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2017

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December 3, 2017

Abstract

The degree of bank competition as well as firms' *and* households' participation in the domestic banking system differ considerably in emerging economies (EMEs) relative to advanced economies (AEs). We build a small-open-economy model with endogenous firm entry, monopolistic banks, household and firm heterogeneity in participation in the banking system, and labor search to analyze the labor market and aggregate consequences of financial participation and banking reforms in EMEs. We find that there is a *pre-reform* threshold of firm participation in the banking system below which reform implementation leads to *sharper* unemployment and aggregate fluctuations amid foreign interest rate and aggregate productivity shocks. Our findings suggest that comprehensive banking reforms that foster household participation and bank competition in tandem can reduce labor market and aggregate volatility, but only under a high-enough pre-reform level of firm participation in the banking system *and* a non-negligible increase in bank competition.

JEL Classification: E24, E32, E44, F41, G21

Keywords: Emerging economies, structural reforms, foreign interest rate shocks, business cycles, banking sector, unemployment, financial participation.

*We thank Fabio Ghironi, Matteo Cacciatore, participants in the conference "Rethinking Competitiveness, Structural Reforms, and Macro Policy", UMass Lowell, and the IMF Research Department for comments and suggestions. Any errors are our own.

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1 Introduction

Amid increasing globalization and cross-country financial linkages, domestic banking and financial participation reforms are an important policy instrument. However, the extent to which such reforms have a differential impact in developing and emerging market economies (EMEs) compared to advanced economies (AEs) is not well understood. Does one size fit all across countries in terms of such reforms? Do the unique structural characteristics of EMEs' domestic financial systems—in particular, the limited degree of domestic financial participation among firms and households, the associated distribution of employment across firms, and EMEs' vulnerability to foreign financial shocks relative to AEs—matter for the domestic labor market and aggregate outcomes of reforms? The answers to these questions are important as EMEs have recently put forth several banking and financial participation reform initiatives.[1]

This paper sheds light on these questions by building a small-open-economy (SOE) RBC model with: endogenous firm entry; a monopolistically-competitive banking sector; labor market frictions; and household and firm heterogeneity in participation in the domestic banking system where productivity and foreign interest rate shocks are the main drivers of aggregate fluctuations. The model captures the fact that EMEs firm and household participation in the domestic banking system differs from that in AEs in four key respects.[2] First, the majority of firms in EMEs do not participate in the domestic banking system. Second, these firms account for a significant share of total employment and job creation (Beck and Demirgüç-Kunt, 2006; Beck, Demirgüç-Kunt, and Martínez Pería, 2007; IFC, 2010, 2013; Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011). In contrast, the majority of firms in AEs have access to (and use) bank credit. Third, less than 50 (more than 90) percent of the population in EMEs (AEs) participates in the domestic banking system, as measured by the rates of account ownership at financial institutions (Global Financial Development Report, 2014, henceforth GFDR, 2014). Fourth, EMEs' banking sectors tend to be less competitive relative to those in AEs.

[1] See Prati, Gaetano Onorato, and Papageorgiou (2013), Hollweg, Lederman, and Mitra (2015), and Dabla-Norris, Ho, and Kyobe (2016), among others, for evidence on structural reforms.

[2] We document the following facts in Section 2.

As a benchmark, we calibrate the model to reflect EME levels of: (1) bank competition (as reflected in higher bank net interest margins); (2) household participation in the banking system; and (3) firm participation via bank-credit usage. We characterize the short- and long-run consequences of financial by bringing (1) and (2) closer to AE standards.[3]

Our analysis yields four main results. First, *amid a low pre-reform level of firm participation in the banking system (as observed in EMEs)*, bolstering households' participation from an initially (EME-consistent) low level *without* fostering bank competition leads to *higher* unemployment volatility; a fall in the countercyclicality of the trade balance; and sharper aggregate fluctuations in the post-reform equilibrium.

Second, fostering bank competition *without* increasing households' participation in the banking system leads to reductions, albeit quantitatively limited, in labor market and aggregate volatility, as well as a fall in the countercyclicality of the trade balance in the post-reform equilibrium. Thus, *comprehensive* banking reform—that is, a *joint* increase in bank competition and households' participation—leads to higher unemployment volatility, an unambiguous reduction in the countercyclicality of the trade balance and, at best, muted reductions in aggregate fluctuations. This stands in contrast with the unambiguous volatility-reducing effects of reforms in more standard environments based on *full* participation of firms in the banking system. Importantly, by influencing consumption dynamics across reform equilibria, foreign interest rate shocks play a significant role in determining the extent to which reforms have non-negligible effects on cyclical volatility.

Third, turning to reform-induced transitional dynamics at EME levels of firm participation, reforms entail short-term reductions in consumption and investment (as well as an increase in foreign debt) that ultimately fuel firm creation and lead to higher long-term output, consumption, and investment, lower unemployment, and a higher trade balance-output ratio. Finally, we show that the adverse impact of reforms on volatility and the short-term costs along the transition path towards the post-reform steady state are decreasing in the

[3]Concrete policy examples of greater household participation in the banking system include: legislation that reduces excessive paperwork requirements and costs of opening *and* using deposit/savings accounts (without compromising financial stability); the expansion of reach-out efforts to unbanked households via advertising and information campaigns; and efforts to support the adoption of technologies that facilitate transactions for households, among others. Given our objectives, we abstract from explicitly modeling any given particular policy and instead consider these policies' implications when reflected in higher household participation in the banking system.

pre-reform level of firm participation in the banking system: above a pre-reform firm participation threshold of roughly 0.30 (which is slightly above the average share of financially-included firms in EMEs), reforms *do* reduce labor market and aggregate volatility *without* entailing short-run costs during the transition to the post-reform steady-state.

The intuition behind our results traces back to how reforms affect financially-included and -excluded households' consumption dynamics, and how these dynamics feed into firm creation decisions and firms' employment and investment decisions, ultimately shaping labor market and aggregate dynamics. Bolstering household participation in the banking system for a given (low) level of bank competition reduces (increases) financially-excluded (financially-included) households' average labor income and makes their consumption more (less) volatile. Higher (lower) consumption volatility makes firms' discounting of the future more (less) volatile, which translates into more (less) volatile financially-excluded-firm (-included-firm) vacancy creation, investment, as well as more (less) volatile firm creation among financially-excluded (-included) households.

Despite the fact that financially-excluded firms represent a much smaller share of the universe of firms under the reform, their more sensitive response via labor demand, investment, and firm creation contributes to higher labor market and aggregate volatility. Conversely, bolstering bank competition for a given (low) level of household participation fosters firm entry among firms that participate in the banking system, employment creation and investment, and labor income. However, financially-excluded firms also benefit from this via improvements in their relative price, which bolster firm entry, investment, and wages among these firms as well. As a result, both financially-included *and* -excluded households enjoy higher consumption, with financially-included households and firms benefiting disproportionately more from the reform. This stabilizes cyclical consumption dynamics across all households, which contributes to smoother fluctuations in employment creation and investment, and ultimately leads to smaller unemployment and output fluctuations.

Thus, under *comprehensive banking reform (reflected in both greater household participation that matches AE standards and bank competition)*, the effect of greater household participation is quantitatively-dominating force due to the relatively large gap in household participation between EMEs and AEs. Importantly, this dominance diminishes and even-

tually vanishes when the *pre-reform* share of firms that participate in the banking system surpasses the 50 percent mark since these firms increasingly account for the bulk of aggregate economic activity and therefore drive aggregate dynamics. As such, for a large-enough share of pre-reform firm participation, banking reforms not only have a volatility-reducing effect, but also entail no short-term costs (reflected in reduced consumption) associated with the transition to the post-reform steady state.

Finally, we note that the presence of foreign interest rate shocks (via their impact on consumption dynamics) is important for characterizing the effects of reforms on cyclical labor market and aggregate dynamics in EMEs. Importantly, the influence of productivity shocks on post-reform dynamics is greater—implying that the influence of interest rate shocks is smaller—the greater is the *pre-reform* share of firm participation (i.e., the closer the economy is to AE standards pre-reform). These findings are consistent with the relative relevance of foreign interest rate shocks in EME business cycles, but also stress the relevance of considering such shocks (or financial shocks more generally) in the analysis of banking reforms in EMEs.

Our work is closest to the literatures on endogenous firm entry and business cycles (Bilbiie, Ghironi, and Melitz , 2012, henceforth BGM; Etro and Colciago, 2010); endogenous entry and labor market dynamics (Shao and Silos, 2013; Colciago and Rossi, 2015); and endogenous firm entry amid a monopolistic banking system (Mandelman, 2010; Totzek, 2011; La Croce and Rossi, 2015; Rossi, 2015).[4] Our work is also related to recent theoretical work on: financial development and firm dynamics and firm dynamics and reforms amid frictionless labor markets (Arellano, Bai, and Zhang, 2012; D'Erasmo and Moscoso-Boedo, 2012; Buera, Moll, and Shin, 2013; Buera and Shin, 2017); financial development, frictional heterogeneous labor markets, and business cycles (Epstein and Finkelstein Shapiro, 2017;

[4]Shao and Silos (2013) show that a model with endogenous firm entry and labor search frictions can explain the cyclical movements in U.S. income shares. Colciago and Rossi (2015) show that a similar model with Cournot competition can explain the empirical response of unemployment and price markups to productivity shocks in the U.S. Mandelman (2010) shows that an imperfectly competitive banking sector can amplify business cycles in EMEs. Totzek (2011) shows that endogenous bank entry à la BGM contributes to successfully reproducing the cyclical dynamics of U.S. financial and macro variables. La Croce and Rossi (2015) find that the interaction between endogenous firm entry and monopolistically competitive banks amplifies business cycle fluctuations. See Olivero (2010) for earlier work on business cycles amid deep habits in banking that abstracts from endogenous firm entry.

Epstein, Finkelstein Shapiro, and González Gómez, 2017a,b); as well as well-known work on financial shocks and business cycles in EMEs (Neumeyer and Perri, 2005; Uribe and Yue, 2006).[5] The joint inclusion of labor search frictions and endogenous firm entry in our framework builds on a growing set of studies on structural reforms in goods and labor markets, which have centered primarily on AEs (Cacciatore and Fiori, 2016; Cacciatore, Ghironi, and Fiori, 2016; Cacciatore, Duval, Fiori, and Ghironi, 2016a,b). Finally, closest to our focus on banking reforms, business cycles, and endogenous firm entry are recent quantitative studies on banking deregulation and macroeconomic dynamics by Stebunovs (2008) and Cacciatore, Ghironi, and Stebunovs (2015), which our framework thoroughly builds on. Importantly, these studies focus on AEs and abstract from considering employment dynamics and the role of firm and household heterogeneity in banking-system participation, both of which are central to our work and main findings.

All told, our main contributions are fourfold. First, our study is the first to focus on the relevance of the depth of participation in the banking system for the short-run labor market and macro consequences of banking reforms. Second, we focus on EMEs, which have received little attention in the growing literature on macro dynamics and structural reforms. Third, we merge a tractable monopolistic banking system, endogenous firm entry, and equilibrium unemployment amid empirically-factual heterogeneous firm and household participation in the banking system. Fourth, our results stress the central role of this pre-reform heterogeneity for characterizing the business cycle implications of banking reforms in EMEs. More broadly, our results suggest that banking reforms in AEs, where there are high levels of incumbent firm participation in the banking system, have positive business cycle effects and no short-run transition costs whereas that may not necessarily be the case in EMEs *if reforms are implemented amid low pre-reform firm participation shares in the banking system*. This result is important since many EMEs and developing economies currently have low firm participation shares.

The remainder of this paper is structured as follows. Section 2 presents empirical evidence

[5]For recent work on labor and goods market reforms that incorporates informality, which is a prevalent feature of EMEs, see Munkacsi and Saxegaard (2017). Also, for work on firm financial inclusion and inequality, see Dabla-Norris et al. (2015). Their work abstracts from the cyclical implications of deeper financial inclusion.

on cross-country domestic banking development that supports our theoretical framework. Section 3 presents our framework. Section 4 explores the quantitative implications of banking reforms that bring a representative EME to AE standards. Section 5 concludes.

2 Empirical Background

The following evidence illustrates key differences in participation in the banking system and banking competition between AEs and EMEs and provides empirical support to the modeling framework presented in Section 3.

Table 1 shows that, compared to AEs, in EMEs both firms and individuals participate much less in the domestic banking system *and* banking competition is much lower. Specifically, The second column shows that over 50 percent of firms in AEs have bank loans, but less than 25 percent of firms in EMEs do so.[6] As such, the participation of firms in the banking system via bank credit usage in AEs is twice as high as in EMEs. The third column shows that individuals' participation in the domestic banking system are considerably lower in EMEs relative to AEs. Indeed, less than half of the population in EMEs has an account at financial institutions, compared to more than 90 percent in AEs.[7] The fourth and fifth columns show that competition in the domestic banking system is much lower in EMEs compared to AEs: bank net interest margins—a measure of banks' loan profitability and therefore a proxy of competition in the banking sector—in AEs are less than 40 percent compared to EMEs; and the Bank Lerner Index is 30 percent higher in EMEs compared to AEs. Finally, the last column of Table 1 shows a complementary measure of domestic access to the banking system: on a per population scale the number of bank branches in AEs is well over twice as that in EMEs.[8]

[6]There is heterogeneity within EMEs, with the share of firms with bank loans ranging from roughly 10 percent in particular EMEs to more than 50 percent in others, but the fact that AEs have larger shares of firm participation in the banking system relative to EMEs continues to hold.

[7]Evidence on *usage* of financial accounts in EMEs and AEs confirms a similar pattern: virtually all individuals in AEs have used their accounts for transactions in the recent past. This stands in contrast with only a small fraction of individuals in EMEs having done so (the correlation between the share of individuals in the economy with an account at financial institutions and the share of individuals depositing/withdrawing at least once in a typical month is 0.999). For similar evidence, see Beck, Demirgüç-Kunt, and Martinez Peria (2007).

[8]The Lerner Index summarizes the degree of market power in the banking system, with a higher index implying a less competitive environment (see the World Bank's Global Financial Development Database).

Table 1: Firms' Bank Financing, Household Participation in Domestic Banking System, and Bank Competition in Advanced and Emerging Economies

Country Group	Share of Firms with Bank Loans (Median, % Firms)	Account at Fin. Institutions (% of Pop. Age 15+)	Bank Net Interest Margins (%)	Bank Lerner Index	Commercial Bank Branches Per 100,000 Adults (Number)
AEs	0.56	96.4	1.69	0.198	28.7
EMEs	0.26	42.2	4.30	0.240	13.0

Sources: Eurostat and Survey of Access to Finance of Enterprises (SAFE, 2011) (for the share of firms with bank loans, advanced economies, or AEs) and IFC Enterprise Finance Gap Database 2010 (for the share of total (formal and informal) firms in AEs, and for all relevant evidence on emerging economies, or EMEs), World Bank Global Financial Inclusion Database (account at financial institutions, 2011), World Bank Financial Development Structure (net interest margins, average 2000-2011), World Bank Global Financial Development Database (Lerner Index, average 2000-2011), and IMF Financial Access Survey (number of commercial bank branches per 100,000 adults, 2011). See Section A.1 of the Appendix for further details. Notes: Similar evidence on firms' usage of bank credit and households' participation in the domestic banking system is presented in Epstein, Finkelstein Shapiro, and González Gómez (2017b).

Amid the backdrop of Table 1, it is important to note that across countries limited firm participation in the banking system is associated with the prevalence of (micro and small) *household-operated* firms. These firms' *internal* accounts are often indistinguishable from those of their owners.[9] Therefore, firms that do not participate in the banking system are more likely than not to be owned and operated by households who do not participate in the system either.[10] Moreover, these firms account for more than 50 percent of employment in EMEs, compared to roughly 15 percent in AEs (OECD, 2009; European Social Survey; IFC, 2010, 2013).

Figure 1 reinforces the evidence in Table 1 by using a more extensive list of countries (see Section A.1 in the Appendix for details). This figure shows that economies with lower domestic banking development as proxied for by the share of individuals with an account

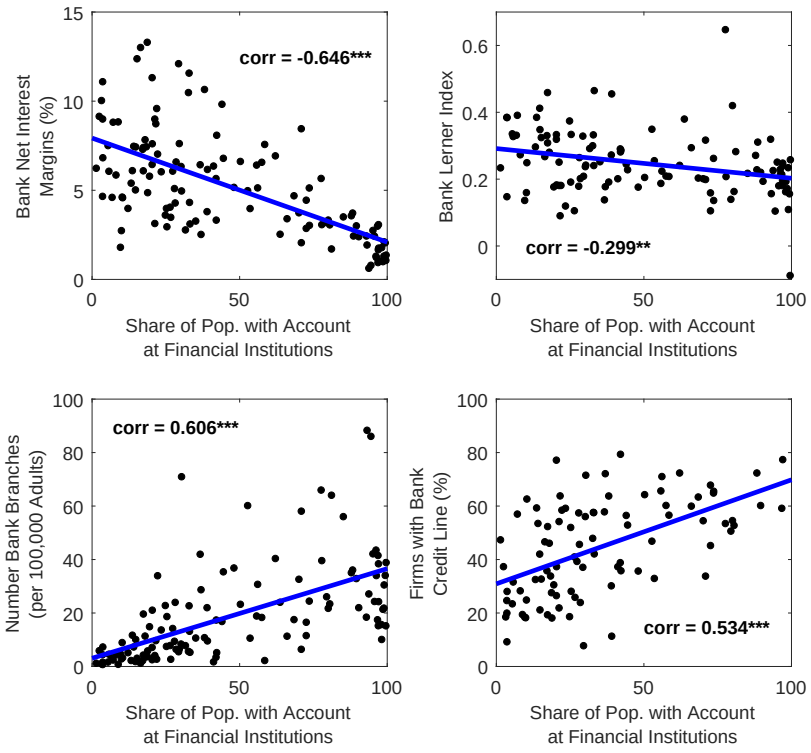
Equality-of-means tests suggest that the differences in net interest margins, the Lerner Index, and the number of bank branches per capita between AEs and EMEs (as well as differences in participation in the banking system) are statistically significant at conventional levels.

[9]Using World Bank Enterprise Survey data (which only includes formal firms), we find a strong and negative relationship between the share of the population with a financial account and the percent of firms with legal status of sole proprietorship (which is the best available proxy of the degree of household-owned firms).

[10]Indeed, given the nature of financial markets, it is unlikely for the majority of (household) firm owners to own firms that participate in the banking system without doing so themselves (via financial account ownership). This is particularly applicable to ownership of micro and small firms, which tend to be unregistered (informal) and account for a large share of the universe of firms in EMEs (see IFC, 2010, 2013).

at financial institutions tend to have: (1) higher bank net interest margins (top left panel); (2) a higher bank Lerner Index (i.e., less bank competition, top right panel); (3) a smaller number of commercial bank branches per capita (bottom left panel); and a smaller share of firms with bank credit lines (bottom right panel).

Figure 1: Domestic Banking Development, Firm Structure, and Economic Development Across Countries



Sources: World Development Indicators, World Bank Global Financial Development Report 2015, IFC Enterprise Finance Database 2010, Penn World Tables. Notes: The lines in each of the subfigures represent regression lines. Each observation represents a country. The full list of countries is presented in the Appendix. Similarly strong patterns hold when we restrict the country sample to include only AEs and EMEs. *** denote significance at the 1 percent level.

3 The Model

The small open economy is comprised of households, banks, and firms. There is a unit mass of households, which is divided into two categories: financially-included (i) households with

measure $0 < \lambda < 1$ of household members, and financially-excluded (e) households with measure $(1 - \lambda)$ of members.[11]

At the heart of the production structure are two general firm categories, each of which comprised of monopolistically-competitive wholesale firms and their perfectly-competitive intermediate-goods suppliers. Each wholesale category has an unbounded number of potential entrants such that the number of wholesale firms in each category is endogenous. In turn, these firms depend on inputs supplied by perfectly-competitive intermediate-goods firms in their own category.

The first category of wholesale firms is comprised of financially-included (i) firms whose creation relies on bank credit to finance the sunk costs of entry of new firms. In turn, an exogenous number of banks operating in a monopolistically-competitive market compete over the number of loans supplied to these firms in a Cournot fashion. These two assumptions follow directly from the frameworks in Stebunovs (2008) and Cacciatore, Ghironi, and Stebunovs (2015). The second category of wholesale firms is comprised of financially-excluded (e) firms whose creation relies on resources from e households to cover the sunk costs of entry of new firms (as opposed to bank credit in the case of i firms).[12]

Differentiated output from the two categories of wholesale firms is bundled by a perfectly-competitive retail firm that produces a final good. Intermediate-goods firms, regardless of their category, accumulate capital and demand labor, and labor is subject to search frictions, which leads to equilibrium unemployment.[13] Following the EME business cycle literature, aggregate productivity and foreign interest rate shocks drive aggregate fluctuations.

Banks, wholesale, and intermediate-goods i firms are owned by i households. The latter supply deposits to banks and hold foreign debt. The members of i households are employed in intermediate-goods i firms. In turn, e households own wholesale and intermediate-goods e firms and their members are employed in e intermediate-goods firms.[14] There is perfect

[11]Given these assumptions, we use the terms "share of financially-included/-excluded households" and "share of individuals in financially-included/-excluded households" interchangeably in the rest of the paper.

[12]Evidence for EMEs suggests that household savings are one of the main sources of financing for the creation of micro and small firms (i.e. firms that, on average, have little to no access to bank credit in these economies) (Kantis, Ishida, and Komori, 2002; IFC 2010, 2013; GFDR, 2014).

[13]For a similar separation between labor search frictions and endogenous firm entry, see Cacciatore, Duval, Fiori, and Ghironi (2016). Assuming a capital producer that supplies capital to both categories of intermediate-goods firms does not change our conclusions.

[14]The Appendix explores the implications of different firm-ownership assumptions. Our main conclusions

consumption insurance within each household but not across households (a standard assumption). Absent endogenous labor force participation, the total labor force is normalized to 1.

Section A.9 of the Appendix presents the details of a non-trivial modification to our model where we allow members from each household category can search for employment *across intermediate-goods-firm categories* and not just within their own category. *As the Appendix confirms, our main conclusions remain unchanged in this richer environment.*

3.1 Final Goods and Wholesale Aggregator Firms

A representative final goods firm aggregates total output from each firm category $Y_{i,t}$ and $Y_{e,t}$ to create a final good Y_t. Specifically, the firm maximizes profits $\Pi_{a,t} = [P_t Y_t - P_{i,t} Y_{i,t} - P_{e,t} Y_{e,t}]$ subject to the CES aggregator

$$Y_t = \left[(1-\alpha_y)^{\frac{1}{\phi_y}} (Y_{i,t})^{\frac{\phi_y - 1}{\phi_y}} + \alpha_y^{\frac{1}{\phi_y}} (Y_{e,t})^{\frac{\phi_y - 1}{\phi_y}} \right]^{\frac{\phi_y}{\phi_y - 1}}, \tag{1}$$

where P_t is the aggregate price level and $P_{i,t}, P_{e,t}$ are the sectoral price indices, $0 < \alpha_y < 1$, and $\phi_y > 0$ determines how substitutable $Y_{i,t}$ and $Y_{e,t}$ are in total output. The corresponding demand functions for the two sectoral output bundles can be written as:

$$P_{i,t}/P_t = (1-\alpha_y)^{\frac{1}{\phi_y}} (Y_t/Y_{i,t})^{\frac{1}{\phi_y}}, \tag{2}$$

and

$$P_{e,t}/P_t = \alpha_y^{\frac{1}{\phi_y}} (Y_t/Y_{e,t})^{\frac{1}{\phi_y}}, \tag{3}$$

where $P_t = \left[(1-\alpha_y) (P_{i,t})^{1-\phi_y} + \alpha_y (P_{e,t})^{1-\phi_y} \right]^{\frac{1}{\phi_y - 1}}$.

Perfectly competitive wholesale output aggregators in each firm category $j \in \{e, i\}$ demand differentiated goods from wholesale firms in each of the two categories. In particular, the sectoral output bundle from firm category j is $Y_{j,t} = \left(\int_{\omega_j \in \Omega_j} y_{j,t}(\omega_j)^{\frac{\varepsilon - 1}{\varepsilon}} d\omega_j \right)^{\frac{\varepsilon}{\varepsilon - 1}}$, where ε is the elasticity of substitution, and $y_{j,t}(\omega_j)$ is differentiated output produced by firm ω_j within each firm category j. Ω_j is the subset of differentiated goods within each firm category

do not change.

j that, in principle, the wholesale output aggregator firm can potentially purchase from (only a fraction of Ω_j ends up being produced each period). The corresponding price subindex is given by $P_{j,t} = \left(\int_{\omega_j \in \Omega_j} p_{j,t}(\omega_j)^{1-\varepsilon} d\omega_j \right)^{\frac{1}{1-\varepsilon}}$ where $p_{j,t}(\omega_j)$ is the price of the differentiated good produced by firm ω_j in category j. The optimal demand for differentiated goods in each firm category, which wholesale firms are subject to, are given by

$$y_{i,t}(\omega_i) = (1-\alpha_y) \left(\rho_{i,t}(\omega_i)\right)^{-\varepsilon} \left(\frac{P_{i,t}}{P_t}\right)^{\varepsilon-\phi_y} Y_{i,t}, \tag{4}$$

and

$$y_{e,t}(\omega_e) = \alpha_y \left(\rho_{e,t}(\omega_e)\right)^{-\varepsilon} \left(\frac{P_{e,t}}{P_t}\right)^{\varepsilon-\phi_y} Y_{e,t}, \tag{5}$$

where the real price $\rho_{j,t}(\omega_j) = p_{j,t}(\omega_j)/P_t$ for $j \in \{e, i\}$.

3.2 Incumbent Wholesale Firms

For an incumbent firm ω_j in category $j \in \{e, i\}$, individual profits are given by $d_{j,t}(\omega_j) = [\rho_{j,t}(\omega_j) - mc_{j,t}]\, y_{j,t}(\omega_j)$ where $mc_{j,t}$ is the price of intermediate output in category j. Each firm maximizes $\mathbb{E}_t \sum_{s=t}^{\infty} \Xi^j_{s|t} [(1-\delta)^{s-t} d_{j,s}(\omega_j)]$ subject to their demand from wholesale output aggregator firms, where $0 < \delta < 1$ is the exogenous exit probability and $\Xi^j_{s|t}$ is household j's stochastic discount factor (defined further below). The solution to this problem yields $\rho_{j,t}(\omega_j) = \mu mc_{j,t}$ where the markup $\mu = \varepsilon/(\varepsilon - 1)$.

Following the literature on endogenous firm entry (BGM), there is an unbounded number of potential wholesale entrants into firm category $j \in \{e, i\}$. Let $N_{j,t}$ be the mass of firms in category j that are currently producing in period t. New entrants $N_{E,jt}$ in period t face a one-period production lag, so that they start producing in $t+1$, and all firms (whether incumbent or new entrants) exit with exogenous probability δ at the end of each period. Then, the current mass of firms in category j is given by $N_{j,t} = (1-\delta)\left(N_{j,t-1} + N_{E,jt-1}\right)$. Potential new firms in j need to incur an exogenous sunk entry cost ψ_j (expressed in terms of final goods) in order to enter their category.[15] Banks provide financing for the entirety of

[15] This cost can embody a number of factors, including physical and technological costs of entry as well as regulatory expenses and financial and institutional barriers (see, for example, Cacciatore, Duval, Fiori, and Ghironi, 2016a,b). Expressing the sunk entry costs in terms of labor does not change any of our results.

wholesale i firms' entry costs, whereas e households use internal resources to cover wholesale e firms' entry costs.

Entry of Wholesale e Firms The entry cost for wholesale e firms is financed using internal resources from e households. Since firms that would enter in period t anticipate their future profits post-entry, the present discounted value of expected profits obtained from period $t+1$ onwards is given by $e_{e,t}(\omega_e) = \mathbb{E}_t \sum_{s=t+1}^{\infty} \Xi^e_{s|t}(1-\delta)^{s-t} d_{e,s}(\omega_e)$. Free entry implies that in equilibrium and after imposing symmetry, $e_{e,t}(\omega_e) = e_{e,t} = \psi_e$ obtains.

Banks and Entry of Wholesale i Firms We follow the exposition in Stebunovs (2008) and Cacciatore, Ghironi, and Stebunovs (2015) in modeling wholesale i firms' reliance on monopolistically-competitive banks and the banking structure. Since our objective is to explore the impact of banking reforms as reflected in *exogenous changes* in the degree of bank competition, we abstract from explicitly modeling the underlying reason for new i firms' dependence on external finance from banks. As such, we follow related literature and assume that potential i firms require bank funds to finance their sunk entry costs. Furthermore, we assume that banks have enough power to set loan repayments to extract the entirety of i firms' profits $d_{i,t}$, and that each new firm requires a single loan to finance its sunk entry cost (i.e., the number of firms is the same as the number of loans; see Cacciatore, Ghironi, and Stebunovs, 2015).[16]

An exogenous number of banks H compete over the number of loans supplied to wholesale i firms in a market characterized by Cournot competition. As noted in Cacciatore, Ghironi, and Stebunovs (2015), we can think of H as embodying the number of banks in the economy along with the number of locations of each bank. Since we are interested in banking reforms that increase bank competition and participation in the banking system, without loss of generality we assume that each bank has a fixed number of locations such that a change in H represents a change in the number of banks (which in turn changes the amount of bank credit available).[17] In particular, bank $h \in H$ caters to an endogenous number $N_i(h)$ of

[16]This assumption is made for simplicity. Assuming that banks set the interest rate on loans, that only a fraction of entry costs is financed with bank credit, or that banks finance wholesale i firms' entry costs *and* intermediate-goods i firms' investment (described further below) does not change any of our conclusions.

[17]The fact that the number of banks and their locations are more limited in EMEs relative to AEs is

wholesale i firms and chooses how many potential wholesale i entrants $N_{E,it}$ it supplies new loans to. This decision is made in tandem with other banks, taking the latter's choices over loans as given and also taking into account firms' optimal decisions over their own pricing after entry. Since wholesale i entrants end up exiting before production takes place with exogenous probability δ, the evolution of bank h's stock of i firms in its portfolio is given by $N_{i,t}(h) = (1-\delta)\left(N_{i,t-1}(h) + N_{E,it-1}(h)\right)$. Then, the total number of incumbent wholesale i firms and i entrants is $N_{i,t} = \sum_h N_{i,t}(h)$ and $N_{E,it} = \sum_h N_{E,it}(h)$, respectively.

Since i households are the ultimate owners of banks and all i firms, bank h's problem at the beginning of period t is to choose the desired number of loans $N_{i,t+1}(h)$ and new loans $N_{E,it}(h)$ to maximize the present discounted value of profits $\mathbb{E}_0 \sum_{t=0}^{\infty} \Xi^i_{t|0} \pi_{b,t}(h)$ subject to bank profits $\pi_{b,t}(h) = N_{i,t}(h) d_{i,t} + b_{t+1}(h) - \psi_i N_{E,it}(h) - R_t b_t(h)$ and the balance sheet constraint $b_{t+1}(h) = \psi_i N_{E,it}(h)$, where $d_{i,t}$ are wholesale i firm profits, $b(h)$ are household deposits in bank h, and R is the domestic gross real interest rate on bank deposits. Denoting the value to bank h of having one more active wholesale i firm in its portfolio by $Q_t(h)$, we have

$$Q_t(h) = \mathbb{E}_t \Xi^i_{t+1|t} \left\{ d_{i,t+1} + N_{i,t+1}(h) \left[\frac{\partial d_{i,t+1}}{\partial N_{i,t+1}} \frac{\partial N_{i,t+1}}{\partial N_{i,t+1}(h)} \right] + (1-\delta) Q_{t+1}(h) \right\}. \tag{6}$$

This expression is identical to the one in Stebunovs (2008) and Cacciatore, Ghironi, and Stebunovs (2015). The term in brackets on the right-hand-side captures bank h's internalization of the fact that having an additional firm in its portfolio implies more competition for all other firms in its portfolio, which in turn lowers profits for all incumbent firms in the latter (this occurs despite the fact that, for a given level of firm profits, expanding the loan portfolio brings in additional revenue for bank h). The third term on the right-hand-side captures the continuation value if the wholesale i firm survives into the next period, which occurs with exogenous probability $(1-\delta)$.

Bank h will continue to supply loans to wholesale i firm entrants until the marginal benefit of having a loan, $Q_t(h)$, is equal to the expected marginal cost, where this marginal

consistent with evidence on the number of ATMs per 1000 people and the number of bank branches per 100,000 individuals, which proxy for bank accessibility, as well as the actual number of banks in the data (see, for example, GFDR, 2014).

cost is given by the discounted cost of entry, taking into account that new entrants exit before production with exogenous probability δ. That is,

$$Q_t(h) = Q_t = \left(\frac{1}{1-\delta}\right)\psi_i. \tag{7}$$

This expression, which effectively characterizes wholesale i firms' optimal entry condition via banks' decisions to fund entrants, is also identical to the one in Stebunovs (2008) and Cacciatore, Ghironi, and Stebunovs (2015).

Absent idiosyncratic differences across banks, all banks make the same decisions so that we can write

$$Q_t = \mathbb{E}_t \Xi^i_{t+1|t}\left[\left(1-\frac{1}{H}\right)d_{i,t+1} + (1-\delta)Q_{t+1}\right]. \tag{8}$$

Intuitively, a larger number of banks H expands the number of firms by increasing the supply of loans and reduces a given bank's market power. Importantly, banks' net interest margin is defined as $\left[N_{i,t}d_{i,t} - R_{t-1}b_{t-1}\right]/N_{i,t}Q_t$, which is decreasing in the number of banks H in the economy.[18]

3.3 Intermediate Goods Firms

Intermediate-goods firms in category $j \in \{e, i\}$ are perfectly competitive and act as suppliers to wholesale firms in their respective category.[19] They produce using internally-accumulated capital and labor, and labor is subject to search and matching frictions. In particular, let $m(u_{j,t}, v_{j,t}) = u_{j,t}v_{j,t}/(u^{\xi}_{j,t}+v^{\xi}_{j,t})^{1/\xi}$, $\xi > 0$, be a constant-returns-to-scale matching function in firm category j whose inputs are household-j unemployed individuals $u_{j,t}$ and vacancies $v_{j,t}$ (Den Haan, Ramey, and Watson, 2000).[20] Then, the category-specific job-finding and job-filling probabilities are defined as $f(\theta_{j,t}) = v_{j,t}/(u^{\xi}_{j,t} + v^{\xi}_{j,t})^{1/\xi}$ and $q(\theta_{j,t}) = u_{j,t}/(u^{\xi}_{j,t} + v^{\xi}_{j,t})^{1/\xi}$,

[18]This is consistent with the evidence on bank competition, net interest margins, and firm participation presented in Section 2.

[19]For simplicity, we assume that intermediate-goods firms in one category cannot act as suppliers to wholesale firms in the other category. Given our interest in labor market dynamics, this assumption is not crucial for our results. The Appendix shows that a richer version of our model where households can search for employment opportunities *across firm categories* (and not just within their own category) does not change our main conclusions.

[20]This particular functional form guarantees that matching probabilities are always bounded between 0 and 1. Our results remain the same if we adopt a Cobb-Douglas matching specification.

respectively, where market tightness $\theta_{j,t} \equiv v_{j,t}/u_{j,t}$.

Intermediate-goods firms in category j choose capital accumulation $k_{j,t+1}$, vacancies $v_{j,t}$, and desired employment $n_{j,t+1}$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \Xi^j_{t|0} \Pi_{j,t}$ subject to the definition of firm profits

$$\Pi_{j,t} = mc_{j,t} z_{j,t} n_{j,t}^{1-\alpha} k_{j,t}^{\alpha} - w_{j,t} n_{j,t} - \kappa_j v_{j,t} - i_{j,t},$$

the evolution of capital[21]

$$k_{j,t+1} = (1-\delta) k_{j,t} + i_{j,t}, \tag{9}$$

and the perceived evolution of employment

$$n_{j,t+1} = (1-\rho_j^n) \left(n_{j,t} + v_{j,t} q(\theta_{j,t}) \right), \tag{10}$$

where $mc_{j,t}$ is the real price of intermediate goods, κ_j is the flow cost of posting a vacancy, and ρ_j^n is the exogenous separation probability in category j. $z_{j,t}$ is exogenous category-specific productivity and follows a stochastic process. We obtain standard capital Euler equations and job creation conditions for each category j:

$$1 = \mathbb{E}_t \Xi^j_{t+1|t} \left[1 + \alpha mc_{j,t+1} z_{j,t+1} n_{j,t+1}^{1-\alpha} k_{j,t+1}^{\alpha-1} - \delta \right], \tag{11}$$

and

$$\frac{\kappa_j}{q(\theta_{j,t})} = (1-\rho_j^n) \mathbb{E}_t \Xi^j_{t+1|t} \left\{ (1-\alpha) mc_{j,t+1} z_{j,t+1} n_{j,t+1}^{-\alpha} k_{j,t+1}^{a} - w_{j,t+1} + \frac{\kappa_j}{q(\theta_{j,t+1})} \right\}. \tag{12}$$

The intuition behind these conditions is standard: firms equate the expected marginal cost of posting a vacancy to the expected marginal benefit. Importantly, recall that optimal pricing behavior among wholesale firms implies that $\rho_{j,t}(\omega_j) = \mu mc_{j,t}$. Therefore, changes in the number of wholesale firms in the two categories will affect the hiring and investment decisions of intermediate-goods firms via $mc_{j,t}$.[22]

We assume bilateral Nash bargaining between workers and firms. Denoting by η the bar-

[21] We include standard capital adjustment costs as part of our quantitative analysis but abstract from including them here for expositional brevity.

[22] For a similar, one-sector employment structure without banks, see Cacciatore et al. (2016a).

gaining power of workers and by χ_j the contemporaneous value of searching for employment in firm category $j \in \{e, i\}$, the Nash real wage in j is standard:

$$w_{j,t} = \eta \left[(1-\alpha) m c_{j,t} z_{j,t} n_{j,t}^{-\alpha} k_{j,t}^{\alpha} + \kappa_j \theta_{j,t} \right] + (1-\eta)\chi_j. \tag{13}$$

3.4 Households

Utility is of the CRRA form for all households: $\mathbf{u}(c_j) = c_j^{1-\sigma}/(1-\sigma)$ with $\sigma > 0$ for $j \in \{e, i\}$. A fraction $0 < \lambda < 1$ of the population belongs to financially-included (i) households. The remaining share of the population $(1-\lambda)$ belongs to financially-excluded (e) households.

Financially-Included (i) Households Households choose consumption $c_{i,t}$, bank deposits b_{t+1}, foreign debt holdings b^*_{t+1}, and the ownership shares in banks $x_{b,t+1}(h)$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbf{u}(c_{i,t})$ subject to the budget constraint:

$$c_{i,t} + b_{t+1} + R^*_t b^*_t + \frac{\eta_b}{2}(b^*_{t+1})^2 + x_{b,t+1} \sum_{h \in H} e_{b,t}(h) = R_t b_t + b^*_{t+1} + w_{i,t} n_{i,t} + \chi_i u_{i,t} + x_{b,t} \sum_{h \in H} [\pi_{b,t}(h) + e_{b,t}(h)] + \Pi_{i,t}, \tag{14}$$

where R^*_t is the (time-varying) gross real foreign interest rate and households face foreign debt adjustment costs (a standard assumption in SOE models). $e_{b,t}(h)$ is the price of of a claim to bank h's profits $\pi_{b,t}(h)$, and $\Pi_{i,t}$ are profits from intermediate-goods i firms. Unemployment among i household members is $u_{i,t} = \lambda - n_{i,t}$.[23] Of note, in our context and for our purposes, there is no differentiation between owning a deposit bank account and using it.[24] The first-order conditions yield the following standard Euler equations

$$\mathbf{u}'(c_{i,t}) = R_{t+1} \beta \mathbb{E}_t \mathbf{u}'(c_{i,t+1}) \text{ and } 1 = R^*_{t+1} \beta \mathbb{E}_t \frac{\mathbf{u}'(c_{i,t+1})}{\mathbf{u}'(c_{i,t})} + \eta_b b^*_{t+1} \tag{15}$$

[23] In principle, households are also subject to the perceived evolution of employment $n_{i,t+1} = (1 - \rho_i^n)(n_{i,t} + u_{i,t} f(\theta_{i,t}))$. Absent endogenous labor force participation, this law of motion is taken as given by the household and employment is mainly demand-driven.

[24] This is consistent with the evidence on having a financial account and using it, which was briefly discussed in Section 2.

where $\Xi^i_{t+1|t} \equiv \beta \mathbf{u}'(c_{i,t+1})/\mathbf{u}'(c_{i,t})$. The Euler equation for share holdings of banks (after imposing symmetry) is

$$e_{b,t} = \mathbb{E}_t \Xi^i_{t+1|t} \left[\pi_{b,t+1} + e_{b,t+1}\right], \tag{16}$$

Intuitively, households equate the marginal cost of acquiring an additional bank share (the price of a claim to bank profits, e_b) to the expected marginal benefit of doing so (given by discounted future profits and the capital gain from holding bank shares).

Of note, foreign interest rate shocks are one possible manifestation of financial shocks that affect, among other things, the provision of credit by the domestic banking system. Considering other types of financial shocks that affect this provision of credit—such as shocks to ψ_i which, given banks' balance sheet constraint $b_{t+1}(h) = \psi_i N_{E,it}(h)$, can be broadly seen as shocks to banks' costs of providing resources for new firm ventures, which in turn affects firm creation—has *qualitatively* similar effects on labor markets and output to those from interest rate shocks.

Financially-Excluded (e) Households Households choose consumption $c_{e,t}$ and the ownership shares in household-dependent e firms $x_{e,t+1}$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbf{u}(c_{e,t})$ subject to the budget constraint:

$$c_{e,t} + x_{e,t+1}(N_{E,et} + N_{e,t})e_{e,t} = w_{e,t} n_{e,t} + \chi_e u_{e,t} + x_{e,t} N_{e,t} \left[d_{e,t} + e_{e,t}\right] + \Pi_{e,t}, \tag{17}$$

where $e_{e,t}$ is the price of a claim to wholesale e firms' profits $d_{e,t}$ and $\Pi_{e,t}$ are profits from intermediate-goods e firms.[25] Unemployment among e household members is $u_{e,t} = (1 - \lambda) - n_{e,t}$. The first-order conditions yield the Euler equation for e firms

$$e_{e,t} = (1-\delta)\mathbb{E}_t \Xi^e_{t+1|t} \left[d_{e,t+1} + e_{e,t+1}\right], \tag{18}$$

where $\Xi^e_{t+1|t} = \beta \mathbf{u}'(c_{e,t+1})/\mathbf{u}'(c_{e,t})$.

[25] In principle, households are also subject to the perceived evolution of employment $n_{e,t+1} = (1 - \rho^n_e)\left(n_{e,t} + u_{e,t} f(\theta_{e,t})\right)$.

3.5 Symmetric Equilibrium and Market Clearing

Intermediate goods and wholesale output markets satisfy $z_{j,t}n_{j,t}^{1-\alpha}k_{j,t}^{a} = N_{j,t}y_{j,t}$ for each category $j \in \{e,i\}$. In turn, using the sectoral price indices and after imposing symmetry, we have $\rho_{j,t} = (P_{j,t}/P_t)N_{j,t}^{\frac{1}{\varepsilon-1}}$. In addition, in equilibrium, $x_{b,t+1} = x_{b,t} = 1$ and $x_{e,t+1} = x_{e,t} = 1$. Finally, the economy's resource constraint is given by

$$Y_t = c_{i,t} + c_{e,t} + i_{i,t} + i_{e,t} + \kappa_i v_{i,t} + \kappa_e v_{e,t} + \psi_i N_{E,it} + \psi_e N_{E,et} + R_t^* b_t^* - b_{t+1}^* + \frac{\eta_b}{2}(b_{t+1}^*)^2. \quad (19)$$

We define total consumption and investment as $c_t = c_{i,t} + c_{e,t}$ and $inv_t = i_{i,t} + i_{e,t}$, respectively. Furthermore, the total number of firms in the economy is $N_t \equiv N_{e,t} + N_{i,t}$.

3.6 Data-Consistent Variables

Following the literature (Bilbiie, Ghironi, and Melitz, 2012; Cacciatore and Fiori, 2016; Cacciatore, Ghironi, and Fiori, 2016; Cacciatore, Duval, Fiori, and Ghironi, 2016a,b), we note that in the presence of preferences with a "love for variety" component, any variable expressed in terms of final consumption goods that is compared to the data should be adjusted to reflect the fact that CPI measurements abstract from the variety component inherent to models with endogenous firm entry. Specifically, if $x_{m,t}$ is a quantity in the model expressed in final consumption units, then its empirical counterpart in the model is given by $x_{d,t} = \Psi_t^{\frac{1}{1-\phi_y}} x_{m,t}$ where $\Psi_t = (1-\alpha_y)N_{i,t}^{\frac{1-\phi_y}{1-\varepsilon}} + \alpha_y N_{e,t}^{\frac{1-\phi_y}{1-\varepsilon}}$ (see, for example, Cacciatore, Duval, Fiori, and Ghironi, 2016a).

4 Quantitative Analysis

Baseline Calibration A period is a quarter. We calibrate the baseline economy to a representative EME. We introduce standard capital adjustment costs in both intermediate-goods firm categories: $(\varphi_k/2)\left(k_{j,t+1}/k_{j,t} - 1\right)^2 k_{j,t}$, where $\varphi_k > 0$ for $j = e,i$. Following the EME business cycle literature, we set $\sigma = 2, \beta = 0.985$, $\delta = 0.025$, $\alpha = 0.32$. Following the literature on endogenous entry, we choose $\varepsilon = 6$ (alternative values do not change our main conclusions). EMEs generally lack formal safety nets, so we initially set $\chi_j = 0$ for

$j \in \{e, i\}$. The steady-state gross real foreign interest rate is $R^* = 1.0019$, consistent with existing studies. We also set $\varphi_k = 10$ (alternative values do not change our conclusions). The exogenous separation probabilities are $\rho_j^n = 0.05$ for $j \in \{e, i\}$ (Bosch and Maloney, 2008; Epstein, Finkelstein Shapiro, and González Gómez, 2017b). Based on the evidence in Section 2, the share of individuals in financially-included households is $\lambda = 0.42$. We set the elasticity of substitution between sectoral wholesale output $\phi_y = 5$, implying a high degree of substitutability.[26] We set $z_e = 1$ and $z_i = 3$, which is consistent with productivity differentials between larger firms (which generally have access to bank credit) and micro and small firms (with little to no access to bank credit) (see La Porta and Shleifer, 2008; ILO, 2015). As a baseline, we assume symmetry in vacancy posting costs, $\kappa_e = \kappa_i = \kappa$.

We calibrate the remaining parameters $\xi, \kappa, \psi_e, \psi_i, H, \alpha_y$, and η_b to match select first-moment targets consistent with EME averages based on the EME country sample in Table 1: a steady state unemployment rate if 8.2 percent (consistent with the average value in our EME sample; World Development Indicators), a vacancy-posting cost of 3.5 percent of steady-state quarterly average wages (consistent with evidence in Levy, 2007), a steady-state sunk entry cost for i wholesale firms of one third of steady state quarterly wages (consistent with evidence on the cost of obtaining a license (a proxy for the cost of creating a financially-included firm) in our sample of EMEs; World Bank Enterprise Surveys), a sunk entry cost for e firms that is roughly 70 percent of the corresponding cost for i firms (this replicates the average extra costs faced by firms that comply with regulations in our EME sample, World Bank Doing Business Survey), a steady state bank net interest margin of 4.30 percent (see Table 1), a ratio of i firms to the total number of firms N_i/N of 0.26 (see Table 1), and a steady state annual foreign debt-output ratio of 0.30 (all consistent with our EME sample).

All told, we obtain the following parameter values: $\xi = 0.3809, \kappa = 0.0811, \psi_e = 0.5387, \psi_i = 0.7643, H = 2.4290, \alpha_y = 0.9645$, and $\eta_b = 0.0013$. Finally, we assume that all

[26]This value generates an empirically-factual positive relationship between the level of economic development (as proxied by the level of total output) and the share of i individuals. Evidence using the World Bank Financial Development Structure Database shows that registered firms—which are more likely to participate in the banking system—face more direct competition from unregistered firms the less developed the banking system is. Moreover, 70 percent of registered firms in EMEs cite direct competition from unregistered firms as a major obstacle. A direct implication of these facts is that firm output is likely to be highly substitutable between firm categories in economies with less developed banking systems (i.e., EMEs). The Appendix presents results for lower values of ϕ_y for completeness.

shocks follow independent AR(1) processes in logs: $\ln(x_t) = (1-\rho_x)\ln(x) + \rho_x \ln(x_{t-1}) + \varepsilon_t^x$, where $\varepsilon_t^x \tilde{} N(0, \sigma_x)$ for $x = z_e, z_i, z_r$. For illustrative purposes, we assume a common shock to sectoral productivity and set $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$.[27] Of note, we explore realistic asymmetries across firm categories (in entry costs, separation probabilities, vacancy costs, capital shares in production, among others) as part of our robustness checks (presented in the Appendix). These asymmetries do not change any of our main conclusions. For completeness, Table A3 in the Appendix confirms that, under the baseline calibration, the model replicates well-known business cycle facts in EMEs, including a relative volatility of consumption greater than 1 and a countercyclical trade balance-output ratio.

4.1 Banking Reforms

We consider three different banking reform equilibria relative to the benchmark economy. First, banking reform as reflected in an increase in the share of individuals in i households, λ, from 0.42 in the baseline (pre-reform) economy to 0.96 (consistent with the share in AEs), holding bank competition as reflected in net interest margins (and therefore the number of banks H) at their baseline (pre-reform) levels (the column labeled (1) in Table 2). Second, banking reform reflected in a reduction in net interest margins to AEs' standards, holding λ at its baseline (pre-reform) level (the column labeled (2) in Table 2). This equilibrium is obtained by increasing the number of banks H.[28] Third, banking reform reflected in a *joint* increase in λ and H that replicates the level of banking sector development in AEs, that is, an increase in λ from 0.42 to 0.96 and a reduction of 2.61 percentage points in net interest margins (the column labeled (3) in Table 2).

We refer to the first two cases as *individual* banking reforms and to the last case as a *comprehensive banking reform*. Of note, while the reform that bolsters household participation is particularly sizeable (and may take time to be fully implemented), considering a reform that effectively eliminates the household participation gap between EMEs and AEs

[27] We implement a first-order log-linear approximation to the equilibrium conditions and simulate the model for a large number of periods. All simulated data is filtered using an HP filter with smoothing parameter 1600, as we would do with real data.

[28] This reform entails a reduction of 2.61 percentage points in net interest margins to reach AE levels. Recall from Subsection 3.2 that a larger number of banks H generates lower net interest margins. In what follows, we use the terms lower net interest margins, a higher H, and greater bank competition interchangeably.

helps to clearly illustrate the complementarities between individual reforms.

4.1.1 Steady State Reform Equilibria

Table 2 compares key steady-state variables in the baseline, pre-reform economy to the same variables across the banking reform equilibria above.

Table 2: Steady State Under Different Banking Reform Equilibria

Variable	Baseline Economy	Higher λ	Higher H	Higher λ and H
		(1)	(2)	(3)
Y_d	4.143	6.843	4.524	7.996
c_d	2.863	4.882	3.059	5.451
$c_{d,i}$	1.317	4.677	1.475	5.240
$c_{d,e}$	1.546	0.205	1.585	0.211
inv_d	0.687	1.134	0.750	1.325
N	45.74	29.00	57.74	54.77
N_i	11.89	26.14	22.73	51.71
N_e	33.84	2.862	35.01	3.064
N_i/N	0.260	0.901	0.394	0.944
$w_{d,i}$	2.530	3.811	2.963	4.479
$w_{d,e}$	2.161	4.153	2.215	4.270
Labor Income$_{d,i}$	0.977	3.362	1.147	3.961
Labor Income$_{d,e}$	1.150	0.153	1.179	0.157
n_i	0.386	0.882	0.387	0.885
n_e	0.532	0.037	0.532	0.037
u_i/u	0.414	0.960	0.408	0.960
u_e/u	0.586	0.040	0.592	0.040
u	0.082	0.0812	0.081	0.079
Perc. Change in Average Labor Productivity	–	5.311	10.06	27.77
H	2.429	2.429	20.60	20.60
λ	0.420	0.960	0.420	0.960
Δ Net Int. Margin (Percentage Points)	0	0	−2.61	−2.61

Three conclusions emerge from Table 2. First, regardless of whether banking reform is reflected in a higher share of i individuals (a higher λ) or greater bank competition (that is, a higher H that reduces net interest margins), reforms induce a higher steady-state total output, consumption, and investment, and to a larger number and a larger share of i firms in the economy. Furthermore, both individual and comprehensive reforms lead to improvements in average labor productivity (ALP), which is consistent with existing empirical evidence for EMEs (see, for example, Dabla-Norris, Ho, and Kyobe, 2016). Of

note, in all instances changes in aggregate unemployment are negligible, but changes in employment and unemployment shares are of nontrivial magnitude.

Also, while higher bank competition alone (column (2)) has very small effects on the sectoral allocation of employment between e and i firms, this reform has positive effects on wages, labor income, and consumption for both household categories. In addition, this reform expands the number of both e and i firms.[29] Intuitively, a more competitive banking system increases the supply of loans, thereby leading to an expansion of i firms without necessarily having a large crowding-out effect among e firms.

In contrast, an individual reform that increases λ (column (1)) generates a sharp reallocation of employment from e firms to i firms, a substantial reduction in total labor income and consumption among e households (the reverse holds for i households), a sharp increase in the number of i firms, and a large decrease in the number of e firms. Intuitively, this occurs because the increase in λ boosts the amount of resources available to banks via a larger share of i-household members, which in turn are devoted to i-firm creation. At the same time, the sharp reduction in e-household members and workers naturally implies a sharp reduction in the overall resources available for the creation of e firms. As discussed below, the contrasting changes in the composition of consumption, employment and firms that result from individual reforms help rationalize the differential impact of these reforms on cyclical dynamics.

Finally, comprehensive banking reform generates higher average output levels and a larger share of firms that participate in the banking system, thereby replicating macro outcomes consistent with those in AEs. Notably, the effects of an increase in λ described above are magnified amid greater bank competition, and the change in λ appears to drive the allocation of employment, the large change in the share of i firms in the economy, and the composition of aggregate consumption. All told, the comparison of different equilibria in Table 2 show that banking reform has positive *long-term* labor market and aggregate effects.

[29]The increase in bank profits as a result of the reforms also contributes to i households' change in consumption, but this is second-order relative to the changes in labor income.

4.1.2 Reforms and Changes in Cyclical Dynamics

The model has three key margins that can directly affect the impact of reforms: household participation; bank competition; and firm participation. This section begins by focusing explicitly on these first two margins, and then on the third margin. After presenting results, we elaborate on their driving forces.

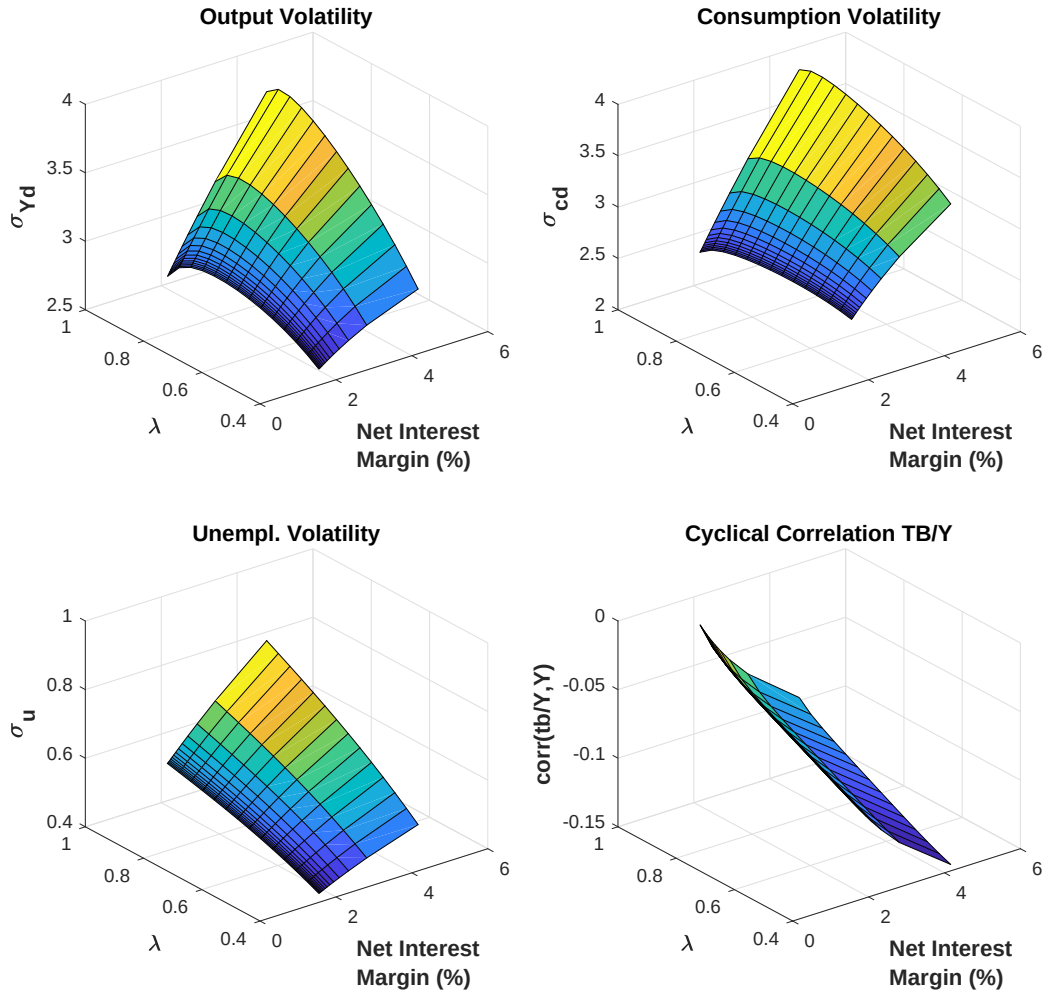


Figure 2: Business Cycle Volatility and Banking Reform Equilibria (Baseline Calibration)

Figure 2 plots the volatility of key macro aggregates (output and consumption) and unemployment, as well as the cyclical correlation of the trade balance-output ratio (in order to illustrate the open-economy implications of reforms), for different combinations of banking

reform equilibria (λ and net interest margins; the range of these variables is in line with their empirically plausible values per the data). Unless otherwise noted, all relevant variables are expressed in data-consistent terms.

This figure shows that *in an economic environment that starts off with low pre-reform household and firm participation levels and high net interest margins*, *comprehensive* banking reform as reflected in a joint increase in λ and a reduction in net interest margins does *not* automatically lead to broad-based reductions in unemployment and aggregate volatility, but *does* reduce the countercyclicality of the trade balance.[30] While not shown, both investment and average wage volatility follow the same pattern as output volatility. Of note, while output becomes marginally less volatile after the reform, unemployment volatility is higher. An important upside is that consumption becomes less volatile under a comprehensive reform. A second key result is that reforms that boost bank competition (and therefore) reduce net interest margins) have quantitatively stronger effects the greater is household participation λ.

Considering individual reforms sheds light on the limited effects of comprehensive reform on output volatility and the adverse impact on unemployment volatility. An increase in λ holding bank competition at its pre-reform level leads to higher labor market, consumption, and output volatility across the board. Greater bank competition limits the adverse effects of greater participation when such participation is low pre-reform. Conversely, lower net interest margins (which arise as a result of an increase in the number of banks H), holding household participation at its pre-reform level, generates (small) reductions in labor market and aggregate volatility. Taken together, it is not surprising that comprehensive reform that brings household participation to AE levels does not reduce labor market volatility on net.

To summarize, Figure 2 offers two important messages. First, all else equal, economies with low pre-reform levels of banking competition and firm and household participation in the banking system will exhibit higher post-reform volatility when reforms increase household

[30] Of note, unemployment volatility is lower than output volatility, which is a reflection of the well-known Shimer puzzle. Our objective is to understand how reforms *change* labor market and aggregate dynamics *across reform equilibria* and *not* to quantitatively explain the high relative volatility of unemployment in the data. As such, we leave extensions of our model that could introduce additional amplification in the labor market for future work (see Finkelstein Shapiro, 2017, for recent work on the role of labor force participation for quantitatively explaining unemployment dynamics in EMEs).

participation in the banking system—effectively, doing so increases the share of individuals, and firms, that would be vulnerable to financial shocks—without also bolstering bank competition. Second, *amid low firm and household participation in the banking system and a concentrated banking system, as observed in EMEs,* undertaking reforms that first foster bank competition and subsequently improve household participation can limit the potential adverse business cycle effects of reforms.[31]

Of note, the findings in Figure 2 remain unchanged under different assumptions regarding households' firm ownership, asymmetries in vacancy posting costs, employment separation probabilities, and capital shares, and different elasticities of substitution between sectoral output (see Figures A3-A11 in the Appendix). Finally, shown in Table A3 in the Appendix, the baseline economy generates a relative volatility of consumption greater than 1 and a countercyclical trade balance-output ratio, which is consistent with well-known facts about EME business cycles (Neumeyer and Perri, 2005).[32]

4.2 The Importance of Firms' Pre-Reform Participation Levels

To shed light on the importance of firms' *pre-reform* level of participation in the banking system for the cyclical effects of reforms, we consider the baseline model under two different *pre-reform* steady-state shares of i firms. First, we consider a pre-reform share of 0.17 (low pre-reform equilibrium), which is the lowest share observed in the EME sample in Table 1. Second, we consider a pre-reform share of 0.56 (high pre-reform equilibrium), which is the share in our sample of AEs (as well as the highest share observed in the sample of EMEs in Table 1). The results for these two cases are presented in Figures 3 and 4, respectively. This experiment maintains the same calibration *targets* as those used in our baseline calibration, except for the target pertaining to the pre-reform share of i firms.[33] Of note, keeping the

[31]Recall that, in the long run, banking reforms, regardless of whether they foster bank competition or household participation, lead to positive macro outcomes.

[32]In contrast, a more advanced economy—as reflected in a larger share of i household members and lower bank net interest margins—generates a relative volatility of consumption smaller than 1 and an acyclical trade balance-output ratio relative to the baseline (EME) economy, which is consistent with key stylized facts regarding business cycles in AEs as well.

[33]We use α_y to hit this target, but using other plausible parameters delivers the same conclusions. Note that while the sunk entry cost is another natural parameter that can generate variation in the share of i firms, our experiments under changes in sunk entry costs would then involve joint goods-markets and banking reforms. Given our sole focus on banking reforms, we consider α_y—ultimately a technological parameter

same parameter *values* from our baseline calibration (except, of course, for the parameter that yields the pre-reform share of i firms) does not change any of our main conclusions.

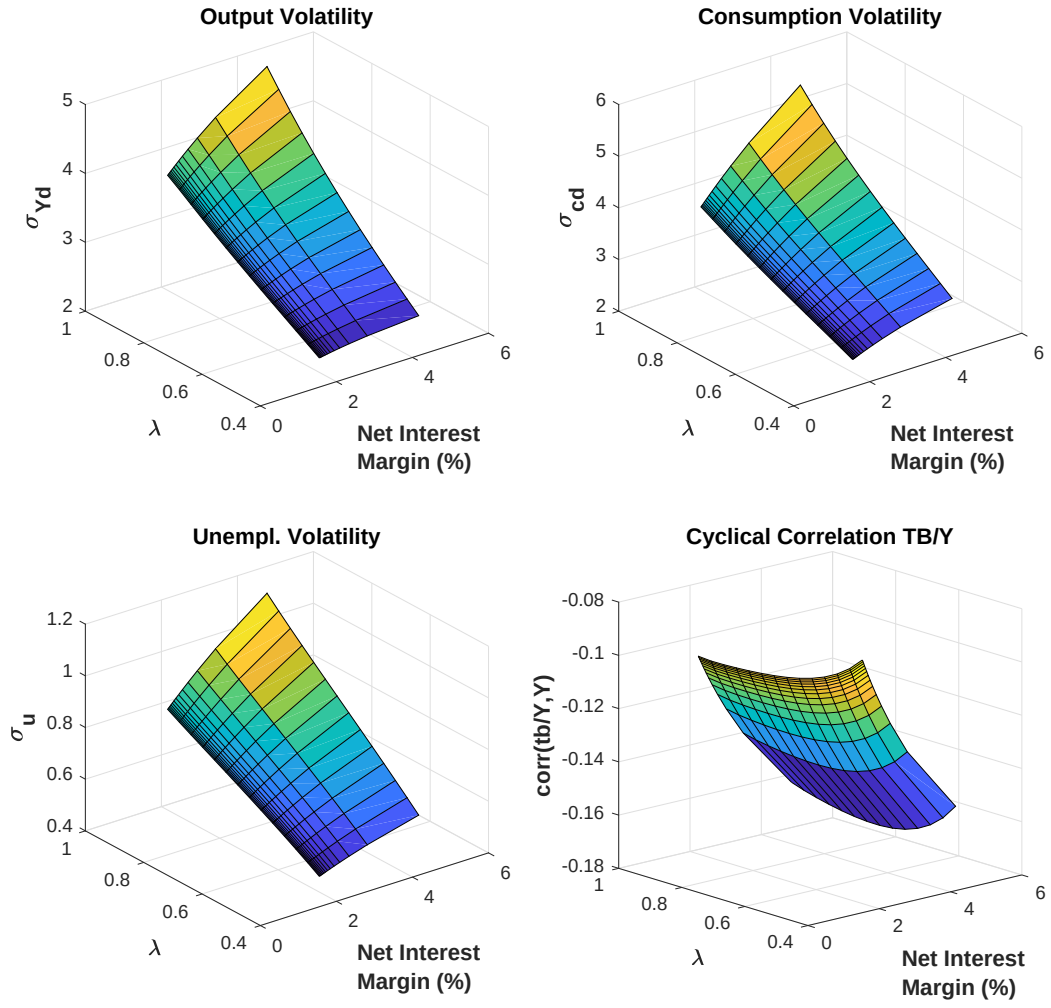


Figure 3: Cyclical Dynamics and Banking Reform Equilibria, Baseline i-Firm Share = 0.17

within the confines of our framework—to be a more natural choice.

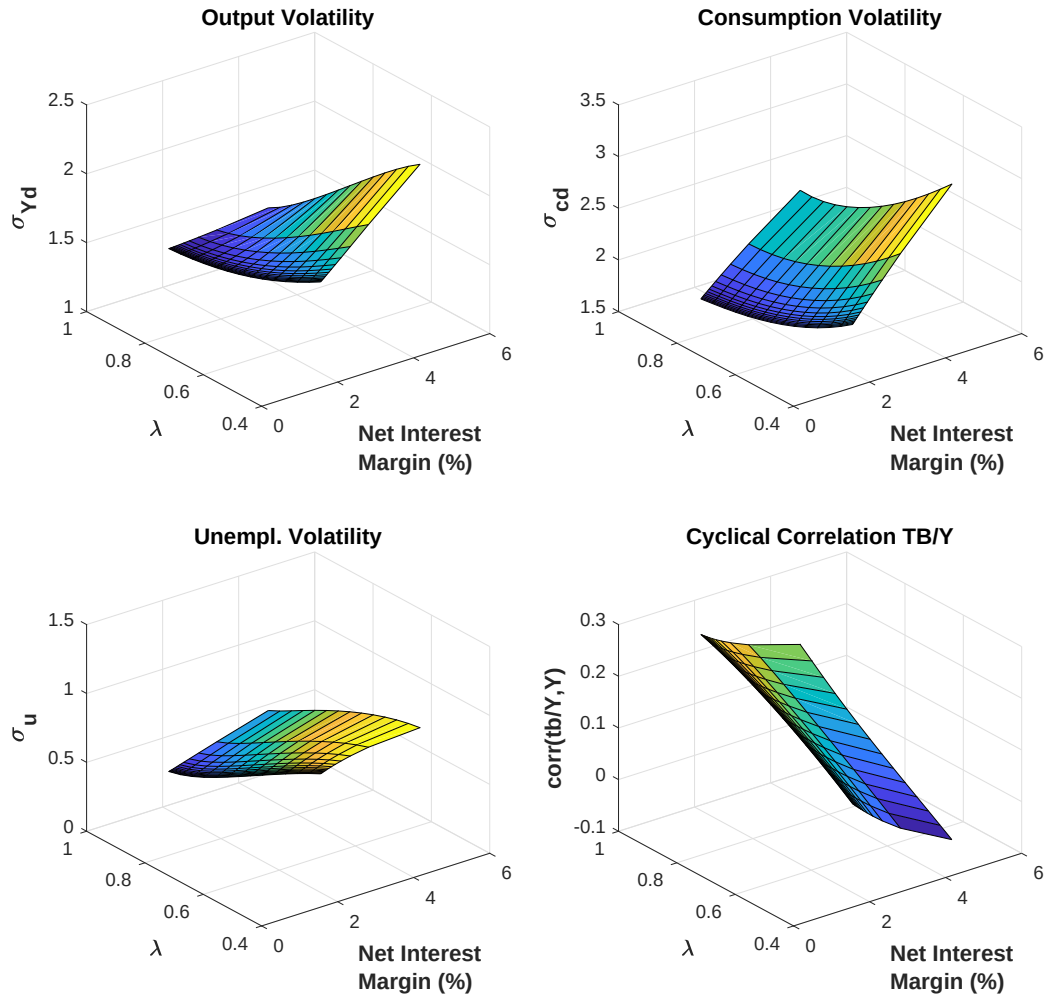


Figure 4: Cyclical Dynamics and Banking Reform Equilibria, Baseline i-Firm Share = 0.56

First, we note that comparison of Figures 2 through 4 shows that the higher is the *pre-reform* share of i firms, the lower is the volatility of output and unemployment *in the pre-reform economy* (that is, in the economy with lower λ and high net interest margins). To the extent that a higher pre-reform N_i/N reflects a more developed economy (with greater firm participation in the banking system, per Table 1), this is empirically-consistent with more developed economies exhibiting smoother business cycles.

Second, in the low pre-reform equilibrium (Figure 3), the volatility of output, consumption, and unemployment is always increasing in household participation and bank compe-

tition. In addition, the countercyclicality of the trade balance is decreasing in household participation, while it is U-shaped in bank competition. In contrast, in the high pre-reform equilibrium (Figure 4), the volatility of output, consumption, and unemployment is always decreasing in household participation and bank competition, while the countercyclicality of the trade balance is always decreasing.

Finally, the greater is the pre-reform share of i firms, the greater is the change in the cyclicality of the trade balance-output ratio in response to reforms. Of note, a model with two households (financially-excluded and -included) *but a single (financially-included) firm category* which, incidentally, implies that all firms participate in the banking system, shows that both individual and comprehensive banking reforms *unambiguously* reduce labor market and aggregate volatility. This is consistent with existing findings in one-household, one-firm models for AEs (see, for example, Cacciatore, Ghironi, and Stebunovs, 2015). These results highlight the importance of not only accounting for different firm categories, but also their relative participation rates in the domestic banking system for the analysis of banking reform in EMEs, especially when the latter exhibit low levels of firm and household participation.

Importantly, comparison of Figures 2, 3, and 4 reveals an important finding regarding the impact of banking reforms on cyclical dynamics: there is a threshold in the *pre-reform* share of i firms above which banking reform, regardless of whether it is manifested in greater household participation or more bank competition, leads to lower output and consumption volatility, *even if the economy starts off with a low level of household participation* λ (under this scenario, investment and wage volatility follow the same pattern as output volatility; that is, they are decreasing under both individual and comprehensive reforms). This holds for unemployment volatility as well where, for a high-enough pre-reform N_i/N, an increase in λ actually leads to *reductions* in unemployment volatility.

While for expositional purposes we show the results for three different pre-reform shares of i firms for illustrative purposes, this threshold is somewhat different depending on whether we look at output volatility or unemployment volatility. Specifically, the threshold for the pre-reform share of i firms above which *comprehensive* reforms that bring our representative EME to AE levels lead to lower *output volatility* occurs roughly around 0.27 under our baseline calibration (note that this is slightly above the empirical mean i-firm share in EMEs; see

Table 1). In turn, the threshold for the pre-reform share of i firms above which *comprehensive* reforms that bring our representative EME to AE levels lead to lower *unemployment volatility* occurs roughly around 0.30.[34]

Economic Intuition and Mechanisms An individual reform that increases λ implies that a larger segment of the economy—workers and household members, but also firms since households are the ultimate owners of firms—is vulnerable to interest rate shocks. The expansion in the share of i individuals leads to a large change in the steady-state composition of total consumption, the total number of firms, and total (un)employment, with u_i accounting for the bulk of total unemployment post-reform (Table 2). The increase (decrease) in steady-state i-household (e-household) consumption makes i-households' consumption less sensitive to shocks, but exacerbates the sensitivity of e-households' consumption to exogenous disturbances. In turn, this generates contrasting changes in the two households' valuation of the future via distinct movements in their stochastic discount factors.[35] This mechanism stabilizes the expected marginal benefit of creating vacancies and accumulating capital by intermediate-goods i firms such that hiring and investment decisions, as well as the creation of i firms, become less sensitive to shocks. Of note, despite the reduction in i-category unemployment volatility, the sharp rise in steady-state u_i/u is such that *total* unemployment volatility increases.[36]

The opposite takes place among e firms since e households' lower steady-state income and consumption post-reform make their consumption decisions more sensitive, leading to more volatile hiring, investment, and firm creation decisions. This is ultimately reflected in more volatile e-category consumption and output. Importantly, this greater e-category volatility more than offsets the reduction in i-households' volatility, thereby leading to a

[34]Details available upon request.

[35]Formally, consider log-linear versions of each household category's stochastic discount factor: $\widehat{\Xi}^{j}_{t+1|t} = \mathbf{u}'(c_j)\left[\widehat{\mathbf{u}}'(c_{j,t+1}) - \widehat{\mathbf{u}}'(c_{j,t})\right]\left(\Xi^{j}\right)^{-1}$ for $j \in \{e, i\}$, where hatted terms denote log deviations from steady-state. Consider household i, who experiences higher steady-state c_i post-reform, implying that $\mathbf{u}'(c_i)$ is lower post-reform. Then, for a given deviation in c_i from steady-state, $\widehat{\Xi}^{i}_{t+1|t}$ becomes less sensitive post-reform.

[36]To understand this result formally, consider a log-linear version of total unemployment: $\widehat{u}_t = (u_i/u)\widehat{u}_{i,t} + (u_e/u)\widehat{u}_{e,t}$, where hatted terms denote log deviations from steady-state and variables without time subscripts denote steady-state variables. Then, for a given variability of $u_{i,t}$, the sharp rise in (u_i/u) is such that i-category unemployment will put upward pressure on the volatility of total unemployment.

sharper response in the post-reform economy. All told, despite the fact that the contribution of e firms and households to firms, employment, and economic activity is smaller post-reform, their more sensitive response to shocks more than offsets the gains in lower volatility among i firms and households and leads to higher unemployment and aggregate volatility.

A similar rationale applies to the behavior of i firms and households holds under an individual reform that bolsters bank competition. However, in contrast to the individual reform that increases λ, the change in the steady-state composition of total consumption and firms amid lower net interest margins is small. Moreover, the increase in bank competition boosts steady-state consumption *across both household categories* and the steady-state number of *both* e and i firms. Thus, firms' and households' decisions become less sensitive to shocks *across the board*, thereby leading to smoother labor market and aggregate dynamics (especially amid interest rate shocks) post-reform.

Figures 5 and 6 shed light on these effects by showing impulse responses to temporary adverse aggregate productivity and interest rate shocks, respectively, for the the different reform equilibria (all pertinent quantities are expressed in data-consistent terms).[37] For the same productivity shock across reform equilibria, reforms seem to have limited effects on the aggregate responses to these shocks. Importantly, though, this is not the case under foreign interest rate shocks, suggesting that these shocks are important in the analysis of banking reforms in EMEs. Indeed, Figure 6 shows how greater bank competition contributes to lowering labor market and aggregate volatility in response to interest rate shocks. It also shows how such reform can offset the adverse cyclical effects of a reform-driven increase in λ. Of note, a reform-driven increase in λ expands the share of individuals who are exposed to interest rate shocks and leads to sharper fluctuations relative to the baseline economy.[38] All told, the opposing forces between individual banking reforms described above—with a higher λ making

[37]Of note, the baseline economy generates factual dynamics in response to adverse aggregate productivity and interest rate shocks: temporarily lower output, consumption, investment, and wages, and higher unemployment.

[38]The fact that having a larger share of financially-included households leads to a sharper output and unemployment response to financial shocks is consistent with the empirical and theoretical findings in Epstein, Finkelstein Shapiro, and González Gómez (2017b) in the context of global financial risk shocks. As shown in their work, the empirical response of unemployment to global financial risk shocks in economies with a larger share of financially-included households is stronger, and within a theoretical context, this share can rationalize the differential response to these shocks in AEs relative to EMEs.

the economy more sensitive to shocks and a higher H stabilizing aggregate fluctuations—explain why comprehensive reform ultimately has very limited volatility-reducing effects on aggregate dynamics, and in the case of unemployment volatility, adverse effects if the share of firms benefiting from the reforms is small enough.

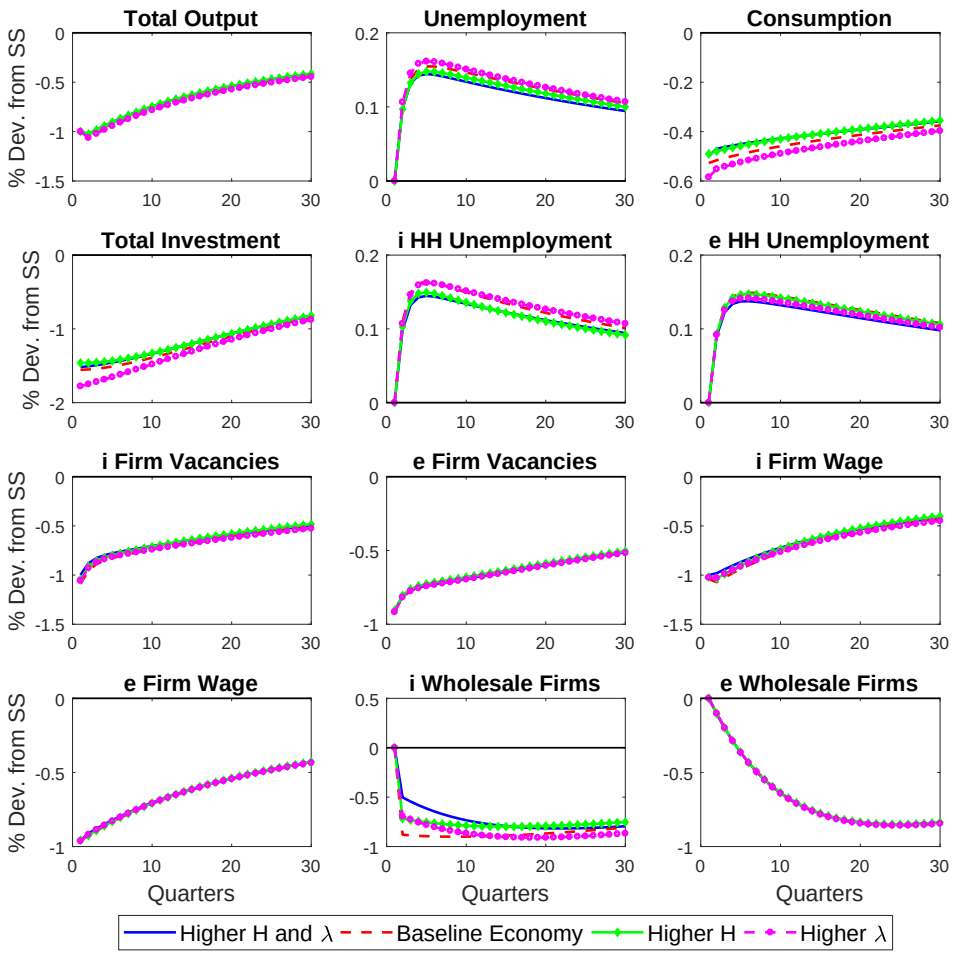


Figure 5: Response to a One Standard Deviation Reduction in Aggregate Productivity

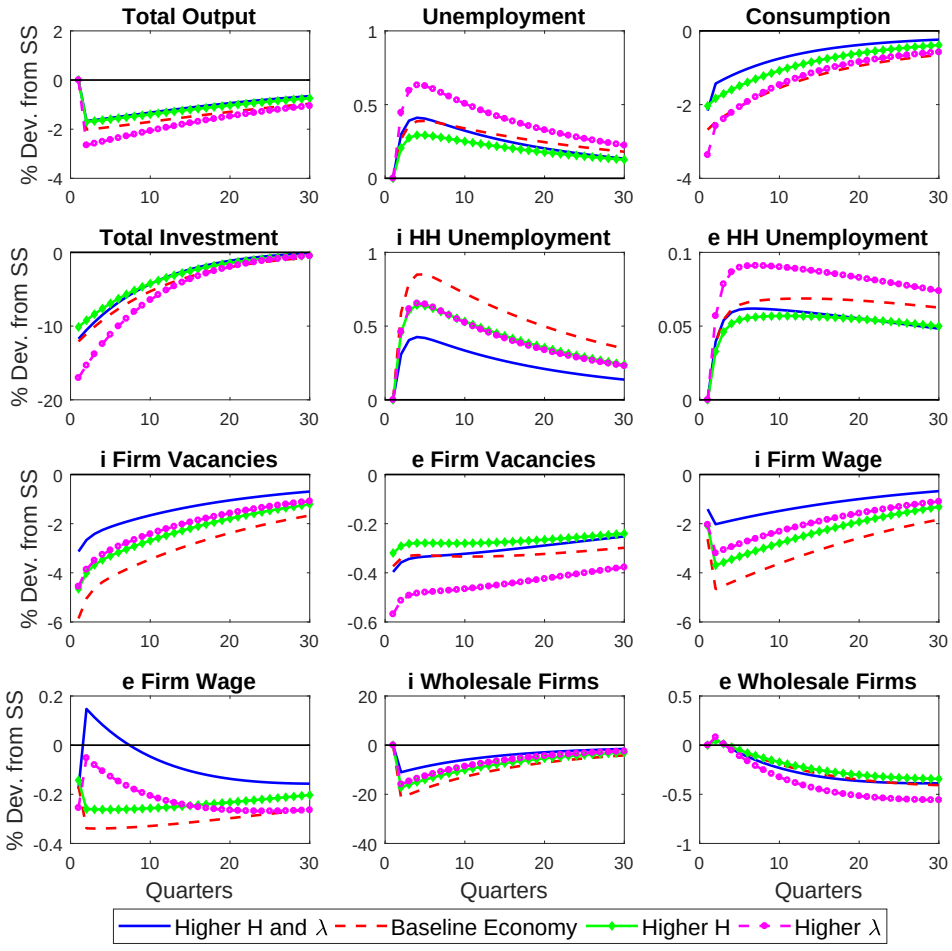


Figure 6: Response to a One Standard Deviation Increase in Foreign Interest Rates

Turning to the importance of firm participation, Figures 2, 3, and 4 above illustrated how a high-enough pre-reform share of firm participation implies that reforms have unambiguous volatility-reducing effects in the labor market and the economy as a whole. To understand the role of this share, note that there is a positive relationship between the *initial share* of i firms pre-reform and these firms' contribution to total output. Moreover, the model suggests a disproportionate contribution by i firms to total output relative to their share in the universe of firms. Specifically, an economy with a baseline share of i firms of alternatively 0.17, 0.26, and 0.56 has a contribution to total output by i firms of 0.331, 0.459, and 0.754, respectively.[39]

[39]This result is independent of the specific parameter we use to match the pre-reform share of i firms in the model.

These results are broadly consistent with evidence on the distribution of firms by firm size (with firms with access to bank credit being on average larger) and their contribution to total value added (see, for example, OECD, 2013). Furthermore, these findings shed light on why banking reforms reduce labor market and aggregate volatility for high-enough pre-reform levels of firm participation in the banking system: since these reforms have unambiguous volatility-reducing effects among i firms' and households' decisions, the larger is these firms' contribution to total output, the more stabilizing these reforms are. More importantly, as the share of i-firm output becomes increasing larger, greater household participation becomes less destabilizing (and for high enough levels, individual reforms boosting household participation have virtually no negative effects on volatility). This is apparent from Figures A10 and A11 in the Appendix, which show the response to productivity and interest rate shocks of an economy with a pre-reform share of i firms of 0.56 (as in AEs).

Finally, we note that while data on the contribution to GDP by firms without access to credit is generally not available, the size of the informal sector (as a share of GDP) can be used as a reasonable proxy. Then, our model-based implication is consistent with the well-known negative relationship between the level of economic development (which is associated with a more developed and more competitive banking system and more household and firm participation) and the size of the informal sector.

4.3 Transitional Dynamics and Welfare

We briefly discuss how transition paths post-reform differ across individual and comprehensive reforms (all relevant details are summarized in Figures A14, A15, and A16 in the Appendix). Given the large changes in λ and net interest margins we consider, we consider a *gradual* (and hence more plausible) and permanent increase in the level of bank competition H alone, in the level of household participation λ alone, and in both λ and H, that spans roughly 2.5 years. For illustrative purposes, the change we consider for λ (from 0.42 to 0.62) is consistent with the average change in household participation from 2011 to 2014 (the dates for which data from the Global Financial Inclusion Database on the share of individuals with an account at financial institutions is available) in our sample of EMEs.

The post-reform transition is such that consumption is temporarily lower before rising

above the pre-reform steady-state and eventually converging to a permanently higher level. This occurs despite the slow but persistent rise in output and is driven by the fact that i households cut back on consumption to channel resources towards the creation of i firms in response to the reforms. At the same time, the trade balance temporarily deteriorates relative to its pre-reform level as households acquire foreign debt to also finance the creation of firms. In the long run, output, consumption, investment, and the trade balance-output ratio are all higher, while unemployment is lower. Importantly, the short-run cost reflected in a temporary contraction in consumption post-reform is *decreasing* in the pre-reform share of i firms. In fact, for a pre-reform share of 0.56, consumption does *not* fall and instead gradually rises in response to the reforms. In contrast, for a pre-reform share of 0.17, the temporary contraction in consumption after the implementation of reforms is considerably more long-lived relative to the scenario under the benchmark calibration (see Figures A17 and A18 in the Appendix).[40] Once again, this highlights the importance of considering firms' level of participation when characterizing the business cycle consequences of banking reforms, but also the transition path post-reform.

For completeness, Table A2 presents the long- and short-term impact of individual reforms on e and i households. While i households unambiguously benefit from individual reforms, e households are adversely affected by reforms that bolster household participation but benefit from greater bank competition.[41] Of note, the welfare gains for e households amid greater bank competition are increasing in the pre-reform share of i firms.

4.4 Robustness Checks

The Appendix presents results for: (1) alternative assumptions regarding firm ownership (Section A.7 of the Appendix), (2) different values for the elasticity of substitution between sectoral output (Section A.5 of the Appendix) and, importantly, (3) sectoral differences in vacancy posting costs, employment separation probabilities, and capital shares (Section A.6 of the Appendix), among others. Our main conclusions remain unchanged under these

[40] Moreover, unemployment actually rises temporarily before slowly following a downward path.

[41] This is consistent with the results in Table 2, where e households' consumption falls (rises) under greater household participation (bank competition).

alternative assumptions and calibrations. In addition, we note that assuming that banks choose the interest rate on loans instead of extracting the entirety of i firms' profits (a baseline assumption in line with Cacciatore, Ghironi, and Stebunovs, 2015), or that both entry costs *and* investment among i firms are financed with bank credit, does not change any of our conclusions.[42]

Finally, as noted earlier, Section A.9 of the Appendix presents the details of a richer version of our model where members from each household category can search for employment *across* firm categories and not just within their own category. Figures A12 and A13 confirm that the importance of the degree of firm participation for the volatility-reducing effects of banking reforms continues to hold under this richer environment. All told, our main conclusions are robust to alternative assumptions and, importantly, richer specifications of the labor market.

5 Conclusion

Developing and emerging economies (EMEs) differ considerably in the level of bank competition and firm and household participation in the banking system relative to advanced economies (AEs). We study the labor market and business cycle implications of banking reforms using a framework with endogenous firm entry and a monopolistically-competitive banking sector, labor market frictions, and empirically-factual household and firm heterogeneity in banking system participation. Calibrating the model to a representative EME amid aggregate productivity and foreign interest rate shocks, we consider banking reforms that bring the banking system closer to AE standards via: (1) a higher share of financially-included households; (2) increased bank competition (via a larger number of banks and lower net interest margins); and (3) a joint improvement in both (1) and (2) that embodies *comprehensive* banking reform.

Three key messages emerge from our work. First, while reforms unambiguously lead to better long-term macroeconomic outcomes, economies that begin reforms amid low levels of bank competition *and both* low firm and household participation in the banking system

[42]Details and results available upon request.

exhibit higher post-reform labor market and business cycle volatility as they incorporate more individuals into the banking system. However, improvements in banking competition can limit the adverse effect of greater household participation on aggregate fluctuations, but their smoothing effect is limited *amid low pre-reform firm participation in the banking system*, as is the case in many EMEs. Second, the extent to which reforms bring about reductions in business cycle volatility depends crucially on the *pre-reform* share of firm participation: there is a critical threshold in the pre-reform share above (below) which reforms unambiguously smooth (increase) labor market and aggregate fluctuations. Third, the transition towards long-run post-reform equilibria starting from an EME scenario can entail short-term reductions in consumption and a deterioration in the trade balance, which arise to support the creation of firms that participate in the banking system. However, this cost is decreasing in the *pre-reform* share of firms that participate in the banking system, and this cost eventually disappears for high-enough pre-reform levels of firm participation. More broadly, our work identifies critical features that shape the short- and medium-term effects of banking reforms in EMEs vis--vis similar reforms in AEs. Our work abstracted from the financial stability consequences of banking reforms, as well as the political feasibility of welfare-improving reforms that entail non-negligible short-term adjustment costs. We plan to explore these and other relevant issues in future work.

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A Online Appendix

A.1 Data Sources and Details: Table 1 and Figure 1

Table 1 and Figure 1 are based on data from 2000 to 2011 from the World Bank Global Financial Development Report 2014 (share of the population with accounts at financial institutions (% of population age 15+) in 2011), the IFC Enterprise Finance Gap Database 2010 (share of firms with credit line; share of informal and formal firms, share of formal and informal firms with bank loans), the World Bank Financial Development Structure Database 2011 (net interest margins, Lerner Index).

Regarding Table 1: The sample of AEs with data on firms with bank loans is comprised of: Austria, Belgium, Finland, and The Netherlands based on data availability. The AE country sample for the remaining measures is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Luxembourg, New Zealand, The Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and United Kingdom (data for some countries may not be available for particular variables). Similar facts hold if we restrict the sample to those countries with data on firms with bank loans only. The EME country sample is comprised of: Argentina, Brazil, Colombia, Indonesia, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. Data on the share of firms with bank loans from the SAFE and the IFC databases is not strictly comparable: the above evidence is only meant to illustrate the disparities in firms' access to bank finance in the two country groups. The share of firms with a loan in AEs is based on semi-annual data for small and medium enterprises (SMEs) and encompasses bank loans or bank overdrafts, averaged over 2011 (for related evidence on firms' reliance on bank loans in Europe, see Hoffmann and Sorensen, 2015). The share of firms with bank loans is computed as follows: first, firms are categorized as formal if they are micro (1-4 employees), very small (5-9 employees), small (10-49 employees), and medium (50-250 employees) enterprises registered with their local government or tax authorities. Informal firms are not registered with tax authorities and includes one-person firms regardless of whether these are registered (see https://www.smefinanceforum.org/data-sites/ifc-enterprise-finance-gap for more details). The share of formal firms in AEs is roughly 69 percent, and 76 percent

of them have bank loans. The share of formal firms in EMEs is roughly 27 percent, and only 55 percent of them have bank loans. In turn, only 11 percent of the remaining (informal) firms have bank loans. All told, the total share of firms with bank loans in each group is obtained by adding the shares of formal and informal firms with bank loans, assuming that the share of informal firms with bank loans is similar in the two country groups absent data for AEs. The Lerner Index is a measure of the degree of competition in the banking system, with a higher index being associated with a less competitive banking system (see the World Bank Global Financial Development Report for more details). The number of commercial bank branches represents a demographic measure of bank penetration.

List of countries in Figure 1: Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Dem. Rep. of Congo, Republic of Congo, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, Gabon, The Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Senegal, Serbia, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia. Data availability and coverage for each variable presented in Figure 1 varies by country.

A.2 Aggregation in Benchmark Model

To determine the equilibrium real relative price for each monopolistically-competitive wholesale firm category $j \in \{e, i\}$, consider

$$P_{j,t} = \left(\int_{\omega_j \in \Omega_j} p_{j,t}(\omega_j)^{1-\varepsilon} d\omega_j \right)^{\frac{1}{1-\varepsilon}}.$$

Dividing both sides by P_t, we have

$$\frac{P_{j,t}}{P_t} = \left(\int_{\omega_j \in \Omega_j} \left(\frac{p_{j,t}(\omega_j)}{P_t} \right)^{1-\varepsilon} d\omega_j \right)^{\frac{1}{1-\varepsilon}},$$

Imposing symmetry, we have

$$\frac{P_{j,t}}{P_t} = \frac{p_{j,t}}{P_t} \left(\int_{\omega_j \in \Omega_j} 1 d\omega_j \right)^{\frac{1}{1-\varepsilon}},$$

where we can define $p_{j,t}/P_t \equiv \rho_{j,t}$. Then, since there are $N_{j,t}$ wholesale firms operating in firm category j in period t, the above expression becomes

$$\frac{P_{j,t}}{P_t} = \rho_{j,t} N_{j,t}^{\frac{1}{1-\varepsilon}},$$

which can be rewritten as

$$\rho_{j,t} = \frac{P_{j,t}}{P_t} N_{j,t}^{\frac{1}{\varepsilon-1}}.$$

Similarly, recall that wholesale output at sectoral level is given by $Y_{j,t} = \left(\int_{\omega_j \in \Omega_j} y_{j,t}(\omega_j)^{\frac{\varepsilon-1}{\varepsilon}} d\omega_j \right)^{\frac{\varepsilon}{\varepsilon-1}}$. Imposing symmetry, we have

$$Y_{j,t} = y_{j,t} \left(\int_{\omega_j \in \Omega_j} 1 d\omega_j \right)^{\frac{\varepsilon}{\varepsilon-1}},$$

Then, since there are $N_{j,t}$ wholesale firms operating in firm category j in period t, the above expression becomes

$$Y_{j,t} = y_{j,t} N_{j,t}^{\frac{\varepsilon}{\varepsilon-1}}.$$

A.3 Equilibrium Conditions: Benchmark Model

Taking the stochastic processes $\{z_t, z_{r,t}\}$ as given, the allocations and prices $\{Y_t, mc_{i,t}, mc_{e,t}\}$,

$\{N_{E,et}, N_{E,it}, Q_t, n_{i,t}, n_{e,t}, k_{i,t}, k_{e,t}, v_{i,t}, v_{e,t}, w_{i,t}, w_{e,t}, b_t, b_t^*, e_{b,t}, e_{e,t}, \rho_{i,t}, \rho_{e,t}, Y_{i,t}, Y_{e,t}, c_{i,t}, c_{e,t}, P_{i,t}, P_{e,t}, P_t\}$ satisfy:

$$Y_t = \left[(1-\alpha_y)^{\frac{1}{\phi_y}} (Y_{i,t})^{\frac{\phi_y-1}{\phi_y}} + \alpha_y^{\frac{1}{\phi_y}} (Y_{e,t})^{\frac{\phi_y-1}{\phi_y}}\right]^{\frac{\phi_y}{\phi_y-1}}, \tag{20}$$

$$\rho_{i,t} = (\varepsilon/(\varepsilon-1))\, mc_{i,t}, \tag{21}$$

$$\rho_{e,t} = (\varepsilon/(\varepsilon-1))\, mc_{e,t}, \tag{22}$$

$$e_{e,t} = \psi_{e,t}, \tag{23}$$

$$Q_t = \left(\frac{1}{1-\delta}\right)\psi_{i,t}, \tag{24}$$

$$Q_t = \mathbb{E}_t \Xi_{t+1|t} \left\{\left(1-\frac{1}{H}\right) d_{i,t+1} + (1-\delta) Q_{t+1}\right\}, \tag{25}$$

$$n_{i,t+1} = (1-\rho_i^n)\left(n_{i,t} + v_{i,t} q(\theta_{i,t})\right), \tag{26}$$

$$n_{e,t+1} = (1-\rho_e^n)\left(n_{e,t} + v_{e,t} q(\theta_{e,t})\right), \tag{27}$$

$$1 = \mathbb{E}_t \Xi_{t+1|t} \left\{1 + \alpha mc_{i,t+1} z_{i,t+1} n_{i,t+1}^{1-\alpha} k_{i,t+1}^{a-1} - \delta\right\}, \tag{28}$$

$$1 = \mathbb{E}_t \Xi_{t+1|t} \left\{1 + \alpha mc_{e,t+1} z_{e,t+1} n_{e,t+1}^{1-\alpha} k_{e,t+1}^{a-1} - \delta\right\}, \tag{29}$$

$$\frac{\kappa_i}{q(\theta_{i,t})} = (1-\rho_i^n)\mathbb{E}_t \Xi_{t+1|t}^i \left\{(1-\alpha) mc_{i,t+1} z_{i,t+1} n_{i,t+1}^{-\alpha} k_{i,t+1}^a - w_{i,t+1} + \frac{\kappa_i}{q(\theta_{i,t+1})}\right\}, \tag{30}$$

$$\frac{\kappa_e}{q(\theta_{e,t})} = (1-\rho_e^n)\mathbb{E}_t \Xi_{t+1|t}^e \left\{(1-\alpha) mc_{e,t+1} z_{e,t+1} n_{e,t+1}^{-\alpha} k_{e,t+1}^a - w_{e,t+1} + \frac{\kappa_e}{q(\theta_{e,t+1})}\right\}, \tag{31}$$

$$w_{i,t} = \eta\left[(1-\alpha) mc_{i,t} z_{i,t} n_{i,t}^{-\alpha} k_{i,t}^a + \kappa_i \theta_{i,t}\right] + (1-\eta)\chi, \tag{32}$$

$$w_{e,t} = \eta\left[(1-\alpha) mc_{e,t} z_{e,t} n_{e,t}^{-\alpha} k_{e,t}^a + \kappa_e \theta_{e,t}\right] + (1-\eta)\chi, \tag{33}$$

$$\mathbf{u}'(c_{i,t}) = R_{t+1}\beta \mathbb{E}_t \mathbf{u}'(c_{i,t+1}), \tag{34}$$

$$1 = R^*_{t+1}\beta\mathbb{E}_t\frac{\mathbf{u}'(c_{i,t+1})}{\mathbf{u}'(c_{i,t})} + \eta_b b^*_{t+1}, \tag{35}$$

$$e_{b,t} = \mathbb{E}_t\Xi^i_{t+1|t}\left\{\pi_{b,t+1} + e_{b,t+1}\right\}, \tag{36}$$

$$e_{e,t} = (1-\delta)\mathbb{E}_t\Xi^e_{t+1|t}\left\{d_{e,t+1} + e_{e,t+1}\right\}, \tag{37}$$

$$\rho_{i,t} = \frac{P_{i,t}}{P_t}N_{i,t}^{\frac{1}{\varepsilon-1}}, \tag{38}$$

$$\rho_{e,t} = \frac{P_{e,t}}{P_t}N_{e,t}^{\frac{1}{\varepsilon-1}}, \tag{39}$$

$$c_{e,t} + x_{e,t+1}N_{E,et}e_{e,t} = w_{e,t}n_{e,t} + \chi_e u_{e,t} + x_{e,t}N_{e,t}\left[d_{e,t} + e_{e,t}\right] + \Pi_{e,t}, \tag{40}$$

$$Y_{i,t} = N_{i,t}^{\frac{\varepsilon}{\varepsilon-1}}y_{i,t} = N_{i,t}^{\frac{1}{\varepsilon-1}}z_{i,t}n_{i,t}^{1-\alpha}k_{i,t}^a, \tag{41}$$

$$Y_{e,t} = N_{e,t}^{\frac{\varepsilon}{\varepsilon-1}}y_{e,t} = N_{e,t}^{\frac{1}{\varepsilon-1}}z_{e,t}n_{e,t}^{1-\alpha}k_{e,t}^a, \tag{42}$$

$$Y_t = c_{e,t} + c_{i,t} + i_{e,t} + i_{i,t} + \kappa_e v_{e,t} + \kappa_i v_{i,t} + \psi_{e,t}N_{E,et} + \psi_{i,t}N_{E,it} + R^*_t b^*_t - b^*_{t+1} + \frac{\eta_b}{2}(b^*_{t+1})^2, \tag{43}$$

$$P_{i,t}/P_t = (1-\alpha_y)^{\frac{1}{\phi_y}}\left(Y_t/Y_{i,t}\right)^{\frac{1}{\phi_y}}, \tag{44}$$

$$P_{e,t}/P_t = \alpha_y^{\frac{1}{\phi_y}}\left(Y_t/Y_{e,t}\right)^{\frac{1}{\phi_y}}, \tag{45}$$

$$P_t = \left[(1-\alpha_y)\left(P_{i,t}\right)^{1-\phi_y} + \alpha_y\left(P_{e,t}\right)^{1-\phi_y}\right]^{\frac{1}{\phi_y-1}}, \tag{46}$$

given the definitions of the stochastic discount factors, the matching probabilities, and total unemployment, $u_t = 1 - n_{e,t} - n_{i,t}$.

A.4 Baseline Economy under Different Baseline Steady-State i-Firm Shares

In what follows, we present the calibration details for versions of the baseline EME under different steady-state i firm shares.

Baseline Economy with Steady-State $N_i/N = 0.17$ We adopt the same calibration targets as the baseline economy in the main text, *except for the share of i firms in the economy, which we now change to 0.17 (vs. 0.26 in the main text).* We continue to assume

that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters are: $\xi = 0.3789, \kappa = 0.0629, \psi_e = 0.4177, \psi_i = 0.5926, H = 2.4290, \alpha_y = 0.9923$, and $_b = 0.0016$.

Baseline Economy with Steady-State $N_i/N = 0.56$ We adopt the same calibration targets as the baseline economy in the main text, *except for the share of i firms in the economy, which we now change to 0.56 (vs. 0.26 in the main text).* We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters are: $\xi = 0.4136, \kappa = 0.1523, \psi_e = 1.0153, \psi_i = 1.4362, H = 2.4290, \alpha_y = 0.4030$, and $_b = 0.0008$.

A.5 Robustness Checks: Alternative Parameterizations

Benchmark Model with $\phi_y = 1.5$ Relative to the baseline calibration in the main text ($\phi_y = 5$), we assume that $\phi_y = 1.5$. We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative calibration of the baseline EME economy are: $\xi = 0.3858, \kappa = 0.1118, \psi_e = 0.7432, \psi_i = 1.0546, H = 2.4290, \alpha_y = 0.6359$, and $\eta_b = 0.0013$.

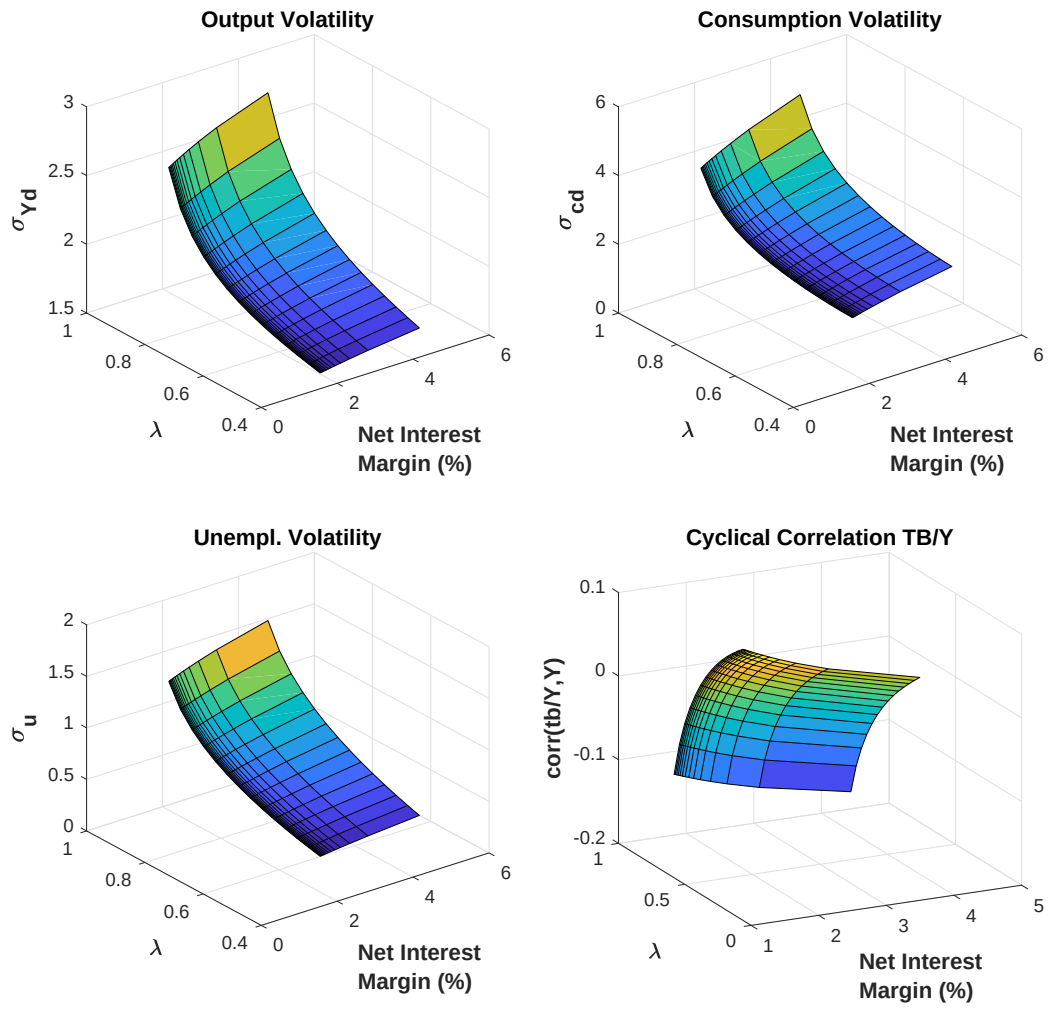

Figure A1: Business Cycle Volatility and Banking Reform Equilibria ($\phi_y = 1.5$)

Benchmark Model with $\phi_y = 3$ Relative to the baseline calibration in the main text ($\phi_y = 5$), we assume that $\phi_y = 3$. We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative calibration of the baseline EME economy are: $\xi = 0.3824, \kappa = 0.0931, \psi_e = 0.6184, \psi_i = 0.8775, H = 2.4290, \alpha_y = 0.8499$, and $\eta_b = 0.0013$.

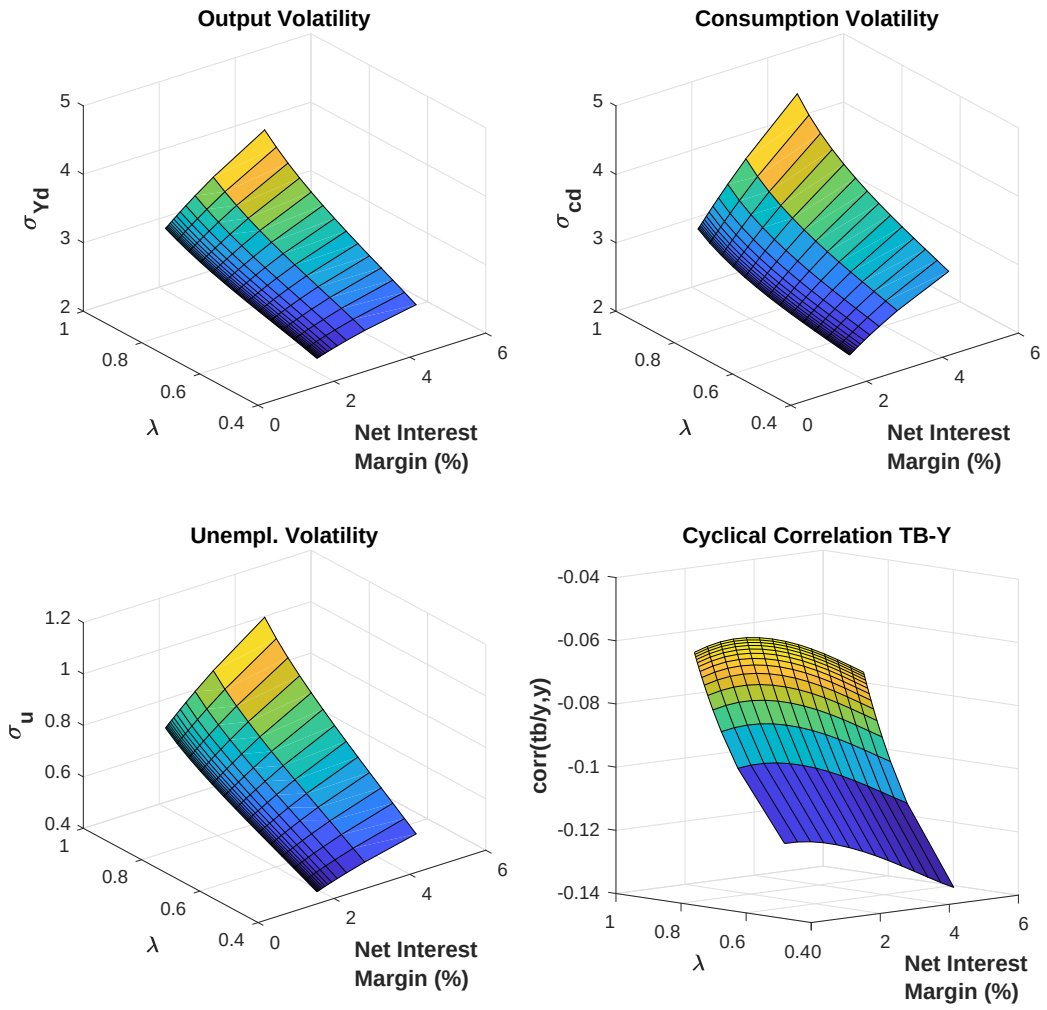

Figure A2: Business Cycle Volatility and Banking Reform Equilibria ($\phi_y = 3$)

A.6 Robustness Checks: Asymmetries Across Firm Categories

Firm-Category Vacancy-Cost Differences Relative to the baseline calibration in the main text, we assume that the cost of posting vacancies for e firms represents 50 percent of the cost faced by i firms (this can reflect, among other things, the fact that smaller firms in EMEs often circumvent labor market regulations, thereby leading to lower hiring costs). We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative calibration of the baseline EME economy are:

$\xi = 0.3607, \kappa_e = 0.0407, \kappa_i = 0.0814, \psi_e = 0.5406, \psi_i = 0.7673, H = 2.4290, \alpha_y = 0.9635$, and $\eta_b = 0.0013$.

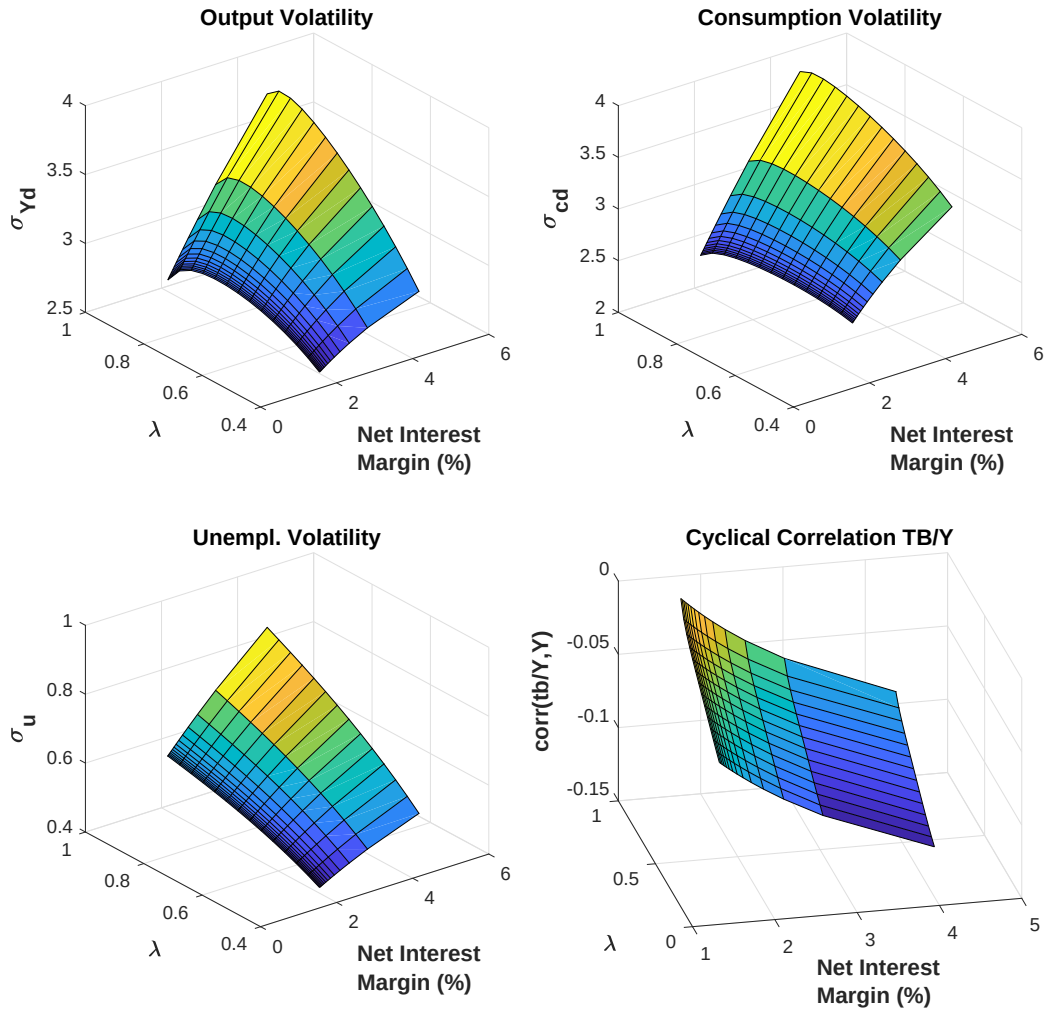

Figure A3: Business Cycle Volatility and Banking Reform Equilibria ($\kappa_e < \kappa_i$)

Firm-Category Capital Share Differences Relative to the baseline calibration in the main text, we assume that e firms are less capital intensive relative to i firms. This assumption is consistent with the fact that smaller firms in EMEs, which are less likely to have access to bank credit, are less capital intensive. Specifically, we assume a capital share of 0.27 for e firms (vs. 0.32 for i firms). We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative calibration of the baseline EME

economy are: $\xi = 0.3812, \kappa = 0.0595, \psi_e = 0.4021, \psi_i = 0.5614, H = 2.4290, \alpha_y = 0.9863$, and $\eta_b = 0.0013$. The results below become even stronger for larger differences in capital shares between i and e firms.

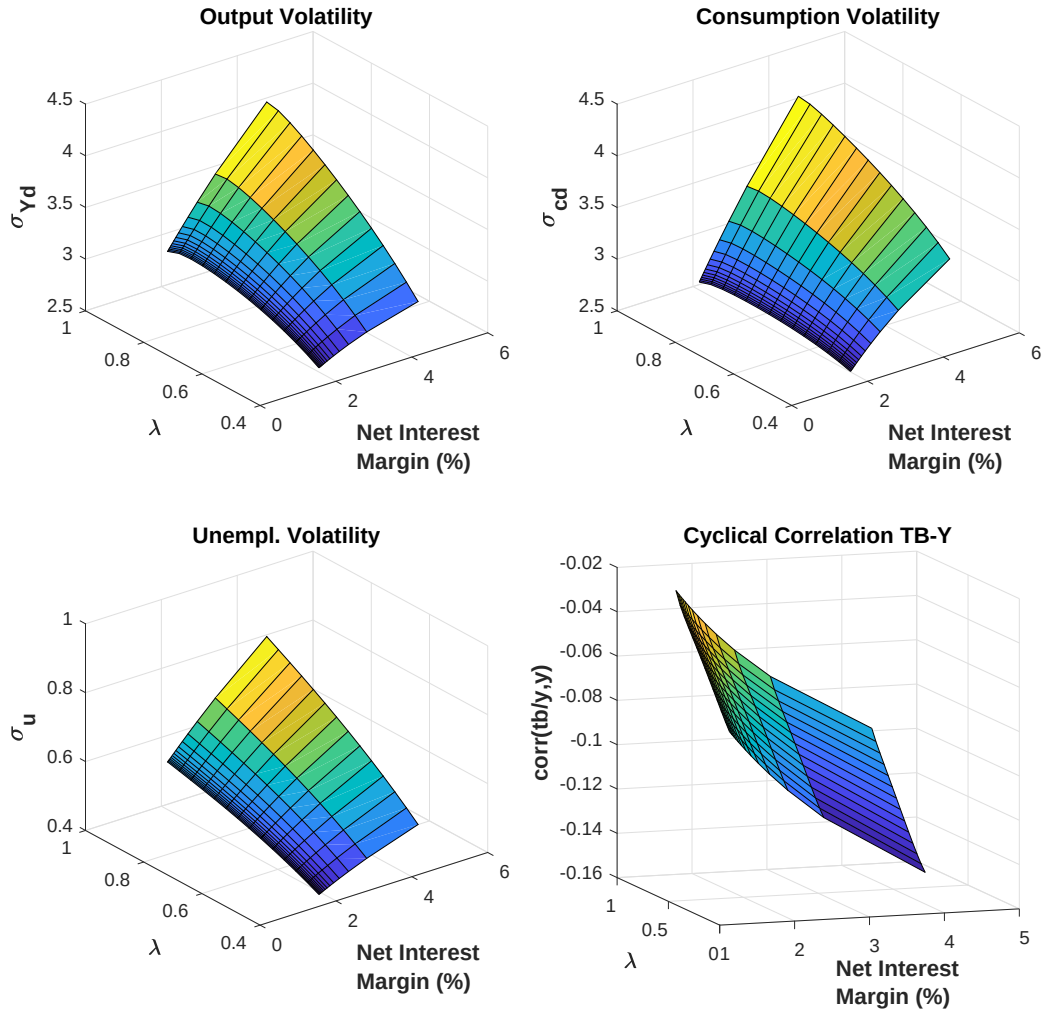

Figure A4: Business Cycle Volatility and Banking Reform Equilibria, Lower Capital Share Among e Firms

Firm-Category Differences in Separation Probabilities Relative to the baseline calibration in the main text, we assume that e firms face higher employment separation probabilities relative to i firms (this assumption is consistent with the fact that smaller firms, which are more likely to be informal, face higher separation probabilities (see, for exam-

ple, Bosch and Maloney, 2008)). Specifically, we assume that $\rho_e^n = 0.08$ and $\rho_i^n = 0.05$. We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative calibration of the baseline EME economy are: $\xi = 0.5381, \kappa = 0.0802, \psi_e = 0.5341, \psi_i = 0.7557, H = 2.4290, \alpha_y = 0.9682$, and $\eta_b = 0.0013$.

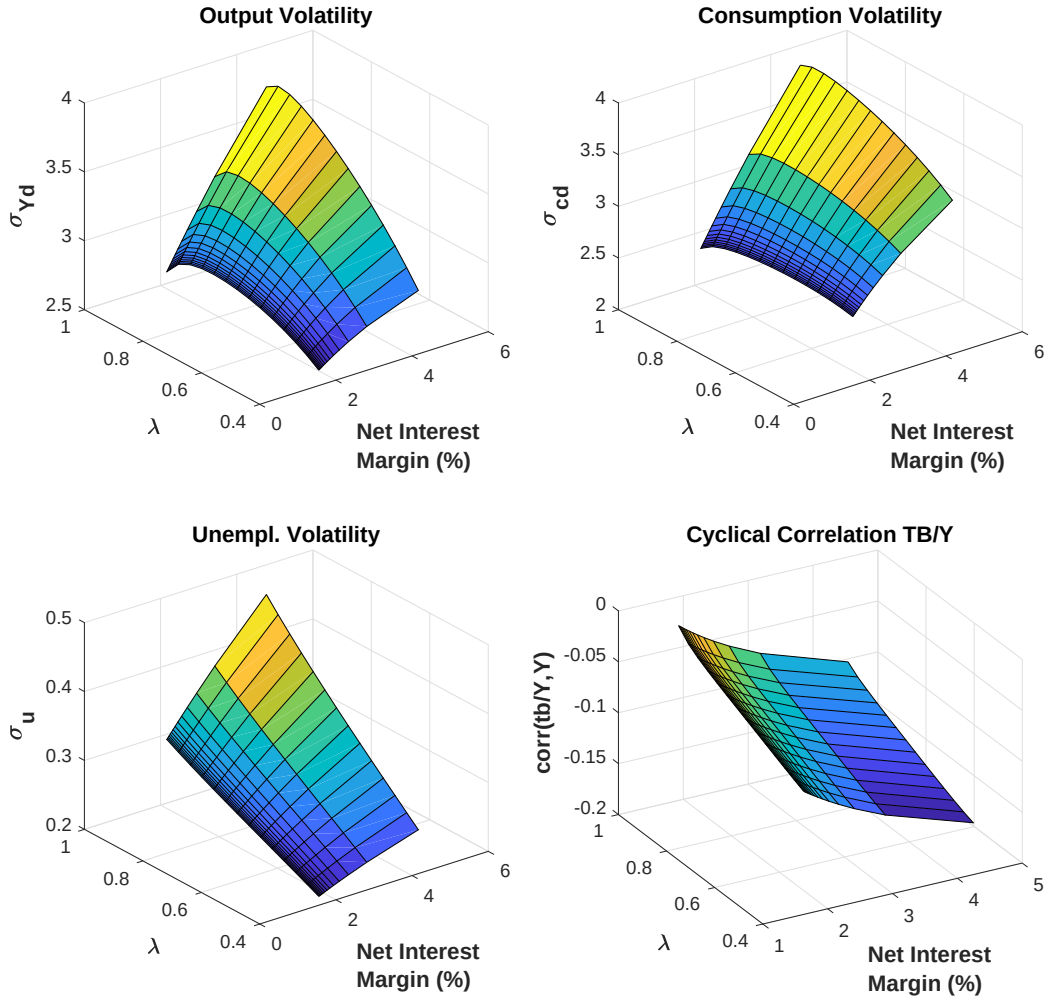

Figure A5: Business Cycle Volatility and Banking Reform Equilibria, Different Employment Separation Probabilities

Identical Sunk Entry Costs Across Firms Relative to the baseline calibration in the main text, we assume all wholesale firms face the same sunk entry cost. Specifically, we assume that $\psi_e = \psi_i = \psi$. We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$.

The resulting calibrated parameters under this alternative calibration of the baseline EME economy are: $\xi = 0.3837, \kappa = 0.0654, \psi = 0.6168, H = 2.4290, \alpha_y = 0.9899$, and $\eta_b = 0.0013$.

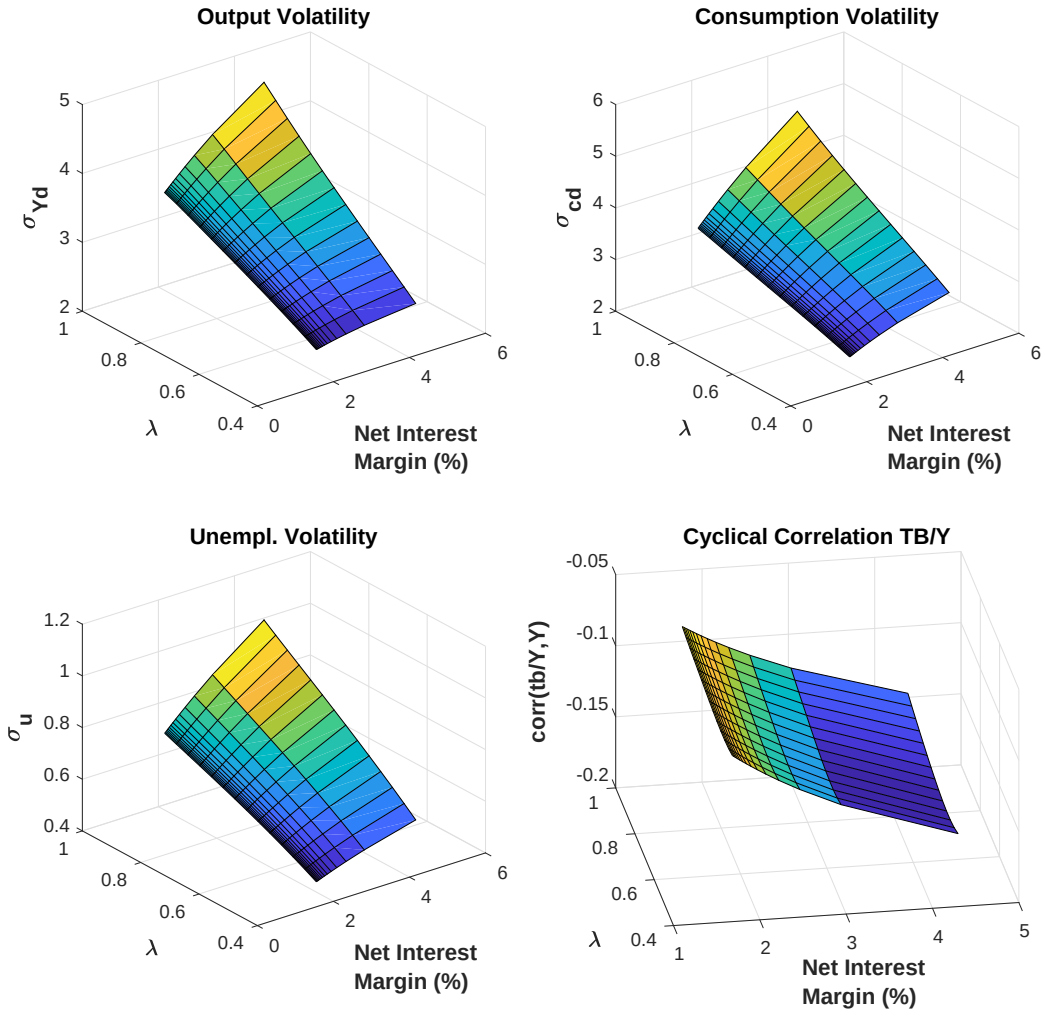

Figure A6: Business Cycle Volatility and Banking Reform Equilibria, Identical Sunk Entry Costs Across Firms

A.7 Banking Reforms: Alternative Firm-Ownership Assumptions

Benchmark Model, i Households Own All Firms This version of the model assumes that all firms are owned by i households, implying that e households' sole source of income comes from labor income via employment in e firms. We assume the same calibration targets used in the main text. and continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The

resulting calibrated parameters under this alternative version of the baseline EME economy are: $\xi = 0.3809, \kappa = 0.0811, \psi_e = 0.5387, \psi_i = 0.7643, H = 2.4290, \alpha_y = 0.9645$, and $\eta_b = 0.0013$.

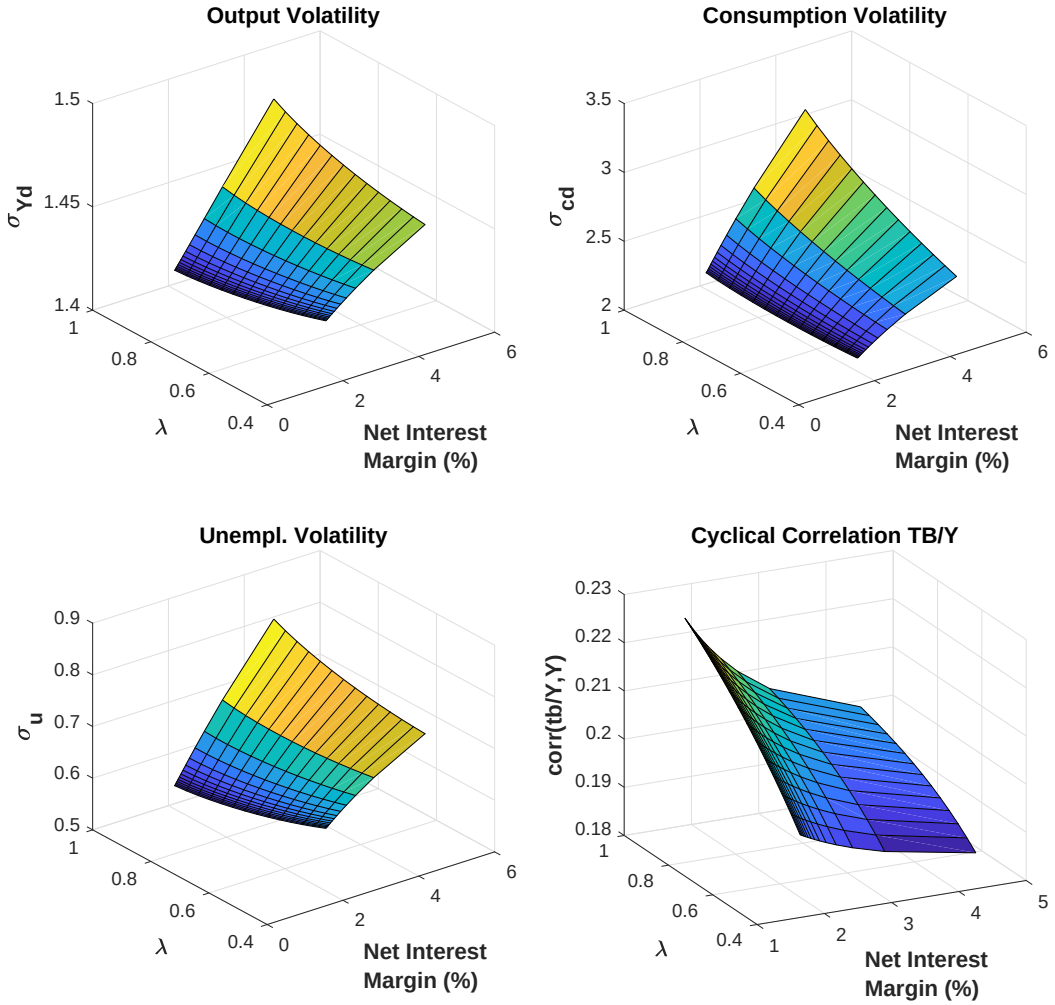

Figure A7: Business Cycle Volatility and Banking Reform Equilibria, i Households Own All Firms

Benchmark Model, i Households Own Wholesale e Firms This version of the model assumes that wholesale e firms are owned by i households, implying that e households' sources of income come from labor income via employment in e firms and ownership of intermediate-goods e firms. We assume the same calibration targets used in the main text. and continue

to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative version of the baseline EME economy are: $\xi = 0.3809, \kappa = 0.0811, \psi_e = 0.5387, \psi_i = 0.7643, H = 2.4290, \alpha_y = 0.9645$, and $\eta_b = 0.0013$.

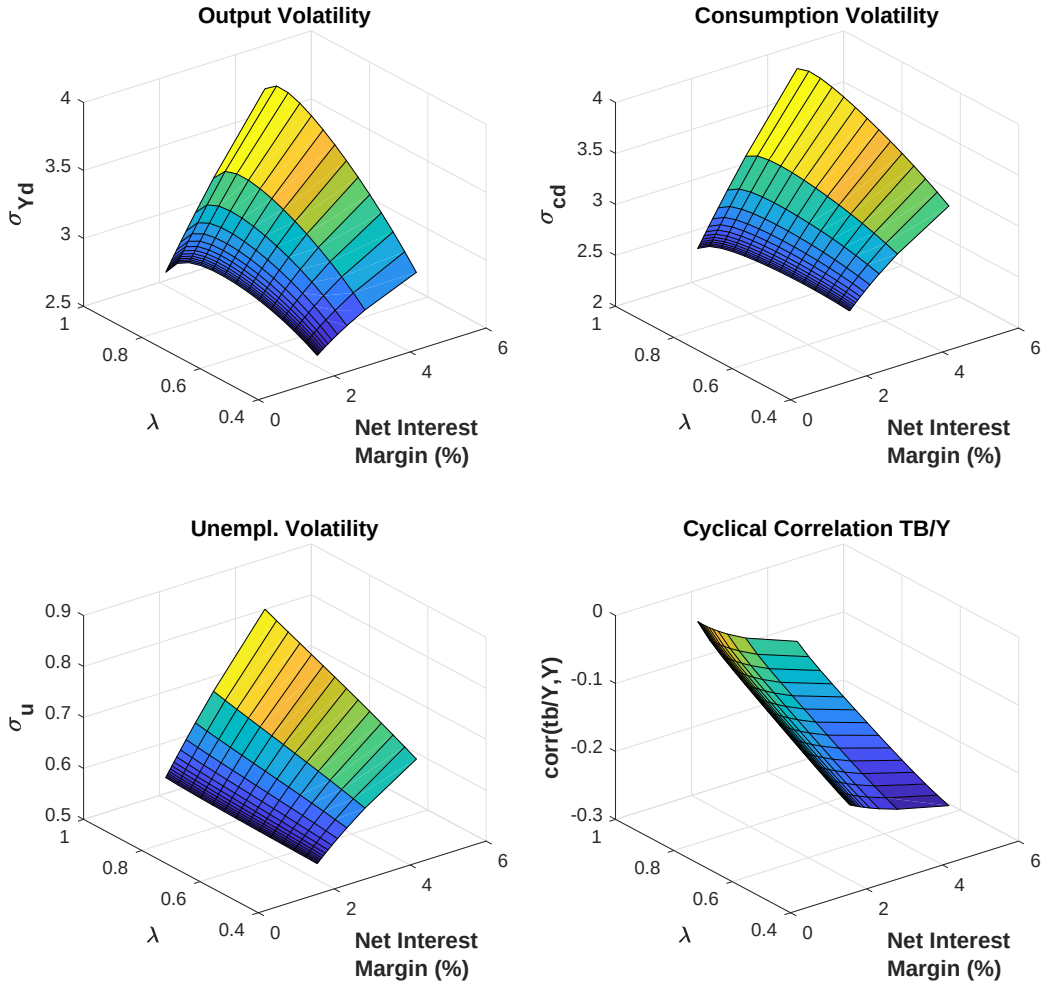

Figure A8: Business Cycle Volatility and Banking Reform Equilibria, i Households Own Wholesale e Firms

Benchmark Model, i Households Own Intermediate-Goods e Firms This version of the model assumes that intermediate-goods e firms are owned by i households, implying that e households' sources of income come from labor income via employment in e firms and ownership of wholesale e firms. We assume the same calibration targets used in the

main text. and continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters under this alternative version of the baseline EME economy are: $\xi = 0.3809, \kappa = 0.0811, \psi_e = 0.5387, \psi_i = 0.7643, H = 2.4290, \alpha_y = 0.9645$, and $\eta_b = 0.0013$.

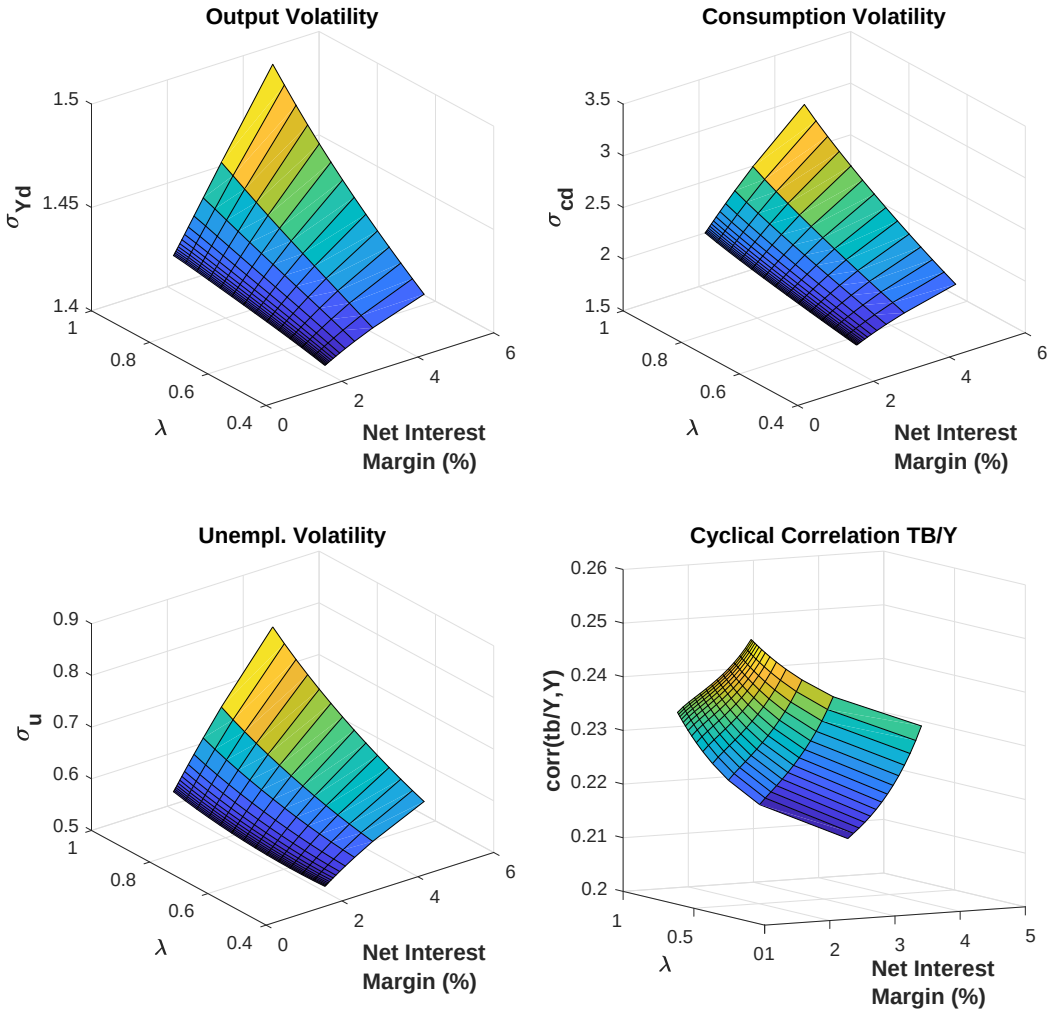

Figure A9: Business Cycle Volatility and Banking Reform Equilibria, i Households Own Intermediate-Goods e Firms

A.8 Banking Reforms: Steady State and Impulse Response Functions, Baseline Economy with $N_i/N = 0.56$

Table A1 below compares our main results for the baseline economy with a pre-reform i-firm share of 0.26 and the same economy under a comprehensive banking reform (which were presented in Table 3 in the main text) to an otherwise identically-calibrated baseline economy with a pre-reform i-firm share of 0.56 and the corresponding economy under a comprehensive banking reform.

Table A1: Steady State Under Different Banking Reform Equilibria - Baseline and High N_i Share

Variable	Baseline (EME) Economy, $N_i/N = 0.26$	Baseline $N_i/N = 0.26$ Higher λ and H	Baseline (EME) Economy, $N_i/N = 0.56$	Baseline $N_i/N = 0.56$ Higher λ and H
	(1)	(2)	(3)	(4)
Y_d	4.143	7.996	7.859	16.38
c_d	2.863	5.451	5.567	11.39
$c_{d,i}$	1.317	5.240	4.397	11.29
$c_{d,e}$	1.546	0.211	1.170	0.105
inv_d	0.687	1.325	1.302	2.715
N	45.74	54.77	28.83	99.41
N_i	11.89	51.71	17.30	98.04
N_e	33.84	3.064	11.53	1.367
N_i/N	0.260	0.944	0.600	0.986
$w_{d,i}$	2.530	4.479	8.193	9.459
$w_{d,e}$	2.161	4.270	1.645	2.129
Labor Income$_{d,i}$	0.977	3.961	3.203	8.483
Labor Income$_{d,e}$	1.150	0.157	0.867	0.078
n_i	0.386	0.885	0.391	0.897
n_e	0.532	0.037	0.527	0.037
u_i/u	0.414	0.960	0.355	0.951
u_e/u	0.586	0.040	0.645	0.049
u	0.082	0.079	0.082	0.067
H	2.429	20.60	2.429	20.60
λ	0.420	0.960	0.420	0.960
Δ Net Int. Margin (Percentage Points)	0	-2.61	0	-2.61

The figures below show the response to adverse aggregate productivity and interest rate shocks for a version of the baseline economy with a share of i firms of 0.56 under the different reform equilibria considered in Table 3 of the main text.

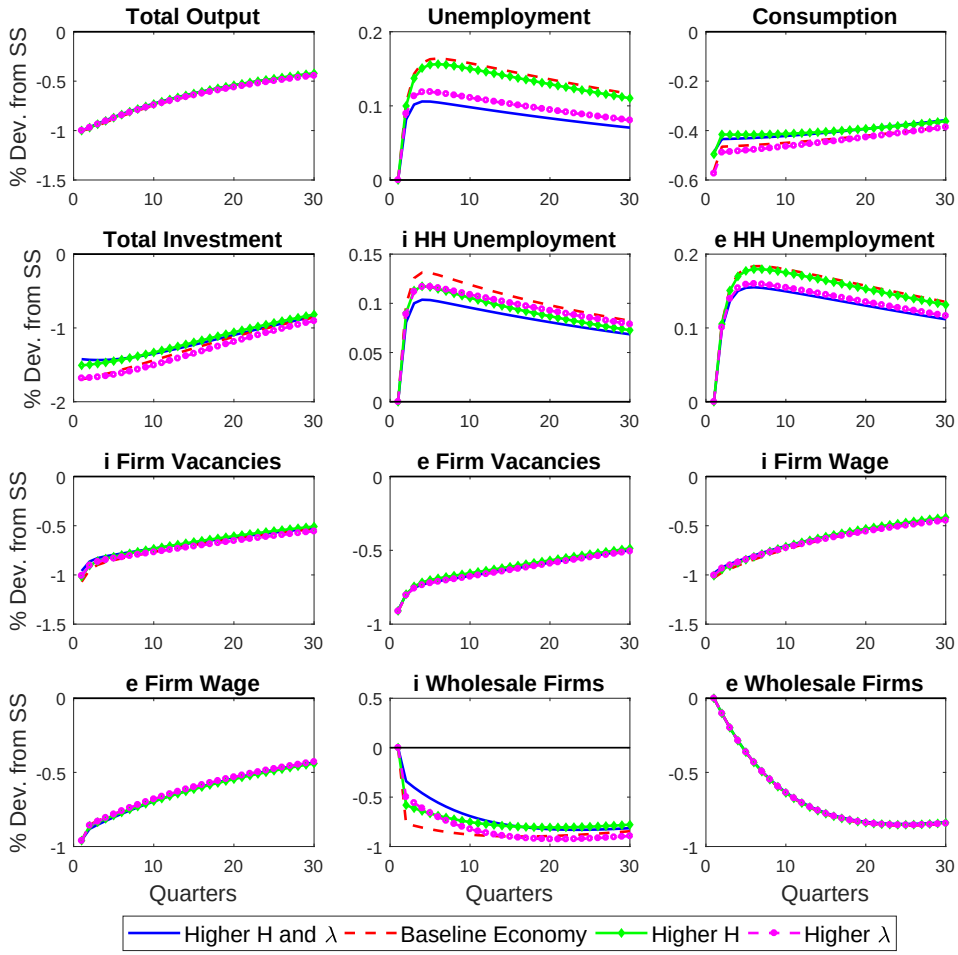

Figure A10: Response to a One Standard Deviation Reduction in Aggregate Productivity – Higher Baseline N_i/N Share

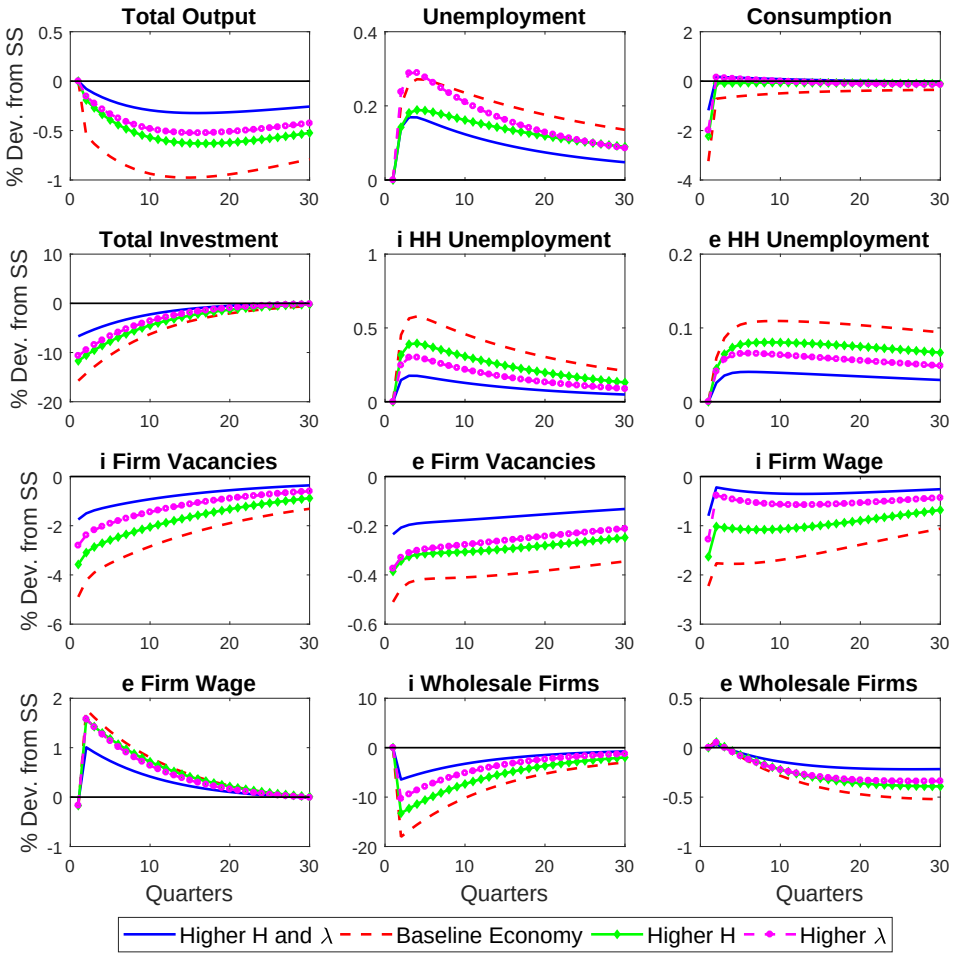

Figure A11: Response to a One Standard Deviation Increase in Foreign Interest Rates – Higher Baseline N_i/N Share

A.9 Household Search for Employment Across Firm Categories

Our baseline model assumes that household members in one category can only work in an intermediate-goods firm *within their own category*. This implies that the labor market is essentially a segmented one. This section describes an extension of the model in the main text where households in a given category can send its unemployed individuals to search for employment *across* intermediate-goods-*firm categories* (both e and i). We note that the final goods', wholesale aggregator, and wholesale firms' problems remain unchanged since these firms do not face search and matching frictions. Among other things, this implies that the decision over entry by wholesale firms remains unchanged. As such, we only describe the modifications we make *relative to the baseline model in the main text* when we allow for *directed job search across firm categories by the two household categories*. This richer structure follows the Appendix in Epstein, Finkelstein Shapiro, and González Gómez (2017), who present a similar modification to their baseline model in a context with banking frictions.

Matching Processes This modification implies that the matching functions become $m(u^i_{i,t}+u^e_{i,t}, v_{i,t}) = (u^i_{i,t}+u^e_{i,t})v_{i,t}/((u^i_{i,t}+u^e_{i,t})^\xi+v^\xi_{i,t})^{1/\xi}$ and $m(u^e_{e,t}+u^i_{e,t}, v_{e,t}) = (u^e_{e,t}+u^i_{e,t})v_{e,t}/((u^e_{e,t}+u^i_{e,t})^\xi+v^\xi_{e,t})^{1/\xi}$ where $\xi > 0$, $v_{e,t}$ and $v_{i,t}$ denote vacancies posted by e and i intermediate-goods firms, respectively, and $u^e_{e,t}$ ($u^i_{i,t}$) denote unemployed searchers from e (i) households searching for employment in e (i) intermediate-goods firms. In turn, $u^i_{e,t}$ denotes unemployed searchers from e households searching for employment in i firms, whereas $u^e_{i,t}$ denotes unemployed searchers from i households searching for employment in e firms. Both matching functions are constant-returns-to-scale (Den Haan, Ramey, and Watson, 2000).[43] Given these matching functions, the job-finding and job-filling probabilities in firm category e are defined as $f(\theta_{e,t}) = f_{e,t} = v_{e,t}/((u^e_{e,t}+u^i_{e,t})^\xi+v^\xi_{e,t})^{1/\xi}$ and $q(\theta_{e,t}) = q_{e,t} = (u^e_{e,t}+u^i_{e,t})/((u^e_{e,t}+u^i_{e,t})^\xi+v^\xi_{e,t})^{1/\xi}$, where market tightness $\theta_{e,t} \equiv v_{e,t}/(u^e_{e,t}+u^i_{e,t})$. Similarly, the job-finding and job-filling probabilities in firm category i are defined as $f(\theta_{i,t}) = f_{i,t} = v_{i,t}/((u^i_{i,t}+u^e_{i,t})^\xi+v^\xi_{i,t})^{1/\xi}$ and $q(\theta_{i,t}) = q_{i,t} = (u^i_{i,t}+u^e_{i,t})/((u^i_{i,t}+u^e_{i,t})^\xi+v^\xi_{i,t})^{1/\xi}$, where market tightness $\theta_{i,t} \equiv v_{i,t}/(u^i_{i,t}+u^e_{i,t})$.

[43] As noted in the main text, this particular functional form guarantees that matching probabilities are always bounded between 0 and 1. Our results remain the same if we adopt a Cobb-Douglas matching specification (the Den Haan, Ramey, and Watson specification allows us to consider a wider range of parameter values in our quantitative experiments).

In what follows, total i-firm employment is given by $n_{i,t} \equiv n^i_{i,t} + n^e_{i,t}$, where $n^i_{i,t}$ ($n^e_{i,t}$) denotes i-firm employment supplied by i (e) households. Similarly, total e-firm employment is given by $n_{e,t} \equiv n^e_{e,t} + n^i_{e,t}$, where $n^e_{e,t}$ ($n^i_{e,t}$) denotes e-firm employment supplied by e (i) households.

Intermediate Goods Firms Intermediate-goods firms in category $j \in \{e, i\}$ are perfectly competitive and act as suppliers to wholesale firms in their respective category. For simplicity, we continue to assume that intermediate-goods firms in one category cannot act as suppliers to wholesale firms in the other category. This does not change our main conclusions. Intermediate-goods firms produce using internally-accumulated capital and labor, where labor is subject to standard search and matching frictions.

Relative to the baseline model in the main text, intermediate goods firms in each category j now employ workers from both household categories (e and i) instead of only hiring individuals from households within their own category.

Intermediate-goods firms in category $j = e, i$ choose capital accumulation $k_{j,t+1}$, vacancies $v_{j,t}$, and desired employment $n^j_{j,t+1}$ and $n^h_{j,t+1}$ where $h = e, i$ and $h \neq j$. They do so in order to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \Xi^j_{t|0} \Pi_{j,t}$ subject to the definition of firm profits

$$\Pi_{j,t} = mmc_{j,t} z_{j,t} F(n^j_{j,t}, n^h_{j,t}, k_{j,t}) - w^j_{j,t} n^j_{j,t} - w^h_{j,t} n^h_{j,t} - \kappa_j v_{j,t} - i_{j,t},$$

the evolution of capital[44]

$$k_{j,t+1} = (1 - \delta) k_{j,t} + i_{j,t}, \tag{47}$$

and the perceived evolution of each type of employment

$$n^j_{j,t+1} = (1 - \rho^j) \left[n^j_{j,t} + \omega^n_{j,t} v_{j,t} q_{j,t} \right], \tag{48}$$

and

$$n^h_{j,t+1} = (1 - \rho^j) \left[n^h_{j,t} + (1 - \omega^n_{j,t}) v_{j,t} q_{j,t} \right], \tag{49}$$

[44]Similar to the model in the main text, we include standard capital adjustment costs as part of our quantitative analysis.

where $mc_{j,t}$ is the real price of intermediate goods, κ_j is the flow cost of posting a vacancy, and ρ_j^n is the exogenous separation probability in category j. The production function $F(n_j^j, n_j^h, k_j)$ is constant-returns-to-scale and is increasing in labor and capital. We allow n_j^j and n_j^h to be imperfect substitutes. $z_{j,t}$ is exogenous category-specific productivity and follows a stochastic process. Similar to Epstein, Finkelstein Shapiro, and González Gómez (2017), $\omega_{j,t}^n = u_{j,t}^j/(u_{j,t}^j + u_{j,t}^h)$, where $u_{j,t}^j$ is the measure of household j searchers for employment in j firms and $u_{j,t}^h$ is the measure of household h searchers for employment in j firms, where $j = e, i$ and $h = e, i$ and $h \neq j$.

The firm's first-order conditions deliver a standard capital Euler equation

$$1 = \mathbb{E}_t \Xi_{t+1|t}^j \left[mc_{j,t+1} z_{j,t+1} F_{k_j,t+1} + 1 - \delta \right], \tag{50}$$

and a job creation condition

$$\frac{\zeta'(v_{j,t})}{q_{j,t}} = (1-\rho^j)\mathbb{E}_t \Xi_{t+1|t}^j \left\{ \omega_{j,t}^n \mathbf{J}_{j,t+1}^j + (1-\omega_{j,t}^n)\mathbf{J}_{j,t+1}^h \right\}, \tag{51}$$

for each firm category $j = e, i$ where $h = e, i$ and $h \neq j$. Above, $\mathbf{J}_{j,t}^j$ ($\mathbf{J}_{j,t}^h$) denote firm j's value from having an additional worker from household j (h). More specifically,

$$\mathbf{J}_{j,t}^j = mc_{j,t} z_{j,t} F_{n_j^j,t} - w_{j,t}^j + (1-\rho^j)\mathbb{E}_t \Xi_{t+1|t}^j \mathbf{J}_{j,t+1}^j,$$

and

$$\mathbf{J}_{j,t}^h = mc_{j,t} z_{j,t} F_{n_j^h,t} - w_{j,t}^h + (1-\rho^j)\mathbb{E}_t \Xi_{t+1|t}^j \mathbf{J}_{j,t+1}^h.$$

The general intuition for these expressions is identical to the one in the main text. Specifically, the expected marginal benefit of posting a vacancy by firm j is given by a weighted average of the values of having a worker from each household category (where the weight is given by the proportion of searchers from a given household).

Financially-Included (i) Households This section is similar (in structure and notation) to the richer household environment presented in the Appendix of Epstein, Finkelstein Shapiro, and González Gómez (2017).

Similar to the model in the main text, i households have a measure $0 < \phi_n < 1$ of household members. These households choose consumption $c_{i,t}$, bank deposits b_{t+1}, foreign debt holdings b^*_{t+1}, and the ownership shares in banks $x_{b,t+1}(h)$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbf{u}(c_{i,t})$ subject to the budget constraint:

$$\begin{aligned} c_{i,t} + b_{t+1} + x_{b,t+1} \sum_{h \in H} e_{b,t}(h) + R^*_t b^*_t + \frac{\eta_b}{2}(b^*_{t+1})^2 &= R_t b_t + b^*_{t+1} + w^i_{i,t} n^i_{i,t} + w^i_{e,t} n^i_{e,t} \\ &\quad + \chi_i u_{i,t} + x_{b,t} \sum_{h \in H} [\pi_{b,t}(h) + e_{b,t}(h)] + \Pi_{i,t}, \end{aligned} \tag{52}$$

where R^*_t is the gross real foreign interest rate, $e_{b,t}(h)$ is the price of of a claim to bank h's profits $\pi_{b,t}(h)$, and $\Pi_{i,t}$ are profits from intermediate-goods i firms. As stated earlier, $n^i_{i,t}$ and $n^i_{e,t}$ are the measures of workers in i households working i and e firms, respectively. $w^i_{i,t}$ and $w^i_{e,t}$ are the associated real wages. With this in mind, unemployment among i household members is given by $u_{i,t} = u^i_{i,t} + u^i_{e,t} = \lambda - n^i_{i,t} - n^i_{e,t}$.

Households are also subject to the perceived evolution of employment in each firm category

$$n^i_{i,t+1} = (1 - \rho^i) \left[n^i_{i,t} + u^i_{i,t} f_{i,t} \right],$$

and

$$n^i_{e,t+1} = (1 - \rho^e) \left[n^i_{e,t} + u^i_{e,t} f_{e,t} \right],$$

where $f_{e,t}$ and $f_{i,t}$ denote the endogenous job-finding probabilities associated with employment in e and i firms, respectively.

The first-order conditions yield the following standard Euler equations

$$\mathbf{u}'(c_{i,t}) = R_{t+1} \beta \mathbb{E}_t \mathbf{u}'(c_{i,t+1}) \text{ and } \mathbf{u}'(c_{i,t}) = R^*_{t+1} \beta \mathbb{E}_t \mathbf{u}'(c_{i,t+1}) \tag{53}$$

where $\Xi^i_{t+1|t} \equiv \beta \mathbf{u}'(c_{i,t+1}) / \mathbf{u}'(c_{i,t})$. The Euler equation for share holdings of banks (after imposing symmetry) is identical to the one in the main text

$$e_{b,t} = \mathbb{E}_t \Xi^i_{t+1|t} \left[\pi_{b,t+1} + e_{b,t+1} \right], \tag{54}$$

Relative to the model in the main text, i households make optimal decisions over how to allocate their searchers across firm categories. In particular, define the value of having a household member search for e-firm employment by

$$\mathbf{U}^i_{e,t} = b + \mathbb{E}_t \Xi^i_{t+1|t} \left\{ (1-\rho^e) f_{e,t} \mathbf{W}^i_{e,t+1} + [1-(1-\rho^e) f_{e,t}] \mathbf{U}^i_{e,t+1} \right\},$$

and the value of having a household member search for i-firm employment by

$$\mathbf{U}^i_{i,t} = b + \mathbb{E}_t \Xi^i_{t+1|t} \left\{ (1-\rho^i) f_{i,t} \mathbf{W}^i_{i,t+1} + [1-(1-\rho^i) f_{i,t}] \mathbf{U}^i_{i,t+1} \right\},$$

where $\mathbf{W}^i_{e,t}$ and $\mathbf{W}_i, t^i$ are the values to the household from having an employed member in firm e and i, respectively. Formally,

$$\mathbf{W}^i_{e,t} = w^i_{e,t} + \mathbb{E}_t \Xi^i_{t+1|t} \left\{ (1-\rho^e) \mathbf{W}^i_{e,t+1} + \rho^e \mathbf{U}^i_{e,t+1} \right\},$$

and

$$\mathbf{W}^i_{i,t} = w^i_{i,t} + \mathbb{E}_t \Xi^i_{t+1|t} \left\{ (1-\rho^i) \mathbf{W}^i_{i,t+1} + \rho^i \mathbf{U}^i_{i,t+1} \right\}.$$

Households then choose to allocate their unemployed searchers such that, in equilibrium, $\mathbf{U}^i_{e,t} = \mathbf{U}^i_{i,t}$.

Financially-Excluded (e) Households Similar to the model in the main text, e households have a measure $0 < -phi_n < 1$ of household members.

Households choose consumption $c_{e,t}$ and the ownership shares in household-dependent e firms $x_{e,t+1}$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbf{u}(c_{e,t})$ subject to the budget constraint:

$$c_{e,t} + x_{e,t+1}(N_{E,et} + N_{e,t}) e_{e,t} = w^e_{e,t} n^e_{e,t} + w^e_{i,t} n^e_{i,t} + \chi_e u_{e,t} + x_{e,t} N_{e,t} \left[d_{e,t} + e_{e,t} \right] + \Pi_{e,t}, \quad (55)$$

where $e_{e,t}$ is the price of a claim to wholesale e firms' profits $d_{e,t}$ and $\Pi_{e,t}$ are profits from intermediate-goods e firms.

Households are subject to the perceived evolution of sectoral employment

$$n^e_{e,t+1} = (1-\rho^e)\left[n^e_{e,t} + u^e_{e,t} f_{e,t}\right],$$

and

$$n^e_{i,t+1} = (1-\rho^i)\left[n^e_{i,t} + u^e_{i,t} f_{i,t}\right],$$

where $u^e_{e,t}$ denotes the measure of e-household searchers for employment in e firms, and $u^i_{e,t}$ is the corresponding measure of i-household searchers looking for employment in e firms. Similar to the i households above, $f_{e,t}$ and $f_{i,t}$ denote household e's job-finding probabilities for employment in e and i firms. Thus, unemployment among e household members is $u_{e,t} = u^e_{e,t} + u^e_{i,t} = (1-\lambda) - n^e_{e,t} - n^e_{i,t}$.

The first-order conditions are the same as in the main text and yield the Euler equation for e firms

$$e_{e,t} = (1-\delta)\mathbb{E}_t \Xi^e_{t+1|t}\left[d_{e,t+1} + e_{e,t+1}\right], \tag{56}$$

where $\Xi^e_{t+1|t} = \beta \mathbf{u}'(c_{e,t+1})/\mathbf{u}'(c_{e,t})$.

Similar to the choices of i households, e households can also optimally allocate their unemployed members between search for employment in e firms or i firms.

The value to an e household from having a household member searching for employment in e firms is

$$\mathbf{U}^e_{e,t} = b + \mathbb{E}_t \Xi^e_{t+1|t}\left\{(1-\rho^e) f_{e,t} \mathbf{W}^e_{e,t+1} + [1-(1-\rho^e) f_{e,t}] \mathbf{U}^e_{e,t+1}\right\},$$

while the value of having a household member searching for employment in i firms is

$$\mathbf{U}^e_{i,t} = b + \mathbb{E}_t \Xi^e_{t+1|t}\left\{(1-\rho^i) f_{i,t} \mathbf{W}^e_{i,t+1} + [1-(1-\rho^i) f_{i,t}] \mathbf{U}^e_{i,t+1}\right\}.$$

Above, $\mathbf{W}^e_{e,t}$ and $\mathbf{W}^e_{i,t}$ represent the values to the household from having an employed worker in an e and an i firm, respectively. These values are given by

$$\mathbf{W}^e_{e,t} = w^e_{e,t} + \mathbb{E}_t \Xi^e_{t+1|t}\left\{(1-\rho^e)\mathbf{W}^e_{e,t+1} + \rho^e \mathbf{U}^e_{e,t+1}\right\}.$$

and

$$\mathbf{W}_{i,t}^{e} = w_{i,t}^{e} + \mathbb{E}_t \Xi_{t+1|t}^{e} \left\{ (1-\rho^{i}) \mathbf{W}_{i,t+1}^{e} + \rho^{i} \mathbf{U}_{i,t+1}^{e} \right\},$$

It follows that households optimally allocate their unemployed searchers across firm categories such that, in equilibrium, $\mathbf{U}_{i,t}^{e} = \mathbf{U}_{e,t}^{e}$

Wage Determination Following the search and matching literature, all wages are determined via bilateral Nash bargaining between firms and workers. Given differences in stochastic discount factors, no closed-form solutions for the wages can be found. Having defined the value functions for each side of the market above, the corresponding Nash wages for i households $w_{i,t}^{i}, w_{e,t}^{i}$ are given by the following implicit functions:

$$\mathbf{W}_{i,t}^{i} - \mathbf{U}_{i,t}^{i} = \frac{\eta}{1-\eta} \mathbf{J}_{i,t}^{i},$$

and

$$\mathbf{W}_{e,t}^{i} - \mathbf{U}_{e,t}^{i} = \frac{\eta}{1-\eta} \mathbf{J}_{e,t}^{i}.$$

Similarly, the corresponding Nash wages for e households and $w_{e,t}^{e}, w_{i,t}^{e}$ are implicitly given by:

$$\mathbf{W}_{e,t}^{e} - \mathbf{U}_{e,t}^{e} = \frac{\eta}{1-\eta} \mathbf{J}_{e,t}^{e},$$

and

$$\mathbf{W}_{i,t}^{e} - \mathbf{U}_{i,t}^{e} = \frac{\eta}{1-\eta} \mathbf{J}_{i,t}^{e}.$$

Data-Consistent Variables Following the main text, if $x_{m,t}$ is a quantity in the model expressed in final consumption units, then its empirical (or data) counterpart is given by $x_{d,t} = \Psi_t^{\frac{1}{1-\phi_y}} x_{m,t}$ where $\Psi_t = (1-\alpha_y) N_{i,t}^{\frac{1-\phi_y}{1-\varepsilon}} + \alpha_y N_{e,t}^{\frac{1-\phi_y}{1-\varepsilon}}$ (see Cacciatore, Duval, Fiori, and Ghironi, 2016a).

Calibration and Main Results Except for the production functions of intermediate-goods firms, all functional forms are the same as in the main text. Specifically, the production functions for intermediate-goods e and i firms are given by $F(n_{j,t}^{j}, n_{j,t}^{h}, k_{\,j,t}) =$

$\left(\left[\gamma_n \left(n_{j,t}^{j}\right)^{\eta_n} + (1-\gamma_n)\left(n_{j,t}^{h}\right)^{\eta_n}\right]^{\frac{1}{\eta_n}}\right)^{1-\alpha_j} k_{j,t}^{\alpha_j}$ where $0 < \alpha_j, \gamma_n < 1$ and $\eta_n < 1$ for $j = e, i$ and $h = e, i$ where $j \neq h$. We use the same calibration *targets* as those in the main text, set $\eta_n = 0.8$ as a reasonable baseline that implies labor from the different household categories is highly substitutable within firm categories, and calibrate γ_n to match a share of e household members working in i firms of roughly 17 percent. This is consistent with the average share of informal employment—a proxy for employed workers from e households—that is employed outside of the informal sector in EMEs with available ILO data on this metric.

Figure A12 below shows the results from the same policy experiments we conduct in the main text for the baseline economy with a share of i firms in the economy of 0.26. We continue to assume that $\rho_x = 0.95$ and $\sigma_x = 0.01$ for $x = z, z_r$. The resulting calibrated parameters are: $\xi = 0.425, \kappa = 0.0637, \psi_e = 0.4977, \psi_i = 0.6007, H = 2.4290, \alpha_y = 0.9787$, and $\eta_b = 0.0013$. Figure A12 shows that our main results remain unchanged in a richer environment where household members in any given household can search for employment across firm categories and not just within its own category.

Figure A13 presents the same experiments *starting with a baseline share of i firms in the economy of 0.56*, which is closer to a representative AE. Figure A15 similarly shows that our main results regarding the critical role of the degree of firm participation for determining the benefits of banking reforms remain unchanged in a richer labor market environment that allows households to allocate their searchers across firm categories.

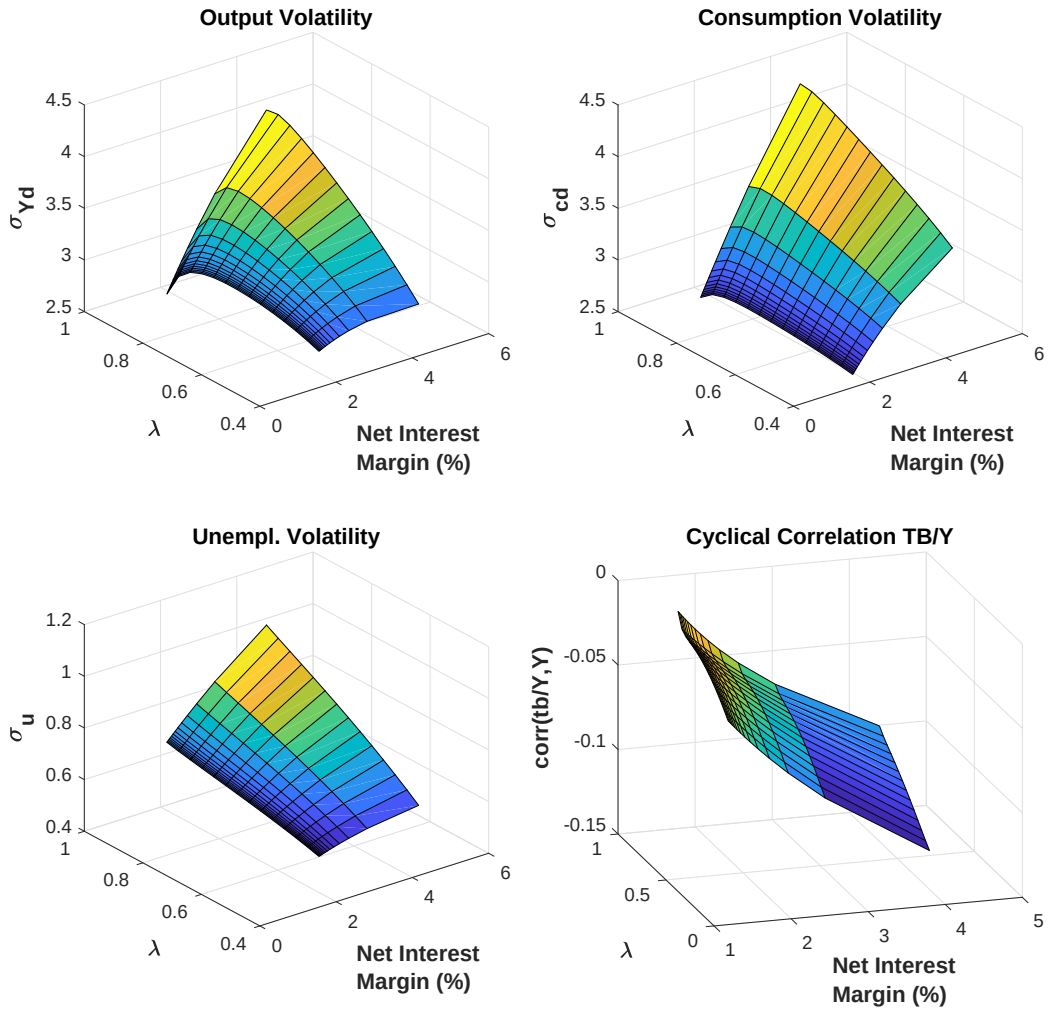

Figure A12: Volatility and Banking Reform Equilibria: Benchmark Model with Full Labor Mobility, Baseline $N_i/N = 0.26$

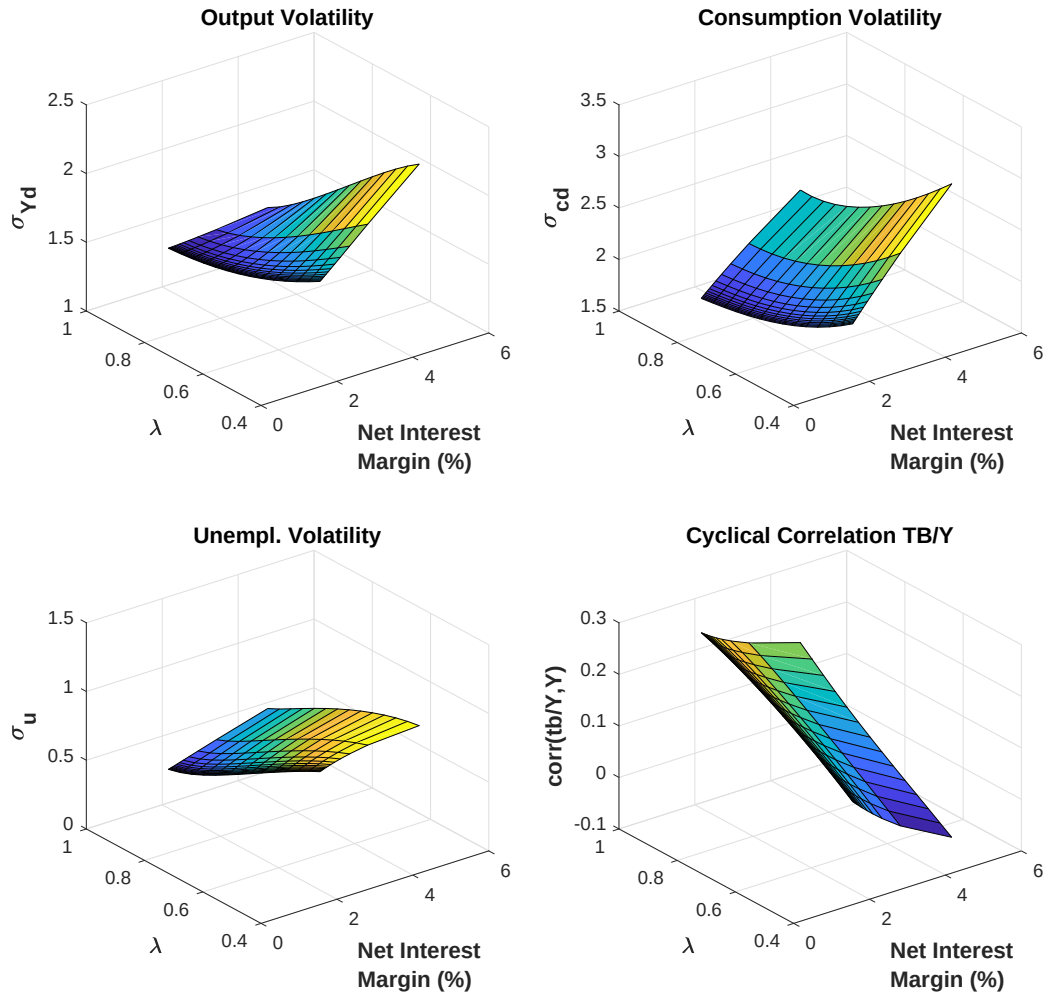

Figure A13: Volatility and Banking Reform Equilibria: Benchmark Model with Full Labor Mobility, Baseline $N_i/N = 0.56$

A.10 Transitional Dynamics and Welfare Effects of Reforms

Transitional Dynamics Figures A14, A15, and A16 show the transitional dynamics of key labor market and aggregate variables after the gradual implementation of individual (Figures A14 and A15) and comprehensive banking reforms (Figure A16).

Specifically, we consider a *gradual* increase in the level of bank competition H alone, in the level of household participation λ alone, and in both the level of bank competition H *alongside* the level of household participation λ, over 2.5 years, after which both H and

λ remain at their post-reform levels permanently. For illustrative purposes, the change we consider in λ, from 0.42 to 0.62, is consistent with the average change in household participation from 2011 to 2014 (the dates for which data on the share of individuals with an account at financial institutions is available) in our sample of EMEs. Furthermore, *for the purposes of analyzing transitional dynamics*, a *gradual and more limited* change in household participation in the banking system represents a more plausible scenario for the analysis of transitional dynamics of reforms. Finally, Figures A17 and A18 show the transitional dynamics when the baseline share of i firms (N_i/N) is lower (Figure A17) and higher (Figure A18) than the baseline share of 0.26 to highlight how this baseline share affects the transition to the post-reform economy.

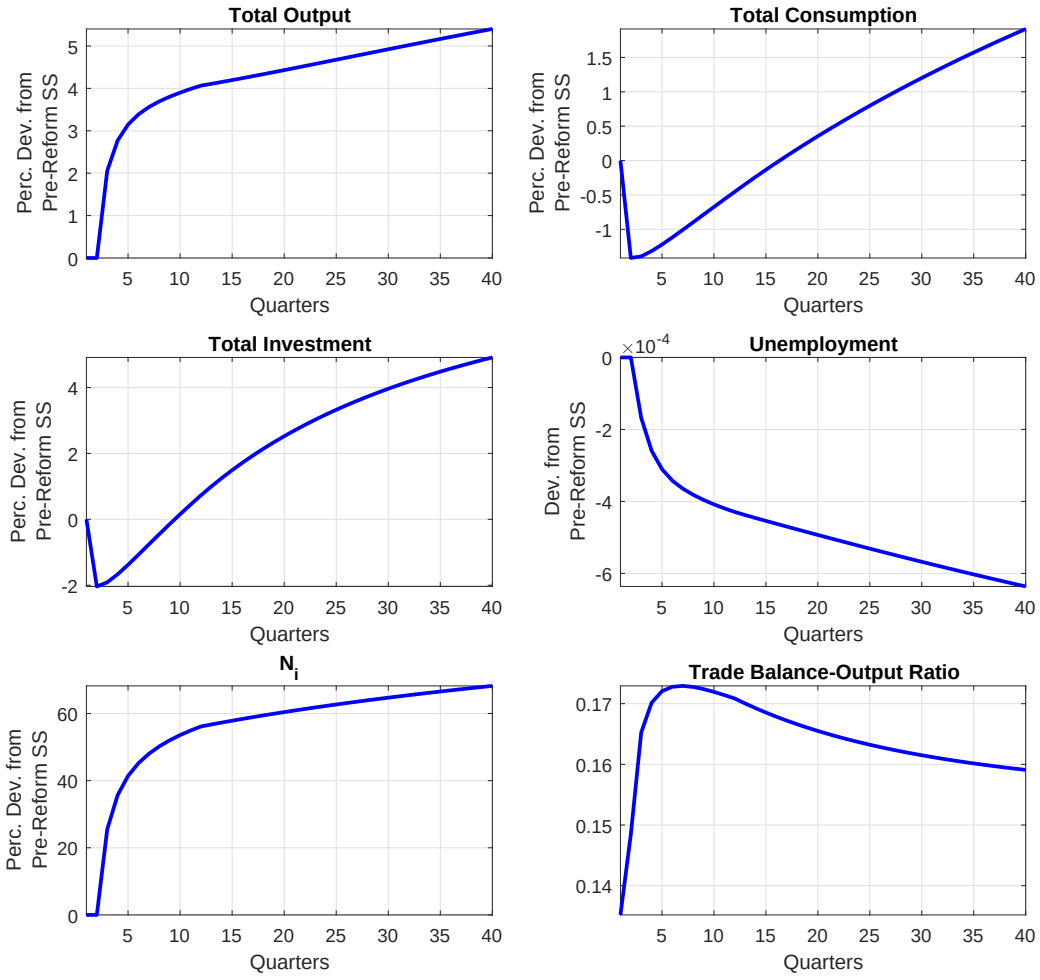

Figure A14: Transitional Dynamics, Gradual Increase in Bank Competition (10 quarters)

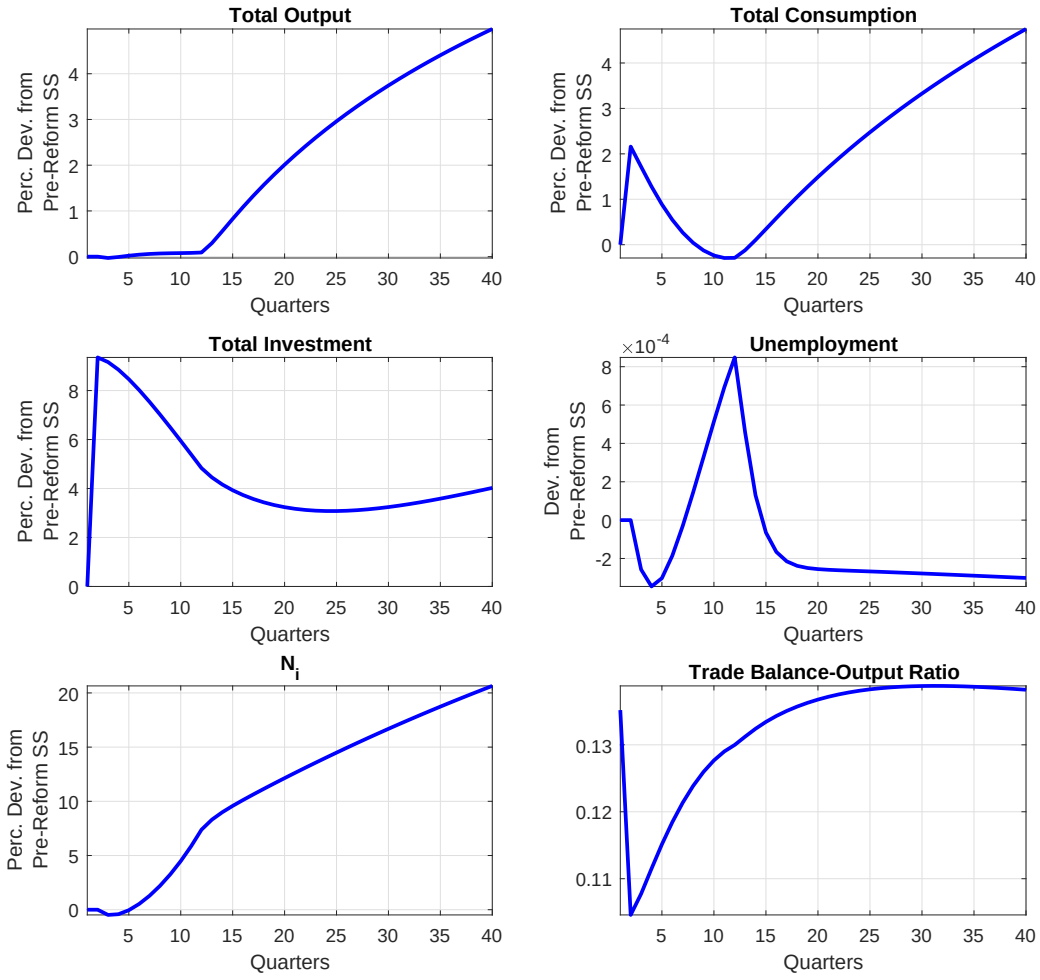

Figure A15: Transitional Dynamics, Gradual Increase in Household Participation (10 quarters)

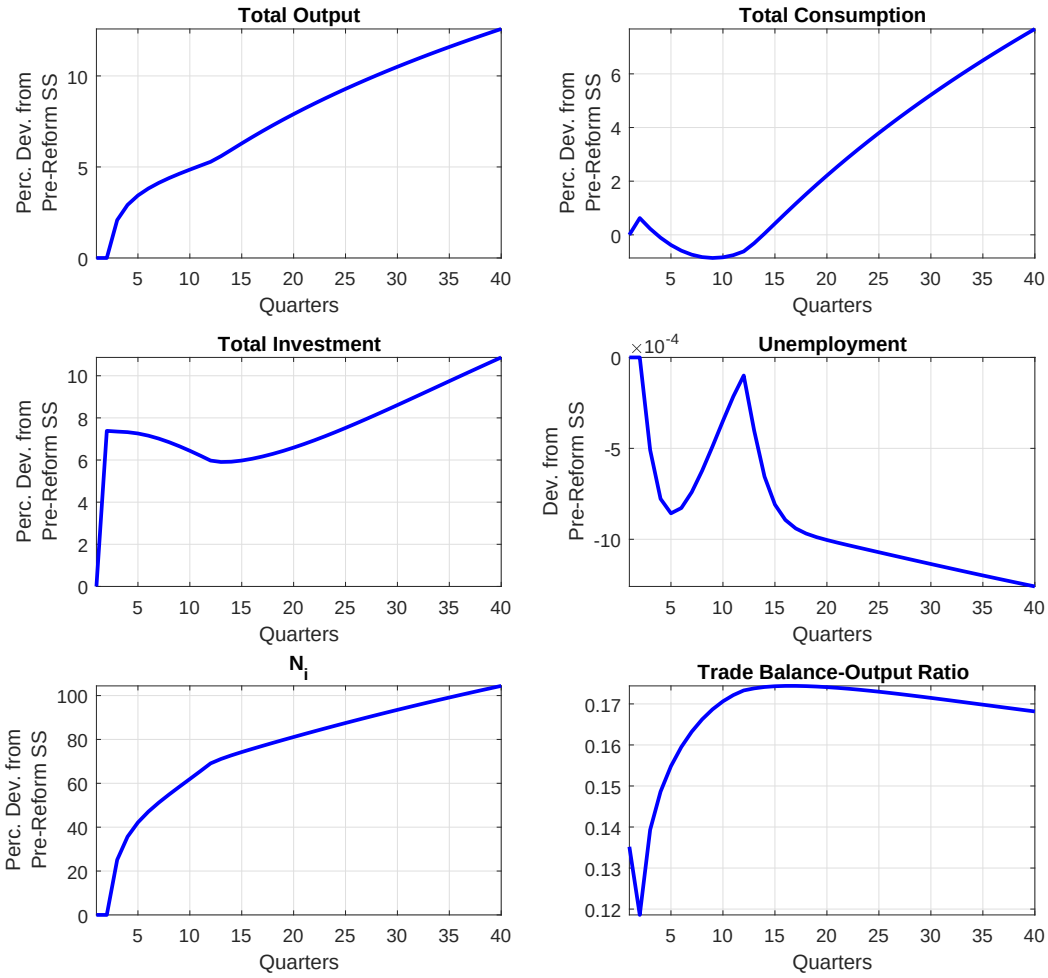

Figure A16: Transitional Dynamics, Gradual Joint Increase in Bank Competition and Household Participation (10 quarters)

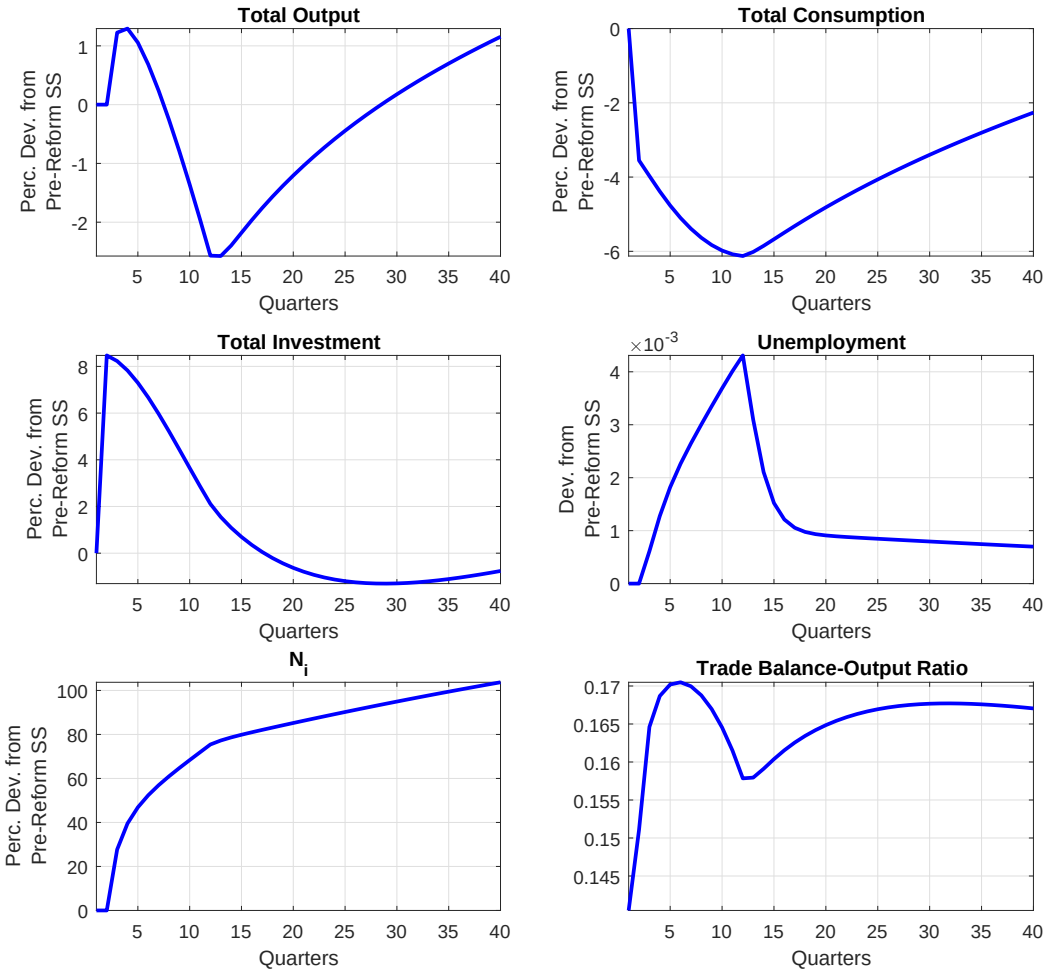

Figure A17: Transitional Dynamics, Gradual Joint Increase in Bank Competition and Household Participation (10 quarters), Lower Pre-Reform N_i Share

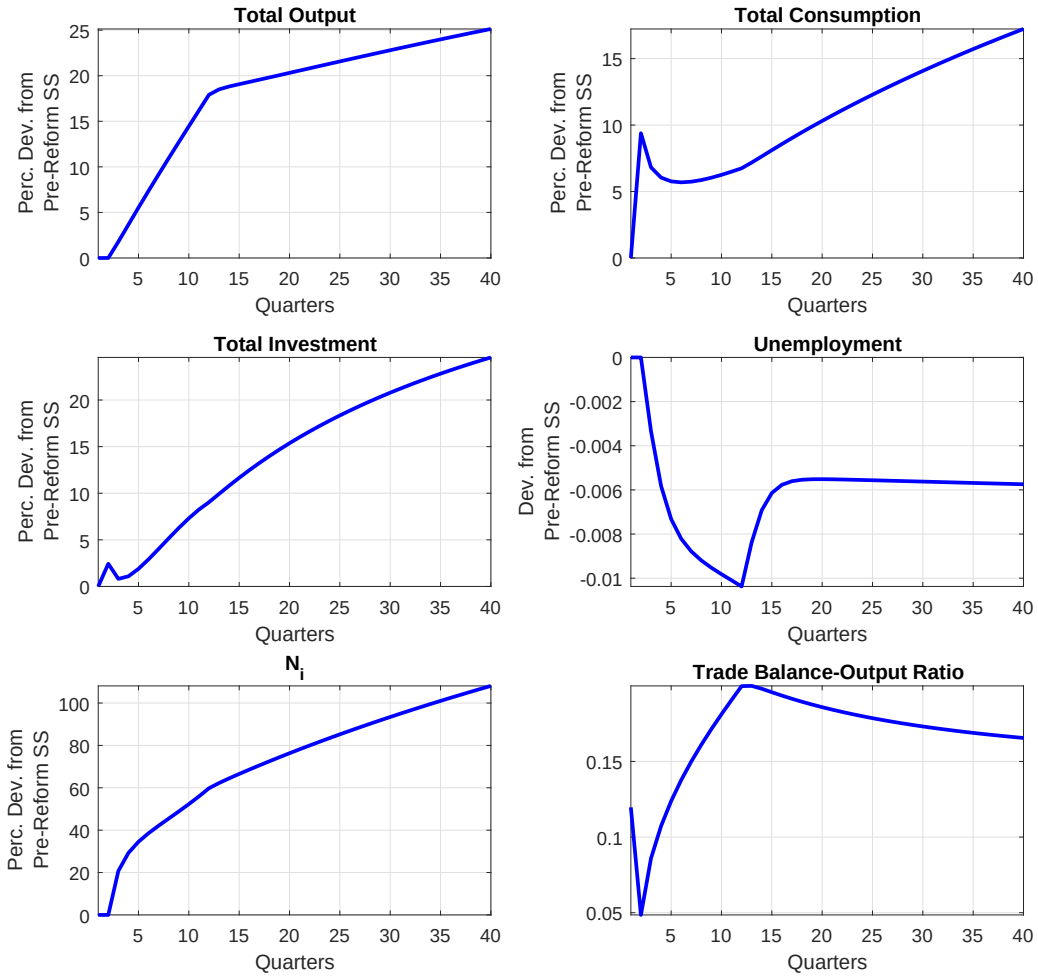

Figure A18: Transitional Dynamics, Gradual Joint Increase in Bank Competition and Household Participation (10 quarters), Higher Pre-Reform N_i Share

As the figures suggest, reforms have a short-run adverse effect on consumption and the trade balance, but an unambiguous positive effect on total output. The temporary adverse effects are mainly explained by the fact that reforms trigger a reallocation of resources away from consumption (alongside an increase in foreign indebtedness) to sustain the initial creation of i firms. In the medium run, the creation of firms, the expansion in investment, and the resulting expansion in output ultimately allows consumption to rise relative to the pre-reform equilibrium. In response to the reform, i households not only reduce consumption

but also temporarily reduce foreign borrowing, resulting in a short-run reduction in the trade balance-output ratio relative to the pre-reform trend. However, in the long run, the reform bolsters consumption as well as foreign debt, resulting in a rise in the trade balance-output ratio.

Welfare Implications Table A2 below characterizes the long- and short-run effects of individual banking reform on households' welfare. For illustrative purposes, we consider increases in λ and H that are consistent with the transitional-dynamics experiments (i.e., an increase in λ from 0.42 to 0.62 and a reduction in net interest margins from 4.30 percent to 1.69 percent).

Following the literature, the *long-run* welfare effect of banking reform Δ_j^{LR} is given by

$$\sum_{t=0}^{\infty}\beta^t\left[u\left(c_j^{pr}\left(1+\frac{\Delta_j^{LR}}{100}\right)\right)\right]=\sum_{t=0}^{\infty}\beta^t\left[u\left(c_{j,t}^{r}\right)\right]$$

for household category $j \in \{e,i\}$, where c_j^{pr} denotes the *pre-reform* (pr) non-stochastic steady-state level of consumption and $c_{j,t}^{r}$ denotes the (time-varying) level of consumption under the banking reform for household category j. Then, $\Delta_j^{LR} > 0$ implies that a given reform is welfare-improving in the long run.

Similarly, the *short-run* welfare effect of banking reform Δ_j^{SR} is given by

$$\sum_{t=0}^{\infty}\beta^t\left[u\left(c_j^{pr}\left(1+\frac{\Delta_j^{SR}}{100}\right)\right)\right]=\mathbb{E}_0\sum_{t=0}^{\infty}\beta^t\left[u\left(c_{j,t}^{r}\right)\right]$$

for household category $j \in \{e,i\}$, where once again c_j^{pr} denotes the *pre-reform* (pr) steady-state level of consumption and $c_{j,t}^{r}$ denotes the (time-varying) level of consumption under the banking reform for household category j. Of note, as is standard in the literature on the welfare costs of business cycles, we compute the *short-run* welfare effects by implementing a second-order approximation to the equilibrium conditions. Then, $\Delta_j^{SR} > 0$ implies that a given reform is welfare improving. Given the large individual reform changes we consider, we present the *normalized short-run and long-run welfare changes* for each individual reform (labeled normalized Δ_j^{SR} and Δ_j^{LR} in Table A2). That is, we present the changes

in welfare *associated with a one-percentage-point increase in household participation and a one-percentage-point reduction in net interest margins, respectively.*

Table A2: Long- and Short-Run Welfare Effects of Individual Banking Reforms

	Higher λ, Baseline $N_i/N = 0.26$	Higher H, Baseline $N_i/N = 0.26$	Higher λ, Baseline $N_i/N = 0.56$	Higher H, Baseline $N_i/N = 0.56$
	(1)	(2)	(3)	(4)
Long-Run Effects				
Normalized Δ_i^{LR}	2.35	4.85	3.14	5.66
Normalized Δ_e^{LR}	−1.58	1.33	−1.19	2.17
Short-Run Effects				
Normalized Δ_i^{SR}	3.40	10.93	3.83	9.72
Normalized Δ_e^{SR}	−1.48	2.17	−1.11	2.90

Notes: Normalized Δ_i^j (Δ_e^j) refers to the value of Δ_i^j (Δ_e^j) adjusted for the absolute change in λ (from 0.42 to 0.62; i.e., 20 percentage points) or H (a change in net interest margins from 4.3 percent to 1.69 percent; i.e., a change of 2.61 percentage points) for $j \in \{LR, SR\}$.

A.11 Business Cycle Moments: Benchmark Model and Richer Model

Table A3 below shows the business cycle moments (in data-consistent terms, whenever appropriate) generated by the benchmark model under the baseline calibration with a share of i firms of 0.26. It also shows the same moments generated under a higher λ and H. Finally, we also show the second moments generated by the richer model presented in Section A.9 above under the baseline (EME) calibration.

Recall that our baseline model is not calibrated to any given economy. Instead, it uses parameter values that are common in calibrations in the EME literature, as well as calibration targets for the banking sector and household and firm financial inclusion, that are based on EME averages in order to capture broad features of representative EMEs. Thus, the results in Table A2 should be seen as confirming that our benchmark model (and its richer version where households can allocate their searchers across firm categories) generates broad business cycle characteristics that are well-known and well-documented in the empirical EME business cycle literature: a relative volatility of consumption and investment greater than 1; strongly procyclical consumption, investment, and wages; countercyclical unemployment;

and a countercyclical trade balance-GDP ratio. Of note, the fact that the model faces limitations in generating high relative unemployment volatility is a well-known reflection of the Shimer puzzle, a solution to which is beyond the scope of our work.[45]

Table A3: Business Cycle Moments, Benchmark Model under Baseline Calibration, under Higher λ and H, and Richer Model under Baseline Calibration

Second Moments	Benchmark Model, Baseline $N_i/N = 0.26$	Benchmark Model, Higher λ and H	Richer Model, Baseline $N_i/N = 0.26$
$\sigma_{c_{d,t}}/\sigma_{Y_{d,t}}$	1.164	0.933	1.234
$\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}}$	5.263	5.700	6.097
$\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$	1.058	1.067	1.075
$\sigma_{u_t}/\sigma_{Y_{d,t}}$	0.178	0.217	0.230
$corr(c_{d,t}, Y_{d,t})$	0.659	0.516	0.620
$corr(inv_{d,t}, Y_{d,t})$	0.604	0.554	0.588
$corr(w_{d,t}, Y_{d,t})$	0.923	0.890	0.923
$corr(u_t, Y_{d,t})$	-0.909	-0.892	-0.930
$corr(tby_t, Y_{d,t})$	-0.149	-0.000	-0.177

Notes: *tby* denotes the trade balance-output ratio. $x_{d,t}$ denotes variable x expressed in data-consistent (d) terms (see, for example Cacciatore, Duval, Fiori, and Ghironi, 2016a).

[45]For recent work on the factors that may quantitatively explain the high volatility of unemployment observed in EMEs, see Finkelstein Shapiro (2017).