Finance, Structural Change, and Growth*

Paul W. Dai† Karsten Müller‡ Emil Verner§

This Version: December 31, 2024

Abstract

This paper studies the interplay between the sectoral allocation of credit and long-run economic development. We document new *Financial Kuznets Facts*: as economies grow, (i) the share of manufacturing credit relative to value added falls, (ii) the share of real estate credit rises, and (iii) the reliance on and price of real estate collateral increase. A two-sector structural change model with heterogeneous collateral constraints explains these patterns through a relative loosening of financing constraints in real estate as countries develop. Governments have historically tried to address financial frictions by directing credit to "priority sectors," especially manufacturing. A new dataset reveals that the liberalization of such policies is associated with a reallocation of credit to real estate. Further, we document that manufacturing credit predicts higher long-run growth, while real estate credit predicts lower growth, consistent with theories emphasizing growth-enhancing externalities of manufacturing. Our findings highlight the role of financial frictions and government policy in shaping credit allocation, structural change, and growth.

*We thank Atif Mian and Yongseok Shin for valuable feedback. Müller acknowledges support from a Singapore MOE PYP grant (WBS A-0003319-01-00 and A-0003319-02-00), Tier 1 grant (A-8001749-00-00), and the NUS Risk Management Institute (A-8002360-00-00). The data on total and sectoral credit used in this paper is available at http://www.globalcreditproject.com.

†MIT Sloan School of Management, paulwdai@mit.edu.

‡National University of Singapore; kmueller@nus.edu.sg.

§MIT Sloan School of Management and NBER, everner@mit.edu.

1 Introduction

Recent decades have witnessed a large rise in real estate-related credit in many economies. At the same time, the size of the manufacturing sector has declined. On the one hand, the reallocation of economic activity and credit away from manufacturing to real estate and service sectors may reflect the natural process of structural transformation in economic development (Kuznets, 1957). On the other hand, the rise of real estate-based finance and the decline in manufacturing has raised concerns that that there might be "too much of the wrong type of credit" (Turner, 2016) amid broader worries of "premature deindustrialization" (Rodrik, 2016).

In this paper, we systematically investigate the interplay between the sectoral allocation of credit and long-run economic development. We examine the following questions: How does the sectoral allocation of credit evolve over economic development? How does this compare to the sectoral allocation of real activity? What are the mechanisms behind real and financial structural changes? And does the sectoral allocation of credit matter for long-run economic growth?

Financial Kuznets Facts We start by presenting a novel set of empirical facts about the sectoral allocation of credit and real activity over the course of economic development. We use novel data on the sectoral allocation of credit covering a sample of 120 countries from 1940-2020 from an updated version of the Global Credit Project database (Müller and Verner, 2024). These data allow us to present the following *Financial Kuznets Facts*:

(i) At low levels of economic development, the vast majority of firm credit flows to the manufacturing sector. However, as countries become richer, the share of credit to the manufacturing sector decreases relative to its share in value added. Thus, while the share of manufacturing in GDP and employment is hump-shaped over economic development, the share of manufacturing credit declines almost monotonically with rising real GDP per capita.

(ii) The share of credit to the construction and real estate sectors ("real estate") sees a large relative increase over economic development, outpacing its rise as a share of value added. The real estate sector thus has an outsized role in credit markets relative to the real economy at high levels of development.

(iii) As countries become richer, they see an increase in real house prices and in the relative importance of real estate collateral, both in credit to households and firms.

Overall, these facts suggest that structural transformation in the credit market is more pronounced than that in the real economy. Moreover, they point to a role for rising collateral values in explaining structural transformation in the economy.

Model and Mechanisms To understand the potential mechanisms behind these *Financial Kuznets Facts* and their relationship to established patterns of structural transformation, we build a two-sector general equilibrium model featuring a manufacturing and real estate sector. The model combines collateral constraints in the spirit of Kiyotaki and Moore (1997) with a workhorse supply-side structural change framework as in Ngai and Pissarides (2007). Entrepreneurs in each sector have sector-specific total factor productivity (TFP), collateral input shares, and collateral constraints. They borrow from a patient saver until their collateral constraint becomes binding. In the model, real estate thus has a dual function, being both consumed and used as collateral.

Our model highlights that both economic forces (changes in sectoral productivity) and financial forces (changes in sectoral collateral constraints) can drive structural changes in credit and the real economy. First, consider the economic force. A rise in the manufacturing sector TFP, an important feature of economic development, leads to higher demand for residential housing and real estate collateral. This, in turn, drives up the price of real estate in equilibrium, consistent with the fact that real estate prices are strongly increasing over economic development. If the manufacturing good and residential housing are complements in consumption, then output migrates from manufacturing to real estate as countries become richer, as in Ngai and Pissarides (2007). The same is true for credit. Based on this real economic force alone, we would thus expect structural transformation in credit to mirror that of output.

In the model, endogenous changes in real estate prices mediate the effect of productivity changes through a collateral channel, leading to relative expansions in sectors that are more reliant on real estate collateral and thereby affecting the pattern of structural transformation. Using instrumental variable local projections, we confirm that shocks to house prices lead to stronger credit growth in sectors with a higher reliance on real estate collateral, especially the real estate sector.

Second, consider the financial force, which affects structural change through changes in sectoral collateral constraints. A loosening of collateral constraints encourages more intensive usage of real estate collateral. If the collateral constraint relaxes more in the real estate sector than in manufacturing, both credit and output are reallocated towards real estate. Moreover, the reallocation in credit will outpace that in the real economy, leading to a rise in the ratio of sectoral credit-to-output, as we observe in the data. In fact, we show that in our model the financial force (in essence, a sector's reliance on real estate collateral) is the sole factor that *differentially* affects the degree of structural change in credit and the real economy.

Why would collateral constraints in different sectors change differentially over the course of economic development? One reason are changes in the reliance on tangible versus intangible capital. Intangible assets are harder to redeploy and liquidate, so they support a lower borrowing capacity than tangible assets (Dell'Ariccia et al., 2021; Falato et al., 2022). Empirically, we show that higher levels of GDP per capita are associated with a marked increase in the share of intangible assets used by the manufacturing sector but not by the real estate sector. We further show that growth in a sector's tangible assets is more strongly correlated with credit growth than growth in intangible assets. These findings provide a rationale for why real estate collateral constraints become less binding, relative to those in manufacturing, as countries get richer.

Quantification Our model allows us to decompose structural change in credit and the real economy into three underlying drivers: (1) the relative productivity of the manufacturing and real estate sectors, (2) the relative reliance on real estate collateral in each sector, and (3) the price of real estate collateral. We evaluate the model at the steady-state equilibrium by varying sectoral TFP and collateral constraints across income levels. The calibrated model successfully matches changes in credit, output, real estate prices, sectoral TFP, and total output per worker over the course of development.

Our calibration yields the following patterns. Manufacturing TFP rises strongly over economic development, while real estate TFP is stagnant. The manufacturing sector's collateral constraints are hump-shaped, rising at low levels of economic development but declining at higher levels. In contrast, real estate collateral constraints rise consistently over the course of economic development.

Using this quantitative model as a laboratory, we conduct a development accounting analysis similar to Caselli (2005). Our key finding is that differences in sectors' reliance on real estate inputs account for 88% of the observed structural transformation in credit and 57% of that in output, holding prices fixed. However, taking general equilibrium effects into consideration, we find that cross-country variation in collateral constraints explain 68% of credit market structural change, while sectoral TFP difference account for almost all of the real economy structural change. Furthermore, we find that sectoral differences in TFP account almost entirely for the rise in real estate prices over the course of development.

Our model quantification suggests that financial factors significantly impact real activity primarily when they contribute to substantial gains in manufacturing sector TFP, as in

Moll (2014) and Buera and Shin (2013). To capture this idea, we extend the model to allow an expansion in manufacturing credit to improve manufacturing TFP by improving the selection of entrepreneurs. We find that better access to finance can play a large role through improvements in TFP at early stages of development. By contrast, the reversal in collateral constraints of the manufacturing sector at moderate levels of development could partly explain premature de-industrialization through the same mechanism (Rodrik, 2016).

Directed Credit Policy and Credit Allocation Next, we examine the role of government policy in influencing the sectoral allocation of credit over the course of development. Many governments have historically steered credit into "priority" sectors, especially to the manufacturing sector, as part of a broader industrial policy agenda. Some of the most prominent examples are the East Asian "growth miracles," although such directed credit policies were also widely used in France and the United Kingdom. To understand the potential role of these 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. We identify years in which these countries abandoned or considerably decreased the importance of directed credit policies targeting specific sectors. Because these policies generally aimed to subsidize manufacturers and prevent excessive lending for real estate purposes, we can interpret them as shocks to sector-specific financing constraints, similar to those in our model.

We find that the abolition of directed credit policies is followed by a reallocation of credit and output from manufacturing to real estate. There is also an increase in the credit-to-output ratio in the real estate sector. These patterns suggest that shocks to financing constraints in a sector can accelerate structural transformation in credit and output even in the absence of changes in productivity. More broadly, they show how some governments have attempted to direct credit to the manufacturing sector at early stages of development as part of a broader development strategy to import technology and accelerate TFP growth.

Credit Allocation and Long-Run Growth In the final part of the paper, we examine the relevance for structural change in credit for a country's economic growth. A growing theoretical literature argues that the allocation of credit and real activity may matter for aggregate TFP growth. In particular, if there are positive externalities to productivity from allocating real resources to the manufacturing sector, then relaxations in financing constraints in the real estate sector or increased demand for real estate could crowd out investments in the manufacturing sector, slowing long-run growth (Benigno et al., 2020; Hirano and Stiglitz, 2024). We show empirically that a larger share of manufacturing credit is robustly positively correlated with future growth in real GDP per capita. In contrast, we find that economic growth is negatively correlated with the share of credit to the real estate sector. While these patterns can at best be interpreted as suggestive, they are, to the best of our knowledge, the first systematic evidence that the allocation of credit may play a role in economic development.

Related Literature The allocation of resources across sectors over the course of economic development has been studied since at least since Lewis (1954), Rybczynski (1955), and Kuznets (1957, 1973). It is well-known that economies shift from agriculture to manufacturing and then to services as countries get richer; see Herrendorf et al. (2014) and Gollin and Kaboski (2023) for surveys. Previous research has proposed several mechanisms to account for these canonical "Kuznets facts."[1] A separate literature has emphasized the role of financial factors in business cycle fluctuations, where a key idea is that such macro-financial linkages are amplified by the presence of collateral constraints (Kiyotaki and Moore, 1997; Bernanke et al., 1999).[2] A few papers have empirically studied the link between the allocation of credit to different sectors with business cycle dynamics or financial crises (Büyükkarabacak and Valev, 2010; Jordà et al., 2016, 2015; Mian et al., 2020; Müller and Verner, 2024).

Our paper sits at the intersection of these two strands of literature. To the best of our knowledge, we are the first to document structural changes in financial resources (credit) across different sectors over the course of long-run economic development, which we call "financial Kuznets facts."[3] We also build on the supply-side structural change literature. Because the productivity in the manufacturing sector increases over development while that in the real estate sector remains stagnant (Kirchberger and Beirne, 2023; Goolsbee and Syverson, 2023), the price of less productive goods (in our case, housing) increases with development (Baumol, 1967; Ngai and Pissarides, 2007). We build on this idea by

[1] Among others, the proposed theoretical channels include non-homothetic preferences (Kongsamut et al., 2001; Herrendorf et al., 2013; Boppart, 2014; Comin et al., 2021), differences in sectoral productivity growth rates (Baumol, 1967; Ngai and Pissarides, 2007; Duarte and Restuccia, 2010), and differences in sectoral capital intensity along with capital deepening (Acemoglu and Guerrieri, 2008). Empirical work has highlighted many potential mechanisms underlying structural transformation, including the rise of the service economy (Buera and Kaboski, 2012; Fan et al., 2023), human capital accumulation (Porzio et al., 2021), skill-biased technological change (Buera et al., 2022), improvement of agriculture productivity (Matsuyama, 1992; Bustos et al., 2016), capital accumulation through financial integration (Bustos et al., 2020), technology and know-how transfer from foreign countries (Giorcelli and Li, 2021), and global imbalances (Kehoe et al., 2018).

[2] Empirical evidence on the link between credit and business cycles includes, among others, Schularick and Taylor (2012), Gourinchas and Obstfeld (2012), Jordà et al. (2016), Mian et al. (2017), and Brunnermeier et al. (2021).

[3] Our paper follows other research documenting new cross-country facts for economic development, including Gollin et al. (2014), Bick et al. (2018), Lagakos et al. (2018), Donovan et al. (2023), and Greenwood et al. (2023), among others.

introducing a novel collateral channel, the role of which has been widely studied in the business cycle literature (Iacoviello, 2005; Gan, 2007; Chaney et al., 2012; Liu et al., 2013; Elenev et al., 2021), but less so in studying long-run economic outcomes. Our quantitative results suggest a limited role of relaxing financial constraints on changes in house prices as countries get richer, compared with improvements in productivity, an insight similar to Kiyotaki et al. (2011). We also emphasize that the presence of collateral constraints can result in different rates of capital deepening across sectors as countries develop. As such, the idea that collateral constraints may affect structural transformation can be interpreted as a "financial" analogue of Acemoglu and Guerrieri (2008), in the sense that an overall capital deepening leads resources to flow into more capital-intensive sectors, measured by a higher share of real estate inputs in our setting.

We also contribute to the broader literature on the role of finance in economic development (e.g., Greenwood and Jovanovic, 1990; King and Levine, 1993; Levine, 1997; Greenwood et al., 2010; Song et al., 2011). Over a century ago, Schumpeter (1911) argued that credit, as a *productive force* for entrepreneurs, plays a vital role for economic growth.[4] By contrast, the seminal work of Lucas (1988) on economic development argues the role of finance is *popularly over-stressed*.[5] Our paper provides a new lens to revisit this long-standing debate by studying the role of the sectoral allocation of credit. First, we find that differences in the availability of collateral coupled with financing constraints are what matters most for the composition of credit. Moreover, we find the role of financial constraints is not the same over different phases of development. At the early stage of development, relaxing collateral constraints in the manufacturing sector is more important, a result related to the literature on stage-dependent development polices (Acemoglu et al., 2006; Itskhoki and Moll, 2019; Matsuyama, 2007; Huneeus and Rogerson, 2023, among others). Second, we argue that the effect of financial forces on output is mediated by how they affect sectoral TFP. This yields a similar conclusion as a large body of macro-development literature: financial constraints facilitates a better selection into entrepreneurship (Evans and Jovanovic, 1989; Buera et al., 2011; Midrigan and Xu, 2014), which acts as a TFP-enhancing technology (Moll, 2014; Buera and Shin, 2013; Howes, 2022). Third, we empirically document that the sectoral allocation of credit matters predicts economic development, above-and-beyond the

[4]In Chapter 3 of Schumpeter (1911), *Credit and Capital*, Schumpeter states: "By credit, entrepreneurs are given access to the social stream of goods before they have acquired the normal claim to it ... Granting credit in this sense operates as an order on the economic system to accommodate itself to the purposes of the entrepreneur, as an order on the goods which he needs: it means entrusting him with productive forces. It is only thus that economic development could arise from the mere circular flow in perfect equilibrium."

[5]Lucas (1988) reiterates that "I believe that the importance of financial matters is very badly over-stressed in popular and even much professional discussion and so am not inclined to be apologetic for going to the other extreme. Yet insofar as the development of financial institutions is a limiting factor in development more generally conceived I will be falsifying the picture, and I have no clear idea as to how badly."

allocation of real activity, suggesting that what credit finances may matter for its relation to growth, as suggested by models of Benigno et al. (2020) and Hirano and Stiglitz (2024). Finally, we present new evidence that policymakers actively shape the allocation of credit as part of broader development policies, and our evidence is consistent with these policies relaxing financing constraints in the manufacturing sector. Thus, our evidence suggests that, in many contexts, policymakers believe that the allocation of finance mattered for development.

2 Financial Kuznets Facts and the Role of Collateral in Development

2.1 Financial Kuznets Facts

In this section, we document a new set of stylized facts about the financial side of structural transformation and compare them with the well-known pattern that countries move from agriculture to manufacturing to services over economic development. In homage to the author first popularizing this pattern, we call these *Financial Kuznets Facts*.

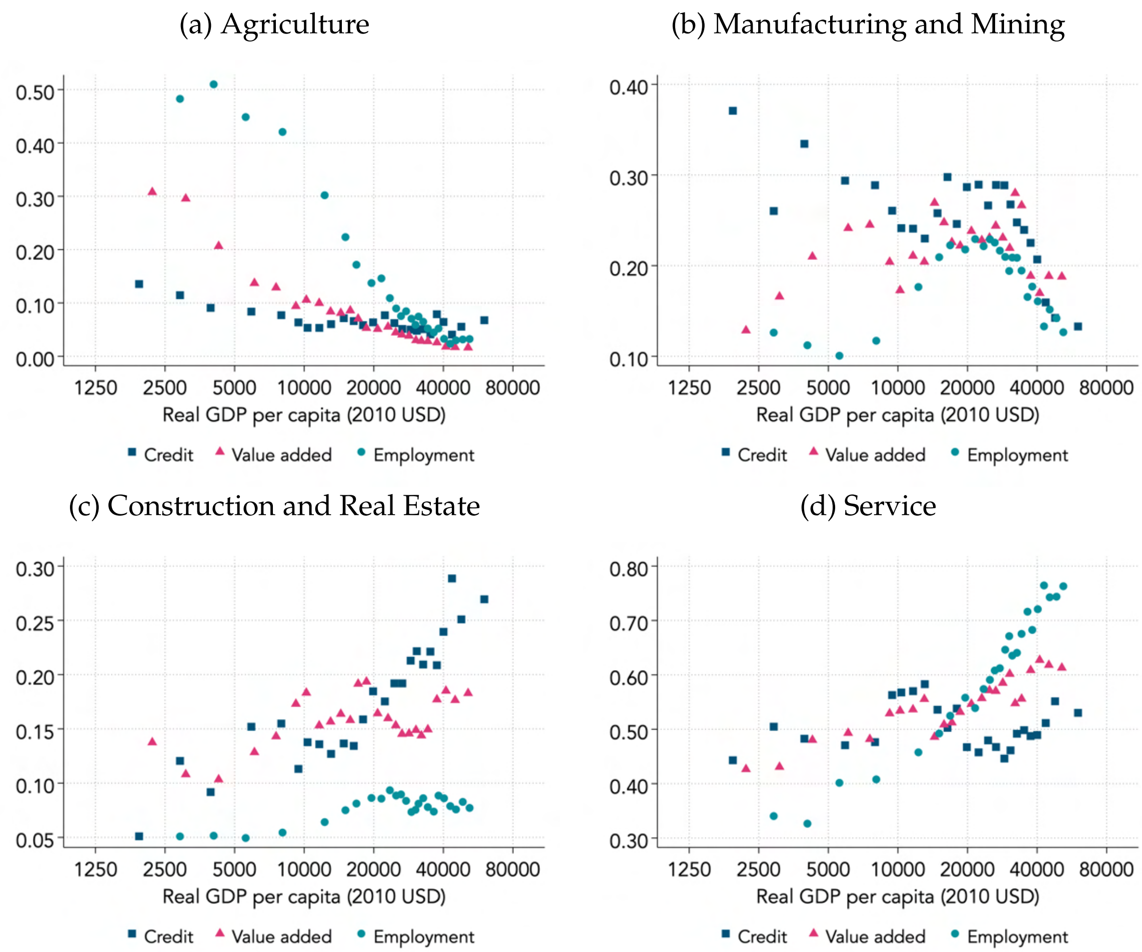
Our data come from the *Global Credit Project*, a large cross-country database that breaks down outstanding credit in the economy into different sectors. The underlying data are drawn from hundreds of scattered sources, including statistical publications, data appendices from central banks, and newly-digitized archival data. We refer the interested reader to Müller and Verner (2024) for more details. In this dataset, credit refers to the end-of-period outstanding claims of financial institutions on the domestic private sector. We also add sectoral data on value added and employment, also taken from Müller and Verner (2024). Because we are interested in the broad patterns of structural changes, we aggregate these industry-level data into four sectors: agriculture, manufacturing, construction and real estate ("real estate"), and services.[6]

We focus on how factors and resources are allocated across sectors during the process of economic development. To do so, we 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). For our main analysis, we restrict our sample to country-year observations with non-missing credit shares for consistency. This sample contains 77 countries and 1707 country-year observations, ranging from 1970 to 2014.

Figure 1 plots how the share of each sector in credit, value added, and employment varies across income levels. Before discussing the financial side of structural transfor-

[6]Given data limitations, the credit data often bulks together manufacturing (ISIC section C) with mining (section B), although the latter is a very small share of outstanding credit in almost every country. We compute the values for value added and employment equivalently to be consistent. For simplicity, we will refer to manufacturing and mining simply as "manufacturing" for the remainder of the paper.

Figure 1: Financial and Canonical Kuznets Facts



Note: These binscatter plots 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 natural logarithm of real GDP per capita).

mation, we note that our data successfully replicates 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 the tertiary sector (including real estate) increases (Kuznets, 1973).

Structural changes in the credit market tell a different story. Figure 1 reveals two notable facts about the evolution in the allocation of credit over economic development. First, at low levels of development, credit to manufacturing is an outsize share of total credit to firms, accounting for a substantially higher share of credit than employment or value added. However, as countries develop, the share of manufacturing in credit falls much more than one would expect based on the sector's share in the real economy. Second, the flipside of the decline in manufacturing credit is the sharp rise in real estate credit. The rise in credit to real estate is considerably more pronounced than the increase in value added or employment. For high-income countries, real estate accounts for a significantly larger share in firm credit than in value added or employment.

In addition, Figure 1 shows that credit to agriculture is low and only mildly declines over the course of development, in contrast to its large decline in the share in employment and value added. The service sector's share in credit also does not vary a lot, unlike its salient increase in employment and value added. Given that the most dramatic pattern of structural change in credit markets is the shift from manufacturing to real estate, we focus the rest of the paper on these two sectors.

A look at time series patterns suggests a similar picture. In Appendix Figure E.1, we also find that 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). Appendix Tables F.1 to F.4 plot the results from regressions that replicate the same pattern, even when we include country or year fixed effects.

2.2 Real Estate Collateral and Development

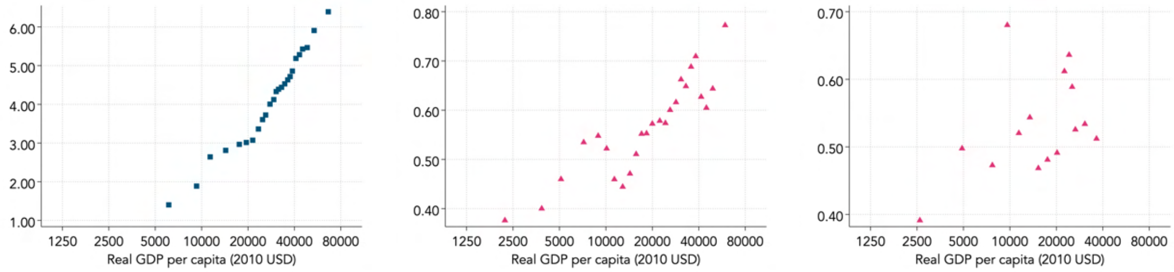
We next document an increasing importance of real estate collateral as countries become richer. In particular, we study how the price and prevalence of real estate collateral change over the course of economic development. To proxy for changes in the price of collateral, we look at real house price indices. In particular, 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).

Figure 2a shows a binscatter plot of a country's real house prices against its GDP per capita. Since housing price indices are not comparable across countries in levels, we include country fixed effects, which means we only exploit variation in house prices within a country over time. The resulting pattern is striking: there is an almost linear positive relation between real GDP per capita and house prices.

Next, we look at the reliance on real estate collateral in the economy using two measures: the share of household credit accounted for by residential mortgages, compiled from the data in Müller and Verner (2024), and firms' reliance on real estate as collateral computed from BEEPS survey data. Both measures suggest that richer economies use substantially more real estate collateral, both in the household and corporate sectors, as shown in Figure 2b and 2c.

Figure 2: Real Estate Collateral and Development

(a) House Prices | (b) Share of Residential Mortgages in Household Credit | (c) Share of Real Estate Collateral in Firm Credit



Note: These figure show stylized facts on the importance of real estate collateral and its valuation over the course of economic development. Figure 2a plots log real house prices, compiled from the Bank for International Settlement's residential property price series, OECD, Dallas Fed International Housing Price Database, and Jordà et al. (2017). We include country fixed effects since house price indices are only comparable within a given country. Figure 2b plots the ratio of residential mortgages to household credit constructed from the *Global Credit Project* (Müller and Verner, 2024). Figure 2c is the real estate collateral share in firm credit, weighted by logged sales. We use the BEEPS (EBRD-World Bank Business Environment and Enterprise Performance Survey) survey (2002, 2004, 2005, 2009, 2011-2015, 2018-2020) to calculate these statistics for countries where we have more than 20 observations. Due to the sparse nature of this data source, we restrict the number of bins to 15.

3 Model: Kiyotaki and Moore (1997) Meet Ngai and Pissarides (2007)

To rationalize the empirical facts in Section 2.1, we build a two-sector general equilibrium model with two key features. First, entrepreneurs face collateral constraints, and real estate serves both as a production input and as collateral for debt, similar to Kiyotaki and Moore (1997). Second, we adopt the workhorse supply-side structural change model of Ngai and Pissarides (2007), where structural transformation is driven by difference in productivity growth between the manufacturing and real estate sectors. We evaluate this tractable model at the steady state equilibrium, derive analytical comparative statics, and analyze the contribution of economic forces (changes in sectoral TFP) and financial forces (changes in collateral constraints) for the sectoral allocation of credit and output. We specify the model in Section 3.1 and organize the model predictions in Section 3.2. Proofs and extensions of the baseline model are in Appendix A.

3.1 Setup

Time is discrete and runs infinitely. A closed economy is populated by savers (denoted by H) and spenders (manufacturing and real estate entrepreneurs, denoted by M and E).[7] The

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

manufacturing good is the numeraire.

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.[8] We assume savers are more patient than entrepreneurs, and entrepreneurs share the same discount factor with $\beta = \beta^M = \beta^E$.

Entrepreneurs The entrepreneur in sector j with productivity z_t^j operates firms 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 sector-specific collateral input share $\alpha^j < 1$. 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 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.[9]

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

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

Our specified collateral constraint is similar to (Kiyotaki and Moore, 1997), Iacoviello (2005), Liu et al. (2013), and Catherine et al. (2022), which parsimoniously models a costly contract enforcement scenario. In reality, λ^j may change due to credit policies (Buera and

[8]The housing service can be interpreted as the demand shifter for housing as in Liu et al. (2013) or the housing demand channel of a credit expansion as in Mian et al. (2017).

[9]The residential housing service is a *flow* variable. This assumption keeps our model analytically tractable such that, at the steady state, for all agents i, $c^i/h^i = (q/s)^\eta$. This provides a simple aggregation rule so that we do not need to track the redistribution of consumption across agents when analyzing comparative statics. We relax this assumption in Section 5. The result is quantitatively similar if we assume agents make residential housing investments.

Shin, 2013; Itskhoki and Moll, 2019), improved legal systems to enhance creditor rights (Djankov et al., 2007), or financial regulation or development (e.g., Rajan and Zingales, 1998; Liu et al., 2013).

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, $y_t^M = \sum_i c_t^i$, and real estate output is invested by entrepreneurs as collateral or consumed by agents as residential housing service each period, $y_t^E = \sum_i h_t^i + \sum_j [l_{t+1}^j - (1-\delta) l_t^j]$. The financial market clears with $b_t = \sum_j d_t^j$.

3.2 Model Predictions

In Appendix A, we define the steady state equilibrium, prove its uniqueness and other propositions, and provide auxiliary results. Here, we summarize the main model properties and predictions.

Financially Constrained Economy For each sector, collateral constraints are binding at the steady state. Intuitively, savers are more patient and provide credit elastically, pricing it at $r = 1/\beta^S - 1$ (Iacoviello, 2005).

Collateral Price Passthrough The entrepreneur equalizes the marginal benefit and user cost of using collateral, choosing

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

where $\widetilde{\lambda}^j \equiv \frac{\beta}{1-\beta(1-\delta)-\lambda^j(\beta^S-\beta)}$ increases with λ^j. The marginal benefit of collateral usage comes from two terms: (1) the marginal revenue production of collateral, and (2) the marginal benefit of relaxing the flow of fund constraint due to more collateral. 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 affects revenues and costs simultaneously, which are cancelled out. But in the manufacturing sector, a higher q solely increases the user cost of collateral, and thus depresses the demand for collateral. Moreover, from a partial equilibrium (PE) perspective, a higher level of collateral intensity in production α^j, an increase in sectoral TFP z^j, and a less binding collateral constraint, represented by higher λ^j, raise the demand for collateral as an input in that sector.

The model characterizes how the sectoral allocation of credit changes as the price of collateral increases. Holding all else equal,

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

These *PE* comparative statics imply that an increase in the price of collateral will have an *asymmetric* effect on credit growth in different sectors. In the real estate sector, a 1% increase of q leads to a 1% increase of collateral values. By contrast, increasing the collateral price has an additional *price* effect discouraging collateral usage by $\frac{1}{1-\alpha^M}$ percent for the manufacturing sector, which we can see from Equation 4. This *quantity* effect overpowers the *price* effect, leading to $\frac{\alpha^M}{1-\alpha^M}$ percent decline in manufacturing credit. Suppose the collateral price soars as a country becomes richer. The asymmetric collateral price passthrough in the model means we expect to see more credit to the real estate sector relative to manufacturing.

Decomposition Rules This tractable model provides simple formulas for the sectoral distribution of credit and output. Specifically, we can decompose changes in sectoral credit and output multiplicatively into three channels: the relative productivity channel $\mathbf{Z}$, the collateral price channel $\mathbf{Q}$, and the reliance on real estate channel $\mathbf{\Gamma}$.

$$\frac{d^E}{d^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M}\frac{\mathbf{\Gamma}^E_d}{\mathbf{\Gamma}^M_d}\mathbf{Q}, \quad \frac{qy^E}{y^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M}\frac{\mathbf{\Gamma}^E_y}{\mathbf{\Gamma}^M_y}\mathbf{Q}, \tag{6}$$

where

$$\mathbf{Z}^j = (z^j)^{\frac{1}{1-\alpha^j}}, \quad \mathbf{Q} = q^{\frac{1}{1-\alpha^M}}, \quad \mathbf{\Gamma}^j_d = \lambda^j(\alpha^j\widetilde{\lambda}^j)^{\frac{1}{1-\alpha^j}}, \quad \mathbf{\Gamma}^j_y = (\alpha^j\widetilde{\lambda}^j)^{\frac{\alpha^j}{1-\alpha^j}}$$

Equation 6 provides important insights about the drivers of structural change in credit and the real economy. Relative productivity ($\mathbf{Z}$) and the price of collateral ($\mathbf{Q}$) matter identically for the share of each sector in credit and output. The discrepancy between structural transformation in credit and the real economy thus comes entirely from $\mathbf{\Gamma}$. According to the model, a divergence in real and financial structural change must be driven by either (i) a differential change in the reliance on real estate in production, captured by α^j, or (ii) a differential change in the ability to borrow against real estate, captured by λ^j. As indicated in Equation 4, looser financial constraints affect the allocation of collateral, which boosts sectoral output, captured by $(\alpha^j\widetilde{\lambda}^j)^{\frac{\alpha^j}{1-\alpha^j}}$. Besides this collateral allocation effect, financing constraints also directly impact a sector's debt capacity, captured by the first term of $\mathbf{\Gamma}^j_d$:

holding the collateral price fixed, for every additional unit of collateral usage, sectoral debt increases by λ^j units.

Determination of the Collateral Price Both relative productivity and collateral constraints are determined by the exogenous parameters of the model, while the collateral price is an endogenous object. The collateral price q is determined by the market clearing condition for real estate output:

$$\overbrace{z^E(\underbrace{\widetilde{\zeta}^E}_{l^E})^{\alpha^E} - \delta\widetilde{\zeta}^E}^{\text{Residual Supply}} = \overbrace{\underbrace{\widetilde{\zeta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}}}_{h(q)} + \delta \underbrace{\widetilde{\zeta}^M q^{-\frac{1}{1-\alpha^M}}}_{l^M(q)}}^{\text{Aggregate Demand}}, \tag{7}$$

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

The left hand side of equation (7) 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 $\delta l^M(q)$ with price elasticity of demand $-\eta - \frac{\alpha^M}{1-\alpha^M}$ and $-\frac{1}{1-\alpha^M}$, respectively. This *aggregate demand* curve for real estate output intersects with the inelastic residual supply curve, which guarantees that a unique q clears the market at the steady state.[10]

The following proposition showcases how the collateral price q varies with the exogenous parameters.

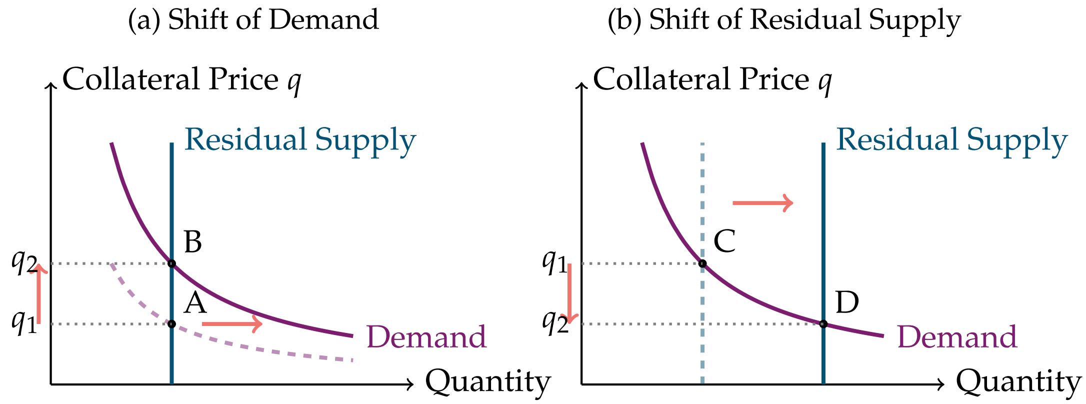
Proposition 1 (Collateral Price)**.** *Holding all others fixed,*

1. *q increases with z^M and λ^M, as well as s;*
2. *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 1 if $\eta = 1$, greater than 1 if $\eta < 1$, and less than 1 if $\eta > 1$;*
3. *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.*

To gain some intuition for Proposition 1, Figure 3 plots the residual supply and aggregate demand for the real estate good. Suppose there is an increase of z^M, as in Figure

[10] As $q \to 0$, the right hand side approaches $+\infty$, while as $q \to \infty$, it approaches 0.

Figure 3: Determining the Price of Collateral



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.

3a. 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. A similar analysis applies a the scenario where financial constraints become less binding. 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. Moreover, a higher s, potentially due to a housing demand boost as in Mian, Sufi, and Verner (2020), 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.

The second part of Proposition 1 presents the determination of the elasticity of the price of collateral with respect to z^M, which measures the percentage change of q in response of percentage change of z^M. This elasticity is essential for understanding how collateral usage in the manufacturing sector changes in equilibrium with z^M, taking into account both partial equilibrium and collateral price effects. Recall that in Equation (4), we have $l^M \propto (z^M/q)^{\frac{1}{1-\alpha^M}}$.

To illustrate this idea, we start with a simple case with $\eta = 1$. A rising cost of the collateral input exactly cancels out the increasing demand for collateral for the manufacturing entrepreneur, i.e., l^M does not change. Thus, the demand elasticity for both residential housing and the manufacturing sector's commercial land investment are $-\frac{1}{1-\alpha^M}$. Meanwhile, the Cobb-Douglas utility function cancels out income and substitution effects, such that $qh/c = s$. Under this scenario, this implies that the elasticity of the collateral price with respect to z^M, ε_{q,z^M}, equals one. When $\eta < 1$, the income effect overpowers the substitution effect, putting upward pressure on the collateral price relative to the case with $\eta = 1$. Hence, $\varepsilon_{q,z^M} > 1$ when $\eta < 1$. A similar analysis applies when $\eta > 1$.

The last part of Proposition 1 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.[11] As shown in Figure 3, the residual supply curves move to the right, the equilibrium moves from C to D, and the collateral price goes down.

Structural Change in the Credit Market and Real Economy We use the aforementioned properties of the collateral price in Proposition 1 and combine them with our accounting identity (6). We summarize the process of structural transformation in the credit market and in the real economy over the course of development in the following proposition.

Proposition 2 (Financial and Canonical Kuznets Facts)**.** *Holding all else equal,*

1. *(Sectoral TFP) both the relative output shares qy^E/y^M and relative credit shares d^E/d^M do not change with z^M if $\eta = 1$, increase with z^M if $\eta < 1$, and decrease with z^M if $\eta > 1$;*
2. *(Sectoral Financial Constraints) if $\eta = 1$, the relative output share of real estate qy^E/y^M increases with both λ^E and λ^M; if $\eta = 1$ the credit share d^E/d^M increases with λ^E and decreases with λ^M.*

The first part of Proposition 2 suggests a similarity between structural change in finance and the real economy. As in the supply-side structural change literature pioneered by Ngai and Pissarides (2007), when the elasticity of substitution is low, $\eta < 1$, resources are allocated from the faster-growing manufacturing sector to the stagnant real estate sector, an analogue of Baumol's cost disease. In this way, there is nothing special about structural change in the credit market compared to that in the real economy.

In the second part of Proposition 2, we shut down this real economy supply-side structural change mechanism. When $\eta = 1$, a sector's share in credit and output do not depend

[11] 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.

on its TFP. Surprisingly, improvements in the financial system, characterized by more relaxed financial constraints, can shift output to the real estate sector, irrespective of whether these improvements favor financing of manufacturing or real estate. That is, there is an asymmetric effect, with increases in λ^E and λ^M both expanding the real estate sector. On one hand, this works through the equilibrium price of collateral, since increases in λ^j act like an improvement in sectoral TFP. On the other hand, because of the presence of collateral constraints, there is a reallocation in the distribution of collateral across sectors through a PE effect.

Turning to the credit market, an increase in λ^E boosts the relative share of the real estate sector in credit for two reasons. First, it directs output towards the real estate sector. Second, it boosts the sector's debt capacity. For the manufacturing sector, these two factors move in opposite directions, so an increase in λ^M implies a reallocation of credit to manufacturing.

Taken together, Proposition 2 highlights that variation in sectoral TFP *or* financial constraints over the course of development are sufficient to have an impact on structural transformation in credit and the real economy. While the first part of Proposition 2 highlights some similarities in the drivers of structural change in credit and output, the following proposition showcases when these two will diverge:

Proposition 3 (Sectoral Credit to Value Added)**.** *A sector's credit to valued added ratio κ^j depends on (1) the sectoral collateral elasticity in the production function α^j, and (2) the slackness of the collateral constraints λ^j, which is given by*

$$\kappa^j \equiv \frac{\lambda^j q l^j}{p^j y^j} = \alpha^j \lambda^j \widetilde{\lambda}^j. \tag{8}$$

Proposition 3 highlights that changes in the price of collateral do not pass through to the sectoral credit to value added ratio. Rather, changes in sectoral credit to value added are driven by a sector's share of real estate as an input and its collateral constraint. This result directly comes from the Cobb-Douglas production function such that the collateral value ql^j is proportionate to revenue $p^j y^j$. Hence, the total amount of debt is linear with $p^j y^j$. From the sectoral credit-to-output ratio, we know that the discrepancy between structural change in credit and the real economy comes from the parameters related to the usage of collateral. Intuitively, a higher share of collateral as an input (higher α^j) and less binding financial constraints (higher λ^j), holding all else equal, lead to a higher credit-to-output ratio. This time, holding all others fixed, a larger λ^j leads to a higher share of real estate collateral.

Taking stock This section develops intuition for structural transformation in the credit market and the real economy based on a simple model. There are two forces: (i) the economic force that manufacturing productivity increases while real estate productivity remains stagnant and (ii) the financial force that collateral constraints become less binding.

First, from a partial equilibrium perspective, an increase in sectoral TFP and a looser collateral constraint can stimulate the demand for collateral in that sector, resulting in an inflow of credit. Second, from a general equilibrium angle, manufacturing productivity growth or a less binding financial constraint can also push the collateral price up due to increasing demand, similar to the mechanism of supply-side structural change. Since credit to the real estate sector is more sensitive to changes in the price of collateral, credit is redistributed away from manufacturing over the course of economic development. These mechanisms guide our empirical analysis in Section 4.

Our model also highlights that both differences in relative productivity growth or financing constraints in isolation may be sufficient to generate structural transformation in the real economy and in the credit market. To investigate the relative importance of these channels, we conduct a decomposition exercise in Section 5.

4 Evidence on the Collateral Channel of Structural Transformation

In this section, we present additional reduced form evidence on the role of real estate collateral in structural change as predicted by our model. Section 4.1 formally tests for sectoral heterogeneity in the link between changes in the price of collateral and sectoral credit growth. Section 4.2 provides evidence on potential reason for heterogeneous changes collateral constraints across sectors: the increasing importance of intangible assets in the manufacturing sector (but not real estate) as countries get richer. In Section 6, we return to another source of heterogeneity in sectoral borrowing constraints arising from government directeded credit policies. We provide comprehensive and detailed robustness checks, along with additional results, in Appendix C.

4.1 Collateral Price Channel: House Price Passthrough to Sectoral Credit

We first investigate how the elasticity of credit with respect to house prices differs across sectors. The key intuition we would like to test is whether credit in sectors with a higher reliance on collateral, such as real estate, respond more strongly to changes in the price of the underlying collateral, as implied by Equation 5 in our model.

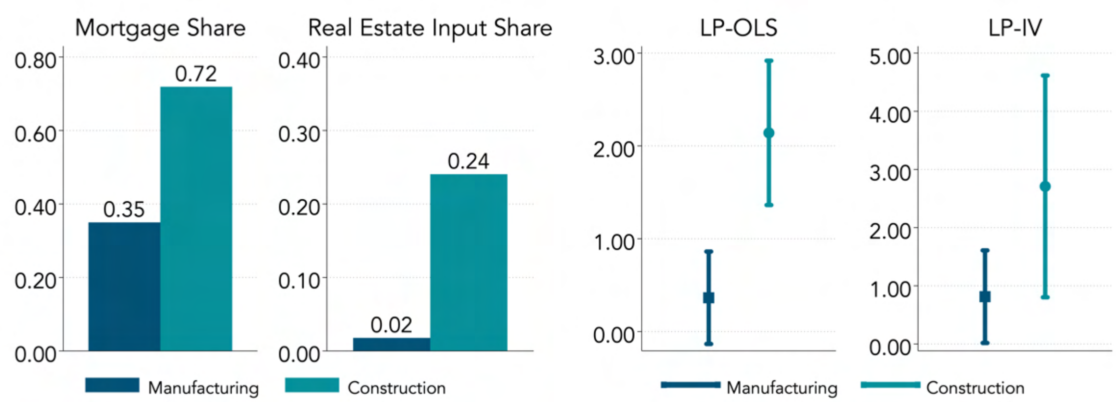
Baseline Local Projections To empirically test this hypothesis, we estimate the path of sectoral credit growth following innovations in the house price index (HPI) using impulse responses obtained from local projections (LP), as outlined in Jordà (2005):

$$\Delta_h y^j_{c,t+h} = \alpha^h_c + \sum_{l=0}^{L} \beta^j_{h,l} \Delta_1 \log\left(\text{HPI}_{c,t}\right) + \sum_{l=0}^{L} \gamma^j_{h,l} \Delta_1 y^j_{c,t-l} + \sum_{l=1}^{L} \theta^j_{h,l} X^j_{c,t-l} + \epsilon^j_{c,t+h}, \tag{9}$$

for $h = 1, \cdots, H$, where $\Delta_h y^j_{c,t+h}$ represents the change in sectoral credit from t to $t+h$, and α^h_c denotes country fixed effects. We control for the path of sectoral TFP and credit to value added ratio $X^j_{c,t-l}$. We opt for a time window of $H = 10$ to study long-run impacts and a conservative lag length of $L = 5$, in line with the recommendations in Montiel Olea and Plagborg-Møller (2021).

Figure 4: Collateral Price Channel

(a) Sectoral Collateral Usage (b) Local Proj. House Price Response



Note: Panel (a) shows how the reliance on real estate as a production input and as collateral differs between the manufacturing and construction sector. *Real estate input share* is computed based on data from the World Input-Output Database (Timmer, Dietzenbacher, Los, Stehrer, and De Vries, 2015). *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. Panel (b) plots the response of manufacturing and real estate credit to innovations in house prices from estimating (9). We report the peak effects at horizon $t+6$. See Figure E.8a for estimates at all horizons. Errors bars represent 90% confidence intervals computed using Driscoll and Kraay (1998) standard errors.

Figure 4 present evidence on this collateral price channel. Panel (a) reports collateral usage intensity according to 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 is over twice as high in the real estate sector compared to the manufacturing sector. Panel (a) also shows that the real estate sector has a much higher share of real estate inputs into production, as measured by input-output tables. Thus, we would expect shocks to real estate collateral values to lead to a stronger pass through to credit in the real estate sector compared to the manufacturing sector.

Figure 4 panel (b) illustrates how manufacturing and real estate credit respond to an innovation in house prices. We report the impulse response in the peak year ($t + 6$) for manufacturing and real estate from estimation of Equation 9. Figure E.8a shows the full impulse response from $t + 1$ to $t + 10$. A one percentage increase in house prices in year t is associated with a 2.14% growth in real estate credit in year $t + 6$. This response is statistically significant over a 10-year time horizon (Figure E.8a). By contrast, the response of manufacturing credit is less pronounced, at about half a percentage point, and is not statistically significant after year $t + 6$. Thus, the real estate—a sector that is both more reliant on credit backed by real estate and naturally hedged against rising real estate prices—borrows significantly more than manufacturing following increases in house prices.

In Figure E.8b, we replicate this analysis for five broad industries, ranking industries by the mortgage share. The pattern that credit responses to house price innovations is stronger in high mortgage share sectors holds across finer sector categories. In addition to the real estate sector, the response of sectoral credit to the change in HPI is more pronounced in agriculture, which also has a high reliance on real estate collateral. On the other hand, the response is weaker in sectors with a relatively lower reliance, including wholesale and retail trade, accommodation, and food services, as well as transportation and communications.

Instrumental Variables Local Projections Our baseline estimation results do not necessarily capture the causal effect of house prices on credit because 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 the credit booms often linked to house price booms are more concentrated in non-tradable sectors such as real estate relative to tradable sectors such as manufacturing (Müller and Verner, 2024).

To address this issue, 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 Saiz (2010), Palmer (2022), and Guren, McKay, Nakamura, and Steinsson (2021), who construct a similar instrument for U.S. cities. 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.

To implement this strategy, we estimate the following regression for each country c:

$$\Delta_1 \log(\text{HPI}_{c,t}) = \varsigma_c + \vartheta_c \Delta_1 \log(\text{HPI}_{r(c),t}) + e_{c,t}, \tag{10}$$

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 E.6 shows the distribution of the estimated elasticities $\widehat{\vartheta}_c$. Next, we construct the interaction term of this housing elasticity and regional housing price fluctuations, ${}_1Z_{c,t} = \widehat{\vartheta}c\Delta_1 \log(\text{HPI}_{r(c),t})$, as the instrumental variable for $\Delta_1 \log(\text{HPI}_{c,t})$ in the baseline local projection (9). The identification assumption for the local projection instrumental variable approach (LP-IV) requires that the instrument is relevant and exogenous at all leads and lags. Following Ramey (2016) and Ramey and Zubairy (2018), we include 2 lags of the instrument in the first stage.

Figure 4 panel (b) reports the LP-IV estimates, again at the peak horizon of $t + 6$. Figures E.8c and E.8d display the LP-IV estimation results, and Appendix Figure E.7 reports the first-stage F statistics. The point estimates show a magnitude approximately twice that of the baseline local projection. However, our main results remain qualitatively unchanged: for industries with a higher reliance on real estate collateral, such as agriculture and construction/real estate, the response of sectoral credit to a house price shock is more pronounced.

Robustness Checks We conduct two robustness checks for estimating heterogeneous elasticities of sectoral credit to changes in house prices: (1) estimating the elasticity using a bi-variate regression for different time horizons with and without the use of the instrumental variable; and (2) estimating it directly from cross-sectional data. By and large, the results in Appendix Table F.5 and F.6, with various controls and fixed effects, are congruent with our previous findings.

4.2 What Drives The Increasing Importance of Real Estate Credit?

In our model, the role of collateral constraints in explaining structural change in credit and output can be summarized as $\mathbf{\Gamma}_d^j = \kappa^j \Gamma_y^j$. κ^j is the effect of debt capacity, summarized by the ratio of credit to output in sector j. Γ_y^j is the input share of collateral on the production side. In this section, we provide evidence for the empirical relevance of the debt capacity effect.

4.2.1 Real Estate Collateral and Credit Growth

We start by showing a positive correlation between reliance on collateralized credit and credit growth. As indicated in our model, the role of collateral constraints matters more for sectors with a higher share of real estate inputs, which then translates into a higher growth rate of credit. We use the following specification to test this hypothesis:

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta^h \text{Mortgage Share}_{c,j} + \delta_{c,t} + \gamma_{j,t} + \epsilon_{c,j,t}, \text{ for } h = 5, 10, \tag{11}$$

where $\Delta_h \log(\text{Credit}_{c,j,t})$ represents the change in credit to industry j deflated by the Consumer Price Index (CPI) in country c from time t to $t+h$. We estimate this specification for different time horizons, controlling for country-year ($\delta_{c,t}$) and industry-year ($\gamma_{j,t}$) fixed effects, and exploiting cross-sectional variation in the reliance of different sectors on real estate as collateral.

Table 1: A Higher Share of Real Estate Collateral Predicts Higher Credit Growth

	$\Delta_h \log(\text{Credit}_{c,j,t})$					
	$h=5$			$h=10$		
	(1)	(2)	(3)	(4)	(5)	(6)
Mortgage Share	1.33***	0.11***		2.78***	0.28***	
	(0.26)	(0.023)		(0.40)	(0.034)	
Δ_hMortgage to GDP$_c$ $\times$ $\mathbf{1}\{j = \text{Cons.}\}$			3.87***			4.09***
			(0.19)			(0.18)
Δ_hMortgage to GDP$_c$ $\times$ $\mathbf{1}\{j = \text{Manu.}\}$			1.03***			1.04***
			(0.15)			(0.17)
Observations	280	15,520	1,668	185	12,752	1,338
# Countries	4	112	34	4	110	29
# Industries	5	5	2	5	5	2
Country FE			✓			✓
Year FE			✓			✓
Country×Year FE	✓	✓		✓	✓	
Industry×Year FE	✓			✓		
Industry Level	Broad	Broad	Broad	Broad	Broad	Broad
Mean of Dependent Var.	0.26	0.70	0.26	0.50	1.44	0.52
R^2	0.89	0.75	0.51	0.90	0.85	0.61

Note: This table reports the relation between a sector's future growth in credit and its reliance on real estate collateral at a 5-year or 10-year time horizon in a country-industry-year panel. In Column (1) and (4), the sample is restricted to the four countries where we have data on a sector's real estate collateral intensity *and* sectoral credit data (Denmark, Latvia, Switzerland, Taiwan). In Column (2) and (5), the independent variable is average real estate collateral intensity for each industry, based on these four countries. In Column (3) and (6), the independent variable is country-specific change of mortgage to GDP ratio interacted with manufacture or real estate dummies. *, ** and *** denote significance at the 10%, 5% and 1% level.

Column (1) and (4) exploit variation on the country-industry level in the reliance on real estate as collateral. The coefficients of 1.33 and 2.78 (statistically significant at the 1% level) suggest that a 10% higher intensity of real estate use is associated with a 13.3% to 27.8% higher credit growth over a 5-year and 10-year horizon, respectively. However, we can only run this estimation for the four countries for which we can measure both a sector's real estate collateral intensity and sectoral credit. To overcome this limitation, we compute each industry's *average* reliance on real estate and use it as the independent variable in Column (2) and (5).[12] We find smaller coefficients, but the result still holds qualitatively. Lastly, we exploit changes in the reliance on real estate collateral over time as proxied by changes in mortgage credit-to-GDP within an economy. The results in Column (3) and (6) suggest that a 10% increase of mortgages relative to GDP is associated with a 10.3% increase of credit to manufacturing and a 38.7% increase of that to real estate.

How does the relationship between the use of real estate collateral and credit growth mesh with the Financial Kuznets Facts of credit flowing from manufacturing to real estate over the course of economic development? In Figure 4a, we saw that the real estate sector uses more real estate both in terms of collateral and real inputs to production. This is consistent with the idea that collateral constraints play a role in the shift of credit from manufacturing to real estate, as shown in Figure 1.

4.2.2 Intangible Assets and Sectoral Financing Constraints

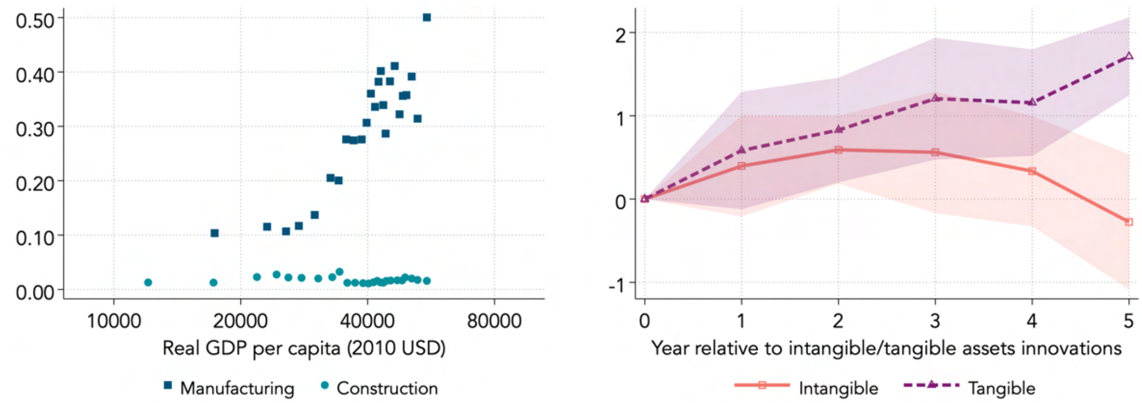
The rising importance of intangible assets as countries get richer may be a potential source of heterogeneous changes in collateral constraints across sectors. As countries develop, firms transition from asset-intensive investments in agriculture or manufacturing towards knowledge assets characterized by specialization (Ma, 2022). This leads to an increasing in corporate investments into intangible capital, such as human capital, business strategy, or patents (Graham, Leary, and Roberts, 2015). Existing evidence for the United States suggests that an increase in intangible assets is associated with a reallocation of credit from commercial & industrial loans to real estate loans (Dell'Ariccia, Kadyrzhanova, Minoiu, and Ratnovski, 2021).

Intangible assets are specific to firms, which in turn makes them harder to be redeployed and liquidated elsewhere (Hart and Moore, 1994; Shleifer and Vishny, 1992; Rampini and Viswanathan, 2013). Throughout the course of economic development, TFP growth in the manufacturing sector is much stronger than that in real estate. Thus, the rising intangibility in the manufacturing sector relative to real estate may crowd out investments in easily-collateralized assets (Kermani and Ma, 2023), contributing to a slower growth rate of credit in the manufacturing sector Falato et al. (2022). This intuition is developed formally through an extended model in Appendix A.4.

[12] This modification relies on the fact that the level of a sector's real estate collateral share may be different across countries, but the ranking among these industries is likely very similar, as shown in Appendix Figure E.4.

Figure 5: Sectoral Asymmetry in Intangibles and Credit

(a) Intangibles and Development (b) Asset Tangibility and Credit Growth



Note: Panel (a) is a binscatter plot showing the relation between a sector's intangible to tangible assets and income levels. Panel (b) plots the local projection impulse response of credit to an innovation to investments in either tangible or intangible investments in a country-year-industry panel.

Sectoral Differences in Intangible Investments over Development To test this hypothesis, we rely on sectoral data from EU-KLEMS and INTANProd, which measure the composition of intangible and tangible assets in 27 European countries, UK, US, and Japan across 15 industry aggregates dating back to 1995 (Bontadini et al., 2023). We compute the share of intangible assets in manufacturing and real estate for each country-year pair. Figure 5a presents a striking increase in the share of intangible assets in manufacturing as countries with GDP per capita, going from 10.4% to 50.0% among the countries for which we have data. In stark contrast, the share of intangible assets does not exceed 3.2% in the real estate sector without any discernible change across income levels.

Intangible Investments and Sectoral Credit Growth To test the idea that a rising reliance on intangible assets may reduce the debt capacity of manufacturing relative to the real estate sector, 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:

$$\begin{aligned}\Delta y_{c,j,t+h} =& \alpha_c^h + \nu_j^h + \sum_{l=0}^{L} \beta_{h,l}^{\text{Intang}} \Delta_1 \log \left(\text{Intang}_{c,t}\right) \\ &+ \sum_{l=0}^{L} \beta_{h,l}^{\text{Tang}} \Delta_1 \log \left(\text{Tang}_{c,t}\right) + \sum_{l=0}^{L} \gamma_{h,l}^{j} \Delta_1 y_{c,t-l}^{j} + \epsilon_{c,t+h}^{j},\end{aligned} \tag{12}$$

where Δ_h is an operator denoting the change of a variable from time t to $t+h$, α_c^h is a country fixed effect, and ν_j^h is an industry fixed effect. Panel (b) of Figure 5 plots the sequence of $\{\widehat{\beta}_{h,0}^{\text{Intang}}, \widehat{\beta}_{h,0}^{\text{Tang}}\}$ within 5 years relative to the change of intangible/tangible asset investments. We find that a 10% increase in tangible asset investment is associated with a 17.1% increase in credit after five years. We find no statistically significant predictive power of innovations in intangible assets for future medium-term credit growth.

Of course, the patterns we have documented here do not allow us to establish a causal relationship. That said, our findings are consistent with existing evidence using more granular data to get at causal effects. Akcigit, Ates, and Impullitti (2018), for example, exploit variation in state-level R&D tax credits in the United States to document that these tax credits increase Research and Development (R&D) expenditure and patenting. Falato and Sim (2014) show that these R&D tax credits, in turn, result in declines in bank debt and secured debt. Dell'Ariccia et al. (2021) find that an increase in banks' exposure to intangible relative to tangible assets leads to a reallocation in lending backed by real estate collateral. These findings support our cross-country evidence. Overall, they suggest that the increase in less collateralizable intangible assets as countries become richer may be associated with a reallocation of credit across sectors.[13]

5 Quantitative Exercise

In this section, we calibrate our model to match the data in Section 5.1 and decompose the impact of sectoral TFP and financial constraints on the real economy and credit market structural change in Section 5.2.

5.1 Calibration

We add two additional 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 capital as intangible asset k^j as production inputs, with shares α_l^j, α_n^j and α_k^j, respectively. Savers provide 1 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 our housing service flow assumption in the baseline model, and instead incorporate residential housing, with a depreciation rate δ_h. Appendix B elab-

[13]There are likely other important factors behind the increased used of collateralized borrowing and the reallocation of credit to real estate over the course of development. For example, improved property rights may increase the ability to borrow against land and real estate collateral (Besley and Ghatak, 2010; Manysheva, 2022). This may especially benefit the real estate sector, which is more reliant on collateralized borrowing, as we saw in Figure 4a.

orates on the set up of this extended model, specifies equilibrium conditions following these modifications, and derives the decomposition of credit and nominal output ratios.

To quantify our model, we assume economies with different income levels are at their own steady states, determined by the exogenous parameters. For each economy, we calibrate the following parameters

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

We further assume *only* $\{z^j, \lambda^j, \alpha_n^j\}_{j\in\{M,E\}}$ are different across economies, and all other parameters are identical across economies.

Externally Assigned Parameters We set $\beta^s = 0.98$ to match the long run real interest rate $r = 2\%$, between the real return of bills and bonds (Jordà, Knoll, Kuvshinov, Schularick, and Taylor, 2019), and set $\beta = 0.95$. Similar to Buera and Shin (2013), δ_h and δ are set to 5%. From the production side, we target $\alpha \equiv \alpha_l^j + \alpha_k^j + \alpha_n^j = 0.9$, commonly used in macro-development models such as Itskhoki and Moll (2019) and empirically related to De Loecker, Goldberg, Khandelwal, and Pavcnik (2016). We impose a labor share α_n^j/α of 2/3, and input share for real estate collateral and capital $(\alpha_l^j + \alpha_k^j)/\alpha$ of 1/3. Lastly, we match the real estate input shares $\alpha_l^j/(\alpha_l^j + \alpha_k^j)$ in these two sectors, which are 0.017 for manufacturing and 0.240 for real estate based on data from the World Input-Output Database.

Internally Calibrated Parameters Our selection of moments for internal calibration is in line with the baseline model's prediction and comparative statics. From Proposition 2, the elasticity of substitution η is closely related to sectoral relative output $qy^E/(y^M + qy^E)$ due to structural change in the real economy. Proposition 1 states that an increase in housing demand, s, *ceteris paribus*, drives up the housing price, so we pick s to match the variation in the housing price index relative to log real GDP per capita in Figure 2. Meanwhile, Proposition 3 provides a one-to-one mapping from the sectoral credit to value added ratio κ^j to sectoral collateral constraint parameters, given sectoral input shares. Lastly, we calibrate sectoral TFP z^j to match the sectoral labor productivity.

We group our country-year panel dataset into $N = 20$ groups based on real GDP per capita. We run a regression of the key data moments on dummies for these income groups, controlling for year and country fixed effects to exploit the variation coming from economic development. Year fixed effects filter out year-specific common shocks that impact all economies, in line with our focus on the steady state equilibrium. Country fixed effects remove country-specific characteristics not captured by our simple model. The empirical house price index is normalized by a manufacturing price index, computed as the ratio of nominal to constant-price value added. The purpose of this normalization is to match our model, where manufacturing good is the numeraire.[14]

Calibration Procedure and Results Our two-step calibration strategy is as follows. First, for a given pair of (η, s), we find a sequence of $\{z_n^j\}_{n=1}^N$ to minimize the distance between sectoral labor productivity in the model and data for each income bin. Second, we search for a pair of (η, s) to target the nominal output share and relative house price variation in all income bins. Figure 6 reports the value of the internally-calibrated parameters. On the financial side, Figure 6a shows the collateral constraints in manufacturing sector are loosened more at the early stage of development and decline sharply afterwards[15]. By contrast, collateral constraints for the real estate sector become increasingly looser over the course of development. For example, λ^E in the richest countries is 4.8 times higher than in the poorest countries. On the real economy side, Figure 6b reveals that manufacturing sector TFP z^M increases considerably as countries get richer, with an approximately six-fold increase when comparing the least-developed to the most-developed countries. In contrast, real estate sector TFP is stagnant. Finally, the internally calibrated parameters are $s = 2.5$ and $\eta = 0.72$. The latter is close to the estimated value of 0.85 in Herrendorf et al. (2013).

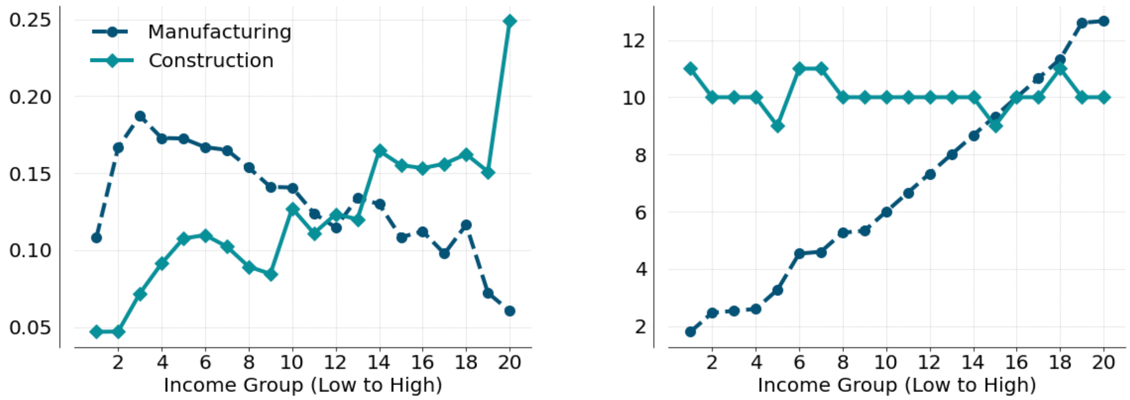
Validation of Model Our model closely matches our key empirical findings about structural transformation in the credit market and in the real economy: a salient rise in the share of real estate credit in Figure 7a, and relatively smaller increase of the real estate sector's nominal output share in Figure 7b. Consistent with the mechanism highlighted in the literature on supply-side structural transformation (Ngai and Pissarides, 2007), Figure 7c shows that our model captures the increase in the (relative) house price over the course of development, consistent with the empirical pattern in Figure 2a. Lastly, Figure 7d shows that the model also matches the un-targeted cross-country difference in total output per worker as an additional model validation.

[14] Because the house price index in the data is only comparable *within* a country, we only control for country fixed effects. We discard the estimates for the first 3 income bins since they contain at most 7 observations, relative to more than 20 observations in other bins.

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

Figure 6: 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 constraint $\{\lambda_n^j\}_{n=1}^N$ and (b) sectoral TFP $\{z_n^j\}_{n=1}^N$ by income group following the procedure outlined in Section 5.1.

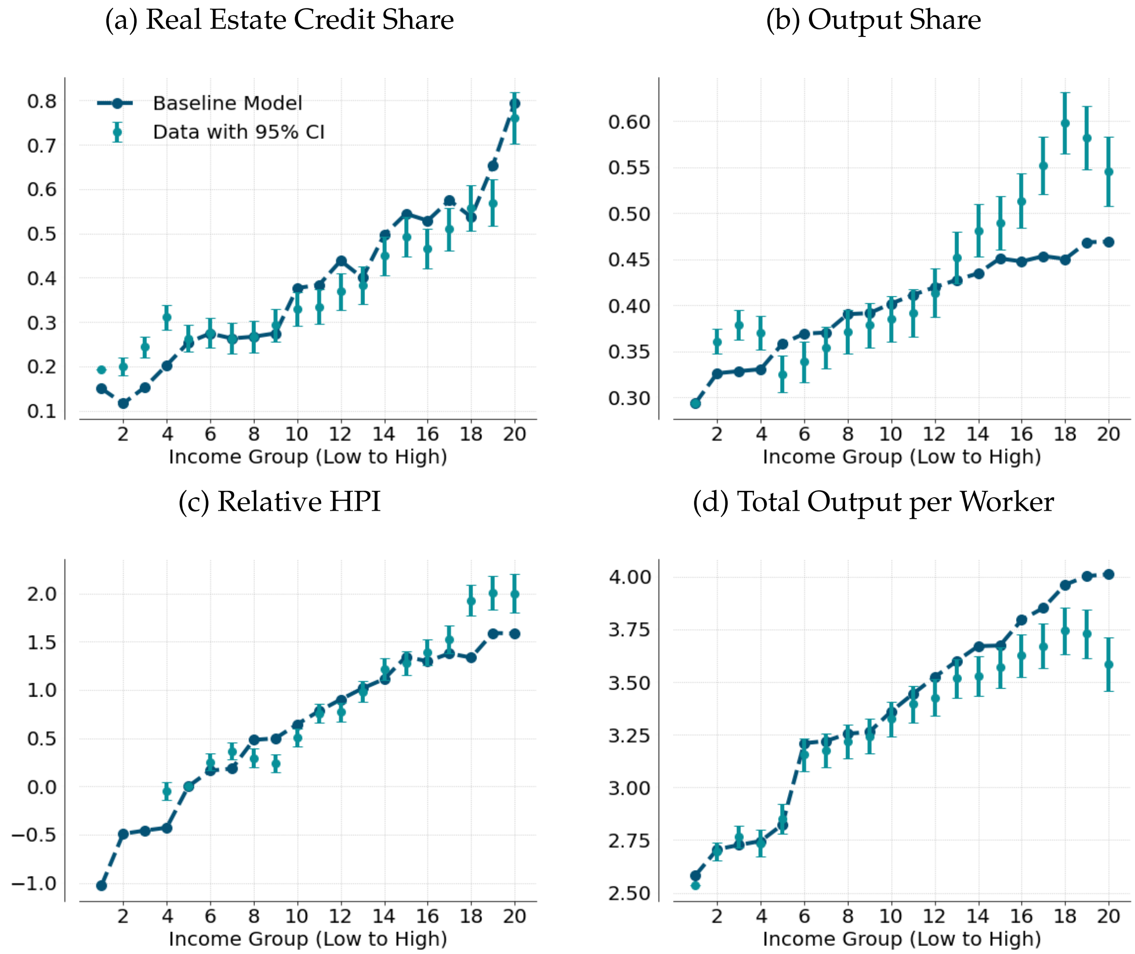
5.2 Unpacking Structural Transformation: Finance vs. Real Economy

Equipped with our quantitative model, we conduct a development accounting analysis in the spirit of Caselli (2005). Our goal is to pin down how differences in sectoral TFP and financial constraints between the poorest and the richest countries may account for the share of different sectors in credit and output.

Quantitative Decomposition We start by quantifying each component in the decomposition rule in (6). In Figure 8, we shut down each channel one-by-one holding all other channels constant as in our baseline model. We plot the corresponding counterfactual credit and output shares. By comparing the difference between the counterfactual scenario and the baseline results, we know how each channel contributes to structural transformation in credit and the real economy.

First, if there were no changes in the price of collateral ($\mathbf{Q}$), the share of the real estate sector in both credit and output would have *decreased* over the course of development. This confirms that the collateral price channel highlighted in Equation 5 is quantitatively important. However, this channel is counterbalanced by the relative productivity ($\mathbf{Z}$) channel. Comparing the baseline model with the counterfactual shutting down $\mathbf{Z}$ confirms our intuition that productivity growth in the manufacturing sector stimulates the use of collateral in that sector, encouraging credit flow into that sector, when holding the collateral price fixed. The overall effect of changing the price of collateral ($\mathbf{Q}$) and relative productivity ($\mathbf{Z}$) is exactly the same as only turning off the role of collateral constraints ($\mathbf{\Gamma}$). From Figure 8a, we can see that, without a change in $\mathbf{\Gamma}_d$, there is much less variation in the share

Figure 7: Key Moments – Model vs. Data



Note: This figure shows the comparison of moments from data and quantitative model, following the calibration procedure in Section 5.1. The light-green vertical bars with dots show the point estimates of empirical moments with 95% confidence interval. The light-colored blue solid line represents the targeted moments from the model. 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 $\log(q/p^E)$, and (d) total output per worker $\log[(y^E + y^M)/(n^E + n^M)]$.

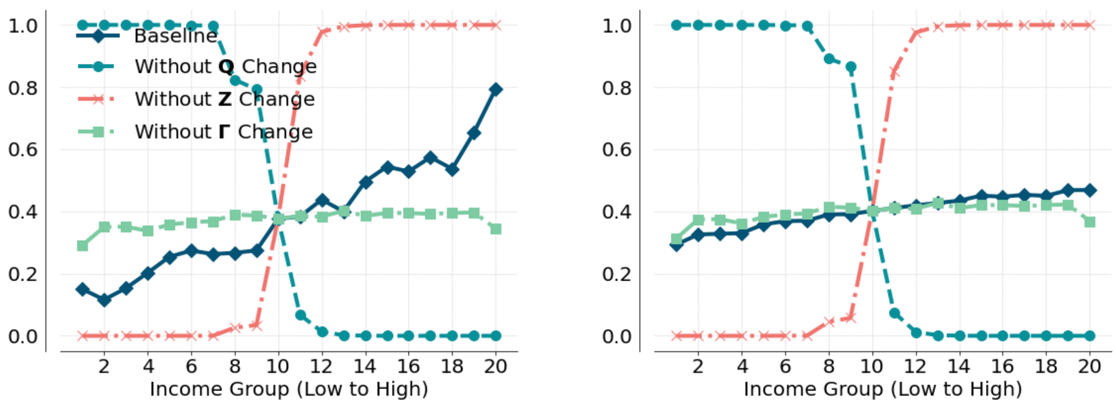
of credit going to the real estate sector than what we observe in the data. In contrast, Figure 8b shows that changes in $\mathbf{\Gamma}_y$ have a smaller effect on the share of the real estate sector in output. In Appendix Table F.13, we show that a sector's reliance on real estate collateral accounts for 88.2% and 57.3% of the cross-country variation in relative credit and output shares, respectively.[16]

Development Accounting Analysis Recall from Proposition 2 that only one of the forces coming from the real economy (e.g., sectoral TFP) and those from the financial sector

[16]By taking logs of our decomposition rule, we can, for example, write the logged credit ratio as the sum of these channels in logs. By taking the logged difference of each channel, we can back out the contribution for each channel. This additively separable nature guarantees the total contribution sums to 100%.

Figure 8: Quantifying the Decomposition Rule

(a) Real Estate Credit Share (b) Real Estate Output Share



Note: These figures plot the counterfactual real estate credit share d^E/d and nominal output share $qy^E/(qy^E + y^M)$ by income groups when *shutting down* the relative productivity channel $\mathbf{Z}$, collateral price channel $\mathbf{Q}$, and collateral constraints channel $\mathbf{\Gamma}$ separately, and hold all other channels constant. The difference between the counterfactual and baseline results represents the contribution of the corresponding channel.

(characterized by the collateral constraint parameter) is theoretically *sufficient* for structural change both in the credit market and in the real economy. To understand the magnitude of these two forces, we conduct a development accounting analysis in a similar fashion to Caselli (2005). Table 2 reports the result. In particular, we compute the variation in the key variables over each income group in the baseline model $\Delta^{\text{bchmk}}_{\text{level}}$ and in different counterfactual experiments ($\Delta^{\text{ctfl}}_{\text{level}}$). To shed light on the contribution of each channel, we use the share of variation in the benchmark explained by the counterfactual in percentage points, i.e. $100 \times \Delta^{\text{ctfl}}_{\text{level}}/\Delta^{\text{bchmk}}_{\text{level}}$.

An interesting disconnect between finance and the real economy structural change arises. In the second row, we only vary productivity for each sector while holding the degree of sectoral TFP constant, while the third row only varies sectoral TFP. From Panel A, we find an loosening of financing constraints, characterized by increasing λ^j, explains approximately 80.6% of structural change in the credit market, while the remaining 27.5% come from differential growth rate of sectoral TFP over economic development. By contrast, results in Panel B suggest that financial constraints account for almost nothing in the structural change of the real economy, which is driven entirely by changes in productivity.[17]

To better understand this disconnect between credit and output, we revisit the two roles the financial constraint parameters have in a sector's output share. First, over economic

[17] The numbers in the Row (3) and (4) for each column of Table 2 do not necessarily sum up to 100% due to the potential interaction between financial and economic forces induced by the non-linearity of the model. But quantitatively, the sum of these numbers is close to that.

Table 2: Development Accounting Analysis

	Panel A: $d^E/(d^E+d^M)$			Panel B: $qy^E/(qy^E+y^M)$		
	1 to 20	1 to 3	3 to 20	1 to 20	1 to 3	3 to 20
(1) Baseline	64.44	0.30	64.14	17.56	3.48	14.08
(2) Vary productivity	17.05 (26.5)	3.32 (n.a.)	13.73 (21.4)	17.53 (99.8)	3.46 (99.5)	14.07 (99.9)
(3) Vary all constraints	52.42 (81.3)	−2.30 (n.a.)	54.72 (85.3)	0.02 (0.1)	0.01 (0.2)	0.02 (0.1)
(4) Vary manu. constraint	14.79 (22.9)	−13.37 (n.a.)	28.16 (43.9)	−0.00 (−0.0)	0.00 (0.1)	−0.01 (−0.1)
(5) Vary cons. constraint	37.36 (58.0)	7.30 (n.a.)	30.07 (46.9)	0.03 (0.2)	0.00 (0.1)	0.02 (0.2)
	Panel C: $\log(q)$			Panel D: $\log[(y^M+y^E)/(n^M+n^E)]$		
	1 to 20	1 to 3	3 to 20	1 to 20	1 to 3	3 to 20
(1) Baseline	2.61	0.57	2.04	1.43	0.14	1.29
(2) Vary productivity	2.64 (101.2)	0.56 (98.8)	2.08 (101.9)	1.42 (99.4)	0.14 (94.9)	1.28 (99.9)
(3) Vary all constraints	−0.03 (−1.2)	0.01 (1.2)	−0.04 (−1.9)	0.01 (0.8)	0.01 (5.5)	0.00 (0.2)
(4) Vary manu. constraint	−0.01 (−0.2)	0.01 (1.8)	−0.02 (−0.8)	−0.00 (−0.3)	0.01 (4.3)	−0.01 (−0.8)
(5) Vary cons. constraint	−0.03 (−1.0)	−0.00 (−0.5)	−0.02 (−1.1)	0.01 (1.0)	0.00 (1.2)	0.01 (1.0)

Note: This table shows how financial constraints and sectoral TFP 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 price of collateral $\log(q)$, and (d) the total value-added per worker $\log(y^M+y^E)$. Row 1 reports the difference of these key variables ($\Delta^{\text{bchmk}}_{\text{level}}$) between high and low income bins using the baseline quantitative model. Row 2 reports results when varying productivity z^M and z^E, while keeping all financial constraint parameters λ^M and λ^E equal across countries. Row 2 varies λ^M and λ^E while keeping z^M and z^E same. Row 3 and 4 only vary one of λ^M and λ^E, respectively, holding all other parameters the same. Numbers outside of parenthesis ($\Delta^{\text{ctfl}}_{\text{level}}$) are level differences across income groups intervals, and number in the parenthesis measures the difference in counterfactual accounts for benchmark difference in percentage points, calculated by $100 \times \Delta^{\text{ctfl}}_{\text{level}}/\Delta^{\text{bchmk}}_{\text{level}}$. The percentage points in parenthesis are omitted when $\Delta^{\text{ctfl}}_{\text{level}}$ is too big relative to $\Delta^{\text{bchmk}}_{\text{level}}$.

development, financial constraint in the real estate sector is relaxed more than that in manufacturing. The real estate sector also enjoys a higher collateral input share. These two effects lead to a larger change in sectoral reliance on collateral in real estate (Γ^E_y) relative to that in manufacturing sector (Γ^M_y), which explains 57.3% of the variation in the real estate output share across income groups, reported in Appendix Table F.13. Second, variation of financial constraints affects collateral price. As indicated by Proposition 1, a higher λ^M also pushes up the price of collateral, holding everything else fixed. However, since the financial constraint is loosened much more in the real estate relative to manufacturing sector, there is also a downward pressure on the price of collateral, thanks to the increasing *supply* of collateral from the real estate sector production. As shown in Panel C, if only financial forces were present, the price of collateral would have slightly decreased throughout economic development. Taking these two effects altogether, the positive partial equilibrium effect of looser financing constraints are largely offset by the general equilibrium effect of a higher price of collateral, which explains the small contribution of changing λ^j on the output share of the real estate sector.

Why is the impact of changing λ^M on housing prices so small relatively to that of changing productivity z^M? The main reason hinges on the different elasticity y^M with respect to z^M and $\widetilde{\lambda^M}$. Consider the production function in the manufacturing sector in equation A.6. Holding all else fixed, a one percent increase of z^M ($\widetilde{\lambda}^M$) leads to a $\frac{1}{1-\alpha^M}$ ($\frac{\alpha^M}{1-\alpha^M}$) percent increase in manufacturing output y^M. Since α^M is quantitatively small, the effect of changing z^M is quantitatively much larger than the effect of $\widetilde{\lambda}^M$. A second reason stems from Figure 6, which shows that the variation in λ^j is generally smaller than the change of z^M across countries. Taken together, these two reasons can explain the relatively smaller importance of collateral constraints compared with the productivity on manufacturing output, quantitatively supported by Panel D, on the price of collateral.[18] Turning to structural changes in the credit market, there is an additional debt capacity effect responsible for the increasing amount of credit per unit of nominal output. This explains why the financial Kuznets facts are mostly driven by variation of sectoral financial constraints instead of that of sectoral TFP.

5.3 Reconciling the Role of Finance on Real Economy

Our development accounting analysis suggests a limited impact of financial development on economic development, measured by output per capita and structural change. Our goal in this section is to provide one potential channel for how financial development may have more meaningful effects on economic development.[19] We show that financial factors can play an important role for real economic outcomes through their impact on sectoral productivity, a channel not incorporated into our baseline model.

Mechanism In a general class of macro-development models with financial constraints (Buera and Shin, 2013; Midrigan and Xu, 2014; Itskhoki and Moll, 2019; Ji, Teng, and Townsend, 2023), the key mechanism is as follows: loosening financial constraints, on the *extensive* margin, enables high-ability but low-wealth individuals to become entrepreneurs. This reduced misallocation of talent itself has a significant impact on sectoral TFP (Hsieh

[18] This result is similar to Kiyotaki et al. (2011), who argue that relaxing collateral constraints can play a limited role due to the conversion from rented to owned units. In our model, the takeaway is similar but operates differently.

[19] There might be other aspects that our baseline model is too simple to capture and that contribute to an underestimation of the real impact of financial development. As an example, the collateral constraints in our model are quantity-based financial frictions. A large body of literature emphasizes the role of financing cost in terms of interest spreads, reviewed by Banerjee and Duflo (2005, 2010). More recently, Cavalcanti, Kaboski, Martins, and Santos (2023) show a sizable efficiency cost in developing counties thanks to both a high level and dispersion in credit spreads by leveraging Brazilian firm credit registry data and through conducting counterfactual analysis from a richer model. This credit spread (dispersion) is likely to narrow significantly over development, due to better monitoring technology of financial intermediaries (Greenwood et al., 2010). In our simplified model, the credit spread across countries is pinned down by the discount factors of savers and entrepreneurs, which is invariant across countries.

et al., 2019).[20] However, such a channel is muted in our model. Instead, the main mechanism of relaxing collateral constraint in our setting is to encourage firm investment on the *intensive* margin, suggesting our baseline estimates may be conservative. Intuitively, if a part of changes in productivity we observe originate from the increasing credit availability through the extensive margin of selection into entrepreneurship, we should expect a larger real economic impact from loosening collateral constraints.

Setup for Model with Two Types of Technology To examine this idea, we introduce this *productivity-enhancing finance channel* into our baseline quantitative model. We assume that there are two types of technologies in the manufacturing sector, which are exogenously assigned to entrepreneurs. The first type of technology is the same as our baseline model in that entrepreneurs use real estate collateral to produce and raise loans. In the spirit of Moll (2014), the production function of the second technology hinges on the entrepreneur's own ability $z^M_{2,t}$ and the amount of credit she can get access to, $d^M_{2,t+1}$. Specifically, we assume that output from the second technology is: $y^M_{2,t} = z^M_t \frac{d^M_{2,t+1}}{1+r_t}$.[21] The entrepreneur receives the revenue from production, spends on interest payment $\frac{r_t}{1+r_t} d^M_{2,t}$, consumes the manufacturing good, and invests in residential housing. Her borrowing limit cannot exceed a fixed share of total manufacturing credit $d^M_{2,t} \leq \iota d^M_t$, where $d^M_t = d^M_{1,t} + d^M_{2,t}$ and $\iota \in (0,1)$ are exogenous.[22] Based on this modified model, we rerun the calibration and development account analysis under $\iota = 10\%$. Appendix B.2 provides additional details on the model derivation, calibration procedure, and results for this extension.

Financing Productivity Enhancement, Real Economy Impact, and Development Policies Table 3 revisits the development accounting analysis for this extended model. As shown in Figure 6, λ^M increases dramatically from bin 1 to 3 (early stage of development) and declines afterwards, so we consider the impact at early and subsequent stages of development. Panel A of Table 3 verifies our intuition that output-based TFP in the manufacturing

[20] Feng and Ren (2023) takes a closer look at this channel by distinguishing the selection into entrepreneurship using cross-country data, finding that own-account individuals (self-employed without employers) are more prevalent in poorer countries, and are negatively selected on education levels.

[21] We do not allow for two types of technology in the real estate sector because, empirically, an increase in credit to real estate-related industries if anything predicts slower output and productivity growth, as we discuss further in Section 7.

[22] Although we model a representative entrepreneur, the framework is fairly general, thanks to the linear production technology. For example, ι can be interpreted as the share of new entrepreneurs who can get access to credit in a setting with a continuum of agents (Howes, 2022). Also, since the production using the second technology increases with the level of sectoral credit and thus the output level of the entrepreneur using the first type of technology, one can also interpret ι as the different types of positive externality, such as learning-by-doing (Benigno et al., 2020) and spillovers across space and input-output linkages (Liu, 2019; Lane, forthcoming, among others).

sector (TFPQ^M) increases significantly with λ^M. Relaxing financial constraints in the manufacturing sector quantitatively explains 19.8% of the manufacturing TFPQ increment at the early stage of development. By contrast, the reduction in manufacturing leverage reduces TFPQ^M by 15.8% of its overall increase at later stages of development. This result directly translates into the variation of output per capita in Panel B. At the early stage of development, loosening the manufacturing collateral constraints can explain up to 23.8% of the differences in income per worker, but -11.2% of that across other income bins.[23]

Table 3: Development Accounting with the Productivity-Enhancing Finance Channel

	Panel A: TFPQ^M			Panel B: $\log[(y^M + y^E)/(n^M + n^E)]$		
	1 to 20	1 to 3	3 to 20	1 to 20	1 to 3	3 to 20
(1) Baseline	1.99	0.71	1.27	1.31	0.36	0.95
(2) Vary productivity	2.21 (111.2)	0.65 (90.8)	1.56 (122.7)	1.40 (106.7)	0.31 (86.2)	1.09 (114.5)
(3) Vary all constraints	−0.06 (−3.0)	0.14 (19.8)	−0.20 (−15.8)	−0.02 (−1.6)	0.09 (23.8)	−0.11 (−11.2)
(4) Vary manu. constraint	−0.06 (−3.0)	0.14 (19.8)	−0.20 (−15.8)	−0.04 (−2.8)	0.08 (23.2)	−0.12 (−12.7)
(5) Vary cons. constraint	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.02 (1.2)	0.00 (0.5)	0.01 (1.5)

Note: This table shows how financial constraints and sectoral TFP contribute to real economy outcomes, measured by (a) output-based productivity (TFPQ) of manufacturing sector $\log\left\{y^M / \left[(l^M)^{\alpha_l^M}(k^M)^{\alpha_k^M}(n^M)^{\alpha_n^M}\right]\right\}$, (b) the total output per worker $\log[(y^M + y^E)/(n^M + n^E)]$. The result is based on model with two types of production technology in manufacturing sector in Appendix B.2, where 10% of manufacturing credit distributed to the new entrepreneur ($\iota = 10\%$). All other notes are the same as Table 2. Additional results for other variable is available in F.12.

This stage-dependent development accounting result also carries through to structural transformation in credit markets. Panel A of Table 2 and Table F.12 suggests that the change in the manufacturing financing constraint λ^M is relatively more important for credit market structural change at the early stage of development. However, as the economy develops, changing real estate collateral constraints matters role. In contrast, both constraints equally contribute to real economy structural change, suggested by results in Panel B. We view these suggestive evidence as an analogue of stage-dependent development policy (Acemoglu et al., 2006; Itskhoki and Moll, 2019).[24] Additionally, our result of declining λ^M explains lower per capita income level for a wide range of income group suggests a

[23]The first three income bins are mostly populated with the growth acceleration of East Asian Miracles. This magnitude is very similar with Ji, Teng, and Townsend (2023), which uses micro-level bank deregulation matching difference-in-difference estimates to calibrate a quantitative spatial model, finding that a credit channel alone generates 17.8% of GDP growth in Thailand from 1986 to 1996.

[24]Specifically, Acemoglu, Aghion, and Zilibotti (2006) propose the stage-dependent policy for development that, countries pursue an investment-based strategy at the early stage of development, and as they move closer to the world technology frontier, they switch to an innovation-based strategy. From another angle, Itskhoki and Moll (2019) argue it is optimal for a social planner to adopt pro-business polices, for example, by depressing wages, at the early stage of development. By relaxing the financial constraints of entrepreneurs, such policies lead to higher productivity at longer horizons. As economy develops, the government policies should then become more pro-worker.

underlying financial channel for (premature) de-industrialization (Rodrik, 2016).[25]

6 Directed Credit Policies and the Sectoral Allocation of Credit

In the previous section, we saw that there are changes in the financing constraints different sectors face over the course of development. This raises the question of whether government policies can and should address these frictions. Such policies can be motivated by the view that financial frictions in specific sectors are an important bottleneck for economic development, and that the financing of specific sectors may lead to positive growth spillovers, something we discuss in more detail in the next section. Policymakers may thus seek to influence the quantity and allocation of credit in the economy, especially at early stages of development. This section provides qualitative evidence that governments extensively use "directed credit" policies, introduces a new narrative chronology for the liberalization of such policies covering 37 events, and documents how the abolishment of directed credit policies impacts the sectoral allocation of credit and real economic activity.

6.1 A Short Primer on Directed Credit Policies

Many countries have used policies that explicitly channel credit into "priority sectors," often as part of a broader industrial policy 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 how they are implemented differ across countries, these policies are designed to steer credit towards sectors deemed productive (usually various manufacturing industries) and restrict lending to uses considered speculative or non-productive (especially real estate purposes). Through the lens of the model in Section 3, directed credit policies can thus be interpreted as shifters in the sectoral collateral constraints λ^M and λ^E.

Joe Studwell's 2013 book "How Asia Works" advocates for a role of directed credit policies in long-run economic development (Studwell, 2013). Studwell argues that directing subsidized credit to manufacturing sectors exposed to global competition played a critical role in the rapid development of the East Asian growth miracles, including in Japan, Korea, and China, and that the failure to effectively implement such policies elsewhere explains the relative lack of development in other Asian economies (see also Cho, 1989; Cho and Kim, 1995). Relatedly, Itskhoki and Moll (2019) compile historical accounts of development policies for the fast-growing East Asian economies. Six out of seven subsi-

[25] However, we note that the fall in λ^M could also reflect forces outside our model, such as changing capital structure and increased internal or external equity financing at later stages of development.

dized credit, and five of them also subsidized intermediate inputs. As we show in Figure 10, the credit expansion during these East Asian Miracle episodes was indeed particularly concentrated in the manufacturing sector.

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, forthcoming). 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.

Importantly, targeted credit policies are not only used in developing countries. They played an integral role in the implementation of monetary policy in most advanced economies during the period of strong economic growth following World War II, including in France (Monnet, 2014, 2018) and the United Kingdom (Aikman et al., 2016a); also see Baron and Green (2023). In many cases, they fell out of favor with the liberalization of capital accounts (which may have 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 through mortgage subsidies, sectoral risk weights or capital buffers, loan guarantees, and the portfolio of development or government-owned banks.

The discussion above highlights that governments clearly believe influencing the allocation of credit in the economy is important for achieving societal goals such as economic development. As such, we interpret the widespread adoption of directed credit policies as prima facie evidence that policy makers believe sectoral financing constraints are binding, and that they should be addressed by government policy.

6.2 A 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. Drawing on dozens of country-specific sources, this chronology specifies years in which directed credit policy was either abolished entirely or sufficiently liberalized to constitute a major change in financial regulation. Appendix D provides a detailed background discussion of each policy change, including a direct quote to rationalize why exactly 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 changes across countries, which can be seen in Appendix Figure E.10. These liberalization events cover all income groups, ranging from Nigeria to Korea and France. In some cases, the timing of these policy changes coincides with a broader agenda of financial liberalization, in developing countries often under the influence of the Washington Consensus prevailing at the time. In other instances, the reforms were part of a change in monetary policy frameworks. Importantly, the chronology we construct does not only include 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). Instead, it 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 two books by Richard Werner (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." 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 liberalization. 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. These policies fixed both the amount of short-term lending banks were allowed to do 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), who provide evidence that the reforms improved the allocation of resources in the economy.

Taken together, the new chronology we construct suggests that directed credit policies are associated with major concurrent changes in macroeconomic outcomes. A critical question, which we will investigate in the next section, is whether and how they affect the allocation of credit in the economy. The answer to these questions are 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 indeed steer credit into particular sectors, or whether such an intuition is biased by prominent individual case studies.

6.3 The Aftermath of Directed Credit Liberalizations

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

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

where $Liberalization_{c,t}$ is a dummy that equals one after a country has liberalized directed credit policies, $y_{c,j,t}$ is a sector specific outcome, 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 C.6, we show that our results are robust to a range of alternative empirical specifications, including only using never-treated countries as controls in the LP-DiD framework, standard local projections, and other recently introduced difference-in-differences estimators.

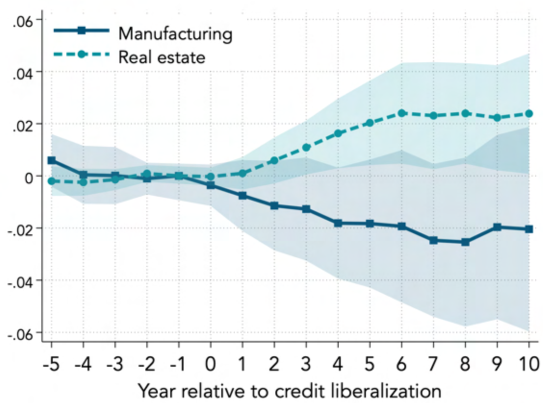
The identifying assumption allowing for a causal interpretation of the sequence of coefficients β_j^h is *not* that liberalizations of directed credit policies are random events. Rather, it is that the outcomes we are interested in would have been on similar trends relative to counterfactual countries in the absence of the liberalization event. We assess the plausibility of this assumption using event study plots that suggest parallel trends. In further support, Table F.10 in the appendix suggests that liberalizations are not particularly predictable using lagged macroeconomic outcomes such as changes in GDP or trade.

Figure 9 plots the path of $\{\widehat{\beta}^h_{\text{Manu.}}, \widehat{\beta}^h_{\text{Cons.}}\}_{h=-5}^{10}$ for various outcomes. Figure 9a shows that, after a liberalization of directed credit policies, credit to the real estate sector increases by about 2 percent of GDP. The increase is significant and persistent, lasting at least ten years after the liberalization. At the same time, manufacturing credit to GDP declines by a similar magnitude.

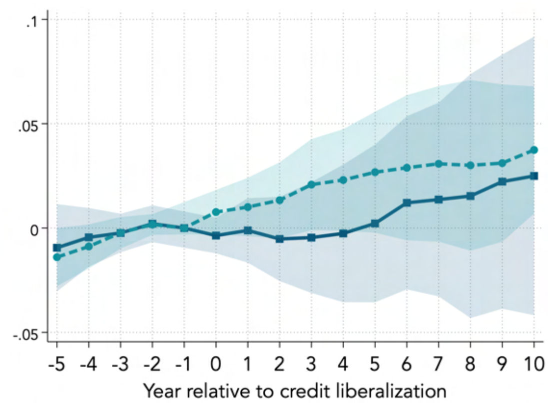
On the real economy side, Figure 9b suggests that the liberalization of directed credit is also followed by an increase in real estate value added as a share of GDP, while there is no change in the share of manufacturing value added. Figure 9c shows that this increase in the output share of the real estate sector is smaller than that in credit, such that credit to value added ratio in the real estate sector soars. These results support our hypothesis that a liberalization of directed credit policies can be thought of as a shifter of the (relative) financial constraint of the real estate sector. They also indicate that expansions in the

Figure 9: Local Projection DiD: Liberalization of Directed Credit Policies

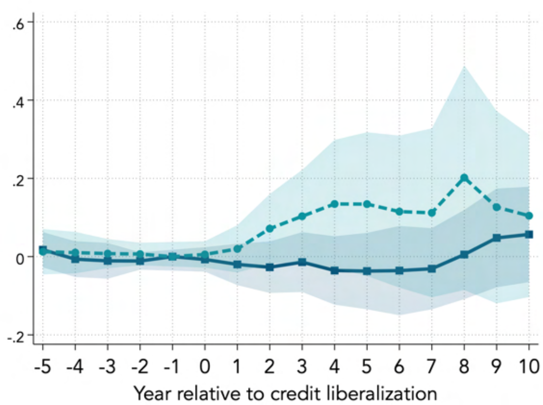
(a) Credit to GDP



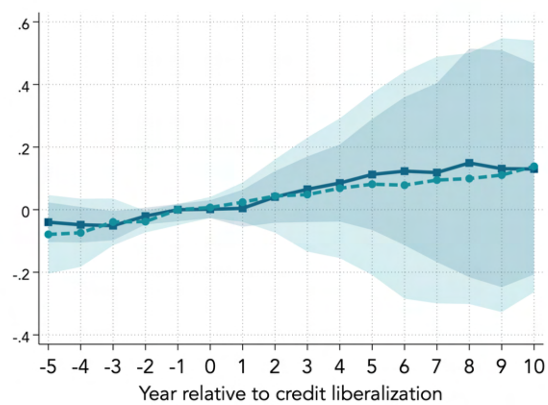
(b) Value Added to GDP



(c) Credit to Value Added



(d) Labor Productivity



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.

availability of credit can significantly impact real outcomes.

A possible concern regarding the interpretation of these results is that the liberalization of directed credit may boost sectoral TFP, which in turn could lead to changes in intangible investments. As we show above, the manufacturing sector increasingly relies on intangible assets at higher levels of income while the same is not true for real estate, which could also be a mechanism through which sectoral financing constraints affect borrowing. In Figure 9d, we thus plot the dynamics of labor productivity following the liberalization of directed credit policies. We find a relatively small and insignificant change in labor productivity in both sectors. These results suggest that it is sectoral financing constraints per se rather than an indirect TFP-enhancing channel why we see increases in lending to the real estate sector.

Our interpretation of the evidence presented in this section is as follows. Government policies that direct credit are a shock to sectoral financing constraints. These constraints are highly 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 believe steering the allocation of credit towards "productive" sectors such as manufacturing matters for long-run growth. In the next section, we investigate the plausibility of this idea in the data.

7 Sectoral Credit Allocation and Long-Run Growth

Does the allocation of credit matter for long-run economic growth? The evidence in the previous section suggests that policy makers believe so. In this section, we provide some evidence that the sectoral distribution of credit across sectors is informative about future growth.

There are several reasons why the relationship between the allocation of financing and long-run growth could be heterogeneous across sectors. First, the allocation of credit 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). Productivity growth has been much stronger in manufacturing than in real estate, and manufacturing has been an important engine of development (Rodrik, 2013). Therefore, a higher share of manufacturing credit could be a signal of stronger future growth prospects.

A second and related reason is that the allocation of credit could causally affect the growth rate of productivity. A growing theoretical literature assumes that the financing of certain productive sectors such as manufacturing can have positive externalities on overall productivity growth (Benigno and Fornaro, 2014; Benigno et al., 2020; Hirano and Stiglitz, 2024). A larger manufacturing sector increases the adoption of foreign knowledge through international trade and foreign investment. Moreover, exposure to global competition forces manufacturing firms to innovate in order to compete, a key argument in Studwell (2013). Benigno et al. (2020) document that the manufacturing sector accounts for most investment in innovation in the economy. These productivity gains can benefit other firms in the economy through knowledge spillovers and input-output linkages.

Credit to the real estate sector is less likely to provide these benefits. A rising real estate share could be the flip-side of a falling manufacturing share, which might indicate premature deindustrialization and reduced financing, investment, and innovation by manufacturing firms (Rodrik, 2016; Charles et al., 2018; Rogoff and Yang, 2021). 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, with adverse consequences for medium-run growth (Müller and Verner, 2024). These factors could all result in lower productivity and output growth.

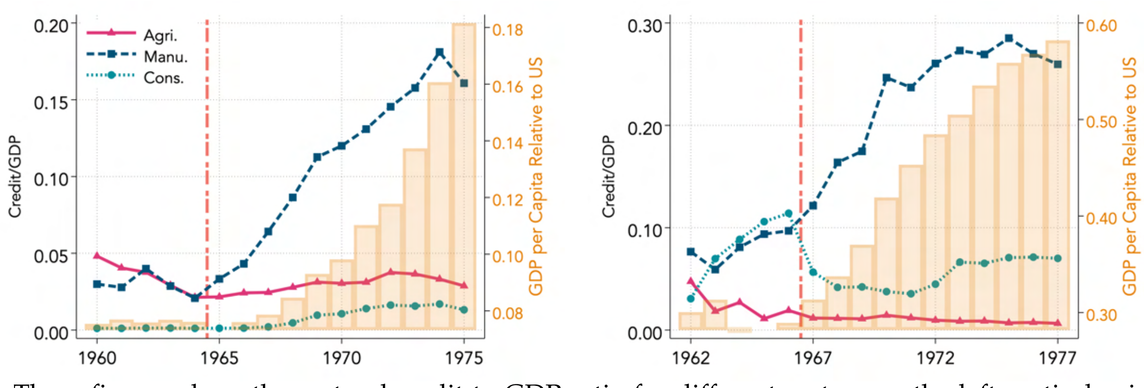
7.1 Case Study Evidence: East Asian Growth Miracles

To illustrate the idea that a large increase in credit to manufacturing can presage spurts in economic growth, we first consider case studies from the East Asian growth miracle. Many East Asian economies experienced spectacular and sustained growth for decades following major economic reforms, including the introduction of directed credit policies. Buera and Shin (2013) document a surge in TFP and GDP per worker during these growth miracles, accompanied by financial deepening, as measured by the ratio of private credit-to-GDP. Our granular credit data allows us to dissect the aggregate increase in credit documented by Buera and Shin (2013) into credit to different sectors.

Figure 10 shows the sectoral allocation of credit around two episodes of rapid economic growth preceded by economic reforms: Korea in 1964 and Singapore in 1967. During both episodes, these reforms were followed by a large uptick in lending to the manufacturing sector, but not to other sectors. In Appendix Figure E.9, we show sectoral credit dynamics for four other East Asian Miracle cases: Japan, Malaysia, Taiwan, and Thailand. With the exception of Thailand where credit expanded in almost all sectors, these growth accelerations were preceded by an expansion in credit mainly to the manufacturing sector.

Figure 10: Credit Allocation During 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. The timing for Singapore's reforms comes from Buera and Shin (2013) and the timing for for South Korea is from McKinnon (1973) and Shaw (1973). Reform years are marked with a vertical line.

7.2 Systematic Evidence

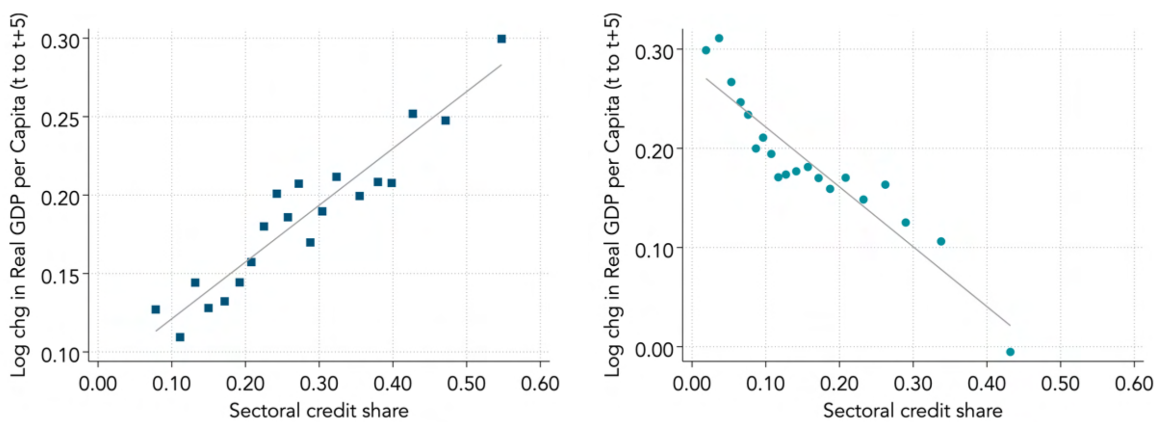
We next explore whether the allocation of credit across sectors has predictive power for a country's future growth trajectory. We estimate variants of the following specification:

$$\Delta_h \log(\text{Real GDP per Capita}_{c,t+h}) = \beta_h^j \text{Credit Share}_{c,t}^j + \gamma_c + \mu_t + \Gamma X_{c,t}^j + \epsilon_{c,t+h}^j, \quad h = 5, 10, \tag{13}$$

where the dependent variable is growth in real GDP per capita from year t to $t+h$ and the key independent variable is the share of manufacturing or real estate in total non-financial firm credit in year t. At the outset, we stress that the correlation between credit shares and future growth is not necessarily causal. For example, sectoral credit may follow news about future productivity, as outlined above, instead of causing the economy to grow. With this limitation in mind, the estimates from equation 13 are nevertheless informative about the potential relevance of the mechanism of our model and the above-cited literature on sectoral heterogeneity and growth.

Figure 11: The Allocation of Credit and Long-Run Growth

(a) Manufacturing (b) Construction and Real estate



Note: These figure visualize the correlation of the share of credit going to manufacturing and the real estate sector with future economic growth. The horizontal axis represents the sectoral credit share at time t, and the vertical axis represents the log-difference of real GDP per capita from t to $t+5$. The binscatter accounts for country fixed effects.

Figure 11 shows a binscatter plot visualizing the relationship between the share of the manufacturing and real estate credit and future economic growth over the next five years. Table 4 reports the corresponding regressions at both the five and ten-year horizons. Table F.16 also reports results using the share of credit to agriculture and services as explanatory variables.

Figure 11 shows that a higher share of credit going to manufacturing is associated with

Table 4: Sectoral Credit Allocation and Subsequent Long-Run Growth

	Panel A: Manufacturing & Mining						
	$h = 5$					$h = 10$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Share$^{\text{Manu}}_{c,t}$	0.17**	0.33***		0.30***	0.24***	0.34***	0.32***
	(0.083)	(0.069)		(0.073)	(0.060)	(0.098)	(0.078)
Value Added to GDP$^{\text{Manu}}_{c,t}$			0.32***	0.23***	0.21***	0.31**	0.30**
			(0.086)	(0.083)	(0.073)	(0.14)	(0.14)
Total Credit to GDP$_{c,t}$					-0.11***		-0.070
					(0.037)		(0.066)
Observations	1,341	1,340	1,340	1,340	1,340	1,014	1,014
# Countries	68	68	68	68	68	61	61
Country FE		✓	✓	✓	✓	✓	✓
Year FE		✓	✓	✓	✓	✓	✓
Other Controls		✓	✓	✓	✓	✓	✓
R^2	0.03	0.16	0.13	0.17	0.21	0.30	0.31
	Panel B: Construction & Real Estate						
	$h = 5$					$h = 10$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Share$^{\text{Cons}}_{c,t}$	-0.41***	-0.37***		-0.34***	-0.26***	-0.49***	-0.48***
	(0.065)	(0.078)		(0.080)	(0.086)	(0.15)	(0.16)
Value Added to GDP$^{\text{Cons}}_{c,t}$			-0.36**	-0.24*	-0.15	-0.15	-0.13
			(0.14)	(0.13)	(0.11)	(0.099)	(0.081)
Total Credit to GDP$_{c,t}$					-0.079**		-0.016
					(0.038)		(0.055)
Observations	1,341	1,340	1,340	1,340	1,340	1,014	1,014
# Countries	68	68	68	68	68	61	61
Country FE		✓	✓	✓	✓	✓	✓
Year FE		✓	✓	✓	✓	✓	✓
Other Controls		✓	✓	✓	✓	✓	✓
R^2	0.11	0.18	0.13	0.19	0.20	0.32	0.32

Notes: This table presents results from estimating (13). Other Controls refers to a second-order polynomial of logged real GDP per capita. Driscoll and Kraay (1998) standard errors are in the parentheses with lag length ceiling$(1.5 \times h)$. *, **, and *** denote significance at the 10%, 5% and 1% level.

stronger future growth in real GDP per capita over the next five years. A one standard deviation increase in the manufacturing credit share (12.4%) predicts 2.1 percentage points higher growth over the next five years. Conversely, a one standard deviation higher share of credit to real estate (10.3%) predicts 4.2 percentage points lower growth over the next five years. The relation between future growth and the real estate credit share is especially strong, with an R^2 of 11% in a simple bivariate regression. In contrast, Appendix Table F.16 shows that the share of credit to agriculture or services have essentially no predictive content for future growth.

Without the addition of control variables, this exercise faces two challenges in addition to the issue of causality. First, richer countries have a lower share of manufacturing in outstanding credit, as shown in Figure 1. As such, we would want to condition on a country's initial level of income. Second, changes in a sector's share in output—independent of credit—may be linked to future GDP (Caselli, 2005). That is, the empirical results we have discussed so far may not necessarily reflect something the sectoral allocation of credit, but rather structural change in the real economy.

To address these concerns, we augment our regression specifications with a quadratic polynomial in log real GDP per capita and the share of each sector in total value added at time t as control variables. We also include year and country fixed effects. Table 4 shows that the baseline finding of a positive correlation between manufacturing credit and future growth, but a negative correlation for real estate credit, is robust to these perturbations. We also see that both sectoral credit shares and sectoral value added shares predict future growth with the same sign. However, the R^2 is higher for the sectoral credit shares, suggesting there is additional information about future growth prospects in the credit shares.

In sum, there is a reasonably strong correlation between the share of credit to different sectors and 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. While these patterns are not necessarily causal, they are potentially consistent with models where the allocation of financing across sectors matters for long-run economic growth. These results therefore also provide motivation for our assumption in Section 5.3 that the *productivity-enhancing financing channel* is more likely to operate in manufacturing than real estate.

8 Conclusion

This paper documents new patterns about the interplay between the sectoral allocation of credit, structural change in the real economy, and growth. Our novel *Financial Kuznets Facts* show a reallocation of credit from manufacturing to real estate over the course of long-run economic development that is more pronounced than structural change in the real economy. At the same time, economic development is associated with an increase in the price of real estate collateral and an increase in borrowing backed by real estate.

To rationalize these patterns, we build a simple two-sector model that integrates sector-specific collateral constraints à la Kiyotaki and Moore (1997) into a workhorse model of supply-side structural transformation (Ngai and Pissarides, 2007). In our model, the higher TFP growth rate of manufacturing relative to the real estate sector leads to a rise in house prices. Because the real estate sector relies more on housing both as an input for production and as collateral to borrow, an increase in house prices causes a reallocation of credit away from the manufacturing sector. We use a calibrated version of our model as a laboratory to study how both "financial" and "real" economic forces contribute to structural change in credit markets. Our counterfactual experiments suggest that a substantial fraction of change in the allocation of credit is driven by changes in the slackness of collateral constraints.

We provide empirical evidence that a reallocation towards real estate could be partly explained by rising real estate values and an increasing reliance on intangible assets in manufacturing. Further, government directed credit policies have historically steered credit to manufacturing, and a liberalization of these policies is associated with a significant reallocation of credit from manufacturing to real estate. Finally, we document robust evidence that long-run growth is positively correlated with the share of credit flowing to manufacturing, and negatively with the share to the real estate sector. These findings suggest the allocation of credit could even causally affect long-run growth, in line with models of growth spillovers from manufacturing.

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. While our empirical evidence 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. 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.

References

ABDELAZIZ, H., D. MOULDI, AND H. HELMI (2011): "Financial Liberalization and Banking Profitability: A Panel Data Analysis for Tunisian Banks," *International Journal of Economics and Financial Issues*, 1, 19–32.

ABIAD, A., N. OOMES, AND K. UEDA (2008): "The Quality Effect: Does Financial Liberalization Improve the Allocation of Capital?" *Journal of Development Economics*, 87, 270–282.

ABILDGREN, K. (2007): "Financial Liberalisation and Credit Dynamics in Denmark in the Post-World War II Period," Tech. rep., Danmarks Nationalbank Working Papers.

ABRAMS, R. (1988): "The Financial Reform in Finland." *IMF Staff Country Reports*.

ACEMOGLU, D., P. AGHION, AND F. ZILIBOTTI (2006): "Distance to Frontier, Selection, and Economic Growth," *Journal of the European Economic Association*, 4, 37–74.

ACEMOGLU, D. AND V. GUERRIERI (2008): "Capital Deepening and Nonbalanced Economic Growth," *Journal of Political Economy*, 116, 467–498.

AGUIAR, M. AND G. GOPINATH (2007): "Emerging Market Business Cycles: The Cycle Is The Trend," *Journal of political Economy*, 115, 69–102.

AIKMAN, D., O. BUSH, AND A. TAYLOR (2016a): "Monetary Versus Macroprudential Policies: Causal Impacts of Interest Rates and Credit Controls in the Era of the UK Radcliffe Report," NBER Working Papers 22380, National Bureau of Economic Research, Inc.

AIKMAN, D., O. BUSH, AND A. M. TAYLOR (2016b): "Monetary Versus Macroprudential Policies: Causal Impacts of Interest Rates and Credit Controls in the Era of the UK Radcliffe Report," Tech. rep., National Bureau of Economic Research.

AKCIGIT, U., S. T. ATES, AND G. IMPULLITTI (2018): "Innovation and Trade Policy in a Globalized World," Tech. rep., National Bureau of Economic Research.

AKHTAR, S. (2007): "Pakistan - Banking Sector Reforms : Performance and Challenges," .

ANTWI-ASARE, T. AND E. ADDISON (2000): "Financial Sector Reforms and Bank Performance in Ghana," .

BALLANTYNE, A., J. HAMBUR, I. ROBERTS, AND M. WRIGHT (2014): "Financial Reform in Australia and China," *Deepening Reform*, 251.

BANERJEE, A. V. AND E. DUFLO (2005): "Growth Theory Through the Lens of Development Economics," *Handbook of Economic Growth*, 1, 473–552.

——— (2010): "Giving Credit Where It Is Due," *Journal of Economic Perspectives*, 24, 61–80.

BANERJEE, B. (1995): "II the Transformation Path in the Czech Republic," in *Road Maps of the Transition*, International Monetary Fund.

BANK, A. D. (1999): *Rising to the Challenge in Asia: A Study of Financial Markets*, vol. 8, Asian Development Bank.

BARON, M. AND I. GREEN (2023): "The Aftermath of Credit Booms: Evidence From Credit Ceiling Removals," *Available at SSRN*.

BARON, M., E. VERNER, AND W. XIONG (2021): "Banking Crises Without Panics," *The Quarterly Journal of Economics*, 136, 51–113.

BAUMOL, W. J. (1967): "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *The American Economic Review*, 57, 415–426.

BEN-BASSAT, A. (2011): "Conflicts, Interest Groups, and Politics in Structural Reforms," *The Journal of Law and Economics*, 54, 937–952.

BENIGNO, G. AND L. FORNARO (2014): "The Financial Resource Curse," *The Scandinavian Journal of Economics*, 116, 58–86.

BENIGNO, G., L. FORNARO, AND M. WOLF (2020): "The Global Financial Resource Curse," *A*.

BERNANKE, B. S., M. GERTLER, AND S. GILCHRIST (1999): "The Financial Accelerator in a Quantitative Business Cycle Framework," *Handbook of Macroeconomics*, 1, 1341–1393.

BERTRAND, M., A. SCHOAR, AND D. THESMAR (2007): "Banking Deregulation and Industry Structure: Evidence from the French Banking Reforms of 1985," *Journal of Finance*, 62, 597–628.

BESLEY, T. AND M. GHATAK (2010): "Property rights and economic development," in *Handbook of development economics*, Elsevier, vol. 5, 4525–4595.

BICK, A., N. FUCHS-SCHÜNDELN, AND D. LAGAKOS (2018): "How Do Hours Worked Vary With Income? Cross-Country Evidence and Implications," *American Economic Review*, 108, 170–199.

BISAT, A., R. B. JOHNSTON, AND V. SUNDARARAJAN (1999): "Sequencing Financial Reform and Liberalization in Five Developing Countries," *Sequencing Financial Sector Reforms: Country Experiences and Issues, Washington, DC: International Monetary Fund*, 95–185.

BLASS, A. (2004): "The Reform of the Israeli Financial System and What Remains to Be Done," .

BONANGELINO, M. (1995): "Costa Rica : Recent Economic Developments," .

BONTADINI, F., C. CORRADO, J. HASKEL, M. IOMMI, AND C. JONA-LASINIO (2023): "EUKLEMS & INTANProd: Industry Productivity Accounts With Intangibles," *Sources of Growth and Productivity Trends: Methods and Main Measurement Challenges*.

BOPPART, T. (2014): "Structural Change and the Kaldor Facts in a Growth Model With Relative Price Effects and Non-Gorman Preferences," *Econometrica*, 82, 2167–2196.

BOUHADI, A. E. AND M. BENALI (2008): "The Moroccan Monetary and Financial Structure Reforms and Economic Agents' Behaviour," *Applied Econometrics and International Development*, 6.

BRUNNERMEIER, M., D. PALIA, K. A. SASTRY, AND C. A. SIMS (2021): "Feedbacks: Financial Markets and Economic Activity," *American Economic Review*, 111, 1845–1879.

BRUNNERMEIER, M. K. AND R. REIS (2023): *A Crash Course on Crises: Macroeconomic Concepts for Run-ups, Collapses, and Recoveries*, Princeton University Press.

BUERA, F. J. AND J. P. KABOSKI (2012): "The Rise of the Service Economy," *American Economic Review*, 102, 2540–2569.

BUERA, F. J., J. P. KABOSKI, M. MESTIERI, AND D. G. O'CONNOR (2020): "The Stable Transformation Path," Tech. rep., National Bureau of Economic Research.

BUERA, F. J., J. P. KABOSKI, R. ROGERSON, AND J. I. VIZCAINO (2022): "Skill-Biased Structural Change," *The Review of Economic Studies*, 89, 592–625.

BUERA, F. J., J. P. KABOSKI, AND Y. SHIN (2011): "Finance and Development: A Tale of Two Sectors," *American Economic Review*, 101, 1964–2002.

BUERA, F. J. AND Y. SHIN (2013): "Financial Frictions and the Persistence of History: A Quantitative Exploration," *Journal of Political Economy*, 121, 221–272.

BUSTOS, P., B. CAPRETTINI, AND J. PONTICELLI (2016): "Agricultural Productivity and Structural Transformation: Evidence From Brazil," *American Economic Review*, 106, 1320–1365.

BUSTOS, P., G. GARBER, AND J. PONTICELLI (2020): "Capital Accumulation and Structural Transformation," *The Quarterly Journal of Economics*, 135, 1037–1094.

BÜYÜKKARABACAK, B. AND N. T. VALEV (2010): "The Role of Household and Business Credit in Banking Crises," *Journal of Banking & Finance*, 34, 1247–1256.

CALLAWAY, B. AND P. H. SANT'ANNA (2021): "Difference-in-Differences With Multiple Time Periods," *Journal of Econometrics*, 225, 200–230.

CANHOTO, A. AND J. DERMINE (2003): "A Note on Banking Efficiency in Portugal, New vs. Old Banks," *Journal of Banking & Finance*, 27, 2087–2098.

CASELLI, F. (2005): "Accounting for Cross-Country Income Differences," *Handbook of Economic Growth*, 1, 679–741.

CATHERINE, S., T. CHANEY, Z. HUANG, D. SRAER, AND D. THESMAR (2022): "Quantifying Reduced-Form Evidence on Collateral Constraints," *The Journal of Finance*, 77, 2143–2181.

CAUSEVIC, F. (2003): "Financial Liberalisation and Globalisation – Impact and Effects in South-East European Countries," South East Europe series Discussion Paper 23, London School of Economics and Political Science, Centre for the Study of Global Governance, London.

CAVALCANTI, T., J. P. KABOSKI, B. MARTINS, AND C. SANTOS (2023): "Financing Costs and Development," *Working Paper*.

CHANEY, T., D. SRAER, AND D. THESMAR (2012): "The Collateral Channel: How Real Estate Shocks Affect Corporate Investment," *American Economic Review*, 102, 2381–2409.

CHARLES, K. K., E. HURST, AND M. J. NOTOWIDIGDO (2018): "Housing Booms and Busts, Labor Market Opportunities, and College Attendance," *American Economic Review*, 108, 2947–2994.

CHO, Y. J. (1989): "Finance and development: The Korean approach," *Oxford Review of Economic Policy*, 5, 88–102.

CHO, Y.-J. AND J.-K. KIM (1995): *Credit Policies and the Industrialization of Korea*, vol. 286, World Bank Publications.

CHOI, J. AND A. A. LEVCHENKO (2021): "The Long-Term Effects of Industrial Policy," Tech. rep., National Bureau of Economic Research.

CHOI, J. AND Y. SHIM (2022): "Technology Adoption and Late Industrialization," *Available at SSRN 4308957*.

COMIN, D., D. LASHKARI, AND M. MESTIERI (2021): "Structural Change With Long-Run Income and Price Effects," *Econometrica*, 89, 311–374.

Cong, L. W., H. Gao, J. Ponticelli, and X. Yang (2019): "Credit Allocation Under Economic Stimulus: Evidence from China," *The Review of Financial Studies*, 32, 3412–3460.

Coorey, S. (1992): "Financial Liberalization and Reform in Mexico," in *Mexico*, International Monetary Fund.

Copley, J. (2022): *Governing Financialization: The Tangled Politics of Financial Liberalization in Britain*, Oxford University Press.

Dadzie, J. and A. Ferrari (2019): "Deregulation, Efficiency and Competition in Developing Banking Markets: Do Reforms Really Work? A Case Study for Ghana," *Journal of Banking Regulation*, 1–13.

Dancourt, O. and R. A. J. Sotelo (2018): "The Experience of Development Banking in Peru," *Oxford Scholarship Online*.

David, J. M., H. A. Hopenhayn, and V. Venkateswaran (2016): "Information, Misallocation, and Aggregate Productivity," *The Quarterly Journal of Economics*, 131, 943–1005.

David, J. M. and V. Venkateswaran (2019): "The Sources of Capital Misallocation," *American Economic Review*, 109, 2531–67.

De Chaisemartin, C. and X. d'Haultfoeuille (2024): "Difference-in-Differences Estimators of Intertemporal Treatment Effects," *Review of Economics and Statistics*, 1–45.

De Loecker, J., P. K. Goldberg, A. K. Khandelwal, and N. Pavcnik (2016): "Prices, Markups, and Trade Reform," *Econometrica*, 84, 445–510.

Deabes, T. (2006): "Competition and Privatization of the Egyptian Banking," *Banking & Insurance*.

Dell'Ariccia, G., D. Kadyrzhanova, C. Minoiu, and L. Ratnovski (2021): "Bank Lending in the Knowledge Economy," *The Review of Financial Studies*, 34, 5036–5076.

Desai, R. M. (1995): "Financial-Market Reform in the Czech Republic, 1991-1994: The Revival of Repression?" *Institutions & Transition Economics: Macroeconomic Issues eJournal*.

Djankov, S., C. McLiesh, and A. Shleifer (2007): "Private Credit in 129 Countries," *Journal of Financial Economics*, 84, 299–329.

Döme, S., S. W. Schmitz, K. Steiner, and E. Ubl (2016): "The Changing Role of Macroprudential Policy in Austria After World War II," *Döme, S., SW Schmitz, K. Steiner, E. Ubl (2016)" the Changing Role of Macroprudential Policy in Austria After World War II", Two Hundred Years of Central Banking in Austria: Selected Topics. Monetary Policy and the Economy Q3-4/16*, 163–189.

Donovan, K., W. J. Lu, and T. Schoellman (2023): "Labor Market Dynamics and Development," *The Quarterly Journal of Economics*, 138, 2287–2325.

Driscoll, J. C. and A. C. Kraay (1998): "Consistent Covariance Matrix Estimation With Spatially Dependent Panel Data," *Review of Economics and Statistics*, 80, 549–560.

Duarte, M. and D. Restuccia (2010): "The Role of the Structural Transformation in Aggregate Productivity," *The Quarterly Journal of Economics*, 125, 129–173.

Dube, A., D. Girardi, O. Jorda, and A. M. Taylor (2023): "A Local Projections Approach to Difference-in-Differences Event Studies," Tech. rep., National Bureau of Economic Research.

Duran-Downing, L. (1996): "Peru: Recent Economic Developments," *IMF Staff Country Reports*.

Eckstein, Z. and T. Ramot-Nyska (2008): "Twenty Years of Financial Liberalisation in Israel: 1987-2007," .

Elenev, V., T. Landvoigt, and S. Van Nieuwerburgh (2021): "A Macroeconomic Model With Financially Constrained Producers and Intermediaries," *Econometrica*, 89, 1361–1418.

Englund, P. (1990): "Financial Deregulation in Sweden," *European Economic Review*, 34, 385–393.

——— (1999): "The Swedish Banking Crisis: Roots and Consequences," *Oxford Review of Economic Policy*, 15, 80–97.

Ericsson, N. R. and S. K. Sharma (1996): "Broad Money Demand and Financial Liberalization in Greece," *Empirical Economics*, 23, 417–436.

Evans, D. S. and B. Jovanovic (1989): "An Estimated Model of Entrepreneurial Choice Under Liquidity Constraints," *Journal of Political Economy*, 97, 808–827.

Falato, A., D. Kadyrzhanova, J. Sim, and R. Steri (2022): "Rising Intangible Capital, Shrinking Debt Capacity, and the US Corporate Savings Glut," *The Journal of Finance*, 77, 2799–2852.

Falato, A. and J. Sim (2014): "Why Do Innovative Firms Hold So Much Cash? Evidence From Changes in State R&D Tax Credits," *FEDS Working Paper*.

Fan, T., M. Peters, and F. Zilibotti (2023): "Growing Like India: The Unequal Effects of Service-Led Growth," *Econometrica*, 91, 1457–1494.

Favara, G. and J. Imbs (2015): "Credit Supply and the Price of Housing," *American Economic Review*, 105, 958–992.

Feng, Y. and J. Ren (2023): "Skill Bias, Financial Frictions, and Selection Into Entrepreneurship," *Journal of Development Economics*, 162, 103046.

Fund, I. M. (1995): "Tunisia: Statistical Annex," *IMF Staff Country Reports*, 1995, A001.

Gan, J. (2007): "Collateral, Debt Capacity, and Corporate Investment: Evidence From a Natural Experiment," *Journal of Financial Economics*, 85, 709–734.

Gelos, R. G. and A. M. Werner (2002): "Financial Liberalization, Credit Constraints, and Collateral: Investment in the Mexican Manufacturing Sector," *Journal of Development Economics*, 67, 1–27.

Giorcelli, M. and B. Li (2021): "Technology Transfer and Early Industrial Development: Evidence From the Sino-Soviet Alliance," Tech. rep., National Bureau of Economic Research.

Gochoco, M. S. (1991): "Financial Liberalization and Interest Rate Determination: The Case of the Philippines, 1981–1985," *Journal of Macroeconomics*, 13, 335–350.

Gollin, D. and J. P. Kaboski (2023): "New Views of Structural Transformation: Insights From Recent Literature," *Oxford Development Studies*, 1–23.

GOLLIN, D., D. LAGAKOS, AND M. E. WAUGH (2014): "The Agricultural Productivity Gap," *The Quarterly Journal of Economics*, 129, 939–993.

GOMES, J. F. (2001): "Financing Investment," *American Economic Review*, 91, 1263–1285.

GOOLSBEE, A. AND C. SYVERSON (2023): "The Strange and Awful Path of Productivity in the US Construction Sector," Tech. rep., National Bureau of Economic Research.

GOURINCHAS, P.-O. AND M. OBSTFELD (2012): "Stories of the Twentieth Century for the Twenty-First," *American Economic Journal: Macroeconomics*, 4, 226–265.

GRAHAM, J. R., M. T. LEARY, AND M. R. ROBERTS (2015): "A Century of Capital Structure: The Leveraging of Corporate America," *Journal of Financial Economics*, 118, 658–683.

GREENWALD, D. (2019): "Firm Debt Covenants and the Macroeconomy: The Interest Coverage Channel," *Working Paper*.

GREENWALD, D. L. AND A. GUREN (2021): "Do Credit Conditions Move House Prices?" Tech. rep., National Bureau of Economic Research.

GREENWOOD, J., N. GUNER, AND R. MARTO (2023): "The Great Transition: Kuznets Facts for Family-Economists," in *Handbook of the Economics of the Family*, Elsevier, vol. 1, 389–441.

GREENWOOD, J. AND B. JOVANOVIC (1990): "Financial Development, Growth, and the Distribution of Income," *Journal of Political Economy*, 98, 1076–1107.

GREENWOOD, J., J. M. SANCHEZ, AND C. WANG (2010): "Financing Development: The Role of Information Costs," *American Economic Review*, 100, 1875–1891.

GRIMES, A. (1998): "Liberalisation of Financial Markets in New Zealand," *Reserve Bank of New Zealand Bulletin*, 61.

GUPTA, P., K. KOCHHAR, AND S. PANTH (2015): "Bank Ownership and the Effects of Financial Liberalization: Evidence From India," *Indian Growth and Development Review*, 8, 109–138.

GUREN, A. M., A. MCKAY, E. NAKAMURA, AND J. STEINSSON (2021): "Housing Wealth Effects: The Long View," *The Review of Economic Studies*, 88, 669–707.

HALL, B. H. (2007): "Measuring the Returns to R&D: The Depreciation Problem," .

HALL, M. (1987): *Financial Deregulation: A Comparative Study of Australia and the United Kingdom*, Springer.

HART, O. AND J. MOORE (1994): "A Theory of Debt Based on the Inalienability of Human Capital," *The Quarterly Journal of Economics*, 109, 841–879.

HAUTCOEUR, P.-C. (1996): "Le Marché Financier Français De 1945 À Nos Jours," *Risques*, 25, 135–151.

HERRENDORF, B., R. ROGERSON, AND A. VALENTINYI (2013): "Two Perspectives on Preferences and Structural Transformation," *American Economic Review*, 103, 2752–2789.

——— (2014): "Growth and Structural Transformation," *Handbook of Economic Growth*, 2, 855–941.

HILBERS, P. L. C. (1998): "Financial Sector Reform and Monetary Policy in the Netherlands," *IMF Working Papers*, 1998, A001.

HINO, H. (1995): "Kenya : Recent Economic Developments," International Monetary Fund.

HIRANO, T. AND J. E. STIGLITZ (2024): "Credit, Land Speculation, and Long-Run Economic Growth," *arXiv Preprint arXiv:2405.05901*.

HOWES, C. (2022): "Why Does Structural Change Accelerate in Recessions? The Credit Reallocation Channel," *Journal of Financial Economics*, 144, 933–952.

HSIEH, C.-T., E. HURST, C. I. JONES, AND P. J. KLENOW (2019): "The Allocation of Talent and Us Economic Growth," *Econometrica*, 87, 1439–1474.

HUNEEUS, F. AND R. ROGERSON (2023): "Heterogeneous Paths of Industrialization," *Review of Economic Studies*, rdad066.

IACOVIELLO, M. (2005): "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle," *American Economic Review*, 95, 739–764.

IDREES, M. A., U. HAYAT, M. RADULESCU, M. S. ALAM, A. REHMAN, AND M. C. PANAIT (2022): "Measuring the Financial Liberalization Index for Pakistan," *Journal of Risk and Financial Management*.

IKHIDE, S. I. (1998): "Financial Sector Reforms and Monetary Policy in Nigeria," .

INTERNATIONAL MONETARY FUND, INDEPENDENT EVALUATION OFFICE (2005): "IMF Support to Jordan, 1989–2004," Evaluation report, International Monetary Fund.

ITSKHOKI, O. AND B. MOLL (2019): "Optimal Development Policies With Financial Frictions," *Econometrica*, 87, 139–173.

JANSEN, E. S. AND T. S. KROGH (2011): "Credit Conditions Indices: Controlling for Regime Shifts in the Norwegian Credit Market," *Economics Discussion Paper*.

JBILI, M. A. (1997): "Financial Sector Reforms in Algeria, Morocco, and Tunisia: A Preliminary Assessment," .

JI, Y., S. TENG, AND R. M. TOWNSEND (2023): "Dynamic Bank Expansion: Spatial Growth, Financial Access, and Inequality," *Journal of Political Economy*, 131, 2209–2275.

JORDÀ, Ò. (2005): "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 95, 161–182.

JORDÀ, Ò., K. KNOLL, D. KUVSHINOV, M. SCHULARICK, AND A. M. TAYLOR (2019): "The Rate of Return on Everything, 1870–2015," *The Quarterly Journal of Economics*, 134, 1225–1298.

JORDÀ, Ò., M. SCHULARICK, AND A. M. TAYLOR (2015): "Betting the House," *Journal of International Economics*, 96, S2–S18.

JORDÀ, Ò., M. SCHULARICK, AND A. M. TAYLOR (2016): "Sovereigns Versus Banks: Credit, Crises, and Consequences," *Journal of the European Economic Association*, 14, 45–79.

Jordà, Ò., M. Schularick, and A. M. Taylor (2016): "The Great Mortgaging: Housing Finance, Crises and Business Cycles," *Economic Policy*, 31, 107–152.

Jordà, Ò., M. Schularick, and A. M. Taylor (2017): "Macrofinancial History and the New Business Cycle Facts," *NBER Macroeconomics Annual*, 31, 213–263.

Juoro, U. (1993): "Financial Liberalization in Indonesia: Interest Rates, Money Market Instruments, and Bank Supervision," *Asean Economic Bulletin*, 9, 323–337.

Kasman, B. and A. Rodrigues (1991): "Financial Liberalization and Monetary Control in Japan," *Federal Reserve Bank of New York Quarterly Review*, 16, 28–46.

Kehoe, T. J., K. J. Ruhl, and J. B. Steinberg (2018): "Global Imbalances and Structural Change in the United States," *Journal of Political Economy*, 126, 761–796.

Kelly, J. and M. Everett (2004): "Financial Liberalisation and Economic Growth in Ireland," .

Kelly, S. (2014): "Light-Touch Regulation: The Rise and Fall of the Irish Banking Sector," .

Kermani, A. and Y. Ma (2023): "Asset Specificity of Nonfinancial Firms," *The Quarterly Journal of Economics*, 138, 205–264.

King, R. G. and R. Levine (1993): "Finance and Growth: Schumpeter Might Be Right," *The Quarterly Journal of Economics*, 108, 717–737.

Kirchberger, M. and K. Beirne (2023): "Concrete Thinking About Development," Tech. rep., CEPR Discussion Papers.

Kiyotaki, N., A. Michaelides, and K. Nikolov (2011): "Winners and Losers in Housing Market," *Journal of Money, Credit and Banking*, 43, 255–296.

Kiyotaki, N. and J. Moore (1997): "Credit Cycles," *Journal of Political Economy*, 105, 211–248.

Kleibergen, F. and R. Paap (2006): "Generalized Reduced Rank Tests Using the Singular Value Decomposition," *Journal of Econometrics*, 133, 97–126.

Kongsamut, P., S. Rebelo, and D. Xie (2001): "Beyond Balanced Growth," *The Review of Economic Studies*, 68, 869–882.

Kovanen, A. (1995): "Capital Account Liberalization in Finland: Analysis of Structural Changes," .

Krogh, T. S. (2010): "Credit Regulations in Norway, 1970-2008," *Statistics Norway*.

Kuznets, S. (1957): "Quantitative Aspects of the Economic Growth of Nations: II. Industrial Distribution of National Product and Labor Force," *Economic Development and Cultural Change*, 5, 1–111.

——— (1973): "Modern Economic Growth: Findings and Reflections," *The American Economic Review*, 63, 247–258.

Lagakos, D., B. Moll, T. Porzio, N. Qian, and T. Schoellman (2018): "Life Cycle Wage Growth Across Countries," *Journal of Political Economy*, 126, 797–849.

LANE, N. (forthcoming): "Manufacturing Revolutions: Industrial Policy and Industrialization in South Korea," *Quarterly Jounal of Economics*.

LAYMAN, T. A. (1987): "Monetary Policy and Financial Reform in Korea," .

LEVINE, R. (1997): "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature*, 35, 688–726.

LEWIS, P. M. AND H. STEIN (1997): "Shifting Fortunes: The Political Economy of Financial Liberalization in Nigeria," *World Development*, 25, 5–22.

LEWIS, W. A. (1954): "Economic Development With Unlimited Supplies of Labour," *The Manchester School*, 22, 139–191.

LIAN, C. AND Y. MA (2021): "Anatomy of Corporate Borrowing Constraints," *The Quarterly Journal of Economics*, 136, 229–291.

LIU, E. (2019): "Industrial Policies in Production Networks," *The Quarterly Journal of Economics*, 134, 1883–1948.

LIU, Z., P. WANG, AND T. ZHA (2013): "Land-Price Dynamics and Macroeconomic Fluctuations," *Econometrica*, 81, 1147–1184.

LUCAS, R. E. (1988): "On the Mechanics of Economic Development," *Journal of Monetary Economics*, 22, 3–42.

MA, Y. (2022): "Specialization in a Knowledge Economy," *Available at SSRN 4052990*.

MANYSHEVA, K. (2022): "Land Property Rights, Financial Frictions, and Resource Allocation in Developing Countries," Tech. rep., Working Paper.

MARSTON, D. (1995): "Financial Sector Reform in Jamaica During 1985-1992: Possible Lessons for the Caribbean," *Banking & Financial Institutions*.

MATRAY, A., K. MÜLLER, C. XU, AND P. KABIR (2024): "EXIM's Exit: The Real Effects of Trade Financing by Export Credit Agencies," Working Paper 32019, National Bureau of Economic Research.

MATSUYAMA, K. (1992): "Agricultural Productivity, Comparative Advantage, and Economic Growth," *Journal of Economic Theory*, 58, 317–334.

——— (2007): "Credit Traps and Credit Cycles," *American Economic Review*, 97, 503–516.

MCKINNON, R. I. (1973): *Money and Capital in Economic Development*, Brookings Institution Press.

MIAN, A. AND A. SUFI (2022): "Credit Supply and Housing Speculation," *The Review of Financial Studies*, 35, 680–719.

MIAN, A., A. SUFI, AND E. VERNER (2017): "Household Debt and Business Cycles Worldwide," *The Quarterly Journal of Economics*, 132, 1755–1817.

——— (2020): "How Does Credit Supply Expansion Affect the Real Economy? The Productive Capacity and Household Demand Channels," *The Journal of Finance*, 75, 949–994.

MIDRIGAN, V. AND D. Y. XU (2014): "Finance and Misallocation: Evidence From Plant-Level Data," *American Economic Review*, 104, 422–58.

MOLL, B. (2014): "Productivity Losses From Financial Frictions: Can Self-Financing Undo Capital Misallocation?" *American Economic Review*, 104, 3186–3221.

MONNET, E. (2014): "Monetary Policy Without Interest Rates: Evidence From France's Golden Age (1948 to 1973) Using a Narrative Approach," *American Economic Journal: Macroeconomics*, 6, 137–169.

——— (2018): *Controlling Credit: Central Banking and the Planned Economy in Postwar France, 1948-1973*, Studies in Macroeconomic History, Cambridge University Press.

MONTIEL OLEA, J. L. AND M. PLAGBORG-MØLLER (2021): "Local Projection Inference Is Simpler and More Robust Than You Think," *Econometrica*, 89, 1789–1823.

MÜLLER, K. AND E. VERNER (2024): "Credit Allocation and Macroeconomic Fluctuations," *Review of Economic Studies*, 91, 3645–3676.

NACEUR, S. B., S. AYARI, AND A. OMRI (2006): "Does Financial Liberalization Spur Tunisian Banking Industry Efficiency?" *SPGMI: Capital IQ Data (Topic)*.

NAKAMURA, E. AND J. STEINSSON (2018): "Identification in Macroeconomics," *Journal of Economic Perspectives*, 32, 59–86.

NEEDHAM, D. (2014): *UK Monetary Policy From Devaluation to Thatcher, 1967-82*, Springer.

NGAI, L. R. AND C. A. PISSARIDES (2007): "Structural Change in a Multisector Model of Growth," *American Economic Review*, 97, 429–443.

ODHIAMBO, N. M. (2006): "Financial Liberalisation and Savings in South Africa: An Empirical Analysis," .

ODHIAMBO, N. M. ET AL. (2010): "Interest Rate Reforms and Credit Allocation in Tanzania: An Application of the ARDL Bounds Testing Approach," *International Business & Economics Research Journal (IBER)*, 9.

PAGOULATOS, G. (2014): "State-Driven in Boom and in Bust: Structural Limitations of Financial Power in Greece," *Government and Opposition*, 49, 452 – 482.

PALMER, C. J. (2022): "An IV Hazard Model of Loan Default With an Application to Subprime Mortgage Cohorts," *Working Paper*.

PARK, W. A. (1996): "Financial Liberalization: The Korean Experience," .

PINTO, M. (1996): "Changing Financial Systems in Small Open Economies: The Portuguese Case," *Bank for International Settlements),'changing Financial Systems in Small Open Economies', Policy Paper*, 96–113.

PORZIO, T., F. ROSSI, AND G. V. SANTANGELO (2021): "The Human Side of Structural Transformation," *National Bureau of Economic Research Working Paper*.

Poshakwale, S. S. and B. Qian (2011): "Competitiveness and Efficiency of the Banking Sector and Economic Growth in Egypt," *African Development Review*, 23, 99–120.

Rajan, R. G. and L. Zingales (1998): "Financial Dependence and Growth," *The American Economic Review*, 88, 559–586.

Ramey, V. A. (2016): "Macroeconomic Shocks and Their Propagation," *Handbook of Macroeconomics*, 2, 71–162.

Ramey, V. A. and S. Zubairy (2018): "Government Spending Multipliers in Good Times and in Bad: Evidence From Us Historical Data," *Journal of Political Economy*, 126, 850–901.

Rampini, A. A. and S. Viswanathan (2013): "Collateral and Capital Structure," *Journal of Financial Economics*, 109, 466–492.

Rattray, A. (2007): "Banking Crisis and Reform: The Case of Jamaica," *Journal of Financial Crime*, 14, 279–298.

Reddy, Y. V. (2002): "Monetary and Financial Sector Reforms in India: A Practitioners Perspective," .

Reis, R. (2013): "The Portuguese Slump and Crash and the Euro Crisis," *Brookings Papers on Economic Activity*, 1, 143–210.

Riddick, L. A. and T. M. Whited (2009): "The Corporate Propensity to Save," *The Journal of Finance*, 64, 1729–1766.

Ritzberger-Grünwald, D. (2006): "Happy, Sad and Open Endings: A Comparison of Credit Growth in CEECs With Past Experiences and Ongoing Developments in Austria, Finland and Spain," *Financial Development, Integration and Stability: Evidence From Central, Eastern and South-Eastern Europe*, 207.

Robin, I. A. (2015): "Financial Deregulation, Banking Efficiency and Productivity Growth: Empirical Evidence From Bangladesh," Ph.D. thesis, Curtin University.

Rodrik, D. (2013): "Unconditional Convergence in Manufacturing," *The Quarterly Journal of Economics*, 128, 165–204.

——— (2016): "Premature Deindustrialization," *Journal of Economic Growth*, 21, 1–33.

Rogoff, K. and Y. Yang (2021): "Has China's housing production peaked?" *China & World Economy*, 29, 1–31.

Rybczynski, T. M. (1955): "Factor Endowment and Relative Commodity Prices," *Economica*, 22, 336–341.

Saiz, A. (2010): "The Geographic Determinants of Housing Supply," *The Quarterly Journal of Economics*, 125, 1253–1296.

Schularick, M. and A. M. Taylor (2012): "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008," *American Economic Review*, 102, 1029–1061.

SCHUMPETER, J. A. (1911): *The Theory of Economic Development*, Leipzig: Duncker & Humblot, translated by Redvers Opie, 1934, Harvard University Press.

SERFATY, C. (2024): *Histoire Économique De La France, De La Gaule À Nos Jours*, Paris: Passés Composés.

SHAW, E. S. (1973): *Financial Deepening in Economic Development*, New York: Oxford University Press.

SHIJAKU, G. AND I. KALLUCI (2013): "Determinants of Bank Credit to the Private Sector: The Case of Albania," *Bank of Albania Working Paper*.

SHLEIFER, A. AND R. W. VISHNY (1992): "Liquidation Values and Debt Capacity: A Market Equilibrium Approach," *The Journal of Finance*, 47, 1343–1366.

SIRIVEDHIN, T. (1998): "Financial Reform and the Monetary Transmission Mechanism: The Case of Thailand," *The Transmission of Monetary Policy in Emerging Market Economies*.

SOLOW, R. M. (1956): "A Contribution to the Theory of Economic Growth," *The Quarterly Journal of Economics*, 70, 65–94.

SONG, Z., K. STORESLETTEN, AND F. ZILIBOTTI (2011): "Growing Like China," *American Economic Review*, 101, 196–233.

STUDWELL, J. (2013): *How Asia Works: Success and Failure in the World's Most Dynamic Region*, Open Road+ Grove/Atlantic.

SUN, L. AND S. ABRAHAM (2021): "Estimating Dynamic Treatment Effects in Event Studies With Heterogeneous Treatment Effects," *Journal of Econometrics*, 225, 175–199.

SUNDARARAJAN, V. AND L. E. MOLHO (1988): "Financial Reform and Monetary Control in Indonesia," in *Social Science Research Network*.

SWAN, T. W. (1956): "Economic Growth and Capital Accumulation," *Economic Record*, 32, 334–361.

TEMU, A. E. AND J. M. DUE (2000): "The Business Environment in Tanzania After Socialism: Challenges of Reforming Banks, Parastatals, Taxation and the Civil Service," *Journal of Modern African Studies*, 38, 683–712.

TIMMER, M. P., E. DIETZENBACHER, B. LOS, R. STEHRER, AND G. J. DE VRIES (2015): "An Illustrated User Guide to the World Input–Output Database: The Case of Global Automotive Production," *Review of International Economics*, 23, 575–605.

TURNER, A. (2016): *Between Debt and the Devil: Money, Credit, and Fixing Global Finance*, Princeton University Press.

UDDIN, S. M. S. AND Y. SUZUKI (2011): "Financial Reform, Ownership and Performance in Banking Industry: The Case of Bangladesh," *International Journal of Biometrics*, 6, 28.

VITTAS, D. AND Y. J. CHO (1996): "Credit Policies: Lessons From Japan and Korea," *The World Bank Research Observer*, 11, 277–298.

VITTAS, D. AND A. KAWAURA (1995): *Policy-Based Finance, Financial Regulation, and Financial Sector Development in Japan*, vol. 1443, World Bank Publications.

WACZIARG, R. AND K. H. WELCH (2008): "Trade Liberalization and Growth: New Evidence," *The World Wank Economic Review*, 22, 187–231.

WALSH, C. E. (1988): "Financial Deregulation and Monetary Policy in New Zealand," in *Monetary Policy in Pacific Basin Countries: Papers Presented at a Conference Sponsored by the Federal Reserve Bank of San Francisco*, Springer, 279–301.

WARNER, A. AND J. SACHS (1995): "Economic Reform and the Process of Global Integration," *Brookings Papers on Economic Activity*, 1, 1–118.

WERNER, R. A. (2002): "A Reconsideration of the Rationale for Bank-Centered Economic Systems and the Effectiveness of Directed Credit Policies in the Light of Japanese Evidence," *Japanese Economy*, 30, 3–45.

——— (2003): *Princes of the Yen: Japan's Central Bankers and the Transformation of the Economy*, New York: M.E. Sharpe.

——— (2005): *The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession*, New York: Palgrave Macmillan.

WILLIAMSON, J. AND M. MAHAR (1998): *A Survey of Financial Liberalization*, no. 211 in Essays in International Finance, International Finance Section, Department of Economics, Princeton University.

WILLIAMSON, J. ET AL. (1990): *Latin American Adjustment: How Much Has Happened?*, vol. 4, Institute for International Economics Washington, DC.

A Proofs, Derivations, and Extensions of the Model

The structure of this section is as follows: Appendix A.1 provides the proofs and derivation in a more general model, incorporating both cash-flow and asset-based constraints (collateral constraints). The benchmark model in Section 3 is thus a spacial case. Appendix A.2 discusses the assumption of our baseline model. Appendix A.3 further provides four auxiliary results: some of them are generalized results for the model, while others provides support for calibration strategy. Appendix A.4 provides an extended model with intangible assets, elaborating the channel tested in Section 6. Appendix A.5 shows that our main result is robust under the non-nomothetic preference with a mild assumption.

A.1 Proofs for Propositions in the Benchmark Model

In this section, we prove the main result in our benchmark model in Section 3.

A.1.1 Set Up

Before the proof, we consider a more general setup, allowing the entrepreneur to raise debt via cash flow-based and asset-based financing, motivated by Lian and Ma (2021). In particular, she faces the sector-specific financial constraint

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

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), which degenerates to our baseline model. This specification parsimoniously models a costly contract enforcement scenario.

A.1.2 Equilibrium Conditions

Savers The Lagrangian of the optimization problem for saver 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_t^j is the Lagrangian multiplier for the flow of fund constraint for savers, $v(c,h)$ is the instantaneous utility function with elasticity of substitution η. The FOCs with respect to c_t^S, h_t^S are

$$v_c(c_t^S, h_t^S) = \phi_t^S, \quad v_h(c_t^S, h_t^S) = \phi_t^S q_t, \quad \Rightarrow \frac{c_t^S}{h_t^S} = \left[\frac{q}{s}\right]^\eta \tag{A.2}$$

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

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

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

$$\begin{aligned}\mathcal{L}^j = \sum_{t=0}^{\infty} \beta^t \Big\{ & v(c_t^j, h_t^j) + \phi_t^j \Big[p_t^j z_t^j (l_t^j)^{\alpha^j} + \frac{d_{t+1}^j}{1+r_t} - c_t^j - q_t h_t^j - q_t \left[l_{t+1}^j - (1-\delta) l_t^j \right] - d_t^j \Big] \\ & + \theta_t^{\lambda^j} (\lambda_t^j q_{t+1} l_{t+1}^j - d_{t+1}^{\lambda^j}) + \theta_t^{\chi^j} (\chi_t^j p_t^j z_t^j (l_t^j)^{\alpha^j} - d_{t+1}^{\chi^j}) \Big\},\end{aligned} \tag{A.4}$$

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

$$\frac{\phi_t^j}{1+r_t} - \beta \phi_{t+1}^j - \theta_t^{\lambda^j} = 0, \quad \frac{\phi_t^j}{1+r_t} - \beta \phi_{t+1}^j - \theta_t^{\chi^j} = 0 \tag{A.5}$$

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 entrepreneur, so they share the same shadow price.

The FOC for collateral usage l_t^j is written as

$$\alpha^j \beta \phi_{t+1}^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha^j - 1} + \theta_t^j \lambda_t^j q_{t+1} + \theta_{t+1}^j \alpha^j \beta \chi_t^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha^j - 1} = \phi_t^j q_t - \beta(1-\delta)\phi_{t+1}^j q_{t+1}. \tag{A.6}$$

Equation (A.6) is intuitive: the left-hand side captures the marginal benefit of increasing one unit of collateral for period $t+1$: she gains the discounted marginal production of collateral in the next period (the first term) and benefits from the marginal value of slackening the collateral constraint for higher debt capacity (the second term). The right-hand side captures the marginal cost of that since the investment of collateral for tomorrow suppresses income today, and reducing consumption today (the first term) in exchange for that tomorrow (the second term).

The consumption side is the similar as the savers, by changing the index from S to j in Equation A.2.

A.1.3 Steady State Equilibrium

We summarize the main results of our model at the steady state equilibrium in this section.

Credit-Constrained Economy Combining Equations (A.3) and (A.5), we have, at the steady states,

$$\theta^j = \phi^j \left(\frac{1}{1+r} - \beta \right) = \phi^j \left(\beta^S - \beta \right) > 0, \text{ and } d^j = \lambda^j q l^j + \chi^j p^j y^j \tag{A.7}$$

The financial constraints are binding for both sectors. Intuitively, the savers are more patient $\beta^S > \beta$, who provides the debt elastically with price $\beta^S/\beta - 1$.

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

$$\frac{c^i}{h^i} = \left[\frac{q}{s} \right]^\eta \Rightarrow \frac{c}{h} = \left[\frac{q}{s} \right]^\eta, \tag{A.8}$$

Equation A.8 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 increment implies less than a one percent increment 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 (A.6) at the steady state, we have

$$l^E = (\alpha^E z^E \widetilde{\lambda}^E \widetilde{\chi}^E)^{\frac{1}{1-\alpha^E}}, \quad l^M = (\alpha^M z^M \widetilde{\lambda}^M \widetilde{\chi}^M / q)^{\frac{1}{1-\alpha^M}}, \tag{A.9}$$

where

$$\widetilde{\lambda}^j = \frac{\beta}{1 - \beta(1-\delta) - \lambda^j(\beta^S - \beta)}, \quad \widetilde{\chi}^j = 1 + \chi^j(\beta^S - \beta)$$

One can easily verify that when $\chi^j = 0$, that is $\widetilde{\chi}^j = 1$, Equation A.9 degenerates 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

$$z^M (l^M)^{\alpha^M} = c, \quad z^E (l^E)^{\alpha^E} - \delta l^E = h + \delta l^M \tag{A.10}$$

Combining Equations (A.8) and (A.10), we have

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

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 $\widetilde{\zeta}^H \equiv s^\eta z^M (\widetilde{\zeta}^M)^{\alpha^M}$. It is easy to verify that $h(q)$ decreases with q. We obtain Equation (7) in Section 3.2 by substituting $h(q)$ and $l^M(q)$ into the market clearing condition for real estate good.

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 real estate sector, $z^E(l^E)^{\alpha^E} - \delta l^E$ is positive by imposing the following assumption,

Assumption A.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*

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

The following proposition defines the steady state equilibrium.

Proposition A.1 (Steady State Equilibrium)**.** *Under Assumption A.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* (A.8), (A.7), (A.7), (4)*;*
2. *market clearing conditions* (A.10) *hold;*
3. *all endogenous variables are constant over time.*

Proof. Notice that when $q \to 0$, the right-hand side of Equation (7) approaches to $+\infty$ and when $q \to \infty$, it approaches to 0. There exists a unique collateral price q clears the market. ■

A.1.4 Proof of Proposition 1

Proof. There are three parts in this proof.

1. With $\widetilde{\lambda}^j$ increasing with λ^j, it is easy to obtain

$$\frac{\partial \widetilde{\zeta}^j}{\partial z^j} > 0, \quad \frac{\partial \widetilde{\zeta}^j}{\partial \lambda^j} > 0, \quad \frac{\partial \widetilde{\zeta}^H}{\partial z^M} > 0, \quad \frac{\partial \widetilde{\zeta}^H}{\partial \lambda^M} > 0$$

   And thus, increasing z^M or λ^M increases the right hand side of Equation (7), 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 (7), holding all else equal. To make the equation balance, q should increase.

2. The proof for elasticity ε_{q,z^M} is intuitive. First, we can rewrite the Equation (7) as

$$z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E = (\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M)(z^M/q)^{\frac{1}{1-\alpha^M}} \tag{A.11}$$

   where $\widetilde{\vartheta}^H = s^\eta(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}, \widetilde{\vartheta}^M = \delta(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)^{\frac{1}{1-\alpha^M}}$. With the simple case that $\eta = 1$, one can write

$$\frac{z^M}{q} = \left[\frac{z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E}{\widetilde{\vartheta}^H + \widetilde{\vartheta}^M}\right]^{1-\alpha^M} \tag{A.12}$$

   where the right hand side is invariant with either z^M or q. Thus, the elasticity $\varepsilon_{q,z^M} = 1$.

   For other case when $\eta \neq 1$, we prove by using implicit function theorem. We construct the following function of q and z^M from Equation (A.11),

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

   Our first goal is to compute $\frac{\partial q}{\partial z^M}$, Notice that

$$\frac{\partial F(q,z^M)}{\partial q} = \left(z^M\right)^{\frac{1}{1-\alpha^M}}\left[\left(\eta + \frac{\alpha^M}{1-\alpha^M}\right)\widetilde{\vartheta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}-1} + \left(\frac{1}{1-\alpha^M}\right)\widetilde{\vartheta}^M q^{-\frac{1}{1-\alpha^M}-1}\right] \tag{A.13}$$

$$\frac{\partial F(q,z^M)}{\partial z^M} = \frac{1}{1-\alpha^M}\left(z^M\right)^{\frac{1}{1-\alpha^M}-1}\left(\widetilde{\vartheta}^H q^{-\eta-\frac{\alpha^M}{1-\alpha^M}} + \widetilde{\vartheta}^M q^{-\frac{1}{1-\alpha^M}}\right) \tag{A.14}$$

By implicit function theorem, we have

$$\varepsilon_{q,z^M} \equiv \frac{z^M}{q}\frac{\partial q}{\partial z^M} = -\frac{z^M}{q}\frac{\partial F(q,z^M)/\partial z^M}{\partial F(q,z^M)/\partial q}$$

Combining with Equations (A.13), (A.14), we get

$$\varepsilon_{q,z^M} = \frac{\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M}{[(1-\alpha^M)\eta + \alpha^M]\,\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M} \Rightarrow \frac{1}{\varepsilon_{q,z^M}} = 1 - (1-\alpha^M)(1-\eta)\underbrace{\frac{\widetilde{\vartheta}^H q^{1-\eta}}{\widetilde{\vartheta}^H q^{1-\eta} + \widetilde{\vartheta}^M}}_{>0} \tag{A.15}$$

Since $\alpha^M \in (0,1)$, when $\eta = 1$, $\varepsilon_{q,z^M} = 1$; when $\eta < 1$, $\varepsilon_{q,z^M} > 1$, and when $\eta > 1$, $\varepsilon_{q,z^M} < 1$.

3. The partial derivative of left-hand side 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 $\alpha^E < 1$. We set this partial derivative to zero,

$$(\widetilde{\zeta}^E)^{1-\alpha^E} = \frac{\alpha^E z^E}{\delta} \Rightarrow \delta\widetilde{\lambda}^E\widetilde{\chi}^E = 1$$

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.

∎

A.1.5 Proof of Proposition 3

We start with proving Proposition 3, which serves as a premise to prove Proposition 2.

Proof. We can rewrite Equation (A.6) as

$$\alpha^j\widetilde{\lambda}^j\widetilde{\chi}^j p^j y^j = ql^j \tag{A.16}$$

that is, at the steady state, the value of collateral ql^j is proportionate to the revenue of the firm $p^j y^j$. By definition, we have

$$\kappa^j \equiv \frac{d^\lambda}{d} = \frac{\lambda^j q^j l^l + \chi^j p^j y^j}{p^j y^j} = \lambda^j\frac{ql^j}{p^j y^j} + \chi^j = \alpha^j\lambda^j\widetilde{\lambda}^j\widetilde{\chi}^j + \chi^j$$

Correspondingly, the mortgage share is given by

$$\omega^j = \frac{\lambda^j q^j l^j}{d^j} = \frac{\alpha^j \lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j}{\kappa^j}$$

A final remark on the special case when $\chi^j = 0$, we have $\kappa^j = \alpha^j \lambda^j \widetilde{\lambda}^j$, the result in Proposition 3. In this case, the mortgage share is 1 by definition. ■

A.1.6 Proof of Propositions 2

Proof. There are two parts in this proof.

1. By Equation (A.16), we have

$$d^j = \kappa^j p^j y^j = \underbrace{\left(\lambda^j + \frac{\chi^j}{\alpha^j \widetilde{\lambda}^j \widetilde{\chi}^j}\right)}_{\mathbf{\Lambda}^j_{d,1}} q l^j.$$

   By Equation (4), we have

$$\frac{l^E}{l^M} = \frac{(\alpha^E z^E \widetilde{\lambda}^E \widetilde{\chi}^E)^{\frac{1}{1-\alpha^E}}}{(\alpha^M z^M \widetilde{\lambda}^M \widetilde{\chi}^M)^{\frac{1}{1-\alpha^M}}} q^{\frac{1}{1-\alpha^M}} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M} \underbrace{\frac{(\alpha^E \widetilde{\lambda}^E \widetilde{\chi}^E)^{\frac{1}{1-\alpha^E}}}{(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)^{\frac{1}{1-\alpha^M}}}}_{(\mathbf{\Lambda}^E_y)^{1/\alpha^E}/(\mathbf{\Lambda}^M_d)^{1/\alpha^M}} \mathbf{Q} \propto \left(\frac{q}{z^M}\right)^{\frac{1}{1-\alpha^M}}. \quad \text{(A.17)}$$

   Due to $\mathbf{\Lambda}^j_d = \mathbf{\Lambda}^j_{d,1}(\mathbf{\Lambda}^j_y)^{1/\alpha^j}$, we can decompose the credit ratio as Equation (6). Similarly, we can write the nominal output ratio as

$$\frac{qy^E}{y^M} = \frac{z^E}{z^M}\frac{(l^E)^{\alpha^E}}{(l^M)^{\alpha^M}} q = \underbrace{\frac{z^E}{z^M}\frac{(z^E)^{\frac{\alpha^E}{1-\alpha^E}}}{(z^M)^{\frac{\alpha^M}{1-\alpha^M}}}}_{\mathbf{Z}^E/\mathbf{Z}^M} \underbrace{\frac{(\alpha^E \widetilde{\lambda}^E \widetilde{\chi}^E)^{\frac{\alpha^E}{1-\alpha^E}}}{(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}}}_{\mathbf{\Gamma}^E_y/\mathbf{\Gamma}^M_y} \underbrace{q^{\frac{\alpha^M}{1-\alpha^M}} q}_{\mathbf{Q}} \propto \left(\frac{q}{z^M}\right)^{\frac{1}{1-\alpha^M}}, \quad \text{(A.18)}$$

   which is exactly the decomposition result in Equation (6). Notice that both shares is proportionate to $(q/z^M)^{\frac{1}{1-\alpha^M}}$, by Proposition 1, we complete the proof of Proposition 2.

2. Consider the case when $\eta = 1$. We can write nominal output ratio as

$$\frac{qy^E}{y^M} = \frac{y^E}{\frac{z^M}{q}\left(\frac{\alpha^M z^M \widetilde{\lambda}^M \widetilde{\chi}^M}{q}\right)^{\frac{\alpha^M}{1-\alpha^M}}} = \frac{y^E}{\left(\alpha^M \widetilde{\lambda}^M \widetilde{\chi}^M\right)^{\frac{\alpha^M}{1-\alpha^M}}}\left(\frac{q}{z^M}\right)^{\frac{1}{1-\alpha^M}}$$

Substituting q/z^M from Equation (A.12) and rearranging, we have

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

which increases with λ^E, λ^M, χ^M and χ^E.

By Proposition 3, the credit to output ratio κ^j increases with λ^j and χ^j. So the credit ratio increases with λ^E and χ^E.

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

We don't have definite results for how credit share changes with λ^M and χ^M. Since less binding financial constraint in manufacturing sector, on one hand, increases the sectoral debt capacity, measured by credit to output ratio; on the other hand, increases the collateral price and encourages the distribution of nominal output from the manufacturing sector.

Under two special cases that there are only one type of borrowing, either asset-based or cash flow-based borrowing, the credit ratio decreases when financial constraint in manufacturing sector is relaxed.

(a) When $\chi^j = 0$ for all j, that is $\widetilde{\chi}^j = 1$, we have

$$\frac{d^E}{d^M} = \frac{\lambda^E}{\lambda^M}\frac{\frac{s}{\alpha^M \widetilde{\lambda}^M} + \delta}{\frac{1}{\alpha^E \widetilde{\lambda}^E} - \delta},$$

which increases with λ^E and decreases with λ^M.

(b) When $\lambda^j = 0$, that is $\widetilde{\lambda}^j = \frac{\beta}{1-\beta(1-\delta)}$, we have

$$\frac{d^E}{d^M} = \frac{\chi^E}{\chi^M}\frac{s + \frac{\beta\delta}{1-\beta(1-\delta)}\alpha^M}{1 - \frac{\beta\delta}{1-\beta(1-\delta)}\alpha^E},$$

which increases with χ^E and decreases with χ^M.

$\blacksquare$

A.2 Model Discussions

Here we provide some discussion for our baseline model.

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 A.8, the FOC of h solely depends on the current period 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. In contrast, an alternative model involving agents investing in residential housing is complicated by the redistribution of wealth among agents, which is not the main focus of this paper.

We want to emphasize that our assumption for residential service flow *does not affect* the decomposition identity in Equations (5) and (6). This assumption will only affects the equilibrium collateral price without changing other components. Unfortunately, we don't have an analytical comparative statics in Propositions 1 and 2 anymore, because we need to figure out how an increase of z^M, for example, affects $\{c^i\}_{i\in\{S,M,E\}}$ *separately*. After figuring out this, we can know how it changes the aggregate consumption c and h. However, we want to stress that the quantitative difference with or without this assumption is negligible.

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. We formalize this micro-foundation in Proposition A.5.

Steady States Equilibrium Instead of Generalized Balanced Growth Path (GBGP) Moreover, 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 a 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 empirical results, following the common approach in macro-development literature.

Non-Homothetic Preference Lastly, we also include an extension with non-homothetic preference as Kongsamut et al. (2001), which contributes substantially to the structural change in the real economy, as in Herrendorf et al. (2013). We show that under some parametric restrictions, for example, there is no substance level for manufacturing good consumption, our main results still hold. Intuitively, the demand side modification, as shown in Proposition A.9, only alters the level of collateral price, but does not affect ε_{q,z^M}.

A.3 Proof of Auxiliary Results

In this section, we prove several additional results.

Proposition A.2 shows how change of preference parameter η affect the endogenous variable of collateral price q, credit share d^E/d^M and nominal output share qy^E/y^M. This result provides some foundation for our calibration strategy to match collateral price and nominal output share to calibrate η.

Proposition A.3 shows that, under a more general setting, the credit to output ratio only depends on (i) the sum of shares of collateralized inputs, and (ii) parameters of collateral constraints (and their monotonic transformations).

Proposition A.4 shows how we can use the sectoral credit to production ratio κ^j and the mortgage share ω^j to uniquely identify the values of λ^j and χ^j in financial constraints. Not only does this result provide the intuition on how different types of borrowing affect these two sectoral moments, but more importantly, this result theoretically shows the validity of identifying λ^j and χ^j in Section 5.1 by using these two carefully chosen moments (Nakamura and Steinsson, 2018). This pair of moments uniquely identifies these two parameters collectively, following the similar fashion in David et al. (2016) and David and Venkateswaran (2019).

Proposition A.5 provides a tractable framework to show s can be interpreted as the productivity of the firm converting the residential housing stock into service.

Proposition A.2 (Impact of s and η on Collateral Price, Credit and Nominal Output Share)**.** *Collateral price q, credit ratio d^E/d^M, nominal output ratio qy^E/y^M increases with s, holding all other fixed.*

Proof. The proof is straightforward.

1. Collateral price: proof for s is in Proposition 1.

2. Credit ratio: recall that s affects the credit share only through the term $f(s,\eta) = s^{\eta}q(s,\eta)^{1-\eta}$. We again rewrite the market clearing condition (A.11) into

$$z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E = \left[(\alpha^M\widetilde{\lambda}^M\widetilde{\chi}^M)^{\frac{\alpha^M}{1-\alpha^M}}\underbrace{s^{\eta}q^{1-\eta}}_{f(s,\eta)} + \widetilde{\vartheta}^M\right](z^M)^{\frac{1}{1-\alpha^M}}q^{-\frac{1}{1-\alpha^M}} \tag{A.19}$$

An increase of s increases q from part 1, which implies the term in the bracket should increase to balance the equation, which implies $f(s,\eta)$ increases with s.

3. Nominal output ratio: the result for nominal output ratio is directly from Proposition 3 and part 2.

■

Proposition A.3 (Sectoral Credit to Value Added Generalization)**.** *If the following three assumptions hold,*

1. *The production function is*

$$y(\mathbf{l},\mathbf{m}) = zm(\mathbf{m})\prod_{k=1}^{K} l_k^{\alpha_k},$$

where $\mathbf{l}$ is a K dimensional vector capturing all collateralized input, l_k is the k-th type of collateralized capital, $\mathbf{m}$ is a vector of other inputs, and m is an arbitrary differentiable function;

2. *All collateralized capital share the same depreciation rate δ;*

3. *The collateral constraint, at the steady state, follows*

$$d = \lambda\sum_{k=1}^{K} p_k l_k + \chi p y$$

then the credit to output ratio is given by

$$\kappa = \left(\sum_{k=1}^{K}\alpha_k\right)\lambda\widetilde{\lambda}\widetilde{\chi} + \chi \tag{A.20}$$

Notice that in our benchmark model is a special case where $\mathbf{m} = 1$, and $K = 1$. The proof, at heart, follows the same intuition.

Proof. The FOC for the k-th collateral capital is

$$\alpha^k p \frac{y(\mathbf{l},\mathbf{m})}{l_k} = \frac{p_k}{\widetilde{\lambda}\widetilde{\chi}} \Rightarrow \alpha^k \widetilde{\lambda}\widetilde{\chi} p y(\mathbf{l},\mathbf{m}) = p_k l_k, \tag{A.21}$$

where p is the price of good produced in that sector, and $\widetilde{\lambda}$ and $\widetilde{\chi}$ are the same expression as in the benchmark model. By definition,

$$\kappa = \frac{d}{py(\mathbf{l},\mathbf{m})} = \frac{\lambda \sum_{k=1}^{K} p_k l_k + \chi p y}{py(\mathbf{l},\mathbf{m})} = \left(\sum_{k=1}^{K} \alpha_k\right) \lambda \widetilde{\lambda}\widetilde{\chi} + \chi \tag{A.22}$$

■

Proposition A.4 (Identification of λ^j and χ^j)**.** *Under the assumptions in Proposition A.3, the financial constraint parameters λ^j and χ^j are uniquely identified by the moments κ^j and ω^j.*

Proof. We denote the real estate collateral input share as α_l^j. Since $\widetilde{\lambda}^j$ increases with λ^j, and $\widetilde{\chi}^j$ increases with χ^j, we have

$$\frac{\partial \kappa^j}{\partial \lambda^j} > 0, \quad \frac{\partial \kappa^j}{\partial \chi^j} > 0 \tag{A.23}$$

In other words, slackening the financial constraint by increasing λ^j or χ^j leads to a higher credit to output ratio.

Next, we can rewrite the sectoral mortgage share as

$$\omega^j = \frac{\alpha_l^j \lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j}{\left(\sum_{k=1}^{K} \alpha_k^j \lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j\right) + \chi^j} = \frac{\alpha_l^j}{\left(\sum_{k=1}^{K} \alpha_k^j\right) + \frac{\chi^j}{\lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j}} = \frac{\alpha_l^j}{\left(\sum_{k=1}^{K} \alpha_k^j\right) + \left[\lambda^j \widetilde{\lambda}^j \left(\frac{1}{\chi^j} + \beta^S - \beta\right)\right]^{-1}}$$

which implies

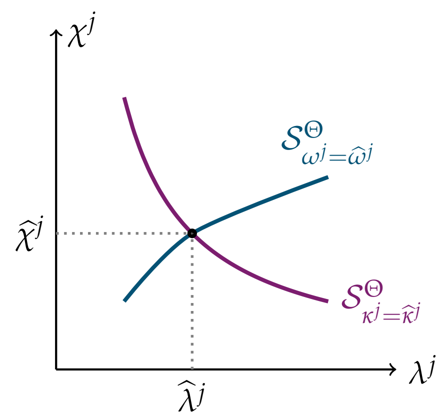
$$\frac{\partial \omega^j}{\partial \lambda^j} > 0, \quad \frac{\partial \omega^j}{\partial \chi^j} < 0 \tag{A.24}$$

As in David and Venkateswaran (2019), we introduce the notion of *isomoment* curve, a level set tracing out combinations of the two parameters that give rise to a given value of the relevant moment, holding the other parameters fixed. Mathematically, the isomoment curve for moment κ^j with estimated value $\widehat{\kappa}^j$ and for moment ω^j with estimated value $\widehat{\omega}^j$ are defined as

$$\mathcal{S}^{\Theta}_{\kappa^j = \widehat{\kappa}^j} \equiv \left\{(\lambda^j, \chi^j) : \kappa^j(\lambda^j, \chi^j; \Theta_-) = \widehat{\kappa}^j\right\}, \quad \mathcal{S}^{\Theta}_{\omega^j = \widehat{\omega}^j} \equiv \left\{(\lambda^j, \chi^j) : \omega^j(\lambda^j, \chi^j; \Theta_-) = \widehat{\omega}^j\right\},$$

where $\Theta_{-} \equiv \Theta \setminus \{\lambda^j, \chi^j\}$, Θ is a set of parameters in the model.

Figure A.1: Isomoment Curve of κ^j and ω^j



Note: This figure plots the isomoment curves of κ^j and ω^j with estimated value $\widehat{\kappa^j}$ and $\widehat{\omega}^j$. The former one is downward sloping in purple, and the latter one is upward sloping in dark blue. The unique intersection pins down the estimated values of parameters $\widetilde{\lambda}^j$ and $\widetilde{\chi}^j$.

From Equation A.23, we know the isomoment curve of κ^j slopes downward as in Figure A.1, by implicit function theorem. Intuitively, a higher level of λ^j and χ^j have similar effects on κ^j. By contrast, from Equation A.24, the isomoment curve of ω^j in Figure A.1 slopes downward since a higher λ^j and a lower χ^j both contribute to higher ω^j. These two isomoment curves intersect at a unique point, which identify $\widehat{\lambda}^j$ and $\widehat{\chi}^j$ jointly. ∎

Proposition A.5 (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 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* (A.8) *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 (A.8). 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 $s^{-\eta} = \mathring{x}^{1-\eta}\mathring{s}^{-\eta}$. ∎

A.4 Baseline Model with Intangible Assets

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

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

$$y^j = z^j (\iota^j)^{\alpha^j}, \text{ where } \iota^j = \left[(\nu_l^j)^{\frac{1}{\psi}} (l^j)^{\frac{\psi-1}{\psi}} + (1-\nu_l^j)^{\frac{1}{\psi}} (k^j)^{\frac{\psi-1}{\psi}} \right]^{\frac{\psi}{\psi-1}}, \tag{A.25}$$

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 (A.25) degenerates to that in our benchmark model.

Second, we assume the *price* of intangible asset investment is the same as tangibles. 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, which we will elaborate later.

One last key feature for intangible assets is that they are not collateralized for raising debt. So the financial constraint remains the same as in our benchmark model.

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, we have

$$[1 + \chi(\beta^S - \beta)]\beta p^j \frac{\partial y^j}{\partial l^j} = q[1 - \beta(1-\delta_l) - \lambda^j(\beta^S - \beta)] \tag{A.26}$$

$$[1 + \chi(\beta^S - \beta)]\beta p^j \frac{\partial y^j}{\partial k^j} = q[1 - \beta(1-\delta_k)] \tag{A.27}$$

where

$$\frac{\partial y^j}{\partial l^j} = (\nu_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}} l^{-\frac{1}{\psi}}, \quad \frac{\partial y^j}{\partial k^j} = (1-\nu_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}} k^{-\frac{1}{\psi}} \tag{A.28}$$

and $\widetilde{\lambda}^j$ and $\widetilde{\chi}^j$ follows the definition in the benchmark model.

Proposition A.6 (Intangible to Tangible Asset Ratio)**.** *The sectoral intangible to tangible asset ratio*

1. *decreases with* $1 - \nu_l^j$*;*
2. *decreases with* δ_k*, increases with* δ_l*,*
3. *decreases with* λ^j
4. *increases with increases with* ψ *if* $\delta_l \leq \delta_k$*.*

Proof. Combining Equations (A.26) and (A.27), we have the intangible to tangible ratios

$$\frac{k^j}{l^j} = \frac{1-\nu_l^j}{\nu_l^j}\Lambda^{\psi}, \text{ where } \Lambda = \frac{1-\beta(1-\delta_l)-\lambda^j(\beta^S-\beta)}{1-\beta(1-\delta_k)} < 1 \tag{A.29}$$

which increases with ν_l^j. ∎

Proposition A.6 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 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. We defer the discussion of this setting in Proposition A.8. Second, the faster the intangible asset depreciates, the less firm invest in that, since it is more costly. Similar analysis applies for δ_l. Third, a higher λ^j encourages more asset-based borrowing. Since intangible asset is not collateralized, this discourages investment in intangible assets. Fourth, when $\delta_l \leq \delta_k$, then a higher ψ, the elasticity of substitution between intangible and tangible assets, indicates lower intangible share. The assumption for depreciation rates of these two types of asset is empirically and quantitatively comparable to previous studies that δ_l is 0.19 (Hall, 2007; Falato and Sim, 2014) and δ_k is 0.145 and 0.15 (Gomes, 2001; Riddick and Whited, 2009). Lastly, as a remark for the price effect which we shut down for simplicity, if we alternatively assume that the price for intangible investment is the same as the price of good of that sector, then the increase in relative price of tangible asset q will further induce more investment in tangible asset in manufacturing as economy becomes richer. Hence, if anything, the result in Proposition A.6 is conservative.

Proposition A.7 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.

Proposition A.7 (Credit to Output Ratio With Intangible Asset Investment)**.** *When* $0 < \psi \leq 1$*, the sectoral credit to output ratio* κ^j *increases with* $1-\nu_l^j$*.*

Proof. By Equation (A.26), we have

$$\alpha^j p^j \underbrace{z^j(\iota^j)^{\alpha^j}}_{y^j} \nu_l^{\frac{1}{\psi}} (\iota^j/l^j)^{\frac{1-\psi}{\psi}} = \frac{q l^j}{\widetilde{\lambda}^j \widetilde{\chi}^j}$$

Thus, the credit to output ratio is given by

$$\kappa^j = \widetilde{\alpha}^j \lambda^j \widetilde{\lambda}^j \widetilde{\chi}^j + \chi^j, \text{ where } \widetilde{\alpha}^j \equiv \alpha^j (\nu_l^j)^{\frac{1}{\psi}} (\iota^j/l^j)^{\frac{1-\psi}{\psi}}$$

By Equation (A.25), 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 (A.29), 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 $1-\nu_l^j$. ∎

Proposition A.7 indicates that the endogenous collateral quantity channel can be rationalized by the change of sectoral asset tangibility.

Our results in Proposition A.6 and A.7 relies on the strong assumption that ν_l^E does not change and ν_l^M decreases over development. However, such process should endogenously evolve over development.

To make sense of this assumption, we argue that this setting is *isomorphic* to an alternative setting with two assumptions: (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.

Altogether, the change of sectoral TFP over development acts as if the asset tangibility declines in manufacturing but not in real estate. We provide a concrete example in Proposition A.8.

Proposition A.8 (TFP Complementarity Production Function)**.** *If $\mathring{\iota}^j$ in production function* (A.25) *admits*

$$\mathring{\iota}^j = \left[(\mathring{\nu}_l^j)^{\frac{1}{\psi}}(l^j)^{\frac{\psi-1}{\psi}} + (1-\mathring{\nu}_l^j)^{\frac{1}{\psi}} g(z^j)(k^j)^{\frac{\psi-1}{\psi}}\right]^{\frac{\psi}{\psi-1}}, \tag{A.30}$$

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 in production function (A.25)*.*

Proof. The only difference appears in Equation (A.28) with following modification

$$\frac{\partial y^j}{\partial k^j} = g(z^j)\left[(1-\mathring{\nu}_l^j)^{\frac{1}{\psi}} z^j \alpha^j (\iota^j)^{\alpha^j - 1 + \frac{1}{\psi}} k^{-\frac{1}{\psi}}\right],$$

which implies

$$\frac{k^j}{l^j} = g(z^j)\frac{1-\mathring{\nu}_l^j}{\mathring{\nu}_l^j}\Lambda^{\psi}.$$

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 when in this specification

$$\frac{\partial^2}{\partial z^j \partial k^j} y^j(z^j, k^j, l^j) > \frac{\partial^2}{\partial z^j \partial l^j} y^j(z^j, k^j, l^j) = 0,$$

where $g(z)$ governs the relative complementarity between sectoral TFP and intangible or tangible asset investment. ■

A.5 Baseline Model with Non-homoethetic Preference

In this section, we consider how non-homothetic utility function affect model prediction. Specifically, the utility function rewrites as

$$\mathcal{C}_t^i = \left[(c_t^i - \underline{c}^i)^{\frac{\eta-1}{\eta}} + s(h_t^i + \overline{h}^i)^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}. \tag{A.31}$$

And the FOC from the consumption side (A.8) 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

$$c_t - \underline{c} = q_t^{\eta}(h_t + \overline{h})$$

Substituting back to the market clearing condition for real estate sector (7), we get

$$z^E(\widetilde{\zeta}^E)^{\alpha^E} - \delta\widetilde{\zeta}^E = \widetilde{\zeta}^H q^{-\eta - \frac{\alpha^M}{1-\alpha^M}} + \delta\widetilde{\zeta}^M q^{-\frac{1}{1-\alpha^M}} - (q^{-\eta}\underline{c} + \overline{h}) \tag{A.32}$$

Assumption A.2 (Parametric Restriction of Non-homothetic Preference)**.**

$$q^{-\eta}\underline{c} + \overline{h} = \Xi,$$

where Ξ *is a constant.*

Proposition A.9. *Under Assumption A.2, Proposition A.1, and Propositions 1 to 3 hold.*

Proof. When $q^{-\eta}\underline{c} + \overline{h}$ is constant, the change of Ξ only affect the level of q, but does not affect the elasticity of collateral price with respect to manufacture TFP, denoted by ε_{q,z^m}. Notice that Equations (A.13) to (A.15) are unchanged, which implies ε_{q,z^M} is the same as the benchmark model. Lastly, the sectoral credit to output ratio satisfies the assumptions in A.3, and thus the baseline Proposition 3 holds. ∎

To gain some intuitions of Assumption A.2, we consider two simple cases. First, when $q^{-\eta}\underline{c} + \overline{h} = 0$, Equation (A.32) degenerates to the benchmark market clearing condition for real estate good (7). This restriction is similar with Kongsamut et al. (2001) to ensure the balanced growth path in the demand-side structural change model. In that class of model, the sectoral price level does not change on the balanced growth path. The second case is that $\underline{c} = 0$, that is, there is no sustenance level of manufacture goods consumption.

B Supplementary Materials for Quantitative Results

In this section, we provide additional results and detailed implementation for Section 5. Appendix B.1 outlines the setup of benchmark quantitative model in Section 5, provides equilibrium conditions, and offers similar model prediction as our tractable baseline theoretical model in Section 3. Appendix B.2 provides the extended quantitative model with two types of production technology, which is summarized in Section 5.3, including deriving the key equilibrium conditions, elaborating calibration strategy and presenting quantitative results. Appendix B.3 presents a generalized quantitative model allowing for both cash-flow based and asset-based financial constraints. Appendix B.4 offers additional quantitative results. Appendix B.5 outlines the computation algorithm of our model.

B.1 Quantitative Model with Capital as Tangible Asset

In this section, we extend our baseline model in Section 3 by incorporating three additional features: First, we include labor input in our production function. This modification provides the model-implied sectoral labor productivity. We calibrate the sectoral TFP to match these moments, which can be easily estimated in the data. Second, we also include capital as an alternative tangible asset in the production function, which is produced by manufacturing sector, and can be used for collateral for loans. Third, agents can invest residential housing instead of enjoying the residential housing service flow as our baseline model.

B.1.1 Set Up

The production function for each sector changes to

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

where l_t^j, k_t^j, 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. This time, the entrepreneur needs to pay for the labor cost wn^j to the savers, who supply 1 unit of labor endowment inelastically, earning wage w_t. The entrepreneur also invests in capital $p_t^M \left[k_{t+1}^j - (1-\delta)k_t^j\right]$ and in commercial real estate. Specifically, the flow of fund constraint changes to

$$c_t^j + q_t \left[h_{t+1}^j - (1-\delta_h)h_t\right] + q_t \left[l_{t+1}^j - (1-\delta)l_t^j\right] + p_t^M \left[k_{t+1}^j - (1-\delta)k_t^j\right] + d_t^j = p_t^j y_t^j - w_t n_t^j + \frac{d_{t+1}^j}{1+r_t}, \tag{B.2}$$

Notice that $q_t \left[h_{t+1}^j - (1-\delta_h)h_t\right]$ is the term for investment in residential housing, which replaces $q_t h_{t+1}$ in Equation 2. Also following this set up, the collateral constraint is modified as $d_{t+1}^j \leq \lambda_t^j (q_{t+1} l_{t+1}^j + p_{t+1} k_{t+1}^j)$.

Finally, the good market clearing conditions change into

$$\begin{aligned} y_t^M &= \sum_i c_t^i + \sum_j \left[k_{t+1}^j - (1-\delta)k_t^j\right], \\ y_t^E &= \sum_i \left[h_{t+1}^i - (1-\delta_h)h_t^i\right] + \sum_j \left[l_{t+1}^j - (1-\delta_h)l_t^j\right], \\ 1 &= n_t^M + n_t^E. \end{aligned}$$

B.1.2 Equilibrium Conditions

We list the conditions for steady state equilibrium in this settings. From the production side, the FOCs can be written as

$$\alpha_n^j p_t^j z_t^j (l_t^j)^{\alpha_l^j} (k_t^j)^{\alpha_k^j} (n_t^j)^{\alpha_n^j - 1} = w_t \tag{B.3}$$

$$\alpha_l^j \beta \phi_{t+1}^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha_l^j - 1} (k_{t+1}^j)^{\alpha_k^j} (n_{t+1}^j)^{\alpha_n^j} + \theta_t^j \lambda_t^j q_{t+1} = \phi_t^j q_t - \beta(1-\delta)\phi_{t+1}^j q_{t+1} \tag{B.4}$$

$$\alpha_k^j \beta \phi_{t+1}^j p_{t+1}^j z_{t+1}^j (l_{t+1}^j)^{\alpha_l^j} (k_{t+1}^j)^{\alpha_k^j - 1} (n_{t+1}^j)^{\alpha_n^j} + \theta_t^j \lambda_t^j p_{t+1} = \phi_t^j p_t - \beta(1-\delta)\phi_{t+1}^j p_{t+1} \tag{B.5}$$

At the steady state and normalizing the manufacturing good price as 1, we obtain

$$\alpha_l^j p^j \frac{y^j}{l^j} = \frac{q}{\widetilde{\lambda}^j}, \quad \alpha_k^j p^j \frac{y^j}{k^j} = \frac{1}{\widetilde{\lambda}^j}, \quad \alpha_n^j p^j \frac{y^j}{n^j} = w. \tag{B.6}$$

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

$$d_{t+1}^j = \lambda(ql^j + k^j) \tag{B.7}$$

From the consumption side, the FOC for residential housing changes into. Now, the FOC for h_{t+1}^j is given by

$$\beta v_h(c_{t+1}^j, h_{t+1}^j) = \phi_t^j q_t - \beta(1-\delta_h)\phi_{t+1}^j q_{t+1}^j \tag{B.8}$$

To see the importance of the assumption about hosing service flow in the benchmark model, we evaluate Equation (B.8) at the steady state and combine with FOC for c_t^j, obtaining that

$$\frac{c^j}{h^j} = \left[\frac{1-\beta(1-\delta_h)}{\beta s} q\right]^\eta, \quad \frac{c^S}{h^S} = \left[\frac{1-\beta^S(1-\delta_h)}{\beta^S s} q\right]^\eta \tag{B.9}$$

Compared to the benchmark model, we lose the simple aggregation rule to derive c/h since the discount factor for savers and entrepreneur are different. It is easy to derive the flow of fund constraints for each type of agents as

$$c^j + \delta_h q h^j = p^j y^j - \left(wn^j + \delta q l^j + \delta k^j + \frac{r}{1+r} d^j\right) \tag{B.10}$$

$$c^S + \delta_h q h^S = \frac{r}{1+r} b + w \tag{B.11}$$

Lastly, the market clearing conditions for good markets are

$$y^M = c + \delta(k^M + k^E), \quad y^E = \delta_h h + \delta(l^M + l^E), \quad 1 = n^M + n^E. \tag{B.12}$$

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), as well as prices (q, w, r) (3 variables) such that

1. FOCs for c^i and h^i (B.9) (3 equations)
2. FOCs for l^j, n^j, and k^j (B.6), and production functions (B.1) ($3 \times 2 + 1 \times 2 = 8$ equations)
3. flow of fund constraints (B.10), (B.11) (3 equations)
4. collateral constraints (B.7) (2 equations)
5. FOC for household saving (A.3) (1 equation)
6. market clearing conditions for manufacture and real estate outputs, labor (B.12) as well as debt ($3 + 1 = 4$ equations).

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

B.1.3 Model Prediction

We can derive similar decomposition rule as Equation 6. We denote $\varrho^j = \frac{1}{1-\alpha_l^j-\alpha_k^j-\alpha_n^k}$. From Equation (B.6) and the production function (B.1), we can express all other inputs as a function of l^j. Plugging these expressions in the FOCs for l^j, we obtain

$$l^j = \underbrace{(z^j)^{\varrho^j}}_{\mathbf{Z}^j} (p^j)^{\varrho^j} q^{-(1-\alpha_n^j-\alpha_k^j)\varrho^j} \left[(\alpha_l^j)^{1-\alpha_k^j-\alpha_n^j} (\alpha_k^j)^{\alpha_k^j} (\widetilde{\lambda}^j)^{1-\alpha_n^j} \right]^{\varrho^j} \underbrace{\left(\frac{\alpha_n^j}{w} \right)^{\alpha_n^j \varrho^j}}_{\mathbf{W}^j} \tag{B.13}$$

noticing that there is an additional wage channel, captured in term $\mathbf{W}^j$. The decomposition of credit and nominal output share is given by

$$\frac{d^E}{d^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M} \frac{\mathbf{W}^E}{\mathbf{W}^M} \frac{\mathbf{\Gamma}_d^E}{\mathbf{\Gamma}_d^M} \mathbf{Q}, \quad \frac{qy^E}{y^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M} \frac{\mathbf{W}^E}{\mathbf{W}^M} \frac{\mathbf{\Gamma}_y^E}{\mathbf{\Gamma}_y^M} \mathbf{Q}, \tag{B.14}$$

where

$$\mathbf{Z}^j = (z^j)^{\varrho^j}, \quad \mathbf{W}^j = \left(\alpha_n^j / w \right)^{\alpha_n^j \varrho^j}, \mathbf{Q} = q^{(\alpha_k^E + \alpha_n^E)\varrho^E + (1-\alpha_k^M - \alpha_n^M)\varrho^M}$$

$$\mathbf{\Gamma}_d^j = \lambda^j (\alpha_l^j + \alpha_k^j) \left[(\alpha_l^j)^{\alpha_l^j} (\alpha_k^j)^{\alpha_k^j} (\widetilde{\lambda}^j)^{1-\alpha_n^j} \right]^{\varrho^j}, \quad \mathbf{\Gamma}_y^j = \left[(\alpha_l^j)^{\alpha_l^j} (\alpha_k^j)^{\alpha_k^j} (\widetilde{\lambda}^j)^{\alpha_l^j + \alpha_k^j} \right]^{\varrho^j}$$

One can notice that if we restrict α_n^j are the same, the case in our baseline calibration, we have $\mathbf{W} = \mathbf{W}^E / \mathbf{W}^M = 1$.

B.2 Quantitative Model with Two Types of Production Technology

In this section, we introduce a framework where there are two types of production technology that operate in the manufacturing sector, while the settings for real estate sector remains unchanged.

B.2.1 Set Up

In manufacturing sector M, there are two type of entrepreneurs: type 1 entrepreneur adopts the same technology following Appendix B.1, while type 2 entrepreneur uses credit to produce directly instead of relying on collateralized lending. The technology is endowed by entrepreneur, i.e., there is no endogenous choice for production technology. Specifically, the production function for type 2 entrepreneur is

$$y_{2,t}^M = z_t^M \frac{d_{2,t+1}^M}{1+r_t},$$

where $d_{1,t}$ is the amount of credit she can get access to. She maximizes life-long discounted utility $\sum_{t=0}^{\infty} \beta^t u(c_{2,t}^M, h_{2,t}^M)$ subject to her budget constraint

$$c_{2,t}^M + q_t \left[h_{2,t+1}^M - (1-\delta_h) h_{2,t}^M \right] + \frac{r_t}{1+r_t} d_{2,t}^M = p_t^M y_{2,t}^M \tag{B.15}$$

Type 2 entrepreneur also faces a debt limit, given by

$$d_{2,t} \leq \iota d_t^M,$$

where $d_t = d_{1,t} + d_{2,t}$, that is, she can only raises an exogenous proportion of debt in that sector, captured by $\iota \in (0,1)$. The market clearing conditions should be adjusted, accounting for two types of entrepreneur in M, i.e., $y_t^M = y_{1,t}^M + y_{2,t}^M$.

B.2.2 Equilibrium Conditions and Model Predictions

Setting up the Lagrangian for type 2 entrepreneurs, we have

$$\mathcal{L}_2^M = \sum_{t=0}^{\infty} \beta^t \Big\{ u(c_{2,t}, h_{2,t}) + \phi_{2,t}^j \left[p_t z_t^M \frac{d_{2,t+1}^M}{1+r_t} - c_{2,t}^M - q_t[(h_{2,t+1}^M - (1-\delta_h) h_{2,t}^M] - \frac{r_t}{1+r_t} d_{2,t}^M \right]$$

$$+ \theta^j_{2,t}(\iota d^M_t - d^M_{2,t})\Big\}$$

The FOC from the consumption side is the same as Equation (B.9) at the steady state. For debt, we have

$$\phi^M_{2,t} p^M_t z^M_t \frac{1}{1+r_t} - \beta \frac{r_t}{1+r_t} \phi^M_{2,t+1} - \beta \theta^M_{2,t+1} = 0 \tag{B.16}$$

with the complementary slackness condition.

To make sure our model is well-defined as the steady state, we impose the following assumption.

Assumption B.1 (Parametric Restriction on z^M)**.**

$$z^M > \frac{1}{\beta^S} - 1$$

This assumption ensures that, at the steady states (i) the debt limit constraint is binding, noticing that $\theta^M_2 = \frac{1}{\beta(1+r)}(z^M - \beta r)\phi^M_2 > 0$, and (ii) raising debt to produce yields non-negative income, since the flow of fund constraints is rewritten as $c^M_2 + \delta_l q h^M_2 = (z^M - r)d^M_2$. As suggested by Figure 6, parametric assumption B.1 holds quantitatively.

To shed lights on our proposed mechanism, we compute the output-based total factor productivity (TFPQ) in the manufacturing sector, denoted by $\tilde{z}^M$,

$$\begin{aligned}
\tilde{z}^M \equiv \frac{y^M_1 + y^M_2}{(l^j)^{\alpha^M_l}(k^j)^{\alpha^M_k}(n^j)^{\alpha^j_n}} &= z^M + \frac{z^M \frac{d^M_2}{1+r}}{(y^M_1/z^M)} \\
&= z^M + \beta^S (z^M)^2 \frac{1-\iota}{\iota} \frac{d^M_1}{y^M_1} \\
&= z^M + \beta^S \frac{1-\iota}{\iota} \lambda^M \tilde{\lambda}^M (\alpha_k + \alpha_l)(z^M)^2.
\end{aligned}$$

The first observation is that setting $\iota = 1$, the result degenerates to our baseline model. Moreover, adding type 2 entrepreneurs boosts the efficient productivity, by adding the second term, which is quadratic with respect to z^M. Intuitively, an increase of manufacturing TFP has a direct effect on output via the production function. Indirectly, due to increasing manufacturing TFP, the amount of credit for type-1 entrepreneur, from the partial equilibrium perspective, also goes up by z^M, translating to better access of credit of type-2 entrepreneurs. Taken these two channels into account, the additional term is quadratic with z^M. We want to emphasize that this setting, if anything, overestimates the role of productivity and underestimates the role of slackening financial constraint on sectoral output.

It is also easy to verify that a higher share of credit distributed to type 2 entrepreneurs (a lower ι), a more slackened manufacturing collateral constraint (a larger λ^M), and a higher tangible asset input share (a higher α_k or α_l) can result in a more significant increase in manufacturing TFPQ.

B.2.3 Quantitative Exercise

Our calibration strategy is the same as Section 5.1 except we need to internally calibrate manufacturing collateral constraints parameters by income group $\{\lambda_n^M\}_{n=1}^N$, because the credit to value added ratio in that sector also hinges on z^M. Recalling that there is no modification for the setup in the real estate sector, in the first step of our calibration procedure, for given (η, s), we find a sequence of $\{z_n^j, \lambda_n^M\}_{n=1}^N$ to minimize the distance between labor productivity in two sectors as well as manufacturing credit to value added ratio. The second step remains unchanged.

Appendix Figure E.15 reports our calibrated parameters for sectoral TFP and collateral constraints, sharing similar trend with our baseline and Appendix Figure E.14 validates our model moments with data. Appendix Table F.12 provides the results for development accounting analysis of other key variables, complementing Table 3.

B.3 Quantitative Model with Cash Flow- and Asset-Based Constraints

In this Appendix, we consider a slightly modified version of our quantitative model. We shut down capital as tangible input but allow for both cash flow- and asset-based constraints, specified as in Equation (A.1) in our generalized baseline model in Appendix A. All other settings are the same as Appendix B.1.1. We first characterize equilibrium condition and model prediction in this setting and discusses our quantitative results.

B.3.1 Equilibrium Conditions and Model Predictions

Evaluating the FOCs for labor input $n^j t$ and collateral l_t^j at the steady state, we obtain the following two equations

$$n = \frac{\alpha_n^j}{\alpha_l^j} \frac{ql}{\widetilde{\lambda}^j \widetilde{\chi}^j w}, \quad \alpha_l^j p^j z^j \left(\frac{\alpha_n^j}{\alpha_l^j w} \right)^{\alpha_n^j} \left(\frac{\widetilde{\lambda}^j \widetilde{\chi}^j}{q} \right)^{1-\alpha_n^j} = l^{1-\alpha_l^j - \alpha_l^j} \tag{B.17}$$

where the definition of $\widetilde{\lambda}^j$ and $\widetilde{\chi}^j$ is the same as the baseline model in Appendix A.1.

We follow the notation of $\widetilde{\lambda}^j$ and $\widetilde{\chi}^j$ in the benchmark model, and define $\varrho^j = \frac{1}{1-(\alpha_l^j + \alpha_n^j)}$.

As the same intuition of Equation (6), we can decompose the credit share into direct, reallocation and collateral price effects. From Equation (B.17), we obtain

$$l^j = \left[\Omega^j \widetilde{\lambda}^j\right]^{(1-\alpha_n^j)\varrho^j} (p^j)^{\varrho^j} q^{-(1-\alpha_n^j)\varrho^j}, \text{ where } \Omega^j = \alpha_l^j \left(\frac{\alpha_n^j}{w}\right)^{\frac{\alpha_n^j}{1-\alpha_n^j}} (z^j)^{\frac{1}{1-\alpha_n^j}}.$$

Thus, the elasticity of sectoral credit to collateral price is

$$\varepsilon_{dq}^j \equiv \frac{\partial \log d^j}{\partial \log q} = 1 + \frac{\partial \log l^j}{\partial \log q} = \begin{cases} (1-\alpha_l^E)\varrho^E & \text{if } j = E, \\ -\alpha_l^M \varrho^M & \text{if } j = M \end{cases} \tag{B.18}$$

By expressing l^j and n^j as functions of prices (p, q, w), we can solve the model using market clearing conditions. Again, our decomposition rule for credit and nominal output ratio reads as follows

$$\frac{d^E}{d^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M} \frac{\mathbf{\Gamma}_d^E}{\mathbf{\Gamma}_d^M} \frac{\mathbf{W}^E}{\mathbf{W}^M} \mathbf{Q}, \quad \frac{qy^E}{y^M} = \frac{d^E}{d^M} = \frac{\mathbf{Z}^E}{\mathbf{Z}^M} \frac{\mathbf{\Gamma}_y^E}{\mathbf{\Gamma}_y^M} \frac{\mathbf{W}^E}{\mathbf{W}^M} \mathbf{Q},$$

where the relative productivity channel $\mathbf{Z}$, collateral price channel $\mathbf{Q}$, and wage channel $\mathbf{W}$ are the same for credit and nominal output share,

$$\mathbf{Z}^j = (z^j)^{\varrho^j}, \quad \mathbf{Q} = q^{(1-\alpha_l^E)\varrho^E + \alpha_l^M \varrho^M}, \quad \mathbf{W}^j = (\alpha_n^j / w)^{\alpha_n^j \varrho^j},$$

while the collateral quantity effects are different for credit and nominal output share

$$\mathbf{\Gamma}_d^j = \left(\lambda^j + \frac{\chi^j}{\alpha_l^j \widetilde{\lambda}^j \widetilde{\chi}^j}\right) (\alpha_l^j \widetilde{\lambda}^j \widetilde{\chi}^j)^{(1-\alpha_n^j)\varrho^j}, \quad \mathbf{\Gamma}_y^j = (\alpha_l^j \widetilde{\lambda}^j \widetilde{\chi}^j)^{\alpha_l^j \varrho^j}$$

It is easy to verify that, as $\alpha_n^j \to 0$ (i.e. $\varrho^j \to \frac{1}{1-\alpha_l^j}$), the following components $\mathbf{Z}^j$, $\mathbf{Q}^j$, $\mathbf{\Gamma}^j$ converge to their counterparts in the benchmark model, and $\mathbf{W}^j$ converges to 1[26].

B.3.2 Quantitative Results

Our calibration strategy does not change, thanks to the results in Proposition A.4: To discipline the cash flow- and asset-based financial constraints parameters (λ^j and χ^j). We resort

[26] It is easy to find $\lim_{x\to 0} x^{\frac{x}{1-x-\alpha_l^j}} = \lim_{x\to 0} \exp\left(\frac{\log(x)}{\frac{1-\alpha_l^j}{x} - 1}\right) = \lim_{x\to 0} \exp\left(-\frac{x}{1-\alpha_l^j}\right) = 1$, where the second last step is by L'Hôpital's Rule.

to the mortgage share in Panel A of Figure 4, combining with sectoral credit to value added ratio κ^j, given the know α^j. Appendix Figure E.15 shows the calibrated values of these parameters and TFP by sectors. We can see the trend of these two constraints within sector are very similar since the mortgage share is the same across income groups.

As a robustness check, Table displays the similar development accounting analysis as Table 2

B.4 Additional Quantitative Results: Role of Sectoral Heterogeneity

Figure E.16 demonstrates the results. First, we set the α^j in both sectors to the level of externally calibrated α^E, as the green line with circles. An increase of α^M leads to a surge in collateral demand in that sector, shifting the demand curve in Figure 3 to the right, and moving up the housing price. Compared to the baseline result, there is nothing change to the real estate sector output y^E since the housing price does not affect real estate collateral usage. Altogether, this drives up the housing price. From the real-economy side, the collateral price effect overpowers, such that the construction nominal output share increase. From the financial side, an increase of α^M significantly boosts the leverage ratio, which dominates the real-economy output reallocation, and thus there is a pronounced construction credit share decreases.

Next, we set λ^M to λ^E by income group, according to Figure 6a without change the sectoral collateral share α^j, plotted in orange line with squares. As before, the change in collateral constraint does not quantitatively affect relative housing price compared to the baseline results, and thus have almost no impact on real-economy structural change. The counterfactual manufacture leverage significantly reduces, leading to credit reallocation towards construction.

Lastly, we shut down both channels, as the purple line with cross marks. Since both α^j and λ^j are set equal, there is no difference in sectoral leverage ratio, following Proposition 3. As expected, the results lie between the previous two experiments. The result is quantitatively closer to Experiment 3, since variation in α^j is quantitatively more important to drive the housing price and real-economy structural change relative to change in λ^j. Quantitatively, for for this counterfactual scenario, the construction credit share is close to what we observe in the data, despite of less variation across income groups.

Taking stock, these counterfactual experiments indicate that sectoral heterogeneity in collateral share and collateral constraint is quantitatively important to *jointly* match observed financial and canonical Kuznets facts.

B.5 Computation Algorithm

We outline the computational algorithm for the steady state equilibrium using the model in Appendix B.1 as an example. All other models share similar algorithm. There are two layers of loops:

1. The inner loop takes a price $\widetilde{q}$ as given, and solve for the wage rate w such that labor market clears as follows

   (a) Given some $\widetilde{q}$, use Equation (B.4) to express the collateral usage $l^j = l^j(w; \widetilde{q})$;

   (b) Given $l^j = l^j(w; \widetilde{q})$ and $\widetilde{q}$, use Equation (B.3) to express the sectoral employment as $n^j = n^j(w, \widetilde{q})$;

   (c) Solve the wage rate $w(\widetilde{q})$ for this particular $\widetilde{q}$ using labor market clearing condition.

2. The outer loop is to solve the equilibrium price q such that the nonlinear equation of real estate good market clearing condition hold, which only involves $(\widetilde{q}, w(\widetilde{q}))$.

C Additional Empirical Results

C.1 Additional Results for Section 2.1

We provide supporting evidence for our main results in Section 2.1 by estimating the following 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 concavity. $y^j_{c,t}$ can be either sectoral credit (Appendix Table F.1), value added (Appendix Tables F.2 and F.3), or employment share (Appendix Table F.4).

Appendix Figure E.1 displays the time series of sectoral credit, value added and employment share, which coincides our main results. Appendix Figure E.2 shows that the level of value added to GDP is higher than credit to GDP for each sector. Compared with a dramatic decline of agriculture value added to GDP, the credit to GDP ratio in that sector remains low. Additionally, the variation of manufacturing credit to GDP ratio is smaller than its value added to GDP ratio. Lastly, real estate sector witnesses a faster increase of credit to GDP relative to value added to GDP, which speaks to our financial Kuznets facts. Similar results for time series evidence are in Appendix Figure E.3.

C.2 Additional Results for Section 4.1

In this Appendix, we report our first-stage IV estimation results in Section 4.1, and show our results are not sensitive to other empirical specifications.

First-Stage of IV Estimation We report the first-stage F statistics, following Kleibergen and Paap (2006), for our baseline instrumental variable local projection specification in Figure E.7. As we can see, most of the F-statistics are above the conservative values, rejecting weak instruments.

Alternative Specifications We consider two alternative specifications. The first is a simple bivariate version following:

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

for $h = 1, 3, 5, 10$, where $\Delta_h y^j_{c,t+h}$ represents the change in sectoral credit from t to $t+h$, 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, obtained from the following regression:

$$\Delta_h \log(\text{HPI}_{c,t}) = \varsigma_c + \vartheta_c \Delta_h \log(\text{HPI}_{r(c),t}) + e_{c,t},$$

We report both the OLS and IV results in Appendix Table F.5.

The second specification explores the long-run elasticity of sectoral credit with respect to HPI, following:

$$\log(\text{Credit}^j_{c,t}) = \beta^j \log(\text{HPI}_{c,t}) + X^j_{c,t} + \mu_c + \gamma_t + e^j_{c,t},$$

where j represents either manufacturing/mining, construction/real estate, or broad industries, c indicates country, and t indicates year. We estimate a similar regression using 5 broad industries for more observations by dividing them into two groups by mortgage shares, with a threshold of 45%, and j indicates whether an industry has a high mortgage share or not. Appendix Table F.6 reports our estimates.

C.3 Additional Results for Section 4.2.1

We present two robustness checks for Table 1, where Columns (1) and (4) exploit country- and industry-level variation in mortgage share, Columns (2) and (5) exploit industry-level variation, and Columns (3) and (6) focus on cross-country differences. We present the corresponding robustness checks in Appendix Tables F.7, F.8, and F.9, respectively.

First, in Appendix Table F.7, we use alternative measures for country-level mortgage usage, including the mortgage-to-GDP ratio, the household residential mortgage-to-GDP ratio and the household residential mortgage-to-household credit. Additionally, in Appendix Table F.8, we change industry-level collateral usage to the real estate input share, obtained from the World Input-Output table; see Müller and Verner (2024) for more details. For all three Appendix Tables, we consider, if possible, the combination of (i) different fixed effects, (ii) different industry categories, including 5 broad industries and 1-digit industries, and (iii) different time horizons, for $h = 5, 10$.

C.4 Additional Results for Section 4.2.2

In this Appendix, we provide details of constructing measures for intangible and tangible assets, and conduct robustness checks about the relation between intangible and sectoral credit growth using alternative specifications.

Measurement for Intangible and Tangible Assets In practice, we compute the intangible ratio using `Kq_Intang` divided by `Kq_Tang`. Both variables are in millions of national currency. The intangible asset consists of the following variables:

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

Intangible Investments and Sectoral Credit Growth To establish the relationship between changes in asset tangibility and credit growth, we estimate two alternative specifications in Appendix Table F.11 as robustness checks. First, we test whether sectoral credit growth responds to change of 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 baseline local projection, we consider the following specification for different time horizons, for $h = 5, 10$,

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

C.5 Additional Results for Section 7

In Section, 7, we explore the relation between sectoral credit allocation and long-run growth.

For East Asian case studies, Appendix Figure E.9 plots credit to GDP ratio across sector during other episodes along with the relative GDP to the US. During these episodes, we find a rise in manufacturing credit to GDP ratio, and a rising relative GDP per capita to the US, consistent with our main findings.

For systematic evidence, in Appendix Table F.16, we report the estimation results of the following regression

$$\Delta_h \log(\text{Real GDP per Capita}_{c,t}) = \beta_h^j \text{Credit Share}_{c,t}^j + \gamma_c + \mu_t + X_{c,t}^j + \epsilon_{c,t,h}^j, \quad h = 5, 10,$$

where Δ_h is the operator for change from t to $t+h$, j indicates sector, γ_c is the country fixed effect, μ_t is year fixed effect, $X_{c,t}^j$ is other other macroeconomic controls. We also include a second-order polynomial of logged real GDP per capita at time t and sectoral value-added share at time t, to capture potential effect driven by economic convergence. As we can see, the regression results suggest a positive (negative) correlation between manufacturing (real estate) credit share and future GDP per capita growth.

Moreover, we pool the manufacturing and real estate sectors together, and report the results in Appendix Table F.15.

C.6 Additional Results for Section 6

In Section 6, we investigate the dynamics of sectoral variables around credit liberalization episodes using the LP-DiD method of Dube, Girardi, Jorda, and Taylor (2023). Here we provide some results supporting our identification assumption, argue that our results are not driven by one particular event, conduct placebo test to strengthen our causal interpretation, and re-estimate our empirical specification using local projection and other on-the-shelf staggered DiD designs.

Case Studies In Appendix Figure E.11, we depict the sectoral credit-to-output ratio around 8 credit liberalization episodes. The dynamics are consistent with our baseline LP-DiD results.

Identifying Assumption There are two identifying assumptions for these event studies: (i) there are no changes in confounding determinants of the structural change in the credit market and in the real economy coincide with these credit liberalization events, and (ii) countries with credit liberalization would have evolved the same way as in the never-treated countries in the absence of liberalization.

For the first identifying assumption, our narrative analysis in Appendix D alleviates this concern. Additionally, leveraging data from Wacziarg and Welch (2008) and Warner and Sachs (1995), we argue that the onset of credit market liberalization does not synchronized with other reforms, such as trade liberalization.[27]

[27] There is only one episode, Israel 1985, coinciding with the start of trade liberalization. As we show later,

The second identifying assumption cannot be tested directly, but several pieces of evidence are in favor of it. First, among our various specifications (including the robustness check below), there is no pre-trend before the onset of credit liberalization. Second, our specification controls 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 the predictive regression 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 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). As reported in Table F.10, these variables have no systematic predictive power on the onset of these liberalization episodes.

Local Projection Specifications We estimate local projections in a country-sector-year panel similar to Baron and Green (2023):

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

for $h = 1, \ldots, H$, 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 E.13 shows the estimation results.

Staggered DiD Design We estimate the impacts of credit liberalization policies using a battery of cutting-edge staggered DiD techniques, aiming to overcome the negative weighted bias of unclean comparisons from previously treated units used as controls for newly treated units. Specifically, we report estimate results for Dube et al. (2023) using never-treated countries as controls, as well as Callaway and Sant'Anna (2021), Sun and Abraham

our results are not driven by one specific episode.

(2021) and De Chaisemartin and d'Haultfoeuille (2024) in Appendix Figure E.12. All these estimates are consistent with our baseline results, and, reassuringly, there are no pre-trends running up to the start years of these policies.

D Credit Market Liberalization

In this Appendix, we provide a worldwide credit market liberalization chronology, 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 liberalisation 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 liberalisation 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).

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' liberalisation 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 liberalisation – 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 sector's 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 bank's 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 (Abrams, 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" (Abrams, 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 d'Equipement (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 bank's 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, 2002, 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, 2002, 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 (January 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, 2002, 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."

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" (Hino, 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" (Hino, 1995, page 38).

Reason: "By mid-1991, the authorities had moved completely away from reliance on quantitative credit ceilings" (Hino, 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, 1987, 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, 1987, 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, 1987, 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, 1987).

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" (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"

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 (January, 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, 1997, page 9).

A gradual process of liberalization started in the 1960s and intensified over the following two decades: "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 later 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 (September 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 lion's 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 liberalisation 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 liberalisation 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 (1968–75) 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 83). The requirement of banks to own government bonds were abolished in 1983 as were the ceilings on bank loans in 1986 (Englund, 1990).

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 country's financial liberalisation 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, "Britain's 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 (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., 2016b, page 10).

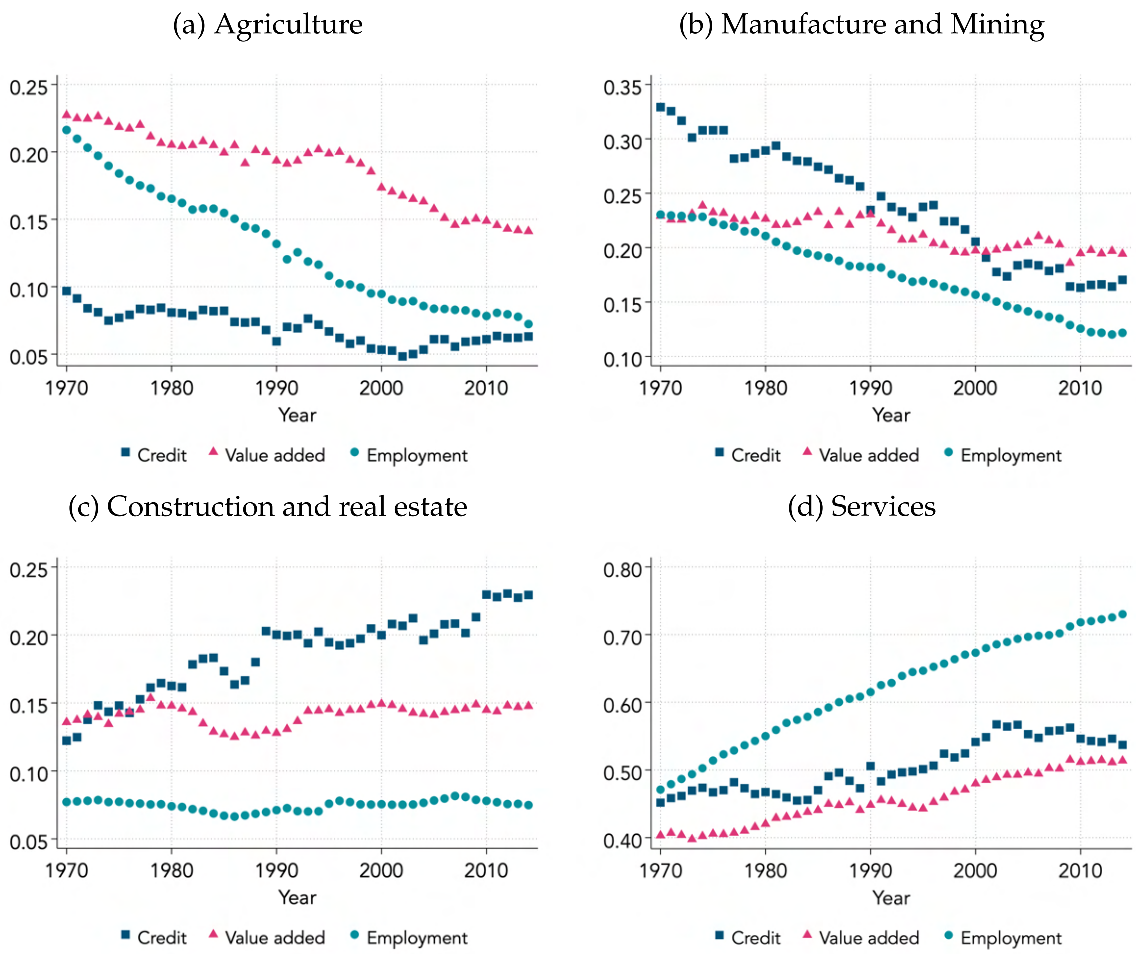
An important shift in monetary policy began in 1970 when the use of credit controls was abolished. The Monetary Policy Group (MPG) proposed replacing these controls with guidance and an increased reliance on special deposits to manage bank liquidity. Consequently, Chancellor Jenkins, in the Budget of 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."(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 (Needham, 2014).

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

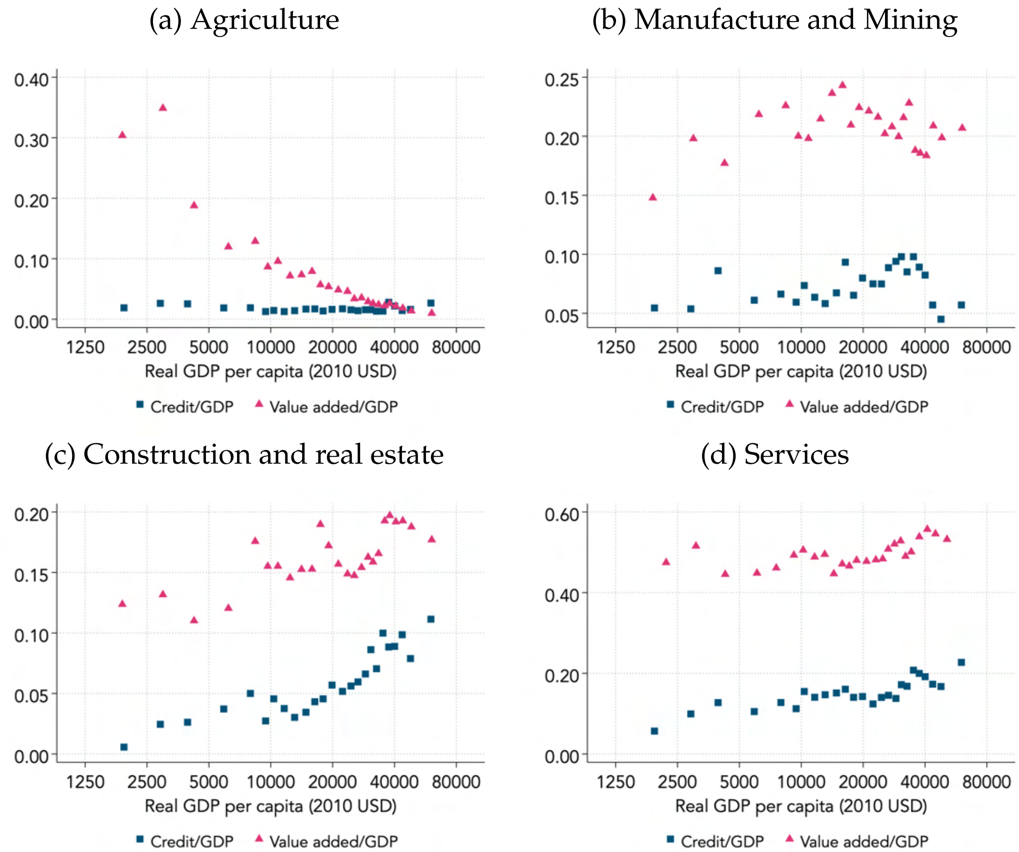
E Supplementary Figures

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



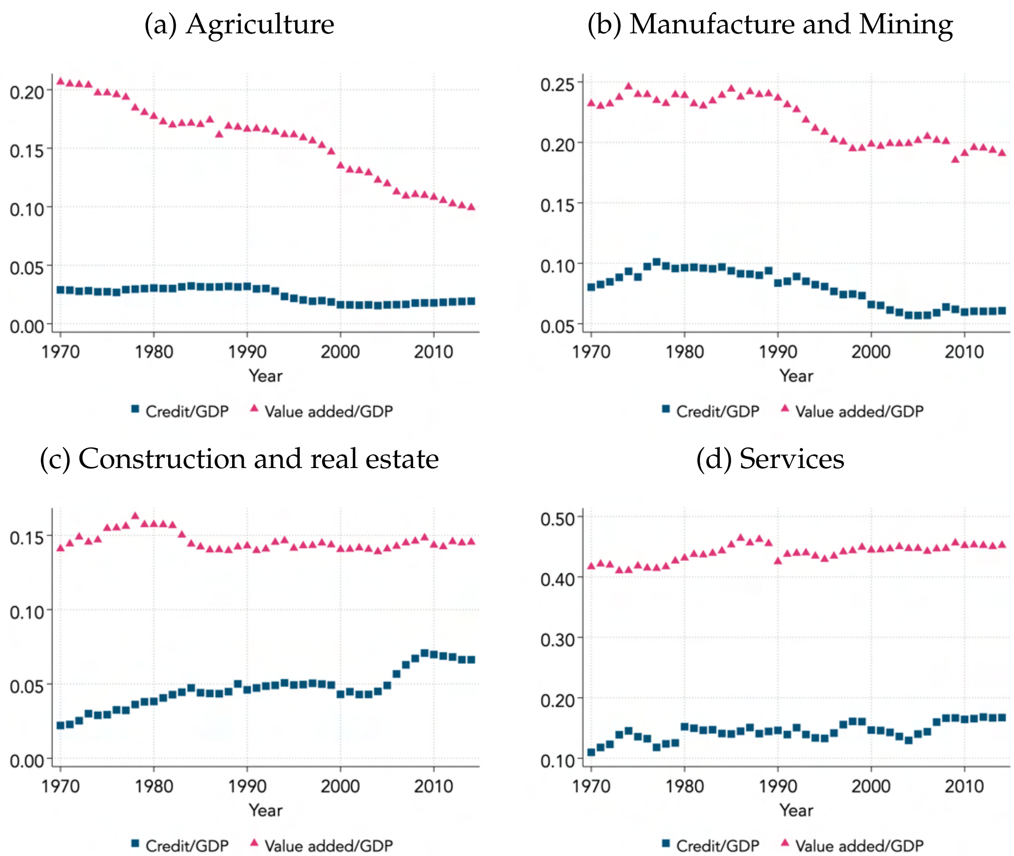
Note: This figure shows the times series of financial and real-economy structural transformation during the process of economic development, measured by the average of each variable within a particular year over different countries. We restrict the sample with non-missing credit, value-added, and employment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

Figure E.2: Credit-to-GDP, VA-to-GDP and Development: Cross-Sectional Evidence



Note: This figure shows the dynamics of sectoral credit-to-GDP, VA-to-GDP through the process of economic development. Left panels are the binscatter plots for cross-sectional data with with logged real GDP per capita. Right panels are time series data, 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.

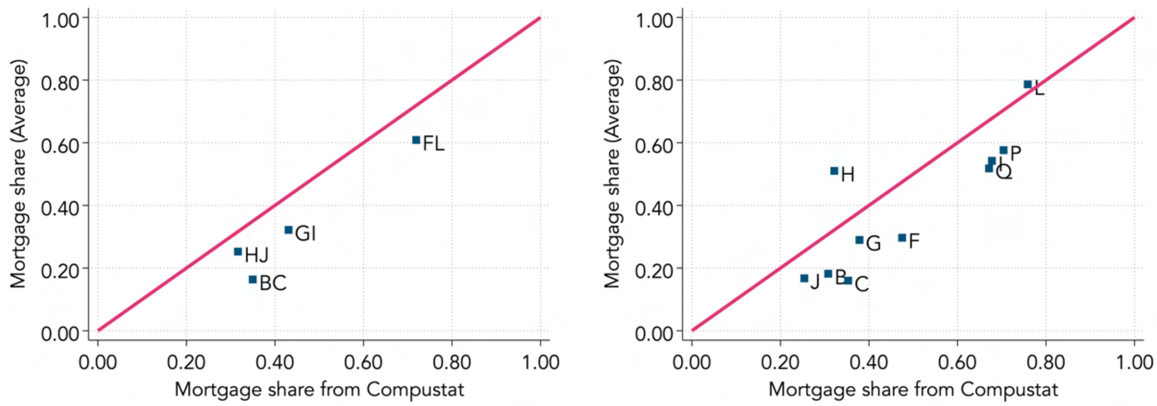
Figure E.3: Credit-to-GDP, VA-to-GDP and Development: Time Series Evidence



Note: This figure shows the dynamics of sectoral credit-to-GDP, VA-to-GDP through the process of economic development. Left panels are the binscatter plots for cross-sectional data with with logged real GDP per capita. Right panels are time series data, 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 E.4: Comparison of Mortgage Share: Compustat vs Country Average

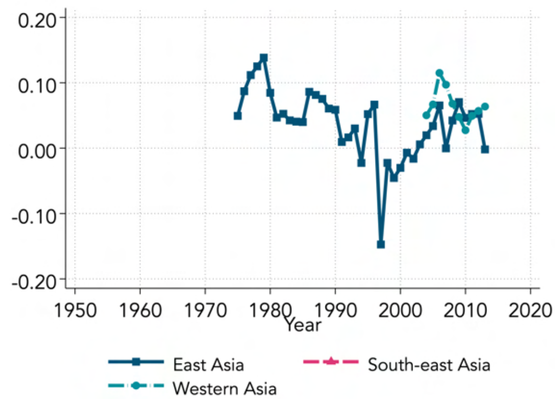
(a) Broad Industries (b) 1 Digit Industries



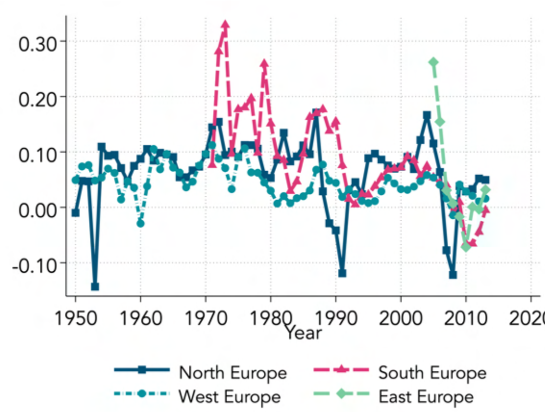
Notes: This figures compare the industry or sector level mortgage share in Compustat and calculated from country-average. Each dots represent a broad sector in Panel (a) and a 1-digit industry in Panel (b). The horizontal axis represents the mortgage share averaged from 5 countries, and the vertical axis represents that computed from Compustat.

Figure E.5: Log Change of Housing Price Index Across Subregions

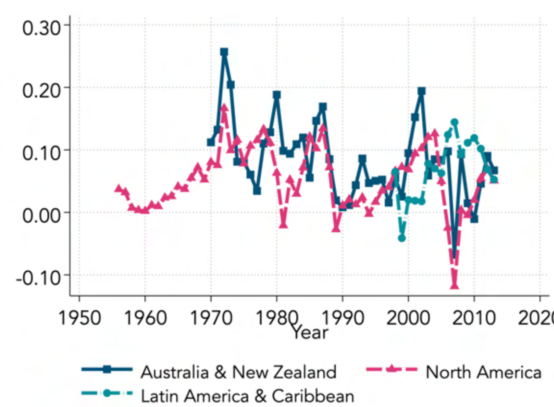
(a) Asia



(b) Europe

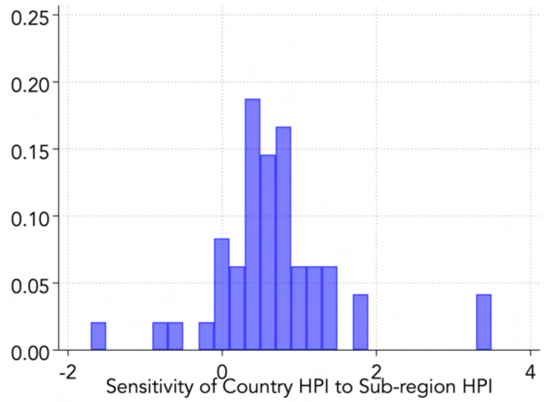


(c) Americas and Oceania



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 $t+1$.

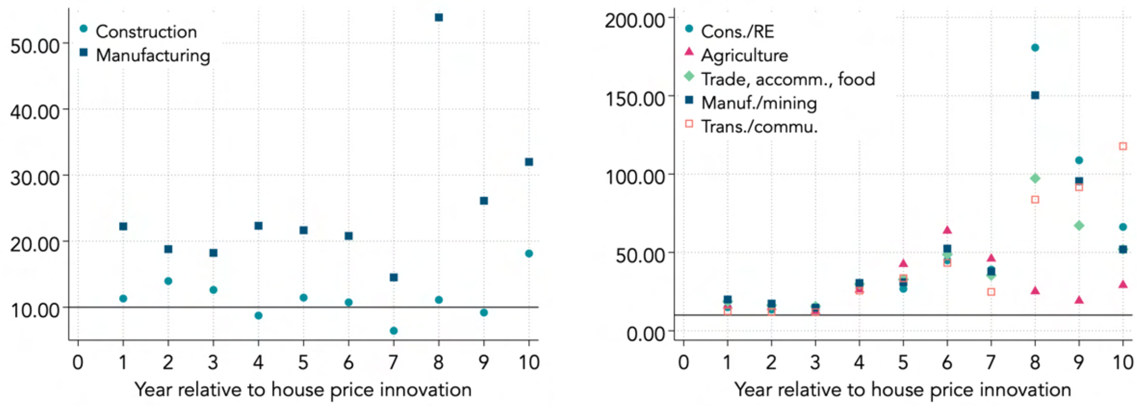
Figure E.6: Distribution of Estimated Sensitivity $\widehat{\vartheta}_c$



Note: This figure 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 10.

Figure E.7: First Stage F-statistics of IV Regression in Figure E.8

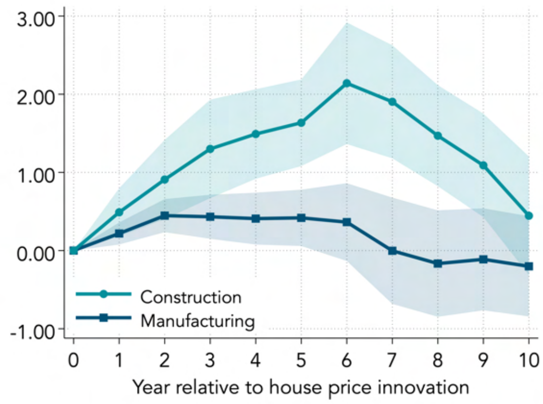
(a) Manufacturing and Real Estate (b) Five Industries



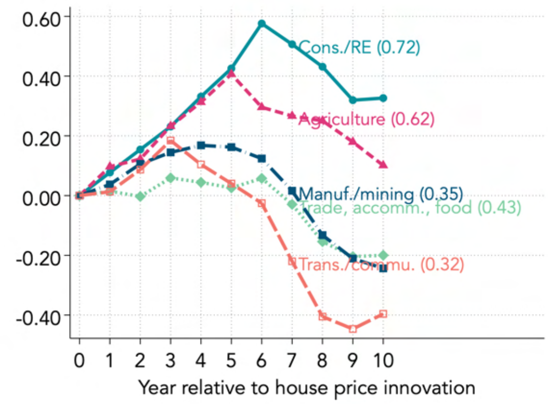
Note: These figures plot the first-stage F-statistics of instrumental variable local projections following specification (9) for Figure E.8c and E.8d, computed as Kleibergen and Paap (2006). The horizontal solid line indicates the rule of thumb, i.e., F-statistics equal to 10.

Figure E.8: Local Projection: Housing Price Pass-Through to Sectoral Credit

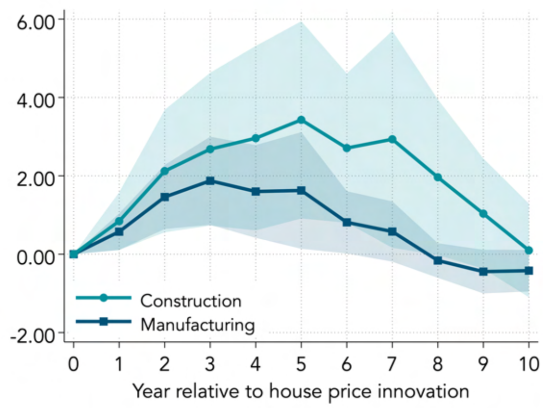
(a) LP: Manufacturing and Real Estate



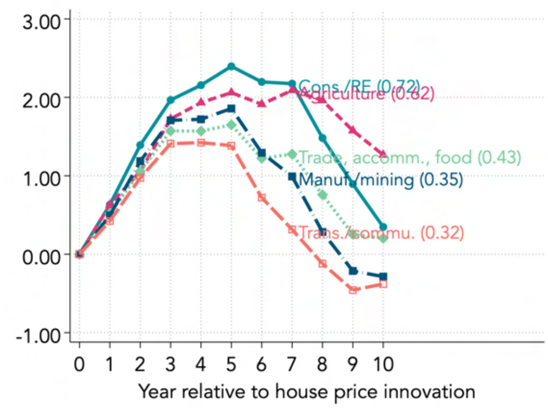
(b) LP: Sectors Ranked by Mortgage Share



(c) LP-IV: Manufacturing and Real Estate

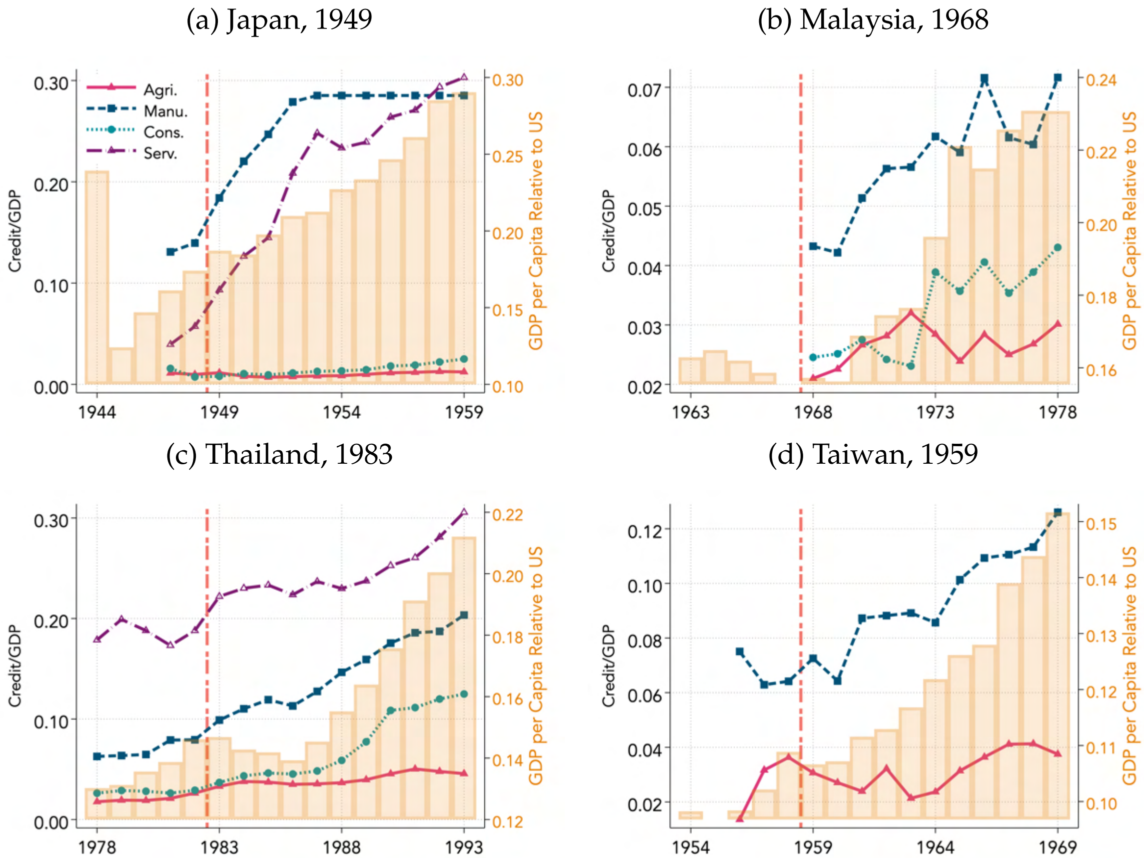


(d) LP-IV: Ranked by Mortgage Share



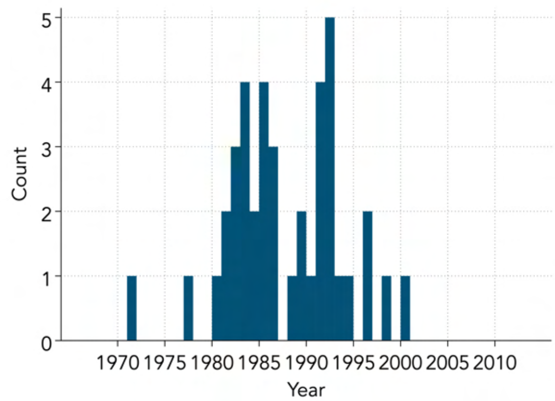
Note: These figures plot local projections following specification (9). Panel (a) plots the sequence of $\{\widehat{\beta}^{j}_{h,0}\}$ for manufacturing and real estate, controlling for lagged sectoral TFP and credit to value added in logs. Dashed lines represent 90% confidence intervals computed using (Driscoll and Kraay, 1998) standard errors. Panel (b) plots a similar sequence of more industries by adding agriculture; trade, accommodation and food services; transportation and communication. Due to the availability of sectoral value added and credit to value added data, we do not control for them in Panel (b). The number in parentheses is the share of real estate collateral used in each industry.

Figure E.9: Credit Allocation During East Asian Growth Miracles: Robustness Check



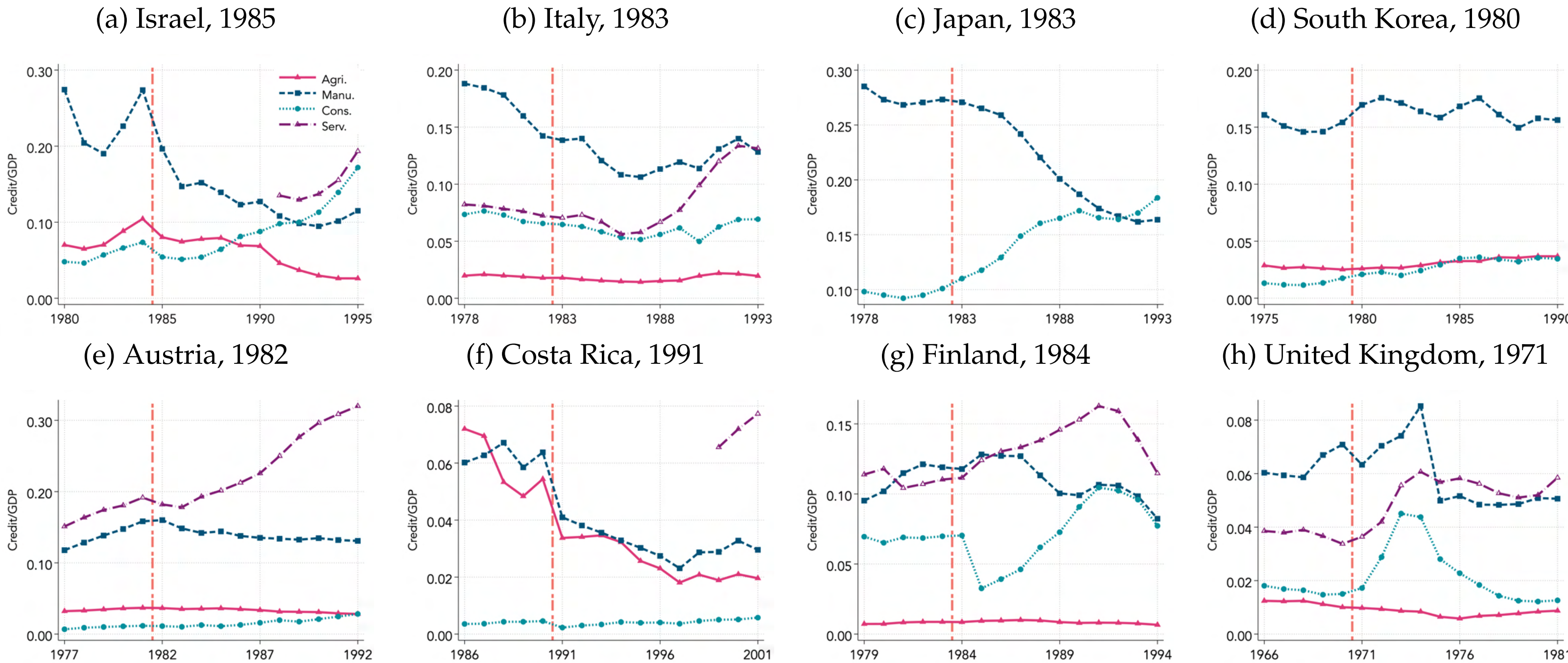
Note: These figures show the sectoral credit-to-GDP ratio for different sectors on the left vertical axis with solid lines and real GDP per capita (based on purchasing power parity) relative to US on the right vertical axis with orange bars during the East Asian growth miracles, including (a) Japan, 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 E.10: Timing of Credit Liberalization



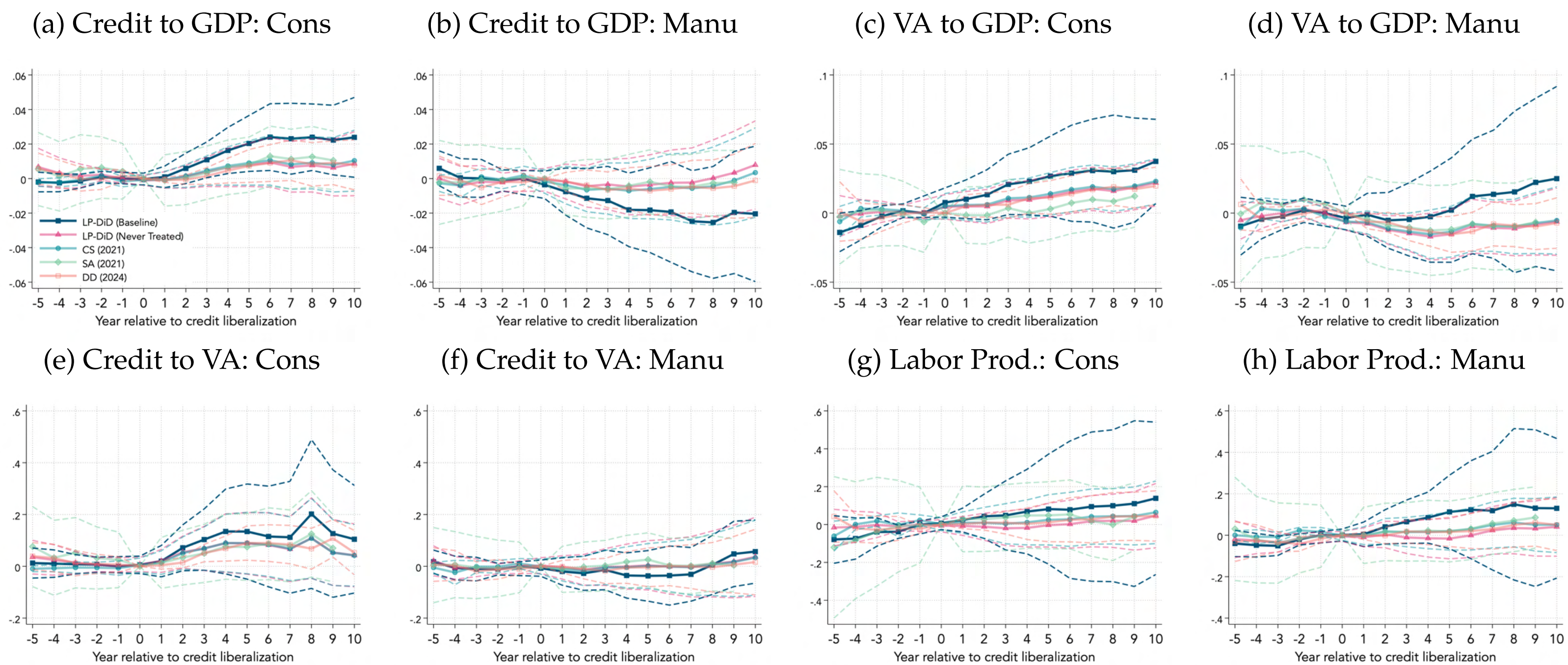
Note: This figure shows the count of credit liberalizations across countries by year.

Figure E.11: Credit Liberalization: Case Studies



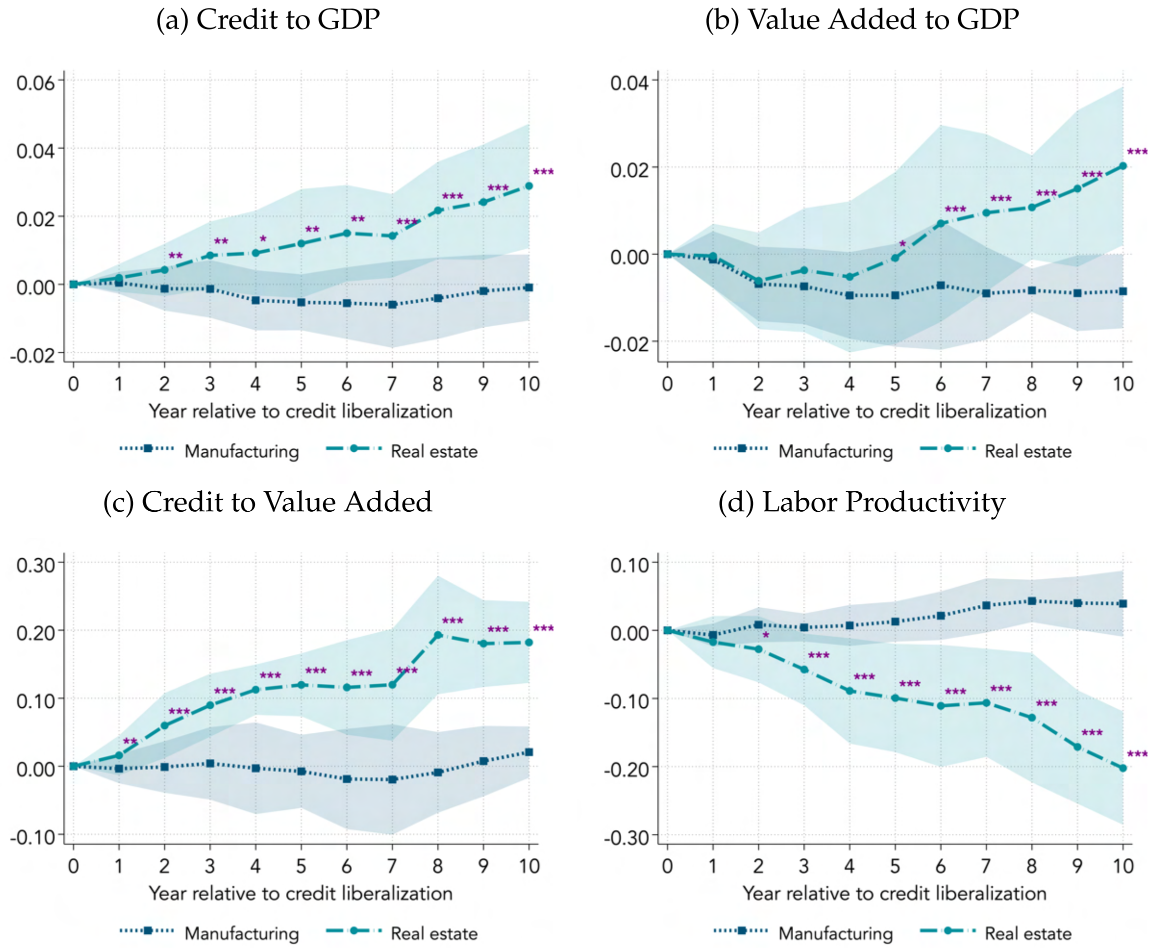
Note: This figure shows the credit-to-GDP ratio across sectors around the credit liberalization, including (a) Israel, 1985, (b) Italy, 1983, (c) Japan, 1983, and (d) South Korea, 1980, (e) Austria, 1982, (f) Costa Rica, 1991, (g) Finland, 1984, and (h) United Kingdom, 1971. Liberalization year is marked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

Figure E.12: Robustness Check: Staggered Diff-in-Diff Credit Liberalization



Note: This figure presents the robustness check of staggered difference-in-difference estimates of sectoral variables around directed credit policy liberalization. The solid lines are point estimates in different staggered DiD designs. (a) dark blue line: baseline local projection DiD following Dube et al. (2023), (b) pink line: local projection DiD following Dube et al. (2023) using never-treated countries as control, (c) the dark green: Callaway and Sant'Anna (2021), (d) light green: Sun and Abraham (2021), (e) orange: De Chaisemartin and d'Haultfoeuille (2024). The dash lines represents 95% confidence intervals. The vertical axis is kept the same as 9 for each variable across sectors for the ease of comparison.

Figure E.13: Local Projection: Credit Liberalization

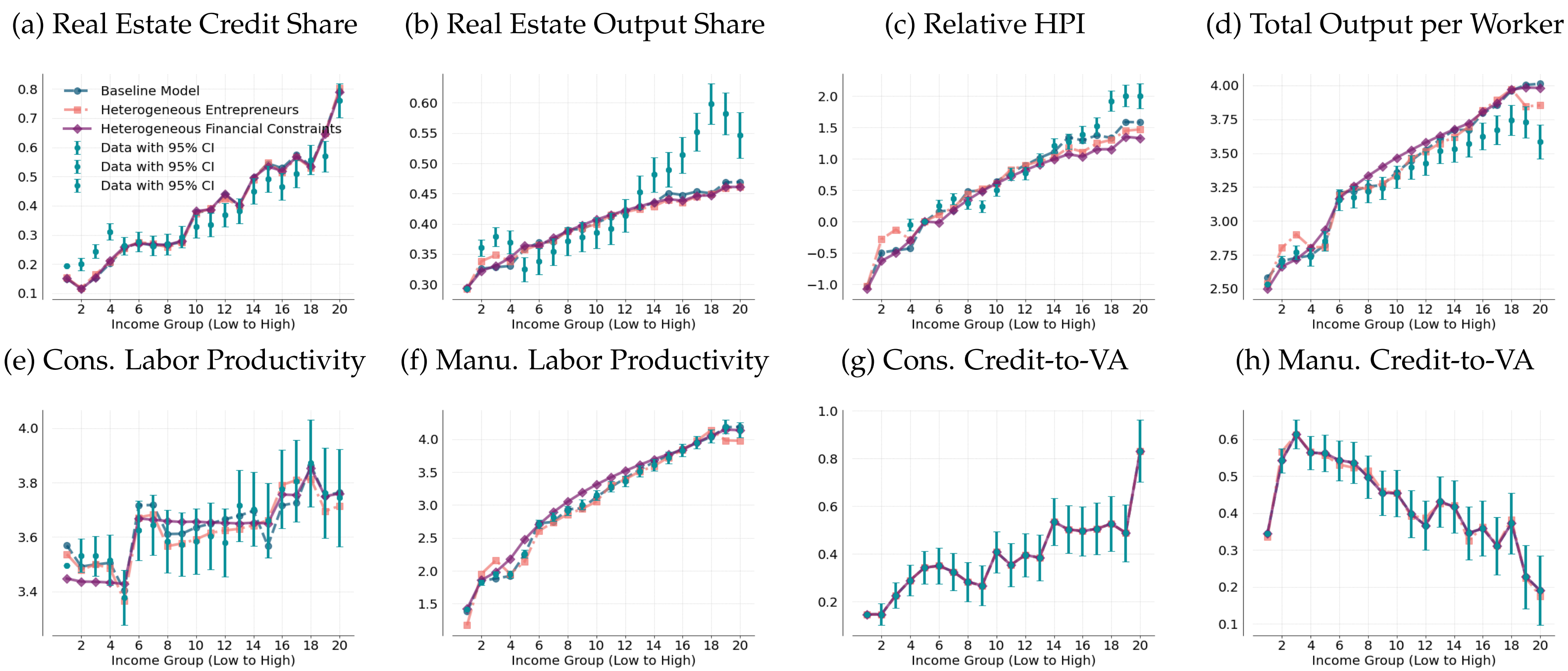


Note: This figure presents local projection impulse responses of aggregate and sectoral variables following directed credit policy liberalization

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

The shaded area represents 95% confidence intervals from standard errors computed using Driscoll and Kraay (1998).

Figure E.14: Moments: Model v.s. Data (Robustness Check)

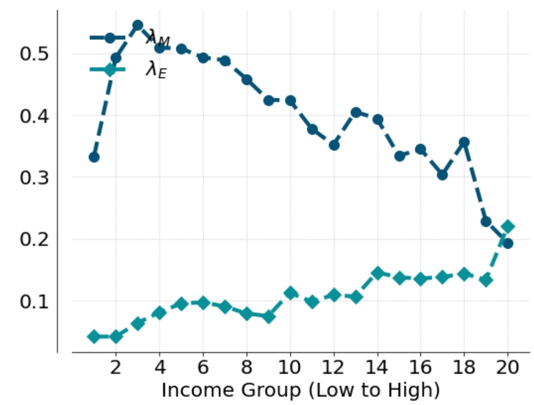


Note: This figure provides a robustness check for the comparison of moments from data and quantitative model. *Baseline Model* represents the results in Figure 7. *Heterogeneous Financial Constraints Model* refers to model in Appendix B.3. *Heterogeneous Entrepreneurs Model* refers to model in Section 5.3 and Appendix B.2. Both model follow similar calibration procedure in Section 5.1. The light-green vertical bars with dots show the point estimates of empirical moments with 95% confidence interval. The light-colored blue solid line represents the targeted moments from the model. 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 $\log(q/p^E)$, (d) total output per worker $\log[(y^E + y^M)/(n^E + n^M)]$, (e) labor productivity in construction sector $\log(y^E/n^E)$, (f) labor productivity in manufacturing sector $\log(y^M/n^M)$, (g) construction credit to value-added $d^E/(qy^E)$, and (h) manufacturing credit to value-added $d^M/(py^M)$.

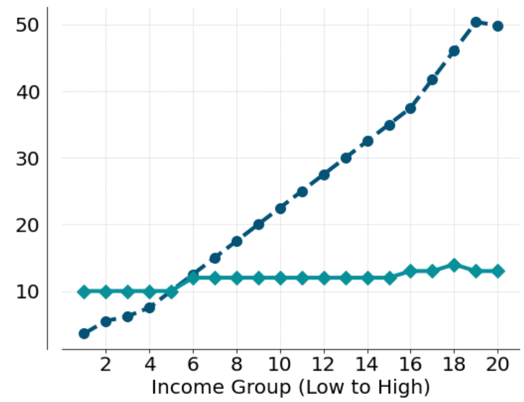
Figure E.15: Calibrated Parameters for Extended Model

Panel A: Quantitative Model with Capital as Tangible Asset in Appendix B.1

(1) Sectoral Financial Constraint $\{\lambda_n^j, \chi_n^j\}_{n=1}^N$

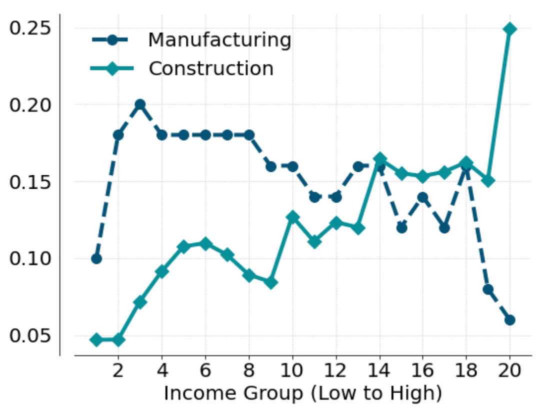


(2) Sectoral TFP $\{z_n^M\}_{n=1}^N$

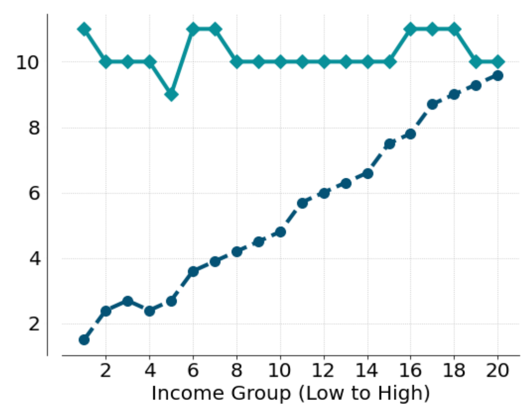


Panel B: Quantitative Model with Cash Flow- and Asset-Based Constraints in Appendix B.3

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



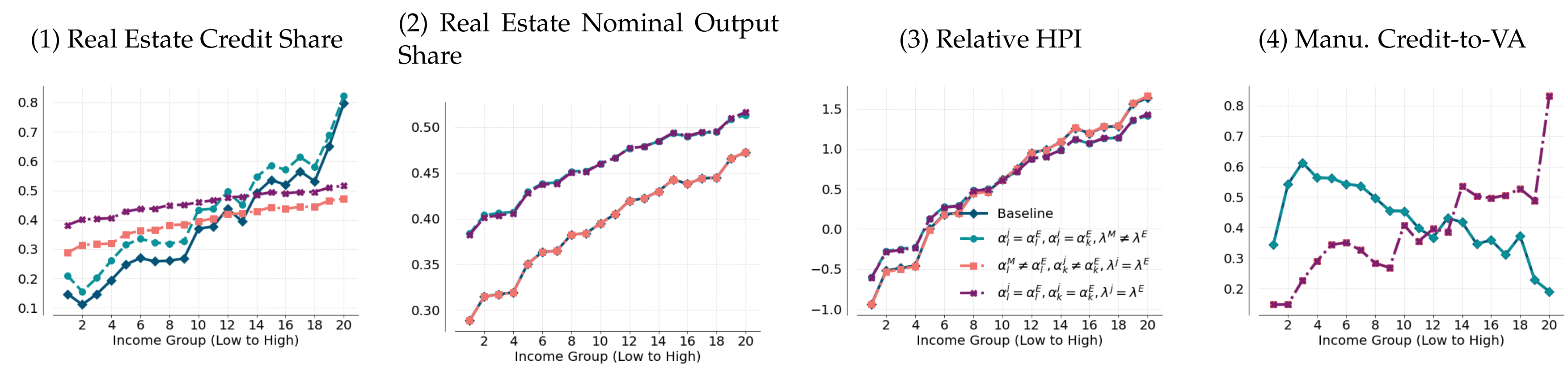
(2) Sectoral TFP $\{z_n^j\}_{n=1}^N$



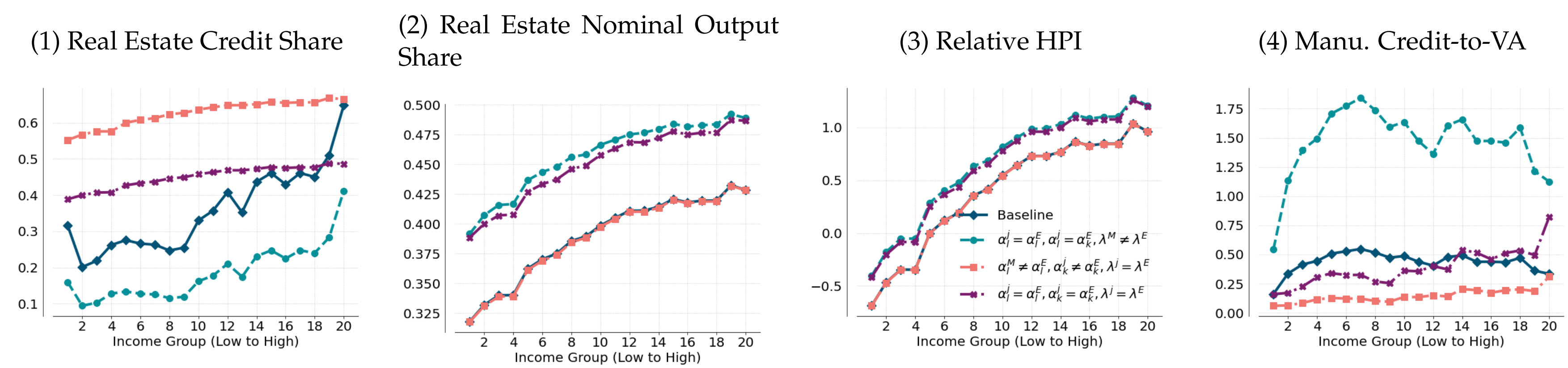
Note: This figure plots the key parameters governing sectoral financial constraints and TFP in our extended model, including sectoral financial constraint and TFP. Panel A and B use the quantitative model with capital as tangible asset in Appendix B.1 and with cash flow- and asset-based constraints in Appendix B.3, respectively.

Figure E.16: Counterfactual for Sectoral Heterogeneity

Panel A: Quantitative Model with Capital as Tangible Asset in Appendix B.1



Panel B: Quantitative Model with Cash Flow- and Asset-Based Constraints in Appendix B.3



Note: This figure shows the results for counterfactual analysis of key variables by shutting down different sources of sectoral heterogeneity. Panel A and B use the quantitative model with capital as tangible asset in Appendix B.1 and with cash flow- and asset-based constraints in Appendix B.3, respectively. The key variables are (1) credit share, (2) nominal output share, (3) relative HPI, and (4) manufacturing credit-to-VA.

F Supplementary Tables

Table F.1: Credit Share and Logged GDP Per Capita

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Agriculture						
ln(Real GDP per Capita)	-0.018***	-0.076**	-0.046***	0.149***	-0.013***	-0.175***
	(0.0018)	(0.0325)	(0.0020)	(0.0299)	(0.0017)	(0.0312)
ln(Real GDP per Capita)^2		0.003*		-0.010***		0.009***
		(0.0017)		(0.0016)		(0.0017)
Observations	1,876	1,876	1,876	1,876	1,872	1,872
# Countries	77	77	77	77	77	77
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.05	0.05	0.81	0.82	0.16	0.18
Panel B: Manufacture & Mining						
ln(Real GDP per Capita)	-0.044***	0.296***	-0.130***	1.105***	-0.032***	0.118**
	(0.0031)	(0.0561)	(0.0044)	(0.0601)	(0.0029)	(0.0532)
ln(Real GDP per Capita)^2		-0.018***		-0.064***		-0.008***
		(0.0030)		(0.0031)		(0.0028)
Observations	1,876	1,876	1,876	1,876	1,872	1,872
# Countries	77	77	77	77	77	77
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.10	0.12	0.71	0.77	0.26	0.27
Panel C: Construction & Real Estate						
ln(Real GDP per Capita)	0.058***	-0.242***	0.115***	-0.600***	0.054***	-0.171***
	(0.0027)	(0.0483)	(0.0040)	(0.0581)	(0.0027)	(0.0490)
ln(Real GDP per Capita)^2		0.016***		0.037***		0.012***
		(0.0026)		(0.0030)		(0.0026)
Observations	1,876	1,876	1,876	1,876	1,872	1,872
# Countries	77	77	77	77	77	77
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.20	0.22	0.72	0.74	0.25	0.26
Panel D: Service						
ln(Real GDP per Capita)	0.004	0.028	0.063***	-0.626***	-0.008**	0.234***
	(0.0035)	(0.0647)	(0.0056)	(0.0835)	(0.0034)	(0.0614)
ln(Real GDP per Capita)^2		-0.001		0.036***		-0.013***
		(0.0034)		(0.0043)		(0.0033)
Observations	1,876	1,876	1,876	1,876	1,872	1,872
# Countries	77	77	77	77	77	77
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.00	0.00	0.60	0.62	0.16	0.17

Notes: This table presents the estimation result for

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

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

Table F.2: Constant Price Value-Added Share and Logged GDP Per Capita

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Agriculture						
ln(Real GDP per Capita)	-0.109***	-0.461***	-0.069***	-0.496***	-0.109***	-0.430***
	(0.0013)	(0.0181)	(0.0022)	(0.0199)	(0.0013)	(0.0185)
ln(Real GDP per Capita)^2		0.020***		0.024***		0.018***
		(0.0010)		(0.0011)		(0.0011)
Observations	4,305	4,305	4,305	4,305	4,305	4,305
# Countries	99	99	99	99	99	99
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.64	0.67	0.90	0.91	0.65	0.67
Panel B: Manufacture & Mining						
ln(Real GDP per Capita)	0.002	0.363***	0.009***	0.123***	0.003*	0.376***
	(0.0016)	(0.0230)	(0.0024)	(0.0228)	(0.0016)	(0.0237)
ln(Real GDP per Capita)^2		-0.021***		-0.006***		-0.021***
		(0.0013)		(0.0013)		(0.0013)
Observations	4,305	4,305	4,305	4,305	4,305	4,305
# Countries	99	99	99	99	99	99
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.00	0.05	0.78	0.78	0.01	0.06
Panel C: Construction & Real Estate						
ln(Real GDP per Capita)	0.020***	0.035**	0.003	0.307***	0.021***	0.010
	(0.0009)	(0.0141)	(0.0021)	(0.0196)	(0.0009)	(0.0143)
ln(Real GDP per Capita)^2		-0.001		-0.017***		0.001
		(0.0008)		(0.0011)		(0.0008)
Observations	4,305	4,305	4,305	4,305	4,305	4,305
# Countries	99	99	99	99	99	99
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.10	0.10	0.57	0.60	0.13	0.13
Panel D: Service						
ln(Real GDP per Capita)	0.084***	0.000	0.054***	0.024	0.082***	-0.020
	(0.0019)	(0.0283)	(0.0038)	(0.0365)	(0.0019)	(0.0289)
ln(Real GDP per Capita)^2		0.005***		0.002		0.006***
		(0.0016)		(0.0020)		(0.0016)
Observations	4,305	4,305	4,305	4,305	4,305	4,305
# Countries	99	99	99	99	99	99
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.32	0.32	0.74	0.74	0.33	0.34

Notes: This table presents the estimation result for

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

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

Table F.3: Nominal Price Value-Added Share and Logged GDP Per Capita

	Panel A: Agriculture					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	-0.103***	-0.260***	-0.102***	-0.242***	-0.101***	-0.274***
	(0.0012)	(0.0185)	(0.0024)	(0.0225)	(0.0012)	(0.0187)
ln(Real GDP per Capita)^2		0.009***		0.008***		0.010***
		(0.0011)		(0.0013)		(0.0011)
Observations	3,704	3,704	3,704	3,704	3,701	3,701
# Countries	89	89	89	89	89	89
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.66	0.66	0.89	0.90	0.66	0.67
	Panel B: Manufacture & Mining					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.027***	0.382***	-0.015***	0.547***	0.029***	0.368***
	(0.0015)	(0.0214)	(0.0030)	(0.0261)	(0.0015)	(0.0217)
ln(Real GDP per Capita)^2		-0.020***		-0.032***		-0.019***
		(0.0012)		(0.0015)		(0.0012)
Observations	3,704	3,704	3,704	3,704	3,701	3,701
# Countries	89	89	89	89	89	89
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.08	0.15	0.70	0.74	0.11	0.17
	Panel C: Construction & Real Estate					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.016***	-0.003	0.036***	0.052**	0.016***	0.000
	(0.0009)	(0.0136)	(0.0023)	(0.0216)	(0.0009)	(0.0138)
ln(Real GDP per Capita)^2		0.001		-0.001		0.001
		(0.0008)		(0.0012)		(0.0008)
Observations	3,704	3,704	3,704	3,704	3,701	3,701
# Countries	89	89	89	89	89	89
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.08	0.08	0.52	0.52	0.11	0.11
	Panel D: Service					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.060***	-0.115***	0.081***	-0.352***	0.057***	-0.090***
	(0.0017)	(0.0255)	(0.0038)	(0.0353)	(0.0017)	(0.0254)
ln(Real GDP per Capita)^2		0.010***		0.024***		0.008***
		(0.0015)		(0.0020)		(0.0015)
Observations	3,704	3,704	3,704	3,704	3,701	3,701
# Countries	89	89	89	89	89	89
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.25	0.26	0.70	0.71	0.30	0.30

Notes: This table presents the estimation result for

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

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

Table F.4: Employment Share and Logged GDP Per Capita

	Panel A: Agriculture					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	-0.178***	0.035	-0.183***	-0.321***	-0.177***	0.033
	(0.0025)	(0.0438)	(0.0032)	(0.0278)	(0.0026)	(0.0450)
ln(Real GDP per Capita)^2		-0.012***		0.008***		-0.011***
		(0.0024)		(0.0015)		(0.0025)
Observations	1,231	1,231	1,226	1,226	1,225	1,225
# Countries	54	54	49	49	54	54
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.81	0.81	0.97	0.98	0.82	0.82
	Panel B: Manufacture & Mining					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.033***	0.305***	-0.030***	0.635***	0.031***	0.277***
	(0.0014)	(0.0239)	(0.0032)	(0.0195)	(0.0013)	(0.0221)
ln(Real GDP per Capita)^2		-0.015***		-0.037***		-0.013***
		(0.0013)		(0.0011)		(0.0012)
Observations	1,231	1,231	1,226	1,226	1,225	1,225
# Countries	54	54	49	49	54	54
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.31	0.37	0.73	0.86	0.46	0.51
	Panel C: Construction & Real Estate					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.016***	0.102***	0.024***	0.149***	0.016***	0.101***
	(0.0006)	(0.0099)	(0.0011)	(0.0092)	(0.0006)	(0.0101)
ln(Real GDP per Capita)^2		-0.005***		-0.007***		-0.005***
		(0.0005)		(0.0005)		(0.0006)
Observations	1,231	1,231	1,226	1,226	1,225	1,225
# Countries	54	54	49	49	54	54
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.40	0.43	0.82	0.84	0.42	0.46
	Panel D: Service					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Real GDP per Capita)	0.129***	-0.447***	0.190***	-0.471***	0.130***	-0.416***
	(0.0024)	(0.0393)	(0.0039)	(0.0276)	(0.0023)	(0.0377)
ln(Real GDP per Capita)^2		0.032***		0.036***		0.030***
		(0.0022)		(0.0015)		(0.0021)
Observations	1,231	1,231	1,226	1,226	1,225	1,225
# Countries	54	54	49	49	54	54
Country FE			✓	✓		
Year FE					✓	✓
R^2	0.71	0.75	0.94	0.96	0.75	0.79

Notes: This table presents the estimation result for

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

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

Table F.5: 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)
$\Delta_h \log(\text{HPI}_{c,t})$	0.16	0.41	0.22	0.59	0.22	0.78	0.26	-0.21
	[0.11,0.22]	[0.26,0.57]	[0.18,0.27]	[0.23,0.94]	[0.18,0.26]	[-0.53,2.10]	[0.21,0.30]	[-0.60,0.17]
Observations	753	679	671	530	601	442	449	258
# Countries	37	34	34	22	31	20	21	14
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Other controls	✓	✓	✓	✓	✓	✓	✓	✓
Specification	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
IV 1st Stage F-statistics		62.06		37.65		1.05		8.51
Mean of Dependent Var.	0.02	0.01	0.04	0.05	0.07	0.09	0.15	0.14
R^2	0.76	0.73	0.83	0.72	0.85	0.58	0.81	0.69

	Panel B: $\Delta_h \log(\text{Credit}^{\text{cons}}_{c,t})$							
	$h=1$		$h=3$		$h=5$		$h=10$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h \log(\text{HPI}_{c,t})$	0.39	0.51	0.49	0.75	0.48	0.66	0.49	-2.22
	[0.31,0.48]	[0.26,0.76]	[0.40,0.58]	[0.30,1.20]	[0.40,0.57]	[0.29,1.04]	[0.29,0.69]	[-20.1,15.6]
Observations	718	648	638	499	570	411	423	237
# Countries	36	33	33	21	30	19	20	14
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Other controls	✓	✓	✓	✓	✓	✓	✓	✓
Specification	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
IV 1st Stage F-statistics		54.86		30.26		71.92		0.10
Mean of Dependent Var.	0.06	0.06	0.17	0.19	0.29	0.33	0.62	0.51
R^2	0.83	0.82	0.87	0.84	0.88	0.86	0.87	-1.11

Notes: This table reports the estimation result for housing price pass-through to sectoral credit in different time horizons. IV 1st Stage F-statistics is computed following Kleibergen and Paap (2006).

Table F.6: Cross-Sectional Evidence of Housing Price Pass-through

	Panel A: Manuf./mining			**Panel B: Cons./RE**		
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(\text{HPI}_{c,t})$	0.28	0.12	0.24	0.67	0.24	0.39
	[0.11,0.45]	[-0.080,0.33]	[0.048,0.44]	[0.39,0.96]	[-0.013,0.49]	[0.23,0.56]
Observations	1,125	1,121	793	1,120	1,116	757
# Countries	46	46	37	46	46	36
Country FE	✓	✓	✓	✓	✓	✓
Year FE		✓	✓		✓	✓
Other controls			✓			✓
R^2	0.98	0.99	1.00	0.95	0.97	0.99

	Panel C: Low Mortgage Share			**Panel D: High Mortgage Share**		
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(\text{HPI}_{c,t})$	0.43	0.12	0.13	0.61	0.20	0.20
	[0.22,0.64]	[-0.16,0.40]	[-0.16,0.41]	[0.35,0.87]	[-0.11,0.51]	[-0.12,0.52]
Observations	5,188	5,188	5,166	5,830	5,830	5,815
# Countries	46	46	46	52	52	52
# Industries	5	5	5	5	5	5
Country FE	✓	✓	✓	✓	✓	✓
Year FE		✓			✓	
Industry FE	✓	✓		✓	✓	
Industry×Year FE			✓			✓
R^2	0.95	0.96	0.96	0.91	0.93	0.93

Notes: This table reports the cross-sectional evidence of housing price pass-through to credit in different sectors or industries with high/low mortgage share. Panel A and B estimate

$$\log(\text{Credit}^j_{c,t}) = \beta^j \log(\text{HPI})_{c,t} + X^j_{c,t} + \mu_c + \gamma_t + e^j_{c,t}$$

where j is sector, either manufacture/mining or construction/real estate, c indicates country, t indicates year. Panel C and D estimate

$$\log(\text{Credit}^\kappa_{c,t,j}) = \beta^\kappa \log(\text{HPI})_{c,t} + \mu_c + \gamma_t + \varrho_j + e^\kappa_{c,t,j}$$

where κ indicates whether the industry has low or high mortgage share, ϱ_j is the industry fixed effect. We separate the high and low mortgage share industry using a threshold of 45%. By definition, $\widehat{\beta}^j$ and $\widehat{\beta}^\kappa$ are the coefficients of interest. Standard errors are clustered at the country level. 95% confidence intervals are in the bracket.

Table F.7: Credit Growth and Collateral Usage: Country and Industry Variation

	$\Delta_h \log(\text{Credit}_{c,j,t})$			
	$h=5$		$h=10$	
	(1)	(2)	(3)	(4)
Mortgage $\text{Share}_{c,j}$	1.33***	0.60**	2.78***	1.20**
	(0.26)	(0.24)	(0.40)	(0.59)
Observations	280	350	185	191
# Countries	4	4	4	4
# Industries	5	9	5	8
Country × Year FE	✓	✓	✓	✓
Industry × Year FE	✓	✓	✓	✓
Industry Level	Broad	1-Digit	Broad	1-Digit
Mean of Dependent Var.	0.26	0.27	0.50	0.55
R^2	0.89	0.81	0.90	0.71

Notes: This table reports the relation between mortgage share and growth of credit for 5-year or 10-year time horizon following the specification in a country-year-industry panel

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

We use nominal credit on the dependent variable since price level is controlled by industry × year fixed effects. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table F.8: Credit Growth and Collateral Usage: Industry Variation

	Panel A: Sectoral Credit Growth and Mortgage Share							
	$h = 5$				$h = 10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mortgage Share$_j$	0.11***	0.11***	0.22***	0.21***	0.27***	0.28***	0.42***	0.45***
	(0.030)	(0.023)	(0.034)	(0.029)	(0.044)	(0.034)	(0.052)	(0.045)
Observations	14,516	15,520	16,046	16,858	11,868	12,752	12,796	13,493
# Countries	111	112	111	109	105	110	105	107
# Industries	5	5	9	9	5	5	9	9
Country FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Country×Year FE		✓		✓		✓		✓
Industry Level	Broad	Broad	1-Digit	1-Digit	Broad	Broad	1-Digit	1-Digit
Mean of Dependent Var.	0.30	0.70	0.29	0.66	0.58	1.44	0.56	1.34
R^2	0.20	0.75	0.16	0.66	0.30	0.85	0.25	0.79
	Panel B: Sectoral Credit Growth and Real Estate Input Share							
	$h = 5$				$h = 10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real Estate Input Share$_j$	0.65***	0.62***	1.55**	1.80***	1.42***	1.35***	3.31***	3.80***
	(0.056)	(0.045)	(0.77)	(0.68)	(0.082)	(0.066)	(1.07)	(0.94)
Observations	16,476	17,650	8,084	7,942	13,415	14,448	6,607	6,473
# Countries	111	112	111	100	105	110	105	95
# Industries	6	6	3	3	6	6	3	3
Country FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Country×Year FE		✓		✓		✓		✓
Industry Level	Broad	Broad	1-Digit	1-Digit	Broad	Broad	1-Digit	1-Digit
Mean of Dependent Var.	0.31	0.72	0.23	0.62	0.60	1.45	0.43	1.27
R^2	0.17	0.66	0.19	0.71	0.28	0.80	0.32	0.84

Notes: This table reports the relation between mortgage share and growth of credit for 5-year or 10-year time horizon following the specification in a country-year-industry panel

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta_h \text{Collateral Usage}_{c,j} + \text{Fixed Effects} + \epsilon_{c,j,t} \text{ for } h = 5, 10.$$

Panel A and B use mortgage share and real estate input share as the measure for sector-specific collateral usage. Country × year fixed effects captures the country-year specific price index. For these columns, the dependent variable is logged sectoral credit which is more available. For columns with country and year fixed effects, the dependent variable is logged sectoral real credit, deflated by CPI. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table F.9: Credit Growth and Collateral Usage: Country Variation

	Panel A: Mortgage to GDP Ratio							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h\left(\frac{\text{Mortgage}}{\text{GDP}}\right)_{c,t}$	1.51***	1.50***	1.68***	1.63***	1.22***	1.21***	1.55***	1.49***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)	(0.11)	(0.11)	(0.11)
Observations	4,683	4,683	4,875	4,823	3,741	3,741	3,793	3,744
# Countries	35	35	35	35	30	30	30	30
# Industries	6	6	9	9	6	6	9	9
Industry FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Industry×Year FE		✓		✓		✓		✓
Industry Level	Broad	Broad	1-Digit	1-Digit	Broad	Broad	1-Digit	1-Digit
Mean of Dependent Var.	0.25	0.25	0.23	0.23	0.48	0.48	0.47	0.46
R^2	0.16	0.22	0.19	0.26	0.17	0.22	0.21	0.27
	Panel B: Household Residential Mortgage to GDP							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h\left(\frac{\text{HH Resid Mortgage}}{\text{GDP}}\right)_{c,t}$	1.21***	1.22***	1.95***	1.87***	0.89***	0.87***	1.40***	1.29***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Observations	7,538	7,537	8,027	8,011	5,720	5,719	5,921	5,899
# Countries	69	69	69	69	57	57	57	57
# Industries	6	6	9	9	6	6	9	9
Industry FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Industry×Year FE		✓		✓		✓		✓
Industry Level	Broad	Broad	1-Digit	1-Digit	Broad	Broad	1-Digit	1-Digit
Mean of Dependent Var.	0.28	0.28	0.25	0.25	0.52	0.52	0.48	0.48
R^2	0.09	0.14	0.10	0.17	0.10	0.14	0.11	0.18
	Panel C: Household Residential Mortgage to Household Credit							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h\left(\frac{\text{HH Resid Mortgage}}{\text{HH Credit}}\right)_{c,t}$	0.41***	0.41***	0.44***	0.44***	0.65***	0.64***	0.56***	0.55***
	(0.071)	(0.071)	(0.069)	(0.070)	(0.080)	(0.081)	(0.077)	(0.078)
Observations	7,419	7,418	7,876	7,854	5,606	5,605	5,780	5,766
# Countries	69	69	69	69	57	57	57	57
# Industries	6	6	9	9	6	6	9	9
Industry FE	✓		✓		✓		✓	
Year FE	✓		✓		✓		✓	
Industry×Year FE		✓		✓		✓		✓
Industry Level	Broad	Broad	1-Digit	1-Digit	Broad	Broad	1-Digit	1-Digit
Mean of Dependent Var.	0.28	0.28	0.25	0.25	0.52	0.52	0.48	0.48
R^2	0.08	0.13	0.08	0.14	0.10	0.15	0.09	0.16

Notes: This table reports the relation between mortgage share and growth of credit for 5-year or 10-year time horizon following the specification in a country-year-industry panel

$$\Delta_h \log(\text{Credit}_{c,j,t}) = \beta_h \Delta_h \text{Collateral Usage}_{c,t} + \text{Fixed Effects} + \epsilon_{c,j,t} \text{ for } h = 5, 10.$$

Panel A, B and C use mortgage to GDP ratio, household residential mortgage to GDP and household residential mortgage to household credit as measure of collateral usage, respectively. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table F.10: Predictive Regression: Credit Liberalization

	$\mathbf{1}\{\text{Liberalization}_{c,t}\}$					
	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)
$X_{c,t-1}$	0.0071	-0.0078	0.0014	-0.0018	0.019**	0.0077
	(0.011)	(0.017)	(0.022)	(0.0055)	(0.0092)	(0.013)
$X_{c,t-1}$	0.00072	0.024	-0.025	-0.0076*	-0.0032	0.0027
	(0.011)	(0.026)	(0.019)	(0.0042)	(0.0090)	(0.010)
$X_{c,t-3}$	0.015	0.0028	-0.00091	0.0077	-0.023**	-0.00051
	(0.014)	(0.0054)	(0.011)	(0.0063)	(0.011)	(0.0081)
$X_{c,t-4}$	0.021*	0.0034	-0.017	0.0020	0.0079	-0.0033
	(0.011)	(0.0050)	(0.015)	(0.0039)	(0.012)	(0.0064)
$X_{c,t-5}$	-0.0046	-0.0039	0.020	0.0017	-0.00057	0.0047
	(0.016)	(0.0079)	(0.015)	(0.0051)	(0.010)	(0.0092)
Observations	5,312	3,982	4,604	4,456	4,379	5,017
Country FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
R^2	.037	.048	.042	.043	.04	.037

Notes: This table report 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 F.11: 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$_{c,j,t}$	-2.06**	-2.79***	-2.83***	-2.46**	-2.50**	-3.54***	-3.84***	-3.93***
	(0.72)	(0.80)	(0.88)	(1.11)	(0.80)	(0.91)	(0.93)	(0.91)
Observations	1,567	1,191	1,551	1,190	825	651	811	650
# Countries	15	15	15	15	14	14	14	14
# Industries	18	11	18	11	17	11	16	11
Country×Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry×Year FE			✓	✓			✓	✓
R^2	.0098	.019	.017	.014	.025	.047	.055	.056
	Panel B: Intangible and Tangible Assets							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_h \log(\text{Intangible}_{c,j,t})$	0.40***	0.40***	0.10	0.18	0.46***	0.37***	0.13	0.17
	(0.087)	(0.088)	(0.17)	(0.17)	(0.038)	(0.047)	(0.16)	(0.17)
$\Delta_h \log(\text{Tangible}_{c,j,t})$	0.74***	0.82***	0.70***	0.61***	0.78***	0.97***	0.79***	0.81***
	(0.063)	(0.093)	(0.10)	(0.13)	(0.032)	(0.033)	(0.024)	(0.058)
Observations	1,567	1,191	1,551	1,190	825	651	811	650
# Countries	15	15	15	15	14	14	14	14
# Industries	18	11	18	11	17	11	16	11
Country×Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry×Year FE			✓	✓			✓	✓
R^2	.065	.089	.037	.039	.12	.15	.089	.099

Notes: This table reports the relation between change of intangible or tangible assets and industry 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

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

*, ** and *** denote significance at the 10%, 5% and 1% level.

Table F.12: Development Accounting Analysis: Model with Two Types of Production Technology (Continued)

	Panel A: $d^E/(d^E+d^M)$			Panel B: $qy^E/(qy^E+y^M)$		
	1 to 20	1 to 3	3 to 20	1 to 20	1 to 3	3 to 20
(1) Baseline	65.01	1.27	63.74	16.91	5.62	11.29
(2) Vary productivity	24.57 (37.8)	6.25 (n.a.)	18.32 (28.7)	17.22 (101.8)	5.56 (98.9)	11.66 (103.3)
(3) Vary all constraints	49.97 (76.9)	−2.50 (n.a.)	52.47 (82.3)	−0.04 (−0.3)	0.17 (3.1)	−0.22 (−1.9)
(4) Vary manu. constraint	11.43 (17.6)	−13.76 (n.a.)	25.19 (39.5)	−0.07 (−0.4)	0.17 (3.0)	−0.24 (−2.1)
(5) Vary cons. constraint	37.24 (57.3)	7.25 (n.a.)	30.00 (47.1)	0.02 (0.1)	0.00 (0.0)	0.02 (0.2)
	Panel C: $\log(q)$			**Panel D: $d^M/(p^My^M)$**		
	1 to 20	1 to 3	3 to 20	1 to 20	1 to 3	3 to 20
(1) Baseline	2.50	0.90	1.60	−0.65	0.60	−1.25
(2) Vary productivity	2.55 (101.8)	0.89 (98.4)	1.66 (103.8)	−0.35 (54.0)	−0.06 (−10.1)	−0.29 (23.3)
(3) Vary all constraints	−0.04 (−1.4)	0.02 (2.1)	−0.05 (−3.4)	−0.46 (71.0)	0.58 (97.4)	−1.05 (83.7)
(4) Vary manu. constraint	−0.01 (−0.4)	0.02 (2.5)	−0.03 (−2.0)	−0.46 (71.0)	0.58 (97.4)	−1.05 (83.7)
(5) Vary cons. constraint	−0.03 (−1.0)	−0.00 (−0.3)	−0.02 (−1.4)	−0.00 (0.0)	−0.00 (−0.0)	0.00 (−0.0)

Note: This table shows how financial constraints and sectoral TFP 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 price of collateral $\log(q)$, and (d) manufacturing credit to value added ratio $d^M/(p^My^M)$. All other notes are the same as Table 3.

Table F.13: Quantifying the Decomposition Rule: Baseline

Group Range	Variable	$\Delta\log(\mathbf{Q})$	$\Delta\log(\mathbf{Z})$	$\Delta\log(\mathbf{W})$	$\Delta\log(\mathbf{\Gamma})$	Total
1 to 20	$\Delta\log(d^E/d^M)$	1263.9%	-1252.1%	0.0%	88.2%	100.0%
1 to 20	$\Delta\log(qy^E/y^M)$	4586.5%	-4543.8%	0.0%	57.3%	100.0%
1 to 3	$\Delta\log(d^E/d^M)$	14946.8%	-14379.1%	0.0%	-467.7%	100.0%
1 to 3	$\Delta\log(qy^E/y^M)$	3691.0%	-3550.8%	0.0%	-40.2%	100.0%
3 to 20	$\Delta\log(d^E/d^M)$	833.7%	-839.4%	0.0%	105.7%	100.0%
3 to 20	$\Delta\log(qy^E/y^M)$	5312.9%	-5349.3%	0.0%	136.4%	100.0%

Note: This table shows how different channels contribute to financial and canonical Kuznets facts.

Table F.14: Quantifying the Decomposition Rule: Two Constraints

Group Range	Variable	$\Delta\log(\mathbf{Q})$	$\Delta\log(\mathbf{Z})$	$\Delta\log(\mathbf{W})$	$\Delta\log(\mathbf{\Gamma})$	Total
1 to 20	$\Delta\log(d^E/d^M)$	1013.2%	-364.3%	-626.3%	77.4%	100.0%
1 to 20	$\Delta\log(qy^E/y^M)$	2950.1%	-1060.7%	-1823.4%	34.1%	100.0%
1 to 7	$\Delta\log(d^E/d^M)$	-2902.2%	1036.7%	1781.2%	184.3%	100.0%
1 to 7	$\Delta\log(qy^E/y^M)$	2959.0%	-1057.0%	-1816.0%	14.0%	100.0%
5 to 15	$\Delta\log(d^E/d^M)$	908.6%	-325.0%	-558.9%	75.3%	100.0%
5 to 15	$\Delta\log(qy^E/y^M)$	3001.1%	-1073.6%	-1846.0%	18.4%	100.0%

Note: This table shows how different channels contribute to financial and canonical Kuznets facts.

Table F.15: Sectoral Credit Allocation and Subsequent Long-Run Growth: Pooling Two Sectors

	Dep Var: $\Delta_h \log(\text{Real GDP per Capita}_{c,t})$							
	$h=5$				$h=10$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit $\text{Share}^{\text{Manu}}_{c,t}$	0.31***		0.23***	0.14	0.41***		0.26***	0.39***
	(0.044)		(0.041)	(0.12)	(0.067)		(0.046)	(0.11)
Credit $\text{Share}^{\text{Cons}}_{c,t}$		-0.33***	-0.25***	-0.017		-0.60***	-0.52***	-0.20
		(0.049)	(0.050)	(0.069)		(0.058)	(0.058)	(0.15)
Total Credit to $\text{GDP}_{c,t}$	-0.097**	-0.062*	-0.059	-0.15***	-0.044	0.028	0.030	0.0046
	(0.037)	(0.036)	(0.038)	(0.036)	(0.068)	(0.053)	(0.057)	(0.041)
Observations	1,511	1,511	1,511	744	1,162	1,162	1,162	545
# Countries	73	73	73	41	65	65	65	36
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
GDP Level Control	✓	✓	✓	✓	✓	✓	✓	✓
Sectoral Value Added Control				✓				✓
R^2	0.19	0.20	0.21	0.29	0.33	0.36	0.37	0.36

Notes: This table presents the estimation result for

$$\Delta_h \log(\text{Real GDP per Capita}_{c,t}) = \sum_{j \in \{\text{cons,manu}\}} \beta^j_h \text{ Credit Share}^j_{c,t} + \gamma_c + \mu_t + X^j_{c,t} + \epsilon^j_{c,t,h}, \quad h = 5, 10.$$

where Δ_h is the operator for change from t to $t+h$, j indicates sector, γ_c is the country fixed effect, μ_t is year fixed effect, $X^j_{c,t}$ is other macroeconomic controls, including a second-order polynomial of logged real GDP per capita, total credit to GDP ratio, sectoral value-added share. Driscoll and Kraay (1998) standard errors are in the parentheses with lag length ceiling$(1.5 \times h)$. *, **, and *** denote significance at the 10%, 5% and 1% level.

Table F.16: Sectoral Credit Allocation and Subsequent Long-Run Growth: All Sectors

	Panel A: Agriculture					
	$h = 5$			$h = 10$		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Share$^{Agri}_{c,t}$	0.12 (0.10)	0.53*** (0.13)	-0.093 (0.15)	0.063 (0.17)	0.88*** (0.21)	-0.23 (0.45)
Observations	1,516	1,515	1,340	1,169	1,166	1,014
# Countries	74	73	68	68	65	61
Country FE		✓	✓		✓	✓
Year FE			✓			✓
Other Controls			✓			✓
R^2	0.00	0.03	0.17	0.00	0.05	0.28
	Panel B: Manufacturing & Mining					
	$h = 5$			$h = 10$		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Share$^{Manu}_{c,t}$	0.17** (0.087)	0.36*** (0.10)	0.24*** (0.060)	0.22 (0.20)	0.44** (0.18)	0.32*** (0.078)
Observations	1,516	1,515	1,340	1,169	1,166	1,014
# Countries	74	73	68	68	65	61
Country FE		✓	✓		✓	✓
Year FE			✓			✓
Other Controls			✓			✓
R^2	0.03	0.08	0.21	0.02	0.05	0.31
	Panel C: Construction & Real Estate					
	$h = 5$			$h = 10$		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Share$^{Cons}_{c,t}$	-0.39*** (0.062)	-0.63*** (0.057)	-0.26*** (0.086)	-0.67*** (0.095)	-1.06*** (0.076)	-0.48*** (0.16)
Observations	1,516	1,515	1,340	1,169	1,166	1,014
# Countries	74	73	68	68	65	61
Country FE		✓	✓		✓	✓
Year FE			✓			✓
Other Controls			✓			✓
R^2	0.10	0.18	0.20	0.10	0.21	0.32
	Panel D: Services					
	$h = 5$			$h = 10$		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Share$^{Serv}_{c,t}$	0.054 (0.067)	-0.0019 (0.069)	-0.094** (0.045)	0.13 (0.19)	0.055 (0.13)	-0.17** (0.076)
Observations	1,516	1,515	744	1,169	1,166	545
# Countries	74	73	41	68	65	36
Country FE		✓	✓		✓	✓
Year FE			✓			✓
Other Controls			✓			✓
R^2	0.00	0.00	0.29	0.01	0.00	0.33

Notes: This table presents the estimation result for

$$\Delta_h \log(\text{Real GDP per Capita}_{c,t+h}) = \beta^j_h \text{Credit Share}^j_{c,t} + \gamma_c + \mu_t + X^j_{c,t} + \epsilon^j_{c,t,h}, \quad h = 5, 10,$$

where Δ_h is the operator for change from t to $t+h$, j indicates sector, γ_c is the country fixed effect, μ_t is year fixed effect, $X^j_{c,t}$ is other other macroeconomic controls, including a second-order polynomial of logged real GDP per capita at time t and sectoral value-added share at time t. Driscoll and Kraay (1998) standard errors are in the parentheses with lag length ceiling($1.5 \times h$). *, **, and *** denote significance at the 10%, 5% and 1% level.