Unbalanced Financial Deepening*

Paul W. Dai† Karsten Müller‡ Emil Verner§

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Abstract

Economic development is associated with a rise in the ratio of firm credit to GDP. Novel cross-country data on the sectoral distribution of credit reveal that underlying this aggregate trend is a significant reallocation of credit from manufacturing towards the real estate sector. This reallocation substantially outpaces structural change in the real economy, suggesting a role for changing financing constraints. We provide evidence on various drivers of the asymmetric increase in firm credit to the real estate sector: a collateral channel driven by rising real estate prices, increasing reliance on intangible assets outside of real estate, and the removal of government-directed credit policies. We then document that higher manufacturing credit predicts higher long-run growth, but the opposite is true for real estate credit. These results have two implications. First, understanding the linkages between finance and economic growth depends not only on the level but also on the composition of credit. Second, financial deepening in credit markets may play a more important role in spurring growth at lower levels of development.

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†MIT, paulwdai@mit.edu.

‡National University of Singapore, Department of Finance and Risk Management Institute, and CEPR; kmueller@nus.edu.sg.

§MIT and NBER, everner@mit.edu.

1 Introduction

Financial development has long been seen as a contributor to economic growth (Schumpeter, 1911; Shaw, 1973; McKinnon, 1973). Improvements in the size and sophistication of the financial system can relax financing constraints and boost productive investment. When measuring financial deepening, empirical studies have commonly relied on the ratio of credit to the private sector relative to GDP (e.g., King and Levine, 1993; Rajan and Zingales, 1998; Arcand et al., 2015). Although this measure encompasses lending to a wide range of activities that may differ in their growth implications, the existing literature has largely overlooked how financial deepening differs across sectors, and how this heterogeneity shapes the link between credit and economic development.

In this paper, we document the highly unbalanced nature of financial deepening in credit markets over the course of economic development and investigate its link with economic growth. Our analysis uses new data on the sectoral distribution of firm credit covering 79 countries over 1970-2020 based on an updated version of the data from Müller and Verner (2024).[1] Over the course of economic development, there is an increase in the ratio of firm credit to GDP. However, underlying this aggregate trend is a reallocation of credit from manufacturing to the real estate sector that substantially outpaces structural changes in the real economy. In lower-income countries, the composition of credit is substantially tilted towards manufacturing. As countries become richer, the flow of credit towards real estate is much more pronounced than the reallocation of real activity, resulting in a large increase in the ratio of real estate credit to value added. These patterns hold both within countries over time and across countries holding fixed global time trends.[2]

To understand the potential mechanisms underlying these facts, we build a two-sector general equilibrium model featuring a manufacturing and real estate sector. The model combines financing constraints in the spirit of Kiyotaki and Moore (1997) with a workhorse supply-side structural change framework as in Ngai and Pissarides (2007). Entrepreneurs are financing-constrained, and sectors differ in total factor productivity (TFP) and their reliance on collateral. Real estate has a dual function: it is used both for production and as collateral. As such, structural transformation in credit and economic activity can be driven

[1] In this paper, we focus entirely on the study of *firm* credit as opposed to household credit. By financing investment and firm creation, firm credit likely plays a more important role in understanding the connection between finance and long-run growth, as highlighted by Beck et al. (2012). Existing work by Jordà et al. (2016) and Müller and Verner (2024), among others, shows that there has been a secular increase in household credit to GDP, especially in advanced economies.

[2] Before proceeding, we note that our data also reveal interesting patterns for agriculture and services. We focus primarily on manufacturing and real estate because credit to these sectors has seen by far the largest changes, both over time and over the course of development, consistent with observations in popular discussions such as Turner (2016).

both by real forces and changes in financing constraints.

The main result from our framework is that, without changes in financing constraints, the reallocation of credit from manufacturing to real estate will only mirror that observed in the real economy. A rise in manufacturing sector TFP leads to higher demand for residential housing and real estate collateral, which drives up real estate prices in equilibrium. If the manufacturing good and residential housing are complements in household consumption, then output migrates from manufacturing to real estate as countries become richer, as in Ngai and Pissarides (2007). To match the fact that credit deepening across sectors outpaces structural change in the real economy, the model requires a relaxation in financial constraints that govern how much firms can borrow for one dollar of collateral value. Through the lens of the model, our empirical finding of unbalanced financial deepening thus implies heterogeneous changes in financing constraints across sectors as countries develop.

Guided by the model, we provide three pieces of empirical evidence that financial frictions contribute to unbalanced credit deepening across sectors. First, we present evidence on the role of a collateral channel via rising real estate prices. The real estate sector relies more on real estate inputs than manufacturing, and this difference becomes more pronounced as countries become richer. Not surprisingly, real estate firms are thus more reliant on credit secured by real estate. Moreover, we show that the elasticity of credit growth to house price shocks is higher in real estate relative to manufacturing. Because real estate prices tend to rise with economic development, collateral constraints become less binding in real estate relative to manufacturing, contributing to a disproportionate rise in real estate credit.

Second, we present evidence that an increase in the reliance on intangible capital in the manufacturing sector contributes to a reallocation of credit towards real estate. Manufacturing in higher-income countries relies considerably more on intangible assets. The same is not true for real estate (and less true for services). In addition, the elasticity of credit growth is much higher for shocks to tangible relative to intangible capital. Because intangible assets are harder to redeploy and liquidate, their increasing share in the manufacturing sector's assets may thus decrease pledgeability, contributing to a reallocation of credit away from manufacturing (Dell'Ariccia et al., 2021; Falato et al., 2022). Credit thus plays a more important role in financing the build-up of tangible assets in manufacturing at lower levels of development, but less of a role in financing the intangibles-intensive activities that are drivers of growth at high levels of development.

Third, we examine the role of government-directed credit policies in shaping credit allocation. Many governments have historically steered credit into "priority" sectors, especially to manufacturing, as part of an industrial policy agenda. Some of the most prominent examples are the East Asian "growth miracles," although directed credit policies were also widely used in countries such as France and the United Kingdom. To understand the role of government policies in shaping the allocation of credit, we construct a new narrative-based chronology of directed credit liberalization events for 37 countries from a wide range of primary and secondary sources. Because these policies generally aim to subsidize manufacturers and prevent excessive lending for real estate purposes, we interpret liberalizations as shocks to sector-specific financing constraints.

We find that the liberalization of directed credit policies is followed by an increase in total firm credit, along with a reallocation of credit and output from manufacturing to real estate. The relative increase in real estate credit exceeds the increase in output, resulting in a rise in the ratio of real estate credit to output. This suggests that policies affecting financing constraints can accelerate structural transformation in credit and output, even in the absence of technology shocks. These findings illustrate that the shift away from directed credit policies has contributed to the rapid rise of real estate credit.

In the final part of the paper, we provide evidence that the unbalanced nature of financial deepening matters for understanding the linkages between finance and economic growth. A recent theoretical literature argues that the manufacturing sector tends to be highly productive and may potentially generate positive externalities for aggregate productivity growth (Benigno et al., 2020; Hirano and Stiglitz, 2024). Real estate, on the other hand, may not generate these growth benefits and may contribute to increased misallocation and a higher risk of financial crisis (e.g., Brunnermeier and Reis, 2023). Excessive real estate financing may thus lead to "too much of the wrong kind of debt" (Turner, 2016), diverting credit from productive investment and leaving the economy with "too many buildings and too few machines" (Rajan, 2013). According to this view, one should expect financial deepening in manufacturing to be more strongly associated with future growth than financial deepening in real estate.

We show empirically that a higher level of manufacturing credit to GDP robustly predicts future growth in real GDP per capita. Thus, financial deepening benefiting the manufacturing sector is indeed associated with higher growth. However, we find the opposite pattern for real estate credit. The magnitudes are sizable. A one standard deviation increase in manufacturing (real estate) credit to GDP predicts 1.1% higher (3.5% lower) growth over the subsequent five years. These patterns hold after carefully controlling for the level of economic development, structural change in real activity, and global shocks. They are also robust to various specification choices, such as measuring credit allocation using each sector's share in total firm credit or estimating the predicted path of real GDP to innovations in sectoral credit growth using local projections. These empirical results are reinforced by case studies illustrating these patterns.

The heterogeneous relationship between sectoral financial deepening and future growth has several implications. Most directly, it is not only the level but also the composition of financial deepening that matters for understanding long-run growth. Moreover, while economic development is associated with a large reallocation of credit to real estate, this reallocation is robustly related to weaker future growth. Financial deepening may thus play a more important role in facilitating growth at lower levels of development by financing productive investments in manufacturing. At higher levels of development, in turn, financial deepening through credit markets may matter less for growth. At least in part, this is because credit predominantly finances real estate rather than specialized activities based on intangible assets that are more central to growth when countries are already highly developed. Our results thus also provide an explanation for why financial deepening is only associated with higher growth up to a point (Cecchetti and Kharroubi, 2012; Arcand et al., 2015).

Related Literature Our paper contributes to three strands of literature. First, our paper connects with the large literature on financial deepening and economic growth. Over a century ago, Schumpeter (1911) argued that credit plays a vital role for economic growth by enabling entrepreneurs to finance innovation. Building on this idea, empirical work has found that overall credit deepening is positively associated with economic growth (King and Levine, 1993; Jayaratne and Strahan, 1996; Levine, 1997; Beck et al., 2000; Levine et al., 2000), in particular for industries reliant on external financing (Rajan and Zingales, 1998). A complementary theory literature builds models of how improvements in the financial system can contribute to economic development (e.g., Townsend, 1983; Greenwood and Jovanovic, 1990; Greenwood et al., 2010). Financial development allows for greater use of external finance (Buera et al., 2011; Midrigan and Xu, 2014), which can reallocate from production toward more productive entrepreneurs (Feng and Ren, 2023), reducing misallocation (Hsieh et al., 2019) and boosting TFP (Moll, 2014; Howes, 2022).

We make several contributions to the literature on finance and growth. To the best of our knowledge, we are the first to document the highly heterogeneous nature of financial deepening in firm credit. Over the course of economic development, credit disproportionately expands toward activities with more easily collateralizable assets, such as real estate. Moreover, our paper provides new evidence that the relation between finance and long-run growth depends on what is being financed. This meshes with work by Beck et al. (2012) showing that the ratio of firm credit to GDP is more predictive of future growth than that of household credit to GDP. Our study thus also relates to work questioning whether financial deepening always boosts growth (Rodrik and Subramanian, 2009; Cecchetti and Kharroubi, 2012; Arcand et al., 2015) and to the literature showing that rapid expansions in credit predict financial crises and growth slowdowns, especially when credit finances households and firms in the nontradable sector (e.g., Büyükkarabacak and Valev, 2010; Schularick and Taylor, 2012; Jordà et al., 2016; Mian et al., 2017, 2020; Müller and Verner, 2024). Our findings suggest that the allocation of credit is crucial for understanding both credit cycles and the link between credit and long-run growth.

Second, our paper relates to the large literature on structural change in the real economy over the course of economic development (Lewis, 1954; Rybczynski, 1955; Kuznets, 1957, 1973). This literature seeks to understand the reallocation of activity from agriculture to manufacturing and then to services as countries develop (Herrendorf et al., 2014; Gollin and Kaboski, 2023). Previous research has proposed several mechanisms to account for these canonical "Kuznets facts," but has not considered the role of financial factors.[3] We contribute to this literature by documenting new facts about structural changes in credit over development, which speaks to the role of finance. We show that, while structural changes in credit are correlated with real activity, they cannot be fully explained by changes in real activity. On the modeling side, we build on supply-side structural change frameworks that emphasize productivity growth in the manufacturing sector as a central driver. Our framework introduces financing constraints, allowing us to decompose real and financial factors in structural changes in the credit market. The model highlights the role of rising collateral prices and changes in financial constraints in the reallocation of financing across sectors.

Finally, our paper relates to work on government-directed credit policies. Buera et al. (2011) and Itskhoki and Moll (2019) provide case studies discussing the role of subsidies in credit and other inputs in the East Asian growth miracles. We expand this evidence by constructing a new chronology of liberalizations of directed credit policies. We show that these policies primarily channel credit toward the manufacturing sector, so the abolition of these policies is associated with a considerable shift towards real estate lending. This evidence indicates that some policymakers believe that the allocation of credit matters for growth, at least at earlier stages of development.[4] These findings are relevant in light of

[3]Among others, the proposed theoretical channels include differences in sectoral productivity growth rates (Baumol, 1967; Ngai and Pissarides, 2007; Duarte and Restuccia, 2010), non-homothetic preferences (Kongsamut et al., 2001; Herrendorf et al., 2013; Boppart, 2014; Comin et al., 2021), and differences in sectoral capital intensity along with capital deepening (Acemoglu and Guerrieri, 2008).

[4]For other evidence on directed credit policies or credit ceilings, see, among others, Baron and Green (2023), Bezemer et al. (2021), and Werner (2002, 2005). Relative to these papers, we systematically estimate the impact of credit policy on sectoral credit and real activity.

renewed interest in industrial policies to shape the allocation of credit and real activity toward manufacturing and other high-tech sectors (e.g., Juhász et al., 2024; Cesa-Bianchi et al., 2026).

Roadmap The paper is structured as follows. Section 2 presents our novel facts on the unbalanced nature of financial deepening. Section 3 presents a model to elucidate the role of real and financial factors in driving heterogeneous structural changes in credit markets. Section 4 presents reduced-form evidence on drivers of the reallocation of credit from manufacturing to real estate over development. Section 5 discusses the role of government interventions in credit markets. Section 6 briefly discusses some alternative demand-side explanations for sectoral heterogeneity in financial deepening. Section 7 documents heterogeneity in the linkage between financial deepening and future growth, and Section 8 concludes.

2 Stylized Facts

2.1 Data

We build a cross-country dataset with information on credit, value added, and employment by broad economic sectors for 79 countries from 1970 to 2020. Our data on the sectoral composition of credit come from the *Global Credit Project* (Müller and Verner, 2024). This is a large cross-country database that breaks down outstanding credit in the economy into different sectors, a breakdown that is not available from other sources. The data underlying the *Global Credit Project* are drawn from hundreds of scattered sources, including statistical publications, data appendices from central banks, and newly-digitized archival data. This paper leverages an updated and expanded version of the dataset that now extends to 2020. We refer the interested reader to Müller and Verner (2024) for more details.

In our dataset, credit refers to the end-of-period outstanding claims of financial institutions on the domestic private sector. In most cases, credit refers to domestic bank loans, similar to what is captured by the International Monetary Fund's (IMF) "Other Depository Corporations Survey" published in the International Financial Statistics, or the "Credit to the Non-Financial Sector" time series published by the Bank for International Settlements (Dembiermont et al., 2013). As shown in Müller and Verner (2024), total credit to the non-financial sector in our data matches the aggregates from the IMF's International Financial Statistics.

The data do not systematically capture corporate bonds, although bonds are sometimes held by the financial institutions surveyed in the compilation of these credit statistics. In robustness exercises, we thus add estimates of bond debt by sector to the baseline sectoral credit measures. To estimate outstanding bond debt, we draw on bond-level data from SDC Platinum that include each bond's precise issuance and maturity date. Because we do not have complete data on defaults and early repayments, we calculate three versions of outstanding corporate bond debt under varying assumptions: (i) *repayment in full*, assuming bonds are never called or defaulted on, (ii) *noncallable only*, assuming no default but that callable bonds are called immediately after issuance, and (iii) *hybrid*, assuming bonds are partially repaid or defaulted on according to the average repayment in the United States extracted from Ma et al. (2023).

We complement the sectoral credit data with a sectoral dataset on value added and employment. To maximize the sample coverage, we carefully combine data from EU KLEMS, Groningen Growth and Development Center, UN, UNIDO, OECD STAN, World Input Output Database, and the Economic Commission for Latin America and the Caribbean.

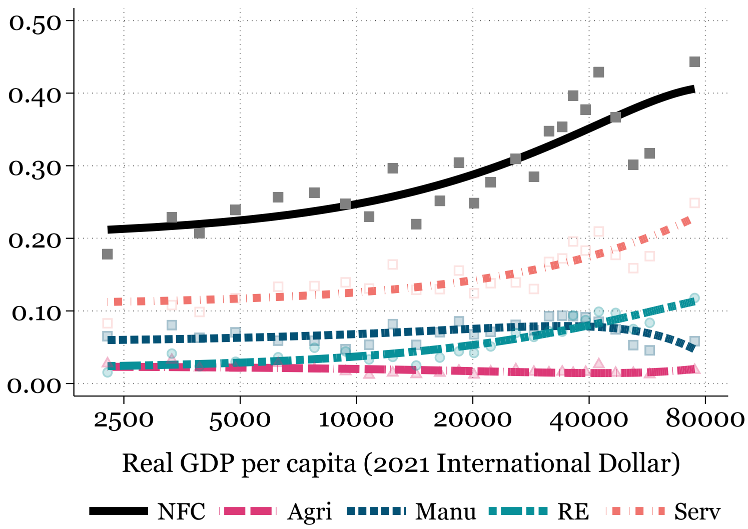
Because we are interested in the broad patterns of structural changes in credit and real activity, we aggregate the industry-level data into four sectors based on the International Standard Industrial Classification of All Economic Activities Revision 4 (ISIC Rev. 4): agriculture (section "A"); mining and manufacturing ("B" and "C"); construction and real estate ("F" + "L"); and services (all other industries). For simplicity, we will refer to manufacturing and mining simply as "manufacturing" and to construction and real estate as "real estate." We note that mining is a small share of outstanding credit in almost every country. We then compute the share of each sector in outstanding non-financial corporate credit, value added, and employment following the existing literature (see Herrendorf et al., 2014). We also compute the ratio of credit to value added for each sector, as well as the ratio of sectoral credit relative to aggregate GDP. For our main analysis, we restrict our sample to country-year observations with non-missing credit shares for consistency. This sample contains 79 countries and 2131 country-year observations, ranging from 1970 to 2020. Table C.1 provides the list of countries and years in the sample.

2.2 Heterogeneous Financial Deepening

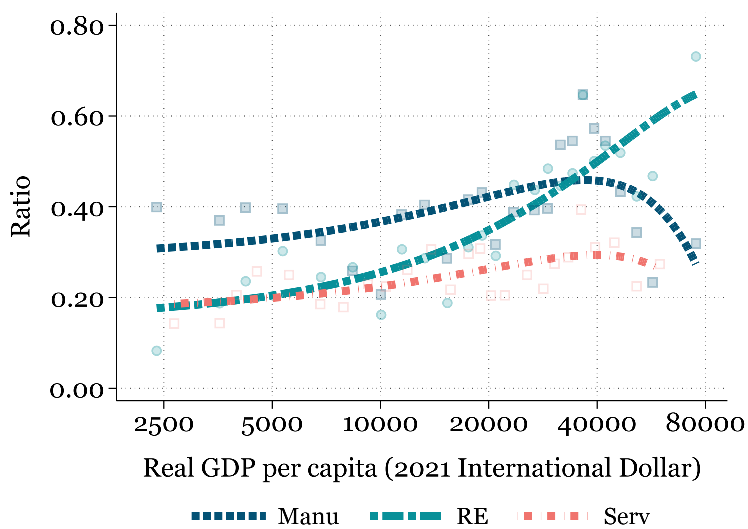
Figure 1a shows a binned scatter plot of the ratio of credit to the non-financial corporate (NFC) sector relative to GDP against income. Income is measured by real GDP per capita in 2021 USD PPP. We also include a quadratic fitted trend line to ease interpretation. The positive slope shows that economic development is associated with a rise in firm credit-to-GDP, a process often called "financial deepening" (Goldsmith, 1969; Shaw, 1973; McKinnon, 1973; Levine, 1997). On average, credit to firms rises from less than 20% of GDP for low-income countries to around 40% of GDP for high-income countries.

Figure 1: Credit Deepening and Development

(a) Non-Financial Firm Credit-to-GDP



(b) Sectoral Credit-to-VA



Note: These figures shows binned scatter plots with quadratic fitted lines. Panel (a) presents total non-financial corporate (NFC) credit to GDP and sectoral credit to GDP. Panel (b) shows sectoral credit-to-value added ratios during the course of economic development (measured by real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale).

Figure 1a also shows sectoral credit relative to GDP for our four broad sectoral categories. The sum of the four categories relative to GDP equals total NFC credit to GDP. The increase in sectoral credit to aggregate GDP varies considerably across industries. Credit to real estate exhibits a clear rise over the course of development, from a negligible fraction of GDP to over 10% of GDP. As a result, real estate goes from being the smallest sector in terms of credit to the second largest. Manufacturing credit to GDP is more stable over the course of development, but declines at high levels of development. Credit to services is the largest component and also rises relative to GDP over development. Finally, credit to agriculture is relatively small compared to GDP throughout.

2.3 Structural Change in Credit and the Real Economy

At least since Lewis (1954), Rybczynski (1955), and Kuznets (1957, 1973), we know that economies shift from agriculture to manufacturing and then to services over development. Herrendorf et al. (2014) and Gollin and Kaboski (2023) provide surveys on this pattern of structural transformation. Can the pattern of heterogeneous financial deepening across different industries be explained by structural transformation in the real economy?

Figure 2 shows that unbalanced financial deepening does not simply mirror structural change in the real economy. The figure presents binned scatterplots of the share of each sector in credit, value added, and employment against income levels. Before turning to credit, we note that our data replicate the canonical "Kuznets facts" on structural transformation in the real economy. As countries become richer, the share of agriculture in employment and value added declines, the share of manufacturing first increases and then declines, and the share of services increases (Kuznets, 1973).

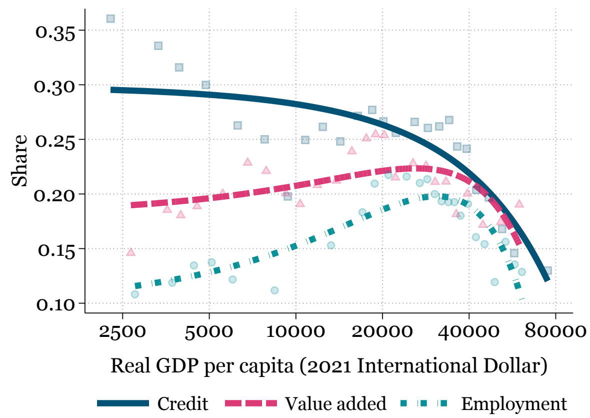
Structural changes in the credit market exhibit two important differences relative to the real economy. First, in less developed economies, manufacturing receives a disproportionately large share of firm credit, well above its contribution to employment or value added. But as countries grow richer, the share of credit going to manufacturing falls much faster than its share of the real economy. Second, as manufacturing credit declines, real estate credit rises sharply—much more than the real estate sector's increase in value added or employment would suggest. In high-income countries, real estate represents a far larger share of firm credit than of value added or employment.

Figure 1b shows that these differences in structural transformation in finance and real activity also translate into credit-to-value added ratios. In particular, the ratio of credit to value added increases sharply for real estate over the course of development. Richer countries do not just have more real estate; they also have a more "leveraged" real estate industry. Real estate thus also accounts for a disproportionate share of banking sector assets in high-income countries. In contrast, credit-to-VA in manufacturing rises gradually over development and then declines markedly in high-income countries.

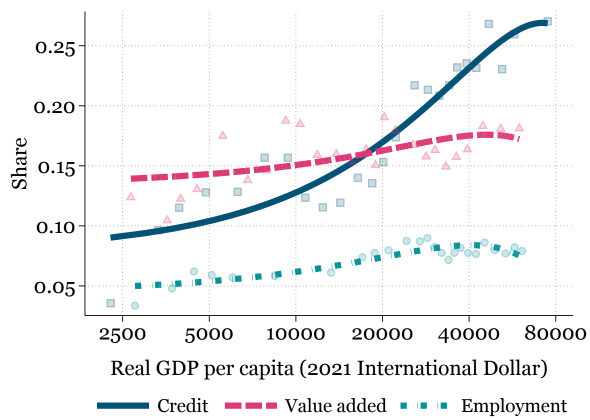
What about other sectors? As income rises, agriculture's share of employment and value added falls sharply. Credit to agriculture, however, is a small share of overall firm credit throughout the development process, at least in part because small scale farmers are

Figure 2: Structural Change in Credit Markets and the Real Economy

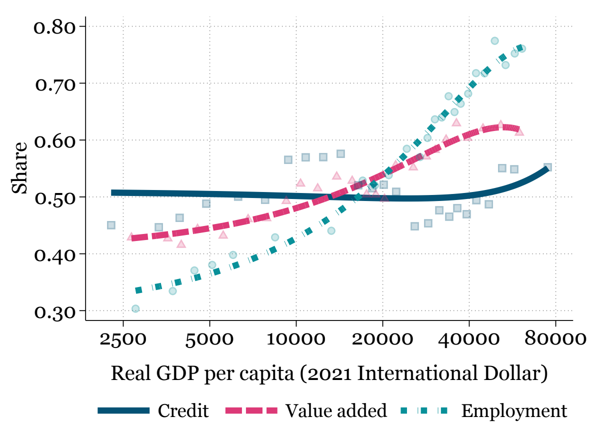
(a) Manufacturing



(b) Real Estate



(c) Services



Note: These binned scatter plots with quadratic fitted lines visualize the share of different sectors in outstanding non-financial corporate credit, value added, and employment over the course of economic development (measured by real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithmic scale).

usually counted as households in credit statistics.[5] Services display a rapid rise in value added and especially employment over development. However, credit to services remains relatively stable as a share of total credit. Thus, the credit-to-value added ratio shows only a modest positive correlation with income levels. Because the dramatic shifts in credit allocation are concentrated in manufacturing and real estate, the remainder of the paper thus focuses primarily on these sectors.

We find similar patterns when looking at changes over time rather than income levels. In Appendix Figures B.1 and B.2, we show that credit to the real estate sector has risen in importance over time (relative to value added), and the opposite pattern for manufacturing. This adds nuance to the well-known fact that the ratio of total credit to the private sector relative to GDP has increased over time (Schularick and Taylor, 2012; Müller and Verner, 2024). The rise in firm credit extended for real estate purposes we document here mirrors the rise in household credit, much of which is also backed by real estate collateral (Jordà et al., 2016; Mian et al., 2017; Müller and Verner, 2024).

Importantly, however, unbalanced financial deepening is not simply driven by time trends. Figures B.3 and B.4 show that the basic patterns are robust to controlling for country and time fixed effects. Moreover, Figure B.5 reveals a similar pattern using only cross-country variation by taking within-country averages. Both exercises show that, as countries become richer, real estate credit exhibits a sharp rise relative to value added, while the opposite is true for manufacturing. Therefore, the pattern of unbalanced financial deepening cannot be explained solely by global trends, such as falling interest rates. In the Figure B.6, we further show that the results are similar when accounting for bond issuance. This is consistent with the fact that bond financing plays a relatively modest role in the vast majority of countries in the sample.

In sum, financial deepening in credit markets is highly uneven across sectors. It is driven disproportionately by a rise in credit to firms in real estate, especially at higher income levels. This surge cannot be explained by structural change in the real economy, as the shifts in credit are substantially larger than those in employment or value added. Consequently, as countries develop, the credit-to-value-added ratio increases sharply in real estate, but it declines in manufacturing. Any theory seeking to explain these patterns thus has to match the fact that the sectoral composition of credit varies far more with income than the underlying real allocations.

[5] For this reason, we also omit the credit-to-value added ratio for agriculture from Figure 1b, because we believe it might be misleading.

3 Model

To understand the potential drivers of the unbalanced financial deepening documented in Section 2, we build a two-sector general equilibrium model with a manufacturing and real estate sector. The key innovation of our model is that we integrate a collateral constraint similar to Kiyotaki and Moore (1997) into a workhorse model of supply-side structural change (Ngai and Pissarides, 2007). Real estate serves both as a production input and collateral.

The model clarifies that the evolution of sectoral credit and real activity over development can be driven by both real economic forces (heterogeneous productivity growth) and financial forces (financial deepening through relaxation in financing constraints or changes in collateral usage). However, unbalanced financial deepening can only be driven by financial forces. We use the model to provide analytical comparative statics that isolate the role of each of these channels in explaining the sectoral allocation of credit and output over the development process.

3.1 Setup

Time is discrete and runs infinitely. A closed economy is populated by savers (denoted by H), manufacturing entrepreneurs, and real estate entrepreneurs (denoted by M and E).[6]

Preferences Agent i consumes the manufacturing good c_t^i and housing service h_t^i each period, maximizing the life-long discounted utility

$$\sum_{t=0}^{\infty}(\beta^i)^t\left[(c_t^i)^{\frac{\eta-1}{\eta}}+s(h_t^i)^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}, \tag{1}$$

where s is the weight of the housing service in the consumption bundle, and η is the elasticity of substitution. We assume savers are more patient than entrepreneurs, and entrepreneurs have the same discount factor $\beta=\beta^M=\beta^E$.

Entrepreneurs The entrepreneur in sector j with productivity z_t^j operates a firm using commercial land l_t^j as an input. The production function is given by $y_t^j=z_t^j(l_t^j)^{\alpha^j}$, with a

[6] As a convention, we index entrepreneurs or sectors using $j\in\{M,E\}$, and index agents, including savers and entrepreneurs, using $i\in\{S,M,E\}$.

sector-specific collateral input share $\alpha^j < 1$.[7] In each period, her flow of fund constraint is

$$c_t^j + q_t h_t^j + q_t \left[l_{t+1}^j - (1-\delta) l_t^j \right] + d_t^j = p_t^j y_t^j + \frac{d_{t+1}^j}{1+r_t}, \tag{2}$$

where q_t is the price of collateral or residential housing, r_t is the real interest rate, and δ is the depreciation rate. In each period, she earns the profit $p_t^j y_t^j$, raises new debt in real terms $\frac{d_{t+1}^j}{1+r_t}$, pays back the last period debt d_t^j, and invests in commercial land $l_{t+1}^j - (1-\delta) l_t^j$ at price q_t. On the consumption side, she consumes the manufacturing good c_t^j and residential housing service h_t^j.[8] Manufacturing output is the numeraire with $p_t^M = 1$, and the price of real estate is denoted as $p_t^E = q_t$.

The maximum amount of debt raised by the entrepreneur d_{t+1}^j is proportional to the resale value of the current period's collateral value $q_{t+1} l_{t+1}^j$ and is given by

$$d_{t+1}^j \le \lambda q_{t+1} l_{t+1}^j. \tag{3}$$

This financial constraint is similar to Kiyotaki and Moore (1997), which parsimoniously captures a costly contract enforcement scenario. In reality, λ may change due to factors such as stronger creditor rights (Djankov et al., 2007), improved property rights (Besley and Ghatak, 2010; Manysheva, 2022), directed credit policies (Buera and Shin, 2013; Itskhoki and Moll, 2019), or general financial development (e.g., Rajan and Zingales, 1998; Liu et al., 2013). We also consider the possibility that λ varies differentially across sectors ($\lambda^M \neq \lambda^E$). The assumption that savers are more patient implies that the collateral constraint is binding in the steady state for each sector. In steady state, savers provide credit elastically, pricing it at $r = 1/\beta^S - 1$.

Rest of the Model The saver consumes c_t^S and h_t^S and saves $\frac{b_{t+1}}{1+r_t}$, i.e., $c_t^S + q_t h_t^S + \frac{b_{t+1}}{1+r_t} = b_t$. The manufacturing good is consumed, $y_t^M = \sum_i c_t^i$. Real estate output is invested by entrepreneurs as collateral or consumed by agents as residential housing service each period. The market clearing condition for the real estate good, $y_t^E = \sum_i h_t^i + \sum_j [l_{t+1}^j - (1-\delta) l_t^j]$, determines the equilibrium collateral price q_t. The financial market clears with $b_{t+1} = \sum_j d_{t+1}^j$.

[7] We assume there is only one factor to highlight our analytical results; in the appendix, we expand the production function to include labor and capital.

[8] Residential housing service is a *flow* variable. Thus, real estate output can be converted into a flow consumption variable or a stock of new real estate collateral. This formulation is analogous to the resource constraint in the neoclassical growth model, where output can be converted into consumption or new capital.

3.2 Model Predictions

We evaluate the model at its steady state equilibrium and conduct comparative statics of the sectoral allocation of credit and output with respect to sectoral productivity, financial constraints, and collateral input shares. All derivations and proofs are provide in Appendix D.[9] Here, we summarize the key predictions that we use to guide our empirical analysis.

Real Factors We start by considering the impact of changes in sectoral productivity. Economic development is associated with rising manufacturing sector productivity z^M. The impact of higher manufacturing productivity is summarized in the following result:

Prediction 1 (Sectoral Productivity)**.** *Holding all else equal, an increase in z^M leads to*

(1) an increase in the relative output share qy^E/y^M and the relative credit share d^E/d^M if $\eta < 1$;

(2) an increase in the collateral price q.

The first part of this result implies that an increase in manufacturing productivity has a similar effect on structural change in credit and the real economy. A rise in manufacturing TFP leads to structural change as follows. As countries develop, productivity growth in manufacturing raises the price of collateral, as collateral becomes relatively scarce. When the elasticity of substitution between manufacturing and housing services is below one ($\eta < 1$), the empirically relevant case, the share of consumption expenditure on housing also increases. As a result, resources and credit are reallocated from the faster-growing manufacturing sector to the stagnant real estate sector, an analogue of Baumol's cost disease. From this perspective, structural change in the credit market simply mirrors structural change in the real economy, driven by changes in sectoral productivity. Prediction 1 thus captures the intuition in supply-side structural change models (Ngai and Pissarides, 2007). As in standard supply-side structural change models, if $\eta = 1$ (Cobb-Douglas preferences), a rise in z^M has no effect on sectoral credit and output shares.

The rise in the collateral price plays a key role in the reallocation of credit to real estate. A rise in the price of real estate collateral has an asymmetric effect on the manufacturing and real estate sectors. In the model, the entrepreneur equalizes the marginal benefit and user cost of collateral,[10] choosing

$$l^E = (\alpha^E z^E \widetilde{\lambda})^{\frac{1}{1-\alpha^E}}, \quad l^M = (\alpha^M z^M \widetilde{\lambda}/q)^{\frac{1}{1-\alpha^M}}, \tag{4}$$

[9] The appendix also considers various generalizations: allowing for both asset and cash-flow based financing, including (intangible) capital and labor in production, and allowing for non-homothetic demand.

[10] The marginal benefit of collateral usage comes from two terms: (1) the marginal revenue product of collateral, and (2) the marginal benefit of relaxing the flow of fund constraint due to more collateral.

where $\widetilde{\lambda} \equiv \frac{\beta}{1-\beta(1-\delta)-\lambda(\beta^S-\beta)}$ and is increasing in λ. Equation (4) shows that l^E does not vary with the collateral price q, while l^M *decreases* with q. The intuition is that, for the real estate sector, a higher q has offsetting effects on both revenues and costs. However, in the manufacturing sector, a higher q only increases the user cost of collateral and thus depresses demand for it. Combining Equation (4) with the binding collateral constraints in Equation (3), the elasticity of sectoral credit d^j with respect to the collateral price q is given by

$$\varepsilon^j_{dq} \equiv \frac{\partial \log d^j}{\partial \log q} = 1 + \frac{\partial \log l^j}{\partial \log q} = \begin{cases} 1 & \text{if } j = E, \\ -\frac{\alpha^M}{1-\alpha^M} & \text{if } j = M. \end{cases} \tag{5}$$

This partial equilibrium comparative static implies that an increase in the price of collateral has an *asymmetric* effect on credit growth in different sectors. In the real estate sector, a 1% increase of q leads to a 1% increase in credit. For manufacturing, higher real estate prices do not increase revenues and thus discourage the use of collateral by $\frac{1}{1-\alpha^M}$%, implying that the manufacturing sector borrows less in response to a rise in the collateral price. Thus, the rise in the collateral price from an increase in manufacturing productivity mediates the reallocation of credit and real activity to the real estate sector.

Financial Factors We next consider the impact of changes in financial factors on the allocation of credit and real activity.

Prediction 2 (Financial Factors)**.** *Holding all else equal, both the relative output shares qy^E/y^M and relative credit shares d^E/d^M*

(1) ***(Financial Development)*** *increase with λ if $\eta = 1$ and $\delta > 0$;*

(2) ***(Collateral Input Share)*** *increase with α^E if $\eta = 1$ and $\delta > 0$.*

In Prediction 2 we purposefully shut down the role of real supply-side structural change by setting $\eta = 1$ (Cobb-Douglas preferences), so a sector's share in credit and output does not depend on its TFP. This result implies that financial factors can lead to structural transformation in credit and output, even in the absence of changes in real factors (sectoral productivity).

The first part of Prediction 2 implies that financial deepening through a relaxation in the aggregate financing constraint λ shifts output to the real estate sector. When financing constraints loosen, there is an increase in demand for collateral. This generates an increase in the price of collateral, which leads to a relatively larger size of the real estate sector.

In the credit market, an increase in λ boosts debt capacity in both sectors, but more so in real estate when it has a higher collateral input share α^j, the empirically relevant case, as we show below. Financial deepening thus leads to structural change from manufacturing to real estate in both credit and output. We stress that this reallocation occurs even for a *symmetric* relaxation in the financing constraint λ. Not surprisingly, if financing constraints relax more for the real estate sector ($\Delta\lambda^E > \Delta\lambda^M$), then the reallocation of credit and real activity to real estate will be even more pronounced than for a common increase in λ.

In addition, Prediction 2 implies that increasing the collateral input share in the real estate sector, α^E, will also lead to a reallocation towards real estate output due to increasing collateral demand. For structural change in the credit market, a higher α^E boosts the real estate sector's debt capacity even if there is no change in the financial constraint parameter λ.

So far, Predictions 1 and 2 imply that real factors (sectoral productivity growth) and financial factors (relaxation of financial constraints or changes in real estate input shares) *in isolation* are sufficient to generate a reallocation of resources from manufacturing to real estate, both in terms of credit and output. However, the next key insight from the model is that any *differential* structural change between credit and the real economy must be explained by financial factors through changes in λ or α^j.

Prediction 3 (Differential Real and Financial Structural Change)**.** *Any differential change in* qy^E/y^M *and* d^E/d^M *must come from changes in* λ *or* $\{\alpha^j\}$.

To understand the intuition for this result, we can compute a sector's ratio of credit to valued added as

$$\kappa^j \equiv \frac{\lambda q l^j}{p^j y^j} = \alpha^j \lambda \widetilde{\lambda}.$$

A sector's financing constraint is jointly determined by its collateral input share α^j and economy-wide financing constraints λ, but it does not depend on sectoral TFP. If real estate is more reliant on real estate collateral than manufacturing ($\alpha^E > \alpha^M$), a rise in λ will lead to a larger rise in credit-to-value added in real estate. Thus, *only* financial factors can explain why we see differences in structural change in credit and output. Moreover, financial deepening will lead to a larger increase in leverage in sectors more reliant on real estate collateral.

3.3 Quantitative Exercise

Predictions 1 and 2 highlight how structural change in credit and the real economy can be affected by three separate mechanisms in isolation: (i) sectoral asymmetries in productivity growth, (ii) changes in financing constraints, and (iii) changes in the intensity of collateral inputs. To quantitatively understand the relative importance of these mechanisms, we calibrate an extended version of the model. Appendix E provides the results from this quantification exercise.[11]

This exercise reveals that manufacturing TFP (z^M) increases with income levels (Figure E.1). In contrast, real estate sector TFP remains stagnant, albeit at an elevated level. This is consistent with the comparative statics considered in Prediction 1 and with empirical evidence from Goolsbee and Syverson (2023). An additional important finding is that variation in the real estate sector's collateral input share α^E, along with a common rise in λ, fail to generate sufficient changes in sectoral credit-to-value added relative to the empirically observed patterns in Figure 1b. We thus allow for *sector-specific* financial constraint parameters $\{\lambda^j\}_{j\in\{M,E\}}$ in the model. Appendix Figure E.1 suggests that financial constraints in the real estate sector λ^E indeed loosen considerably with higher income. The real estate financial constraint is about 3.48 times more relaxed in the richest countries compared to the poorest. In contrast, the manufacturing constraint loosens at early stages of development, but not thereafter. Thus, moving from low to high-income countries, the largest relaxation in financing constraint occurs in the relatively stagnant real estate sector, rather than the high-growth manufacturing sector. When allowing for sector-specific financing constraints, the model matches the key empirical patterns on structural change in output and credit, including the rise in the real estate credit share, the real estate output share, and the collateral price (see Appendix Figure E.2).

To quantify the importance of different channels in Predictions 1 and 2, we also conduct a development accounting exercise in the spirit of Caselli (2005) (see Appendix Table E.1). Our results reveal that changes in financial constraints explain about 67.3% of structural changes in credit. Changes in the real estate sector's collateral input share accounts for 4.0%, and the remaining 29.1% are driven by differences in real factors (productivity growth). The unbalanced financial deepening we document thus requires an understanding of the relative relaxation of real estate financing constraints.

3.4 Taking Stock

What could give rise to the unbalanced financial deepening we document in Section 2.1? The tractable framework outlined here suggests that both real and financial factors can generate a reallocation of credit and output towards real estate, but that financial factors are critical for explaining the disproportionate changes in credit.

[11]The extended model in Appendix F incorporates (i) labor as a production input and (ii) manufacturing-produced capital as additional collateral. The calibration procedure is outlined in Appendix E.1.

First, the model suggests that if the real estate sector is more reliant on collateral, it will disproportionately benefit from financial deepening. Moreover, an *increase* in the real estate sector's collateral input share leads to a reallocation of credit towards the sector. We will empirically study sectoral differences in collateral inputs and collateral-based financing in Section 4.1.

Second, the model highlights a productivity channel of structural change that can also affect the credit market through a rise in collateral prices. In particular, rapid manufacturing productivity growth should lead to a rise in real estate prices. Rising real estate prices, in turn, lead to a larger increase in credit for real estate. These two hypotheses will be tested empirically in Section 4.2.

Third, the model underscores the important role of changes in financial constraints. Section 4.3 provides evidence that the rise of intangibles in manufacturing, but not real estate, could erode the sector's asset pledgeability λ^M. This can lead to a reallocation of credit towards real estate that cannot be explained by productivity changes. Section 5 argues that government directed credit policies can be determinants of sectoral financing constraints. We provide evidence that the liberalization of directed credit policies, which we interpret as negative shocks to the manufacturing sector's constraints, λ^M, and positive shocks to real estate financing constraints, λ^E, are associated with a reallocation towards real estate.

4 Mechanisms of Unbalanced Financial Deepening

In this section, we provide reduced-form evidence on financial factors that can explain unbalanced financial deepening. Our analysis is guided by the theoretical predictions from the previous section. We provide comprehensive robustness checks and additional results in Appendix A.

4.1 Heterogeneous Reliance on Real Estate Inputs and Collateral

Our model implies that sectors with a greater reliance on real estate collateral (higher α^j) will see larger increases in leverage in response to economy-wide financial deepening (λ). To investigate the empirical relevance of heterogeneity in collateral usage, we compute how much the real estate and manufacturing sectors rely on real estate as an intermediate input. We use data on intermediate inputs from the World Input-Output Database (Timmer et al., 2015; Woltjer et al., 2021).

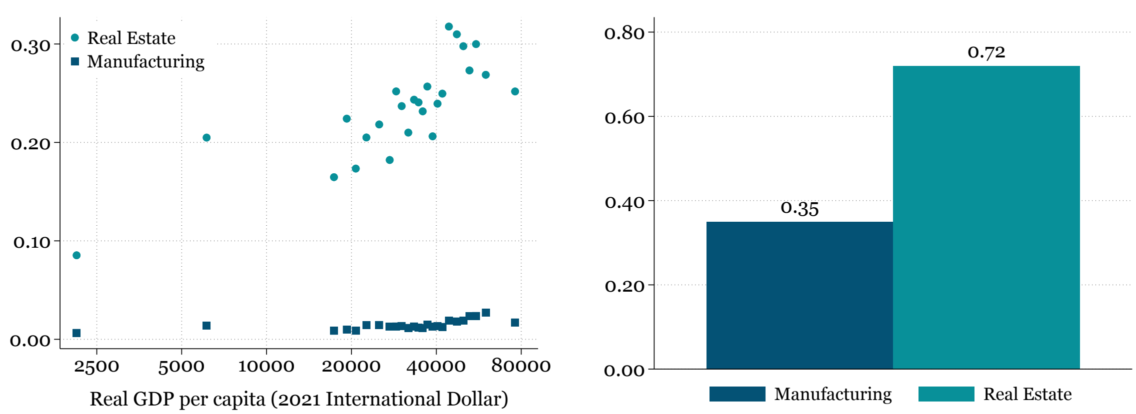
Figure 3a shows that real estate is far more reliant on real estate inputs than manufacturing. The real estate input share ranges from 10% to 30% in real estate, but is consistently below 5% for manufacturing. To further understand heterogeneity in reliance on financing based on real estate collateral, Figure 3b reports statistics on the relative importance of real estate collateral ("mortgage share"). This is defined as the share of outstanding credit backed by real estate collateral. We obtain data on mortgage shares by sector from five economies: Denmark, Latvia, Switzerland, Taiwan, and the US. The mortgage share in total credit is over twice as high in the real estate sector compared to the manufacturing sector. This figure supports the intuitive assumption that the real estate sector is more reliant on borrowing secured by real estate.

The model also predicts that changes in the reliance of real estate collateral (α^j) can generate differential structural change in credit compared to real activity. Consistent with this idea, Figure 3a shows that the use of real estate inputs increases with development, but only within the real estate sector, not in manufacturing. Through the lens of the model, this change raises the real estate sector's demand for collateral, reallocating output towards the sector. Importantly, it also increases the debt capacity of real estate and thus leads to an additional reallocation of credit. While this mechanism plays a role in qualitative terms, our quantitative exercise suggests it only explains a small share of the unbalanced financial deepening we find (see Table E.1).

Figure 3: Sectoral Reliance on Real Estate Inputs and Mortgage Financing

(a) Real Estate Input Share

(b) Mortgage Share



Note: These figures show how the reliance on real estate as a production input and as collateral differs between the manufacturing and real estate sectors. Panel (a) presents a binscatter plot visualizing how much the real estate and manufacturing sectors rely on real estate as an intermediate input over the course of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithmic scale). The *real estate input share* is computed based on data from the World Input-Output Database (Timmer et al., 2015; Woltjer et al., 2021), defined as the value of intermediate input in real estate (ISIC4 industry section F and L68 in WIOD 2016 Release; ISIC3 section F and K in Long-Run WIOD) relative to total value of intermediate inputs. Figure 3b compares the intensity of real estate as collateral for secured loans. *Mortgage Share* is defined as the share of loans secured on real estate relative to all outstanding loans based on data from five economies: Denmark, Latvia, Switzerland, Taiwan, and the United States. See Müller and Verner (2024) for more details.

4.2 Collateral Prices and Credit Allocation

We next study the role of collateral prices in the disproportionate increase in real estate credit over development. First, we examine the correlation of collateral prices with income levels. Second, we analyze how the elasticity of credit with respect to house prices differs across sectors. The key hypothesis is that credit in real estate responds more strongly to changes in collateral prices, as real estate sees both an increase in revenues and input costs from higher collateral prices, as implied by Equation (5) in our model.

Income Levels and the Price of Collateral To proxy for changes in the price of collateral, we use real house price indices. We construct a house price index using the Bank for International Settlement's residential property price series, OECD data on house prices, the Dallas Fed International House Price Database, and additional data from Jordà et al. (2017) and Müller et al. (2025).

Figure 4a shows a binscatter plot of a country's real house prices in logs against its GDP per capita. House price indices are not comparable across countries, but capture within-country variation. We thus include country fixed effects to compare differences in the level of house prices within countries over development. We also control for year fixed effects to absorb global time trends.

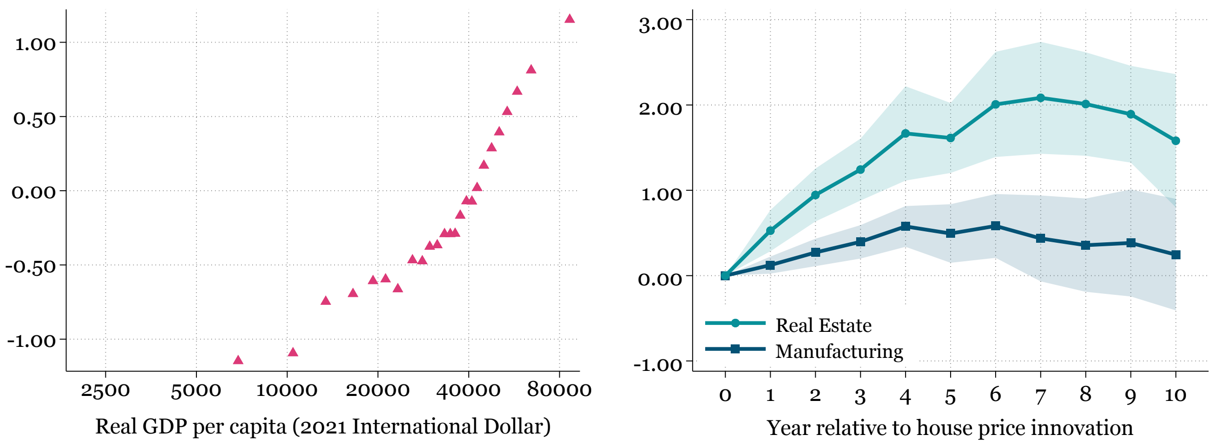
The resulting pattern is striking: there is a strong positive relation between real GDP per capita and house prices. Real house prices increase by over one log point when moving from the lowest to the highest level of income in the sample. This finding is consistent with our model: rising income driven by manufacturing productivity growth alongside a stagnant real estate sector is associated with a higher price of collateral q. Because housing is a non-tradable good, it can also be interpreted as a specific manifestation of the Balassa-Samuelson effect.

The Elasticity of Sectoral Credit to House Price Shocks Our model predicts that increases in the price of collateral q have a stronger effect on borrowing by the real estate sector than the manufacturing sector; see Equation (5). To empirically test this hypothesis, we estimate the path of sectoral credit following innovations in the house price index (HPI) based on the following Jordà (2005) local projection (LP) specification:

$$\Delta_h \log(d^j_{c,t+h}) = \alpha^h_c + \sum_{l=0}^{L} \beta^j_{h,l} \Delta_1 \log\left(\mathrm{q}_{c,t-l}\right) + \sum_{l=0}^{L} \gamma^j_{h,l} \Delta_1 \log(d^j_{c,t-l}) + \sum_{l=0}^{L} \theta^j_{h,l} X^j_{c,t-l} + \epsilon^j_{c,t+h}, \tag{6}$$

Figure 4: Collateral Prices and Credit Allocation

(a) Real House Prices over Development (b) Credit Responses to House Price Innovations



Note: Panel (a) shows a binscatter of log real house prices against real GDP per capita, controlling for country and year fixed effects. Real house prices are compiled from the Bank for International Settlement's residential property price series, OECD, Dallas Fed International Housing Price Database, Jordà et al. (2017) and Müller et al. (2025). Country fixed effects are included since house price indices are only comparable within a given country. Year fixed effects are included to absorb time-specific aggregate shocks that affect all countries. Panel (b) plots the response of manufacturing and real estate credit to innovations in house prices from estimating (6). Errors bars represent 95% confidence intervals computed using Driscoll and Kraay (1998) standard errors with 5 lags.

for $h = 1, \cdots, H$. In this specification, $\Delta_h d^j_{c,t+h}$ represents the change in credit to sector j from t to $t+h$, α^h_c denotes country fixed effects, and $\log\left(\mathrm{q}_{c,t}\right)$ is the log of the real house price index. The index j refers to manufacturing or real estate. As is standard in the LP framework, we control for lags of the dependent variable. We also include controls for lags of sectoral TFP and credit to value added, $X^j_{c,t-l}$. We set the horizon to $H = 10$ and the lag length of $L = 2$; the results are similar for longer lag lengths. The sequence of coefficient estimates $\{\hat{\beta}^j_{h,0}\}$ captures the impulse response of sector j credit to an innovation in house prices.

Figure 4b presents the impulse responses to house price innovations from estimating Equation (6). The evidence is consistent with heterogeneity in the elasticity of credit to house price shocks. A one percent increase in house prices in year t is associated with a 2.08% increase in real estate credit from year t to $t+7$. This response is statistically significant over a 10-year time horizon. By contrast, the response of manufacturing credit is less pronounced and is not statistically significant after year $t+7$. Thus, real estate—which is more reliant on credit backed by real estate and hedged against rising real estate prices—borrows significantly more than manufacturing following innovations in house prices.

The estimates from Equation (6) may not necessarily capture the causal effect of house prices on credit, as these variables are likely to be jointly determined. For example, a credit expansion may stimulate house price growth (Favara and Imbs, 2015; Greenwald and Guren, 2021; Mian and Sufi, 2022), and fundamental shocks such as income growth may drive both credit and house prices. To address this identification concern, we construct an instrumental variable that exploits differences in a country's sensitivity to regional house price cycles. We build on the intuition from earlier work by Palmer (2022) and Guren et al. (2021), who construct a similar instrument for U.S. cities.[12]

Figure B.10 reports the LP-IV estimates. The impulse responses from the LP-IV specification also suggest that real estate credit reacts much more to a shock to house prices than manufacturing credit. As further robustness, Table C.3 estimates the elasticity of credit with respect to house prices using a bi-variate regression for different time horizons with and without the use of the instrumental variable. The results are in line with our previous findings. Taken together, this evidence is consistent with the view that economic development is associated with rising house prices, which in turn disproportionately expands borrowing by the real estate sector.

4.3 Intangible Assets and Sectoral Financing Constraints

The model points to heterogeneous changes in financing constraints (λ^j) as important for understanding unbalanced financial deepening. A potential source of heterogeneous changes in financial constraints across sectors is the rising importance of intangible assets. As countries develop, firms transition from asset-intensive investments in agriculture or manufacturing towards knowledge assets characterized by specialization (Ma, 2022). This leads to an increase in investment particularly into intangible capital, such as human capital, business strategy, research and development, or patents (Graham, Leary and Roberts, 2015).

Intangible assets are specific to firms. This makes them harder to liquidate or redeploy elsewhere (Hart and Moore, 1994; Shleifer and Vishny, 1992; Rampini and Viswanathan, 2013). The increasingly intangible nature of the manufacturing sector's assets may crowd out investments in favor of real estate, where assets can be easily collateralized (Kermani and Ma, 2023), contributing to a slower growth rate of credit in manufacturing relative to real estate (Falato et al., 2022). Through the lens of our model, this could be interpreted as either a reduction in the pledgeability of assets (i.e., lower λ^M) or a reduction in the input share of collateralizable assets in manufacturing production (i.e., lower α^M), both

[12] The idea behind this strategy is that house prices in some countries are systematically more sensitive to regional house-price cycles than house prices in other countries due to differences in housing supply elasticities. When there is a regional house price boom, this boom will thus have a higher pass-through in high-sensitivity countries. We provide further details on the construction of this instrument in Appendix A.3.

of which lower debt capacity.[13] In line with this idea, existing evidence for the United States suggests that an increase in intangible assets is associated with a reallocation of bank credit from commercial & industrial loans to real estate loans (Dell'Ariccia, Kadyrzhanova, Minoiu and Ratnovski, 2021).[14]

Sectoral Differences in Asset Tangibility To test the hypothesis that a rise in intangible assets reduces debt capacity and credit, especially in manufacturing, we rely on sectoral data from EU-KLEMS and INTANProd. These data measure the composition of intangible and tangible assets in 27 European countries, United Kingdom, United States, and Japan across 15 industry aggregates going back to 1995 (Bontadini et al., 2023). We compute the share of intangible assets in manufacturing, real estate, and services for each country-year pair.

Figure 5a documents a striking increase in the share of intangible assets in manufacturing and services as countries develop. For the manufacturing sector, the intangible capital share ranges from 10.2% to 43.1% when moving from the poorest to the richest country in the data. Similarly, for services, intangible capital shares increase from 6.4% to 21.6%.[15] In stark contrast, the share of intangible assets does not exceed 2.6% in the real estate sector, and there is no discernible change across income levels. This observation, based on cross-country data, is consistent with U.S. time series evidence in D'Amico et al. (2024) that construction-related patenting is much more stagnant than that in the manufacturing sector, especially after the 1950s.

Intangible Assets and Sectoral Credit Growth To test the idea that a rising reliance on intangible assets reduces debt capacity and borrowing, we exploit differences in the growth rate of intangible and tangible assets across countries and industries over time. In particular, we estimate impulse responses using the following local projection specification:

$$\begin{aligned}\Delta_h \log(d_{c,j,t+h}) = \alpha_c^h + \nu_j^h &+ \sum_{l=0}^{L} \beta_{h,l}^{\text{Intang}} \Delta_1 \log\left(\text{Intang}_{c,j,t}\right) \\ &+ \sum_{l=0}^{L} \beta_{h,l}^{\text{Tang}} \Delta_1 \log\left(\text{Tang}_{c,j,t}\right) + \sum_{l=0}^{L} \gamma_{h,l}^{j} \Delta_1 \log(d_{c,j,t-l}) + \epsilon_{c,j,t+h}^{j},\end{aligned} \tag{7}$$

[13] This intuition is developed further in an extended model in Appendix D.4, where firms invest in both tangible and intangible assets.

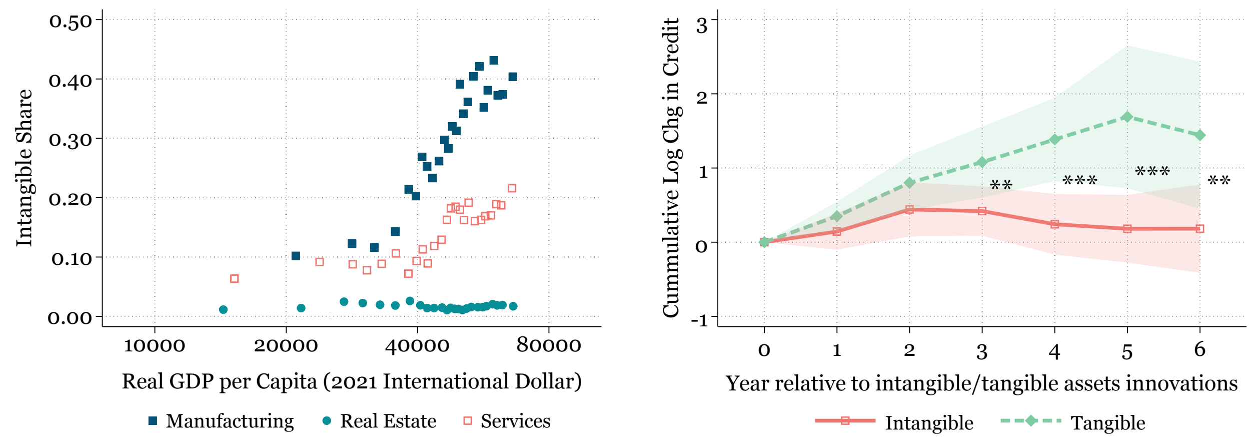
[14] Direct lenders with a specialized lending technology focused on firm continuation values may enter to finance firms more reliant on intangible capital (Jang et al., 2025). This market segment remains relatively small, is concentrated in private equity backed firms, and is also mostly a U.S. phenomenon.

[15] Services includes industries with ISIC code G, H, I, J, M, N, O, P, Q, R, and S.

Figure 5: Sectoral Asymmetry in Intangibles and Credit

(a) Intangibles and Development

(b) Asset Tangibility and Credit Growth



Note: Panel (a) presents a binscatter plot of a sector's intangible to total assets against real GDP per capita. Panel (b) plots the local projection impulse response of credit to an innovation to investments in either tangible or intangible assets in a country-year-industry panel. Shaded areas represent 95% confidence intervals based on Driscoll and Kraay (1998) standard errors with 5 lags. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, for tests of the null hypothesis $\beta_{h,0}^{\text{Intang}} = \beta_{h,0}^{\text{Tang}}$ at each horizon h.

where $\Delta_h \log(d_{c,j,t+h})$ is the change in log credit in country c and sector j from year $t-1$ to $t+h$, $\Delta_1 \log\left(\text{Intang}_{c,j,t}\right)$ and $\Delta_1 \log\left(\text{Tang}_{c,j,t}\right)$ are the log change in real intangible and tangible capital, and α_c^h and ν_j^h are country and industry fixed effects, respectively. The specification is estimated in a country-industry-year panel.

Figure 5b plots the sequence of coefficient estimates $\{\widehat{\beta}_{h,0}^{\text{Intang}}, \widehat{\beta}_{h,0}^{\text{Tang}}\}$, capturing the response of credit to innovations in intangible and tangible asset investment. Higher investment in tangible assets is associated with a persistent increase in credit. A 10% increase of investment in tangible assets is associated with a 16.9% increase in credit after five years. In contrast, we find a smaller and less statistically significant relation between innovations in intangible assets and future credit growth. Investment in tangible assets is thus associated with stronger credit growth relative to intangibles.

Overall, these results suggest that the manufacturing sector's increasing reliance on intangible assets as countries become richer reduces its debt capacity. This, in turn, partly explains why an increasing share of credit flows towards real estate in high-income countries. Banks are thus not able to finance the rise of the knowledge economy and are left holding more and more real estate debt.

5 Government Policies and the Sectoral Allocation of Credit

The analysis so far suggests that technological factors can lead to a heterogeneous loosening of financing constraints across sectors. Another potential factor is changes in government policies that affect the allocation of credit. In this section, we specifically study directed credit policies, a government intervention that has been used extensively worldwide. These policies are often explicitly motivated by the view that financial frictions in specific sectors are an important bottleneck for economic development and that alleviating these frictions may lead to positive growth spillovers.

We first provide qualitative evidence that governments have extensively used directed credit policies. We then introduce a new narrative chronology for the liberalization of these policies and document how their abolition is followed by substantial changes in the sectoral allocation of credit and real economic activity.

5.1 Overview of Directed Credit Policies

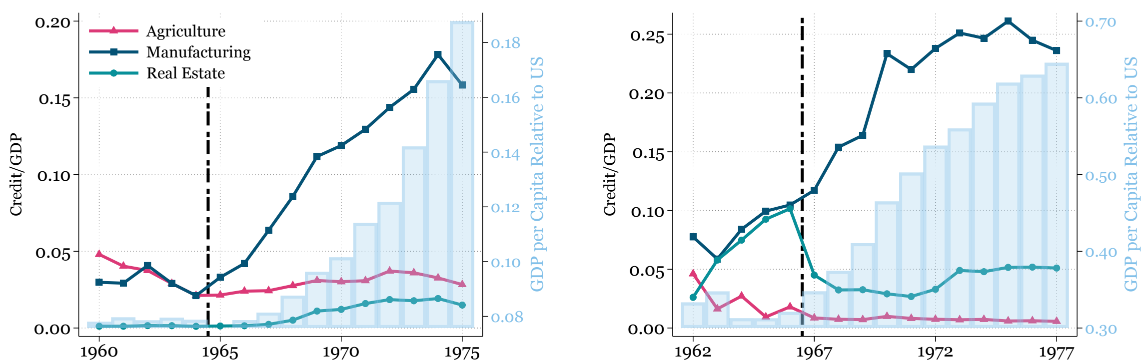
Many countries have used policies that explicitly channel credit into "priority sectors," often as part of a broader industrial policy and development strategy. Known under various names such as directed credit, credit controls, credit ceilings, or window guidance, these policies refer to a tight and direct state control over the allocation of credit in the economy. While the details of their implementation vary across countries, directed credit policies are generally designed to steer credit towards sectors deemed productive (often various manufacturing and export-intensive industries) and restrict lending to uses considered speculative or non-productive (especially real estate and consumption purposes). Through the lens of the model in Section 3, directed credit policies can thus be interpreted as shifters in sectoral collateral constraints λ^M and λ^E.

Several studies argue that directed credit to manufacturers and exporters played an important role in the East Asian growth miracles, including in Japan, Korea, Taiwan, and China (e.g., Johnson, 1982; Cho, 1989; Wade, 1990; Cho and Kim, 1995; Amsden, 1989; Studwell, 2013). Studwell (2013) argues that the failure to effectively implement such policies elsewhere explains the relative lack of development in other Asian economies. Relatedly, Itskhoki and Moll (2019) compile historical accounts of development policies for a list of fast-growing East Asian economies. Six out of seven subsidized credit, and five of them also subsidized intermediate inputs. At the same time, other studies have downplayed the role of credit policy in East Asian growth episodes (World Bank, 1993) or emphasized the distortions created by these policies (e.g., Krueger, 1990).

Figures 6 and B.12 show that credit growth during the East Asian Miracle was particularly concentrated in the manufacturing sector, which was the target of directed credit policies. In the case of South Korea, for example, the government nationalized major commercial banks in the early 1960s, giving it direct control over the allocation of credit. As part of its export-led development strategy, the government directed lending at preferential rates towards export activities, almost exclusively in manufacturing (McKinnon, 1973; Amsden, 1989; Cho, 1989). At the same time, it suppressed lending to consumers. Figure 6a shows that credit to manufacturing surged from the middle of the 1960s, but credit to other sectors remained low as a share of GDP.[16]

Figure 6: Credit Allocation during the East Asian Growth Miracles

(a) South Korea, 1964 (b) Singapore, 1967



Note: These figures show the sectoral credit-to-GDP ratio for different sectors on the left vertical axis with solid lines and real GDP per capita (based on purchasing power parity) relative to US on the right vertical axis with orange bars during the East Asian growth miracles in Korea and Singapore. The vertical lines represent the timing of economic reforms, which include the introduction of export-oriented policies that include subsidized credit. The timing for Singapore's reforms comes from Buera and Shin (2013) and the timing for South Korea is from McKinnon (1973) and Shaw (1973). Reform years are marked with a vertical line.

Targeted credit policies also played an integral role in the implementation of monetary policy in most advanced economies following World War II, including in France (Monnet, 2014, 2018) and the United Kingdom (Aikman et al., 2016); see also Baron and Green (2023). In many cases, they fell out of favor with the liberalization of capital accounts (which undermined their effectiveness) and the rise of interest rate targeting as the dominant policy framework for central banks (which replaced the targeting of monetary or credit aggregates). That said, governments continue to steer credit into particular areas, including

[16]Recent empirical work has investigated individual case studies of such credit policies. Several papers have focused on the short-run and long-run impact of directing credit to the heavy and chemical industry (HCI) in South Korea, emphasizing mechanisms such as learning-by-doing (Choi and Levchenko, 2021), technology adoption (Choi and Shim, 2022), and input-output linkages (Liu, 2019; Lane, 2025). Matray et al. (2024) study the causal effect of export credit subsidies, a widely-used type of industrial policy aimed at supporting exporters using various forms of subsidized credit. Cong et al. (2019) study the effects of the Chinese state-led credit stimulus following the 2007-08 financial crisis.

through mortgage subsidies, sectoral risk weights or capital buffers, loan guarantees, and the loan portfolio of development or government-owned banks.

The discussion above demonstrates that governments view credit allocation as a useful lever for economic development. As such, we interpret the widespread adoption of directed credit policies as prima facie evidence that some policymakers believe sectoral financing constraints should be addressed by government policy.

5.2 New Chronology of Credit Policy Liberalizations

To test whether directed credit policies affect the allocation of credit in the economy, we construct a new narrative chronology covering 37 countries, indicating when these policies were liberalized. The idea is that if these policies affect lending in the economy, we should observe a change in the quantity and composition of lending after their removal. Drawing on dozens of country-specific sources, our new chronology specifies years in which directed credit policy was either abolished entirely or sufficiently liberalized to constitute a major change in financial regulation. Appendix G provides a detailed background discussion of each policy change, including a direct quote to rationalize exactly why an episode was classified as a liberalization event.

The policy changes we identified range from the early 1970s to the 2000s, suggesting considerable heterogeneity in the timing of these events across countries (see Figure B.11). These liberalizations cover all income groups, ranging from Nigeria to Korea and France. In some cases, their timing coincides with a broader agenda of financial liberalization. In other instances, the reforms were part of a change in monetary policy frameworks. Importantly, the chronology we construct is not only restricted to countries which are known to have experienced spectacular growth such as the East Asian Miracle economies, as in the analysis of Itskhoki and Moll (2019) or Liu (2019), but instead covers a broad set of emerging and advanced economies.

Some of the credit policy liberalizations we identified have received considerable attention from economists. In Japan, for example, the Bank of Japan operated a tight system of "window guidance" from the end of World War II until the early 1980s, prominently discussed in Werner (2003, 2005). As discussed by Werner (2002, page 8), "the Bank of Japan essentially instructed the banks on a quarterly basis on how much to increase or reduce lending." Most observers agree that this system was effectively abolished in 1982, preceding the massive Japanese real estate boom that ultimately ended with the banking crisis of the early 1990s.

France is another example of a relatively well-known episode of directed credit policy. During the period of "Les Trentes Glorieuse" following World War II, credit policy was a central pillar of the dirigiste doctrine and implemented by the Banque de France (Monnet, 2014, 2018). These policies fixed both the amount of short-term lending by banks and its sectoral allocation; long-term credit to manufacturers was directly provided by the government, usually through state-owned banks. The liberalization of this system of directed credit in 1984-85 has been studied by Bertrand et al. (2007).

The new chronology we construct allows us to test whether the liberalization of directed credit policies is associated with changes in the allocation of credit and output. The answer to this question is not obvious. When constructing liberalization dates, we do not consider the nature of the credit policy in place before. As such, it is ex-ante unclear whether directed credit policies are indeed effective in channeling credit into particular sectors as stipulated by a few prominent case studies.

5.3 The Aftermath of Directed Credit Liberalizations

To test whether directed credit policies matter for the sectoral composition of credit and output, we use a local projections-based difference-in-differences (LP-DiD) approach in a country-year panel following Dube et al. (2023). This approach is well-suited for dealing with staggered treatment implementation and dynamic treatment effects. The basic LP-DiD specification is:

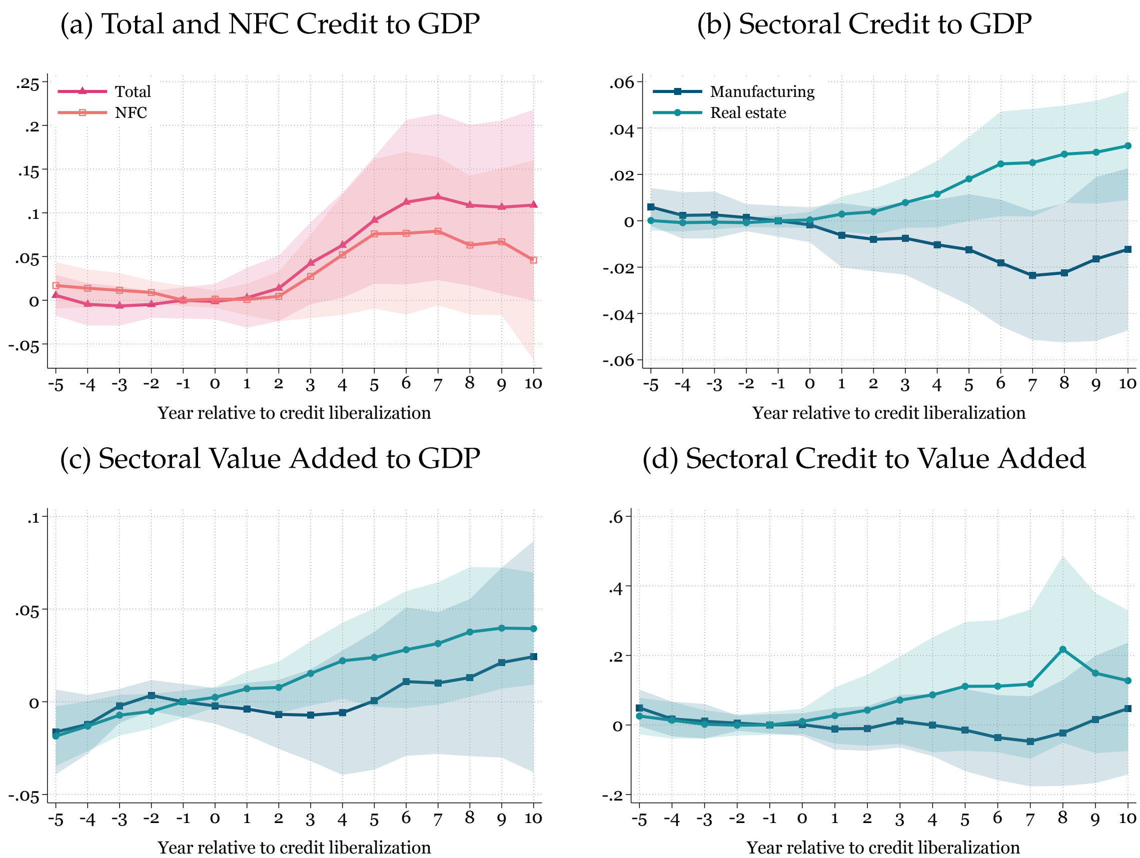
$$y_{c,j,t+h} - y_{c,j,t-1} = \beta_j^h \Delta \text{Liberalization}_{c,t} + \delta_t^h + \epsilon_{c,t}^h,$$

where $\text{Liberalization}_{c,t}$ is a dummy that equals one after a country has liberalized directed credit policies, $y_{c,j,t}$ is a sector-specific outcome for country c and time t, and δ_t is a time fixed effect. Following Dube et al. (2023), the estimation sample is restricted to countries entering treatment and never-treated countries. For countries with multiple liberalizations, we focus on the first liberalization in the sample. In Appendix A.5, we show that our results are also robust to standard local projection framework.

The identifying assumption allowing for a causal interpretation of the sequence of coefficients β_j^h is *not* that liberalizations of directed credit policies are random events. Rather, it is that the outcomes of interest would have evolved on similar trends relative to counterfactual countries in the absence of the liberalization. We assess the plausibility of this assumption using event study plots that suggest pre-parallel trends. To further support this assumption, Table C.5 suggests that liberalizations are not predictable using lagged macroeconomic outcomes such as changes in GDP or trade.

Figure 7 plots the estimated impulse responses $\{\widehat{\beta}_j^h\}_{h=-5}^{10}$ for various outcomes. Figure 7a shows a large increase in total credit to GDP after the liberalization, mostly driven by a

Figure 7: The Aftermath of Directed Credit Liberalizations



Note: This figure presents staggered difference-in-difference estimates using local projections following the methods outlined in Dube et al. (2023). The events are centered around the years countries liberalized directed credit policies. The shaded area represents 95% confidence intervals.

rise in credit to non-financial firms. Figure 7b shows that, after a liberalization of directed credit policies, credit to the real estate sector increases by about 3 percent of GDP. The increase is significant and persistent, and still detectable ten years after the liberalization. Manufacturing credit to GDP declines by a similar magnitude.

Figure 7c suggests that the liberalization of directed credit is also followed by an increase in real estate value added as a share of GDP, while there is less of a change in the share of manufacturing value added. Figure 7d suggests that the ratio of credit to value added soars in the real estate sector but sees little change in manufacturing. These results support our hypothesis that a liberalization of directed credit policies can be thought of as a shifter of the (relative) financing constraint of the real estate sector. Given a trend towards the liberalization of such directed credit policies, their removal may also contribute to the substantial rise of real estate credit in recent decades.

Our interpretation of the evidence presented in this section is as follows. Directed credit policies are government interventions that affect sectoral financing constraints. These constraints are often binding: when countries stop directing credit to the manufacturing sector, banks instead lend to the real estate sector, increasing its leverage. The justification for implementing such directed credit policies in the first place is that policy makers view steering the allocation of credit towards "productive" sectors such as manufacturing as beneficial for long-run growth, at least at certain stages of development. In Section 7, we investigate the plausibility of this idea in the data.

6 Alternative Explanations

Guided by our simple model, our empirical analysis has focused on "ruling in" the role of financial factors in explaining unbalanced financial deepening. However, we note that a more elaborate model may allow for alternative stories based on credit demand.

One alternative explanation is that the composition of investment demand may change over the course of development. At low levels of development, the manufacturing sector may have the highest investment demand as a country builds its capital stock (García-Santana et al., 2021). At the same time, manufacturing sector firms may lack internal funds to finance these investments. Manufacturing firms may thus turn to the domestic credit market, leading to a high ratio of credit to current value added. As a country builds up its capital stock, investment demand in manufacturing falls. At the same time, these firms build up their net worth and repay their debt, financing new investments with internal funds, leading to a fall in manufacturing credit to value added. Note that this story emphasizes the transitional dynamics, rather than steady states.

Another explanation from the credit demand side is that economic development may lead to a disproportionate increase in housing demand. Demand for housing services and consumption may be non-homothetic. If housing is a luxury good, then households in richer countries will devote a larger share of their consumption to housing.[17] In the Appendix D.3, we show that non-homothetic demand alone does not generate a disproportionate increase in real estate credit relative to value added in the steady state of the model. It affects both output and credit by the same proportions, but leads to a larger increase in real estate prices. However, one could imagine an alternative model where investment and credit demand by real estate developers may be elevated as a country builds up its housing stock in response to increasing housing demand along the transition path.

[17] It is not obvious that housing is a luxury good. A basic level of housing services is clearly a necessity. Aguiar and Bils (2015) find that the elasticity of housing consumption with respect to income is very close to unity, consistent with homothetic demand for housing. However, the elasticity may be larger than one when moving from poor to rich countries compared to within countries.

7 The Sectoral Allocation of Credit and Long-Run Growth

Does finance matter for growth? This long-standing question has been studied empirically at least since King and Levine (1993), Rajan and Zingales (1998), Beck et al. (2000), and Levine et al. (2000). These studies find evidence consistent with the view that financial deepening in credit markets contributes to higher growth. At the same time, a recent empirical literature finds that credit booms predict future growth slowdowns, raising questions about the link between credit deepening and growth (Mian et al., 2017; Greenwood et al., 2022; Verner, 2022; Jordà et al., 2022). The evidence on directed credit policies in the previous section suggests that policymakers believe that what matters is not just the amount, but also the allocation of credit. In this section, we provide empirical evidence that the relation between credit and subsequent growth over the medium to long-term indeed depends crucially on the allocation of credit, helping resolve the tension between the "finance-growth" view and the "credit booms and bust" view.

There are several reasons why the allocation of credit across sectors could predict long-run growth. First, it may contain information about a country's future fundamentals. For example, credit may expand to finance new investment following positive news about trend productivity growth or beneficial economic reforms (Aguiar and Gopinath, 2007). Manufacturing has seen much higher productivity growth than real estate, which is why it is often referred to as an engine of growth (Rodrik, 2013). Therefore, a higher share of credit flowing to manufacturing could be a signal of future growth prospects that increased borrowing helps unlock.

Second, the allocation of credit may causally affect the growth rate of productivity. A growing theoretical literature assumes that the financing of certain productive sectors, such as manufacturing, has positive externalities on overall productivity growth (Benigno and Fornaro, 2014; Benigno et al., 2020; Hirano and Stiglitz, 2024). This builds on the long-standing tradition of assuming external economies of capital accumulation in productive sectors (e.g., Romer, 1986). One source of this higher productivity is that manufacturing firms more readily adopt foreign knowledge and technology through foreign trade and investments. Another is that manufacturing firms have to innovate because they are exposed to global competition.

Credit to the real estate sector is less likely to provide these benefits. A rising real estate share could be the flipside of a falling manufacturing share, which might indicate reduced financing, investment, and innovation by manufacturing firms (Rodrik, 2016; Charles et al., 2018). The expansion in real estate financing can be associated with increased misallocation and rising rents, as the real estate sector is often protected from competition (Reis, 2013; Brunnermeier and Reis, 2023). A higher share of real estate credit may also presage a financial crisis, as real estate is especially exposed to booms in collateral-based borrowing, with adverse consequences for medium-run growth (Müller and Verner, 2024). These factors could all result in lower productivity and output growth. To the extent that rising real estate credit crowds out other forms of commercial lending (Chakraborty et al., 2018), the disproportionate rise in real estate credit over the development process and over time we document may divert resources towards sectors that generate higher growth.

The East Asian growth miracles discussed in the previous section provide a clear examples of how a surge in manufacturing credit can presage strong subsequent economic growth. Figure 6 plots credit and real GDP per capita relative to the U.S. in South Korea and Singapore starting in the 1960s. In both cases, rapid credit growth to manufacturing—driven in part by economic reforms and directed credit policies—was followed by sustained accelerations in real GDP per capita. In Appendix Figure B.12, we plot sectoral credit dynamics for four other East Asian cases: Japan, Malaysia, Taiwan, and Thailand. With the exception of Thailand, where credit expanded in almost all sectors, these growth accelerations were associated with an expansion in credit mainly to the manufacturing sector.

In contrast, many episodes with elevated credit financing the real estate sector have been followed by sustained periods of slow growth. Prominent examples include the UK in the early 1970s; Finland and Japan at the end of the 1980s; Germany in the early 1990s; Malaysia, Hong Kong, and other East Asian economies in the middle of the 1990s; and Spain, Portugal, and numerous other European countries in the 2000s. While China is not in our sample, its large rise in real estate credit in the 2010s also preceded a growth slowdown (Glaeser et al., 2017; Rogoff and Yang, 2021; Sufi, 2023).

To systematically test whether the allocation of credit across sectors has predictive power for a country's future growth trajectory, we estimate variants of the following specification:

$$\Delta_h \log(\text{Real GDP per Capita}_{c,t+h}) = \sum_j \beta_h^j \text{Credit}_{c,t}^j + \gamma_c + \mu_t + \Gamma X_{c,t}^j + \epsilon_{c,t+h}^j. \tag{8}$$

The dependent variable is growth in real GDP per capita from year t to $t+h$ in country c. We consider both five and ten-year horizons, $h = 5, 10$. The key independent variables, $\text{Credit}_{c,t}^j$, are measures of credit to sector j in year t. We consider two measures of sectoral credit: the share of sectoral credit to GDP and the share of sectoral credit to total non-financial firm credit.

We control for various other predictors of future growth in $X_{c,t}$. In particular, we control for the level of real GDP per capita to capture the potential for lower-income countries to have higher growth as they converge to higher income levels (Patel et al., 2021). This is potentially important, as lower-income countries have a higher share of manufacturing in outstanding credit, as shown in Figure 2. In some specifications, we also control for the sectoral value-added shares to capture real-side structural change. A sector's share in output—independent of credit—may be linked to future GDP (Caselli, 2005). This allows us to test whether the sectoral allocation of credit has additional information for growth, above and beyond the sectoral allocation of real activity. Finally, we also include country and year fixed effects to capture country-specific growth trajectories and global growth trends. Even with these control variables, we stress that the correlation between sectoral credit and future growth is not necessarily causal. With this limitation in mind, the estimates from Equation (8) are nevertheless interesting, as they help assess empirically whether the sectoral composition of credit is informative about growth.

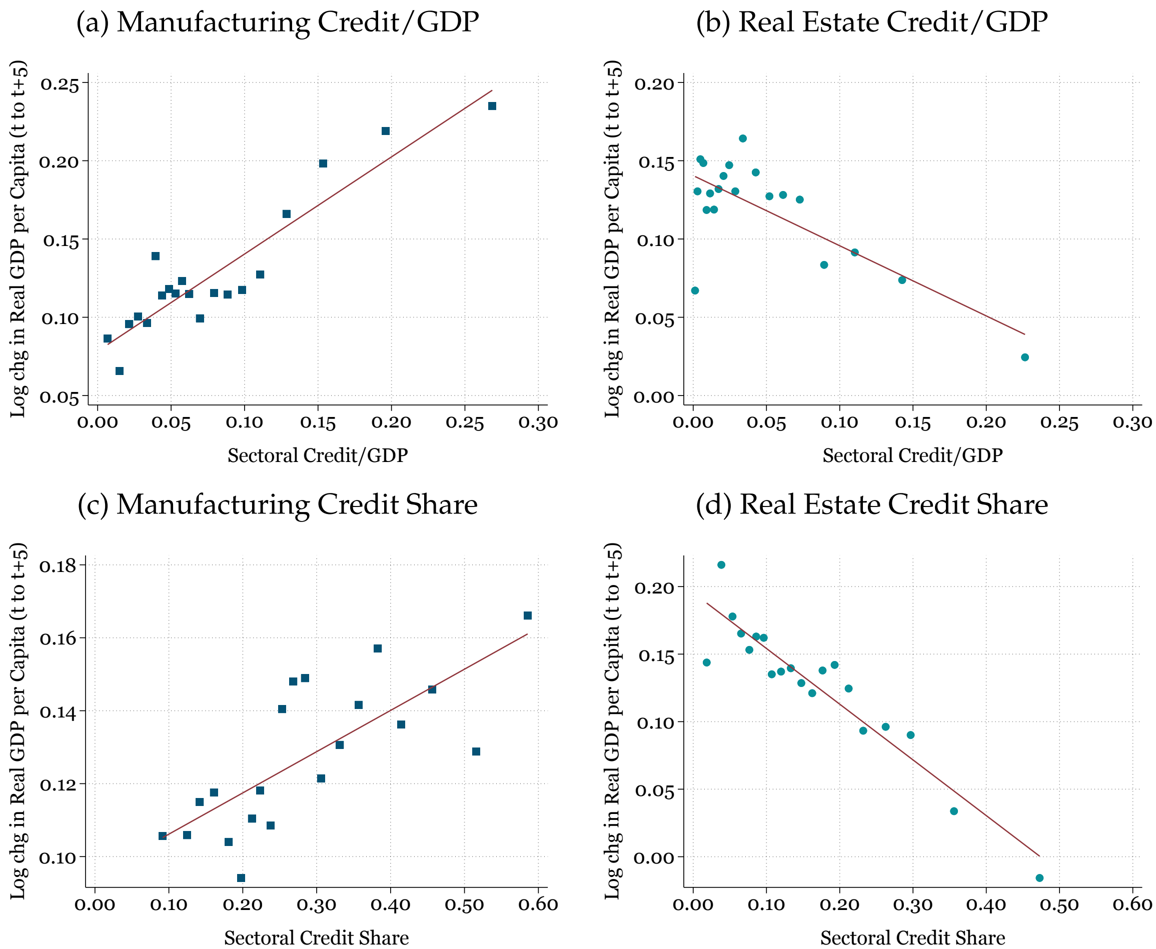
Figure 8 shows a binscatter plot visualizing the relationship between manufacturing and real estate credit in year t and future economic growth from year t to $t+5$. We use both sectoral credit shares and sectoral credit to GDP. The binscatter controls for country fixed effects, year fixed effects, and the level of real GDP per capita in year t.

Figure 8 shows that a higher share of credit going to manufacturing is associated with stronger future growth in real GDP per capita over the next five years. The relation is strongly positive and holds for both manufacturing credit as a share of either GDP or total non-financial firm credit. In terms of magnitudes, a one standard deviation increase in the manufacturing credit to GDP ratio (5.9%) predicts 1.1% higher growth over the next five years. Similarly, a one standard deviation increase in the manufacturing credit share (12.6%) predicts 1.9 percentage points higher growth over the next five years.

In contrast, Figure 8 shows that elevated real estate credit is robustly associated with lower future growth. A one standard deviation increase in real estate credit to GDP (5.4%) predicts 3.5% lower growth over the next five years. A one standard deviation higher share of credit to real estate (10.8%) predicts 3.2 percentage points lower growth.

Table 1 reports the corresponding regressions at the five-year horizon. Column (1) shows that a 10 percentage point increase in manufacturing credit to GDP is associated with 2.9 percentage point higher growth over the next five years. A 10 percentage point increase in real estate credit to GDP predicts 6.3 percentage point lower growth over the next five years. The estimates are similar when controlling for sectoral value added to GDP ratios (column 2). In Column 3, when controlling for agriculture and services credit to GDP (column 3), credit to manufacturing and to real estate are still more robust predictors of future growth, while credit to agriculture or services relative to GDP have more limited predictive content for future growth. Columns 4 through 6 in Table 1 show that a

Figure 8: The Allocation of Credit and Long-Run Growth



Note: This figure presents binscatter plots visualizing the correlation between the credit to manufacturing or real estate and future economic growth. The horizontal axis represents the sectoral credit relative to GDP (panels (a) and (b)) or total non-financial firm credit (panels (c) and (d)) at time t. The vertical axis represents the log-difference of real GDP per capita from t to $t+5$. The binscatter controls for country fixed effects, year fixed effects, sectoral value added to GDP, and a second-order polynomial in real GDP per capita in year t.

higher share of credit in manufacturing predicts higher growth, while the opposite is true for real estate. Thus, the composition of financial deepening is crucial for understanding the relation between credit and future growth.

A direct implication is that, because the manufacturing credit share is higher at earlier stages of development (Figure 2), credit deepening should more strongly facilitate growth in lower-income countries. Columns 7 and 8 support this hypothesis: financial deepening—measured by the total (or non-financial corporate) credit-to-GDP ratio—is more positively associated with subsequent growth in lower-income economies relative to higher-income economies. These results are robust when the horizon is extended to 10 years (see Table C.6).

Table 1: Sectoral Financial Deepening and Subsequent Long-Run Growth

	$\Delta_5 \log(\textbf{Real GDP per Capita}_{c,t})$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Manu Credit to $\text{GDP}_{c,t}$	0.29**	0.26**	0.45***					
	(0.13)	(0.13)	(0.14)					
RE Credit to $\text{GDP}_{c,t}$	-0.63***	-0.67***	-0.57***					
	(0.14)	(0.15)	(0.15)					
Agri Credit to $\text{GDP}_{c,t}$			0.27					
			(0.52)					
Serv Credit to $\text{GDP}_{c,t}$			-0.23**					
			(0.11)					
Manu Credit $\text{Share}_{c,t}$				0.19***		0.14**		
				(0.068)		(0.068)		
RE Credit $\text{Share}_{c,t}$					-0.23***	-0.18***		
					(0.050)	(0.053)		
Lower $\text{Income}_{c,t} \times \text{Credit/GDP}_{c,t}$							0.12**	0.13*
							(0.052)	(0.076)
Higher $\text{Income}_{c,t} \times \text{Credit/GDP}_{c,t}$							-0.13***	-0.17***
							(0.027)	(0.048)
Observations	2,978	2,574	2,129	2,129	2,129	2,129	6,540	2,407
# Countries	82	75	77	77	77	77	131	79
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Control: VA to GDP		✓						
Interacted Var: Credit/GDP							Total	NFC
Control: GDP per Capita	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.17	0.21	0.17	0.13	0.13	0.14	0.05	0.07

Note: This table presents results from estimating equation (8). Each column also controls for logged real GDP per capita. Driscoll and Kraay (1998) standard errors with 5 lags are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

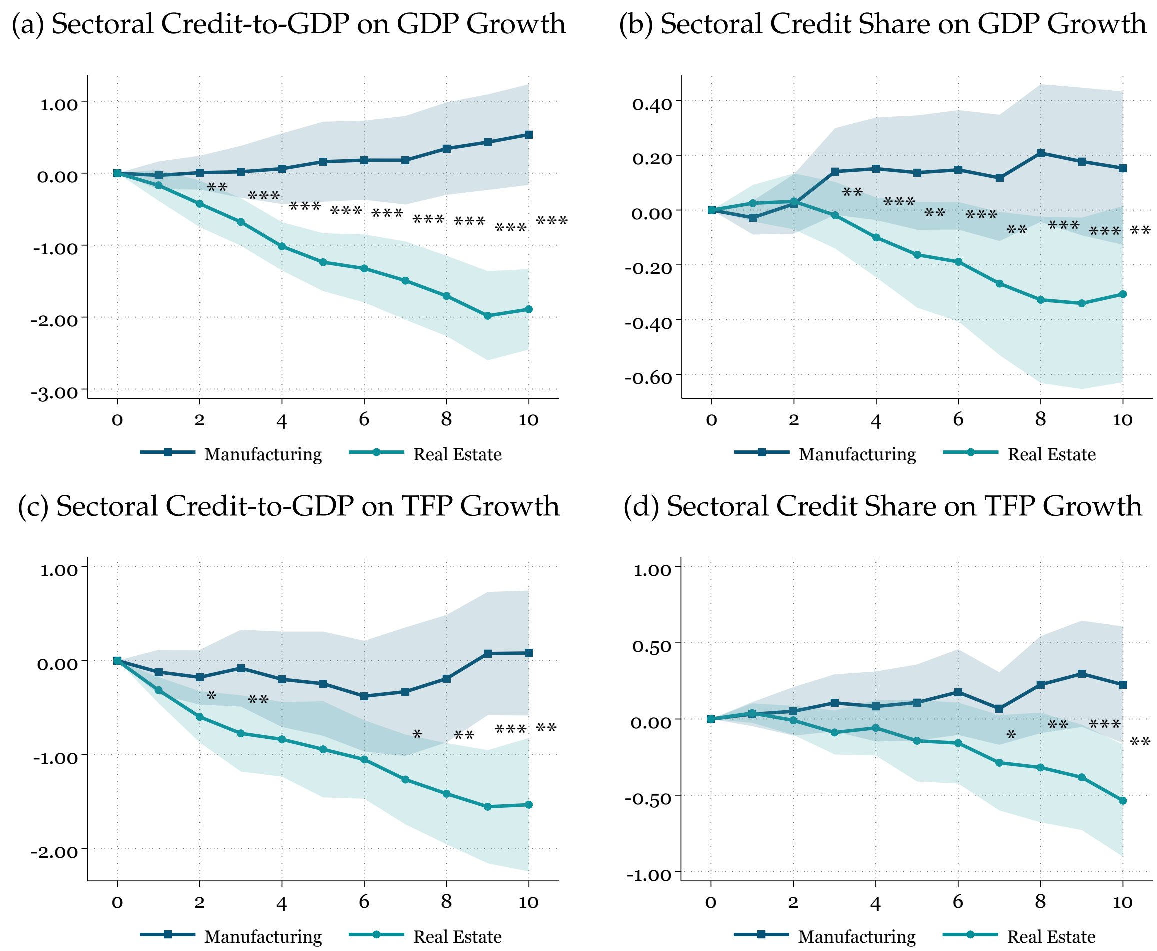
As an additional exercise to trace out the dynamic predictability of output with sectoral credit deepening, we estimate the following local projections

$$\Delta_h \log(y_{c,t+h}) = \alpha_c^h + \sum_j \sum_{l=0}^{L} \beta_{h,l}^j \text{Credit}_{c,t}^j + \sum_{l=0}^{L} \gamma_{h,l} \Delta_1 y_{c,t-l}^j + \epsilon_{c,t+h}^j, \quad h = 1, \ldots, 10, \tag{9}$$

where $\Delta_h \log(y_{c,t+h})$ is the change in output in country c from t to $t+h$, α_c^h controls for country fixed effects, $\text{Credit}_{c,t}^j$ are sectoral credit variables, measured by sectoral credit-to-GDP or credit shares. We choose a lag length of $L = 2$. Relative to Equation (8), this specification controls for lags in the dynamics of credit and real GDP growth, thus testing whether innovations in sectoral credit predict future growth conditional on lagged growth dynamics.

The results in Figure 9 reinforce the previous findings. Credit in the manufacturing

Figure 9: Local Projection: Financial Deepening, Credit Allocation, and Long-Run Growth



Note: This figure plots local-projection impulse responses estimated from Equation (9). Panels (a)-(b) show responses of real GDP per capita to innovations in manufacturing and real-estate credit-to-GDP and credit shares; panels (c)-(d) show the corresponding responses of total factor productivity (TFP) from Penn World Table (Feenstra et al., 2015). Shaded areas represent 95% confidence intervals based on Driscoll and Kraay (1998) standard errors with 5 lags. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, for tests of the null hypothesis $\beta_{h,0}^{\text{Manu}} = \beta_{h,0}^{\text{RE}}$ at each horizon h.

sector predicts a sustained increase in output, while credit deepening in real estate is associated with a future decline in output relative to trends. Again, this holds using both sectoral credit to GDP and sectoral credit shares. The difference between the two estimates is statistically significant at most horizons.

In sum, there is a strong correlation between the share of credit to different sectors and future economic growth. This evidence is complementary to the finding in Müller and Verner (2024) that lending to the non-tradable sector predicts recessions at business cycle frequency, while credit to the tradable sector is linked with higher productivity growth over the next decade. They also mesh well with the evidence in Beck et al. (2012) that firm credit shows a much higher correlation with GDP growth than household credit. While these patterns are not necessarily causal, they are potentially consistent with models where the allocation of financing across sectors matters for the real economy.

8 Conclusion

This paper provides new evidence on the interplay between the sectoral allocation of credit, the sectoral allocation of real activity, and long-run economic growth. We document that financial deepening in corporate credit markets is unbalanced across sectors. Over the course of development, there is a substantial reallocation of credit from manufacturing toward real estate activities that cannot be explained by structural change in the real economy.

To understand the potential drivers these patterns, we build a two-sector general equilibrium model that integrates sector-specific collateral constraints into a workhorse model of supply-side structural transformation. The model illustrates how real and financial factors can drive structural change in credit and real activity. Importantly, however, the reallocation of credit from manufacturing to real estate cannot be explained by real factors alone. While higher productivity growth in manufacturing can explain why credit and output move towards real estate, it cannot account for the "excess" change in credit. Explaining the disproportionate rise of real estate credit calls for a role for structural changes in financial intermediation.

We provide empirical evidence that the reallocation of credit towards real estate is partly explained by rising reliance on real estate collateral and rising real estate values over development. In addition, the increasing reliance on intangible assets in manufacturing also explains the reallocation of credit from manufacturing to real estate. An interesting implication is that because credit must often be backed by collateralizable assets, credit plays less of a role in financing more complex activities based on intangible capital that are central to growth at higher levels of development. Moreover, we provide novel evidence that the liberalization of government directed credit policies also play a role in the reallocation of credit to real estate. Finally, we document that the allocation of credit matters for understanding long-run growth. A larger share of credit flowing to manufacturers is highly predictive of higher future growth, while the inverse holds for credit to the real estate sector, consistent with models where the tradable sector is an engine of economic growth.

Some caveats are in order. First, a clear limitation of our model is that it does not directly consider how an exogenous change in the allocation of credit may affect economic growth. Since our empirical evidence on this question can only be interpreted as suggestive, the possibility of such an effect would be important to study in future work. Second, we abstract from how exactly financial institutions operate. In our model, we focus on sectoral heterogeneity on the borrower side, and credit is directly provided by savers. In reality, the regulation and ownership of banks plays an important role in determining the allocation of credit, as our empirical findings show. Third, our study examines the allocation of credit in a cross-country setting. Studying structural changes in credit in one specific economy may open the door to establishing a causal link between finance and structural changes in the real economy. We leave these promising avenues for future research.

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A Additional Empirical Results

A.1 Sample Selection

For our analysis of credit shares, we use the country sample listed in Appendix Table C.1. We restrict the sample to observations with non-missing sectoral credit shares in agriculture, manufacturing, real estate, and services. To ensure that our results are not driven by very small countries, we keep countries with a population above one million in the year 2000. Lastly, we focus on observations from 1970 to 2020, which gives us a somewhat more balanced sample.

For analyses that only require information on sectoral credit-to-GDP, we do not impose sample restrictions other than the time window. For Section 5, we extend the sample back to the 1950s, because some directed credit policies and their liberalizations occurred in the 1970s.

A.2 Additional Results on Stylized Facts

Section 2 documents a series of facts about financial deepening, which we extend here.

Regression results We provide supporting evidence for our main results in Section 2 by estimating the following regression specifications:

$$\log(y^j_{c,t}) = \beta^j_0 + f\left(\log(\text{real GDP per Capita}_{c,t})\right) + \gamma_c + \mu_t + \epsilon^j_{c,t,h},$$

where c, j, and t indicate country, sector, and year, respectively. γ_c is the country fixed effect, and μ_t is the year fixed effect, and f is a second-order polynomial to capture potential non-linearities. $y^j_{c,t}$ is the sectoral credit share. The results are presented in Appendix Table C.2.

Time series patterns Appendix Figure B.1 plots the time series of sectoral credit, value added, and employment shares. These also suggest an unbalanced reallocation of credit towards real estate, over and above what one would expect based on value added or employment alone.

Different fixed effects To address concerns that structural change in credit may be driven by secular trends, such as declining interest rates, we replicate Figures 1 and 2, with different sets of fixed effects: (i) country FE, (ii) year FE, and (iii) country and year FE. The results are shown in Appendix Figures B.3 and B.4. We also compute country averages from the balanced sample in Appendix Figure B.5.

Bond issuance Our sectoral credit data generally do not systematically include bond market debt. When we include an estimate of outstanding bond debt by sector in Appendix Figure B.6, however, we find results similar to the baseline findings. Specifically, we compute outstanding bond debt using three different methods: (i) *full repayment*, assuming that all bonds are fully repaid only at maturity; (ii) *hybrid probability*, assuming that bonds are partially repaid or called over their life cycle in line with the repayment patterns documented by Ma et al. (2023) in U.S. data; and (iii) *non-callable*, which only takes non-callable bonds into consideration, assuming repayment occurs solely at maturity.

Credit-to-GDP and VA-to-GDP Appendix Figure B.2 plots the ratio of sectoral value added or credit to GDP, either against GDP per capita or over time. Compared with the dramatic decline of agriculture value added to GDP, credit remains relatively low. At least, this may reflect limitations in measuring agricultural credit, given it is often recorded as a part of household rather than firm credit (which is what our numbers are based on). Manufacturing credit varies less relative to GDP than the sector's value added share. Lastly, real estate sector witnesses a faster increase of credit to GDP relative to value added to GDP.

A.3 Additional Results on the Elasticity of Credit to Real Estate prices

Section 4.2 provides evidence on a heterogeneous pass-through of increases in real estate prices on credit. We document additional results here.

The house price sensitivity Instrument To get closer to a causal elasticity of sectoral credit to house price shocks, we estimate the following regression for each country c with $h = 1$:

$$\Delta_h \log(\mathrm{HPI}_{c,t}) = \varsigma_c + \vartheta_c \Delta_h \log(\mathrm{HPI}_{r(c),t}) + e_{c,t}, \tag{A.1}$$

where ϑ_c measures the response of the house price index in country c to changes in house prices in subcontinent $r(c)$. Appendix Figure B.8 documents substantial heterogeneity in regional housing cycles. Appendix Figure B.9a presents the distribution of the estimated elasticities $\widehat{\vartheta}_c$, which vary widely across countries.

Next, we construct the interaction term of this house price beta and regional housing price fluctuations as ${}_1Z_{c,t} = \widehat{\vartheta} c \Delta_1 \log(\mathrm{HPI}_{r(c),t})$. This interaction term thus serves as the instrumental variable for $\Delta_1 \log(\mathrm{HPI}_{c,t})$ in the baseline local projection (6). The identifying assumption for the local projection instrumental variable approach (LP-IV) is that the instrument is relevant and exogenous at all leads and lags. In particular, we assume that, conditional on controls, there are no other factors that are correlated with regional house prices in the time series that differentially impact sectoral credit growth in countries that are more sensitive to house prices as captured by $\hat{\vartheta}_c$. Given that we are most interested in the *relative* response of credit based on a sector's collateral intensity, the key threat to identification is a *differential* shock to manufacturing and real estate credit that is correlated with $\hat{\vartheta}_c \Delta_1 \log(\mathrm{HPI}_{r(c),t})$.

We report the first-stage F statistics, following Kleibergen and Paap (2006), for our baseline instrumental variable local projection specification in Appendix Figure B.9b. These tend to be well above 10. Following Ramey (2016) and Ramey and Zubairy (2018), we include 2 lags of the instrument in the first stage. The full dynamics of local-projection results are shown in Appendix Figure B.10.

Alternative specifications We also consider a simple bivariate version as follows:

$$\Delta_h \log(\text{Credit}^j_{c,t}) = \alpha_c + \mu_t + \beta^j \Delta_h \log(\text{HPI}_{c,t}) + \Gamma X_{c,t} + \epsilon^j_{c,t},$$

for $h = 1, 3, 5, 10$, where $\Delta_h \log(\text{Credit}^j_{c,t})$ represents the change in log sectoral credit from $t - h$ to t, and α^h_c denotes country fixed effects. Control variables include the sectoral credit-to-value-added ratio, motivated by our model. We construct ${}_hZ_{c,t} = \widehat{\vartheta}_c \Delta_h \log(\text{HPI}_{r(c),t})$ as the instrument for $\Delta_h \log(\text{HPI}_{c,t})$, where ϑ_c measures the response of the house price index (HPI) in country c to changes in house prices in subcontinent $r(c)$ over the time horizon h from the specification (A.1). We report both the OLS and IV results in Appendix Table C.3. These regressions provide additional evidence that real estate credit is more correlated with house price growth than is manufacturing credit across most horizons and specifications.

A.4 Additional Results on Intangible Assets

Section 4.3 investigates the role of intangible assets. Here, we provide details on the measurement of intangible and tangible assets, and conduct robustness checks on the relation between intangible and sectoral credit growth using alternative specifications.

Measuring intangible and tangible assets We compute the intangible ratio using `Kq_Intang` divided by `Kq_Tang`. Both variables are in millions of national currency. Intangible assets consists of the following variables, computed via a capitalization factor applied to these purchased components and sum of cost approach for own-account components:

1. `Brand`: brand
2. `Design`: industrial design
3. `OIPP`: entertainment, artistic and literary originals
4. `OrgCap`: organization capital
5. `RD`: research and development
6. `Soft_DB`: computer software and databases
7. `Train`: training

We drop observations with negative values of intangible or tangible assets.

Intangible investment and sectoral credit growth For robustness, we consider two alternative specifications in Appendix Table C.4. First, we test whether sectoral credit growth is correlated with changes in the intangible asset share as follows:

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta^h \Delta_h \text{Intang Share}_{c,j,t} + \text{Fixed Effects} + \epsilon_{c,j,t} \text{ for } h = 5, 10.$$

Second, instead of the baseline local projection, we consider the following specification for different time horizons. For $h = 5, 10$:

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta^h_{\text{Intang}} \Delta_h \log(\text{Intang}_{c,j,t}) + \beta^h_{\text{Tang}} \Delta_h \log(\text{Tang}_{c,j,t}) + \text{Fixed Effects} + \epsilon_{c,j,t}$$

Both specifications yield qualitatively similar estimates to our baseline results.

A.5 Additional Results on Directed Credit Policies

In Section 5, we investigate the dynamics of sectoral variables around the liberalization of directed credit policies using the LP-DiD method of Dube et al. (2023). Here we provide some results and re-estimate our empirical specification using local projections and alternative staggered DiD designs.

Case studies Appendix Figure B.12 plots the sectoral credit to GDP ratio for additional East Asian "growth miracles" along with the relative GDP to the US. During these episodes, we find a rise in the manufacturing credit to GDP ratio, and a rising relative GDP per capita to the US, consistent with our main findings.

In Appendix Figure B.13, we depict the sectoral credit-to-output ratio around eight credit liberalization episodes. The dynamics are consistent with our baseline LP-DiD results in that they suggest a decline of manufacturing and increase in real estate credit.

Identifying assumptions Two identifying assumptions underpin our event study methodology: (i) there are no changes in confounding determinants of sectoral changes in the credit market and in the real economy that coincide with these credit liberalization events, and (ii) countries with directed credit liberalizations would have evolved similarly as the never-treated countries in the absence of liberalization.

For the first identifying assumption, our narrative analysis in Appendix G provides some support. Additionally, investigating data from Wacziarg and Welch (2008) and Warner and Sachs (1995), we found that the onset of credit market liberalization does not typically correlate with other reforms, such as trade liberalization.[18]

The second identifying assumption cannot be tested directly, but several pieces of evidence provide some support. First, among our various specifications, including in the robustness check below, there is no pre-trend before the onset of directed credit liberalization. Second, our specification controls for country and year fixed effects, which means any country-specific components that are invariant over time and any year-specific shock that affect all countries at the same time are absorbed in our estimation. Lastly, we estimate predictive regressions as follows:

$$\text{Liberalization}_{c,t} = \sum_{l=1}^{5} \beta_l X_{c,t-l} + \alpha_c + \gamma_t + \epsilon_{c,t}.$$

where $\text{Liberalization}_{c,t}$ is an indicator for the start year of liberalization for country c in year t, and $X_{c,t-l}$ captures macroeconomic variables and other country characteristics before

[18] There is only one episode, Israel 1985, coinciding with the start of trade liberalization.

time t, which includes real GDP per capita growth rate, inflation, credit-to-GDP ratio, net FDI-inflow-to-GDP ratio, trade-to-GDP ratio, and the banking crisis indicator from Baron et al. (2021). As reported in Table C.5, these variables have no systematic predictive power for the onset of these liberalization episodes.

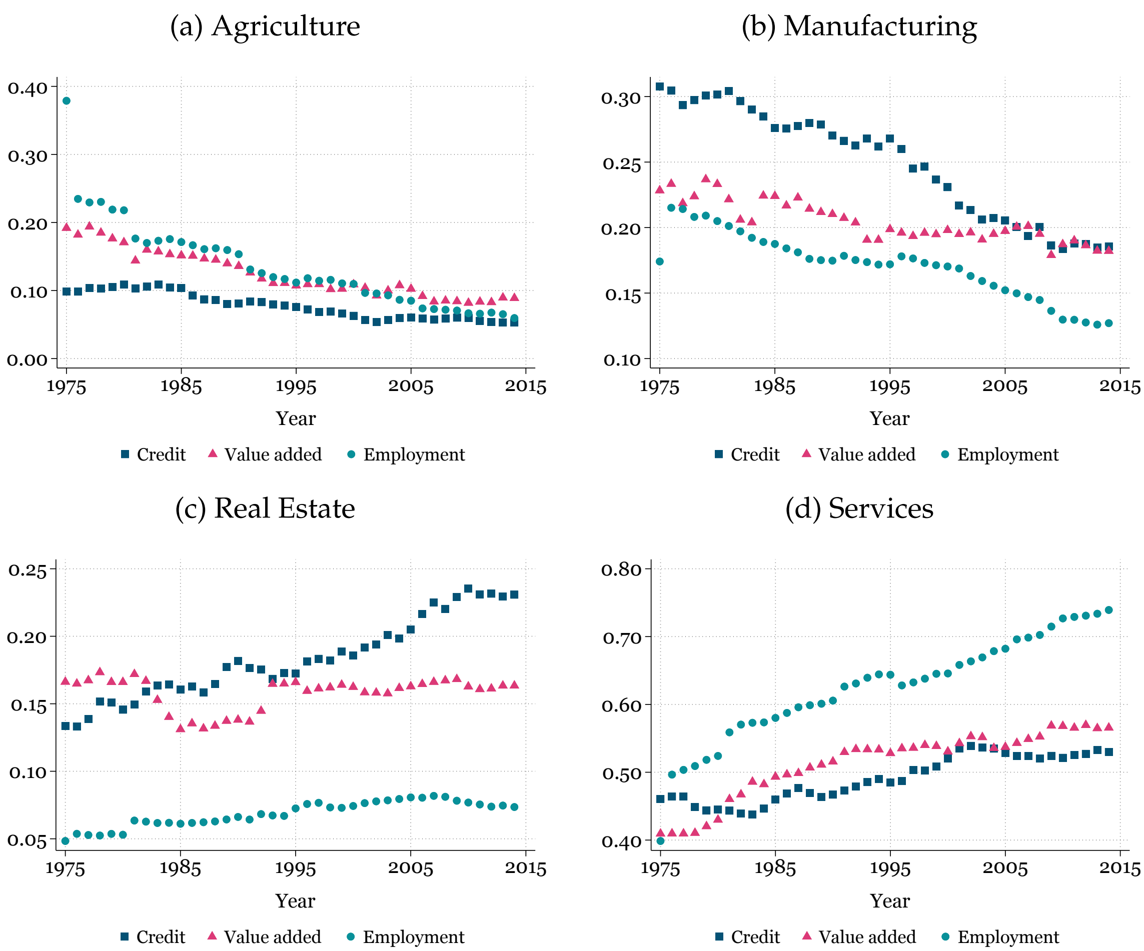
Local projection specifications As an alternative specification, we estimate local projections similar to Baron and Green (2023), except that we use a country-sector-year panel:

$$\Delta_h y_{c,s,t+h} = \alpha_c^h + \gamma_t^h + \sum_{j\in\{\text{Manu.,Cons.}\}} \beta_j^h \text{Liberalization}_{c,t} \times \mathbf{1}\{s=j\} + \sum_{l=0}^{L} \gamma_l \Delta_1 y_{c,s,t-l} + \epsilon_{c,s,t+h}, \tag{A.2}$$

for $h = 1, \dots, H$, where the dependent variable is the change of sector-specific variable from t to $t+h$ in country c sector j, α_c^h is the country fixed effect, $\text{Liberalization}_{c,t}$ is an indicator for credit policy liberalization in country c year t, $\mathbf{1}\{s=j\}$ is an sector indicator, for example, $\mathbf{1}\{s=\text{Manu}\}$ takes 1 if the sector is manufacturing. Using this specification, we can test whether $\beta^h_{\text{Manu.}}$ is statistically different from $\beta^h_{\text{Cons.}}$. Appendix Figure B.14 shows the estimation results, which suggests statistically significant differences.

B Supplementary Figures

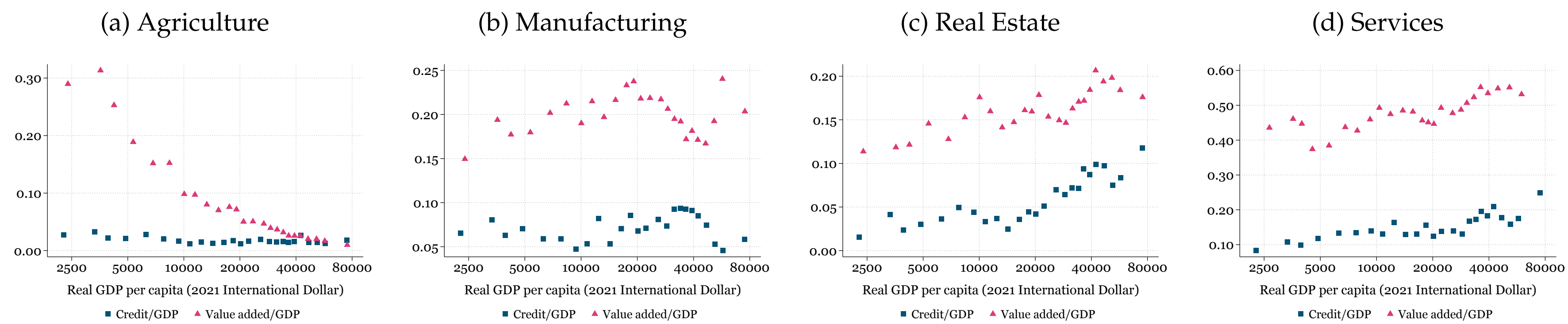
Figure B.1: Credit, Value-added, and Employment Shares: Time Series



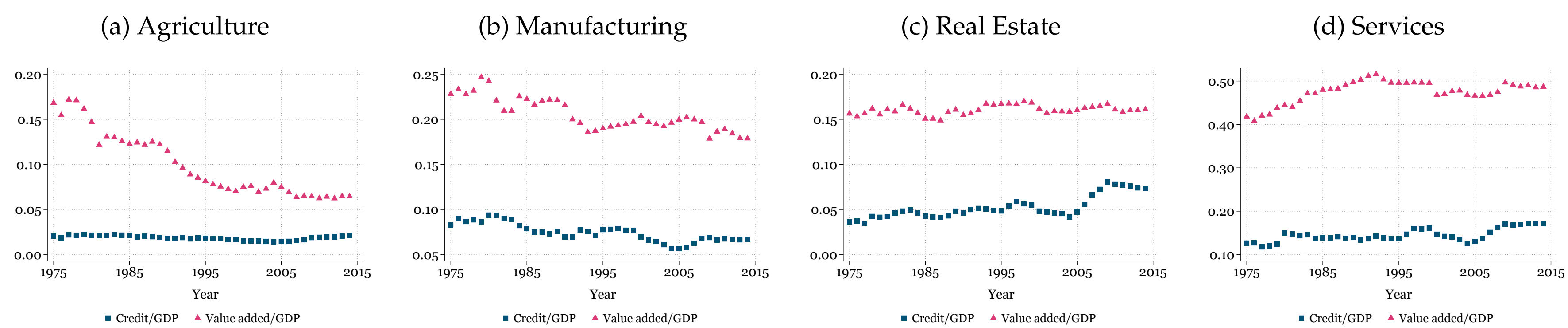
Note: This figure shows the times series of financial and real-economy structural transformation during the process of economic development, measured by the average of each variable within a particular year over different countries. We restrict the sample with non-missing credit, value-added, and employment data for all of these four sectors.

Figure B.2: Credit-to-GDP and VA-to-GDP Over Development and Over Time

Panel A: Change Over GDP per Capita



Panel B: Change Over Time

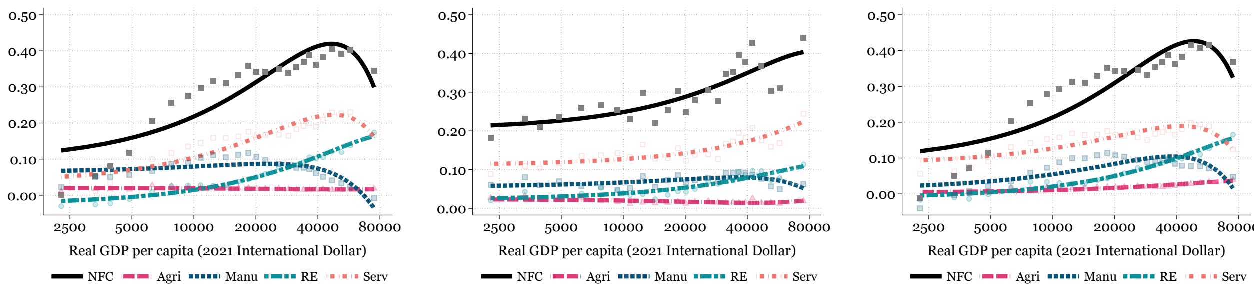


Note: These figures visualize the evolution of sectoral credit-to-GDP and VA-to-GDP through the process of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale) in Panel A and over time in Panel B.

Figure B.3: Credit Deepening and Development: With FE

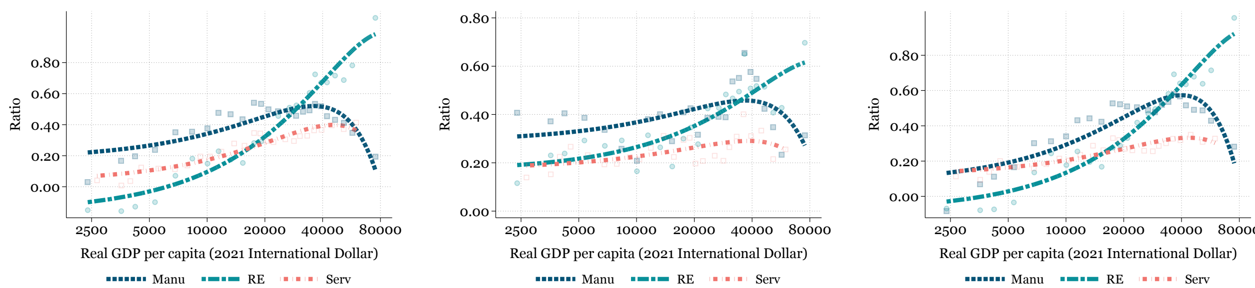
Panel A: Credit-to-GDP

(a) Add Country FE (b) Add Year FE (c) Add Country and Year FE



Panel B: Sectoal Credit-to-VA

(a) Add Country FE (b) Add Year FE (c) Add Country and Year FE

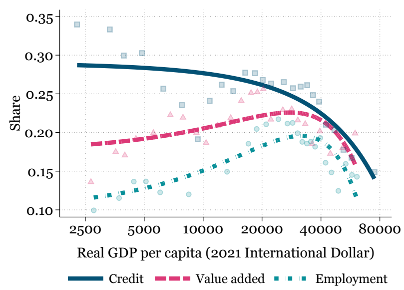


Note: These binscatter plots with quadratic fitted lines show (a) credit to GDP, both for total credit and credit to non-financial corporations and (b) sectoral credit-to-VA ratios over the course of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale) under different fixed effects.

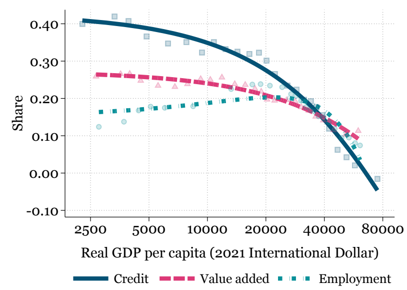
Figure B.4: Financial and Canonical Kuznets Facts: With Fixed Effects

Panel A: Manufacturing

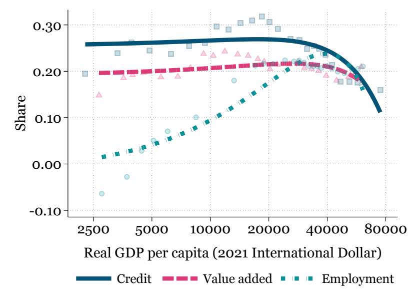
(a) Year FE



(b) Country FE

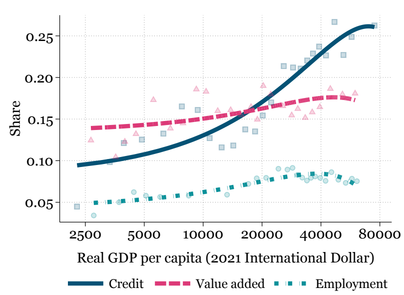


(c) Country and Year FE

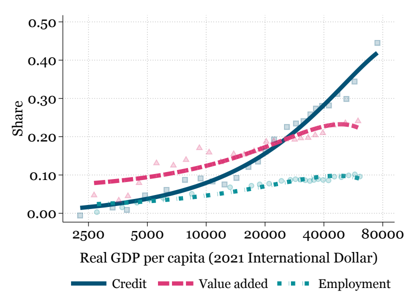


Panel B: Real Estate

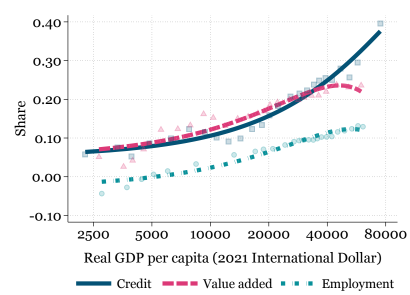
(a) Year FE



(b) Country FE



(c) Country and Year FE

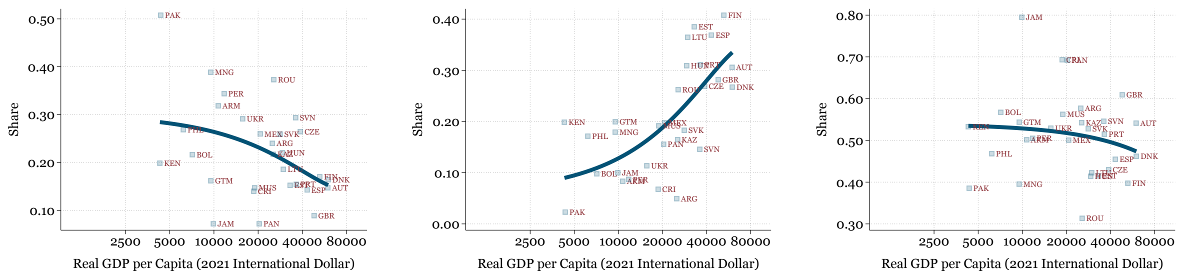


Note: These binscatter plots with quadratic fitted lines visualize the share of different sectors in outstanding non-financial corporate credit, value added, and employment over the course of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale). Panel A adds year fixed effects, Panel B adds country fixed effects, and Panel C adds both country and year fixed effects.

Figure B.5: Sectoral Credit and Value Added Share: Within-Country Average

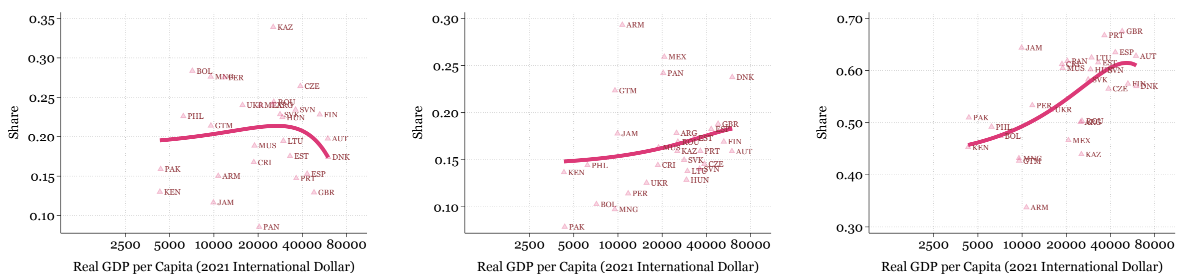
Panel A: Credit Share

(a) Manufacturing (b) Real Estate (c) Services



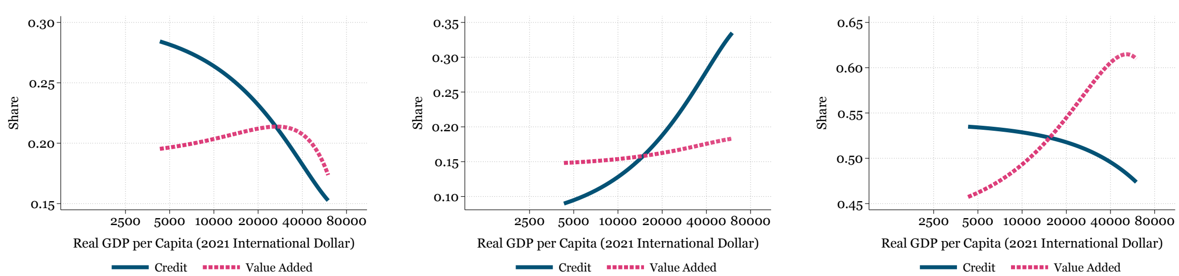
Panel B: Value Added Share

(a) Manufacturing (b) Real Estate (c) Services



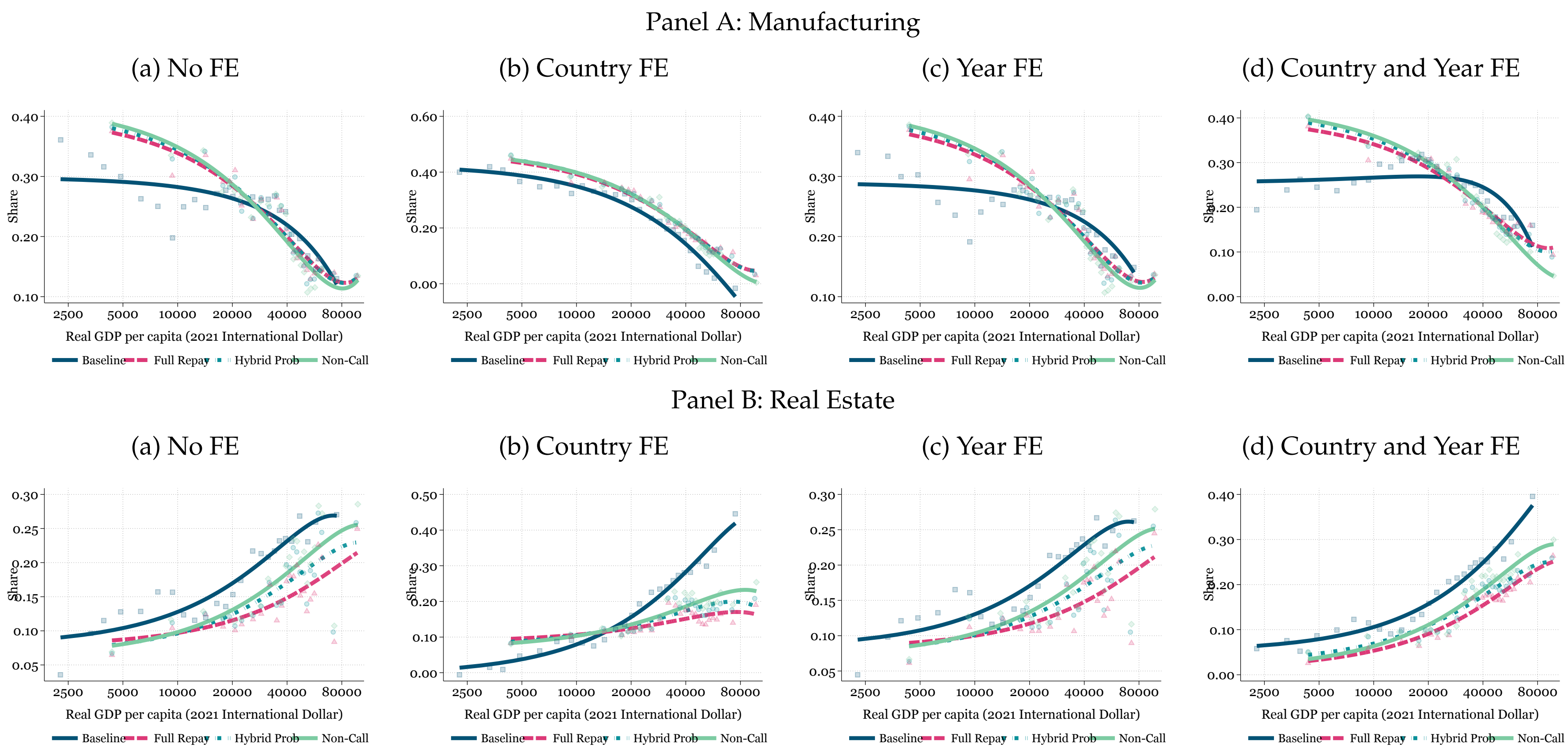
Panel C: Comparison of Credit and Value Added Share

(a) Manufacturing (b) Real Estate (c) Services



Note: These figures visualize the evolution of sectoral credit and value added share during the course of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale). In Panel A and B, each dot represents the within-country average with the solid line as the quadratic fitted line. Panel C compares the credit share and value added share.

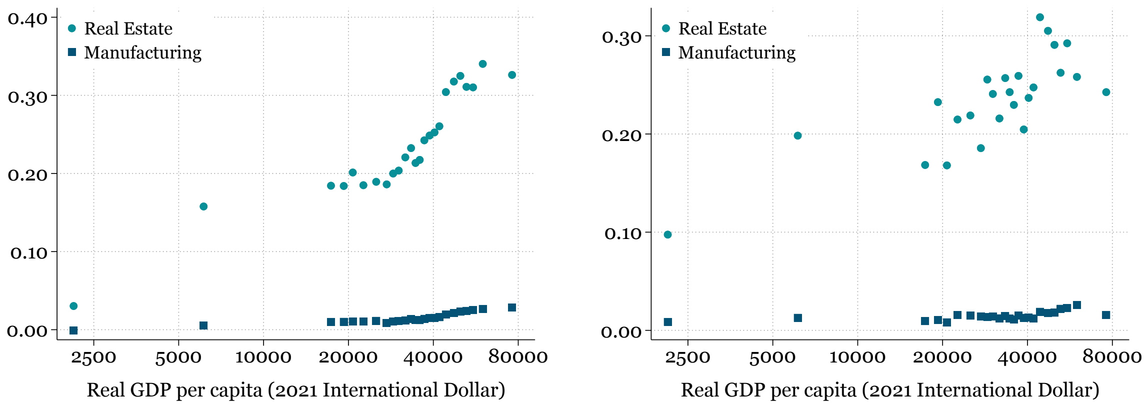
Figure B.6: Financial Kuznets Facts: Including Bond Issuance



Note: These binscatter plots, with quadratic fitted lines, illustrate the sectoral shares in outstanding non-financial corporate creditexcluding or including bond issuanceunder different fixed effects. *Baseline* refers to the sectoral credit shares presented in the main text. *Full Repay* assumes that all bonds are fully repaid only at maturity. *Hybrid Prob* is based on repayment curves from Ma et al. (2023), assuming that bonds are partially repaid or called over their life cycle. *Non-Call* uses only non-callable bonds, assuming repayment occurs solely at maturity.

Figure B.7: Sectoral Real Estate Input Share in Production over Development: With FE

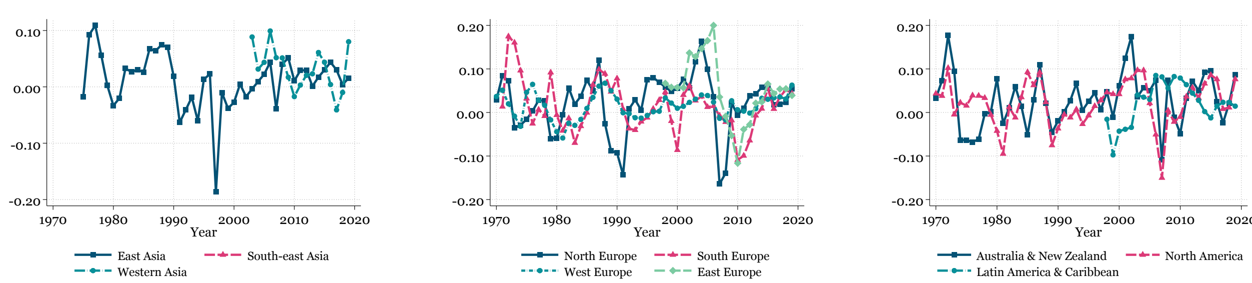
(a) Add Country FE (b) Add Year FE



Note: These binscatter plots visualize the sectoral real estate input share during the course of economic development (measured by the real GDP per capita in 2021 International Dollar, PPP adjusted, on a logarithm scale). *Real estate input share* is computed based on data from the World Input-Output Database (Timmer, Dietzenbacher, Los, Stehrer and De Vries, 2015; Woltjer, Gouma and Timmer, 2021), defined as the value of intermediate input in real estate (ISIC4 industry section F and L68 in WIOD 2016 Release; ISIC3 section F and K in Long-Run WIOD) relative to total value of intermediate.

Figure B.8: Log Change of Housing Price Index Across Subregions

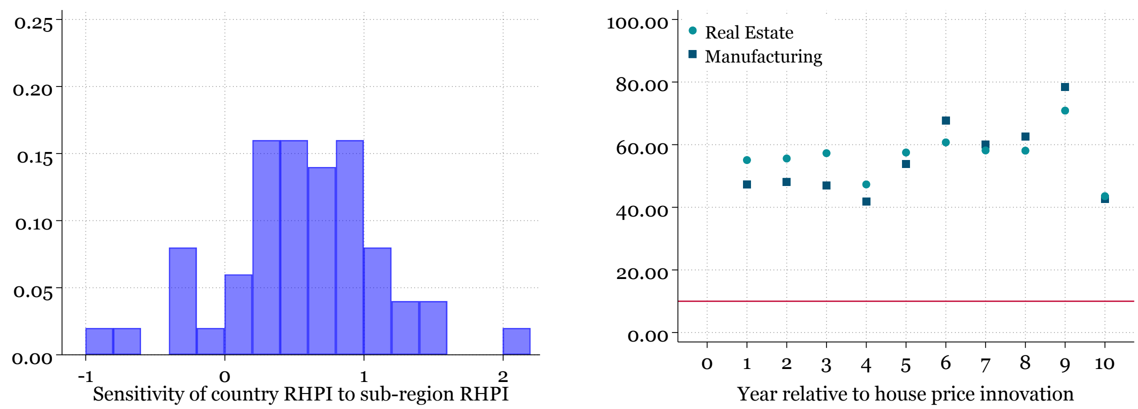
(a) Asia (b) Europe (c) Americas and Oceania



Note: This figure plots the housing price index over time at the sub-region level. We divide the countries into 10 subregions: Eastern/South-eastern/Western Asia, Northern/Southern/Western/Eastern Europe, Australia and New Zealand, and Northern/Southern America. Since the data availability of housing price across countries increase over time, we adjust these breaks. For example, if there is a change of number of countries with valid housing price index at year t, we takes the change at year t as the average of change at $t-1$ and $t+1$.

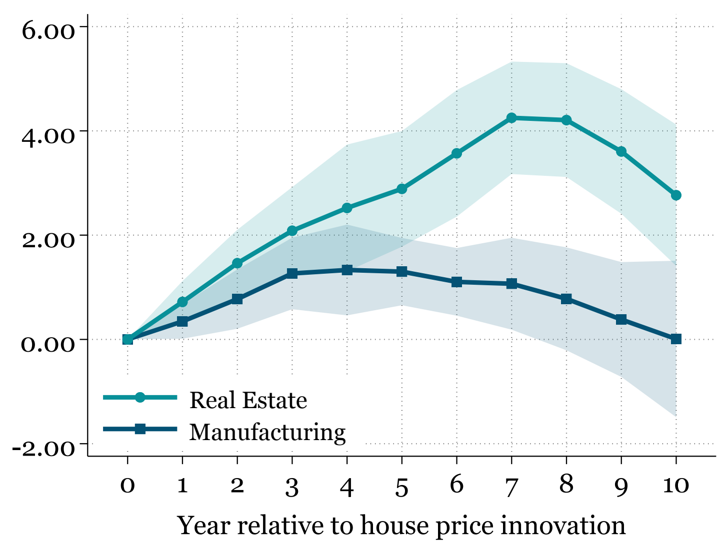
Figure B.9: Sensitivity IV

(a) Distribution of Estimated Sensitivity $\widehat{\vartheta}_c$ (b) F-statistics of IV Regression



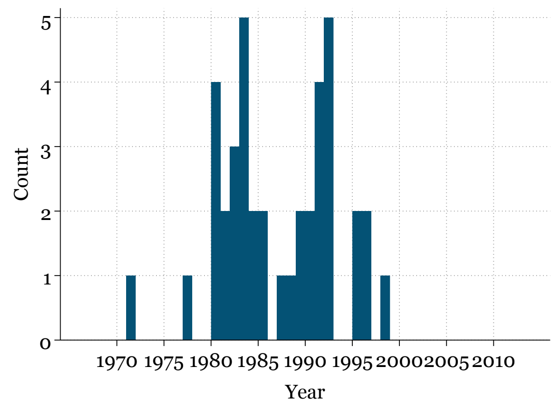
Note: Panel (a) visualizes the probability density function of estimated sensitivity of country level housing price index on regional housing price index in a 1 year time-window, denoted by $\widehat{\vartheta}_c$, from specification (A.1). Panel (b) plots the first-stage F-statistics of instrumental variable local projections following specification (6) for Figure B.10, computed as Kleibergen and Paap (2006). The horizontal solid line indicates the rule of thumb, i.e., F-statistics equal to 10.

Figure B.10: Instrumental Variable Local Projections: Collateral Price and Sectoral Credit



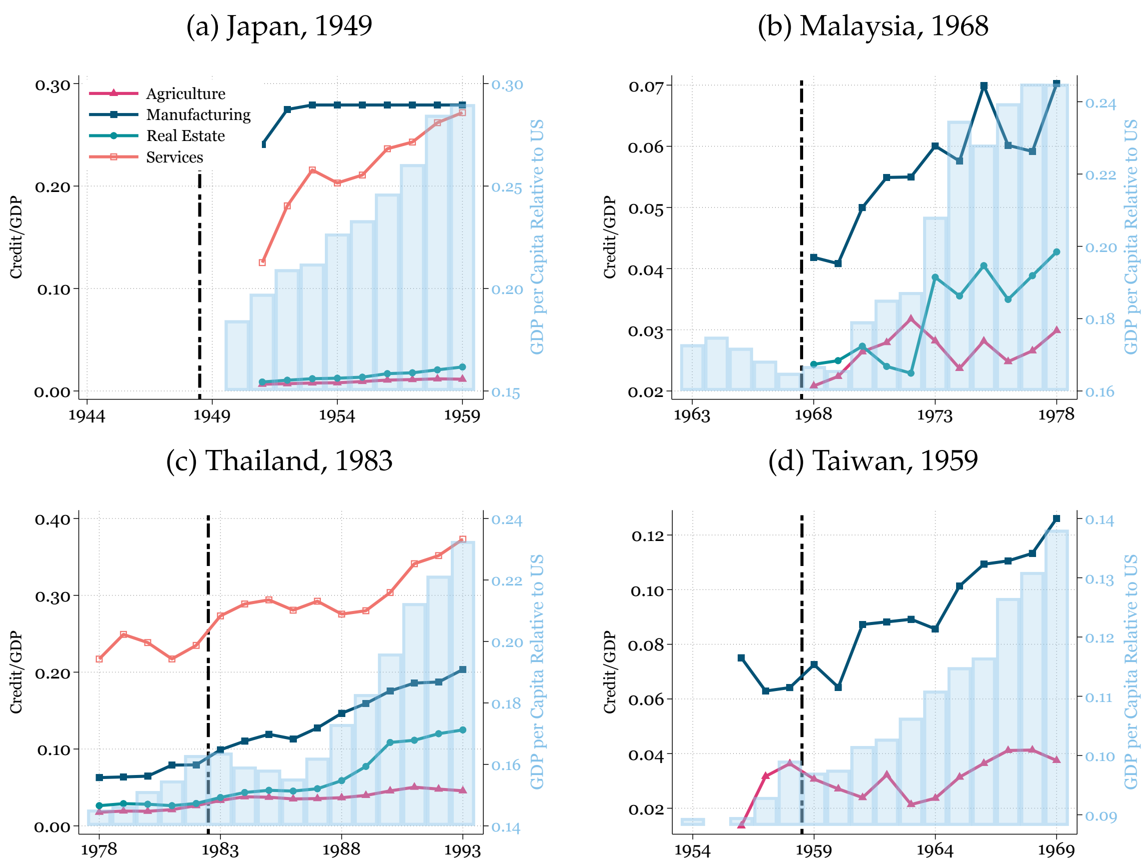
Note: This figure plot the sequence of $\{\widehat{\beta}^{j}_{h,0}\}$ for manufacturing and real estate, controlling for lagged sectoral TFP and credit to value added in logs from instrumental variable local projections following specification (6).

Figure B.11: Timing of Directed Credit Liberalizations



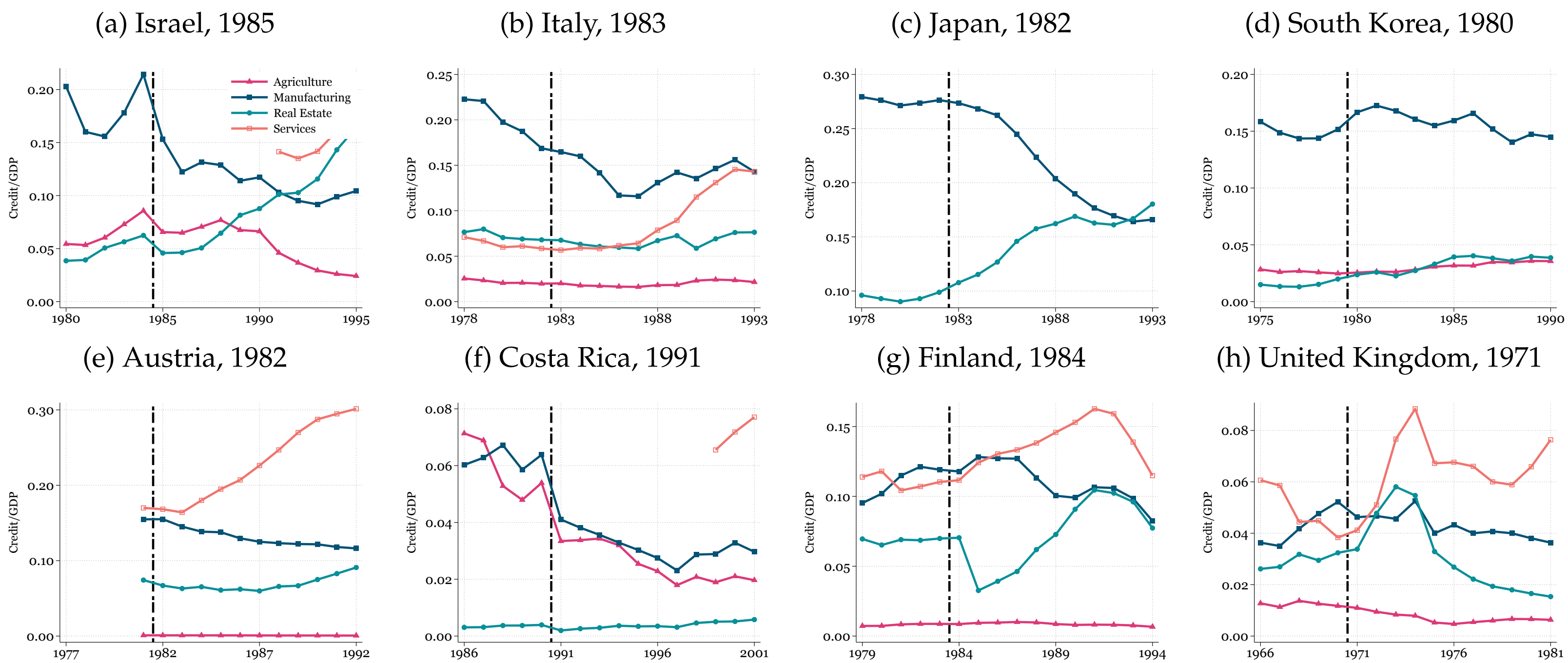
Note: This figure shows the count of directed credit liberalizations across countries by year.

Figure B.12: Credit Allocation During East Asian Growth Miracles: Additional Cases



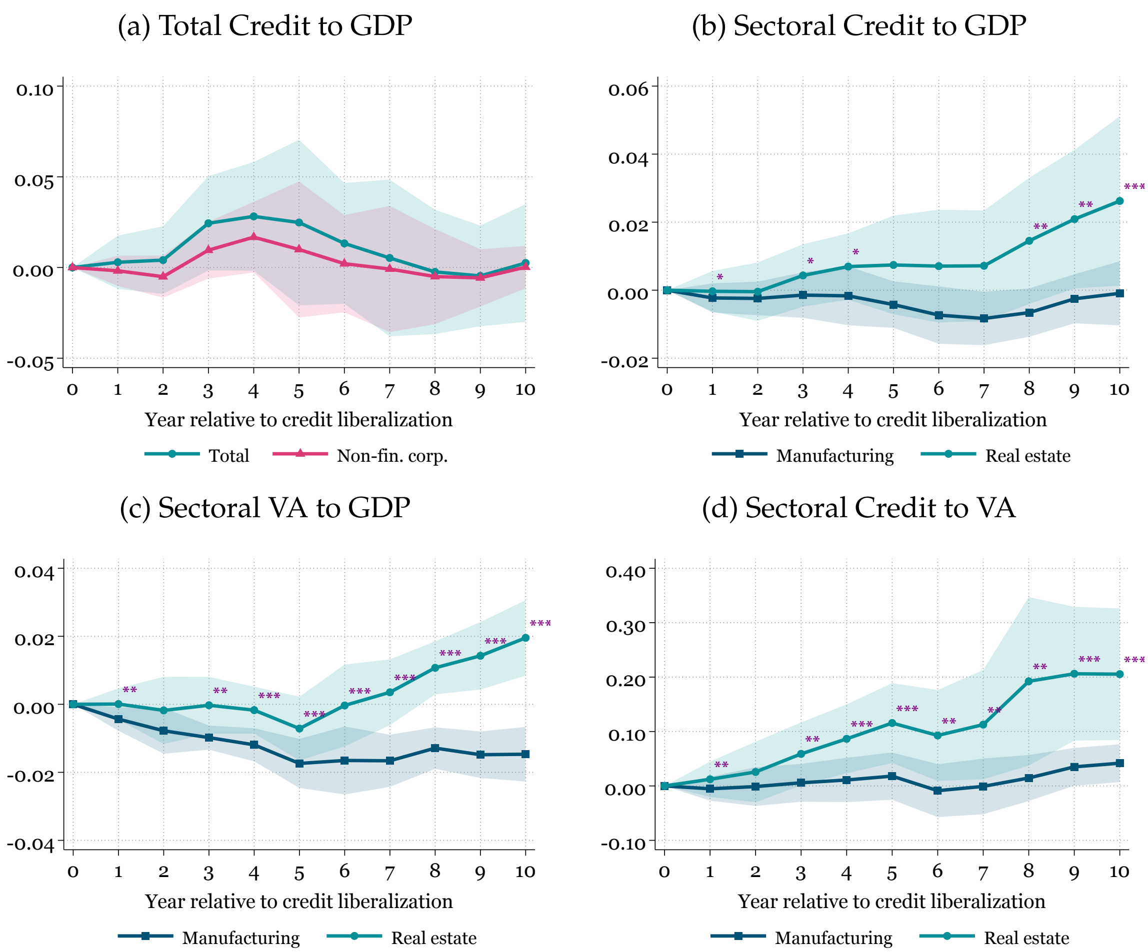
Note: These figures show the sectoral credit-to-GDP ratio for different sectors on the left vertical axis with solid lines and real GDP per capita (based on purchasing power parity) relative to US on the right vertical axis with orange bars during the East Asian growth miracles, including (a) Japan, 1949, (b) Malaysia, 1968, (c) Thailand, 1983, and (d) Taiwan, 1959. The timing for economic reform comes from Buera and Shin (2013). Reform years are marked with a vertical line.

Figure B.13: Directed Credit Liberalization: Case Studies



Note: This figure shows the credit-to-GDP ratio across sectors around the credit liberalization, including (a) Israel, 1985, (b) Italy, 1983, (c) Japan, 1982, (d) South Korea, 1980, (e) Austria, 1982, (f) Costa Rica, 1991, (g) Finland, 1984, and (h) United Kingdom, 1971. Liberalization year is marked as a vertical line in the figure.

Figure B.14: Local Projections: Liberalization of Directed Credit Policies



Note: This figure presents local projection impulse responses of aggregate and sectoral variables following directed credit policy liberalization, following (A.2). The solid lines are point estimates, and the shaded area represents 95% confidence intervals from standard errors computed using Driscoll and Kraay (1998).

C Supplementary Tables

Table C.1: List of Countries

ISO3	Country	Year Range	ISO3	Country	Year Range
ALB	Albania	2001–2015	KEN	Kenya	1970–2020
ARG	Argentina	1970–2014	KHM	Cambodia	2004–2020
ARM	Armenia	2000–2020	KOR	South Korea	1993–2020
AUS	Australia	1970–2020	LTU	Lithuania	1997–2020
AUT	Austria	1981–2019	LVA	Latvia	2001–2020
AZE	Azerbaijan	2001–2020	MAR	Morocco	2001–2020
BEL	Belgium	1976–2020	MEX	Mexico	1984–2020
BGD	Bangladesh	1984–2015	MKD	Macedonia	2004–2020
BGR	Bulgaria	2000–2020	MNG	Mongolia	2000–2016
BHR	Bahrain	1998–2016	MUS	Mauritius	1995–2020
BOL	Bolivia	1999–2014	MWI	Malawi	2013–2014
BWA	Botswana	1990–2020	MYS	Malaysia	1996–2020
CAN	Canada	1970–2014	NGA	Nigeria	1970–1992
CHE	Switzerland	1997–2020	NLD	Netherlands	2010–2014
CHL	Chile	1998–2015	NOR	Norway	1975–2014
COL	Colombia	1988–2020	NZL	New Zealand	1994–2014
CRI	Costa Rica	1999–2020	PAK	Pakistan	1982–2020
CZE	Czech Republic	1995–2020	PAN	Panama	1975–2014
DEU	Germany	2006–2020	PER	Peru	1990–2020
DNK	Denmark	1981–2014	PHL	Philippines	1970–2017
DOM	Dominican Republic	2001–2020	POL	Poland	2002–2012
ESP	Spain	1992–2019	PRT	Portugal	1973–2020
EST	Estonia	1995–2020	ROU	Romania	2000–2020
FIN	Finland	1976–2014	RUS	Russian Federation	2002–2020
FRA	France	2006–2014	SAU	Saudi Arabia	1998–2020
GBR	United Kingdom	1970–2020	SGP	Singapore	1980–2020
GEO	Georgia	2003–2015	SVK	Slovakia	1992–2019
GRC	Greece	2002–2020	SVN	Slovenia	1994–2014
GTM	Guatemala	1975–2014	THA	Thailand	1970–2020
HKG	Hong Kong	1970–2003	TTO	Trinidad and Tobago	1971–2019
HND	Honduras	2001–2020	TUN	Tunisia	2007–2020
HTI	Haiti	1999–2020	TUR	Turkey	1977–2014
HUN	Hungary	1995–2020	TWN	Taiwan	1997–2014
IND	India	1973–2018	TZA	Tanzania	2003–2020
ISR	Israel	1991–2019	UGA	Uganda	2004–2006
ITA	Italy	1970–2020	UKR	Ukraine	2000–2014
JAM	Jamaica	1970–2019	VEN	Venezuela	2004–2015
JOR	Jordan	1970–2020	ZAF	South Africa	1994–2019
JPN	Japan	1970–2020	ZWE	Zimbabwe	2009–2019
KAZ	Kazakhstan	1997–2020			

Table C.2: Credit Share and Logged GDP Per Capita

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Agriculture						
ln(Real GDP per Capita)	-0.026***	-0.178***	-0.055***	-0.158***	-0.020***	-0.176***
	(0.0014)	(0.0244)	(0.0018)	(0.0231)	(0.0014)	(0.0235)
ln(Real GDP per Capita)^2		0.008***		0.005***		0.008***
		(0.0013)		(0.0012)		(0.0012)
Observations	2,683	2,683	2,683	2,683	2,682	2,682
# Countries	93	93	93	93	93	93
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.12	0.13	0.78	0.78	0.21	0.23
Panel B: Manufacturing						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	-0.044***	-0.088*	-0.094***	0.934***	-0.031***	-0.109**
	(0.0026)	(0.0453)	(0.0036)	(0.0404)	(0.0026)	(0.0436)
ln(Real GDP per Capita)^2		0.002		-0.054***		0.004*
		(0.0024)		(0.0021)		(0.0023)
Observations	2,683	2,683	2,683	2,683	2,682	2,682
# Countries	93	93	93	93	93	93
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.10	0.10	0.75	0.80	0.20	0.20
Panel C: Real Estate						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.061***	-0.172***	0.097***	-0.316***	0.056***	-0.150***
	(0.0020)	(0.0351)	(0.0032)	(0.0392)	(0.0021)	(0.0349)
ln(Real GDP per Capita)^2		0.012***		0.022***		0.011***
		(0.0018)		(0.0021)		(0.0018)
Observations	2,683	2,683	2,683	2,683	2,682	2,682
# Countries	93	93	93	93	93	93
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.25	0.27	0.73	0.74	0.30	0.31
Panel D: Service						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.010***	0.468***	0.055***	-0.392***	-0.005	0.465***
	(0.0032)	(0.0556)	(0.0043)	(0.0538)	(0.0032)	(0.0537)
ln(Real GDP per Capita)^2		-0.024***		0.023***		-0.025***
		(0.0029)		(0.0028)		(0.0028)
Observations	2,683	2,683	2,683	2,683	2,682	2,682
# Countries	93	93	93	93	93	93
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.00	0.03	0.74	0.74	0.10	0.13

Note: This table presents the estimation result from estimating variants of the following regression:

$$\log(\text{Credit Share}^j_{c,t}) = \beta^j_0 + \beta^j_1 \log(\text{Real GDP per Capita}_{c,t}) + \beta^j_2 \log(\text{Real GDP per Capita}_{c,t})^2 + \gamma_c + \mu_t + \epsilon^j_{c,t},$$

where c, j and t indicate country, sector and year, respectively. γ_c are country fixed effects, μ_t year fixed effects. *, **, and *** denote significance at the 10%, 5% and 1% level.

Table C.3: Housing Price Pass-through to Sectoral Credit: Bivariate Regressions

	Panel A: $\Delta_h \log(\text{Credit}^{\text{manu}}_{c,t})$							
	$h=1$		$h=3$		$h=5$		$h=10$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h \log(\text{HPI}_{c,t})$	0.18	0.32	0.23	0.27	0.23	0.12	0.31	0.46
	[0.14,0.22]	[0.16,0.48]	[0.20,0.27]	[0.15,0.40]	[0.18,0.27]	[0.0072,0.23]	[0.26,0.36]	[0.25,0.67]
Observations	745	728	675	662	611	568	461	331
# Countries	32	31	31	30	30	26	23	17
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Other controls	✓	✓	✓	✓	✓	✓	✓	✓
Specification	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
IV 1st Stage F-statistics		97.72		53.68		128.52		26.71
Mean of Dependent Var.	0.01	0.01	0.03	0.03	0.05	0.05	0.13	0.14
R^2	0.77	0.76	0.83	0.83	0.87	0.86	0.86	0.83
	Panel B: $\Delta_h \log(\text{Credit}^{\text{RE}}_{c,t})$							
	$h=1$		$h=3$		$h=5$		$h=10$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h \log(\text{HPI}_{c,t})$	0.35	0.33	0.47	0.53	0.48	0.40	0.51	0.43
	[0.27,0.44]	[0.14,0.53]	[0.37,0.56]	[0.18,0.88]	[0.40,0.56]	[0.20,0.60]	[0.39,0.62]	[-0.071,0.93]
Observations	742	725	672	659	608	564	458	332
# Countries	32	31	31	30	30	26	23	17
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Other controls	✓	✓	✓	✓	✓	✓	✓	✓
Specification	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
IV 1st Stage F-statistics		90.81		49.82		87.38		29.84
Mean of Dependent Var.	0.06	0.05	0.16	0.16	0.28	0.29	0.59	0.60
R^2	0.80	0.80	0.82	0.82	0.85	0.84	0.84	0.82

Note: This table reports the estimation result for the elasticity of sectoral credit growth to house price shocks at different time horizons. The IV first stage F-statistics is computed following Kleibergen and Paap (2006).

Table C.4: Sectoral Credit Growth and Change of Intangibles/Tangibles

	Panel A: Intangible Asset Share							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ_hIntangible Share$_{c,j,t}$	-1.18**	-1.23*	-1.37**	-1.15*	-0.92	-1.15	-1.08*	-1.31
	(0.52)	(0.66)	(0.49)	(0.61)	(0.69)	(1.18)	(0.55)	(1.03)
Observations	2,753	2,680	2,196	2,125	1,810	1,755	1,463	1,410
# Countries	17	15	17	15	17	14	17	14
# Industries	19	18	14	13	19	18	14	13
Country FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Industry FE	✓		✓		✓		✓	
Country×Year FE		✓		✓		✓		✓
Industry×Year FE		✓		✓		✓		✓
Industry Restriction			✓	✓			✓	✓
R^2	.0026	.0033	.0037	.0033	.0022	.0044	.0032	.0058

	Panel B: Intangible and Tangible Assets							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h \log(\text{Intangible}_{c,j,t})$	0.32**	0.100	0.25	0.076	0.45***	0.28***	0.34**	0.24**
	(0.12)	(0.10)	(0.17)	(0.14)	(0.080)	(0.066)	(0.12)	(0.10)
$\Delta_h \log(\text{Tangible}_{c,j,t})$	0.87***	0.36**	0.94***	0.39***	0.76***	0.36**	0.85***	0.49***
	(0.11)	(0.15)	(0.13)	(0.13)	(0.100)	(0.15)	(0.093)	(0.094)
Observations	2,751	2,678	2,194	2,123	1,809	1,754	1,462	1,409
# Countries	17	15	17	15	17	14	17	14
# Industries	19	18	14	13	19	18	14	13
Country FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Industry FE	✓		✓		✓		✓	
Country×Year FE		✓		✓		✓		✓
Industry×Year FE		✓		✓		✓		✓
Industry Restriction			✓	✓			✓	✓
R^2	.089	.01	.11	.013	.13	.03	.14	.044

Note: This table reports regression results on the relation between changes in intangible or tangible assets and sectoral credit growth in a country, year, 1-digit industry panel. Panel A estimates the following specification

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta^h \Delta_h \text{Intangible Share}_{c,j,t} + \text{Fixed Effects} + \epsilon_{c,j,t} \text{ for } h = 5, 10.$$

Panel B estimates the following specification

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta^h_{\text{Intang}} \Delta_h \log(\text{Intang}_{c,j,t}) + \beta^h_{\text{Tang}} \Delta_h \log(\text{Tang}_{c,j,t}) + \text{Fixed Effects} + \epsilon_{c,j,t} \text{ for } h = 5, 10.$$

Driscoll and Kraay (1998) standard errors with 5 lags are in parenthesis. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table C.5: How Predictable Are Directed Credit Liberalizations?

	$\mathbf{1}\{\text{Liberalization}_{c,t}\}$					
	GDP Growth	Inflation	$\frac{\text{Credit}}{\text{GDP}}$	$\frac{\text{FDI Inflow}}{\text{GDP}}$	$\frac{\text{Trade}}{\text{GDP}}$	Bank Crisis
	(1)	(2)	(3)	(4)	(5)	(6)
$X_{c,t-1}$	0.0037	0.00010	-0.012	0.0015	0.014*	0.0074
	(0.0082)	(0.0094)	(0.019)	(0.0015)	(0.0073)	(0.012)
$X_{c,t-2}$	-0.00097	0.011	-0.011	-0.0034	-0.0031	0.0027
	(0.0086)	(0.013)	(0.016)	(0.0028)	(0.0077)	(0.0099)
$X_{c,t-3}$	0.010	-0.0016	-0.0034	0.0045	-0.017*	-0.00063
	(0.010)	(0.0050)	(0.015)	(0.0034)	(0.0089)	(0.0079)
$X_{c,t-4}$	0.015**	-0.00033	-0.0082	0.00092	0.0055	-0.0034
	(0.0078)	(0.0019)	(0.014)	(0.0025)	(0.011)	(0.0063)
$X_{c,t-5}$	-0.0019	-0.0019	0.015	0.0037	-0.00077	0.0045
	(0.011)	(0.0023)	(0.013)	(0.0023)	(0.0083)	(0.0091)
Observations	8,676	7,432	6,208	5,717	5,847	6,301
Country FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
R^2	.031	.036	.042	.038	.037	.034

Note: This table reports the results for predictive regression

$$\mathbf{1}\{\text{Liberalization}_{c,t}\} = \sum_{l=1}^{5} \beta_l X_{c,t-l} + \alpha_c + \gamma_t + \epsilon_{c,t}$$

where $\mathbf{1}\{\text{Liberalization}_{c,t}\}$ is an indicator for credit liberalization in country c at time t, $X_{c,t-l}$ represents characteristics before time t, which includes real GDP per capita growth rate, inflation, credit-to-GDP ratio, net FDI-inflow-to-GDP ratio, trade-to-GDP ratio, and bank crisis indicator from Baron et al. (2021). Standard errors are clustered at the country level. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table C.6: Sectoral Financial Deepening and Long-Run Growth: 10-Year Horizon

	$\Delta_{10}\log(\textbf{Real GDP per Capita}_{c,t})$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Manu Credit to $\text{GDP}_{c,t}$	0.74***	0.80***	1.01***					
	(0.17)	(0.19)	(0.23)					
RE Credit to $\text{GDP}_{c,t}$	-0.81***	-0.81***	-0.74***					
	(0.17)	(0.20)	(0.26)					
Agri Credit to $\text{GDP}_{c,t}$			0.072					
			(0.72)					
Serv Credit to $\text{GDP}_{c,t}$			-0.34*					
			(0.18)					
Manu Credit $\text{Share}_{c,t}$				0.36***		0.30***		
				(0.098)		(0.10)		
RE Credit $\text{Share}_{c,t}$					-0.33***	-0.23***		
					(0.069)	(0.079)		
Lower $\text{Income}_{c,t}$ × Credit/$\text{GDP}_{c,t}$							0.25***	0.45***
							(0.079)	(0.11)
Higher $\text{Income}_{c,t}$ × Credit/$\text{GDP}_{c,t}$							-0.24***	-0.20***
							(0.032)	(0.053)
Observations	2,632	2,287	1,823	1,823	1,823	1,823	6,074	2,075
# Countries	82	75	76	76	76	76	130	77
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Control: VA to GDP		✓						
Interacted Var: Credit/GDP							Total	NFC
Control: GDP per Capita	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.32	0.36	0.30	0.25	0.24	0.26	0.09	0.11

Note: This table presents results from estimating equation (8). Each column also controls for logged real GDP per capita. Driscoll and Kraay (1998) standard errors with 5 lags are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

D Proofs, Derivations, and Extensions of the Model

Appendix D.1 solves a more general version of the benchmark model in Section 3, incorporating both cash-flow-based and asset-based (collateral) constraints. Appendix D.2 provides proofs of the model predictions 1-3. Appendix D.3 discusses the baseline model.

Appendix D.4 provides an extended model with intangible assets, related to one of the mechanisms tested in Section 5. Appendix D.5 shows that our main result is robust to non-homothetic preferences, echoing our discussion in Section 6.

D.1 Predictions in the Benchmark Model

D.1.1 Setup

We consider a more general setup: (i) the entrepreneur is allowed to raise debt via cash flow-based and asset-based financing, motivated by Lian and Ma (2021), and (ii) the financial constraint parameters are allowed to be sector-specific. In particular,

$$d^j_{t+1} = d^{\lambda^j}_{t+1} + d^{\chi^j}_{t+1}, \quad d^{\lambda^j}_{t+1} \leq \lambda^j q_{t+1} l^j_{t+1}, \quad d^{\chi^j}_{t+1} \leq \chi^j p^j_t y^j_t. \tag{D.1}$$

The asset-based financing $d^{\lambda^j}_{t+1}$ is proportionate to the resale value of current period collateral $q_{t+1} l^j_{t+1}$. The maximum amount of cash flow-based financing $d^{\chi^j}_{t+1}$ is proportionate to the current period revenue $p^j_t y^j_t$.

If $\lambda^j = 0$, our financial constraint is similar to that in Matsuyama (2007) and Greenwald (2019). If $\chi^j = 0$, our financial constraint can be interpreted as a collateral constraint (Kiyotaki and Moore, 1997; Iacoviello, 2005; Liu et al., 2013; Catherine et al., 2022), as in our baseline model. This specification parsimoniously models a costly contract enforcement scenario.

D.1.2 Key Conditions

Savers The Lagrangian for the savers' optimization problem is

$$\mathcal{L}^S = \sum_{t=0}^{\infty} (\beta^S)^t \left\{ v(c^S_t, h^S_t) + \phi^S_t \left[b_t - c^S_t - q_t h^S_t - \frac{b_{t+1}}{1+r_t} \right] \right\},$$

where ϕ^j_t is the Lagrangian multiplier savers' for the savers' fund constraint, and $v(c, h)$ is the instantaneous utility function with elasticity of substitution η. The FOCs with respect to c^S_t, h^S_t are

$$v_c(c^S_t, h^S_t) = \phi^S_t, \quad v_h(c^S_t, h^S_t) = \phi^S_t q_t, \quad \Rightarrow \frac{c^S_t}{h^S_t} = \left[\frac{q}{s} \right]^\eta \tag{D.2}$$

For savers, the optimal savings, analogous to the Euler equation for the consumption-saving problem, is expressed as

$$\beta^S \phi_{t+1}^S - \frac{1}{1+r_t}\phi_t^S = 0 \tag{D.3}$$

Entrepreneurs Setting up the Lagrangian of the optimization problem for the entrepreneur in sector j, we have

$$\mathcal{L}^j = \sum_{t=0}^{\infty} \beta^t \Big\{ v(c_t^j, h_t^j) + \phi_t^j \Big[p_t^j z_t^j (l_t^j)^{\alpha^j} + \frac{d_{t+1}^j}{1+r_t} - c_t^j - q_t h_t^j - q_t \left[l_{t+1}^j - (1-\delta) l_t^j \right] - d_t^j \Big]$$
$$+ \theta_t^{\lambda j} (\lambda_t^j q_{t+1} l_{t+1}^j - d_{t+1}^{\lambda j}) + \theta_t^{\chi^j} (\chi_t^j p_t^j z_t^j (l_t^j)^{\alpha^j} - d_{t+1}^{\chi^j}) \Big\},$$

where ϕ_t^j, $\theta_t^{\lambda j}$ and $\theta_t^{\chi^j}$ are the non-negative Lagrangian multipliers for the flow of fund constraint (2) and the financial constraints (D.1). The FOCs for $d_{t+1}^{\lambda j}$ and $d_{t+1}^{\chi^j}$ are

$$\frac{\phi_t^j}{1+r_t} - \beta \phi_{t+1}^j - \theta_t^{\lambda j} = 0, \quad \frac{\phi_t^j}{1+r_t} - \beta \phi_{t+1}^j - \theta_t^{\chi^j} = 0 \tag{D.4}$$

with their complementary slackness conditions. One can notice that $\theta_t^{\lambda j} = \theta_t^{\chi^j} \equiv \theta_t$. Intuitively, the asset-based and cash flow-based borrowing are fungible for the entrepreneur, so they share the same shadow price.

The FOC for collateral usage l_t^j is written as

$$\alpha^j \beta \phi_{t+1}^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha^j - 1} + \theta_t^j \lambda_t^j q_{t+1} + \theta_{t+1}^j \alpha^j \beta \chi_t^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha^j - 1} = \phi_t^j q_t - \beta(1-\delta)\phi_{t+1}^j q_{t+1}. \tag{D.5}$$

Equation (D.5) is intuitive. The left-hand side captures the marginal benefit of increasing one unit of collateral for period $t+1$: the entrepreneur obtains the discounted marginal production of collateral in the next period (the first term) and gains from the the looser collateral constraint, which raises debt capacity (the second term). The right-hand side captures the marginal cost: investing in collateral for tomorrow reduces income and thus consumption today (the first term), but increases it tomorrow (the second term).

The consumption side is similar as that of savers, except that one would change the index from S to j in Equation D.2.

D.1.3 Steady-State Equilibrium

We summarize the main results of our model at the steady-state equilibrium.

Credit-Constrained Economy Combining Equations (D.3) and (D.4), we obtain, at the steady state,

$$\theta^j = \phi^j \left(\frac{1}{1+r} - \beta \right) = \phi^j \left(\beta^S - \beta \right) > 0, \text{ and } d^j = \lambda^j q l^j + \chi^j p^j y^j \tag{D.6}$$

The financial constraints are binding for both sectors. Intuitively, the savers are more patient $\beta^S > \beta$, and provide debt elastically with $r = 1/\beta^S - 1$.

Consumption Side Aggregation Aggregating Equation D.2 over i, we obtain the relation between aggregate manufacturing goods $c = \sum_i c^i$ and residential housing $h = \sum_i h^i$,

$$\frac{c^i}{h^i} = \left[\frac{q}{s} \right]^\eta \implies \frac{c}{h} = \left[\frac{q}{s} \right]^\eta, \tag{D.7}$$

Equation D.7 implies that the higher the collateral price q is, the lower the relative demand for residential housing h/c is. The elasticity of relative expenditure qh/c to collateral price q is $1 - \eta$. When the elasticity of substitution η is less than one, a one percent increase implies less than a one percent increase of relative expenditure. Conversely, when η is greater than one, an increase in collateral price leads to a decline in relative expenditure in residential housing because the price effect dominates.

Optimal Collateral Usage By evaluating Equation (D.5) at the steady state, we have

$$l^E = (\alpha^E z^E \widetilde{\lambda}^E \widetilde{\chi}^E)^{\frac{1}{1-\alpha^E}}, \quad l^M = (\alpha^M z^M \widetilde{\lambda}^M \widetilde{\chi}^M / q)^{\frac{1}{1-\alpha^M}}, \tag{D.8}$$

where $\widetilde{\lambda}^j = \frac{\beta}{1-\beta(1-\delta)-\lambda^j(\beta^S-\beta)}, \widetilde{\chi}^j = 1 + \chi^j(\beta^S - \beta)$. It is easy to verify that when $\chi^j = 0$, that is $\widetilde{\chi}^j = 1$, Equation D.8 collapses to our baseline results in Equation 4 in Section 3.2.

Market Clearing Conditions The market clearing conditions at the steady state are written as

$$z^M (l^M)^{\alpha^M} = c, \quad z^E (l^E)^{\alpha^E} - \delta l^E = h + \delta l^M \tag{D.9}$$

Definition of Steady-State Equilibrium To ensure the steady-state equilibrium is well-defined, we assume that collateral usage for each sector $l^j > 0$, and the net output of the real estate sector $z^E (l^E)^{\alpha^E} - \delta l^E$ is positive by imposing the following assumption:

Assumption D.1 (Parameters Restriction for Asset-Based Financial Constraint)**.** *The parameters for asset-based financial constraints λ^j are restricted below $\lambda^j_{\max}$, for $j \in \{M, E\}$, where*

$$\lambda^M_{\max} \equiv \frac{1 - \beta(1-\delta)}{\beta^S - \beta}, \quad \lambda^E_{\max} \equiv \frac{1 - \beta(1 - \delta - \alpha^E \delta)}{\beta^S - \beta}$$

We define the steady-state equilibrium and prove its uniqueness.

Prediction D.1 (Steady-State Equilibrium). *Under Assumption D.1, there exists a unique steady-state equilibrium, consisting of (aggregate) allocations (c, h, l^j, d^j) and prices and shadow prices (r, q, ϕ^i, θ^j), such that*

1. *the optimization problem for each agents is solved by Equations* (D.7), (D.6), (4);
2. *market clearing conditions* (D.9) *hold.*

Proof. Notice that when $q \to 0$, the right-hand side of Equation (D.10) approaches to $+\infty$ and when $q \to \infty$, it approaches to 0. There exists a unique collateral price q clears the market. ∎

D.1.4 Determination of the Collateral Price

The collateral price q is an endogenous object determined by the market clearing condition for real estate output:

$$\overbrace{z^E(\underbrace{\widetilde{\zeta}^E}_{l^E})^{\alpha^E} - \delta\widetilde{\zeta}^E}^{\text{Residual Supply}} = \overbrace{\underbrace{\widetilde{\zeta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}}}_{h(q)} + \delta\underbrace{\widetilde{\zeta}^M q^{-\frac{1}{1-\alpha^M}}}_{l^M(q)}}^{\text{Aggregate Demand}}, \tag{D.10}$$

where $\widetilde{\zeta}^j \equiv (\alpha^j z^j \widetilde{\lambda}^j \widetilde{\chi}^j)^{\frac{1}{1-\alpha^j}}$ for $j \in \{M, E\}$ and $\widetilde{\zeta}^H \equiv s^\eta z^M (\widetilde{\zeta}^M)^{\alpha^M}$.

To see this, combining Equations (D.7) and (D.9), we have

$$h = (s/q)^\eta c = (s/q)^\eta z^M (l^M)^{\alpha^M} = \widetilde{\zeta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}}.$$

It follows that $h(q)$ decreases with q. Finally, to obtain Equation (D.10), we substitute $h(q)$ and $l^M(q)$ into the market clearing condition for real estate good.

The left hand side of Equation (D.10) is the *residual supply* of the real estate good, the difference between real estate output y^E and collateral investment δl^E in that sector at the steady state. Residual supply is invariant with q from Equation (4). The right hand side includes downward sloping residential housing demand $h(q)$ and the manufacturing sector's commercial land investment $\delta l^M(q)$. This demand curve for real estate output intersects with the inelastic residual supply curve, which guarantees that a unique q clears the market in steady state.

The following proposition showcases how the collateral price q varies with the exogenous sectoral productivity and collateral constraint parameters. To elucidate the mechanism: (i) we focus only on asset-based constraint, though intuition is similar for cash-flow based constraint; (ii) we relax the collateral constraint in one sector at a time, while holding the constraint in the other sector fixed.[19]

Prediction D.2 (Collateral Price). *Holding all else equal, and suppose $\chi^M = \chi^E = 0$,*

1. ***(Manufacturing)*** *q increases with z^M and λ^M;*

[19]For exposition, in Prediction D.2, we use λ^j. In the model, we *do not* assume a sector-specific λ.

2. ***(Real Estate)** if the real estate collateral constraint is relatively binding, i.e. $\widetilde{\lambda}^E < 1/\delta$, the supply effect dominates such that q decreases with z^E and λ^E; otherwise, the demand effect dominates such that q increases with z^E and λ^E.*

Proof. The proof contains two parts.

1. With $\widetilde{\lambda}^j$ increasing with λ^j, it is easy to obtain $\frac{\partial \widetilde{\zeta}^j}{\partial z^j} > 0, \frac{\partial \widetilde{\zeta}^j}{\partial \lambda^j} > 0, \frac{\partial \widetilde{\zeta}^H}{\partial z^M} > 0, \frac{\partial \widetilde{\zeta}^H}{\partial \lambda^M} > 0$ And thus, increasing z^M or λ^M increases the right hand side of Equation (D.10), shifting the demand curve to the right, while it does not affect the left-hand side of it, which implies q should go up. Lastly, an increase in s only increases the right hand side of Equation (D.10), holding all else equal. To make the equation balance, q should increase.

2. The partial derivative of left-hand side of Equation (D.10) with respect to $\widetilde{\zeta}^E$ is $\frac{\partial [z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta \widetilde{\zeta}^E]}{\partial \widetilde{\zeta}^E} = \alpha^E z^E (\widetilde{\zeta}^E)^{\alpha^E - 1} - \delta$, noticing that $\alpha^E < 1$. Setting this partial derivative to zero, we obtain $\delta \widetilde{\lambda}^E \widetilde{\chi}^E = 1$. Thus, residual supply $z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta \widetilde{\zeta}^E$ increases when $\widetilde{\lambda}^E \widetilde{\chi}^E < 1/\delta$, and then decreases.

∎

To gain some intuition for Prediction D.2, Figure D.1 plots the residual supply and demand for the real estate good. Suppose there is an increase of z^M, as in Figure D.1a. Both the demand curves $l^M(q)$ and $h(q)$ shift to the right, resulting in an overall shift in aggregate demand. The residual supply, however, remains unchanged. Consequently, the equilibrium moves from point A to B with a boost in the price of collateral q. Thus, a rise in manufacturing productivity—as is typically observed over the course of development—places upward pressure on the collateral price. A similar analysis applies to a relaxation of financial constraints. For example, an increase in λ^M acts like an increase in manufacturing TFP (Buera and Shin, 2013; Itskhoki and Moll, 2019; Howes, 2022), leading to an increase in the price of collateral.[20]

The last part of Prediction D.2 focuses on the shift of the residual supply curve. Consider a scenario where the real estate sector's financial constraints are relaxed. Due to two counterbalancing forces, the change in the collateral price is *state-dependent*: (1) rising revenues drive up the supply, and (2) there is growing demand for real estate collateral. When financial constraints become relatively binding with $\widetilde{\lambda}^E < 1/\delta$, the *supply effect* dominates.[21] As shown in Figure D.1, the residual supply curves move to the right, the equilibrium moves from C to D, and the collateral price goes down.

D.2 Proof of Model Predictions

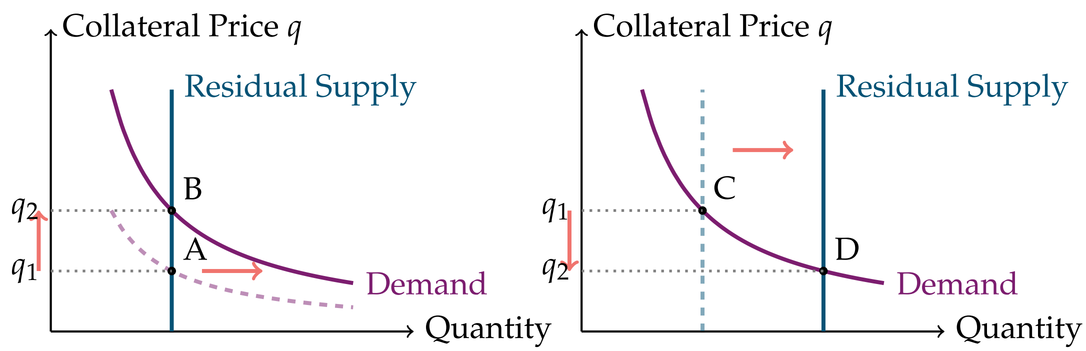
This section provides proofs of model predictions in Section 3.2.

[20] Moreover, an increase in housing demand s makes households spend more on the residential housing service, which shifts $h(q)$ to the right and boosts the collateral price q. This is in line with the intuition in Liu et al. (2013), where competing demand between residential housing and the manufacturing sector's commercial land pushes up the collateral price in a credit-constrained economy.

[21] When the supply and demand effects offset each other, the level of collateral usage in the real estate sector is exactly the capital level with golden rule saving rate in the Solow-Swan model.

Figure D.1: Determining the Price of Collateral

(a) Shift of Demand (b) Shift of Residual Supply



Note: These figures illustrate how residual supply and demand determine the price of collateral in the steady state equilibrium. The horizontal axis is the quantity of residual supply or demand, and the vertical axis is the collateral price q. Panel (a) illustrates the case of an increase in z^M, λ^M or s shifting the demand curve to the right, from the dashed pink line to the solid pink line. The equilibrium moves from point A to B, along with a rising collateral price from q_1 to q_2. Panel (b) illustrates the case of the real estate sector's collateral constraint is relatively binding, i.e. when $\lambda^E < \lambda_*$, and the supply effect dominates. In this case, an increase of z^E or λ^E shifts the residual supply curve to the right, from the dashed blue line to solid blue line. The equilibrium moves from point C to D, along with a decline of collateral price from q_1 to q_2.

D.2.1 Proof of Prediction 3

We start by deriving the sectoral credit to output ratio κ^j, which serves as a premise to prove Prediction 2.

Proof. Using Equation (D.8), sectoral production function and financing constraints, we can express the real estate credit and output ratios as

$$\frac{d^E}{d^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M}\frac{\mathbf{\Gamma}_d^E}{\mathbf{\Gamma}_d^M}\mathbf{Q}, \qquad \frac{qy^E}{y^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M}\frac{\mathbf{\Gamma}_y^E}{\mathbf{\Gamma}_y^M}\mathbf{Q}, \tag{D.11}$$

where $\mathbf{Z}^j = (z^j)^{\frac{1}{1-\alpha^j}}, \mathbf{Q} = q^{\frac{1}{1-\alpha^M}}, \mathbf{\Gamma}_y^j = (\alpha^j\widetilde{\lambda}^j\widetilde{\chi}^j)^{\frac{\alpha^j}{1-\alpha^j}}, \mathbf{\Gamma}_d^j = \kappa^j(\alpha^j\widetilde{\lambda}^j\widetilde{\chi}^j)^{\frac{\alpha^j}{1-\alpha^j}}$.

Notice that in this Equation, the only difference between d^E/d^M and qy^E/y^M comes from the sectoral differences in $\mathbf{\Gamma}_d^j$ and $\mathbf{\Gamma}_y^j$, with $\mathbf{\Gamma}_d^j/\mathbf{\Gamma}_y^j = \kappa^j$. In words, sectoral credit to value added govern the difference between structural change in credit and output.

To compute $\kappa^j \equiv d^j/(p^jy^j)$, we can rewrite Equation (D.5) as $\alpha^j\widetilde{\lambda}^j\widetilde{\chi}^jp^jy^j = ql^j$ that is, at the steady state, the value of collateral ql^j is proportionate to the revenue of the firm p^jy^j. By definition, we have $\kappa^j \equiv \frac{d^\lambda}{p^jy^j} = \frac{\lambda^jq^jl^l+\chi^jp^jy^j}{p^jy^j} = \lambda^j\frac{ql^j}{p^jy^j} + \chi^j = \alpha^j\lambda^j\widetilde{\lambda}^j\widetilde{\chi}^j + \chi^j$. ∎

D.2.2 Proof of Prediction 1

The following Lemma is useful for the proof of Prediction 1.

Lemma D.1. *The elasticity of the collateral price q with respect to z^M, denoted by $\varepsilon_{q,z^M} \equiv \frac{\partial \log q}{\partial \log z^M}$ is greater than 1 if $\eta < 1$.*

Proof. First, we can rewrite the Equation (D.10) as

$$z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E = (\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M)(z^M/q)^{\frac{1}{1-\alpha^M}} \tag{D.12}$$

where $\widetilde{\vartheta}^H = s^\eta(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}, \widetilde{\vartheta}^M = \delta(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)^{\frac{1}{1-\alpha^M}}, \widetilde{\zeta}^j = (\alpha^j z^j\widetilde{\lambda}^j\widetilde{\chi}^j)^{\frac{1}{1-\alpha^j}}$. We construct $F(q, z^M)$ from Equation (D.12) by moving all terms to the left hand side [22],

$$F(q, z^M) = z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E - \left(\widetilde{\vartheta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}} + \widetilde{\vartheta}^M q^{-\frac{1}{1-\alpha^M}}\right)\left(z^M\right)^{\frac{1}{1-\alpha^M}}.$$

To compute $\frac{\partial q}{\partial z^M}$, we use implicit function theorem. [23] After some algebra, we get $\varepsilon_{q,z^M} \equiv \frac{z^M}{q}\frac{\partial q}{\partial z^M} = \frac{\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M}{[(1-\alpha^M)\eta + \alpha^M]\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M}$. Taking the reciprocal on both sides,

$$\frac{1}{\varepsilon_{q,z^M}} = 1 - (1-\alpha^M)(1-\eta)\widetilde{\vartheta} \quad \text{where } \widetilde{\vartheta} \equiv \frac{\widetilde{\vartheta}^H q^{1-\eta}}{\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M} \in (0,1) \tag{D.13}$$

Notice that $\alpha^M \in (0,1)$. If $\eta = 1$, $\varepsilon_{q,z^M} = 1$; if $\eta < 1$, $\varepsilon_{q,z^M} > 1$, and if $\eta > 1$, $0 < \varepsilon_{q,z^M} < 1$. ∎

Now we use Lemma D.1 to prove Prediction 1.

Proof. The proof follows from simple comparative statics.

1. Part 1 directly follows Prediction D.2 or Lemma D.1.

2. From the decomposition rule (D.11), we have $\frac{d^E}{d^M} \propto (\frac{q}{z^M})^{\frac{1}{1-\alpha^M}}$, $\frac{qy^E}{y^M} \propto (\frac{q}{z^M})^{\frac{1}{1-\alpha^M}}$ up to some other exogenous parameters unaffected by z^M. Using Lemma D.1 completes the proof.[24]

∎

[22]Observe that, under $\eta = 1$, the two q terms in the bracket share the same power $-\frac{1}{1-\alpha^M}$. In this case, we have a closed-form expression for q, and so do all endogenous variables in the model.

[23]Some simple algebra yields

$$\frac{\partial F(q, z^M)}{\partial q} = -\left(z^M\right)^{\frac{1}{1-\alpha^M}}\left[\left(\eta + \frac{\alpha^M}{1-\alpha^M}\right)\widetilde{\vartheta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}-1} + \left(\frac{1}{1-\alpha^M}\right)\widetilde{\vartheta}^M q^{-\frac{1}{1-\alpha^M}-1}\right],$$

$$\frac{\partial F(q, z^M)}{\partial z^M} = \frac{1}{1-\alpha^M}\left(z^M\right)^{\frac{1}{1-\alpha^M}-1}\left(\widetilde{\vartheta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}} + \widetilde{\vartheta}^M q^{-\frac{1}{1-\alpha^M}}\right).$$

[24]Formally, denote $x = d^E/d^M$ or $x = qy^E/y^M$. Observe that

$$\text{sign}\left(\frac{\partial x}{\partial z^M}\right) = \text{sign}\left(\frac{\partial \log x}{\partial \log z^M}\right) = \text{sign}\left(\frac{1}{1-\alpha^M}\frac{\partial(\log q - \log z^M)}{\partial \log z^M}\right) = \text{sign}\left(\frac{\partial \log q}{\partial \log z^M} - 1\right) = \text{sign}(\epsilon_{q,z^M} - 1),$$

where the second equation uses the $x \propto (q/z^M)^{\frac{1}{1-\alpha^M}}$, and the last one uses the definition of ε_{q,z^M}.

D.2.3 Proof of Prediction 2

Proof. If $\eta = 1$, then from Equation (D.12) we have

$$\frac{q}{z^M} = \left(\frac{\widetilde{\vartheta}^H + \widetilde{\vartheta}^M}{y^E - \delta l^E} \right)^{1-\alpha^M}. \tag{D.14}$$

The nominal output ratio can be rewritten as

$$\frac{qy^E}{y^M} = \frac{y^E \left(q/z^M\right)^{\frac{1}{1-\alpha^M}}}{(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}} = \frac{y^E}{y^E - \delta l^E} \frac{\widetilde{\vartheta}^H + \widetilde{\vartheta}^M}{(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}} = \frac{s + \delta(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)}{1 - \delta \, \frac{(l^E)^{1-\alpha^E}}{z^E}} = \frac{s + \delta(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)}{1 - \delta(\alpha^E \widetilde{\lambda}^E \widetilde{\chi}^E)}.$$

The first equality uses the expression for y^M and collapses the term q/z^M. The second equality substitutes z^M/q from Equation (D.14). The third equality applies the expressions for $\widetilde{\vartheta}^H$ and $\widetilde{\vartheta}^M$. The final equality substitutes the expression for l^E.

From the expression for the sectoral credit-to-output ratio in Appendix D.2.1, the relative credit share is

$$\frac{d^E}{d^M} = \frac{\alpha^E \lambda^E \widetilde{\lambda}^E \widetilde{\chi}^E + \chi^E}{\alpha^M \lambda^M \widetilde{\lambda}^M \widetilde{\chi}^M + \chi^M} \cdot \frac{s + \delta(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)}{1 - \delta(\alpha^E \widetilde{\lambda}^E \widetilde{\chi}^E)}.$$

Under $\chi^j = 0$ (i.e., $\widetilde{\chi}^j = 1$), $\lambda^M = \lambda^E = \lambda$, and $\delta > 0$, we have

$$\frac{qy^E}{y^M} = \frac{s + \delta \alpha^M \widetilde{\lambda}}{1 - \delta \alpha^E \widetilde{\lambda}}, \qquad \frac{d^E}{d^M} = \frac{\alpha^E}{\alpha^M} \frac{s + \delta \alpha^M \widetilde{\lambda}}{1 - \delta \alpha^E \widetilde{\lambda}}. \tag{D.15}$$

Equation (D.15) implies that

1. both d^E/d^M and qy^E/y^M increase in $\widetilde{\lambda}$, and therefore in λ, holding all else constant.
2. both d^E/d^M and qy^E/y^M increase in α^E, holding all else constant.

∎

D.3 Model Discussions

D.3.1 Residential Service Flow

Instead of agents investing in residential housing, our model assumes that the residential housing stock converts to intra-period residential housing services at a fixed rate. This setting simplifies the model, allowing us to aggregate the total manufacturing goods and residential housing consumption across different agents. As shown in Equation (D.7), the FOC of h solely depends on the current period's collateral price. In other words, the total consumption of manufacturing goods and residential housing at the steady state depends only on the total income in the economy, not on how income is *distributed* among agents.

Our assumption for residential service flow *does not affect* the decomposition identity in Equations (5). This assumption only affects the equilibrium collateral price without changing other components.[25]

There are two potential economic interpretations of s: first, at the steady-state equilibrium, when residential housing investment is fully depreciated, s can be interpreted as a demand shifter as in Liu et al. (2013) or as the housing demand channel of credit expansion as in Mian et al. (2020). Second, it can be micro-founded by a competitive housing service market that uses the housing stock to produce housing services with a fixed efficiency, formalized below in Prediction D.3.

Prediction D.3 (Residential Housing Stock and Service Flow). *Denote the parameters in this environment as $\mathring{x}$. Suppose there is a zero-profit residential housing service firm that converts the stock of residential housing $\mathring{h}$ to service with quantity $\mathring{h}^{SF} = \mathring{x}\mathring{h}$. Denote $\mathring{q}$ is the price for collateral or stock of residential housing, $\mathring{q}^{SF}$ is the price for residential housing service, and $\mathring{x}$ is the productivity of that firm. In this setting, the FOC from the consumption side* (D.7) *in the benchmark can be recovered using the following transformation of parameter $s = \mathring{x}^{-\frac{1-\eta}{\eta}}\mathring{s}$.*

Proof. The profit for this residential service firm is given by $\mathring{\pi} = \mathring{q}^{SF}\mathring{h}^{SF} - \mathring{q}\mathring{h}$, implying that $\mathring{x}\mathring{q}^{SF} = \mathring{q}$. The FOC from the consumption side is literally the same as Equation (D.7). Altogether, we have $\frac{\mathring{c}}{\mathring{x}\mathring{h}} = \left[\frac{\mathring{q}/\mathring{x}}{\mathring{s}}\right]^{\eta}$, which can be converted to our benchmark FOC by setting $s^{-\eta} = \mathring{x}^{1-\eta}\mathring{s}^{-\eta}$. ■

D.3.2 Steady-State Equilibrium vs Generalized Balanced Growth Path (GBGP)

Solving the generalized balanced-growth path analytically, as done in the structural transformation literature (Buera, Kaboski, Mestieri and O'Connor, 2020), is complicated. Instead, we consider economies with different income levels at their own steady states and ask how different levels of the same set of exogenous parameters (such as sectoral TFP) affect the endogenous variables (such as credit share). We evaluate the model at the steady state and map it to the empirical results, following the common approach in macro-development literature.

D.4 Baseline Model with Intangible Assets

In this section, we consider the case that firms also make intangible asset investments. We rationalize how the collateral quantity channel stems from sectoral specific variation of asset tangibility.

D.4.1 Set Up

To simplify our analysis, investment in intangible asset k^j is costly and happens within each period. There are two modifications compared to our benchmark model.

First, the production function is modified as

$$y^j = z^j(\iota^j)^{\alpha^j}, \text{ where } \iota^j = \left[(\nu_l^j)^{\frac{1}{\psi}}(l^j)^{\frac{\psi-1}{\psi}} + (1-\nu_l^j)^{\frac{1}{\psi}}(k^j)^{\frac{\psi-1}{\psi}}\right]^{\frac{\psi}{\psi-1}}, \tag{D.16}$$

[25] Unfortunately, we do not have analytical comparative statics in Predictions D.2 and 2 anymore, which requires to figure out how an increase of z^M, for example, affects $\{c^i\}_{i\in\{S,M,E\}}$ *separately*. Nonetheless, we stress that the quantitative difference with or without this assumption is negligible.

where $0 < \nu_l \leq 1$ measures the asset tangibility, $0 < \psi \leq 1$ is the elasticity of substitution between the intangible and tangible asset investment as in Falato et al. (2022). When $\nu_l = 1$ and $\psi \to 1$, the production function (D.16) reduces to the benchmark case. Second, we assume the *price* of intangible asset investment is the same as tangibles. [26] Lastly, intangible assets are not collateralized for raising debt, implying the financial constraint remains the same as in our benchmark model.

D.4.2 Main Predictions

We show how a change in weight of asset tangibility ν_l can induce a rising intangibles in manufacturing sector and how it will affect sectoral credit to value added ratio.

Prediction D.4 (Intangible to Tangible Asset Ratio)**.** *The sectoral intangible to tangible asset ratio (i) increases with asset intangiblity $1 - \nu_l^j$ and (ii) decreases with λ^j.*

Proof. Compared to our benchmark model, the only changes are the FOCs for l_{t+1}^j and k_{t+1}^j. Evaluating them at the steady states and dividing each other, we obtain the intangible to tangible ratios [27]

$$\frac{k^j}{l^j} = \frac{1-\nu_l^j}{\nu_l^j}\Lambda^{\psi}, \text{ where } \Lambda = \frac{1-\beta(1-\delta_l) - \lambda^j(\beta^S - \beta)}{1-\beta(1-\delta_k)} < 1 \tag{D.17}$$

which increases with ν_l^j. ■

Prediction D.4 shows the connection between asset tangibility ν_l and intangible share. First, as $\nu_l^j \to 1$, we have $l^j/(l^j + k^j) \to 1$, coinciding our baseline result. If the ν_l^M decreases over development, which is micro-founded in D.6 and ν_l^E is close to 1, we expect to see that intangible share goes up in manufacturing and remains low in real estate. Moreover, a higher λ^j encourages more asset-based borrowing. Since intangible asset is not collateralized, this discourages investment in intangible assets.

Prediction D.5 illustrates that an increase of asset intangibility $1 - \nu_l^j$ acts *as if* a decrease in the credit to output ratio through the collateral input share α^j. In other words, the endogenous collateral quantity channel can be rationalized by the change of sectoral asset tangibility.

Prediction D.5 (Credit to Output Ratio With Intangible Asset Investment)**.** *When $0 < \psi \leq 1$, the sectoral credit to output ratio κ^j decreases with asset intangibility $1 - \nu_l^j$.*

Proof. FOC for l^j is rewritten as $\alpha^j p^j y^j \nu_l^{\frac{1}{\psi}} (\iota^j / l^j)^{\frac{1-\psi}{\psi}} = \frac{q l^j}{\widetilde{\lambda}^j \widetilde{\chi}^j}$ where $y^j = z^j (\iota^j)^{\alpha^j}$. Thus, the credit to output ratio is given by $\kappa^j = \widetilde{\alpha}^j \lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j + \chi^j$, where $\widetilde{\alpha}^j \equiv \alpha^j (\nu_l^j)^{\frac{1}{\psi}} (\iota^j / l^j)^{\frac{1-\psi}{\psi}}$. By Equation (D.16),

[26] This assumption helps us get rid of tedious price channel and the main implication does not change even if the price of sectoral intangible is the same as the price of sectoral output. If anything, our result is conservative.

[27] New FOCs are given by $[1 + \chi(\beta^S - \beta)]\beta p^j \frac{\partial y^j}{\partial l^j} = q[1 - \beta(1-\delta_l) - \lambda^j(\beta^S - \beta)]$, $[1 + \chi(\beta^S - \beta)]\beta p^j \frac{\partial y^j}{\partial k^j} = q[1 - \beta(1-\delta_k)]$ where $\frac{\partial y^j}{\partial l^j} = (\nu_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}} (l^j)^{-\frac{1}{\psi}}$, $\frac{\partial y^j}{\partial k^j} = (1-\nu_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}} (k^j)^{-\frac{1}{\psi}}$ and $\widetilde{\lambda}^j$ and $\widetilde{\chi}^j$ follows the definition in the benchmark model.

we have $\frac{\iota^j}{l^j} = [(\nu_l^j)^{\frac{1}{\psi}} + (1-\nu_l^j)^{\frac{1}{\psi}}(k^j/l^j)^{\frac{\psi-1}{\psi}}]^{\frac{\psi}{\psi-1}}$. Then substituting with (D.17), we obtain $\widetilde{\alpha}^j = \alpha^j \left[1 + \left(\frac{1-\nu_l^j}{\nu_l^j}\right)^{\frac{1}{\psi}} \left(\frac{k^j}{l^j}\right)^{\frac{\psi-1}{\psi}}\right]^{-1} = \alpha^j \left[1 + \frac{1-\nu_l^j}{\nu_l^j}\Lambda^{\psi-1}\right]^{-1}$. Noticing that $\widetilde{\alpha}^j$ is increasing with ν_l^j, we have κ^j decreases with $1-\nu_l^j$. ■

Micro-foundation for Changing ν_l^j Our results in Prediction D.4 and D.5 relies on the strong assumption that ν_l^E does not change and ν_l^M decreases over development.

We provide a micro-foundation of this assumption and illustrate how the change of sectoral TFP over development possibly acts as if the asset tangibility declines in manufacturing but not in real estate. We make two assumptions in this setting: (1) ν_l^j is constant over development, and (2) for each sector and intangible asset investment is relatively more complementary with sectoral TFP than tangible asset investment with that, i.e., $\frac{\partial^2}{\partial z^j \partial k^j} y^j(z^j, k^j, l^j) > \frac{\partial^2}{\partial z^j \partial l^j} y^j(z^j, k^j, l^j)$ in a CES production function; (3) the real estate sector TFP barely varies but manufacturing TFP soars over development.

Prediction D.6 formalizes this argument.

Prediction D.6 (TFP Complementarity Production Function)**.** *If $\mathring{\iota}^j$ in production function (D.16) admits $\mathring{\iota}^j = \left[(\mathring{\nu}_l^j)^{\frac{1}{\psi}}(l^j)^{\frac{\psi-1}{\psi}} + (1-\mathring{\nu}_l^j)^{\frac{1}{\psi}} g(z^j)^{\frac{1}{\psi}}(k^j)^{\frac{\psi-1}{\psi}}\right]^{\frac{\psi}{\psi-1}}$, where $\mathring{\nu}_l^j$ is fixed, and $g(z)$ is monotonically increasing and differentiable. Then an increase of z^j with fixed $\mathring{\nu}_l^j$ is isomorphic to a decrease of $1-\nu_l^j$ in the production function* (D.16)*.*

Proof. The only difference is in $\frac{\partial y^j}{\partial k^j} = g(z^j)^{\frac{1}{\psi}}(1-\mathring{\nu}_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}}(k^j)^{-\frac{1}{\psi}}$, implying $\frac{k^j}{l^j} = g(z^j)\frac{1-\mathring{\nu}_l^j}{\mathring{\nu}_l^j}\Lambda^{\psi}$. Since g is increasing, an increase of z^j with fixed $\mathring{\nu}_l^j$ is isomorphic with a decrease of ν_l^j via the following mapping $\nu_l^j = \left(1 + \frac{1-\mathring{\nu}_l^j}{\mathring{\nu}_l^j} g(z^j)\right)^{-1}$, which is decreasing with z^j. Notice that this specification satisfies $\frac{\partial^2}{\partial z^j \partial k^j} y^j(z^j, k^j, l^j) > \frac{\partial^2}{\partial z^j \partial l^j} y^j(z^j, k^j, l^j) = 0$. ■

D.5 Non-Homothetic Preference

Following the discussion in Section 6, we consider a setting with non-homothetic preference as Kongsamut et al. (2001), which also contributes to the structural change in the real economy (Herrendorf et al., 2013).

We show our main prediction largely holds under some parametric restrictions. Intuitively, the demand side modification, as shown in Prediction D.7, only alters the level of collateral price, but does not affect ε_{q,z^M}.

More formally, the utility function rewrites as

$$\mathcal{C}_t^i = \left[(c_t^i - \underline{c}^i)^{\frac{\eta-1}{\eta}} + s(h_t^i + \overline{h}^i)^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}. \tag{D.18}$$

And the FOC from the consumption side (D.7) becomes $\frac{c^i - \underline{c}^i}{h^i + \overline{h}^i} = \left[\frac{q}{s}\right]^{\eta}$. For simplicity, we denote that $\sum_i \underline{c}^i = \underline{c}$ and $\sum_i \overline{h}^i = \overline{h}$, then the relationship of aggregate consumption and housing service $c_t - \underline{c} = (q/s)^{\eta}(h_t + \overline{h})$. Substituting back to the market clearing condition for real estate sector (D.10), we get

$$z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E = \widetilde{\zeta}^H q^{-\eta - \frac{\alpha^M}{1-\alpha^M}} + \delta\widetilde{\zeta}^M q^{-\frac{1}{1-\alpha^M}} - (q^{-\eta}\underline{c} + \overline{h}) \tag{D.19}$$

Assumption D.2 (Parametric Restriction of Non-homothetic Preference). $q^{-\eta}\underline{c} + \overline{h} = \xi$, *where ξ is a constant.*

To gain intuition for Assumption D.2, we consider two simple cases. First, when $q^{-\eta}\underline{c} + \overline{h} = 0$, Equation (D.19) collapses to the benchmark market clearing condition for real estate good (D.10). This restriction is similar to Kongsamut et al. (2001) to ensure the balanced growth path in the demand-side structural change model. The second case is that there is no sustenance level of manufacturing goods consumption ($\underline{c} = 0$).

Prediction D.7. *Under $\underline{c} = 0, \overline{h} = \xi > 0$, Predictions 1, 2 (Part 1) and 3 hold.*

Proof. The proof contains 2 parts:

1. Lemma D.1 still holds by constructing $\widetilde{F}(q, z^M) = F(q, z^M) + \xi$ and applying implicit function theorem. Predictions D.1, and D.2 hold, which implies Prediction 1 hold. Since the computation of κ^j does *not* depend on the demand side of the economy, Prediction 3 is also unchanged.

2. Under $\eta = 1$, the key results are modified as

$$\frac{q}{z^M} = \left(\frac{\widetilde{\vartheta}^H + \widetilde{\vartheta}^M + \xi}{y^E - \delta l^E}\right)^{1-\alpha^M}, \quad \frac{qy^E}{y^M} = \frac{s + \delta(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)}{1 - \delta(\alpha^E\widetilde{\lambda}^E\widetilde{\chi}^E) + \xi/y^E}$$

   Notice that when $\xi = 0$, they collapse to the baseline case. For Prediction 2 (Part 1), under $\lambda^j = \lambda$ and $\chi^j = 0$. qy^E/y^M increases with λ since ξ/y^E decreases with λ. For Prediction 2 (Part 2), it may not hold since a higher α^E has an ambiguous effect on $y^E = z^E(\alpha^E\lambda^E\widetilde{\lambda}^E)^{\frac{\alpha^E}{1-\alpha^E}}$.

∎

E Quantitative Exercise

In this section, we calibrate our model to match the data in Section E.1 and decompose the impact of sectoral TFP and financial constraints on structural change in the real economy and the credit market in Section E.2.

E.1 Calibration

We add two features relative to the baseline model for the calibration.

First, we generalize our decreasing-returns-to-scale production function by incorporating real estate collateral l^j, labor n^j, and intangible capital k^j as production inputs, with input shares α_l^j, α_n^j, and α_k^j, respectively. Savers provide one unit of labor inelastically at the equilibrium wage w. Manufacturing goods serve as the capital input. Both k^j and l^j can be collateralized for credit.

Second, we relax the housing service flow assumption in the baseline model and instead incorporate residential housing, with depreciation rate δ_h. Appendix F elaborates on the setup of this extended model, specifies the equilibrium conditions under these modifications, and derives the decomposition of credit and nominal output ratios.

To quantify the model, we assume that economies at different income levels are at their own steady states, determined by exogenous parameters. There are two sets of parameters: (i) parameters that differ across economies, Ω_1, and (ii) parameters that are the same across economies, Ω_2:

$$\Omega_1 = \{ \underbrace{z^j, \alpha_l^j, \alpha_k^j, \alpha_n^j,}_{\text{production}} \underbrace{\lambda^j}_{\substack{\text{collateral}\\ \text{constraint}}} \}_{j \in \{M,E\}}, \quad \Omega_2 = \{ \underbrace{\beta, \beta^S, \eta, s,}_{\text{preference}} \underbrace{\delta, \delta_h}_{\text{depreciation}} \}.$$

Externally Assigned Parameters We set $\beta^S = 0.98$ to match the long-run real interest rate $r = 2\%$, which lies between the real returns on bills and bonds (Jordà, Knoll, Kuvshinov, Schularick and Taylor, 2019), and set $\beta = 0.95$. As in Buera and Shin (2013), we set δ_h and δ to 5%. On the production side, we target $\alpha \equiv \alpha_l^j + \alpha_k^j + \alpha_n^j = 0.95$, a value commonly used in macro-development models such as Itskhoki and Moll (2019) and empirically related to De Loecker et al. (2016). We impose a labor share α_n^j/α of 2/3 and a combined share for real estate collateral and capital, $(\alpha_l^j + \alpha_k^j)/\alpha$, of 1/3. Lastly, we match the collateral input shares α_l^j/α in the two sectors using the World Input-Output Table, shown in Figure 3.

Internally Calibrated Parameters Our selection of moments for internal calibration is guided by the baseline model's predictions and comparative statics. From Proposition 2, the elasticity of substitution η is closely related to sectoral relative output $qy^E/(y^M + qy^E)$ through structural change in the real economy. Proposition D.2 states that an increase in housing demand, s, *ceteris paribus*, raises the housing price, so we choose s to match the variation in the housing price index relative to log real GDP per capita in Figure 4a. Meanwhile, Appendix D.2.1 provides a one-to-one mapping from the sectoral credit-to-value-added ratio κ^j to the sectoral collateral-constraint parameters, holding sectoral collateral input shares fixed. Lastly, we calibrate sectoral TFP z^j to match sectoral labor productivity.

We group the country-year panel into $N = 10$ bins based on real GDP per capita. We then run regressions of the key data moments on dummies for these income groups, controlling for year and country fixed effects to exploit variation associated with economic development. Year fixed effects filter out year-specific common shocks that affect all economies, in line with our focus on steady-state equilibria. Country fixed effects remove country-specific characteristics not captured by our simple model.[28] The empirical house price index is normalized by a manufacturing price index, computed as the ratio of

[28]We include country fixed effects for the sectoral collateral input share because of the scarcity of data from the World Input-Output Table.

nominal to constant-price value added. The purpose of this normalization is to match our model, in which the manufacturing good is the numeraire.[29]

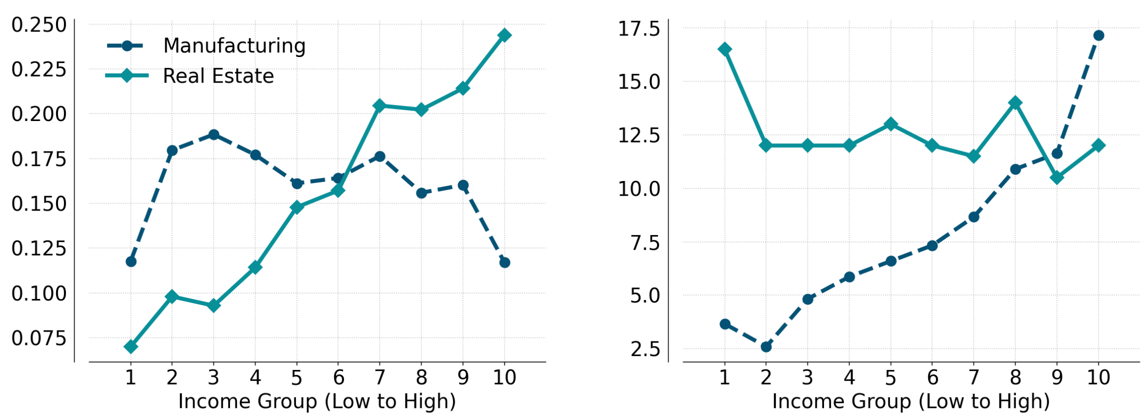
Calibration Procedure and Results Our two-step calibration strategy is as follows. First, for a given pair (η, s), we find a sequence $\{z_n^j\}_{n=1}^N$ that minimizes the distance between sectoral labor productivity in the model and in the data for each income bin. Second, we search for a pair (η, s) that matches the nominal output share and relative house price variation in all income bins. Figure E.1 reports the values of the internally calibrated parameters.

On the financial side, Figure E.1a shows that collateral constraints in the manufacturing sector are relaxed more strongly at early stages of development, with this effect tapering off sharply thereafter.[30] By contrast, collateral constraints in the real estate sector become progressively looser over the course of development. For example, λ^E in the richest countries is 3.48 times higher than in the poorest countries.

On the real-economy side, Figure E.1b reveals that manufacturing-sector TFP z^M increases considerably as countries become richer, with an approximately six-fold increase when comparing the least-developed and most-developed countries. In contrast, real-estate-sector TFP is largely stagnant. Finally, the internally calibrated parameters are $s = 3.9$ and $\eta = 0.73$. The latter is close to the estimated value of 0.85 in Herrendorf et al. (2013).

Figure E.1: Calibrated Parameters of the Model

(a) Sectoral Collateral Constraint $\{\lambda_n^j\}_{n=1}^N$ (b) Sectoral TFP $\{z_n^j\}_{n=1}^N$



Note: This figure presents the internally calibrated parameters governing (a) sectoral collateral constraints $\{\lambda_n^j\}_{n=1}^N$ and (b) sectoral TFP $\{z_n^j\}_{n=1}^N$ by income group, following the procedure outlined in Section E.1.

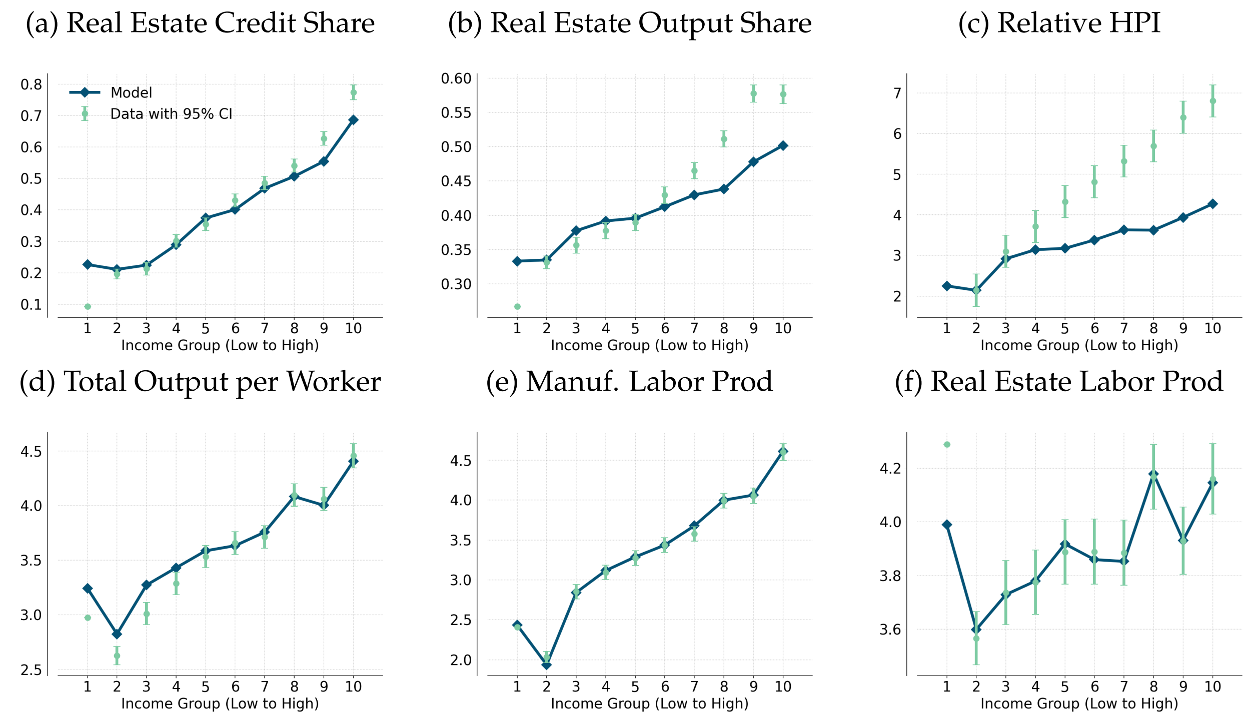
Model Validation Our model closely matches the key empirical patterns of structural transformation in the credit market and the real economy: a salient rise in the share of real estate credit in Figure E.2a, and a relatively smaller increase in the real estate sector's

[29] Because the house price index in the data is only comparable *within* a country, we control only for country fixed effects.

[30] The data in the first three bins are mostly episodes related to the East Asian growth miracle, during which credit disproportionately flowed into the manufacturing sector. We provide more evidence on these episodes in Section 7.

nominal output share in Figure E.2b. Consistent with the mechanism highlighted in the literature on supply-side structural transformation (Ngai and Pissarides, 2007), Figure E.2c shows that our model captures the increase in the relative house price over the course of development, in line with the empirical pattern in Figure 4a. Lastly, Figure E.2d shows that the model also matches the untargeted cross-country differences in total output per worker as an additional validation exercise.

Figure E.2: Key Moments – Model vs. Data



Note: This figure compares moments from the data and the quantitative model. The light-green vertical bars with dots show point estimates of empirical moments with 95% confidence intervals. The light blue solid line represents the model-implied moments. The variables are: (a) credit share $d^E/(d^E + d^M)$, (b) output share $qy^E/(qy^E + y^M)$, (c) relative housing price index $\log(q/p^M)$, and (d) total output per worker $\log[(y^E + y^M)/(n^E + n^M)]$.

E.2 Unpacking Structural Transformation: Finance vs. Real Economy

Equipped with our quantitative model, we conduct a development accounting analysis in the spirit of Caselli (2005). Recall from Proposition 2 that either forces from the real economy or forces from the financial sector are theoretically *sufficient* to generate structural change in both the credit market and the real economy. Our goal here is to quantify this argument by assessing how differences between the poorest and richest countries in sectoral (i) TFP, (ii) collateral input shares, and (iii) financing constraints account for differences in sectoral shares of credit and output.

Table E.1 reports the results. Specifically, we compute the variation in key variables across income groups in the baseline model, $\Delta^{\text{bnmk}}_{\text{level}}$, and in a set of counterfactual experiments, $\Delta^{\text{ctfl}}_{\text{level}}$. The contribution of each channel is measured as the share of variation in the benchmark explained by the counterfactual, expressed in percentage points, i.e., $100 \times \Delta^{\text{ctfl}}_{\text{level}} / \Delta^{\text{bnmk}}_{\text{level}}$.

Our headline finding is that the drivers of structural change in the real economy differ from those in credit markets. Panel A shows that about 29.1% of cross-country heterogeneity in credit shares is accounted for by economic forces (row (2)). Of the remaining variation, 67.3% is explained by the relaxation of financing constraints (row (3)), particularly those in the real estate sector (row (3)(b)). By contrast, only 4.0% of the financial Kuznets facts can be attributed to changes in sectoral input shares.

Turning to the canonical Kuznets facts, most of the variation (80.8%) is explained by differences in sectoral productivity (row (2)), while financial factors play a relatively limited role. Within the latter, the dominant channel (11.2%) is variation in sectoral input shares (row (4)), especially in the real estate sector, rather than the relaxation of financing constraints (row (3)).

Table E.1: Development Accounting Analysis

	Panel A: $\frac{d^E}{d^E+d^M}$	Panel B: $\frac{qy^E}{qy^E+y^M}$	Panel C: $\log(q)$	Panel D: $\log\left[\frac{y^M+y^E}{n^M+n^E}\right]$
(1) Baseline	45.98	16.88	2.02	1.16
(2) Vary productivity (z^M, z^E)	13.38 (29.1)	13.64 (80.8)	2.27 (112.3)	1.12 (96.5)
(3) Vary both sector constraints (λ^M, λ^E)	30.95 (67.3)	−0.02 (−0.1)	−0.02 (−1.1)	0.01 (1.0)
(a) Vary manuf. constraint (λ^M)	0.14 (0.3)	0.00 (0.0)	−0.00 (−0.0)	−0.00 (−0.0)
(b) Vary real estate constraint (λ^E)	28.78 (62.6)	−0.02 (−0.1)	−0.02 (−1.1)	0.01 (1.0)
(4) Vary both sector input share (α^M, α^E)	1.86 (4.0)	1.89 (11.2)	−0.37 (−18.2)	0.19 (16.4)
(a) Vary manuf. input share (α^M)	0.27 (0.6)	0.28 (1.6)	−0.05 (−2.2)	−0.03 (−2.4)
(b) Vary real estate input share (α^E)	1.57 (3.4)	1.61 (9.5)	−0.32 (−16.0)	0.21 (17.9)

Note: This table reports how sectoral productivity, financing constraints, and sectoral input shares contribute to structural transformation in credit and output, measured by (a) the real estate credit share $d^E/(d^E + d^M)$, (b) the real estate output share $qy^E/(qy^E + y^M)$, and other macroeconomic variables, measured by (c) the collateral price $\log(q)$ and (d) total value added per worker $\log(y^M + y^E)$. Row 1 reports the difference in these variables ($\Delta^{\text{bnmk}}_{\text{level}}$) between high- and low-income bins in the baseline quantitative model. Row 2 reports the counterfactual that varies sectoral productivity (z^M, z^E) while holding financing constraints and sectoral input shares fixed across countries. Row 3 reports the counterfactual that varies financing constraints while holding sectoral productivity and sectoral input shares fixed across countries. Row 4 reports the counterfactual that varies sectoral input shares while holding sectoral productivity and financing constraints fixed across countries. Subrows (a) and (b), where applicable, vary only the manufacturing or real estate component of the corresponding channel. Numbers outside parentheses ($\Delta^{\text{ctfl}}_{\text{level}}$) are level differences across income-group intervals. Numbers in parentheses report the share of the benchmark difference explained by the counterfactual, computed as $100 \times \Delta^{\text{ctfl}}_{\text{level}} / \Delta^{\text{bnmk}}_{\text{level}}$. Percentages in parentheses are omitted when $\Delta^{\text{ctfl}}_{\text{level}}$ is too large relative to $\Delta^{\text{bnmk}}_{\text{level}}$.

F Supplementary Materials for Quantitative Results

In this section, we provide additional results and implementation details for Section E. Appendix F.1 outlines the setup of the benchmark quantitative model in Section E, provides equilibrium conditions, and derives model predictions analogous to those in our tractable baseline model in Section 3. Appendix F.3 outlines the computation algorithm of our model.

We extend our baseline model in Section 3 by incorporating three additional features. First, we include labor as an input in the production function. This modification allows the model to generate sectoral labor productivity, and we calibrate sectoral TFP to match these moments, which can be estimated directly in the data. Second, we include capital as an additional tangible asset in the production function. Capital is produced by the manufacturing sector and can serve as collateral for loans. Third, agents can invest in residential housing, rather than deriving utility directly from a residential housing service flow as in the baseline model.

F.1 Set Up

We summarize all modifications in this setup. First, the production function for each sector becomes

$$y_t^j = z_t^j (l_t^j)^{\alpha_l^j} (k_t^j)^{\alpha_k^j} (n_t^j)^{\alpha_n^j}, \tag{F.1}$$

where l_t^j, k_t^j, and n_t^j are commercial land, capital, and labor inputs in sector j, with corresponding input shares α_l^j, α_k^j, and α_n^j, satisfying $0 < \alpha_l^j + \alpha_k^j + \alpha_n^j < 1$.

Second, the flow-of-funds constraint is modified as follows: (i) the entrepreneur pays labor costs $w_t n_t^j$ to savers, who supply one unit of labor inelastically and earn wage w_t; (ii) the entrepreneur also invests in capital, $\mathcal{K}_{t,t+1} = p_t^M \left[k_{t+1}^j - (1-\delta)k_t^j\right]$, in addition to commercial real estate; and (iii) instead of enjoying a residential housing service flow (which is $q_t h_{t+1}$ in the baseline model), the entrepreneur invests in residential housing, with investment $\mathcal{H}_{t,t+1} = q_t \left[h_{t+1}^j - (1-\delta_h)h_t\right]$. That is,

$$c_t^j + \mathcal{H}_{t,t+1} + q_t \left[l_{t+1}^j - (1-\delta)l_t^j\right] + \mathcal{K}_{t,t+1} + d_t^j = p_t^j y_t^j - w_t n_t^j + \frac{d_{t+1}^j}{1+r_t}. \tag{F.2}$$

Third, the collateral constraint now incorporates capital as a tangible asset that can serve as collateral: $d_{t+1}^j \le \lambda_t^j (q_{t+1} l_{t+1}^j + p_{t+1} k_{t+1}^j)$.

Finally, the good market clearing conditions are changed correspondingly: (i) the manufacturing good are either consumed, as in the baseline model, or invested as tangible capital, i.e. $y_t^M = \sum_i c_t^i + \sum_j \left[k_{t+1}^j - (1-\delta)k_t^j\right]$; (ii) the real estate market clearing incorporates residential housing investment, i.e. $y_t^E = \sum_i \left[h_{t+1}^i - (1-\delta_h)h_t^i\right] + \sum_j \left[l_{t+1}^j - (1-\delta)l_t^j\right]$;(iii) The labor market clearing is also added, i.e. $1 = n_t^M + n_t^E$.

F.2 Equilibrium Conditions

We list the conditions for steady-state equilibrium in this setting.

From the production side, normalizing the manufacturing-good price to one, we obtain

$$\alpha_l^j p^j \frac{y^j}{l^j} = \frac{q}{\widetilde{\lambda}^j}, \quad \alpha_k^j p^j \frac{y^j}{k^j} = \frac{1}{\widetilde{\lambda}^j}, \quad \alpha_n^j p^j \frac{y^j}{n^j} = w. \tag{F.3}$$

Similar to the benchmark model, savers are more patients than entrepreneurs, thus the collateral constraints are binding for both sectors

$$d_{t+1}^j = \lambda(ql^j + k^j) \tag{F.4}$$

From the consumption side, the FOC for h_{t+1}^j is given by $\beta v_h(c_{t+1}^j, h_{t+1}^j) = \phi_t^j q_t - \beta(1-\delta_h)\phi_{t+1}^j q_{t+1}^j$. Evaluating at the steady state and combining with the FOC for c_t^j yields[31]

$$\frac{c^j}{h^j} = \left[\frac{1-\beta(1-\delta_h)}{\beta s} q\right]^\eta, \quad \frac{c^S}{h^S} = \left[\frac{1-\beta^S(1-\delta_h)}{\beta^S s} q\right]^\eta. \tag{F.5}$$

The flow-of-funds constraints for each type of agent can be rewritten as

$$c^j + \delta_h q h^j = p^j y^j - \left(wn^j + \delta q l^j + \delta k^j + \frac{r}{1+r} d^j\right) \tag{F.6}$$

$$c^S + \delta_h q h^S = \frac{r}{1+r} b + w \tag{F.7}$$

Lastly, we write the market-clearing conditions for the goods market as

$$y^M = c + \delta(k^M + k^E), \quad y^E = \delta_h h + \delta(l^M + l^E), \quad 1 = n^M + n^E. \tag{F.8}$$

where $c = \sum_{i \in \{S,M,E\}} c^i$, and $h = \sum_{i \in \{S,M,E\}} h^i$.

In this quantitative model, the steady-state equilibrium consists of consumption and saving allocations (c^i, h^i, b) for agents $i \in \{S, M, E\}$ ($2 \times 3 + 1 = 7$ variables), production allocations $(k^j, l^j, n^j, y^j, d^j)$ for $j \in \{M, E\}$ ($5 \times 2 = 10$ variables), and prices (q, w, r) (3 variables), and is characterized by

1. FOCs for c^i and h^i in (F.5) (3 equations)

2. FOCs for l^j, k^j, and n^j in (F.3), together with the production functions (F.1) ($3 \times 2 + 1 \times 2 = 8$ equations)

3. Flow-of-funds constraints (F.6) and (F.7) (3 equations)

4. Collateral constraints (F.4) (2 equations)

5. FOC for household saving (D.3) (1 equation)

[31] Compared to the benchmark model, we lose the simple aggregation rule for deriving c/h because the discount factors for savers and entrepreneurs differ.

6. Market-clearing conditions for manufacturing goods, real estate goods, and labor in (F.8), as well as debt market clearing ($3 + 1 = 4$ equations).

Altogether, by Walras' Law, we have $21 - 1 = 20$ equations and 20 unknown variables.

F.3 Computation Algorithm

We outline the computational algorithm for the steady-state equilibrium. The other models use a similar algorithm. There are two nested loops:

1. The inner loop takes a candidate price $\widetilde{q}$ as given and solves for the wage rate w such that the labor market clears:
   (a) Given $\widetilde{q}$, express collateral usage as $l^j = l^j(w; \widetilde{q})$.
   (b) Given $l^j = l^j(w; \widetilde{q})$ and $\widetilde{q}$, use (F.3) to express sectoral employment as $n^j = n^j(w, \widetilde{q})$.
   (c) Solve for the wage rate $w(\widetilde{q})$ corresponding to this $\widetilde{q}$ using the labor-market-clearing condition.
2. The outer loop solves for the equilibrium price q such that the nonlinear equation of real estate goods' market-clearing condition holds, which depends only on $(\widetilde{q}, w(\widetilde{q}))$.

G Credit Market Liberalization

In this Appendix, we provide a chronology of directed credit liberalizations, with detailed background information and specific criteria that each case meets.

Albania (1999) In the aftermath of the communist regime's collapse in 1990, Albania embarked on a series of reforms to overhaul its financial and banking sectors, which had been under state control for decades. Throughout the 1990s and early 2000s, the country implemented various measures to modernize the financial system. One of the most significant changes was the introduction of a two-tier banking system in 1992, replacing the previous mono-banking structure under which the Bank of Albania was the sole banking entity. The reform process also had an international aspect, as foreign-owned banks were allowed to enter the market, and several domestic banks were sold to overseas investors: "Financial liberalization in Albania started in 1992/1993 when the first steps were undertaken by establishing the two-tier banking system (1992) and by allowing the first foreign-owned bank to start operating (1993)" (Causevic, 2003, page 7).

At the same time, the Bank of Albania implemented monetary policy measures designed to limit credit growth by imposing credit ceilings and increasing liquidity requirements for banks: "The tight policy of credit, through the imposition of credit ceilings for banks and the increasing level of non-performing loans (NPL) restrained the ability of commercial banks to meet rising demand for credit" (Shijaku and Kalluci, 2013, page 1).

The Banking Law was amended in 1998 to deepen banking sector reforms, enabling the Bank of Albania to gradually relax restrictive policies. This process began with the removal of credit ceilings for private banks in 1999 and concluded with the complete deregulation of interest rates by the end of 2002: "The process of financial liberalization has been intensified since 1997 by putting financial pyramids under the international administration (1997), amending the Banking law (1998), lifting credit ceilings for private banks (1999) and selling the National Commercial Bank to a foreign investor" (Causevic, 2003, page 7).

Reason: "... lifting credit ceilings for private banks (1999)" (Causevic, 2003).

Argentina (1977) Liberalization in Argentina started in 1976 with the goal of reforming the country's financial and banking sector by removing controls on credit and interest rates: "The liberalization of interest rates commenced in 1976 when interest rates on certificates of deposit (CDs) were freed. This was followed in 1977 by a major financial sector liberalization and reform of monetary control instruments. In 1977, all bank deposit and loan rates were liberalized, the controls on bank credit were removed, the 100 percent reserve requirement was reduced (initially to 45 percent and then lowered progressively to 10 percent by 1980), and interest was paid on required reserves held against time deposits through a newly established Interest Equalization Fund. Selective credit practices were abandoned (except for export-oriented loans), and selective re-discounts were replaced with a single discount window with the discount rate set at a penalty level compared with market rates" (Bisat et al., 1999).

Following a crisis in 1982, credit controls were reimposed again, to be liberalized again in 1992: "Credit controls were initially removed in 1977 but were reimposed in 1982. The controls were reduced after 1992 to less than half the level before the reforms" (Bisat et al., 1999).

Reason: "Credit controls were initially removed in 1977 but were reimposed in 1982" (Bisat et al., 1999).

Australia (July 1983) Prior to financial liberalization in the 1970s and 1980s, Australia had a heavily regulated financial system. The exchange rate was fixed, capital controls restricted cross-border flows, and the banking sector faced extensive regulations on interest rates, credit ceilings, and foreign exchange trading: "Australia also had a heavily regulated domestic banking sector, with quantitative and qualitative controls on bank lending, ceilings on banks' deposit and lending rates and reserve requirements all used. These regulations, especially the reserve requirements, also served as the main tools for implementing monetary policy for much of the 1950s, 1960s and 1970s" (Ballantyne et al., 2014, pages 6-7).

Reforms to liberalize the financial system and the banking system occurred gradually in the 1970s and 1980s. Key steps included removing some banking regulations in the early 1970s, such as the ceilings on deposit rates for certificates of deposit in 1973, which resulted in an increase of competition among banks: "The first major step in the deregulation of the banking sector was taken in 1973, when the interest rate ceiling on CDs was removed. This allowed trading banks to compete for funds and gave them control over a larger portion of their balance sheets" (Ballantyne et al., 2014, page 12).

Deregulation progressed in the 1980s with the removal of interest rate ceilings on all deposits and loans, and the entry of foreign banks. These reforms affected the overall structure of the financial system specifically with the floating of the exchange rate and removal of capital controls: "Banking sector deregulation also provided the impetus for further development of Australia's corporate bond markets and, in particular, the market for Australian bank bonds. At the same time, the removal of capital controls and the development of hedging markets also facilitated increased offshore bond issuance by Australian firms" (Ballantyne et al., 2014, page 19).

Reason: "The Loan Council discontinued arrangements whereby the terms, conditions and timing of domestic borrowings by larger authorities were subject to Loan Council control" (Hall, 1987).

Austria (1981) Before the financial liberalization reforms began in the late 1970s, Austria had heavily regulated financial and banking sectors. Credit controls were implemented through voluntary agreements between banks and the Ministry of Finance from 1951 to 1982 in consultation with the OeNB. These agreements were used due to the absence of a legal framework. They consisted of three components: qualitative credit controls, minimum liquidity requirements, and credit ceilings. Initially targeting only the banking sector, the agreements were gradually expanded to cover all banking sectors by 1960, in addition to insurance and installment companies that were added in 1955: "The first legal framework for macroprudential policy, the Kreditwesengesetz (KWG, Austrian credit services act), was introduced in Austria in 1979, almost 30 years after the first credit control agreement had entered into force in Austria in 1951"(Döme et al., 2016, page 166).

Starting in 1977, Austria began implementing measures aiming to liberalize the banking sector. These measures included lifting restrictions on branch establishment, liberalizing interest rates, reforming banking supervision, removing capital controls, introducing free market entry, and privatizing state-owned banks: "Austria liberalized its financial markets quite slowly. In fact it took the country nearly 25 years to eliminate all restrictions. Starting with the lifting of restrictions on the establishment of branch offices in 1977, continuing with the liberalization of interest rates in 1980, the reform of banking supervision in 1987, the removal of capital controls from 1988 to 1991, the introduction of free market entry in 1994 and the privatization of state-owned banks from 1992 to 2000, the overall process was very protracted" (Ritzberger-Grünwald, 2006, page 211).

Reason: "Credit controls were in place from 1951 to 1981" (Döme et al., 2016).

Bangladesh (1990) After independence in 1971, Bangladesh's banking sector was dominated by state-owned banks, while the central bank imposed credit controls and maintained interest rates below market levels: "Bangladesh adopted state directed credit policy with a view to rehabilitating the economy immediately after the independence in 1971. Domestic private commercial banks were not allowed to operate until 1982 and the banking sector was predominantly dictated by government owned commercial and specialized banks (SPBs). Both the deposit and lending rates were fixed by the central bank, and state-owned banks were operating within a protective environment" (Uddin and Suzuki, 2011, page 31).

The state ownership of banks resulted in a large and inefficient banking sector that prompted the government to adopt reforms aimed at liberalizing the sector by privatizing some of the banks: "Against this backdrop, the government denationalized two state-owned large commercial banks Uttara and Pubali in 1983 and 1984 respectively, while another state-owned bank Rupali was partly privatized" (Robin, 2015, page 36).

Furthermore, the central bank shifted to market-oriented monetary policy tools by removing controls over credit allocation and interest rates: "The central bank implemented liberalized monetary policy with indirect control over money supply in the early 1990s after the financial reform program initiated. The instruments of direct control (credit ceilings and interest rate prescriptions) were no longer available for attaining the targeted levels of domestic credit; instead new instruments of indirect control had to be adopted" (Robin, 2015, page. 49).

Reason: "The instruments of direct control (credit ceilings and interest rate prescriptions) were no longer available" (Robin, 2015).

Chile (1975) Before the start of liberalization in Chile, the banking sector was heavily regulated and subject to various restrictions. Credit and interest rate controls were imposed, in addition to state ownership of commercial banks: "Almost all of the economic reforms recommended to highly indebted countries after the onset of the debt crisis in 1982 were implemented in Chile during the 1970s. Reprivatization, decontrol of prices, and deregulation were begun shortly after the 1973 military coup; fiscal reform and liberalization of trade and financial markets were accomplished over a short span of time thereafter (table 3.5). Consequently, by the beginning of the 1980s Chile had an open, free-market economy, with a homogeneous 10 percent tariff, free domestic interest rates, a relatively liberalized capital market, and a disciplined, non-disruptive labor force" (Williamson et al., 1990, page 53).

Following the military coup in 1973, the government started a process of liberalization by removing all controls on the banking and financial sectors. However, the process of liberalization was slowed by the crisis of 1982: "Chile first liberalized with a big bang in the late 1970s. It privatized nationalized banks, removed all controls on interest rates, and permitted banks to become "universal." Foreign banks and nonbank financial institutions were encouraged to enter the market, and capital controls were eased. Argentina also eliminated directed credit and interest-rate controls in the late 1970s and liberalized capital flows. Both Chile and Argentina, however, reimposed controls during the financial crisis of the early 1980s, and Chile renationalized ("intervened") a number of banks at that time. Chile removed most controls again by 1984 and reprivatized the renationalized banks in the mid-1980s" (Williamson and Mahar, 1998, page 11).

Reason: "Directed credit eliminated and reserve requirements reduced in the mid-1970s. Development assistance from multilateral agencies now auctioned off to eligible financial institutions" (Williamson and Mahar, 1998).

Costa Rica (1991) Prior to the start of liberalization, Costa Rica's banking sector was heavily regulated. It was dominated by state-owned banks that were required to finance the government's public deficit: "The financial sector in Costa Rica is dominated by the banking system and, in particular, by large public banks" (Bonangelino, 1995, page 12).

With support from the International Monetary Fund and the World Bank, Costa Rica started a process of liberalization in 1991. Among the first reforms was the removal of credit restrictions. Subsequent reforms included the opening of competition in the banking system, allowing private banks to accept deposits and make loans in foreign exchange, and increasing the independence of the Central Bank: "After the abandonment of formal credit limits in 1991, the main Instruments of monetary policy have been open market operations and reserve requirements" (Bonangelino, 1995, page 10).

Reason: "After the abandonment of formal credit limits in 1991" (Bonangelino, 1995, page 10).

Czech Republic (1992) Prior to the start of the liberalization of the banking sector in the Czech Republic, the Czechoslovak Socialist Republic's banking system was fully controlled by the state with centralized decision-making consisting of a "socialist monobank" that combined both commercial and monetary functions: "the state dominated production; market mechanisms were virtually absent; and trade was heavily oriented toward members of the former Council of Mutual Economic Assistance (CMEA)" (Desai, 1995, page 24).

The liberalization of the Czech Republic's banking sector started during the Czech and Slovak Republic, as part of a broader economic transformation. Key steps included: breaking up the socialist "monobank" into separate commercial and central banks, and allowing the entry of new private and foreign banks: "The establishment of a healthy commercial banking sector has figured prominently in the transformation program of the former CSFR during 1991-92 and subsequently in the Czech Republic" (Banerjee, 1995, page 31).

More reforms were adopted following the dissolution of the Czech and Slovak Republic in 1992 which included: removing credit ceilings and shifting to indirect monetary controls; determining interest rates through market forces; strengthening regulation and supervision; and privatizing most large state-owned banks. "Czech policymakers have made considerable progress in developing indirect instruments of monetary control. With the removal of direct ceilings on commercial bank credits by October 1992, the primary focus of monetary control shifted to auctions of refinance credit and adjustments in minimum reserve requirements" (Desai, 1995, page 30).

Reason: "With the removal of direct ceilings on commercial bank credits by October 1992" (Desai, 1995).

Denmark (1980) The process of financial liberalization in Denmark was gradual in order to provide banks with the necessary time to adapt for the new environment: "Financial markets liberalization in Denmark was a gradual process during the 1970s and 1980s, giving the banks the necessary time to adapt to a more liberal environment" (Abildgren, 2007, page 4).

Among the measures included we cite the liberalization of interest rates, and the removal of control on foreign transactions and bank lending: "A large part of the liberalization such as the deregulation of several cross-border capital restrictions during the 1970s and early 1980s, the dismantling of the ceilings on domestic bank lending in 1980, the removal of the last restrictions on capital account credit-transactions in 1988 and the further easing of the access to raise mortgage loans against free mortgageable value in the early 1990s occurred in periods with slow economic growth" (Abildgren, 2007, page 17).

Reason: "... the dismantling of the ceilings on domestic bank lending in 1980".

Egypt (1992) Prior to the start of liberalization in 1990, Egypt's financial and banking sectors were subject to various government controls. Deabes (2006) provides a chronology of all the restrictions imposed during that period: "Egypt, like many other developing economies, has spent much of its post-independence history operating in an illiberal economic environment in which commodity, labor and financial markets are all subject to significant degrees of official intervention" (Deabes, 2006, page 3).

Liberalization started in 1990 and resulted in the removal of restrictions on interest rates, credit ceilings, and foreign ownership of banks: "The process of banking sector reforms in Egypt started in 1990 with the removal of the state sectors monopoly by liberalization of deposit and lending rates. More significantly, banks were allowed to set their own service charges and fees. In February 1991, the foreign exchange market was reformed and central banks control on exchange rates was lifted. This was followed by elimination of any ceilings on bank loans in 1992" (Poshakwale and Qian, 2011, page 100).

Reason: "In particular, controls on interest rates charged by banks were lifted early in 1992, as were the fixed tariffs on certain services. Ceilings on lending were also abolished in the same year and more indirect methods of monetary control were instituted" (Deabes, 2006).

Finland (1983) Prior to the start of its liberalization, the Finnish banking sector was subject to various restrictions and was dominated by few banks through a monopoly on the provision of tax-exempt household deposits. Various credit control tools were adopted to regulate the market. Among these were limits on lending rates, quotas on borrowing from the central bank, and penalty rates for excess borrowing. According to (Fund, 1988, page 1), "[t]he banking system has been highly regulated, with tightly controlled and rigid lending rates."

Moreover, various measures of credit controls were adopted: "Bank lending was subject to direct limits on interest rates and indirect limits on volume. Loan rates were constrained by a ceiling on average lending rates, although individual loans could, within limits, exceed the ceiling. Loan volume was controlled by adjusting the quotas on central bank advances or by altering the spread between central bank finance and lending rates" (Fund, 1988, page 3).

The process of liberalization started in the 1980s with the rise of the "grey" market which undermined the effectiveness of credit controls. Thus, the Bank of Finland started the liberalization process in 1980 by withdrawing from the forward exchange market and allowing banks to handle foreign exchange risk hedging: "In 1986, the Bank of Finland accelerated the process of dismantling the remaining capital account controls. Most important were the lifting of the controls on long-term foreign borrowing with a maturity of at least five years by domestic manufacturing and shipping companies for financing their own operations" (Kovanen, 1995, page 4).

Finally, credit controls were lifted gradually starting in 1983: "Controls on lending interest rates were gradually removed during the period 1983-86. At the same time, the Central Bank moved from the direct controls of monetary aggregates toward market-oriented monetary management, including open market operations" (Kovanen, 1995, page 7).

Reason: "Controls on lending interest rates were gradually removed during the period 1983-86"

France (1984) Credit policy in France after the Second World War was determined by the law of December 2, 1945: "The major changes concerning the credit system at the Liberation were written into the law of December 2, 1945, 'relating to the nationalization of the Banque de France and the major banks and credit institutions,' which contemporaries often dubbed 'the credit nationalization law."'. This law created the *Conseil National du Credit*: "At the heart of credit organization, the 1945 law placed the National Credit Council (CNC), which it created to this end and which was incorporated legally and administratively into the Banque de France" (Monnet, 2018, page 47).

During the period between 1945 and 1973, also known as les trentes glorieuses or the Glorious Thirty, the government's economic doctrine, known as dirigiste or dirigisme, consisted of supervising, financing, and supporting industry. Credit policy represented a central pillar of this doctrine as it was the last component of the dirigste policies that were abandoned following the shift to a more liberal economic policy. Moreover, a government report in 1958 suggested the adoption of economic reforms that were all implemented except the reforms concerning credit policy: "It was in credit policy that the State took the longest time to renounce dirigisme. However, it had aroused vocal criticism such as that of the liberal Jacques Rueff. Of all the measures he prepared for the Minister of Finance Antoine Pinay in 1958, only those relating to the liberalization of credit were not adopted. Politicians and senior officials continued to believe that credit needed to be directed in order to pursue modernization. A 1973 law on the status of the Banque de France reaffirmed its role in controlling credit as a government tool" (Serfaty, 2024, page 363).

Credit policy was initially conducted and monitored by the Banque de France. The Banque used credit ceilings on two levels: first by fixing the amounts that banks were allowed to lend, and second by setting quotas for the sectoral distribution of credit. This approach was a consequence of the nature of the French banking sector which consisted of specialized banks that only lent to specific sectors. However, bank lending focused mainly on short-term credit, as well as providing liquidity to customers. In fact, banks were authorized to provide medium term credit only in 1966: "If a few steps in this direction were taken at the beginning of the 1960s, it was mainly the 1966 banking reform that gave banks a new and central role. It authorized them to freely create counters, to freely distribute and at their own risk medium-term loans that could be mobilized beforehand, subject to prior authorization from the National Credit or the FDES. This solution allows for a better allocation of credit based on productivity prospects, as banks are closer to companies and better informed about their prospects. In fact, competition between banks becomes very strong for deposit collection and granting credit to companies. We are simultaneously witnessing a rapid decline in direct loans from the FDES and an increase in the share of banks in deposits and loans (the latter rises from 41 to 55%, while the Treasury's share goes from 35 to 15% of loans to the economy between 1966 and 1973)" (Hautcoeur, 1996, pages 143-144).

The remaining type of credit, in this case long-term credit for industry, was provided directly by the government through the treasury and state-owned development banks such as the FDES: "The Commissariat Général du Plan (Planning Office) was assigned the coordination of Marshall Plan funds whereas, starting with the 1948 Mayer Stabilization Plan, the Treasury was in charge of the Caisse autonome de Reconstruction and the Fonds de Modernisation et dEquipement (FEM) which granted reconstruction loans and would become the Fonds de Développement Économique et Social (Economic and Social Development Fund, or FDES) in 1954 (Margairaz 1991, p. 1033; Lynch 1997, p. 89). It fell to the Banque de France and the CNC to intervene in the allocation and regulation of bank credit" (Monnet, 2018, page 54).

Finally, the wave of liberalization that started gradually in 1958, and of which the Banking law of 1966 was an important milestone, culminated in the end of all forms of credit controls in 1984 during a period of slow growth, financial instability, and high inflation: "This dirigiste policy only ended in 1984, when the socialist government liberalized the credit market and allowed banks to lend without control from the Banque de France. There is no evidence that this directed credit was completely ineffective until the 1970s: for example, investments were prioritized towards the less capitalized sectors of the economy, which roughly corresponds to what one would expect from efficient markets. However, this changed in the 1970s, when the crisis weakened many public and private institutions, which were over-indebted by 1981" (Serfaty, 2024, page 363).

Reason: "This dirigiste policy only ended in 1984, when the socialist government liberalized the credit market and allowed banks to lend without control from the Banque de France" (Serfaty, 2024).

Ghana (1988) During the post-independence era and until the start of liberalization, Ghana's banking sector was subject to a restrictive regulatory environment in the form of negative real interest rates, credit ceilings, directed lending, and high reserve requirements. Moreover, state-owned banks, which were established following independence to support government development policies, dominated the banking sector: "The economic policy agenda following independence, for most part of the 1960s to the late 1980s, had a socialist orientation with a heavily regulated banking sector: entry restrictions were in place, with state banks dominating the sector, along with interest rate controls, credit ceilings, geographical and product restrictions, enormous reserve requirements and directed credit to support specific sectors of the economy" (Dadzie and Ferrari, 2019, page 329).

By the mid-1980s however, the banking sector was in distress, with banks suffering from severe under-capitalization, non-performing loans, and operational losses. To address these challenges, Ghana initiated a comprehensive financial sector reform program in the late 1980s and early 1990s. A new banking law was enacted in 1989, which introduced minimum capital requirements, capital adequacy ratios, and limits on lending to related parties. Interest rates were liberalized, credit ceilings were lifted, and directed lending was abolished: "A new banking law was enacted in 1989, which specifically defined capital adequacy and minimum capital requirements, prudential lending guidelines and financial reporting procedures. No explicit entry or exit restrictions were imposed in order to foster competition. Foreign-exchange bureaux *[sic]* were authorised to operate in 1988, and the monetary authorities gradually moved away from credit ceilings and credit allocation policies to more indirect instruments of monetary control. Controls over bank charges were lifted and interest rates liberalised" (Antwi-Asare and Addison, 2000, page 7).

Reason: "Foreign-exchange bureaus were authorised to operate in 1988, and the monetary authorities gradually moved away from credit ceilings and credit allocation policies to more indirect instruments of monetary control" (Antwi-Asare and Addison, 2000).

Greece (1987) Liberalization started in Greece during the 1980s, prior to which the banking and financial sectors were subject to strict regulations in the form of quantitative and qualitative credit controls, in addition to various regulations aimed at mobilizing resources for economic development: "In the 1970s and early 1980s, the Greek financial system was very strictly regulated. Funds were allocated at administratively set interest rates through a complicated reserve/rebate system of bank credit. Compulsory investment requirements for banks channeled funds into certain sectors of the economy at subsidized rates, with below-market financing of the government and tight foreign exchange controls" (Ericsson and Sharma, 1996, page 3).

The liberalization of the Greek banking sector started gradually in the 1980s and accelerated in the 1990s as the country prepared to join the European single market. Many measures were adopted, including the removal of restrictions on interest rates, savings deposits, and the allocation of credit. "Financial liberalization in Greece was gradually initiated in the late 1980s and early 1990s ... The central banks effort to dis-inflate from the second half of the 1980s and especially into the 1990s drove liberalization; financial reform was a precondition for monetary austerity " (Pagoulatos, 2014, pages 453-454).

Reason: "Several measures had cleared the ground, but the year 1987 when the short-term lending rate ceiling was abolished, can be taken as the symbolic initiation of credit deregulation, implementing the European single market program" (Pagoulatos, 2014).

India (1992) Prior to the start of liberalization, India's banking and financial sectors were subject to various restrictions that included: administered interest rates, directed credit, and public ownership of banks. The stated goal of these various measures was to allocate credit for economic and social policies: "The Indian financial system in the pre-reform period (i.e., prior to Gulf crisis of 1991), essentially catered to the needs of planned development in a mixed-economy framework where the public sector had a dominant role in economic activity. The strategy of planned economic development required huge development expenditure, which was met through Government's dominance of ownership of banks, automatic monetization of fiscal deficit and subjecting the banking sector to large pre-emptions both in terms of the statutory holding of Government securities (statutory liquidity ratio, or SLR) and cash reserve ratio (CRR). Besides, there was a complex structure of administered interest rates guided by the social concerns, resulting in cross-subsidization" (Reddy, 2004, page 1).

The start of reforms, which can be dated to 1991, included the privatization of government banks and the removal of restrictions on private banks operations: "The share of the public sector banks in the aggregate assets of the banking sector has come down from 90 per cent in 1991 to around 75 per cent in 2004. The share of wholly Government- owned public sector banks (i.e., where no diversification of ownership has taken place) sharply declined from about 90 per cent to 10 per cent of aggregate assets of all scheduled commercial banks during the same period" (Reddy, 2004, page 2).

Interest rates were gradually liberalized in 1992: "Complex system of regulated interest rates simplified in 1992. Interest-rate controls on CDs and commercial paper eliminated in 1993" (Williamson and Mahar, 1998).

Finally, credit controls followed a similar trend with various liberalizing reforms starting in 1992: "The focus of reform efforts has been on: giving banks more freedom to set the credit requirement for their borrowers; relaxing the conditions for consortium lending; withdrawing the regulations on Maximum Permissible Bank Finance (MPBF) and allowing banks to use their on methods in order to assess working capital requirements; allowing banks to use their discretion in levying commitment charges; deciding on the level of inventory and receivable holdings of different industries" (Gupta et al., 2015, page 37)

Indonesia (June, 1983) Prior to the push for financial liberalization in 1983, Indonesia's banking sector was heavily regulated. The government used credit ceilings as the primary tool of monetary and credit control, interest rates were tightly controlled, state-owned banks dominated the sector, and private bank participation was limited: "Before the financial reform of June 1, 1983, the major BI instruments of monetary policy were credit ceilings for individual banks,interest rate controls for state banks, and a selective re-discount mechanism designed to reallocate credit at subsidized interest rates. During each fiscal year, the authorities targeted aggregate credit expansion consistent with projected money demand, and with their target for the balance of payments. The aggregate credit target was then allocated among groups of banks and individual banks on the basis of past performance, with additional sub-ceilings applied for various credit types at each bank" (Sundararajan and Molho, 1988, page 7).

The financial liberalization process in Indonesia began in June 1983 and proceeded gradually. First, credit ceilings were eliminated, interest rates were deregulated, and subsidized credit to banks from the Central Bank were reduced. Later reforms focused on modernising the system by adapting monetary policy tools to the new environment, initiating open market operations, and introducing new market instruments like SBI (Bank Indonesia certificates) and SBPU (money market securities) in 1984 and 1985 respectively: "The first stage of the reform became effective on 1 June 1983. Its main features were the elimination of credit ceilings (which had been the primary tool of monetary and credit control), deregulation of interest rates, and a reduction of subsidized credit to banks from the Central Bank (Bank Indonesia)" (Juoro, 1993, page 324).

Reason: "... the first stage of the reform became effective on 1 June 1983. Its main features were the elimination of credit ceilings ..." (Juoro, 1993).

Ireland (February 1981) Ireland's banking sector was subject to a large set of regulations prior to the 1980s with strict controls over international capital flows, interest rates, in addition to quantitative credit controls, and high reserve requirement for banks. "Until the mid-1980s, the Irish banking system was reputedly one of the most heavily regulated systems of the western world with significant interest-rate, credit and capital controls in place" (Kelly, 2014, page 62).

The liberalization of Ireland's banking sector began in the 1980s and accelerated in the 1990s. Key measures included the abolition of restrictions on credit growth and interest rate rules, successive reductions in banks' reserve requirements, and the removal of controls on capital movements by 1993. The government supported greater competition in the banking sector and adopted market-oriented monetary policy instruments: "Structural change in Ireland has affected both the supply of and demand for credit. On the supply side, first, progressive steps were taken from the 1980s onwards to dismantle credit, capital and interest-rate controls. These steps included the abolition of quantitative restrictions on credit growth; the lowering of banks reserve requirement ratios; the progressive dismantling of capital controls; the break-up of the interest-rate cartel and the eventual removal of all restrictions on interest rates; and the removal of legal and tax impediments to the development of the non-Government securities market. In addition, market-oriented monetary policy instruments were developed by the Central Bank and competition in retail lending markets was encouraged" (Kelly and Everett, 2004, page 95).

Reason: "February 1981: Explicit sectoral credit guidelines discontinued" (Kelly and Everett, 2004).

Israel (1985) Prior to financial liberalization, Israel's financial and banking sectors were subject to strict government regulations. These regulations included controls on credit, interest rates, as well as high liquidity requirements for banks: "The stabilization program preceded the start of liberalization: Over the last 20 years, Israel has moved from almost complete control and deep government involvement in every segment of the financial markets to a regime with a practically independent central bank (see more about the independence of the central bank in Cukierman (2007)) and free capital flows, having implemented many structural and financial reforms" (Eckstein and Ramot-Nyska, 2008, page 289).

The process of financial liberalization in Israel started in the 1980s with the gradual removal of restrictions on the banking sectors: "There was also a relaxation of financing restrictions. In particular, until the mid-to-late 1980s, it was very difficult to issue corporate bonds or stocks because corporate financing of that sort required government approval. There were other restrictions as well that related to the banking sector. Another reform was the gradual elimination of direct credit, the process by which the government came in and acted as a direct intermediary providing credit to different parts of the Israeli economy, primarily to exporters and manufacturers" (Blass, 2004).

Finally, starting in 1985, credit restrictions were gradually removed and have declined from covering 60 percent of allocated credit to 6 percent by 2004: "There are three key components to credit. The first is directed government credit, which was basically phased out in the late 1980s and early 1990s. At the same time, particularly when the directed credit was phased out, domestic bank credit jumped dramatically and in recent years has also become a major factor. Indeed, this can be viewed as one successful aspect of the reforms, where the banking system is providing the credit instead of the government directing the credit" (Blass, 2004).

Reason: "Government intervention was reduced dramatically; for example, the share of directed bank credit plummeted from 60 percent in 1985 to only 6 percent in 2004" (Ben-Bassat, 2011).

Jamaica (1991) Prior to the start of liberalization in the mid-1980s, Jamaica's banking sector was subject to various restrictions in the form of quantitative and qualitative credit controls, coupled with central bank restrictions on interest rates: "In 1985, Jamaica attempted to move from direct to indirect instruments of monetary control for the first time. Prior to this, the system of monetary management had involved: global credit ceilings and directed credit operations through sector specific refinance windows operated by the BoJ and activity specific credit ceilings; a statutory saving deposit floor rate, and a maximum mortgage lending rate; interest subsidies were given not only through refinance operations but also through specialized agencies; a non-remunerated cash reserve ratio (which differed between commercial banks and non-bank financial institutions) and a non-cash liquid asset requirement" (Marston, 1995, page 4).

The start of liberalization in 1985 was marked by the removal of restrictions on interest rates, and credit ceilings. The latter were adopted again in 1989 to be lifted completely in 1991: "interest rate controls were removed, a program to remunerate reserve requirements was instituted, and the liquid asset ratio (LAR) was phased out. Open market type operations replaced credit ceilings as the primary instrument of control" (Marston, 1995, page 3). Because of the short period of "abolition", we thus treat January 1991 as the date of directed credit liberalization.

Jamaica also went through a process of privatization of its state-owned banks: "In the mid 1980s the new government undertook a strategy of reducing its role in the public sector. This included the banks that had been acquired in the 1970s. These banks were sold to the private sector and the public. As a result of this, domestic entrepreneurs gained increasing importance in the ownership and control of the sector, as the privatisation favoured indigenous investors" (Rattray, 2007, page 218).

Reason: "In January 1991, credit ceilings were abandoned because the BoJ practice of granting exemptions, as well as circumvention by banks through off-balance sheet transactions, had made them ineffectual" (Marston, 1995).

Japan (1982) Japan's history of financial and banking regulation following the Second World War consisted of three periods. The first two periods were marked by a combination of various forms of restrictions on credit as well as banking and financial operations. The third period witnessed a push towards liberalization with the removal of government restrictions on credit: "Three phases are usually identified: the reconstruction period, from 1945 to 1955, when industrial policy and the direct government allocation of funds were most significant; the high-growth period, from 1955 to 1973, when government policy operated less directly, although the financial system was rigidly segmented and subject to wide-ranging controls; and the liberalization period, from the mid-1970s to the present, when policy became less interventionist, and a slow but steady process of financial liberalization began" (Vittas and Cho, 1996, page 282).

During the first two periods, the government aimed to mobilize resources for reconstruction and industrialization. To achieve this, various restrictions were imposed on the financial and banking sectors: "Japan Financial regulations that affected the pace and direction of financial sector development included a fragmentation and segmentation of the financial system, merger and branching controls, interest rate ceilings, tight regulation of bond and equity issues, foreign exchange controls, including restrictions on foreign direct investment and, last but by no means least. Restrictions on consumer credit and housing finance. In addition, government financial institutions and policy-based finance played a significant part in channeling funds to priority sectors or activities" (Vittas and Kawaura, 1995, page 30)

Regarding credit allocation, the Bank of Japan used window guidance, which consisted of instructions to influence the flow and distribution of credit in the economy: "The credit guidance in Japan consisted of regular meetings between the central bank and private sector banks, during which the Bank of Japan essentially instructed the banks on a quarterly basis on how much to increase or reduce lending" (Werner, 2002a, page 8).

Once the country had achieved its reconstruction objectives, industrial policy became the center of focus and credit was directed to support these efforts: "Throughout, Japanese credit (and industrial) policy seems to have had four specific industrial objectives: to pick and support "winning" industries, especially in markets in which Japan could enjoy a dynamic comparative advantage; to phase out industries in which Japan was no longer internationally competitive; to support small firms; and to provide the industrial infrastructure necessary for growth" (Vittas and Cho, 1996, page 282).

Prioritization of industry nevertheless was accompanied by strict oversight and monitoring: "Another important aspect of Japan's directed credit programs has been the high quality of loan appraisal and project oversight. Loan approval is based on detailed reviews of the projects to be financed and evaluations of the history and character of the firms involved" (Vittas and Cho, 1996, page 283).

The process of liberalization started in the 1970s and was considered complete by the 1990s. It encompassed the financial and banking sector with a focus on removing government intervention in favor of market-based monetary operations: "Financial liberalization and the associated process of financial innovation have had far-reaching effects on Japan's financial system. Many constraints on portfolio and expenditure choices have been removed, altering the tightly controlled flow of funds patterns that supported the monetary control mechanism of the mid-1970s. Three changes have been particularly significant in the evolution of the Bank of Japan's operating strategy: First, the importance of bank loans as a source of funds has greatly declined. Second, the range of instruments used by banks to raise funds has expanded dramatically. Third, assets with market-determined prices now predominate in the portfolios of all sectors of the economy" (Kasman and Rodrigues, 1991, page 31).

Reason: "The Bank of Japan announced that it was abandoning direct credit controls in 1982" (Werner, 2002b).

Jordan (1995) Prior to the start of Banking and Financial sectors liberalization in Jordan, various restrictions were adopted such as the preferential credit facilities, interest rate controls, and limitations on the operations and ownership of banks (Abiad et al., 2008, page 39).

Credit controls were widely adopted and were eliminated only for some sectors: "policy instruments still relied heavily on various direct controls, including of various exchange transactions and tight direct credit control measures" (International Monetary Fund, Independent Evaluation Office, 2005, page 27).

Liberalization started in the 1980s and intensified in the 1990s under the guidance of the International Monetary Fund (IMF). Various reforms were adopted among which the liberalization of interest rates in 1988, as well as the partial lifting of credit controls: "Following the move from direct credit controls to indirect monetary control, the limit was set on the NDA of the Central Bank of Jordan (CBJ) from 1995" (International Monetary Fund, Independent Evaluation Office, 2005, page 28).

Reason: "Following the move from direct credit controls to indirect monetary control, the limit was set on the NDA of the Central Bank of Jordan (CBJ) from 1995" (International Monetary Fund, Independent Evaluation Office, 2005, page 28).

Kenya (1991) Before the start of liberalization, Kenya's banking sector operated under a strict regime controlled by the central bank. Under this regime, various restrictions were implemented, among them quantitative and qualitative credit controls, as well as interest rates controls. "In the period prior to 1991, the Central Bank of Kenya (CBK) set ceilings on total domestic credit and (net) banking system credit to the Government. Commercial bank credit to non-government borrowers, i.e., parastatals and the private sector, was controlled through monthly credit ceilings on individual banks. All interest rates were administered" (International Monetary Fund, 1995, page 38).

Starting at the end of the 1980s, many restrictions affecting the banking and financial sector were gradually removed. For example, credit ceilings and interest rate controls were abolished: "The institutional setting of monetary policy implementation began to change dramatically at the end of the 1980s, when Kenya embarked on a comprehensive program of financial sector reforms. By mid-1991, the authorities had moved completely away from reliance on quantitative credit ceilings and interest rate controls, toward an indirect monetary policy environment, with cash (reserve) ratio, rediscount window, and open market operations as the main policy instruments" (International Monetary Fund, 1995, page 38).

Reason: "By mid-1991, the authorities had moved completely away from reliance on quantitative credit ceilings" (International Monetary Fund, 1995).

South Korea (1982) Following the end of the Korean war in 1953, South Korea's banking and financial sectors were oriented toward the financing of the country's reconstruction and industrialization. They were subject to a strict regime of controls. For example, the government nationalized all commercial banks in the 1960s: "Control over the financial system was further concentrated in the hands of the Ministry of Finance in the early 1960s as majority ownership of commercial banks was transferred to the government, and several additional specialized banks were created to support the development of high priority sectors of the economy" (Layman, 1988, page 355).

During its strict regulatory regime, the majority of credit was subject to government directives: "The Board has allocated credit by measures ranging from setting general guidelines to earmarking funds for specific sectors, industries, and even individual firms and projects. As recently as the late 1970s, the government allocated, directly or indirectly, anywhere from 50 to 70 percent of domestic credit, depending upon the classification of 'directed' or 'policy' loans" (Layman, 1988, page 362).

The first step toward liberalization can be traced back to 1980 when the economy was subject to internal pressure in the form of high inflation, and external pressures: "The unfavorable economic developments of 1980 (further increases in oil prices, a devaluation of 21 percent on January 12, a poor agricultural performance, and political unrest) caused the authorities to seek changes that emphasized increased international competitiveness, and price stability through higher domestic savings and monetary discipline" (Layman, 1988, page 367).

The reforms adopted to liberalize the financial and banking sectors started with the removal of restrictions on the operations of banks as well as the privatization of commercial banks: "Financial deregulation commenced with the removal of various restrictions on bank management and the privatization of commercial bank ownership in the early 1980s. Regulations on commercial banks in the spheres of the organization, budget, branching, and business practices were greatly loosened. During 1981-83, the government sold its shares in all nationwide commercial banks" (Park, 1996, page 249).

Similar reforms were adopted with regard to credit policy in 1982 when directed credit was abolished: "First, in 1982, the authorities replaced direct control over bank lending with an indirect reserve control system. Since 1982, there has been no formal direct control of bank credit except for measures to restrict loans to large conglomerates" (Park, 1996, page 258).

Reason: "Although credit controls for banks were removed in 1982, the credit requirement for small and medium business continues, and the Monetary Board retains the right to impose such controls and ceilings as appropriate" (Layman, 1988).

Malaysia (1980) Prior to start of the financial liberalization, the Malaysian government intervened regularly in the banking and financial sectors through directed lending to priority sectors, controls on interest rates, and restrictions on foreign bank entry and branching: "Each year since October 1976, the Malaysian Government issues lending guidelines to the banking industry under which these financial institutions are required to provide credit what is considered the 'priority sectors' of the economy at below market rates of interest" (Asian Development Bank, 1999).

The process of the liberalization was gradual and protracted, it resulted in the implementation of a new interest rate regime in which banks can determine deposits rates. Moreover, ceilings on foreign lending were increased. Nevertheless, credit controls have not been fully abandoned and instead were gradually decreased: "Fifty percent of net lending required to go to priority sectors in 1975. (Regulation quickly reduced to 20% and largely nonbinding.) Scope of priority lending reduced in the 1980s. Extension of bank credit below the cost of funds eliminated in the 1980s" (Williamson and Mahar, 1998).

Reason: "Scope of priority lending reduced in the 1980s. Extension of bank credit below the cost of funds eliminated in the 1980s." While there is no one sharp date when directed credit policies were liberalized, we set the liberalization to 1980. This date is also recorded as a liberalization by Abiad et al. (2010).

Mexico (1989) Prior to the start of financial liberalization, Mexico's financial sector was subject to a tight regime of various controls. Among these measures were high liquidity requirement in addition to interest rates and credit controls: "Until late 1988, Mexico's financial system was a textbook case of financial repression: high reserve requirements, coupled with regulated interest rates and officially directed bank funding to preferential sectors, resulted in low levels of financial intermediation" (Gelos and Werner, 2002, page 4).

Credit controls represented a central pillar of government policy as they were the main tool of monetary policy: "In addition, monetary control was based mainly on quantitative credit controls rather than on market mechanisms, such as open market operations" (Coorey, 1992, page 38).

The International Monetary Fund (IMF) intervention following the Mexican financial crisis in 1982 led to the adoption of economics reforms and the start of a process of financial liberalization. Various measures were adopted, among which the elimination of credit controls, the liberalization of interest rates, and the privatization of government's owned commercial banks: "Key liberalization measures included the freeing of interest rates and the elimination of direct controls on credit. In November 1988, quantitative restrictions on the issuance of bankers' acceptances were lifted, and banks were allowed to invest freely from these resources. In April 1989, major reforms were introduced that eliminated controls on interest rates and maturities on all traditional bank instruments and deposits, as well as remaining restrictions on bank lending to the private sector. But the cornerstone of the institutional reform was the reprivatization of Mexico's commercial banks, announced in 1990, and subsequently successfully implemented, which was part of a wider plan to promote financial integration through a universal banking system" (Coorey, 1992, page 10)

Reason: "In April 1989, major reforms were introduced that eliminated controls on interest rates and maturities on all traditional bank instruments and deposits, as well as remaining restrictions on bank lending to the private sector".

Morocco (1991) Prior to the start of liberalization, Morocco's economy "can be qualified as [an] administered debt economy which it was financed by banking sector". Various restrictions on credit and interest rates were used: "In other words, the question is to make a successful financial transition and assure a passage from the system based both on the monetary control, the administration of interest rates, the quantitative credit rationing and the required reserves policy" (Bouhadi and Benali, 2008, page 126).

Directed credit allocation represented the main tool of monetary policy during the pre-liberalization period: "Monetary policy in all three countries was primarily conducted through direct quantity allocation of credit and refinancing. Interest rates were set administratively, and were negative in real terms in all three countries during most of the early 1980s" (Jbili et al., 1997, page 9).

A gradual process of liberalization started in the 1980s: "Following the example of several OECD countries, where the process of reorganization of the financial structure was begun in the 1960s, intensified and generalized during the 1970s and 1980s, Morocco undertook, the beginning of the 1980s, a vast process of modernization of its economic system in order to increase its efficiency and to improve its nationally and internationally attractiveness" (Bouhadi and Benali, 2008, page 125).

This process of liberalization led to the removal of controls on interest rates: "The liberalization of interest rates in Morocco was established progressively and occurred in two phases: the first phase attempted to liberalize the creditor interest rates (begun in 1985 and finished in 1990) and the second phase attempted to liberalize the debtor interest rates (1990-1992). Debtor rates, however, remained subdued until the end of January, 1996, with an upper limit fixed by monetary authorities" (Bouhadi and Benali, 2008, page 127). The removal of credit controls occurred in 1991: "The credit deregulation was introduced in January 1st, 1991" (Bouhadi and Benali, 2008, page 127).

Reason: "The deregulation of directed credit was introduced on January 1st, 1991" (Bouhadi and Benali, 2008).

Netherlands (1989) Before the liberalization process began, the Dutch financial system was characterized by a high degree of regulation and direct control by the monetary authorities. During the late 1950s and early 1960s, the Netherlands Bank exerted detailed and rigid controls over the banking sector, including qualitative and quantitative credit controls. For instance, "toward the end of the 1950s, however, the possibilities for the Netherlands Bank to exert these rather detailed and rigid controls gradually disappeared," indicating a tightly regulated financial environment. Moreover, "at the beginning of the 1960s, quantitative credit controls were introduced...the growth of total bank credit, irrespective of its sectoral distribution, was limited" (Hilbers, 1998, page 17).

The process of liberalization in the Netherlands was characterized by a gradual and integrated approach: "What is special about the Dutch case is that a gradual approach was adopted, both in terms of the move toward full reliance on exchange rate policy and in terms of the transition from direct to indirect instruments of monetary control." This approach allowed for a smooth transition, mitigating potential negative impacts: "The advantage of an integrated and gradual approach is that one gains experience with new strategies and instruments, while still relying-at least to some extent and temporarily-on existing policy practices" (Hilbers, 1998, page 26).

The liberalization process involved "a conversion from the use of monetary indicators to full reliance on an exchange rate target, a gradual deregulation of domestic financial markets, and liberalization of international capital flows" (Hilbers, 1998, page 3).

It also involved the removal of credit ceilings in 1989: "In the spring of 1989, agreement was reached with the banking sector about a new instrument of monetary policy. The driving force was the need to develop an instrument to control credit growth in a more market-based fashion than by straightforward credit ceilings. There would no longer be a ceiling for individual banks, but banks for which the rate of credit expansion exceeded a certain threshold value (the permitted exemption) would in principle be obliged to hold a non-interest-bearing cash reserve (deposit) with the central bank" (Hilbers, 1998, page 20).

Reason: "In the spring of 1989, agreement was reached with the banking sector about a new instrument of monetary policy" (Hilbers, 1998).

New Zealand (1984) Before the liberalization in 1984, New Zealand's banking and financial sector faced a strict regulatory framework that significantly affected the allocation and volume of credit. The banking sector was highly segmented, subject to rigid controls in the form of interest rate caps, as well as qualitative and quantitative lending restrictions.

The liberalization process started in 1976 but was interrupted for the period between 1981 and 1984 when restrictions were re-adopted: "While an intensified program of deregulation began in 1976, this was reversed in the 1981-84 period. During this latter period, strict interest rate controls on deposits and loans were reintroduced and 'moral suasion' regarding the total allowable increase in credit extended by banks was exercised" (Grimes, 1998, page 295).

In 1984, the process of liberalization was resumed and the measures adopted resulted in the removal of all restrictions on the allocation of credit: "As a result of these policy actions, the financial sector has moved rapidly from being one of the most heavily regulated among industrialized economies to being one of the most unregulated. Interest rate controls have been removed, reserve requirements on depository institutions have been abolished, and barriers to entry in banking have been significantly reduced" (Walsh, 1988, page 279).

Reason: "New Zealand removed all credit and interest controls over the two-year period from 1984 through 1985" (Williamson and Mahar, 1998).

Nigeria (1992) Prior to the start of financial liberalization in 1986, Nigeria's banking sector was highly regulated and dominated by few large banks. The Central Bank of Nigeria implemented monetary policy by using instruments such as credit ceilings and sectoral allocation targets. Foreign exchange was also strictly regulated, with the government maintaining a fixed exchange rate regime: "Thus prior to the commencement of structural adjustment programme in 1986, government intervention in credit allocation targeting industry, small and medium-scale enterprises, agriculture, state-owned enterprises, exports and even regional balances was perverse and remained the main form of monetary management" (Ikhide, 1998, page 17).

Nigeria began liberalizing its financial sector in 1986 as part of a broader Structural Adjustment Program (SAP) which included the lifting of restrictions on interest rates in 1987, the opening of bank licensing in the same year: "Liberalization began with a relaxation of barriers to entry in financial services. At the end of 1986, the CBN quietly eased restrictions on bank licensing, fostering a profusion of new banks" (Lewis and Stein, 1997, page 7).

Credit ceilings were removed partially in September 1992: "With effect from September 1992, the lifting of credit ceilings on banks that are adjudged healthy by the CBN has been in place" (Ikhide, 1998, page 23).

Reason: "With effect from September 1992, the lifting of credit ceilings on banks that are adjudged healthy by the CBN has been in place" (Ikhide, 1998).

Norway (1987) Prior to the liberalization of the Norwegian financial system, the credit market was subject to strict regulations. The Credit Law of 1965 formed the legal basis for credit policy during this period. Credit controls were adopted with targets communicated through annual credit budgets that specified the desirable amount of credit to be supplied by financial institutions. To meet these targets, the authorities employed various tools, including "quantitative regulations, interest rate controls, and foreign exchange controls" (Krogh, 2010, page 9). In addition, direct interest rate regulations were imposed on bank loans to the public, with the government setting interest rates. During this period, the primary objective of directed credit policy was to keep credit growth under control and maintain low inflation rates. As documented by (Krogh, 2010, page 15), "[a]s in the late

70s, the government was aiming at keeping the growth in prices and costs low through 1980, and this required a tight credit policy."

The Norwegian financial system underwent a gradual deregulation process during the 1980s. In September 1980, interest rate regulations were relaxed with the introduction of interest rate declarations, which allowed for more flexibility compared to the previous strict norms. “These norms were given a less strict formulation as interest rate declarations from September 1980, which prevailed for five years until it was abandoned in September 1985, when interest rates were allowed to float freely" (Jansen and Krogh, 2011, page 13).

Similarly, the authorities gradually lifted control credit controls throughout the 1980s: “A first move towards deregulation was taken already in 1977 when interest rate norms were removed albeit only temporarily as a price freeze (which included interest rates) was introduced shortly afterwards. Then followed a removal of the lions share of banks foreign exchange controls in 1978, a very important step in the deregulation with an immense long-term effect, as it made it possible for domestic banks to finance themselves more heavily abroad. Most quantitative regulations were gone by the mid-1980s and the credit market was fully deregulated around 1987/88.” (Jansen and Krogh, 2011, page 10)

The liberalization process was completed in 1990 with the removal of restrictions on capital flows, foreign ownership of domestic bonds, and domestic ownership of foreign securities: “Even though the deregulation was basically finished, the liberalization of capital flows continued in 1989. In May foreigners were again allowed to buy listed bonds in Norway and this time without any limits. In July the authorities gave domestic residents permission to buy shares in foreign securities funds. Finally, in December foreigners were allowed to issue bonds on the Norwegian bond market. The liberalization was finalised in 1990 when a new set of foreign exchange regulations was presented, but the practical implications of this change were modest" (Krogh, 2010, page 21).

Reason: “Most quantitative regulations were gone by the mid-1980s and the credit market was fully deregulated around 1987/88” (Jansen and Krogh, 2011, page 14).

Pakistan (1995) Prior to the start of liberalization in the 1980s, Pakistan’s banking sector was heavily controlled by the government. Restrictions included interest rates controls, credit ceilings, and a state-owned banking monopoly.

The liberalization process began in the 1980s and accelerated in the 1990s with assistance provided by the International Monetary Fund and the World Bank. Major reforms included privatizing state-owned banks, removing barriers to entry for new private banks, deregulating interest rates, and removing credit ceilings: “Deregulation and restructuring took a strong foothold in Pakistan as the Government decided to privatize banks and allow liberal entry of new banks. Simultaneously, SBP removed all restrictions and barriers on banks’ conduct of business by 1997/98 which included: (i) removal of floor and caps on interest rate structure by 1997-98; (ii) abolishment of concessional lending schemes (except for Locally Manufacturing Machine and Export Finance scheme); and (iii) lifting the cap for project financing" (Akhtar, 2007, page 2). Credit controls were removed in 1995 (Idrees et al., 2022, page 14).

Reason: “Credit controls were lifted in 1995” (Idrees et al., 2022, page 14).

Peru (1992) Prior to the start of financial liberalization, Peru's banking and financial sectors were subject to various regulations which included controls on credit allocation, interest rates, and capital flows. "At the start of the 1970s, the ECLAC-inspired structural reforms implemented by the military regime of Velasco (196875) created a strong sector of public enterprises, productive and financial, which came to control more than 30% of GDP and endured without major changes until the 1990s. This process entailed the nationalization of a considerable proportion of foreign investment and much of the real assets owned by the oligarchy of the day " (Dancourt and Sotelo, 2018, page 198).

Liberalization started following the election of a new government in 1990. This resulted in the removal of controls on the allocation of credit and interest rates: "During the 1991-92 period the main objective of monetary policy was to reduce the rate of inflation by keeping the growth of base money in line with the needs of the economy while allowing interest rates to be determined by market forces ... Monetary policy shifted away from the use of direct instruments, including credit allocation schemes and interest controls, to that of indirect tools of monetary management" (Duran-Downing, 1996, page 198).

Reason: "Monetary policy shifted away from the use of direct instruments, including credit allocation schemes and interest rate controls, to that of indirect tools of monetary management" (Duran-Downing, 1996).

Phillipines (1983) In the period preceding the onset of financial liberalization in the 1980s, the Filipino banking and financial sector was subject to heavy government intervention, segmentation, and limited competition. Credit controls were adopted as well interest rate ceilings: "In the Philippines, 1956-1973 was a period of low and rigid interest rates, with ceilings on loan rates prescribed by the Usury Act of 1916. The economy grew in the 1960s and a wider excess demand for credit emerged. Selective credit controls were used to allocate credit, but these became ineffective as the Central Bank simultaneously liberalized its rediscounting policy" (Gochoco, 1991, page 333).

Liberalization reforms which started in 1974 included the removal of interest rate ceilings as well as the deregulation of rates on long-term time deposits. Finally, ceilings on all types of deposits and loans were removed: "Directed credit partly abolished in 1983. Remaining directed credit shifted to the relevant government agency and extended at market-oriented interest rates" (Williamson and Mahar, 1998).

Reason: "Directed credit partly abolished in 1983."

Portugal (1990) Prior to the start of the liberalization process, Portugal's banking system was characterized by extensive state intervention. Following the military coup of 1974, all banks were nationalized in 1975. The 1976 Constitution further cemented this nationalization, barring private participation in the banking sector. This era was marked by strict regulations with considerable restrictions on banking activities. According to (Canhoto and Dermine, 2003, page 2), "[t]he banking system was very much repressed by very strict regulations in terms of entry, opening of branches, regulation of interest rates, *credit ceilings*, and very high reserve requirements needed to finance a large public deficit" (emphasis ours).

The process of liberalization started following the election of Prime Minister Cavaco Silva in the mid-1980s and the implementation of reforms necessary for entry into the European Community (EC) in 1986. These reforms centered around three main objectives: the entry of private banks, privatization, and liberalization. The entry of private firms started when the banking sector was opened to competition in 1984, allowing private firms to enter the market. Concurrently, the government privatized state-owned banks, lifted restrictions on branch openings, and deregulated administered interest rates and credit ceilings. "Private entry into banking was authorized in February 1984. The banking sector then included 12 state-owned institutions, one domestic savings bank, and three foreign banks that had not been nationalized in 1975" (Canhoto and Dermine, 2003, page 3).

Despite these reforms, Portugal's monetary policy from 1977 to 1990 relied heavily on credit ceilings in the form of direct quantitative credit limits. Nevertheless, the country's integration into the European Community undermined the effectiveness of these controls, as evidenced by unpredictable capital inflows and the growth of credit markets outside the ceilings. This ultimately resulted in a shift towards a market-based monetary policy, culminating in the reform of the Bank of Portugal's charter in October 1990. The reform abolished formal credit ceilings and introduced indirect control through open market operations and cash reserves, in line with a new monetary policy framework focused on managing liquidity growth. According to Pinto (1996, page 8), "[t]he implementation of these reforms allowed the changeover from a system of direct quantitative limits on credit, in place since 1977, to one of indirect monetary control via open market operations. Following the suspension of formal credit ceilings in March 1990 and of credit growth recommendations at the end of 1990..."

Reason: "Following the suspension of formal credit ceilings in March 1990 and of credit growth recommendations at the end of 1990..." (Pinto, 1996).

South Africa (1980) Prior to the start of liberalization in South Africa, the banking and financial sectors were subjected to various restrictions that included interest rate controls, credit ceilings, and limited competition: "Financial liberation in South Africa was initiated shortly after the De-Kock Commission reports of 1978 and 1985. Interest and credit controls were virtually removed in 1980, while bank's liquidity ratios were reduced substantially between 1983 and 1985. Credit ceilings were in effect from 1965 to 1972 and 1976 to 1980. The register of co-operation, which limited bank competition, was also eliminated in 1983" (Odhiambo, 2006, page 61).

In 1978, the government began to implement reforms aimed at liberalizing the sector, these reforms included the removal of credit ceilings and interest rate controls: "Credit ceilings removed and reserve and liquidity requirements lowered in 1980" (Williamson and Mahar, 1998, page 22).

Reason: "Credit ceilings removed and reserve and liquidity requirements lowered in 1980" (Williamson and Mahar, 1998).

Sweden (1985) Prior to the start of liberalization, extensive regulations were imposed on financial and banking institutions in Sweden. These regulations included credit ceilings,

ceilings on interest rates, and requirements for bank to hold government bonds: “During the first decades after World War II the most important intermediary goal of Swedish monetary policy was to keep interest rates at a low and stable level. Since the central bank was not prepared to accept the consequences of this goal in terms of monetary expansion a series of regulations directed at bank lending, investment and interest rates were introduced around 1950” (Englund, 1990, page 386).

The process of liberalization started gradually in 1978, with the removal of ceilings on deposit rates, and intensified in the 1980s : “In the early 1980s the stage was set for deregulation” (Englund, 1999, page 383). “Regulations of quantities. - Requirements on banks and insurance companies to hold bonds: Abolished for banks in 1983 and for insurance companies in 1986. Ceilings on loans from banks and finance companies: Abolished in 1985” (Englund, 1990, page 386).

Reason: “Ceilings on loans from banks and finance companies: Abolished in 1985” (Englund, 1990).

Tanzania (1996) Prior to the start of reforms in the 1980s, Tanzania had a banking system that was largely state-owned and controlled. Interest rates controls were put in place in addition to qualitative credit controls that allocated credit to government prioritized sectors: “The financial system in socialist Tanzania was very narrow. It essentially comprised : (a) the Bank of Tanzania (the central bank) ; (b) three state-owned commercial banks (The National Bank of Commerce, The Co-operative and Rural Development Bank (), and the Peoples Bank of Zanzibar) ; (c) three state-owned development finance institutions (Tanzania Development Finance, Tanzania Investment Bank and Tanzania Housing Bank) ; and (d) state- owned non-bank financial institutions (e.g. the National Insurance Corporation and the National Provident Fund)” (Temu and Due, 2000, page 686).

Tanzania’s reforms started gradually in the 1980s and were intensified in the 1990s. They resulted in the removal of interest rate controls as well as the removal of credit ceilings in 1996: “ Although Tanzania started pursuing financial reforms as early as the 1980s, it was only in the 1990s that fully-fledged financial reforms were implemented... A year later, the liquidity asset ratio was also abolished, and in 1996, the credit ceiling on commercial banks lending was also abolished” (Odhiambo et al., 2010, page 1).

Reason: “A year later, the liquidity asset ratio was also abolished, and in 1996, the credit ceiling on commercial banks lending was also abolished” (Odhiambo et al., 2010).

Thailand (1980) Prior to the start of the financial liberalization process, the Thai financial system was characterized by government controls and limited competition. Among the measures adopted were interest rate ceilings, ceilings on deposits rates, and interest rate ceilings for priority sectors. Moreover, foreign banks were barred from entry, and government ownership of banks was common (Abiad et al., 2008, page 41).

The 1980s witnessed a gradual process of financial liberalization: “The countrys financial liberalization process can be generally characterised as following a gradual approach, implemented in steps so as to allow financial institutions and consumers to adjust to the new environment” (Sirivedhin, 1998, page 197).

Among the measures adopted was the lifting of controls in May 1985 on opening of letters of credit, and in June 1992 on interest rates and deposit rates ceilings. During the 1990s more reforms were implemented following the adoption of three financial system development plans which included the liberalization of international transactions, the adoption of international measures, and the establishment of credit agencies to monitor credit (Sirivedhin, 1998, page 218).

Reason: "The government gradually eliminated directed credit after 1980" (Abiad et al., 2008).

Tunisia (1996) Prior to the adoption of reforms to liberalize its banking sector, Tunisia resembled a classic case of financial repression with restrictions on the allocation of credit, interest rates, and banks operations: "During the 1970s and the 1980s, the financial system in Tunisia was heavily controlled. The financial market remained inactive, as there was no real equity market where investors could buy or sell stocks. Interest rates were set administratively and were usually negative, at -4% in real terms over the period 1963-1985. The money market was underdeveloped. Although the number of bank branches was sizeable by the 1980s, competition remained weak due to the high concentration of deposits and lending and the segmentation of bank activity. Moreover, the inactivity of money markets made commercial banks dependent on central bank refinancing when facing liquidity problems. Additionally, commercial banks were often compelled to lend to priority sectors with little concern for the borrowing firm's profitability" (Naceur et al., 2006, page 6).

The adoption of reforms to liberalize the sector started in 1987 by lifting restrictions on interest rates and promoting more competition in the banking sector: "Since the mid 1980s, the increasing costs of an inefficient banking sector and the attendant problems for monetary control created a mounting impetus for reform. The changes initiated in 1987 and 1988 aimed at liberalizing interest rates and allowing market forces to play a greater role in banks business, while at the same time creating a deeper and more diversified financial market" (Fund, 1995).

These reforms intensified following the introduction of a new banking law which further liberalized the activities of banks with regard to the allocation of credit: "In an effort to strengthen banks role in the economy, the new banking law, which was passed in February 1994, introduces 'universal banking' and permits deposit money banks to expand their activities to new areas, such as regular medium- and long-term lending, portfolio management, and financial restructuring services" (Fund, 1995).

Reason: "Lifting of framing of credit (LEC) 1996: allows to banks a great margin to operate as regards distribution of credit like to the fixing of the debtor interest rates on the market" (Abdelaziz et al., 2011).

United Kingdom (1971) In the United Kingdom, credit policy after World War II was intricately tied to the government's economic objectives. As Copley (2022) puts it, "Britains postwar political economy relied on an uneasy compromise between an oligopolistic, cartelized banking sector and a state oriented towards meeting social democratic goals." The Bank of England, constrained by its limited legal authority, relied on "moral suasion" and banking cartels for control. This approach dated back to agreements in the nineteenth century, including zero-interest current accounts and collective agreements among Discount Houses since 1935 for Treasury Bill tenders (Duncan Needham, 2014).

The government used several tools to restrict and direct credit in the economy. These tools consisted of credit ceilings, special deposits, supplementary credit deposits scheme (the Corset), and the hire-purchase controls. Credit ceilings were implemented by the Bank of England and consisted of: "Short-term quantitative ceilings on the level of credit extended to the private sector and overseas. Export finance usually excluded and lending to households and hire purchase lenders usually particularly discouraged" (Aikman et al., 2016, page 10).

An important shift in monetary policy began in 1970 when the use of credit controls was abolished. The Monetary Policy Group (MPG) proposed replacing these controls with guidance and an increased reliance on special deposits to manage bank liquidity. Consequently, Chancellor Jenkins, in the Budget of April 1970, lifted credit ceilings and advised a modest lending increase of about 5% for the coming year: "The MPG submitted its interim report to the Chancellor on 25 March 1970. Having discounted the alternatives, members settled on abolishing ceiling controls on the clearing banks in favor of guidance on lending in the year ahead, coupled with more active calls for special deposits to control bank liquidity."(Duncan Needham, 2014).

The introduction of Competition and Credit Control (CCC) by the Bank of England in 1971 was a significant change in the conduct of monetary policy. Implemented after extensive consultations, the CCC marked the full liberalization of the banking sector and the end of direct government control over credit. This transition led to the complete replacement of quantitative ceilings with credit rationing based on cost, repayment of special deposits, and the dissolution of longstanding banking cartels (Duncan Needham, 2014).

Reason: "Scheme used on various occasions in all three decades until abolition in 1971" (Aikman et al., 2016).

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