, since institutions of social protection and redistribution fundamentally shape inequality outcomes. Inequality is not a simple economic byproduct; it is deeply embedded in human perceptions of fairness, dignity, and frustration. Individuals do not passively accept inequality; they react emotionally and politically to it, often building states and institutions precisely to regulate and mitigate unjust outcomes. Thus, understanding the complex interplay between financial development, institutional capacity, and societal responses to inequality remains crucial for future research.

Declaration of Research and Publication Ethics
This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

Researcher's Contribution Rate Statement
I am a single author of this paper. My contribution is 100%.

Declaration of Researcher's Conflict of Interest
There are no potential conflicts of interest in this study.

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APPENDICES

Appendix 1. Regression Results and Marginal Effects Graphs for Remaining Samples

Findings based on the full sample and the low- and lower-middle-income country group are presented in this section.

Table A1. Baseline Regression Results: All Countries

Dependent Variable: Gini Index (Disposable Income, post-tax, post-transfer)							
	POLS (1)	**POLS (2)**	**POLS (3)**	**FE (4)**	**FE (5)**	**FE (6)**	**2SLS (7)**
ln(Credit/Deposit)	-3.060***	-2.362***	-2.227***	-0.060	-0.580	-0.388	-41.23***
	(0.297)	(0.641)	(0.421)	(0.312)	(0.518)	(0.507)	(12.628)
Bank Overhead Cost		0.702***	0.370***		0.037	0.035	-0.169*
		(0.229)	(0.138)		(0.025)	(0.022)	(0.089)
Interaction Term		-0.153	0.383***		0.096	0.108*	0.694
		(0.239)	(0.132)		(0.068)	(0.063)	(0.875)
ln(GDP per capita)			-2.536***			-1.874***	3.912*
			(0.183)			(0.674)	(2.280)
Inflation			0.028*			0.005	-0.040
			(0.015)			(0.006)	(0.070)
Government Cons.			-0.321***			0.000	-0.303**
			(0.023)			(0.037)	(0.144)
Constant	36.63***	36.30***	65.55***	38.09***	37.55***	55.20***	—
	(0.733)	(1.332)	(2.241)	(0.196)	(0.208)	(6.267)	—
Observations	2,410	2,164	2,109	2,410	2,164	2,109	1,628
R-squared	0.047	0.138	0.321	0.135	0.157	0.188	—
KP rk LM (p-val)	—	—	—	—	—	—	0.007
KP rk Wald F-stat	—	—	—	—	—	—	4.27
St.-Yogo 10% C.V.	—	—	—	—	—	—	13.43
Hansen J (p-value)	—	—	—	—	—	—	0.000
Number of countries	—	—	—	136	132	131	100

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively. Standard errors in parentheses. All estimations with time dummies and robust standard errors. 2SLS diagnostics include the Kleibergen-Paap rk LM statistic (KP rk LM (p-val)), the Kleibergen-Paap rk Wald F statistic (KP rk Wald F-stat), the Stock-Yogo 10% critical value (St.-Yogo 10% C.V.), and the Hansen J statistic (Hansen J p-value).

In the full sample analysis, the fixed effects estimations yield mixed results. While the signs of the main explanatory variables are generally in line with theoretical expectations, i.e., a negative coefficient for the credit-to-deposit ratio and a positive one for the interaction term, the coefficient on the credit-to-deposit ratio is statistically insignificant, whereas the interaction term is positive and statistically significant. When accounting for potential endogeneity through 2SLS estimation, the results deviate further: the credit-to-deposit ratio becomes negative and statistically significant, while the interaction term loses significance. Additionally, the Hansen J

test indicates that the overidentifying restrictions may not be valid, further limiting the reliability of the instrumental variable estimates for the full sample.

Table A2. Baseline Regression Results: Low and Lower-Middle Income Countries

Dependent Variable: Gini Index (Disposable Income, post-tax, post-transfer)							
	POLS (1)	**POLS (2)**	**POLS (3)**	**FE (4)**	**FE (5)**	**FE (6)**	**2SLS (7)**
ln(Credit/Deposit)	-0.531	-1.330***	-1.873***	0.596	0.485	0.561	-30.987
	(0.324)	(0.386)	(0.423)	(0.490)	(1.282)	(1.362)	(46.925)
Bank Overhead Cost		0.973***	1.235***		0.035	0.042	-2.409
		(0.109)	(0.133)		(0.098)	(0.098)	(3.816)
Interaction Term		0.147	0.153		0.032	0.068	-8.838
		(0.140)	(0.157)		(0.163)	(0.161)	(15.313)
ln(GDP per capita)			1.976***			-0.116	3.810
			(0.343)			(0.905)	(6.351)
Inflation			-0.012			0.007*	0.226
			(0.017)			(0.003)	(0.289)
Government Cons.			-0.284***			0.051	-0.266
			(0.031)			(0.043)	(0.499)
Constant	40.840***	36.570***	23.730***	41.240***	40.890***	40.970***	—
	(0.881)	(1.001)	(3.310)	(0.316)	(0.559)	(7.239)	—
Observations	1,085	891	868	1,085	891	868	631
R-squared	0.009	0.150	0.254	0.173	0.218	0.240	—
KP rk LM (p-val)	—	—	—	—	—	—	0.766
KP rk Wald F-stat	—	—	—	—	—	—	0.174
St.-Yogo 10% C.V.	—	—	—	—	—	—	13.43
Hansen J (p-value)	—	—	—	—	—	—	0.153
Number of Countries	—	—	—	64	61	61	44

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively. Standard errors in parentheses. All estimations with time dummies and robust standard errors. 2SLS diagnostics include the Kleibergen-Paap rk LM statistic (KP rk LM (p-val)), the Kleibergen-Paap rk Wald F statistic (KP rk Wald F-stat), the Stock-Yogo 10% critical value (St.-Yogo 10% C.V.), and the Hansen J statistic (Hansen J p-value).

None of the core regression coefficients are statistically significant across specifications for the subsample of low- and lower-middle-income countries. Moreover, the signs of the main variables, including the credit-to-deposit ratio and its interaction with overhead cost, vary considerably across models, indicating a lack of robustness. Although the Hansen J test does not reject the validity of the instruments, the under-identification test fails to reach statistical significance, suggesting potential weakness in instrument relevance. These findings imply that the theoretical mechanism linking financial intermediation efficiency to inequality may not be observable in lower-income settings, possibly due to structural limitations or measurement issues.

Figures A1 and A2 in Appendix 1 provide binned scatter plots of the relationship between the demeaned credit-to-deposit ratio and income inequality for all countries and low and lower-middle-income countries, respectively. While the plot for all countries (Figure A1) shows a weak negative association, consistent with the main sample, the plot for low and lower-middle-income countries (Figure A2) reveals a slight positive association. These visual patterns reinforce the regression results: the inequality-reducing effect of credit expansion appears to hold predominantly in upper-income countries. Still, it weakens or reverses in lower-income economies, likely due to differences in financial sector development and institutional capacity.

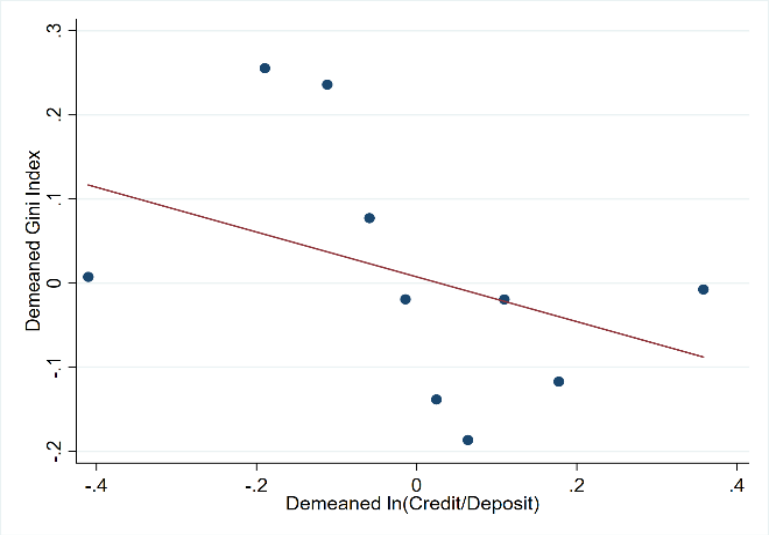

Figure A1: Binned Scatter Plot of ln(Credit/Deposit) and Income Inequality-All Countries

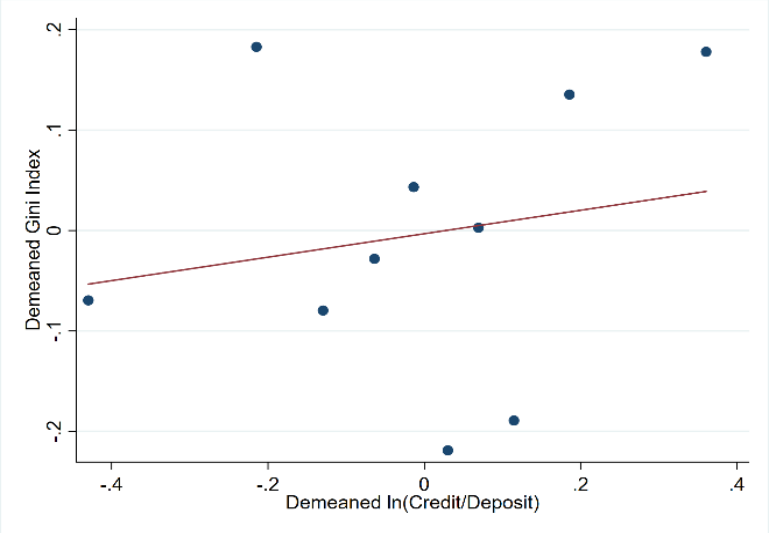

Figure A2: Binned Scatter Plot of ln(Credit/Deposit) and Income Inequality-Low and Lower Middle-Income Countries

Like Figure 2 for developed countries, Figures A3 and A4 present the marginal effects of credit expansion across different levels of bank overhead costs for the full sample and low- and lower-middle-income countries, respectively. The patterns observed reinforce the core findings: for the full sample (Figure A3), the marginal effect is generally weak and becomes positive as banking inefficiencies rise, suggesting that the inequality-reducing potential of financial development is diluted when considering a heterogeneous group of countries. For low- and lower-middle-income countries (Figure A4), the relationship is even less stable, displaying a nonlinear pattern with wide confidence intervals, indicating substantial uncertainty. These results further underscore that the theoretical mechanism outlined in Section 2 operates most clearly in institutional contexts where financial intermediation is sufficiently mature and efficient.

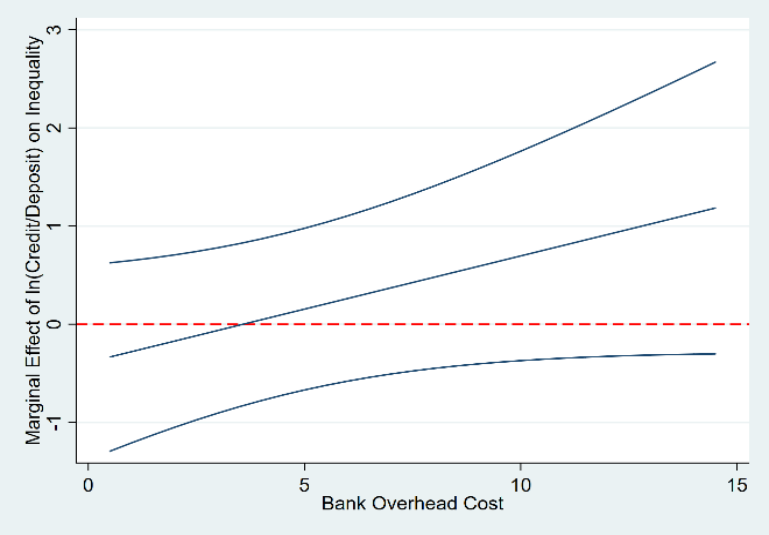

Figure A3: Marginal Effect of ln(Credit/Deposit) across Bank Overhead Cost – All Countries

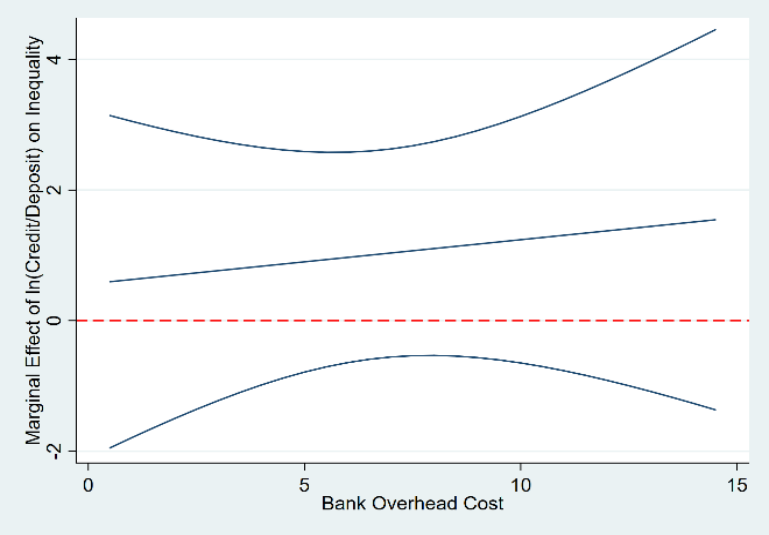

Figure A4: Marginal Effect of ln(Credit/Deposit) across Bank Overhead Cost – Low and Lower Middle-Income Countries

Appendix 2

Centered Interaction Specification and Results

Building the interaction with raw (uncentered) variables makes the main effects hard to interpret (they are evaluated at unrealistic zeros) and can inflate collinearity. To address these concerns without changing the core identification, we re-parameterize the model by mean-centering the continuous regressors before constructing the interaction, and we rebuild the IV set accordingly. This improves interpretability and mitigates non-essential multicollinearity.

We proceed in three steps. First, we subtract the sample means from the log credit-to-deposit ratio and bank overhead cost and form the interaction from these centered versions. Centering makes the main effects interpretable "at the average level of the other variable" and reduces non-essential multicollinearity; the interaction slope itself is invariant to centering. Second, we estimate country and year fixed-effects models with standard errors clustered at the country level. The control set includes log GDP per capita, inflation, and government consumption. Third, we report results for the full sample and separately for high/upper-middle and low/lower-middle income subsamples. In the IV–FE specifications, we treat the centered credit variable and its interaction with overhead as endogenous. Because country fixed effects absorb time-invariant instruments, we used interacted instruments constructed as *instrument* × *centered-overhead* terms (*natural log of latitude* × *centered overhead; legal origin* × *centered overhead*). An over-identified variant additionally uses lagged inequality as an instrument. Year effects are included in all specifications. Table A3 reports the FE-IV results for all three samples.

Table A3. Centered Credit–Overhead Interaction: Fixed-Effects and 2SLS Estimates

Dependent Variable: Gini Index (Disposable Income, post-tax, post-transfer)						
	All		**High**		**Low**	
	FE	**2SLS**	**FE**	**2SLS**	**FE**	**2SLS**
ln(Credit/Deposit)	0.034	-38.58***	-0.400	-31.86**	0.880	-72.572
	(0.421)	(12.34)	(0.425)	(14.04)	(0.879)	(107.14)
Bank Overhead	0.019	-0.265	0.029*	-0.635*	0.019	0.573
	(0.024)	(0.186)	(0.016)	(0.333)	(0.072)	(1.601)
Interaction Term	0.109*	0.694	0.14*	13.11**	0.068	-8.838
	(0.063)	(0.875)	(0.083)	(5.260)	(0.161)	(15.31)
ln(GDP per capita)	-1.87***	3.912*	-3.70***	-0.746	-0.116	3.809
	(0.674)	(2.279)	(0.796)	(3.337)	(0.905)	(6.351)
Inflation	0.005	-0.040	0.011	-0.121	0.007*	0.226
	(0.005)	(0.070)	(0.017)	(0.114)	(0.003)	(0.289)
Government Cons.	0.000	-0.302**	-0.069	-0.157	0.051	-0.266
	(0.037)	(0.144)	(0.054)	(0.250)	(0.043)	(0.499)
Constant	55.67	-	73.13***	-	43.08	-
	(5.939)	-	(7.889)	-	(6.833)	-

Table A3. Continued

Observations	2,109	1,628	1,241	997	868	631
R-squared	0.188	-	0.246	-	0.24	-
KP rk LM (p-val)	-	0.007	-	0.005	-	0.766
KP rk Wald F-stat	-	4.272	-	3.73	-	0.174
St.-Yogo 10% C.V.	-	13.43	-	13.43	-	13.43
Hansen J (p-value)	-	0.000	-	0.175	-	0.153
Countries	131	100	70	56	61	44

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively. Standard errors in parentheses. All estimations with time dummies and robust standard errors. 2SLS diagnostics include the Kleibergen-Paap rk LM statistic (KP rk LM (p-val)), the Kleibergen-Paap rk Wald F statistic (KP rk Wald F-stat), the Stock-Yogo 10% critical value (St.-Yogo 10% C.V.), and the Hansen J statistic (Hansen J p-value).

We re-estimated the model after mean-centering the continuous variables so that the main effects are evaluated at average conditions. In the high-income sample, the IV–FE results indicate that, at average overhead, a rise in credit depth (log credit-to-deposit) is associated with lower inequality. The positive interaction with overhead means this equalizing effect shrinks as banking costs rise. In other words, when intermediation is efficient (low overhead), credit looks more inclusive; as overhead grows, the same expansion in credit becomes less inequality-reducing and can become neutral or even inequality-increasing once costs are sufficiently high.

For the low/lower-middle subsample, coefficients are uniformly insignificant. In the full sample, 2SLS yields coefficients that resemble the high/upper-middle pattern; however, aside from passing the under-identification test, diagnostics are unsatisfactory, so we refrain from interpreting these estimates.

Appendix 3. Credit–Inequality Heterogeneity Across Overhead Regimes

We explored the possibility of applying a panel threshold regression in the spirit of Hansen (1999). However, this approach requires a balanced panel structure, while our dataset is inherently unbalanced. Imposing balance would have led to a substantial loss of information and a significant reduction in country coverage. We then examined alternative specifications, such as the Gonzalo and Pitarakis (2002) extension, which allows threshold models under unbalanced panels. Unfortunately, this methodology is not implemented in the econometric software available to us, and more importantly, it requires technical expertise in threshold estimation. Given these constraints, we sought an alternative way to operationalize the threshold concern. Specifically, we designed a regime-splitting strategy based on the annual cross-sectional median of bank overhead costs, which allows us to capture potential nonlinearities in the effect of credit expansion on inequality. While this approach is admittedly more limited than a full-fledged panel threshold regression, it provides a tractable and transparent way to assess whether the marginal effect of credit expansion differs across banking efficiency regimes.

Because the panel is unbalanced, instead of Hansen (1999), we implement a simple, time-varying regime split based on the annual cross-sectional median of bank overhead costs. Define

$$D_{i,t} = 1\left(Over_{i,t} \leq Median_t(over)\right)$$

So that $D_{i,t} = 1$ denotes the low-overhead/high-efficiency regime and $D_{i,t} = 0$ the high-overhead regime. This construction (i) lets the threshold move with cyclical/temporary changes in sectoral efficiency, (ii) avoids dropping observations to balance the panel, and (iii) permits heterogeneous marginal effects of credit across regimes.

Our baseline fixed-effects specification is:

$$Gini_{i,t} = \alpha + \beta_1\, ln(Cred/Dep)_{i,t} + \beta_2 Over_{i,t} +$$

$$\beta_3\left(ln(Cred/Dep)_{i,t} \times D_{i,t}\right) + \beta_j X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

where μ_i are country fixed effects, λ_t year fixed effects, and $X_{i,t}$ includes control variables, including the real GDP per capita logarithm, government consumption (as a share of GDP), and inflation. Coefficient interpretation:

β_1: effect of credit $ln(Cred/Dep)_{i,t}$ on inequality in the high-overhead regime $D_{i,t} = 0$;

$\beta_h = \beta_1 + \beta_3$: implied effect in the low-overhead regime ($D_{i,t} = 1$); we report this via the Stata command:

lincom $ln(Cred/Dep)_{i,t} + \left(ln(Cred/Dep)_{i,t} \times D_{i,t}\right)$;

We test $H_0: \beta_3 = 0$ (no regime difference) with a Wald test; the reported "*Wald (p-val)*" is the corresponding p-value.

To address the potential endogeneity of credit, we also estimate an IV–FE version treating $ln(Cred/Dep)_{i,t}$ and $\left(ln(Cred/Dep)_{i,t} \times D_{i,t}\right)$ as endogenous. The instrument set comprises the natural log of latitude, legal-origin dummies, and their interactions with $D_{i,t}$; year fixed effects are partialled out, and standard errors are clustered by country.

Table A4. Credit Expansion, Banking Efficiency Regimes, and Inequality: FE and IV–FE Estimates (Annual-Median Overhead Split)

Dependent Variable: Gini Index (Disposable Income, post-tax, post-transfer)						
	All		**High**		**Low**	
	FE	**2SLS**	**FE**	**2SLS**	**FE**	**2SLS**
ln(Credit/Deposit)	0.017	-22.74**	-0.423	-38.06	0.674	-87.378
	(0.478)	(11.55)	(0.563)	(42.18)	(0.731)	(172.92)
Bank Overhead	0.034*	-0.077	0.028**	-0.195	0.005	0.968
	(0.018)	(0.065)	(0.013)	(0.218)	(0.076)	(2.896)
Interaction Term	0.063	-8.098**	0.097	-20.57	0.533	-26.633
	(0.581)	(4.125)	(0.584)	(16.39)	(0.776)	(55.79)
Implied Effect	0.079	-30.84**	-0.327	-58.63	1.207	-114.01
	(0.534)	(13.41)	(0.451)	(53.59)	(1.191)	(222.51)
ln(GDP per capita)	-1.89***	2.316	-3.65***	4.026	-0.213	12.602
	(0.674)	(2.983)	(0.805)	(11.07)	(0.901)	(27.388)
Inflation	0.004	-0.023	0.014	-0.127	0.005**	0.358
	(0.006)	(0.080)	(0.017)	(0.197)	(0.002)	(0.837)

Table A4. Continued

Government Cons.	-0.002	-0.235	-0.072	-0.661	0.052	-0.616
	(0.037)	(0.223)	(0.054)	(1.038)	(0.043)	(1.264)
Constant	55.72***	-	72.634***	-	44.10***	-
	(5.85)	-	(7.950)	-	(6.978)	-
Observations	2,109	1,628	1,241	997	868	631
R-squared	0.185	-	0.242	-	0.241	-
Wald (p-val)	0.91	0.049	0.869	0.210	0.49	0.63
KP rk LM (p-val)	-	0.05	-	0.48	-	0.79
KP rk Wald F-stat	-	2.49	-	0.49	-	0.14
St.-Yogo 10% C.V.	-	13.43	-	13.43	-	13.43
Hansen J (p-value)	-	0.00	-	0.38	-	0.65
Countries	131	100	70	56	61	44

Note: ***, **, and * indicate that the coefficient is significant at 1%, 5%, and 10%, respectively. Standard errors in parentheses. All estimations with time dummies and robust standard errors. 2SLS diagnostics include the Kleibergen-Paap rk LM statistic (KP rk LM (p-val)), the Kleibergen-Paap rk Wald F statistic (K-Park Wald F-stat), the Stock-Yogo 10% critical value (St.-Yogo 10% C.V.), and the Hansen J statistic (Hansen J p-value).

For the full sample in the fixed-effects estimation, bank overhead is positive and significant, while $ln(Cred/Dep)_{i,t}$ and $\left(ln(Cred/Dep)_{i,t} \times D_{i,t}\right)$, and the implied effect $(ln(Cred/Dep)_{i,t} + \left(ln(Cred/Dep)_{i,t} \times D_{i,t}\right))$ are insignificant; the *Wald p-value (0.91)* indicates no regime difference. *ln(GDP per capita)* enters with a negative and economically sizable coefficient. In 2SLS for the full sample, the natural logarithm of the credit to deposit ratio and the implied effect (low-overhead regime) turn negative and significant; however, diagnostics clearly invalidate these estimates *(KP rk F=2.49 below Stock–Yogo 10% critical value 13.43; Hansen J (p-value)=0.00).* Overhead costs are inequality-increasing; we find no evidence of regime heterogeneity; any 2SLS "equalizing" effect of credit is not credible due to weak/invalid instruments.

Considering high- and upper-middle-income countries, fixed effects estimation shows overhead positive and significant, and natural log of GDP per capita negative and significant; neither the interaction nor the implied effect is significant *(Wald p=0.869)*. For high- and upper-middle-income countries. 2SLS coefficients are unstable and insignificant with severe weak-ID (*KP rk LM p =0.48; KP rk F=0.49<13.43; Hansen J p-value=0.38)*. As a result, the credit–inequality slope does not differ by regime; overhead is again inequality-increasing; IV–FE is uninformative.

For low- and lower-middle-income countries, fixed effects yields no significant impact for credit or overhead; only inflation is positive and significant. Regime difference is again rejected *(Wald p=0.49)*. For this sample, 2SLS is dominated by extreme, insignificant coefficients and very weak identification (*KP rk LM p=0.79; KP rk F=0.14<13.43; Hansen J p-value=0.65)*. one can conclude that, no robust association between credit and inequality; macro-stability (inflation) matters more in this group.