Domestic Financial Participation, Labor Markets, and Business Cycles*

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Abstract

Relative to advanced economies (AEs), emerging economies (EMEs) exhibit: a relative volatility of consumption and wages greater than 1, a countercyclical trade balance, and lower relative unemployment volatility. In addition, the degree of firm and household participation in the domestic banking system are significantly lower in EMEs compared to AEs. We build a small-open-economy model with endogenous firm entry, household and firm heterogeneity in participation in the banking system, and equilibrium unemployment to analyze whether improvements in household and firm financial participation in EMEs bring EME labor market dynamics and business cycles closer to those of AEs. Greater household financial participation alone fails to do so qualitatively. Increasing household and firm financial participation jointly delivers aggregate dynamics that are quantitatively consistent with those of AEs except for unemployment fluctuations, which are smoother. Combining greater firm and household participation with unemployment benefits as seen in AEs generates both labor market and aggregate dynamics that are consistent with those of AEs. Our analysis stresses the combination of greater household financial participation with greater firm financial participation to obtain smoother labor market and aggregate fluctuations in EMEs.

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1 Introduction

There are two well-known facts that distinguish emerging economy (EME) business cycles from those of advanced economies (AEs). First, in EMEs consumption is more volatile than GDP, while in AEs consumption is less volatile than GDP. Second, in EMEs the trade balance-GDP ratio is countercyclical, while in AEs it is acyclical. In addition, compared to AEs, EMEs have higher wage volatility wages and lower unemployment volatility relative to GDP volatility. A lesser known fact is that the degree of both household and firm participation in the domestic banking system differs starkly in AEs versus EMEs. Specifically, virtually every individual in AEs has an account at a financial institution, while less than 50 percent of individuals in EMEs do so. Moreover, in AEs, the share of firms with bank credit is at least three times as large as that of EMEs. The stark differential in firm financial participation is all the more relevant for labor markets since a significant share of total employment in EMEs is in firms that do not participate in the banking system (see Section 2 for details). Amid this backdrop, EMEs are actively promoting greater household and firm participation in the domestic banking system. However, the extent to which this greater participation may affect cyclical labor market, consumption, and aggregate fluctuations in EMEs is not well understood. Shedding light on these issues in an EME-consistent context is important since the greater depth of domestic financial participation in AEs cannot speak directly to the labor-market and aggregate consequences of greater household and firm domestic financial participation in economies where such participation is starkly lower, as is the case in EMEs.

This paper addresses the following two questions: to what extent does greater domestic financial participation in EMEs bring these economies’ labor market, consumption, and aggregate fluctuations closer to those of AEs, and does the margin of domestic financial participation (household versus firm) matter? To answer these two questions, we build a small-open-economy (SOE) RBC model with endogenous firm entry, equilibrium unemployment, and household and firm heterogeneity in participation in the domestic banking system that captures the characteristics of EMEs described above. In particular, our baseline model calibration reflects EMEs’ low shares of firm and household participation in the banking sys-
tem and, given aggregate productivity and interest rate shocks, generates empirically- and quantitatively-consistent EME business cycle dynamics. We then use the model to characterize the labor market and business cycle effects of bringing household and/or firm financial participation levels in EMEs closer to AE standards.

Our main findings are twofold. First, the two margins of domestic financial participation (household versus firm) are not equal in their ability to bring EME business cycles closer to those of AEs. In particular, starting off from low levels of firm and household financial participation consistent with EMEs, explicitly increasing household financial participation to AE levels generates negligible reductions in the countercyclicality of the trade balance, has marginal effects on unemployment volatility, and does not decrease the relative volatility of consumption. This outcome takes place despite an indirect, endogenous increase in the share of firm financial participation that arises as a byproduct of greater household participation. In contrast, starting off from low levels of firm and household financial participation consistent with EMEs, explicitly increasing firm financial participation by reducing the sunk entry costs of becoming a firm that uses bank credit generates reductions in the relative volatility of consumption, unemployment, and wages, and makes the trade balance less countercyclical. However, from a quantitative standpoint, consumption still remains more volatile than output and the trade balance-output ratio remains countercyclical.

The clear volatility-reducing effects of greater firm participation lead us to our second main finding. Starting off from low levels of financial participation, an increase in household financial participation that is explicitly accompanied by greater firm participation via lower firm sunk entry costs—which we refer to as a joint increase in financial participation—generates a relative volatility of consumption that is lower than 1 alongside an acyclical trade balance-output ratio, both of which are qualitatively and quantitatively consistent with AE business cycles. Greater joint participation by households and firms also results in smoother labor market dynamics. Given this last finding, we show that complementing greater joint domestic financial participation with unemployment benefits as observed in AEs delivers cyclical labor market and aggregate dynamics that are completely in line with those of AEs. Therefore, the main key message from our work is that greater domestic financial participation in EMEs can bring EME business cycles closer to those in AEs, but only if greater
domestic financial participation by households is accompanied by a considerable expansion in firm participation that is not solely a byproduct of greater household participation.

Our baseline framework features two firm categories—financially-included \((i)\) and -excluded \((e)\) firms—each of which is comprised of monopolistically-competitive firms. Each firm category has an unbounded number of potential entrants subject to sunk entry costs so that the number of firms in each category is endogenous. Both \(i\) and \(e\) firms use capital and labor to produce. Potential \(i\) firms face higher sunk entry costs but have access to a more capital-intensive technology that delivers endogenously-higher labor productivity. In turn, there is a measure one of members in the economy. A fraction of those members belongs to financially-included \((i)\) households—who create and own firms, accumulate capital, and have access to bank deposits and foreign debt. A portion of capital investment and \(i\) firms’ sunk entry costs is financed with bank credit. The remaining share of members belongs to financially-excluded \((e)\) households, whose resources are solely comprised of labor income from workers in \(e\) firms. Following the EME business cycle literature, aggregate productivity and foreign interest rate shocks drive aggregate fluctuations.

In this environment, an exogenous increase in the measure of \(i\)-household members increases household financial participation. In turn, a reduction of \(i\)-firms’ sunk entry costs directly increases firm financial participation. We discipline our quantitative experiments by considering an increase in household participation that bring EMEs’ household financial participation shares up to AE levels; by considering a reduction in the average cost of creating \(i\) firms in EMEs to AE levels given the baseline EME household financial participation level (thereby increasing the share of firm financial participation in the economy); and by considering a joint increase in household participation and reduction in \(i\) firms’ sunk entry costs from EME levels to AE levels.

The intuition behind our main results traces back to the differential effect of greater household financial participation alone relative to greater firm financial participation obtained via reductions in \(i\) firms’ entry costs on \(i\) and \(e\) firms’ average (steady-state) labor productivity. Importantly, the changes in firms’ steady-state labor productivity directly affect the value to firms of having a worker and therefore play a key role in shaping firms’ hiring and capital demand decisions amid productivity and interest rate shocks. Specifically, greater household
financial participation alone reduces labor productivity among \( i \) firms by generating a sharp reallocation of employment towards \( i \) firms that surpasses the endogenous increase in capital usage, the end result being endogenously-lower \( i \)-firm labor productivity. In contrast, greater firm financial participation for a given EME level of household participation increases average labor productivity in both firm categories by generating greater capital demand across the board, thereby raising all workers’ labor productivity. These stark qualitative differences in the response of steady-state, firm-category labor productivity to changes in the two margins of financial participation imply that, given greater household financial participation alone, \( i \) firms’ hiring and capital demand decisions become more sensitive to shocks. This outcome is compounded by having a greater share of household members exposed to interest rate shocks. Then, absent smoother movements in labor income that could partially offset this greater exposure to financial shocks, greater household financial participation alone does not generate smoother cyclical movements in consumption relative to output, and has marginal effects on labor market fluctuations and the cyclicity of the trade balance.

In contrast, the increase in average labor productivity across firm categories stemming from greater firm financial participation explicitly rooted in lower \( i \) firms’ sunk entry costs reduces firms’ sensitivity to shocks, thereby lowering the volatility of hiring, capital demand, wages, employment, labor income, and ultimately household and total consumption. In turn, these changes make the trade balance considerably less countercyclical. These effects are quantitatively stronger if they are coupled with greater household financial participation due to the resulting additional increase in resources available to \( i \) firms, and explain why a joint increase in household and firm financial participation can bring EME consumption and aggregate dynamics quantitatively close to the ones in AEs. Finally, while this joint increase in financial participation reduces unemployment volatility—which runs counter to the higher relative volatility observed in AEs—introducing unemployment benefits, which is a distinctive characteristic of AE labor markets, at the level of AEs alongside greater joint financial participation delivers labor market and consumption dynamics broadly consistent with those of AEs. These findings remain unchanged under alternative parameterizations of our framework. Moreover, we explicitly show that a richer environment where household financial participation shares are endogenized generates the same conclusions as our simpler
framework. This non-trivial modification of the model provides additional support to our main findings.

Relative to existing studies on EME business cycles, our work highlights the structural differences in EMEs’ domestic household and more importantly firm financial participation relative to AEs, and characterizes the extent to which these two participation margins shape the differential labor market and business cycle dynamics between EMEs and AEs. In particular, the stark differences in both households’ and firms’ degree of domestic financial participation have received little attention in the macro literature. Furthermore, considering labor market outcomes in a context of greater firm financial participation, which the literature has generally abstracted from, is important given the large shares of employment in firms that do not participate in the banking system in EMEs.

The remainder of this paper is as follows. Section 2 summarizes related literature, places our contributions in context, and presents empirical evidence that motivates our theoretical framework. The model is presented in Section 3. Section 4 discusses the quantitative implications of greater firm and household financial participation in EMEs and summarizes our robustness analysis. Section 5 concludes.

2 Related Literature, Contributions, and Empirical Motivation

2.1 Related Literature and Contributions

Our work contributes to a well known literature documents and analyzes the distinct features of EME business cycles and labor market dynamics (see Neumeyer and Perri, 2005; Fernández and Gulan, 2015, among others; see Boz, Durdu, and Li, 2015, for cyclical facts about EME labor markets). Our work is also related to a growing strand of research on endogenous firm entry and business cycles that builds on the seminal work of Bilbiie, Ghironi, and Melitz (2012) (henceforth BGM), and to recent work on financial development, labor markets, and business cycles (Epstein and Finkelstein Shapiro, 2018; Epstein, Finkelstein Shapiro, and González Gómez, 2018). The combination of labor search frictions and endogenous
firm entry in a business cycle framework builds on Cacciatore and Fiori (2016), Cacciatore, Ghironi, and Fiori (2016), and Cacciatore, Duval, Fiori, and Ghironi (2016a,b), all of which have centered on AEs. The analysis of firm participation in the banking system is related to Cacciatore, Ghironi, and Stebunovs (2015), who explore the firm-level and aggregate implications of greater bank competition in the U.S. in a model with endogenous firm entry and monopolistically-competitive banks that finance firms’ sunk entry costs. Our explicit focus on partial firm financial participation in EMEs therefore differs from their work.

Munkacsi and Saxegaard (2017) study the impact of labor and goods market reforms in an EME context where informality is prevalent.\(^1\) Our focus on domestic financial participation in EMEs, especially by firms, is complementary to their work. Dabla-Norris et al. (2015) study the consequences of domestic financial inclusion for long-run aggregate outcomes and inequality, while Buera, Moll, and Shin (2013) characterize the aggregate effects of credit market interventions that relax financial frictions. Both of these studies abstract from labor market and business cycle dynamics, whereas unemployment, wage, and aggregate fluctuations are at the center of our work. Bhattacharya and Ila (2016) show that greater household financial inclusion is associated with higher consumption volatility in EMEs; Barrail Halley (2017) and Chopra (2017) stress similar findings.\(^2\) A critical and non-trivial difference of our work relative to these existing studies, and hence one of our contributions, is our focus not only on household participation but also on the extensive margin of firm financial participation. The explicit consideration of limited firm financial participation in EMEs is key to our main findings on the potential volatility-reducing effects of greater domestic financial participation.

### 2.2 Stylized Facts: Business Cycles in AEs and EMEs

Table 1 presents extensively-documented facts about business cycles in AEs and EMEs. The most notable and well-known differences between these two country groups are that: in EMEs, the volatility of consumption (\(c\)) relative to GDP (\(Y\)) is greater than 1, while in

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

\(^2\)Levchenko (2005) focuses on the link between international financial liberalization and consumption volatility in EMEs in an environment with limited commitment in individual risk sharing.
AEs this volatility is less than 1; and EMEs have a countercyclical trade balance-GDP ratio \((tby)\), while AEs have an acyclical trade balance-GDP ratio. Similar facts are documented by Neumeyer and Perri (2005) and more recently by Fernández and Gulan (2015), among others. In addition, from a labor market perspective, Boz, Durdu, and Li (2015) document that EMEs have a relative volatility of unemployment that is half of that of AEs, less countercyclical unemployment, and a volatility of real wages \((w)\) relative to GDP that is greater than 1. In contrast, the relative volatility of real wages in AEs is smaller than 1.

Table 1: Business Cycle Statistics in Advanced and Emerging Economies

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Advanced Economies</th>
<th>Emerging Economies</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\sigma_{Y_t})</td>
<td>1.43</td>
<td>2.46</td>
</tr>
<tr>
<td>(\sigma_{c_t}/\sigma_{Y_t})</td>
<td>0.92</td>
<td>1.21</td>
</tr>
<tr>
<td>(\sigma_{i_t}/\sigma_{Y_t})</td>
<td>3.63</td>
<td>3.28</td>
</tr>
<tr>
<td>(\sigma_{u_t}/\sigma_{Y_t})</td>
<td>7.47</td>
<td>3.41</td>
</tr>
<tr>
<td>(\sigma_{w_t}/\sigma_{Y_t})</td>
<td>0.87</td>
<td>2.67</td>
</tr>
<tr>
<td>(\sigma_{tby_t})</td>
<td>1.33</td>
<td>2.19</td>
</tr>
<tr>
<td>(corr(c_t, Y_t))</td>
<td>0.52</td>
<td>0.72</td>
</tr>
<tr>
<td>(corr(i_t, Y_t))</td>
<td>0.68</td>
<td>0.71</td>
</tr>
<tr>
<td>(corr(u_t, Y_t))</td>
<td>−0.61</td>
<td>−0.39</td>
</tr>
<tr>
<td>(corr(tby_t, Y_t))</td>
<td>0.01</td>
<td>−0.31</td>
</tr>
</tbody>
</table>

Notes: \(Y\) denotes real GDP, \(c\) denotes real private consumption, \(i\) denotes real investment, \(u\) denotes the unemployment rate, \(w\) denotes the real wage, and \(tby\) denotes the trade balance-GDP ratio. \(\sigma_{x_t}\) denotes the standard deviation of the cyclical component of variable \(x_t\) and \(corr(x_t, Y_t)\) denotes the contemporaneous correlation between the cyclical component of \(x_t\) and \(Y_t\). All data are at a quarterly frequency. Following related literature, second moments are obtained using HP-filtered data with smoothing parameter 1600 and represent averages over each country sample using data from 1990Q1 to 2017Q4 for EMEs and data from 1980Q1 to 2017Q4 for AEs (time span varies by country) based on data availability. The AE sample is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, Netherlands, New Zealand, Norway, Sweden, and Switzerland. The EME sample is comprised of: Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. The relative volatility of wages is borrowed from Boz, Durdu, and Li (2015) and based on averages of Australia, Austria, Belgium, Canada, Denmark, Finland, New Zealand, Norway, and Sweden for the AE sample, and Brazil, Ecuador, Malaysia, Mexico, Philippines, and Turkey for the EME sample due to limited data availability on quarterly labor earnings series. Sources: International Monetary Fund International Financial Statistics, and Boz, Durdu, and Li (2015) (for real wages).

2.3 Domestic Financial Participation by Households and Firms

**Domestic Financial Participation** Table 2 shows that, on average, EMEs have much lower levels of household and firm financial participation in the domestic banking system.
compared to AEs. In particular, virtually every individual in AEs has an account at a financial institution (a measure of household participation in the domestic banking system). In contrast, less than 50 percent of individuals in EMEs have an account at a financial institution. In addition, the share of firms that have bank credit (a measure of firm participation in the banking system) in AEs is almost three times as large as the corresponding share in EMEs.

There is considerably heterogeneity in these measures within country groups. Indeed, the share of firms with bank credit ranges from 26 to 82 percent in AEs, and from 6 to 37 percent in EMEs. In turn, the share of individuals with an account at financial institutions ranges from 71 to 100 percent in AEs, and from 21 to 73 percent in EMEs. However, it is still the case that on average AEs have larger shares of firm and household participation in the banking system relative to EMEs.\(^3\)

<table>
<thead>
<tr>
<th>Country Group</th>
<th>Share of Firms with Bank Credit, % Firms (Min, Max)</th>
<th>% of Pop. Age 15+ (Min, Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEs</td>
<td>58 (25.6, 81.7)</td>
<td>96.4 (71, 99.7)</td>
</tr>
<tr>
<td>EMEs</td>
<td>20 (6, 36.6)</td>
<td>42.2 (20.5, 72.7)</td>
</tr>
</tbody>
</table>

Notes: Averages for AEs are based on data for Austria, Belgium, Denmark, Finland, Luxembourg, Netherlands, and Sweden based on data availability. EMEs are based on data for Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. Sources: Eurostat and Survey of Access to Finance of Enterprises (SAFE, 2011) (share of firms with bank loans, bank overdraft, and credit line, AEs) and IFC Enterprise Finance Gap Database 2010 (share of firms with bank credit line, EMEs), World Bank Global Financial Inclusion Database (account at financial institutions, 2011). See Section A1 of the Appendix for more details.

Concrete examples of changes that bolster household participation in the banking system in EMEs 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 individuals.

\(^3\)Evidence on usage of accounts by individuals in EMEs and AEs confirms a similar pattern: virtually all individuals in AEs have used their accounts for transactions in the recent past, whereas only a small fraction of individuals in EMEs have done so (World Bank Global Financial Inclusion Database). 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 0.99. For similar evidence, see Beck, Demirgüç-Kunt, and Martinez Peria (2007).
households, among others. In turn, efforts to expand firm financial participation in EMEs include reducing firm entry costs by lowering the cost of firm registration, where registering is often a requirement to participate in the domestic banking system (this can accomplished via better and more efficient monitoring, the reduction of excessive red tape, as well as the adoption of new technologies that streamline the registration process).

**Domestic Financial Participation and Employment Allocation** Firms in EMEs that do not have bank credit are mainly micro and small firms. These firms are generally unregistered but represent the majority of firms in these economies and, importantly, account for a significant share of total employment and job creation (see Beck and Demirgüç-Kunt, 2006; Beck, Demirgüç-Kunt, and Martínez Pería, 2007; IFC, 2010, 2013; Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011). While data on the share of employment in firms that have bank credit is not explicitly available, we can construct an empirical range for the share of employment in firms that participate in the banking system (as measured by firms that use bank credit) using data on the allocation of employment by firm size and the share of firms with bank credit.

Data from the International Finance Corporation (IFC) on employment by firm size shows that in our EME sample, micro, small and medium enterprises (MSMEs) account on average for 69 percent of total employment (the remaining 31 percent is accounted for by large firms). Moreover, *micro firms represent 90 percent of all firms* (large firms only represent 0.8 percent of all firms).\(^4\) Recall that per Table 2, roughly 20 percent of firms have bank loans in EMEs. Now, assume that all large firms have bank loans and that the remaining firms with bank credit, which are MSMEs, account for 20 percent of MSME (and not total) employment. Of note, this last assumption on is an upper bound given existing census-based studies for select EMEs that document the breadth of employment in micro firms, the majority of which are unregistered and therefore financially-excluded firms (see, for example, Busso, Fazio, and Levy, 2012). Therefore, this simple calculation suggests that in EMEs, employment among firms that participate in the banking system (as proxied

\(^4\)Micro firms are categorized as having 10 workers or less, small firms are categorized as having between 10 and 50 workers, and medium enterprises are categorized as having less than 200 workers. See https://www.smefinanceforum.org/data-sites/msme-country-indicators for more details.
by the share of firms that have bank credit) can range anywhere from 31 percent of total employment (assuming no MSMEs have bank credit and only large firms do) to 44 percent of total employment (assuming all large firms have bank credit and that roughly 20 percent of MSME employment is in MSMEs with bank credit).

3 The Model

Model Structure The small open economy (SOE) is comprised of firms and households. Households have a unit mass and are 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. On the production side, there are two firm categories—financially-included ($i$) and -excluded ($e$) firms—each of which is comprised of monopolistically-competitive firms. Each firm category has an unbounded number of potential entrants such that the number of firms in each category is endogenous. Firms within each category $j \in \{e, i\}$ use capital and labor in production, and labor is subject to search frictions that give rise to equilibrium unemployment. Output from the two firm categories is bundled using a CES technology by a perfectly-competitive firm to create a final good. Following the EME RBC literature, aggregate productivity and foreign interest rate shocks drive aggregate fluctuations.

Key Differences Between Household Categories $i$ households choose deposits and foreign debt. They are the owners of all firms and create new firms subject to sunk entry costs. These households also accumulate capital, which is then rented to both firm categories in frictionless markets. We assume that a portion of physical capital investment and $i$ firms’ sunk entry costs is financed with bank credit such that those two expenditures are subject to a standard working capital constraint. The use of external financing to cover a portion of $i$ firms’ entry costs immediately makes these firms financially included. In any

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5Given 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.

6Assuming that each household accumulates its own capital, with capital for $i$ firms being accumulated by $i$ households and partially financed with bank credit, and capital for $e$ firms being entirely internally financed by $e$ households, does not change any of our conclusions. More broadly, our baseline assumption is
given period, \( i \) household members either work or search for employment in \( i \) firms. In contrast to \( i \) households, \( e \) households do not hold deposits or foreign debt and therefore do not participate in the financial system. Moreover, \( e \)-household members either work or search for employment in \( e \) firms, with labor income being the sole source of income for \( e \) households. There is perfect consumption insurance within each household category (a standard assumption in search models) but not across household categories. In line with standard labor search models, labor force participation is exogenous and normalized to 1.

**Key Differences Between Firm Categories** All firms within each category use capital and labor to produce. Given labor search frictions, all firms post vacancies to attract workers. Financially-included (\( i \)) firms face higher sunk entry costs but have access to a more capital-intensive (constant-returns-to-scale) production technology that delivers endogenously-higher labor productivity. In contrast, financially-excluded (\( e \)) firms face lower sunk entry costs, but produce using a less capital-intensive (constant-returns-to-scale) technology, which delivers endogenously-lower labor productivity.

**Relevance of Each Model Element** Each of the model features described above is necessary to address our two research questions. First, a small open economy accommodates interest rate shocks, which are well-known to be a key driving force of business cycles and consumption dynamics in EMEs. Second, search frictions allow us to study the impact of greater financial participation on employment allocation and unemployment; considering employment outcomes is important in a context where a significant share of employment is in financially-excluded firms, as is the case in EMEs (recall Section 2). Third, household heterogeneity in financial participation allows us to address the impact of greater household participation (an issue of significant importance for EMEs given the evidence in Table 2). Fourth, the inclusion of physical capital in the production process allows us to have endogenously-determined differences in labor productivity between firm categories (arising from asymmetries in capital intensity in production) in a tractable way. These productivity consistent with evidence for EMEs showing that the bulk of the capital stock is held by larger firms, which tend to have access to bank credit (see, for example, Busso et al., 2012).
differentials are in line with empirical evidence on productivity and access to credit. Finally, endogenous firm entry and firm heterogeneity in participation allow us to explicitly model the extensive margin of firm financial participation—an issue of significant importance for EMEs given the evidence in Table 2—as well as the interaction between greater firm and household domestic financial participation, which proves to be key for our findings. For simplicity, our framework assumes an exogenous share of household financial participation but an endogenous share for firm financial participation. After discussing and main quantitative findings, we explore the implications from a non-trivial extension of our model that incorporates endogenous household financial participation and show explicitly that our main results remain unchanged.

3.1 Sectoral Output Bundles and Final Goods Firms

**Sectoral Output Bundles** Total output of financially-excluded \((e)\) and financially-included \((i)\) firms is given by the sectoral output bundle \(Y_{j,t} = \left(\int_{\omega_j \in \Omega_j} y_{j,t}(\omega_j)^{\frac{\epsilon-1}{\epsilon}} d\omega_j\right)^{\frac{1}{\epsilon-1}}\), for firm category \(j \in \{e, i\}\), where \(\Omega_j\) is the subset of differentiated goods within each firm category \(j\) that can potentially be produced (as in BGM, only a fraction of \(\Omega_j\) ends up being produced each period). A firm in category \(j \in \{e, i\}\) produces a single good \(\omega_j\). As such, \(\omega_j\) represents both the good produced and the firm. Then, \(y_{j,t}(\omega_j)\) denotes differentiated output produced by firm \(\omega_j \in \Omega_j\) in firm category \(j\), and \(\epsilon\) is the elasticity of substitution between differentiated output \(y_{j,t}(\omega_j)\) in each firm category. The corresponding price subindex for the output bundle in each firm category \(j\) is given by \(P_{j,t} = \left(\int_{\omega_j \in \Omega_j} p_{j,t}(\omega_j)^{1-\epsilon} d\omega_j\right)^{\frac{1}{1-\epsilon}}\) where \(p_{j,t}(\omega_j)\) is the nominal price of the differentiated good produced by firm \(\omega_j\).

**Final Goods Firms** A representative perfectly-competitive final goods firm aggregates sectoral output bundles \(Y_{i,t}\) and \(Y_{e,t}\) to create a final good \(Y_t\) using a CES technology. Formally, the final goods firm chooses the sectoral output bundles \(Y_{e,t}\) and \(Y_{i,t}\) to maximize profits \(\Pi_{a,t} = \left[P_t Y_t - P_{i,t} Y_{i,t} - P_{e,t} Y_{e,t}\right]\) subject to the the CES output aggregator

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

7See, for example, Kouamé and Tapsoba (2018).
where $0 < \alpha_y < 1$, and the parameter $\phi_y > 0$ determines the degree of substitutability between sectoral output categories. $P_t = \left[ (1 - \alpha_y) (P_{t,t})^{1-\phi_y} + \alpha_y (P_{e,t})^{1-\phi_y} \right]^{\frac{1}{1-\phi_y}}$ is the aggregate price level and $P_{t,t}$ and $P_{e,t}$ are the corresponding price subindices of each sectoral output bundle. The demand functions for the two sectoral output bundles are implicitly given by

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

and

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

In addition, the final goods firm chooses its demand for differentiated good $\omega_j$ within each firm category $j \in \{e, i\}$. The demand function for firm $\omega_j$’s output is

$$y_{j,t}(\omega_j) = (\rho_{j,t}(\omega_j))^{-\varepsilon} \left( \frac{P_{j,t}}{P_t} \right)^\varepsilon Y_{j,t}, \quad (4)$$

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

### 3.2 Incumbent Firms

**Evolution of Firms** Following BGM, there is an unbounded number of potential firm 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 $N_{E,j,t}$ in period $t$ face a one-period production lag and start producing in $t + 1$, and all firms (whether incumbent or new entrants) exit with exogenous probability $0 < \delta < 1$ at the end of each period. Then, the mass of firms in period $t$ in category $j$ is given by $N_{j,t} = (1 - \delta) (N_{j,t-1} + N_{E,j,t-1})$. Potential new firms in category $j$ need to incur an exogenous sunk entry cost $\psi_j$ (expressed in terms of final goods) in order to enter the market.\(^8\) As shown in the problem of $i$ households below, we assume that $i$ households partially finance the sunk entry cost of $i$ firms with bank credit. Incurring this cost in turn gives $i$ firms access to a more capital-intensive technology. In contrast, the creation of $e$ firms is not linked to bank credit and entails lower sunk entry costs, but implies

---

\(^8\)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 our results.
that $e$ firms have a less capital-intensive technology. Under a disciplined calibration, the more capital-intensive technology available to $i$ firms generates endogenously-higher labor productivity among $i$ firms compared to $e$ firms, which is consistent with empirical evidence on firms with access to credit exhibiting greater productivity.

**Incumbent Firm Profits**  The description of firms is similar to Cacciatore and Fiori’s (2016) one-firm-category environment. We also assume that firms take the wage and rental rate of capital as given when making decisions over capital and employment. This assumption is in line with similar search models with monopolistic competition that abstract from strategic bargaining (see Cacciatore and Fiori, 2016, for more details). For an incumbent firm $\omega_j$ in category $j \in \{e, i\}$, individual profits are given by

$$d_{j,t}(\omega_j) = \rho_{j,t}(\omega_j)y_{j,t}(\omega_j) - w_{j,t}(\omega_j)n_{j,t}(\omega_j) - r_tk_{j,t}(\omega_j) - \kappa v_{j,t}(\omega_j), \quad (5)$$

where firm $\omega_j$’s output $y_{j,t}(\omega_j)$ is

$$y_{j,t}(\omega_j) = z_t\left[n_{j,t}(\omega_j)\right]^{1-\alpha_j}\left[k_{j,t}(\omega_j)\right]^{\alpha_j}. \quad (6)$$

Above, $\kappa$ is the exogenous flow cost of posting vacancies $v_{j,t}(\omega_j)$, $r_t$ is the capital rental rate (common across firm categories given free capital mobility across firms), and $w_{j,t}(\omega_j)$ is the real wage (determined via bilateral Nash bargaining). In turn, the capital share is $0 < \alpha_j < 1$, $z_t$ is aggregate productivity, and $n_{j,t}(\omega_j)$ and $k_{j,t}(\omega_j)$ denote firm $\omega_j$’s employment and capital, respectively. Note that total employment, $L_{j,t}$, total capital $K_{j,t}$, and total vacancies $V_{j,t}$ in each firm category $j$ are given by $L_{j,t} \equiv \int_{\omega_j \in \Omega_j} n_{j,t}(\omega_t)d\omega_j$, $K_{j,t} \equiv \int_{\omega_j \in \Omega_j} k_{j,t}(\omega_t)d\omega_j$, and $V_{j,t} \equiv \int_{\omega_j \in \Omega_j} v_{j,t}(\omega_t)d\omega_j$.

---

9Cacciatore and Fiori (2016) assume that firms post vacancies, demand capital, and use workers to produce in a model with endogenous separations. In contrast to their framework, we abstract from endogenous separations but introduce two firm categories, each of which has an endogenous measure of firms. Framing the problem we describe in this section in terms of perfectly-competitive intermediate-goods firms that hire frictional labor and sell their output to monopolistically-competitive firms whose entry is endogenous (as in Cacciatore, Duval, Fiori, and Ghironi, 2016a,b) delivers identical optimality conditions.
**Search Frictions and Evolution of Firm Employment**  Let \( m(u_{j,t}, V_{j,t}) = u_{j,t}V_{j,t}/(u_{j,t}^\xi + V_{j,t}^\xi)^{1/\xi}; \xi > 0 \), be a constant-returns-to-scale matching function in firm category \( j \in \{e, i\} \) whose inputs are household-\( j \) unemployed individuals \( u_{j,t} \) and total vacancies from category-\( j \) firms \( V_{j,t} \).\(^{10}\) The firm-category-\( j \) job-finding and job-filling probabilities are then defined as \( f(\theta_{j,t}) = V_{j,t}/(u_{j,t}^\xi + V_{j,t}^\xi)^{1/\xi} \) and \( q(\theta_{j,t}) = u_{j,t}/(u_{j,t}^\xi + V_{j,t}^\xi)^{1/\xi} \), respectively, where market tightness \( \theta_{j,t} \equiv V_{j,t}/u_{j,t} \). Therefore, the perceived evolution of employment for firm \( \omega_j \) is

\[
n_{j,t+1}(\omega_j) = (1 - \rho_n^j) (n_{j,t}(\omega_j) + v_{j,t}(\omega_j)q(\theta_{j,t})), \tag{7}
\]

where \( 0 < \rho_n^j < 1 \) is the exogenous job separation probability.

**Optimal Pricing, Capital Demand, and Job Creation**  Each firm \( \omega_j \) maximizes \( \mathbb{E}_t\sum_{s=t}^{\infty}\Xi_{s|t}[(1 - \delta)^{s-t}d_{j,s}(\omega_j)] \) subject to its respective demand function from final goods firms and its perceived evolution of employment as defined above, where \( \Xi_{s|t} \) is household \( i \)'s stochastic discount factor (defined in household \( i \)'s problem further below). Denoting by \( mc_{j,t} \) the multiplier on the firm’s output, the optimal real price for firm \( \omega_j \) in category \( j \) is \( \rho_{j,t}(\omega_j) = \mu mc_{j,t} \), where the markup \( \mu = \varepsilon/(\varepsilon - 1) \). In turn, optimal capital demand for firm \( \omega_j \) is given by

\[
r_{j,t} = \alpha_j mc_{j,t} z_t [n_{j,t}(\omega_j)]^{1-\alpha_j} [k_{j,t}(\omega_j)]^{\alpha_j-1}, \tag{8}
\]

while its job creation condition is

\[
\frac{\kappa}{q(\theta_{j,t})} = (1 - \delta)(1 - \rho_n^j)\mathbb{E}_t\Xi_{t+1|t} \left\{ (1 - \alpha_j)mc_{j,t+1}z_{t+1} [n_{j,t+1}(\omega_j)]^{-\alpha_j} [k_{j,t+1}(\omega_j)]^{\alpha_j-1} \right\} \left[ -w_{j,t+1}(\omega_j) + \frac{\kappa}{q(\theta_{j,t+1})} \right]. \tag{9}
\]

The intuition behind these conditions is standard: firms equate the marginal cost of a unit of capital to its marginal benefit, and equate the expected marginal cost of posting a vacancy to the expected marginal benefit. Importantly, since optimal pricing behavior among firms implies that \( \rho_{j,t}(\omega_j) = \mu mc_{j,t} \), changes in the number of firms in each of the categories \( e \) or \( i \), which directly influence firms’ real price \( \rho_{j,t}(\omega_j) \), will affect the hiring and investment

\(^{10}\)This particular functional form is well known to guarantee that matching probabilities are always bounded between 0 and 1 (see Den Haan, Ramey, and Watson, 2000).
decisions of firms via $mc_{j,t}$.

**Wage Determination** We assume bilateral Nash bargaining between workers and individual firms. Denoting by $\eta$ the bargaining power of workers and by $\chi_j$ the contemporaneous value of searching for employment in firm category $j \in \{e, i\}$, the Nash real wage for a worker in firm $\omega_i$ is

$$w_{i,t}(\omega_i) = \eta \left[ (1 - \alpha_i)mc_{i,t} z_t [n_{i,t}(\omega_i)]^{-\alpha_i} [k_{i,t}(\omega_i)]^{\alpha_i - 1} + \kappa \theta_{i,t} \right] + (1 - \eta) \chi_i. \quad (10)$$

Due to differences in stochastic discount factors between $e$ households (given by $\Xi_t^{e}$) and $i$ firms (given by $\Xi_t^{i}$) and after some algebra, the real wage for a worker in firm $\omega_e$ can be expressed as

$$w_{e,t}(\omega_e) = \left[ \eta \left[ (1 - \alpha_e)mc_{e,t} z_t [n_{e,t}(\omega_e)]^{-\alpha_e} [k_{e,t}(\omega_e)]^{\alpha_e - 1} \right] + (1 - \eta) \chi_e \right]$$

$$+ \eta \left[ \frac{\kappa}{q(\theta_{e,t})} - (1 - \delta)(1 - \rho^e_n) \int_{\omega_e \in \Omega_{e,t}} \frac{z_t(\omega_e)}{\omega_e} \left( (1 - f(\theta_{e,t})) \mathbb{E}_t \Xi_{t+1|t}^{e} J_{\omega_e|t+1}(\omega_e) \right) \right], \quad (11)$$

where $\kappa / q(\theta_{e,t}) = (1 - \delta)(1 - \rho^e_n) \mathbb{E}_t \Xi_{t+1|t}^{i} J_{\omega_e|t+1}(\omega_e)$ and the value to firm $\omega$ in category $e$ of having an additional worker is $J_{\omega_e|t}(\omega_e) = (1 - \alpha_e)mc_{e,t} z_t [n_{e,t}(\omega_e)]^{-\alpha_e} [k_{e,t}(\omega_e)]^{\alpha_e - 1} - w_{e,t}(\omega_e) + (1 - \delta)(1 - \rho^e_n) \mathbb{E}_t \Xi_{t+1|t}^{i} J_{\omega_e|t+1}(\omega_e)$. An analogous expression exists for $J_{\omega_i|t}(\omega_i)$.\(^{11}\)

### 3.3 Financially-Included (i) Households and Firm Creation

We assume that financially-included (i) households own all firms, and that firms that start in a given category ($e$ or $i$) cannot transition into a different category after they enter the market and start producing.\(^{12}\) Formally, $i$ households choose consumption $c_{i,t}$, total capital accumulation $k_{t+1}$, deposits $b_{t+1}$, foreign debt holdings $b^s_{t+1}$, the desired number of $e$ and $i$

\(^{11}\)Note that if $\Xi_{t+1|t} = \Xi_{t+1|t}^{e} = \Xi_{t+1|t}^{i}$, which would be the case in a one-household framework, the expression for $w_{e,t}(\omega_e)$ collapses to its standard form: $w_{e,t}(\omega_e) = \eta \left[ (1 - \alpha_e)mc_{e,t} z_t [n_{e,t}(\omega_e)]^{-\alpha_e} [k_{e,t}(\omega_e)]^{\alpha_e - 1} + \kappa \theta_{e,t} \right] + (1 - \eta) \chi_e$.

\(^{12}\)Assuming that $e$ households own $e$ firms does not change our conclusions. Also, World Bank Enterprise Survey data shows that more than 90 percent of firms that were formally registered with tax and local authorities started their operations under that status, suggesting that a small fraction of *operating* firms that started as unregistered firms transition to registered status. Importantly, given that access to bank credit often requires proof of registration with local or tax authorities, the bulk of firms that participate in the banking system are formally registered.
firms next period, $N_{e,t+1}$ and $N_{i,t+1}$, and the number of corresponding new $e$ and $i$ firms, $N_{E,et}$ and $N_{E,it}$, in order to reach the desired targets $N_{e,t+1}$ and $N_{i,t+1}$ to maximize $E_0 \sum_{t=0}^{\infty} \beta^t u(c_{i,t})$

subject to the budget constraint:

$$c_{i,t} + b_{t+1} + R_{c,t}b^*_t + \frac{m}{2} (b^*_t)^2 + (\psi_i N_{E,it} + i_t) [1 - \xi_b + \xi_b R_t] + \psi_e N_{E,et}$$

$$= R_t b_t + b^*_{t+1} + w_{i,t} L_{i,t} + \chi_i u_{i,t} + d_{i,t} N_{i,t} + d_{e,t} N_{e,t} + r_t k_t,$$

and the laws of motion for $e$ and $i$ firms

$$N_{e,t+1} = (1 - \delta)(N_{e,t} + N_{E,et}),$$

(13)

and

$$N_{i,t+1} = (1 - \delta)(N_{i,t} + N_{E,it}),$$

(14)

where physical capital investment $i_t = k_{t+1} - (1 - \delta) k_t$ (we abstract from including capital adjustment costs above for expositional simplicity, but include them in our quantitative analysis) and $L_{i,t}$ denotes total $i$-firm employment. Above, $R_{c,t} = S_t R^*_t$ is the country interest rate, where $R^*_t$ is the (time-varying) gross real foreign interest rate, $S_t$ is the country spread, and households face foreign debt adjustment costs (this is a standard assumption in SOE models for EMEs; see, for example, Neumeyer and Perri, 2005). $R_t$ is the real gross deposit rate, and also the lending rate absent financial frictions that give rise to interest rate spreads.

As noted in the description of the model, we assume that $\psi_i > \psi_e$, and that $i$ households face a working capital constraint such that a fraction $0 \leq \xi_b \leq 1$ of investment expenditures $i_t$ and the total cost of creating $i$ firms $\psi_i N_{E,it}$ is financed with external financing. For our purposes, there is no difference between owning a deposit bank account and using it (this is consistent with existing evidence on having a financial account and using it, which was briefly highlighted in Section 2). Since $i$ households have a measure $0 < \lambda < 1$ of members, unemployment among $i$ household members is given by $u_{i,t} = \lambda - L_{i,t}$.\(^{13}\)

The first-order conditions yield the following standard Euler equations for deposits and

\(^{13}\)In principle, households are also subject to the perceived evolution of employment. Absent endogenous labor force participation, this law of motion is taken as given by households.
foreign debt

\[ 1 = R_{t+1} \beta \mathbb{E}_t \frac{u'(c_{i,t+1})}{u'(c_{i,t})} \quad \text{and} \quad 1 = R_{c,t+1} \beta \mathbb{E}_t \frac{u'(c_{i,t+1})}{u'(c_{i,t})} + \eta b^*_t, \quad (15) \]

where the stochastic discount factor of \( i \)-households is \( \Xi_{t+1|t}^i \equiv \beta u'(c_{i,t+1})/u'(c_{i,t}) \). In turn, the firm creation and capital accumulation decisions can be written as

\[ \psi_i [1 - \xi_b + \xi_b R_t] = (1 - \delta) \mathbb{E}_t \Xi_{t+1|t}^i \left[ d_{i,t+1} + \psi_i [1 - \xi_b + \xi_b R_{t+1}] \right], \quad (16) \]

\[ \psi_e = (1 - \delta) \mathbb{E}_t \Xi_{t+1|t}^i \left[ d_{e,t+1} + \psi_e \right], \quad (17) \]

and

\[ [1 - \xi_b + \xi_b R_t] = \mathbb{E}_t \Xi_{t+1|t}^i \left[ r_{t+1} + (1 - \delta) [1 - \xi_b + \xi_b R_{t+1}] \right]. \quad (18) \]

Intuitively, households equate the marginal cost of creating one more \( i \) firm to the expected marginal benefit of doing so (given by discounted future firm profits and the continuation value, i.e. the resources saved from not having to create an additional firm if the current firm survives with probability \((1 - \delta)\)). Note that the marginal cost and benefit are affected by the usage of external financing to partially finance the sunk entry costs of new \( i \) firms. The upside of incurring a greater sunk entry cost \( \psi_i \) than for \( e \) firms is access to a more capital-intensive (and more productive) production technology. Similarly, the marginal cost of accumulating capital is also affected by the usage of external financing to acquire new physical capital.

### 3.4 Financially-Excluded (e) Households

Financially-excluded \( e \) households only consume labor income from working in \( e \) firms. Their expected lifetime utility is \( \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c_{e,t}) \) and their budget constraint is

\[ c_{e,t} = w_{e,t} L_{e,t} + \chi_e u_{e,t}, \quad (19) \]

where \( L_{e,t} \) denotes total \( e \)-firm employment. Unemployment among \( e \) household members is given by \( u_{e,t} = (1 - \lambda) - L_{e,t} \) and \( \Xi_{t+1|t}^e = \beta u'(c_{e,t+1})/u'(c_{e,t}) \). We note once again that
assuming that each household accumulates its own capital and supplies it to firms in their own category (with capital for \(i\) firms being partially financed with bank credit but capital for \(e\) firms being financed with household resources alone) does not affect the model’s economic mechanisms and does not change any of our conclusions.

3.5 Market Clearing and Symmetric Equilibrium

Total capital is given by \(K_t = K_{i,t} + K_{e,t}\). Since total capital is allocated across firm categories in a frictionless environment, in equilibrium \(r_{i,t} = r_{e,t} = r_t\). Using the sectoral price indices and imposing symmetry, we have \(\rho_{j,t} = (P_j^t/P_t)N_{j,t}^{-1}\) as well as \(Y_{j,t} = y_{j,t}N_{j,t}^{-1}\). In addition, total employment in each firm category \(j\) evolves as follows

\[
L_{j,t+1} = (1-\delta)(1-\rho_{j,t}^t)(L_{j,t} + m(V_{j,t}, u_{j,t}))
\]

The economy’s resource constraint is given by

\[
Y_t = c_{i,t} + c_{e,t} + \iota_t + \kappa V_{i,t} + \kappa V_{e,t} + \psi_iN_{E,i,t} + \psi_eN_{E,e,t} + R_{c,t}b_{t+1}^* - b_{t+1}^* + \frac{\eta b_{t+1}^*}{2}, \quad (21)
\]

where total consumption is \(c_t = c_{i,t} + c_{e,t}\). Furthermore, the total number of firms in the economy is \(N_t \equiv N_{e,t} + N_{i,t}\). Appendix A.3 shows the list of variables and equilibrium conditions that characterize the competitive equilibrium.

Following BGM, we note that in the presence of preferences with a “love for variety” component (as is the case in frameworks rooted in BGM, including ours), 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 the model quantity that is readily comparable to the corresponding quantity in the data is given by \(x_{d,t} = \Psi_t^{-1-\phi y} x_{m,t}\), where \(\Psi_t = (1-\alpha_y)N_{i,t}^{-1-\phi y} + \alpha_yN_{e,t}^{-1-\phi y}\) (see Cacciatore, Duval, Fiori, and Ghironi, 2016a). Thus, in what follows, variables with a \(d\) subscript denote model variables that are readily comparable to their empirical counterparts.
4 Quantitative Analysis

Our main objective is to examine the extent to which greater household and/or firm financial participation in EMEs can bring these economies’ labor market and business cycle dynamics closer to those of AEs. Our calibration strategy is in this spirit.

4.1 Calibration

We calibrate the baseline economy to a representative EME using select average first- and second-moments for the EME country sample in Section 2 as targets (all empirical second moments are based on the data span used in Table 1 of Section 2). In particular, our approach explicitly captures two well-known features of EME business cycles, mainly a countercyclical trade balance-GDP ratio and a volatility of consumption relative to GDP that is greater than 1.

Functional Forms and Shock Processes A period is a quarter. Utility is of the CRRA form for both households: \( u(c_j) = c_j^{1-\sigma}/(1 - \sigma) \) with \( \sigma > 0 \) for \( j \in \{e, i\} \). We introduce standard capital adjustment costs to obtain empirically-plausible fluctuations in investment: 
\[
\left(\varphi_k/2\right) \left(k_{t+1}/k_t - 1\right)^2 k_t,
\]
where \( \varphi_k > 0 \). In line with Neumeyer and Perri (2005) and others, we assume that the country spread is inversely related to expected productivity: 
\[
S_t = -\eta_c E_t [z_{t+1}],
\]
where \( \eta_c > 0 \). Finally, we assume that aggregate productivity and foreign interest rate shocks follow independent AR(1) processes in logs: 
\[
\ln(x_t) = (1 - \rho_x) \ln(x) + \rho_x \ln(x_{t-1}) + \varepsilon_t^x, \quad \varepsilon_t^x \sim N(0, \sigma_x)
\]
for \( x = z, R^* \).

Parameters from Related Literature Following the EME business cycle literature, we set \( \sigma = 2, \beta = 0.985, \delta = 0.025, \) and \( \alpha_i = 0.32 \). We initially choose \( \alpha_e = 0.20 \), a value that is consistent with other studies on EME business cycles with firm heterogeneity (see, for example, Fernández and Meza, 2015; we explore the sensitivity of our results to alternative values as part of our robustness analysis). Consistent with the literature on endogenous entry, we choose \( \varepsilon = 6 \) (alternative values for \( \varepsilon \) do not change our main conclusions). EMEs generally lack formal safety nets and unemployment insurance (UI) schemes, so we initially

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\(^{14}\)See Section 2 and Table A1 in the Appendix for more details.
set $\chi_j = 0$ for $j \in \{e, i\}$ (we consider how differences in $\chi_j = 0$ between EMEs and AEs play a role when we discuss the effects of domestic financial participation on labor market dynamics in Section 4.3.4). The steady-state gross real foreign interest rate is $R^* = 1.0019$, consistent with the average quarterly gross real U.S. interest rate on the 3-month Treasury bill over our sample period. The exogenous separation probabilities are set to $\rho_n^j = 0.05$ for $j \in \{e, i\}$ (Bosch and Maloney, 2008). Based on the evidence on household financial participation in Section 2, the share of individuals in $i$ households is $\lambda = 0.42$. We initially set the elasticity of substitution between sectoral output $\phi_y = 5$, implying a high degree of substitutability.\footnote{Imperfect substitutability generates an empirically-consistent positive relationship between the level of economic development (as proxied by the level of total output) and the share of household financial participation ($\lambda$). Evidence using data from 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 our EME sample cite direct competition from unregistered firms as a major obstacle. A direct implication of these facts is that sectoral output is likely to be highly substitutable between firm categories in economies with less developed banking systems such as EMEs.} We set $z = 1$ without loss of generality, and choose $\xi_b = 0.40$, which is consistent with evidence on the average share of investment and working capital financed with bank credit in our EME sample per World Bank Enterprise Survey data. Turning to the shock processes, we set $\rho_{R^*} = 0.76$ and $\sigma_{R^*} = 0.0084$, which are based on estimating an AR(1) process for the real U.S. 3-month Treasury bill over our sample period.

Robustness results presented in the Appendix confirm that plausible asymmetries between firm categories in vacancy posting costs (which we calibrate below) and separation probabilities, as well as alternative plausible values for other relevant parameters such as $\alpha_e$, do not change any of our main conclusions (see Section A.4 of the Appendix for details).

**Calibrated Parameters** We calibrate the remaining parameters $\xi, \kappa, \psi_e, \psi_i, \alpha_y, \eta_b, \eta_c, \varphi_k, \rho_z$, and $\sigma_z$ to match select first- and second-moment targets consistent with EME averages for our EME country sample (see Table 1 in Section 2). In terms of first moments, we match: a steady state unemployment rate of 8.2 percent (World Development Indicators), a vacancy-posting cost of 3.5 percent of steady-state quarterly average wages (this yields a ratio of vacancy costs to GDP consistent with the macro-labor EME literature; see, for example, Boz, Durdu, and Li, 2015), a steady-state sunk entry cost for $i$ firms of 15 percent of
output per capita (this is consistent with World Bank Enterprise Survey data on the average cost of obtaining a business license—a proxy for the cost of creating $i$ firms—in our EME sample), a ratio of $i$ firms to the total number of firms, $N_i/N$, of 0.20 (consistent with the average share in our EME sample; see Table 1 in Section 2), a steady state annual foreign debt-output ratio of 0.30 (consistent with the average ratio in our EME sample per World Bank external debt statistics), and a labor-productivity differential of 25 percent (consistent with data from ILO, 2015; alternative plausible differentials deliver similar conclusions). In terms of second moments, we target: a volatility of output of 2.46, a relative volatility of consumption and investment of 1.21 and 3.28, respectively, and a cyclical correlation between the trade balance-output ratio and output of -0.31. These targets are consistent with EME averages per Table 1 in Section 2.\footnote{\footnotetext{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.}}

All told, we obtain the following calibrated parameter values: $\xi = 0.3805$, $\kappa = 0.0421$, $\psi_e = 0.1658$, $\psi_i = 0.5972$, $\alpha_y = 0.5793$, $\eta_b = 0.0027$, $\eta_c = 0.20$, $\varphi_k = 16.98$, $\rho_z = 0.98$, and $\sigma_z = 0.0173$. Note that our calibration plausibly implies that the sunk entry costs of $e$ firms are indeed lower than those of $i$ firms. In addition, the model generates an endogenous allocation of employment across firm categories such that in steady state, $n_e = 0.5322$ and $n_i = 0.3858$. These shares are empirically plausible: given that the labor force is normalized to 1, our endogenously-generated share of $i$-firm employment, $n_i = 0.3858$, lies within range of 31-44 percent of total employment for EMEs in the data, as noted in Section 2.

### 4.2 Baseline Business Cycle Moments

Table 3 compares select business cycle moments generated by the model to their empirical counterparts based on EME averages (unless otherwise noted, all relevant model-generated moments are based on data-consistent variables, denoted by $d$ subscripts per Section 3.5). By construction, the model matches the volatility of output, the relative volatility of investment, and the countercyclicality of the trade balance-output ratio. The relative volatility of consumption is greater than 1, as is the case in EMEs, and only marginally higher compared
to the data.

Table 3: Business Cycle Moments–Data vs. Model

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Data</th>
<th>Benchmark Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_{y_{d,t}}$</td>
<td>2.46</td>
<td>2.46*</td>
</tr>
<tr>
<td>$\sigma_{c_{d,t}}/\sigma_{y_{d,t}}$</td>
<td>1.21</td>
<td>1.26*</td>
</tr>
<tr>
<td>$\sigma_{i_{d,t}}/\sigma_{y_{d,t}}$</td>
<td>3.28</td>
<td>3.28*</td>
</tr>
<tr>
<td>$\sigma_{u_{t}}/\sigma_{y_{d,t}}$</td>
<td>2.67</td>
<td>1.27</td>
</tr>
<tr>
<td>$\sigma_{u_{t}}/\sigma_{y_{d,t}}$</td>
<td>3.41</td>
<td>0.29</td>
</tr>
<tr>
<td>$corr(c_{d,t}, Y_{d,t})$</td>
<td>0.72</td>
<td>0.77</td>
</tr>
<tr>
<td>$corr(i_{d,t}, Y_{d,t})$</td>
<td>0.71</td>
<td>0.87</td>
</tr>
<tr>
<td>$corr(u_{t}, Y_{d,t})$</td>
<td>-0.39</td>
<td>-0.62</td>
</tr>
<tr>
<td>$corr(tby_{t}, Y_{d,t})$</td>
<td>-0.31</td>
<td>-0.31*</td>
</tr>
</tbody>
</table>

Notes: Empirical second moments are obtained using HP-filtered data with smoothing parameter 1600 and represent averages over each country sample using data from 1990Q1 to 2017Q4 for EMEs (time span varies by country; see Table A1 in the Appendix for details). $\sigma_{x_{t}}$ denotes the standard deviation of the cyclical component of variable $x_{t}$ and $corr(x_{t}, Y_{d,t})$ denotes the contemporaneous correlation between the cyclical component of $x_{t}$ and $Y_{d,t}$. The EME sample is comprised of: Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. The empirical relative volatility of wages is borrowed from Boz, Durdu, and Li (2015) and based on averages for Brazil, Ecuador, Malaysia, Mexico, Philippines, and Turkey due to limited data availability on quarterly labor earnings series. $tby$ 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). * denotes a targeted moment.

In addition, while not targeted, the model produces a relative volatility of wages greater than 1, which is consistent with available data for EMEs (recall Section 2), and a cyclical correlation between the unemployment rate and output of -0.62. Of note, while the model underestimates the relative volatility of wages in the data, Section 4.4 shows how allowing for endogenous household financial participation improves the fit of the model on this front without changing our main conclusions. Moreover, while not shown, the model generates a cyclical correlation between country interest rates and output of -0.42. The countercyclicality of country interest rates is a well-documented empirical fact in the EME business cycle literature (see, for example, Neumeyer and Perri, 2005, and Fernández and Gulan, 2015). All told, Table 3 confirms that our model captures broad features of EME business cycles.

As is well known in the labor search literature, standard search models cannot generate high unemployment volatility under conventional calibrations. Unsurprisingly, our model is not immune to this well-known limitation.\(^{17}\) We note that our robustness analysis considers a

\(^{17}\)We note that in our EME framework, assuming a calibration of the baseline model with a high con-
richer version of our baseline framework that endogenizes households’ financial participation in both household categories. As we show in Section 4.3.6, this richer model can quantitatively match the volatility of unemployment in the data and delivers the same conclusions regarding the effect of greater domestic financial participation as our benchmark model. As such, the fact that our benchmark framework generates low unemployment volatility relative to the data in no way affects the model mechanisms and, most importantly, is inconsequential for our main conclusions regarding the volatility effects of greater domestic financial participation.

4.3 Changes in Domestic Financial Participation

We consider the effects of increasing household financial participation alone, bolstering firm financial participation for a given EME household financial participation share, and a joint increase in both household and firm financial participation.

In the rest of the paper, we refer to the share of firm financial participation—that is, the share of $i$ firms, $N_i/N$—that the economy starts with before any changes in participation take place as the baseline share of firm participation.

4.3.1 Operationalization

Greater Household Financial Participation Only  Greater household participation is reflected in an exogenous increase in the share of $i$-household individuals, $\lambda$. Specifically, we increase $\lambda$ from an EME baseline of 0.42 to 0.96, where this last share represents the average for AEs (see Table 2 in Section 2).18

18 Of course, a change in household financial participation of such magnitude may be gradual and take time to materialize. Recent data on the evolution of household participation suggests that, on average, financial participation can increase by up to 6 percentage points per year in the average developing economy (World Bank World Development Indicators).
Greater Firm Financial Participation Only  An increase in the share of $i$-firms for a given share of household financial participation $\lambda$ is obtained by reducing the sunk entry cost of $i$ firms, $\psi_i$. Specifically, we reduce $\psi_i$ from its baseline EME value which, as noted in Section 4.1, matches a cost of creating a business of 15 percent of output per capita per World Bank Enterprise Survey data for our EME sample, to a value that generates a sunk entry cost for $i$ firms of 0.7 percent of output per capita in the new, AE financial-participation equilibrium. This last target for the sunk entry cost is consistent with the median cost of creating a business in AEs, implying that the reduction in $\psi_i$ we consider is empirically plausible. We note that in our quantitative experiments, the lowest value of $\psi_i$ we consider is never below $\psi_e$.

Joint Increase in Household and Firm Financial Participation  A joint increase in household and firm financial participation is obtained by increasing $\lambda$ and reducing $\psi_i$ in tandem by the same magnitudes discussed above.

Without loss of generality and for the sake of transparency, in what follows we center our discussion on the outcomes from greater household financial participation only and the outcomes from a joint increase in participation since this last case intuitively sheds light on the implications of an increase in firm financial participation only (indeed, the differences in outcomes between the household-participation-only case and the joint-participation case represent the outcomes from greater firm participation only).

4.3.2 Steady State Equilibria and Intuition

To highlight visually the steady-state impact of changes in household and firm participation, which sheds light on the implications for cyclical dynamics, consider two scenarios. In the first scenario, we characterize changes in the steady state as we increase household participation $\lambda$ alone. In the second scenario, we analyze how the steady state changes when we increase $\lambda$ while concurrently reducing $i$-firms’ sunk entry cost $\psi_i$ to match the cost of creating firms in AEs. This second scenario illustrates how greater household participation interacts with a complementary, more direct increase in firm participation that arises independently of
household participation.¹⁹

Figure 1 plots the steady-state of select variables for these two scenarios (variables are expressed in data-consistent terms and denoted with subscript \(d\) whenever appropriate; recall Section 3.5). The steady state due to a change in \(\lambda\) alone is depicted by the dashed red line (“No Change in \(\psi_i\”), while the steady state due to a joint change in \(\lambda\) and \(\psi_i\) is depicted by the solid blue line (“With Joint Reduction in \(\psi_i\”).

¹⁹Specifically for this experiment, we consider an incremental, gradual increase in \(\lambda\) of 0.02 that is accompanied by an incremental, gradual reduction in the sunk entry cost for \(i\) firms of 0.02 until both \(\lambda\) and \(\psi_i\) reach levels consistent with the share of household financial participation and the cost of creating a firm in AEs.
Two main results stand out. First, an increase in $\lambda$ alone generates an endogenous increase in the share of firm financial participation (that is, an increase in the share of $i$ firms $N_i/N$), which arises as a byproduct of the reallocation of resources towards $i$ households since the sunk entry cost for $i$ firms remains unchanged. Second, the consequences for firms’ labor productivity and the total number of firms differ dramatically depending on whether greater household financial participation $\lambda$ is accompanied by a commensurate reduction in $\psi_i$ that bolsters firm financial participation further independently from the change in $\lambda$. We delve deeper into these two outcomes and their importance below.

**Increase in Household Financial Participation $\lambda$ Alone** Intuitively, a larger $\lambda$ increases the resources that are available to $i$ firms (in particular, labor), and reduces the resources available for $e$ firms. The measure of unemployed individuals that can originally match with $e$ firms, $u_e$, drops dramatically as a greater share of individuals in the economy are now part of $i$ households. All else equal, the reduction in $u_e$ puts upward pressure on $e$ firms’ wages via a sharp increase in $e$-category market tightness. $e$ firms respond by reducing vacancies (and employment) and capital demand, which leads to a sharp equilibrium reduction in the number of $e$ firms and in $e$-category output.

Under the baseline share of $i$ firms of 0.20 consistent with EMEs, $e$ firms account for the bulk of firms and, to a somewhat lesser extent, total output, prior to the increase in household financial participation. As a result, the reduction in the number of $e$ firms in response to greater household participation is strong enough to partially offset the benefits to $i$ firms of having more individuals from $i$ households (and therefore the benefit of having more resources channeled to $i$ firms). This result is primarily reflected in the behavior of the total number of firms, which falls marginally, and unemployment, which remains very close to its baseline level despite the rise in labor demand by $i$ firms.\footnote{Specifically, the total number of firms in our baseline EME calibration is 63.6. An increase in $\lambda$ alone from its baseline (EME) level to AE levels decreases the total number of firms to 32.6, even though the share of $i$ firms increases with $\lambda$. The equilibrium reduction in the total number of firms is driven by the fall in $e$ firms.} Importantly, the sharp reallocation of individuals away from $e$ firms and towards $i$ firms ultimately translates into a slight fall in $i$-firm labor productivity (and, incidentally, in the value to $i$ firms of having a worker) but an increase in $e$-firm labor productivity ($i$-firm labor productivity falls from a
The reduction in $i$-firm labor productivity is rooted in the fact that the change in $i$-firm employment is quantitatively larger than the increase in $i$-firm capital as $\lambda$ increases. Along similar lines, $e$-firm labor productivity increases since the number of $e$ works drops sharply and by more than the reduction in $e$-firm capital demand. All told, an increase in $\lambda$ alone leads to an equilibrium with a larger share of $i$ firms and higher total consumption and output despite a fall in $i$-firm labor productivity.

**Increase in Household Participation $\lambda$ Alongside Lower $i$-Firm Sunk Entry Costs $\psi_i$**

Now consider how an increase in $\lambda$ accompanied by a concurrent reduction in $i$-firms’ sunk entry costs $\psi_i$ changes the steady state. Recall that a lower $\psi_i$ has a direct impact on firm financial participation by explicitly incentivizing $i$-firm creation. While the number of $i$ firms increases and the number of $e$ firms falls, the sharper increase in $i$-firm creation raises capital and labor demand. Employment and capital among $i$ firms and consumption among $i$ households both rise, and this ultimately increases total consumption and output. Critically, sectoral labor productivity (and the value of having an additional worker to firms) increases in the two firm categories and not in $e$ firms alone. *This stands in stark contrast with the changes under greater household participation alone, where $i$-firm labor productivity falls.*

The results in Figure 1 highlight two important issues. First, an increase in firm participation arising directly from lower sunk entry costs (as opposed to indirectly via greater household participation) is a key contributor to the increase in labor productivity in $i$ firms. This increase takes place because greater firm entry bolsters capital demand by $i$ firms (not shown) above and beyond the capital demand that arises from a larger $\lambda$ alone, thereby boosting $i$-firm output as well as labor productivity. In turn, the change in $\lambda$ alone is quantitatively more important in reallocating labor towards $i$ firms by increasing the supply of potential $i$ workers, with lower $i$-firm sunk entry costs playing a negligible role. All told, the combination of both effects amplifies the aggregate changes that result from increasing household participation alone. We revisit the response of $i$ firms’ steady-state labor productivity to a joint increase in financial participation when we discuss the intuition behind the business cycle effects of greater participation.
Interaction Between Household and Firm Financial Participation Figure 2 presents a comprehensive summary of our steady state results by plotting the steady state as we vary household financial participation $\lambda$ for different baseline shares of $i$ firms $N_i/N$ (denoted by “$N_i$ Share”), where these baseline firm shares are obtained by changing the sunk entry cost of $i$ firms $\psi_i$.

Three results from Figure 2 are worth noting. First, when $\lambda$ rises, the increase in output, consumption, the number of $i$ firms, and labor productivity are greater the higher the baseline $N_i$ share the economy starts with. Moreover, unemployment is decreasing in this share, so that an increase in $\lambda$ alone under a high-enough baseline $N_i$ share leads to a reduction in
unemployment. Second, an increase in firm financial participation via a reduction in $\psi_i$ for a given $\lambda$ leads to a sharp increase in the number of $i$ firms and to a moderate increase in the number of $e$ firms as well. This stands in contrast with the change in the number of firms resulting from a larger $\lambda$ alone or from the change in both $\lambda$ and $\psi_i$ discussed above. Also, as noted in our discussion of Figure 1, an increase in firm financial participation via a reduction in $\psi_i$ for a given $\lambda$ is associated with greater $i$-firm labor productivity, which drives the rise in total labor productivity shown in Figure 2.

Intuitively, $i$ households have three different asset classes that they can allocate resources to: physical capital (via investment), $i$ firms (via firm creation), and $e$ firms (via firm creation). All else equal, greater $i$-firm entry reduces individual-firm profits $d_i$ for existing $i$ firms. This adverse impact on individual $i$-firm profits pushes households to also devote resources to the creation of $e$ firms so as to optimally equate returns across those two asset classes. Since the number of firms increases in both categories, total profits from $i$ and $e$ firms (that is, $N_i d_i$ and $N_e d_e$) rise. The resulting increase in firm creation across categories bolsters capital and labor demand, leading to a greater number of $i$ firms and $e$ firms, greater consumption among both households, greater sectoral labor productivity, greater total consumption and output, and lower unemployment. An increase in $\lambda$ partially offsets some of these effects by reallocating a larger share of individuals towards $i$ firms. Finally, the lower is the baseline share of firm financial participation, the greater is the endogenous change in this share as $\lambda$ increases. Intuitively, increasing $\lambda$ has a larger effect on the share of $i$ firms (but not necessarily on the number of $i$ firms) for a low-enough baseline share of $i$ firms since the return to creating $i$ firms is higher relative to an equilibrium where the bulk of firms are already participating in the banking system, and the marginal return to an $i$ firm is lower. More broadly, Figure 2 sheds light on why it is critical to consider both changes in household participation and direct changes in firm participation as opposed to household participation alone.

4.3.3 Financial Participation Equilibria and Cyclical Dynamics

Figure 3 plots the relative volatility of consumption, the cyclical correlation between the trade balance-output ratio and output, the relative volatility of wages, and the relative
volatility of unemployment as we increase household financial participation $\lambda$ alone, and as we increase $\lambda$ while concurrently reducing the sunk entry cost for $i$ firms $\psi_i$. The changes in $\lambda$ and $\psi_i$ are the same ones we consider for Figure 1. The change in $\lambda$ alone is depicted by the dashed red line (“No Change in $\psi_i$”), while the joint change in $\lambda$ and $\psi_i$ is depicted by the solid blue line (“With Joint Reduction in $\psi_i$”).

Figure 3: Household Participation, Greater Firm Participation, and Cyclical Dynamics

**Consumption and Trade Balance-GDP Ratio Dynamics** Figure 3 shows that increasing household financial participation $\lambda$ alone: generates a mild *increase* in the relative volatility of consumption (which, incidentally, is still greater than 1); marginally reduces the countercyclicality of the trade balance; and leads to negligible reductions in the relative volatility of unemployment. Put differently, greater household participation alone does *not* bring EME business cycles—in particular, the relative volatility of consumption and the cyclicality of the trade balance-output ratio—closer to those of AEs. In contrast, increasing
\( \lambda \) while simultaneously reducing \( \psi_i \) generates a reduction in the relative volatility of consumption from an EME baseline of 1.26 to 0.90, and a change in the cyclical correlation of the trade balance-GDP ratio from -0.31 to 0.04 (of note, the absolute volatility of consumption falls by 30 percent). Importantly, recall from Table 1 in Section 2 that in the data for AEs, the relative volatility of consumption is 0.92 and the cyclical correlation of the trade balance-GDP ratio is 0.01. Therefore, an increase in household participation accompanied by a disciplined reduction in \( \psi_i \)-firm sunk entry costs that explicitly bolsters firm participation can quantitatively generate consumption and trade balance dynamics consistent with those of AEs. The Appendix presents results for versions of the baseline model (1) calibrated to a higher elasticity of substitution between output categories (Figure A1); (2) with sectoral differences in vacancy posting costs (Figure A2); (3) with sectoral differences in employment separation probabilities (Figure A3), and (4) with a higher capital share for \( e \) firms (Figure A4). Our main findings remain unchanged under these alternative calibrations of the benchmark model.

Relative Wage and Unemployment Volatility

Table 1 in Section 2 shows that AEs exhibit a relative volatility of unemployment that is more than twice as high as that of EMEs, and a relative volatility of wages less than 1. Our experiments show that greater household and firm domestic financial participation puts downward pressure on the relative volatility of wages, which is consistent with AEs having lower relative wage volatility than EMEs (see Figure 3). However, amid greater participation, the relative volatility of unemployment is also lower, suggesting that other structural features of AEs unrelated to domestic financial participation may explain why the relative volatility of unemployment is higher in AEs than in EMEs.

A key difference between AE and EME labor markets is the presence of unemployment insurance (UI) benefits in AEs, and the absence of these benefits for a large share of workers in EMEs given the breadth of labor informality in EMEs. To determine whether the presence of UI benefits in AEs is relevant for our findings, we conduct an additional experiment where we implement a joint increase in household and firm financial participation (that is, a higher \( \lambda \) alongside a lower \( \psi_i \), which already delivers factual consumption and trade balance
dynamics for AEs) in a scenario in which UI benefits for households are at the level of AEs. Specifically, we assume that these benefits represent 65 percent of steady-state wages, which is in line with average replacement rates in our AE sample.

Table 4: Business Cycle Moments–Data, Benchmark Model, Greater Financial Participation, and Relative Unemployment Volatility

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Data AE</th>
<th>Data EME</th>
<th>Benchmark (EME) Model</th>
<th>Higher λ Lower ψ_i</th>
<th>Higher λ Lower ψ_i, and UI Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>σ_{c_i,t}/σ_{Y_{i,t}}</td>
<td>0.92</td>
<td>1.21</td>
<td>1.26*</td>
<td>0.90</td>
<td>0.87</td>
</tr>
<tr>
<td>σ_{i_i,t}/σ_{Y_{i,t}}</td>
<td>3.63</td>
<td>3.28</td>
<td>3.28*</td>
<td>1.98</td>
<td>1.98</td>
</tr>
<tr>
<td>σ_{w_{i,t}}/σ_{Y_{i,t}}</td>
<td>0.87</td>
<td>2.67</td>
<td>1.27</td>
<td>1.06</td>
<td>0.96</td>
</tr>
<tr>
<td>σ_{u_i}/σ_{Y_{i,t}}</td>
<td>7.47</td>
<td>3.41</td>
<td>0.29</td>
<td>0.16</td>
<td>0.93</td>
</tr>
<tr>
<td>corr(c_{i,t},Y_{i,t})</td>
<td>0.52</td>
<td>0.72</td>
<td>0.77</td>
<td>0.86</td>
<td>0.85</td>
</tr>
<tr>
<td>corr(i_{i,t},Y_{i,t})</td>
<td>0.68</td>
<td>0.71</td>
<td>0.87</td>
<td>0.94</td>
<td>0.92</td>
</tr>
<tr>
<td>corr(u_{i,t},Y_{i,t})</td>
<td>-0.61</td>
<td>-0.39</td>
<td>-0.62</td>
<td>-0.67</td>
<td>-0.43</td>
</tr>
<tr>
<td>corr(tby_{i,t},Y_{i,t})</td>
<td>0.01</td>
<td>-0.31</td>
<td>-0.31*</td>
<td>0.04</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Notes: Second moments are obtained using HP-filtered data with smoothing parameter 1600 and represent averages over each country sample using data from 1990Q1 to 2017Q4 for EMEs and data from 1980Q1 to 2017Q4 for AEs (time span varies by country). σ_{x_t} denotes the standard deviation of the cyclical component of variable x_t and corr(x_t, Y_{d,t}) denotes the contemporaneous correlation between the cyclical component of x_t and Y_{d,t}. The AE sample is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, Netherlands, New Zealand, Norway, Sweden, and Switzerland. The EME sample is comprised of: Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. The relative volatility of wages is borrowed from Boz, Durdu, and Li (2015) and based on averages of Australia, Austria, Belgium, Canada, Denmark, Finland, New Zealand, Norway, and Sweden for the AE sample, and Brazil, Ecuador, Malaysia, Mexico, Philippines, and Turkey for the EME sample due to limited data availability on quarterly labor earnings series. 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). * denotes a targeted moment.

Table 4 shows that accounting for this labor market feature of AEs and implementing a joint increase in household and firm financial participation (with greater firm participation obtained via lower sunk entry costs for i firms) can qualitatively replicate the fact that the relative volatility of unemployment in AEs (0.93 with UI benefits in the model) is higher than the corresponding volatility in EMEs (0.29 in the model). This takes place in a context where the model continues to generate cyclical consumption and trade-balance dynamics consistent with AEs under greater joint domestic financial participation. Unsurprisingly, the model continues to exhibit the Shimer puzzle under this alternative calibration, but including UI benefits alongside greater financial participation does generate higher relative unemployment.
volatility compared to the baseline EME model, which is qualitatively consistent with the differential unemployment dynamics between EMEs and AEs. Moreover, the same joint increase in household and firm financial participation concurrently with UI benefits brings the relative volatility of wages below 1, which is empirically and quantitatively consistent with AEs as well (recall Table 1).

All told, while a disciplined increase in financial participation by both firms and households can bring the relative volatility of consumption and the cyclicity of the trade balance-GDP ratio quantitatively close to that of AEs, generating labor market dynamics consistent with those of AEs requires introducing UI benefits alongside the greater financial participation to replicate labor market as well as aggregate dynamics that resemble those of AEs.

**Interaction between Household and Firm Financial Participation** For completeness, we show explicitly how household and firm financial participation interact and how this interaction influences cyclical dynamics.

Figure 4 plots the same variables as Figure 3 as we vary \( \lambda \) for different baseline shares of firm participation \( N_i/N \) (denoted by “\( N_i \) Share” in Figure 4). The increase in the share of firm financial participation for a given \( \lambda \) is once again obtained by reducing the sunk entry cost of \( i \)-firms from its baseline for EMEs to a level that replicates the median cost of creating a firm in AEs. The Figure clearly illustrates how the strength of greater firm participation plays a fundamental role in smoothing relative consumption fluctuations and changing the cyclicity of the trade balance, and how increasing \( \lambda \) enhances the volatility-reducing effects of greater firm financial participation that is rooted in a reduction in \( i \)-firms’ sunk entry costs.
4.3.4 Cyclical Dynamics and Economic Intuition

Figures 5 and 6 shed light on the economic mechanisms behind the volatility results from Figures 3 and 4 by showing impulse responses to temporary adverse aggregate productivity and interest rate shocks, respectively. These figures show the response of (1) the baseline (EME) economy (red dashed line), (2) the same economy under $\lambda = 0.96$ (green solid line with circles), and (3) the same economy with both $\lambda = 0.96$ and a lower sunk entry cost for $i$ firms that matches the median cost of creating a firm in small open AEs (blue solid line).\footnote{Versions (2) and (3) use the same parameter values as (1) except for those parameters that change as part of the experiments ($\lambda$ or $\psi_i$ or both). Using recalibrated versions of the baseline model under a higher $\lambda$ or a higher $\lambda$ and lower $\psi_i$ delivers identical conclusions.}
All model quantities are expressed in data-consistent terms whenever appropriate.

**Negative Aggregate Productivity Shock**  As shown in Figure 5, greater household participation $\lambda$ has relatively small effects on the response to an adverse aggregate productivity shock: the economy exhibits a somewhat more persistent contraction in output but otherwise similar dynamics relative to the baseline (EME) economy.

![Figure 5: Response to a One Standard Deviation Reduction in Aggregate Productivity (Quarters after Shock)](image)

In contrast, a combination of greater household participation alongside greater firm participation (obtained via lower sunk entry costs for $i$ firms) sharply curtails the responses of sectoral and total unemployment, consumption, and investment and, to a lesser extent, total
output. The economic intuition is straightforward: as noted above, the joint increase in household and firm participation increases steady-state labor productivity for both $i$ and $e$ firms, which translates into higher steady-state values of having a worker in both categories ($J_{e,t}$ and $J_{i,t}$). This last steady-state outcome renders vacancies and employment across firm categories less sensitive to productivity shocks, which feeds into wage dynamics (via market tightness), capital demand, individual-firm profits, and ultimately firm creation. As a result, household and total consumption, investment, the trade balance-output ratio, and output all exhibit more subdued responses to a fall in aggregate productivity. All told, conditional on productivity shocks, bolstering both household and firm financial participation reduces sectoral and aggregate fluctuations.

**Positive Interest Rate Shock**  As shown in Figure 6, the response of the economy to a temporary increase in foreign interest rates is qualitatively similar to the response to productivity shocks. However, as is well known from the EME business cycle literature, these shocks are of fundamental importance for generating a relative volatility of consumption greater than 1 in EMEs.

With greater household participation alone, total consumption dynamics are primarily driven by $i$-households' consumption since $i$ households now account for the bulk of household members in the economy. Given that a larger fraction of household members (and consumption) becomes exposed to interest rate shocks relative to the baseline (EME) economy, total consumption becomes somewhat more responsive to interest rate shocks.
In addition, note that the contraction of total output becomes more persistent. Intuitively, while greater household participation generates an endogenous increase in the number of $i$ firms, recall that steady-state $i$-firm labor productivity falls slightly relative to the baseline economy. As such, any stabilizing (positive) effects from having more resources being allocated to $i$ firms as a result of having more $i$-household individuals is offset by the endogenous reduction in $i$-firm labor productivity. The net effect on labor productivity from increasing $\lambda$ to AE levels ultimately explains why the response of equilibrium sectoral vacancies (and employment), wages, and firms under a larger $\lambda$ is very similar to the baseline (EME) economy (implying that relative consumption volatility increases mildly and
the volatility of unemployment remains virtually unchanged), despite a large reallocation of workers towards $i$ firms (recall Figure 1). Moreover given that $i$-firm output accounts for the bulk of total output under $\lambda = 0.96$, the recovery in total output becomes more sluggish.

A joint increase in household participation (via a higher $\lambda$) and firm participation (via a lower sunk entry cost $\psi_i$) increases steady-state sectoral productivity and the value to firms of having a worker across the board (recall Figures 1 and 2). This higher steady-state labor productivity stabilizes firms’ hiring and capital demand decisions in the presence of shocks. As a result, sectoral vacancies, market tightness, and wages respond less to interest rate innovations, which feeds into household consumption and total consumption. This stabilizing effect more than offsets the fact that a larger share of individuals are exposed to interest rate shocks. The end result is smoother labor market and macro aggregate responses to interest rate shocks, which are ultimately reflected in lower volatility in consumption, wages, and unemployment, and in a non-trivial reduction in the countercyclicality of the trade balance-output ratio. Of note, were we to include UI benefits as part of the joint increase in household and firm financial participation, unemployment would become more responsive to shocks, but the effects of greater steady-state $i$-firm labor productivity noted earlier would remain strong enough to reduce consumption and wage fluctuations relative to the baseline (EME) economy, and would deliver both labor market and aggregate dynamics consistent with AEs.

### 4.4 Endogenous Household Financial Participation

Our baseline model follows much of the business cycle literature with household heterogeneity by assuming exogenous measures of household members in each household category. Section A.5 of the Appendix presents the details of a richer version of our baseline framework where the household financial participation share is endogenized (we refer to this endogenous share as $\lambda_i$ below). In particular, we endogenize this share by introducing endogenous labor force participation in both household categories. As discussed in detail in the Appendix, this richer framework effectively allows us to have two endogenous measures of household members—those who belong to households that participate in the banking system and those who do not. In turn, this environment accommodates endogenous changes in the share of household
members that participate in the banking system, and delivers a framework with endogenous household and firm financial participation.

Table 5: Business Cycle Moments–Data, Model with Endogenous Household Participation and Participation Equilibria

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Data</th>
<th>Data</th>
<th>Endog. Part.</th>
<th>Endog. Part.,</th>
<th>Endog. Part.,</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AE</td>
<td>EME</td>
<td>Model</td>
<td>Model</td>
<td>Model</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EME</td>
<td>Higher HH Part.</td>
<td>Higher HH Part.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calibration</td>
<td>and Lower Entry Costs</td>
<td>and Lower Entry Costs</td>
</tr>
<tr>
<td>( \sigma_{c_{d,t}} / \sigma_{Y_{d,t}} )</td>
<td>0.92</td>
<td>1.21</td>
<td>1.71</td>
<td>0.96</td>
<td>0.87</td>
</tr>
<tr>
<td>( \sigma_{i_{d,t}} / \sigma_{Y_{d,t}} )</td>
<td>3.63</td>
<td>3.28</td>
<td>3.28</td>
<td>1.79</td>
<td>1.69</td>
</tr>
<tr>
<td>( \sigma_{w_{d,t}} / \sigma_{Y_{d,t}} )</td>
<td>0.87</td>
<td>2.67</td>
<td>2.02</td>
<td>1.84</td>
<td>0.89</td>
</tr>
<tr>
<td>( \sigma_{u_{t}} / \sigma_{Y_{d,t}} )</td>
<td>7.47</td>
<td>3.41</td>
<td>3.42</td>
<td>1.79</td>
<td>7.20</td>
</tr>
<tr>
<td>( corr(c_{d,t}, Y_{d,t}) )</td>
<td>0.52</td>
<td>0.72</td>
<td>0.64</td>
<td>0.68</td>
<td>0.71</td>
</tr>
<tr>
<td>( corr(i_{d,t}, Y_{d,t}) )</td>
<td>0.68</td>
<td>0.71</td>
<td>0.88</td>
<td>0.92</td>
<td>0.88</td>
</tr>
<tr>
<td>( corr(u_{t}, Y_{d,t}) )</td>
<td>-0.61</td>
<td>-0.39</td>
<td>-0.75</td>
<td>-0.73</td>
<td>-0.85</td>
</tr>
<tr>
<td>( corr(tby_{t}, Y_{d,t}) )</td>
<td>0.01</td>
<td>-0.31</td>
<td>-0.28</td>
<td>0.20</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Notes: Second moments are obtained using HP-filtered data with smoothing parameter 1600 and represent averages over each country sample using data from 1994Q1 to 2017Q4 for EMEs and data from 1980Q1 to 2017Q4 for AEs (time span varies by country). \( \sigma_{x_{t}} \) denotes the standard deviation of the cyclical component of variable \( x_{t} \) and \( corr(x_{t}, Y_{d,t}) \) denotes the contemporaneous correlation between the cyclical component of \( x_{t} \) and \( Y_{d,t} \). The AE sample is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, Netherlands, New Zealand, Norway, Sweden, and Switzerland. The EME sample is comprised of: Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. The relative volatility of wages is borrowed from Boz, Durdu, and Li (2015) and based on averages of Australia, Austria, Belgium, Canada, Denmark, Finland, New Zealand, Norway, and Sweden for the AE sample, and Brazil, Ecuador, Malaysia, Mexico, Philippines, and Turkey for the EME sample due to limited data availability on quarterly labor earnings series. \( tby \) 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).

Table 5 summarizes the results from conducting the same experiments outlined in Section 4.3.1 using this richer framework. Of note, an added benefit of having endogenous household participation is that our richer model can quantitatively match the volatility of unemployment in the data under a plausible calibration (this traces back to the presence of endogenous labor force participation). Table 5 confirms that all our main results, including those for unemployment volatility, continue to hold, proving that neither assuming an exogenous household financial participation share nor being unable to capture the empirical
volatility of unemployment in our baseline model is a limiting factor for our main conclusions. Figure A5 in Appendix A.5 presents the counterpart of Figure 3 for the model with endogenous firm and household participation).

Importantly, Table 5 also shows that allowing for UI benefits at the level of AEs alongside joint increases in firm and household participation generates labor market dynamics and business cycles that are now quantitatively consistent with those of AEs in a comprehensive way: compared to EMEs, the model delivers a higher relative unemployment volatility, relative volatilities of wages and consumption smaller than 1, and a procyclical trade balance-output ratio. Moreover, the joint increase in household and firm participation alongside UI benefits generates non-targeted relative volatilities of unemployment and wages that are very close to the ones in AEs (a relative volatility of unemployment of 7.20 in the model versus 7.43 in the data, and a relative volatility of wages of 0.89 in the model versus 0.87 in the data). Thus, a richer version of our benchmark model that incorporates endogenous household financial participation performs quantitatively better without altering any of the key channels and findings from the simpler, benchmark model.

5 Conclusion

Business cycles in emerging economies (EMEs) are characterized by having a volatility of consumption and wages relative to GDP greater than 1, a lower relative unemployment volatility than AEs, and a countercyclical trade balance. In contrast, advanced economies (AEs) have a relative volatility of consumption and wages smaller than one, a greater relative unemployment volatility than EMEs, and an acyclical trade balance. Moreover, EMEs exhibit starkly lower average shares of domestic household and firm financial participation in the banking system relative to AEs, as well as large shares of employment in firms that do not participate in the banking system.

We build a small-open-economy (SOE) RBC model with endogenous firm entry, equilibrium unemployment, and household and firm heterogeneity in participation in the domestic banking system and calibrate it to match the above facts for EMEs. We use the model to answer the following two questions: can greater household and firm domestic financial
participation bring EME labor market dynamics and business cycles closer to those of AEs, and does the margin of domestic financial participation (household vs. firm) matter?

Our analysis shows that greater household financial participation alone generates mild increases in relative consumption volatility and no changes in trade-balance dynamics. In contrast, a joint increase in household and firm financial participation starting from an EME context can quantitatively generate consumption and trade-balance dynamics typically associated with AEs. In addition, we find that joint increases in household and firm domestic financial participation produce smoother labor market dynamics. Introducing unemployment benefits alongside greater firm and household financial participation, as is empirically the case in AEs, delivers both labor market and aggregate dynamics consistent with those of AEs. An important issue that our analysis abstracts from in the absence of a microfounded banking system is the potential impact of greater domestic financial participation on financial stability, which is an important avenue for future research.
References


Is Informal Normal? Towards More and Better Jobs in Developing Countries, OECD
Development Centre, Ed. Johannes P. Jütting and Juan R. de Laiglesia.

for Growth.”


A Online Appendix

A.1 Data Sources and Details

Table 1 The following table lists the countries and relevant sample periods used for the construction of Table 1. Important note: the column “Sample Period UR” shows the sample period for data on the unemployment rate for EMEs.

<table>
<thead>
<tr>
<th>Country</th>
<th>Sample Period</th>
<th>Country</th>
<th>Sample Period</th>
<th>Sample Period UR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1996Q1:2017Q4</td>
<td>Colombia</td>
<td>2001Q1:2017Q4</td>
<td>2001Q1:2017Q4</td>
</tr>
<tr>
<td>Sweden</td>
<td>1993Q1:2017Q4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>1980Q1:2017Q4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: International Monetary Fund International Financial Statistics.

Table 2 The facts are based on data from 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) and the European Central Bank’s SAFE 2011 Survey. The sample of AEs with data on firms with bank credit is comprised of: Australia, Austria, Belgium, Denmark, Finland, Luxembourg, Netherlands, Norway, Sweden, and Switzerland based on data availability. The AE country sample for the remaining measures is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, Luxembourg, New Zealand, Netherlands, Norway, Sweden, and Switzerland (data for some countries may not be available for particular variables). The EME country sample is comprised of: Brazil, Colombia, Ecuador, 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. As such, the evidence in Table 2 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 and bank overdrafts, averaged over 2011 (for related evidence on firms’ reliance on bank loans in Europe, see Hoffmann and Sorensen, 2015). The total share of firms with bank loans for EMEs is computed using evidence on micro, very small, small and medium formal firms and informal (or unregistered) firms (which represent the bulk of firms) having loans from the IFC database. The total share of firms with bank loans in each EME is obtained by adding the shares of formal and informal firms with bank loans.

A.2 Aggregation in Benchmark Model

To determine the equilibrium real relative price for each monopolistically-competitive retail 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 \( N_{j,t} \) retail 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

\[
\rho_{j,t} = \frac{P_{j,t}}{P_t} N_{j,t}^{\frac{1}{1-\varepsilon}}.
\]
Similarly, recall that retail output at sectoral level is given by
\[ Y_{j,t} = \left( \int_{\omega_j \in \Omega_j} y_{j,t}(\omega_j) \frac{1}{\epsilon} d\omega_j \right)^{\frac{\epsilon}{\epsilon-1}}. \]
Imposing symmetry, we have
\[ Y_{j,t} = y_{j,t} \left( \int_{\omega_j \in \Omega_j} 1 d\omega_j \right)^{\frac{1}{\epsilon-1}}, \]
Then, since there are \( N_{j,t} \) retail firms operating in firm category \( j \) in period \( t \), the above expression becomes
\[ Y_{j,t} = y_{j,t} N_{j,t}^{\frac{1}{\epsilon-1}}. \]

A.3 Symmetric Equilibrium: Benchmark Model

Taking the stochastic processes \( \{z_t, z_{r,t}\} \) as given, the allocations and prices \( \{Y_t, mc_{i,t}, mc_{e,t}\}, \{N_{E,et}, N_{E,it}, N_{i,t}, N_{e,t}, n_{i,t}, n_{e,t}, k_{i,t}, k_{e,t}, k_t, v_{i,t}, v_{e,t}, w_{i,t}, w_{e,t}, r_{i,t}, r_{e,t}, b_t, b^{*}_t, \rho_{i,t}, \rho_{e,t}, Y_{i,t}, Y_{e,t}\} \), and \( \{c_{i,t}, c_{e,t}, P_{i,t}, P_{e,t}, P_{t}\} \) satisfy

\[ Y_t = \left[ (1 - \alpha_y) \frac{\phi_y}{\phi_y-1} (Y_{i,t})^{\frac{\phi_y-1}{\phi_y}} + \alpha_y \frac{1}{\phi_y} (Y_{e,t})^{\frac{\phi_y-1}{\phi_y}} \right]^\frac{\phi_y}{\phi_y-1}, \quad (22) \]
\[ \rho_{i,t} = \left( \frac{\epsilon}{\epsilon-1} \right) mc_{i,t}, \quad (23) \]
\[ \rho_{e,t} = \left( \frac{\epsilon}{\epsilon-1} \right) mc_{e,t}, \quad (24) \]
\[ \psi_i \left[ 1 - \xi_b + \xi_b R_{i,t} \right] = (1 - \delta) \mathbb{E}_t \Xi^i_{t+1|t} \left[ d_{i,t+1} + \psi_i \left[ 1 - \xi_b + \xi_b R_{i,t+1} \right] \right], \quad (25) \]
\[ \psi_e = (1 - \delta) \mathbb{E}_t \Xi^i_{t+1|t} \left[ d_{e,t+1} + \psi_e \right], \quad (26) \]
\[ [1 - \xi_b + \xi_b R_{i,t}] = \mathbb{E}_t \Xi^i_{t+1|t} \left[ r_{t+1} + (1 - \delta) \left[ 1 - \xi_b + \xi_b R_{i,t+1} \right] \right], \quad (27) \]
\[ N_{i,t} = (1 - \delta) (N_{i,t-1} + N_{E,it-1}), \quad (28) \]
\[ N_{e,t} = (1 - \delta) (N_{e,t-1} + N_{E,et-1}), \quad (29) \]
\[ n_{i,t+1} = (1 - \rho_n^i) (n_{i,t} + v_{i,t} q(\theta_{i,t})), \quad (30) \]
\[ n_{e,t+1} = (1 - \rho_n^e) (n_{e,t} + v_{e,t} q(\theta_{e,t})), \quad (31) \]
\[ r_{i,t} = \alpha_i m c_{i,t} n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i-1}, \]
\[ r_{e,t} = \alpha_c m c_{e,t} n_{e,t}^{1-\alpha_c} k_{e,t}^{\alpha_c-1}, \]
\[ k_t = k_{i,t} + k_{e,t}, \]
\[ r_{e,t} = r_{i,t} = r_t, \]
\[ \frac{\kappa}{q(\theta_{i,t})} = (1-\delta)(1-\rho_n^i)E_t \Xi_{t+1}^i \left\{ (1-\alpha_i) m c_{i,t+1} n_{i,t+1}^{\alpha_i} k_{i,t+1}^{\alpha_i-1} - w_{i,t+1} + \frac{\kappa}{q(\theta_{i,t+1})} \right\}, \]
\[ \frac{\kappa}{q(\theta_{e,t})} = (1-\delta)(1-\rho_n^e)E_t \Xi_{t+1}^e \left\{ (1-\alpha_e) m c_{e,t+1} n_{e,t+1}^{\alpha_e} k_{e,t+1}^{\alpha_e-1} - w_{e,t+1} + \frac{\kappa}{q(\theta_{e,t+1})} \right\}, \]
\[ w_{i,t} = \eta \left[ (1-\alpha_i) m c_{i,t} z_t [n_{i,t}]^{-\alpha_i} [k_{i,t}]^{\alpha_i-1} + \kappa \theta_{i,t} \right] + (1-\eta) \chi_i, \]
\[ w_{e,t} = \eta \left[ (1-\alpha_e) m c_{e,t} z_t [n_{e,t}]^{-\alpha_e} [k_{e,t}]^{\alpha_e-1} \right] + (1-\eta) \chi_e + \eta \left[ \frac{\kappa}{q(\theta_{e,t})} - (1-\delta)(1-\rho_n^e) (1-f(\theta_{e,t})) E_t \Xi_{t+1}^e \right], \]
\[ u'(c_{i,t}) = R_{t+1} \beta E_t u'(c_{i,t+1}), \]
\[ 1 = R_{e,t+1} \beta E_t \frac{u'(c_{i,t+1})}{u'(c_{i,t})} + \eta b_{t+1}^*, \]
\[ \rho_{i,t} = \frac{P_{i,t}}{P_t} N_{i,t}^{1/\gamma_y}, \]
\[ \rho_{e,t} = \frac{P_{e,t}}{P_t} N_{e,t}^{1/\gamma_y}, \]
\[ c_{e,t} = w_{e,t} n_{e,t} + \chi_e u_{e,t}, \]
\[ Y_{i,t} = N_{i,t}^{1/\gamma_y} y_{i,t} = N_{i,t}^{1/\gamma_y} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i}, \]
\[ Y_{e,t} = N_{e,t}^{1/\gamma_y} y_{e,t} = N_{e,t}^{1/\gamma_y} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e}, \]
\[ Y_t = c_{e,t} + c_{i,t} + i_t + \kappa V_{e,t} + \kappa V_{i,t} + \psi_e N_{E,e,t} + \psi_i N_{E,i,t} + R_{e,t} b_t^* - b_{t+1}^* + \frac{\eta b_{t+1}^*}{2} (b_{t+1}^*)^2, \]
\[ P_{i,t}/P_t = (1-\alpha_y)^{1/\gamma_y} \left( Y_t / Y_{i,t} \right)^{1/\gamma_y}, \]
\[ P_{e,t}/P_t = c_{\alpha_y} \left( Y_t / Y_{e,t} \right)^{1/\gamma_y}, \]
\[ P_t = \left[ (1-\alpha_y) (P_{i,t})^{1-\gamma_y} + \alpha_y (P_{e,t})^{1-\gamma_y} \right]^{1/(\gamma_y-1)}, \]
where \( J_{e,t} = (1 - \alpha_e)mc_{e,t}z_t[n_{e,t}]^{-\alpha} [k_{e,t}]^{1 - \alpha} - w_{e,t} + (1 - \delta)(1 - \rho_n)\Xi_t \Xi_{t+1} | J_{e,t+1} \) and given the definitions of the stochastic discount factors, the matching probabilities, and total unemployment, \( u_t = 1 - L_{e,t} - L_{i,t} \).

### A.4 Robustness Checks

**Higher Elasticity of Substitution Parameter \( \phi_y = 7 \)** Relative to the baseline calibration in the main text, we assume that output between firm categories is more substitutable and set \( \phi_y = 7 \) (versus \( \phi_y = 5 \) in the baseline calibration).

![Image](image-url)  

Figure A1: Business Cycle Volatility and Participation Equilibria (\( \phi_y = 7 \))
**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).

![Figure A2: Business Cycle Volatility and Participation Equilibria ($\kappa_e < \kappa_i$)](image)

**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 example,
Bosch and Maloney, 2008)). Specifically, we assume that $\rho_n^e = 0.06$ and $\rho_n^i = 0.03$.

Figure A3: Business Cycle Volatility and Participation Equilibria, Different Employment Separation Probabilities

**Higher Capital Share for e Firms** Relative to the baseline calibration in the main text, we assume that the capital share for $e$ firms is $\alpha_e = 0.25$. This assumption reduces the labor-productivity differential between $i$ and $e$ firms.
Figure A4: Business Cycle Volatility and Participation Equilibria, Higher Capital Share for e Firms
A.5 Endogenizing Household Financial Participation

A.5.1 Model Structure

The baseline model follows the business cycle literature that considers household heterogeneity and assumes that the fraction of household members in each household is exogenous. Specifically, in our baseline framework, an exogenous fraction of members in the economy $0 < \lambda < 1$ belongs to financially-included ($i$) households, while the share of $i$ firms is endogenously determined. To determine whether having an exogenous share of household members that participates in the domestic banking system is important for our main findings, we modify our baseline model to endogenize this share.

To do so tractably, we expand our baseline model to incorporate endogenous labor force participation in the spirit of the one-household search model in Arsenneau and Chugh (2012) into both household categories. The advantage of this approach is that it effectively allows us to have an endogenous measure of household members who participate in the banking system: since the labor force of each household category is now endogenous, the measure of individuals in each household category who are employed or unemployed and searching—that is, the labor-force measure in each household category—effectively represents the measure of household members who participate in the banking system as well (once again, this stands in contrast with the baseline model, where the measure of household members in the labor force is exogenous). Of course, each household category also has household members who are outside of the labor force. This does not represent a limitation to our analysis since what ultimately matters for our purposes is how the endogenous composition of the labor force between household categories changes amid changes in financial participation.

In what follows, we describe the changes to the baseline model only. To keep notation tractable and avoid excessive subscripts in a richer environment, we assume that representative perfectly-competitive intermediate-goods firms using capital and labor produce in each category $j \in \{e, i\}$ and sell their output to monopolistically-competitive firms (whose entry is endogenous) in their respective categories at price $mc_{j,t}$. This setup is similar to Cacciatore, Duval, Fiori, and Ghironi (2016a,b) and does not change our main conclusions.
A.5.2 Households

Following Arseneau and Chugh (2012), households can make labor force participation decisions for their members. Without loss of generality and to remain close to their framework, we adopt their labor market timing assumption whereby new matches become productive within the same period. This assumption is inconsequential for our main conclusions but makes our labor market structure readily comparable to Arseneau and Chugh. The total population is fixed and normalized to 1, so the level of labor force participation is also the labor force participation rate.

Financially-Included (i) Households and Firm Creation Similar to the baseline model in the main text, financially-included (i) households own all firms and firms that start in a given category (e or i) cannot transition into a different category after they enter the market and start producing. As noted in the main text, this last fact is consistent with evidence on firm entry by registered firms from the World Bank Enterprise Surveys.

Formally, in addition to i households choosing consumption $c_{i,t}$, total capital accumulation $k_{t+1}$, bank deposits $b_{t+1}$, foreign debt holdings $b_{t+1}^*$, the desired number of e and i firms next period, $N_{e,t+1}$ and $N_{i,t+1}$, and the number of corresponding new e and i firms, $N_{E,et}$ and $N_{E,it}$, needed to reach the desired firm targets (as was the case in the main text), they also choose their desired target for employed household members $n_{i,t}$ in firm category $i$ and the measure of searchers $u_{i,t}$ required to reach that target to maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t [u(c_{i,t}) - h(lf_{p_{i,t}})]$$

subject to the budget constraint:

$$c_{i,t} + b_{t+1} + R_{c,t} b_t^* + \frac{\psi_e}{2} (b_{t+1}^*)^2 + (\psi_i N_{E,it} + i_t) [1 - \xi_b + \xi_b R_t] + \psi_e N_{E,et} = R_t b_t + b_{t+1}^* + w_{i,t} n_{i,t} + \chi_i (1 - f(\theta_{i,t})) u_{i,t} + d_{i,t} N_{i,t} + d_{e,t} N_{e,t} + r_t k_t,$$

the laws of motion for i and e firms

$$N_{i,t+1} = (1 - \delta) (N_{i,t} + N_{E,it});$$

and

$$N_{e,t+1} = (1 - \delta) (N_{e,t} + N_{E,et});$$
and their perceived evolution of employment (following Arseneau and Chugh (2012)’s timing)
\[ n_{i,t} = (1 - \rho_n^e)n_{i,t-1} + u_{i,t}f(\theta_{i,t}), \]  
where \( h(lfp_{i,t}) \) is increasing and convex in the labor force participation of \( i \) households, 
\[ lfp_{i,t} = (1 - f(\theta_{i,t}))u_{i,t} + n_{i,t}. \]

The first-order conditions with respect to the variables in the baseline model remain
unchanged. In turn, the first-order condition that determines \( i \) household members’ partici-
pation is given by
\[ h'(lfp_{i,t}) \frac{u'(c_{i,t})}{u'(c_{i,t})} = \left[ f(\theta_{i,t}) \left[ w_{i,t} + (1 - \rho_n^i)\mathbb{E}_t \Xi_{t+1|t} \left( \frac{1-f(\theta_{i,t+1})}{f(\theta_{i,t+1})} \left( \frac{h'(lfp_{i,t+1})}{u'(c_{i,t+1})} - \chi_i \right) \right) \right] + (1 - f(\theta_{i,t}))\chi_i \right]. \]

where \( \Xi_{t+1|t} = \beta u'(c_{i,t+1})/u'(c_{i,t}) \) and \( h'(lfp_{i,t}) \) denotes the marginal disutility from partic-
ipation. This expression is identical to the one in Arseneau and Chugh (2012), except for
the fact that our environment has two household categories. Importantly, we assume that
the relevant (endogenous) measure of financially-included household members that matters
for our purposes is given by \( lfp_{i,t} \).

**Financially-Excluded (e) Households** Financially-excluded (e) households consume
their labor income. They choose consumption \( c_{e,t} \), the desired number of household mem-
bers employed in e firms, \( n_{e,t} \), and the searchers needed to reach that target \( u_{e,t} \) to maximize
\[ \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t [u(c_{e,t}) - h(lfp_{e,t})] \] subject to the budget constraint
\[ c_{e,t} = w_{e,t}n_{e,t} + \chi_e(1 - f(\theta_{e,t}))u_{e,t}, \]
and their perceived evolution of employment (following Arseneau and Chugh’s timing)
\[ n_{e,t} = (1 - \rho_n^e)n_{e,t-1} + u_{e,t}f(\theta_{e,t}), \]
where \( h(lfp_{e,t}) \) is increasing and convex in the labor force participation of e households,
\[ lfp_{e,t} = (1 - f(\theta_{e,t}))u_{e,t} + n_{e,t}. \]
The first-order condition that determines \( e \) household members' participation is given by

\[
\frac{h'(lp_{e,t})}{u'(c_{e,t})} = \left[ f(\theta_{e,t}) \left[ w_{e,t} + (1 - \rho_{e}^X) \mathbb{E}_{t} \Xi_{e,t+1} \frac{1-f(\theta_{e,t+1})}{f(\theta_{e,t+1})} \left( \frac{h'(lp_{e,t+1})}{u'(c_{e,t+1})} - \chi_e \right) \right] + (1 - f(\theta_{e,t})) \chi_e \right],
\]

(58)

where \( \Xi_{e,t+1} = \beta u'(c_{e,t+1})/u'(c_{e,t}) \) and \( h'(lp_{e,t}) \) denotes the marginal disutility from participation. This expression is identical to the one in Arseneau and Chugh (2012), except for the fact that our environment has two household categories. Importantly, we assume that the relevant (endogenous) measure of financially-excluded household members that matter for our purposes is given by \( lp_{e,t} \).

Search Frictions and Evolution of Firm Employment

Given labor search frictions, let

\[ m(u_{j,t}, v_{j,t}) = u_{j,t}v_{j,t}/(u_{j,t}^x + v_{j,t}^x)_{1/\xi}, \xi > 0, \]

be a constant-returns-to-scale matching function in firm category \( j \in \{e, i\} \) whose inputs are household-\( j \) searchers \( u_{j,t} \) and total category-\( j \) vacancies \( v_{j,t} \). The category-\( j \) job-finding and job-filling probabilities are then defined as

\[ f(\theta_{j,t}) = v_{j,t}/(u_{j,t}^x + v_{j,t}^x)_1/\xi \]

and

\[ q(\theta_{j,t}) = u_{j,t}/(u_{j,t}^x + v_{j,t}^x)_1/\xi, \]

respectively, where market tightness \( \theta_{j,t} = v_{j,t}/u_{j,t} \).

With this in mind, the perceived evolution of employment for firm \( \omega_j \) is

\[ n_{j,t} = (1 - \rho_{j}^\eta)n_{j,t-1} + v_{j,t}q(\theta_{j,t}), \]

(59)

for \( j \in \{e, i\} \), where \( 0 < \rho_{j}^\eta < 1 \) is the exogenous job separation probability.

Wage Determination

We assume bilateral Nash bargaining between workers and individual firms. Denoting by \( \eta \) the bargaining power of workers and by \( \chi_j \) the contemporaneous value of searching for employment in firm category \( j \in \{e, i\} \), the Nash real wage for a worker in firm in category \( j \in \{e, i\} \) is implicitly given by

\[ W_{j,t} - U_{j,t} = \eta \frac{\kappa}{1 - \eta} J_{j,t}, \]

(60)

where

\[ \kappa/q(\theta_{j,t}) = J_{j,t}, \]

(61)

\[ J_{j,t} = (1 - \alpha_j)mc_{j,t}z_{t} [n_{j,t}]^{-\alpha_j} [k_{j,t}]^{\alpha_j-1} - w_{j,t} + (1 - \rho_{j}^\eta) \mathbb{E}_{t} \Xi_{j,t+1} | J_{j,t+1}, \]

(62)
\[
W_{j,t} - U_{j,t} = \left[ h'(lfp_{j,t}) - \chi_j u'(c_{j,t}) \right] / \left[ f(\theta_{j,t})u'(c_{j,t}) \right].
\]  

(63)

Similar to the baseline model, we impose a symmetric equilibrium.

**Share of Household Financial Participation in the Model** Define the economy’s total labor force participation rate as \( lfp_t = lfp_{i,t} + lfp_{e,t} \). Then, recalling that the measures of \( i \) households’ employed and unemployed members represents the measure of (relevant) individuals who participate in the banking system, the model counterpart of the share of individuals who have a bank account at financial institutions—that is, the share of household financial participation in the data—is \( \lambda_{i,t} = lfp_{i,t}/lfp_t \).

**A.5.3 Quantitative Analysis**

**Calibration** Following Arseneau and Chugh (2012), we assume that the disutility of participation \( h'(lfp_{j,t}) = (\psi_n/(1 + 1/\iota_j))lfp_{j,t}^{(1+1/\iota_j)} \) for \( j \in \{e, i\} \). In addition to the same parameter values and calibration targets adopted in the baseline model’s quantitative analysis, we calibrate \( \psi_{i}^{e} \) to match a steady-state total labor force participation rate of 0.70 (consistent with our EME sample), and \( \psi_{n}^{i} \) to match \( \lambda_i = lfp_{i,t}/lfp_t = 0.42 \) in steady state, which is consistent with the household financial participation share in our EME sample (see Table 2 in Section 2). Finally, we assume that \( \iota_e = \iota_i = \iota \) and set it to match the relative volatility of unemployment in our EME sample, equal to 3.42 (see Table 1 in Section 2 of the main text).

**Greater Household Financial Participation** We induce an increase in household financial participation by lowering (increasing) the costs of participation for \( i \) (\( e \)) households, \( \psi_{n}^{i} \) (\( \psi_{n}^{e} \)), such that total participation remains at its baseline level, but the bulk of labor force participation is now comprised of \( i \)-household members, as is the case in AEs. This approach is comparable with our baseline framework (allowing total labor force participation to increase with greater household participation does not change our main conclusions). The direct increase in firm financial participation is implemented in the same way as in the baseline model (via a disciplined reduction in \( i \) firms’ sunk entry cost \( \psi_i \)).
Figure A5: Household Financial Participation, Firm Participation, and Cyclical Dynamics, Model with Endogenous Household Financial Participation