Increasing Domestic Financial Participation: Implications for Business Cycles and Labor Markets*

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Abstract

Recent policies in emerging economies (EMEs) have sought to increase the shares of households and firms that participate in the domestic banking system amid the backdrop that, compared to advanced economies (AEs), EMEs have drastically lower shares of both firm and household financial participation. We build a model with extensive margins of firm and household financial participation and equilibrium unemployment to study the impact on EME labor-market and business cycle dynamics of increasing the shares of firm and household financial participation in EMEs to AE levels. We find that a joint increase in household and firm domestic financial participation considerably narrow the differences in some, but not all business cycle moments between EMEs and AEs. Critically, the impact of increasing only firm or only household participation can differ substantially from the impact of a joint increase. We stress the relevance of the extensive margin of domestic financial participation for labor-market and business cycle dynamics and the fact that promoting a joint increase in the shares of household and firm financial participation in EMEs can lead to smoother cyclical fluctuations, particularly in labor markets.

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1 Introduction

This paper addresses the following question: what are the labor-market and business-cycle implications in emerging economies (EMEs) of transitioning from their low shares of firm and household participation in the domestic banking system to the much greater shares that characterize advanced economies (AEs)? Understanding these implications is both timely as EMEs have recently undertaken efforts to steadily and consistently raise their firm and household domestic financial participation shares (GFDR, 2014), and critical as credit markets and the banking system play important roles as domestic transmitters of external shocks in EMEs. However, given the recentness of EMEs’ efforts to bolster the extensive margin of domestic financial participation, there is little empirical evidence that can plausibly shed light on the business cycle consequences of these efforts. Moreover, lessons from episodes of greater domestic financial participation in AEs do not necessarily apply given the distinctive economic characteristics of EMEs. In light of these facts, we address our research question using a quantitative theoretical framework.

Our main results show that the extensive margin of household and firm domestic financial participation can be an important factor behind several, but not all, defining differences in labor-market and business cycle dynamics between EMEs and AEs. Importantly, we find that greater firm financial participation in EMEs can exert substantial downward pressure on cyclical volatility, though greater firm participation is not, by itself, powerful enough to completely eliminate the differences in business cycle dynamics with respect to AEs. While greater household financial participation alone has negligible volatility-reducing effects, combining it with greater firm participation can significantly narrow the quantitative differences in business cycle dynamics between EMEs and AEs. Our findings have two broader implications. First, to the extent that lower cyclical volatility may be a desirable objective for EMEs, our findings stress the importance of joint expansions in firm and household domestic financial participation and not in any given extensive margin alone. Second, the fact that greater firm and household participation are both associated with greater credit-GDP ratios but the two margins have different implications for volatility suggests that changes in aggregate indicators of financial participation—such as credit-GDP and bank deposits-GDP
ratios—may be insufficient to adequately characterize the qualitative and quantitative impact of domestic financial participation on cyclical dynamics. That is, the underlying source of these aggregate indicators’ changes, and importantly the margin driving their changes, are critical.

Regarding business cycles, which is the focus of our analysis, there are three well-known characteristics that distinguish EMEs from AEs. First, in EMEs consumption is more volatile than GDP, while the opposite is true in AEs. Second, in EMEs the trade balance-GDP ratio is countercyclical, while in AEs it is acyclical. Third, compared to AEs, EMEs have higher wage volatility and lower unemployment volatility relative to GDP volatility. Speaking directly to our focus on domestic financial participation, it is well known that compared to AEs, EMEs have much lower bank credit-GDP and bank deposits-GDP ratios—two aggregate measures of domestic financial participation. Importantly, these aggregate measures combine the extensive and intensive margins of firm and/or household financial participation. A much less-known but important characteristic of developing economies and EMEs is that the shares of households and firms that participate in the domestic banking system—that is, the extensive margins of financial participation—are starkly lower in EMEs compared to AEs (see Section 2). Indeed, it is noteworthy that empirically: (1.) on average, less than 50 percent of individuals in EMEs have an account at a financial institution, while virtually every individual in AEs does; and (2.) on average, the share of EME firms that have bank loans (which are by definition financially-included) is roughly 20 percent, while the corresponding share of AE firms with bank loans is at least three times as large. Of note, the strikingly low share of financially-included firms is of particular relevance since a significant share of total employment in EMEs is in financially-excluded firms, thereby making labor markets a central element of interest as changes in firm financial participation shares take place.

Our theoretical framework consists of a small open economy (SOE) with two household and two firm categories—financially-included (i) and -excluded (e)—equilibrium unemployment, and endogenous firm entry in each firm category. i households, whose members account for a share of the population, have access to deposits and foreign debt and create firms. e household members, who account for the remaining share of the population, only consume
labor income and do not participate in the banking system. Compared to $e$ firms, $i$ firms face higher sunk-entry costs, a fraction of which is financed by credit. The benefit of becoming an $i$ firm, and the defining feature of firm financial participation in our framework, is access to a more capital-intensive technology that delivers *endogenously-higher labor productivity* (this feature is in line with the positive empirical link between productivity and firms’ access to credit). Endogenous firm entry gives rise to an endogenous share of firm financial participation and is therefore critical to introduce an *extensive margin* of firm financial participation, which is a central margin of interest in our analysis. Our calibrated model replicates the low shares of firm and household financial participation in EMEs and matches key empirical EME business cycle moments, thereby yielding an appropriate laboratory to explore our research question.

Revisiting our findings in more detail, *jointly* raising the shares of both firm and household financial participation in our benchmark EME calibration to AE levels reduces the relative volatility of consumption below 1 (as is observed in AEs), reduces the relative volatility of wages from its EME baseline (recall that this relative volatility is lower in AEs), and makes the trade balance acyclical (similar to AEs). In contrast, the relative volatility of unemployment decreases non-trivially, which *widens* the difference between EMEs and AEs (this last finding suggests that the lessons from AEs regarding financial participation need not apply to EMEs). *Only* increasing firm financial participation achieves similar results, but from a quantitative standpoint, greater household participation is needed, even though *only* increasing household participation from EME to AE levels hardly changes the baseline (EME) second-moments.

The intuition behind our main results traces back to the differential effect of greater *household* financial participation *alone* relative to greater *firm* financial participation on average $i$-firm labor productivity relative to $e$-firm labor productivity. Greater *firm* financial participation *alone* generates greater capital demand and *increases* average labor productivity across firm categories, with the change in $i$-firms’ labor productivity being non-trivially greater compared to that of $e$ firms. Critically, the greater change in $i$ firms’ labor productivity increases the average value to firms of having a worker, thereby stabilizing firms’ hiring and capital demand decisions. Ultimately, this stabilizing effect reduces the volatility
of hiring, capital demand, wages, employment, labor income, and ultimately household and total consumption amid productivity and interest rate shocks. These changes also make the trade balance considerably less countercyclical and reduce both labor market and aggregate volatility.

The opposite outcome takes place under greater household financial participation alone: by generating a sharp steady-state reallocation of employment towards $i$ firms that surpasses the endogenous increase in capital demand, $e$ firms’ labor productivity changes relatively more compared to $i$ firms’ labor productivity. As such, $i$ firms’ decisions become more sensitive to shocks, thereby contributing to sharper fluctuations. This last mechanism is compounded by having a greater share of the population exposed to interest rate shocks. This explains why an EME that experiences greater household financial participation alone does not generate significantly different cyclical fluctuations in labor market and aggregate variables relative to what existing EMEs (which have small shares of household financial participation) already exhibit. If greater firm financial participation takes place alongside greater household participation, the resulting greater reallocation of resources available to $i$ firms interacts with the greater increase in $i$ firms’ labor productivity, which explains why a joint increase in financial participation brings EME aggregate dynamics quantitatively closer to the ones in AEs, and why relative unemployment volatility becomes considerably lower.

Relative to existing literature, which we discuss in Section 2, we stress three contributions. First, we illustrate that the extensive margin of both firm and household domestic financial participation can have nontrivial effects on business cycles, and that the type of extensive margin matters for the labor market and aggregate volatility consequences of greater domestic financial participation. Second, to the extent that lower relative volatilities may be a desirable objective in EMEs, we find that implementing greater joint firm and household domestic financial participation can be a means to achieve this objective, with greater firm participation being a critical factor. Third, our work highlights the limitations of aggregate measures of domestic financial participation for understanding the volatility consequences of bolstering domestic financial participation 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 Facts

2.1 Related Literature and Contributions

Our work contributes to a well-known literature that documents and analyzes the distinct features of EME business cycles and labor market dynamics (Neumeyer and Perri, 2005, and Fernández and Gulan, 2015, among others; see Boz, Durdu, and Li, 2015, for the cyclical facts about EME and AE labor markets). Relative to this literature, our focus is novel given our emphasis on the extent to which the extensive margin of domestic financial participation not only by households but also by firms can matter for differences in labor-market and business cycle dynamics between AEs and EMEs.

Our work is also related to a growing strand of research on endogenous firm entry and business cycles building on the seminal work of Bilbiie, Ghironi, and Melitz (2012) (henceforth BGM), and to recent empirical and theoretical work linking financial development, labor markets, and business cycles in EMEs (Pinheiro, Rivadeneyra, and Teignier, 2017; Epstein, Finkelstein Shapiro, and González Gómez, 2019; Epstein and Finkelstein Shapiro, 2019). By bringing these frameworks together, we contribute to this literature by highlighting the extensive margin of domestic financial participation as a potential driving force behind differences in labor market and aggregate dynamics between AEs and EMEs, which existing related studies on EMEs have abstracted from. In turn, the combination of labor search frictions and endogenous firm entry in a business cycle framework is similar in broad terms to Cacciatore and Fiori (2016), Cacciatore, Ghironi, and Fiori (2016), and Cacciatore, Duval, Fiori, and Ghironi (2016a,b), all of which have centered on AEs, but not on EMEs, which is the case of our paper. Our focus on EMEs necessarily requires a modified framework that incorporates important characteristics of EME labor and credit markets, one of which is the limited domestic financial participation of firms and households, which is absent in
work on AEs. Munkacsi and Saxegaard (2017) study the impact of labor and goods market reforms in a context where informality is prevalent. A critical difference in our work relative to theirs is our focus on domestic financial participation by both households and firms in EMEs. As such, our work complements theirs.

Our analysis of firm financial participation amid endogenous firm entry in the banking system is also 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. In addition to our focus on EMEs, there are three fundamental differences between their work and ours. First, in their framework, all firms and households participate in the banking system whereas in our model, only a fraction of firms and households do so. Second, their environment abstracts from studying labor markets and unemployment, which we do given the prevalence of employment in financially-excluded firms in EMEs (and hence the potential consequences for unemployment from changes in firm financial participation). Third, while their focus is on changes in banking-sector competition and their implications for U.S. business cycles, our focus is different as it centers on changes in the extensive margin of both firm and household financial participation and their implications for EME business cycles, taking the banking structure and degree of bank competition as given.

Focusing as we do on EMEs, Dabla-Norris et al. (2015) study the consequences of domestic financial inclusion for long-run aggregate outcomes and inequality. In related work, 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. As such, our paper contributes to this literature given our explicit focus on labor market dynamics in addition to the dynamics of other key macro aggregates. Finally, Bhattacharya and Ila (2016) show that greater household financial inclusion is associated with higher consumption volatility in EMEs, while Barrail Halley (2017) and Chopra (2017) stress similar findings. A critical and non-trivial difference of our work relative to these

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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 In earlier work, Levchenko (2005) focuses on the link between international financial liberalization and
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 reflected in the extensive margin of participation is key to our main findings on the potential volatility-reducing effects of greater domestic financial participation in EMEs.

2.2 Stylized Facts: Business Cycles in AEs and EMEs

Table 1 summarizes key extensively-documented and well-known facts about the differences in business cycle dynamics between EMEs and AEs (see Neumeyer and Perri, 2005, and Fernández and Gulan, 2015, for updated stylized facts). In particular, in EMEs, the volatility of consumption \( c_t \) relative to GDP \( Y_t \) is greater than 1, while in AEs this volatility is less than 1. In turn, EMEs have a countercyclical trade balance-GDP ratio \( tby_t \), while AEs have an acyclical trade balance-GDP ratio. 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 relative to AEs, and a volatility of real wages \( w_t \) relative to GDP that is greater than 1. In contrast, the relative volatility of real wages in AEs is smaller than 1.

Table 1: Select Business Cycle Statistics in Advanced and Emerging Economies

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Advanced Economies</th>
<th>Emerging Economies</th>
</tr>
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<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_{inv_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(inv_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>

consumption volatility in EMEs in an environment with limited commitment in individual risk sharing.
Notes: $Y$ denotes real GDP, $c$ denotes real private consumption, $inv$ 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 Stylized Facts: Domestic Financial Participation by Households and Firms

Bank credit is by far the most prevalent source of formal external financing for those firms that have access to the banking system (IFC, 2010; GFDR, 2014). Using data from the World Bank Global Financial Development database for the period 2000-2016 shows that median domestic credit to the private sector as a share of GDP is 37 percent in EMEs but more than 110 percent in AEs. Similarly, average bank deposits as a share of GDP is roughly 43 percent in EMEs but 77 percent in AEs. These two measures provide an aggregate snapshot of the stark differences in domestic financial development between EMEs and AEs. More importantly, these two aggregate measures are a combination of the extensive margin—the number (or share) of firms or households that has bank credit or deposits, irrespective of the bank loan or deposit amount—and the intensive margin—the amount of bank credit per firm or deposits per household that participates in the banking system—of domestic financial participation.

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3Firms that do not have access to the banking system rely on internal resources or informal sources of external financing, such as interfirm trade credit, friends, and family. Equity issuance is only available for firms that participate in formal credit markets, and only a minuscule share of EME firms do so.
Extensive Margin of Domestic Financial Participation  Table 2 highlights the extensive margin of household and firm financial participation in the domestic banking system in AEs and EMEs by showing two measures in these two country groups. First, the share of individuals ages 15+ that have an account at a financial institution—that is, the extensive margin of household participation in the domestic banking system (this is an extensive margin since it considers the share of individuals with an account, regardless of their account balance). Second, the share of firms that have bank loans or lines of bank credit—that is, the extensive margin of firm participation in the banking system (this is an extensive margin since it considers the share of firms with bank loans, regardless of the loan amount per firm).

On average, EMEs have much lower shares of household and firm financial participation in the domestic banking system compared to AEs. Per Table 2, virtually every individual ages 15+ in AEs has an account at a financial institution. In contrast, less than 50 percent of individuals ages 15+ in EMEs has an account at a financial institution. In addition, the share of firms that have bank loans or lines of credit with banks in EMEs is on average 20 percent, with the corresponding share of firms in AEs being almost three times as large. Unsurprisingly, there is considerable heterogeneity in these extensive-margin measures of domestic financial participation 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 considerably larger shares of firm and household participation in the banking system relative to EMEs.

4Evidence 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). Thus, for our purposes, there is no difference between owning a deposit bank account and using it.
Table 2: Firm and Household Participation in Domestic Banking System in Advanced and Emerging Economies: Extensive Margin of Participation

<table>
<thead>
<tr>
<th>Country Group</th>
<th>Share of Firms with Bank Credit, % Firms (Min, Max)</th>
<th>Account at Financial Institutions, % 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. *** and ** denote significance at the 1 and 5 percent levels, respectively.

Figure 1 plots two aggregate measures of domestic financial participation—the bank credit-GDP ratio and the bank deposits-GDP ratio—against our two measures of the extensive margin of participation for a large sample of developing and emerging economies with available data on these measures. The figure clearly shows that the shares of household as well as firm financial participation are strongly and positively correlated with the bank credit-GDP ratio. Similarly positive and significant correlations hold between the shares of household and firm financial participation and the bank deposits-GDP ratio.

Revisiting our summary of findings in the Introduction, this fact is important to highlight since our work shows that the consequences of greater extensive-margin domestic financial participation for labor market and aggregate dynamics are different depending on which extensive margin of participation (firm or household), even though the increase in aggregate (that is, extensive- and intensive-margin) financial participation is qualitatively identical under both extensive margins.
Figure 1: Aggregate and Extensive-Margin Measures of Domestic Financial Participation in Developing and Emerging Economies

Sources: 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), World Bank Worldwide Development Indicators (bank credit to the private sector as a share of GDP, 2011), and World Bank Financial Development database (bank deposits-GDP ratio, 2011). Notes: See Section A1 of the Appendix for the list of economies included in the figure.

Domestic Financial Participation and Employment Allocation Across Firms  

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 (Beck and Demirgüç-Kunt, 2006; Beck, Demirgüç-Kunt, and Martínez Pería, 2007; IFC, 2010, 2013; Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011). While specific data on the share of employment in firms that have bank credit is not available for EMEs, we can construct a plausible empirical
range for the economy-wide share of employment in firms that participate in the banking system (as measured by the share of firms that use bank credit, i.e. the extensive margin of financial participation) by combining data on the allocation of employment by firm size and data on 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 employed in large firms). Moreover, micro firms represent 90 percent of all firms (large firms only represent 0.8 percent of all firms).\(^5\) 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. This last assumption 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 firms and therefore financially-excluded since registration is necessary for accessing bank credit (see, for example, Busso, Fazio, and Levy, 2012). All told, this simple calculation suggests that in EMEs, employment among firms that participate in the banking system (as proxied by the share of firms that have bank credit) can range anywhere from 31 percent of total employment (assuming that no MSMEs have bank credit and only large firms do) to 44 percent of total employment (assuming that all large firms have bank credit and that roughly 20 percent of MSME employment is in MSMEs with bank credit). The share of employment in financially-excluded firms is therefore non-trivial, suggesting that changes in the extensive margin of firm financial participation may have non-trivial implications for labor market outcomes and dynamics.

**Efforts to Raise Household and Firm Domestic Financial Participation: Some Examples**

Concrete examples of recent efforts to raise the share of 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 compro-

\(^5\)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.
mising 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, among others. In turn, efforts to expand the share of firm financial participation in EMEs include cutting red tape and reducing firm entry costs by lowering the cost of firm registration, where registering is often a requirement to obtain bank loans and therefore participate in the domestic banking system (this can be 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 and evaluation process of new bank loan applications).

3 The Model

Necessary Model Features Each of the following model elements is necessary to address our research question in the simplest way possible:

1. Interest rate shocks, which are a key driving force of cyclical consumption and aggregate dynamics in EMEs)

2. Two household categories: introduces an extensive margin of domestic financial participation in EMEs (recall Table 2)

3. Two firm categories: firm heterogeneity in domestic financial participation is necessary to study such participation (and its interaction with household participation) in EMEs

4. Endogenous firm entry in each firm category: introduces an explicit extensive margin of firm financial participation (recall Table 2)

5. Labor search frictions: allow us to study unemployment and employment allocation across firms (which, per Section 2, matters in an EME context where a significant share of employment is in financially-excluded firms)

6. Our focus is on domestic financial participation by households and firms, taking the banking structure as given
Of note, our focus is on domestic financial participation by households and firms and not on the banking system itself. As such, we take the banking structure as given. Our baseline framework incorporates the features listed above into a standard small-open-economy (SOE) RBC model.

**Basic Model Structure** The SOE has a population of unit mass and is comprised of two categories—financially-included ($i$) and -excluded ($e$)—of firms and households. $i$-household members account for a measure $0 < \lambda < 1$ of the population and $e$-household members account for the remaining measure $(1 - \lambda)$. On the production side, each firm category $j \in \{e, i\}$ is comprised of monopolistically-competitive firms and an unbounded number of potential entrants who face sunk entry costs 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 in a labor market where labor force participation is exogenous and the total labor force is normalized to 1. Output from the two firm categories is bundled using a CES technology by a perfectly-competitive firm to create final goods. Following the EME business cycle literature, aggregate productivity and foreign interest rate shocks drive aggregate fluctuations.

We outline the defining differences between the two household and firm categories in the model next.

**Defining Differences Between Firm Categories** Firms within each category $j \in \{e, i\}$ use capital and labor to produce, and must post vacancies to attract new workers. Compared financially-excluded ($e$) firms, financially-included ($i$) firms face higher sunk entry costs but in return have access to a more capital-intensive (constant-returns-to-scale) production technology that, under a plausible calibration, 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 that delivers endogenously-lower labor productivity. Firms that start in a given category ($e$ or $i$) cannot transition into a different category after they enter the market and start producing.

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$^6$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
Since we take as given the banking structure to focus on domestic financial participation, we assume that such participation from the perspective of firms is associated with having access to a more productive (capital-intensive) technology. This assumption is consistent with existing empirical evidence on access to credit and firm productivity (Dabla-Norris, Ho, and Kyobe, 2016; Kouamé and Tapsoba, 2018). In fact, one rationale for participating in domestic credit markets is to bolster productivity. As such, this defining feature of firms is in this spirit, and is sufficient for our purposes. The description of households explains further how firms are directly linked to credit markets.

**Defining Differences Between Household Categories** The fundamental difference between household categories lies in their domestic financial participation via deposit and foreign-debt holdings. We adopt further simplifying assumptions regarding the ownership and accumulation of non-financial assets (mainly, firms and physical capital) but these assumptions are not crucial for defining household categories or for our findings.

$i$ households hold deposits and foreign debt. They are the owners of all firms and create firms subject to sunk entry costs in both categories. These households also accumulate physical capital, which is allocated and rented to both firm categories in frictionless markets. A portion of physical capital investment and the sunk entry costs of $i$ firms is subject to a standard working capital constraint. These assumptions are consistent with evidence for EMEs showing that the bulk of the capital stock is held by larger firms, which tend to have access to credit (hence our baseline assumption on physical-capital ownership; see, for example, Busso et al., 2012). More broadly, the working capital constraint we adopt introduces a simple and tractable notion of aggregate credit above and beyond what would be captured by a pure extensive margin of firm financial participation. Moreover, tying entry costs for $i$ firms to credit via the working capital constraint makes these firms financial participants by definition. Finally, in any 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 fraction of operating firms that started as unregistered firms transition to registered status. Importantly, given that access to formal credit and hence financial participation often requires proof of registration with local or tax authorities, the bulk of firms that participate in the banking system are formally registered.
do not participate in the domestic financial system. Moreover, e-household members either work or search for employment in e firms, with labor income being their sole source of income. There is perfect consumption insurance within each household category (a standard assumption in labor search models) but not across household categories.

Given our model structure, \( \lambda \) represents the share of household financial participation and therefore the extensive margin of household financial participation in the economy. In turn, the number of \( i \) firms divided by the total number of firms in the economy represents the share of firm financial participation and therefore the (normalized) extensive margin of firm financial participation.

**A Note on the Banking Structure** It is well known that the banking systems in EMEs and AEs differ in their efficiency, degree of competition, and cost structure, among other characteristics. Our focus in this paper is *not* on differences in the structure of the banking system but instead on differences in domestic financial participation on the side of households (in the form of having access to deposits and/or foreign assets) and firms (in the form of having access to a more productive technology, which is associated with participation in credit markets). As such, we take the banking system’s competitive and cost structure as given. For this reason and to have the simplest framework possible given our main research question, the banking structure in our baseline model is consciously stylized: \( i \) households’ deposits are directly transformed into bank credit to finance the working-capital costs, and deposit and lending rates are the same. Given the complexity of having endogenous firm entry in a multi-category firm and household environment, we leave the study of differences in the competitiveness and cost structure of banks, banking frictions, and business cycle dynamics in EMEs for future work.

**Baseline Model Assumptions and Robustness** The firm and household assumptions in our baseline model outlined above are chosen with the sole purpose of having the simplest framework possible while still being able to address key issues related to limited domestic financial participation and business cycles in EMEs. These assumptions are innocuous for

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\(^7\)Given these assumptions, we use the terms “share of financially-included/-excluded households” and “share of individuals in financially-included/-excluded households” interchangeably.
our main results.

In particular, our baseline model assumes the following:

1. *i* households own all firms and capital: assuming that *e* households own *e* firms does not change our conclusions

2. *i* households accumulate a single type of capital, which is allocated across firm categories: assuming that each household category accumulates capital for its own firm category, with *e* households accumulating capital internally for *e* firms, does not change our conclusions

3. Physical capital investment and *i* firms’ sunk entry costs are subject to a working capital constraint: modifying the working capital constraint to include *i* firms’ wage and capital bill does not change our conclusions

4. An exogenous share of household financial participation (*λ*) but an endogenous share of firm participation: after discussing our main findings, we discuss results from an extension of our baseline model that incorporates *endogenous household financial participation* and show that our main results remain unchanged

The description of our model below should be read with these possible variations of our baseline economic environment in mind, *while* remembering that ultimately these variations are inconsequential for our main findings.

### 3.1 Sectoral Total Output Bundles and Final Goods Firms

**Sectoral Total Output Bundles** Total output in each firm category (financially-excluded (*e*)) or -included (*i*)) *j* ∈ \{*e*, *i*\} is given by the sectoral output bundle \(Y_{j,t} = \left( \int_{\omega_j \in \Omega_j} y_{j,t}(\omega_j) \frac{1}{\varepsilon} d\omega_j \right)^\frac{\varepsilon}{\varepsilon - 1} \), 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* ∈ \{*e*, *i*\} produces a single good *ωj*. As such, *ωj* represents both the good produced and the firm. Then, \(y_{j,t}(\omega_j)\) denotes differentiated output produced by firm *ωj* ∈ \(\Omega_j\) in firm category *j*, and \(\varepsilon\) 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 $P_{j,t} = \left( \int_{\Omega_j} p_{j,t}(\omega_j)^{1-\epsilon} d\omega_j \right)^{\frac{1}{1-\epsilon}}$ 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 category-level 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 category-level output bundles $Y_{e,t}$ and $Y_{i,t}$ to maximize profits $\Pi_{a,t} = [P_t Y_t - P_{i,t} Y_{i,t} - P_{e,t} Y_{e,t}]$ subject to the CES aggregator

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

where $0 < \alpha_y < 1$ and $\phi_y > 0$ determines the degree of substitutability between category-level output categories. $P_t = \left[ (1 - \alpha_y) (P_{i,t})^{1-\phi_y} + \alpha_y (P_{e,t})^{1-\phi_y} \right]^{\frac{1}{1-\phi_y}}$ is the aggregate price level and $P_{i,t}$ and $P_{e,t}$ are the corresponding price subindices of each category-level output bundle. In addition to choosing category-level output demand $Y_{e,t}$ and $Y_{i,t}$, the final goods firm chooses its demand for differentiated good $\omega_j$ within each firm category $j \in \{e, i\}$.

The demand functions for the two category-level output bundles are implicitly given by

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

and

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

In turn, the demand function for firm $\omega_j$'s output is

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

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 entrants into firm category $j \in \{e, i\}$. Let $N_{j,t}$ be the mass of firms in category $j$ that are currently
producing in period $t$. New entrants $N_{E,jt}$ in period $t$ face a one-period production lag 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 $N_{j,t} = (1 - \delta) (N_{j,t-1} + N_{E,jt-1})$.

Potential new firms in category $j$ incur a sunk entry cost $\psi_j$ (expressed in terms of final goods) in order to enter the market. We assume that $\psi_i > \psi_e$ to reflect the fact that becoming a financially-included firm is more costly. 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 to be a participant in the domestic banking system. The benefit of paying $\psi_i$ and entering as an $i$ firm is access to a more capital-intensive production technology that delivers greater labor productivity relative to $e$ firms (recall that this is broadly consistent with the positive empirical link between access to credit and productivity noted earlier).

**Incumbent-Firm Production and Profits** The description of firms follows Cacciatore and Fiori’s (2016) one-firm-category environment. We also adopt the same rationale outlined in Cacciatore (2014) and Cacciatore and Fiori (2016) and abstract from any strategic component related to firms’ employment and capital choices, firm size, and wage outcomes. Then, firms take the wage and rental rate of capital as given when making decisions over capital and employment (described further below).

Output of incumbent firm $\omega_j$ in category $j \in \{e, i\}$ is given by

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

(5)

where the capital share is $0 < \alpha_j < 1$, $z_t$ is aggregate productivity, and $n_{j,t}(\omega_j)$ and $k_{j,t}(\omega_j)$

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8Expressing the sunk entry costs in terms of labor does not change our results.

9Cacciatore and Fiori (2016) assume endogenous separations, which we abstract from given the two-category nature of our model. Framing the production structure 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 in a symmetric equilibrium.

10As noted in Cacciatore (2014), amid monopolistic competition in the goods market, larger firms in principle take into account how their employment decisions affect workers’ wages. We follow related literature and abstract from this particular effect for similar reasons outlined in Cacciatore (2014).
denote the firm $\omega_j$’s employment and capital, respectively.

Individual profits for firm $\omega_j$ are given by

$$d_{j,t}(\omega_j) = \rho_{j,t}(\omega_j)y_{j,t}(\omega_j) - w_{j,t}(\omega_j)n_{j,t}(\omega_j) - r_t k_{j,t}(\omega_j) - \kappa v_{j,t}(\omega_j), \quad (6)$$

where $\kappa$ 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.

In each firm category $j$, aggregate employment, $L_{j,t}$, aggregate capital $K_{j,t}$, and aggregate vacancies $V_{j,t}$ are given by

$$L_{j,t} \equiv \int_{\omega_j \in \Omega_j} n_{j,t}(\omega_t)d\omega_j, \quad K_{j,t} \equiv \int_{\omega_j \in \Omega_j} k_{j,t}(\omega_t)d\omega_j, \quad V_{j,t} \equiv \int_{\omega_j \in \Omega_j} v_{j,t}(\omega_t)d\omega_j.$$

**Search Frictions and Evolution of Firm-Level 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 aggregate vacancies from category-$j$ firms $V_{j,t}$. The functional form we adopt is well known to guarantee that matching probabilities are always bounded between 0 and 1 (see Den Haan, Ramey, and Watson, 2000).

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 firm-category-$j$ market tightness is $\theta_{j,t} \equiv V_{j,t}/u_{j,t}$.

Given this background, the perceived evolution of employment for firm $\omega_j$ is

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

where $0 < \rho_n^{j} < 1$ is the exogenous job separation probability.

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

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

(8)

while its job creation condition is

$$\frac{\kappa}{q(\theta_{j,t})} = (1-\delta)(1-\rho_{j}^{e}) \mathbb{E}_t\Xi_{t+1|t}^i \left\{ (1 - \alpha_j) mc_{j,t+1}(\omega_j) z_{t+1} [n_{j,t+1}(\omega_j)]^{-\alpha_j} [k_{j,t+1}(\omega_j)]^{\alpha_{j-1}} \right\} - \omega_{j,t+1}(\omega_j) + \frac{\kappa}{q(\theta_{j,t+1})}.$$

(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.

**Wage Determination** Denoting by $\eta$ the bargaining power of workers and by $\chi_j$ the contemporaneous value of searching for employment in firm category $j \in \{e, i\}$, wages are determined by bilateral intra-firm Nash bargaining between workers and firms.

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}(\omega_i) 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.

(10)

Due to differences in stochastic discount factors between $e$ households (given by $\Xi_{t+1|t}^e$) and $i$ firms (given by $\Xi_{t+1|t}^i$) and after some algebra, the real wage for a worker in firm $\omega_e$ can be expressed as

$$w_{e,t}(\omega_e) = \left[ \eta \left[ (1 - \alpha_e) mc_{e,t}(\omega_e) z_t [n_{e,t}(\omega_e)]^{-\alpha_e} [k_{e,t}(\omega_e)]^{\alpha_{e-1}} \right] + (1 - \eta) \chi_e \right] + \eta \left( \frac{\kappa}{q(\theta_{e,t})} - (1 - \delta)(1 - \rho_{e}^{e}) \mathbb{E}_t\Xi_{t+1|t}^e \int_{\omega_e \in \Xi_{e,t}} \frac{w_{e,t}(\omega_e)}{w_{e,t}(\omega_e)} (1 - f(\theta_{e,t})) \mathbb{E}_t\Xi_{t+1|t}^e J_{e,t+1}(\omega_e) \right),$$

(11)

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

\[\text{Note that if we had a one-household framework, } \Xi_{t+1|t}^e = \Xi_{t+1|t}^i = \Xi_{t+1|t}, \text{ and the expression for } w_{e,t}(\omega_e)\]
### 3.3 Financially-Included (i) Households and Firm Creation

Financially-included (i) households own all firms and spend resources to create them. Firms that start in a given category (e or i) cannot transition into a different category after they enter the market and start producing (recall from the model’s summary description that this is in line with the data).

Formally, i households choose consumption $c_{i,t}$, total capital accumulation $k_{t+1}$, deposits $b_{t+1}$, foreign debt holdings $b^*_{t+1}$, the desired number of active 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 $N_{E,it}$, in order to reach the desired targets of active firms in each category to maximize $E_0 \sum_{t=0}^{\infty} \beta^t u(c_{i,t})$ subject to the budget constraint

$$c_{i,t} + b_{t+1} + R_{c,t} b^*_t + \frac{1}{2} \left( b^*_{t+1} \right)^2 + (\psi_e N_{E,it} + inv_t) \left[ 1 - \xi_e + \xi_e R_t \right] + \psi_e N_{E,et}$$

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

and the laws of motion for e and i firms

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

and

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

where physical capital investment is $inv_t = k_{t+1} - (1 - \delta) k_t$ and $L_{i,t}$ denotes total employment in i firms. We abstract from including capital adjustment costs for expositional simplicity, but include them in our quantitative analysis as is standard in the literature. Following Neumeyer and Peri (2005), $R_{c,t} = S_t R^*_t$ 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 (see, for example, Cacciatore, Duval, Fiori, and Ghironi, 2016a,b). In turn, $R_t$ is the real gross deposit rate, and absent financial frictions that would otherwise give rise to interest rate spreads, also the lending rate. The sunk entry cost of i firms is greater would collapse to its standard form: $w_{e,t}(\omega_e) = \eta \left[ (1 - \alpha_e) m_{e,t}(\omega_e) z_t [n_{e,t}(\omega_e)]^{-\alpha_e} [k_{e,t}(\omega_e)]^{\alpha_e-1} + \kappa \theta_{e,t} \right] + (1 - \eta) \chi_e$. 

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than the corresponding cost for \( e \) firms, so that \( \psi_i > \psi_e \). As described earlier, the upside of incurring a greater sunk entry cost \( \psi_i \) is giving \( si \) firms access to a more capital-intensive and therefore more productive technology.

\( i \) households face a working capital constraint such that a fraction \( 0 \leq \xi_b \leq 1 \) of investment expenditures \( inv_t \) and the total cost of creating \( i \) firms \( \psi_iN_{E,it} \) is financed with credit. This allows for a tractable measure of aggregate credit in the model, \( \xi_b(\psi_iN_{E,it} + inv_t) \), that goes beyond the extensive margin of participation. Finally, given that \( i \) households have a measure \( 0 < \lambda < 1 \) of members and the total labor force is normalized to 1, unemployment among \( i \) household members is given by \( u_{i,t} = \lambda - L_{i,t} \).

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

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

where the stochastic discount factor of \( i \) households is \( \Xi^i_{t+1|t} \equiv \beta u'(c_{i,t+1})/u'(c_{i,t}) \). In turn, the firm creation and capital accumulation decisions are given by

\[
\psi_i [1 - \xi_b + \xi_b R_t] = (1 - \delta) \mathbb{E}_t \Xi^i_{t+1|t} [d_{i,t+1} + \psi_i [1 - \xi_b + \xi_b R_{t+1}]],
\]

\[
\psi_e = (1 - \delta) \mathbb{E}_t \Xi^i_{t+1|t} [d_{e,t+1} + \psi_e],
\]

and

\[
[1 - \xi_b + \xi_b R_t] = \mathbb{E}_t \Xi^i_{t+1|t} [r_{t+1} + (1 - \delta) [1 - \xi_b + \xi_b R_{t+1}]].
\]

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 of creating \( i \) firms are affected by the usage of credit to partially finance the sunk entry costs of new \( i \) firms. Similarly, the marginal cost of accumulating capital is also affected by the usage of credit.

\[\text{In principle, households are also subject to the perceived evolution of employment. Absent endogenous labor force participation, this law of motion is taken as given by households.}\]
3.4 Financially-Excluded (e) Households

Financially-excluded (e) households use labor income from working in e firms to finance consumption. Their expected lifetime utility is \( E_0 \sum_{t=0}^{\infty} \beta^t u(c_{e,t}) \) and their budget constraint is
\[
c_{e,t} = w_{e,t} L_{e,t} + \chi_{e} u_{e,t},
\]
where \( L_{e,t} \) denotes total employment in e firms. Given that e households have a measure \( 1 - \lambda \) of members, unemployment among e household members is \( u_{e,t} = (1 - \lambda) - L_{e,t} \) and e households’ stochastic discount factor is given by \( \Xi^{e}_{t+1} = \beta \frac{u'(c_{e,t+1})}{u'(c_{e,t})} \).

3.5 Closing the Model

Market Clearing and Symmetric Equilibrium  Total capital is given by \( K_t = K_{i,t} + K_{e,t} \), where \( K_{j,t} \) is aggregate capital in firm category \( j \in \{ e, i \} \). 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 \( \rho_{j,t} = (P_{j,t}/P_t)N_{j,t}^{\frac{1}{\epsilon}} \) as well as \( Y_{j,t} = y_{j,t}N_{j,t}^{\frac{1}{\epsilon}} \). In addition, total employment in each firm category \( j \) evolves as follows
\[
L_{j,t+1} = (1 - \delta)(1 - \rho_{j,t}^1)(L_{j,t} + m(V_{j,t}, u_{j,t})).
\]

The economy’s resource constraint is given by
\[
Y_t = c_{i,t} + c_{e,t} + inv_t + \kappa V_{i,t} + \kappa V_{e,t} + \psi_i N_{E,it} + \psi_e N_{E,et} + R_{c,t} b_t^* - b_{t+1}^* + \frac{\eta b_t^*}{2}(b_{t+1}^*)^2,
\]
where total consumption is \( c_t = c_{i,t} + c_{e,t} \). Finally, the total number of firms in the economy is \( N_t \equiv N_{e,t} + N_{i,t} \) so that the share of firm financial participation is \( N_{i,t}/N_t \) and the share of household financial participation is given by \( \lambda \). Appendix A.3 shows the list of variables and equilibrium conditions that characterize the competitive equilibrium.
**Data-Consistent Model Variables** 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 $x_{d,t} = \Psi_t \frac{1}{1-\phi_y} x_{m,t}$, where $\Psi_t = (1 - \alpha_y) N_{i,t}^{1-\phi_y} + \alpha_y N_{e,t}^{1-\phi_y}$ (see, for example, Cacciatore, Duval, Fiori, and Ghironi, 2016a). Then, in what follows variables with a $d$ subscript denote model variables that are readily comparable to their empirical (or data) counterparts.

## 4 Quantitative Analysis

We use the model to examine the implications for labor-market and aggregate dynamics of EMEs transitioning from their low shares of firm and household domestic financial participation to the greater shares that characterize AEs. Our baseline calibration 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 (see Section 2 and Table A1 in the Appendix for more details). Among other characteristics in EMEs, our calibration approach is such that the model explicitly replicates 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:
\((\varphi_k/2)(k_{t+1}/k_t - 1)^2k_t\), 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: \(S_t = -\eta_c \mathbb{E}_t [z_{t+1}]\), where \(\eta_c > 0\) (this allows us to match select second moments that characterize EMEs). Finally, we assume that aggregate productivity and foreign interest rate shocks follow independent AR(1) processes in logs: \(\ln(x_t) = (1 - \rho_x) \ln(x) + \rho_x \ln(x_{t-1}) + \varepsilon_t^x\), where \(\varepsilon_t^x \sim N(0, \sigma_x)\) 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 \(\alpha_i = 0.32\), all of which are standard values. 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; alternative plausible values explored as part of our robustness analysis do not change our conclusions). Consistent with the literature on endogenous entry, we choose \(\varepsilon = 6\). EMEs generally lack formal safety nets and unemployment insurance (UI) schemes, so we initially set \(\chi_j = 0\) for \(j \in \{e, i\}\) (we consider how differences in \(\chi_j = 0\) between EMEs and AEs play a role after discussing our main results). 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 \(\rho_{jc} = 0.05\) for \(j \in \{e, i\}\) based on available evidence for EMEs (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.\(^\text{13}\) 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

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\(^\text{13}\)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 output is likely to be highly substitutable between firm categories in economies with less developed banking systems, such as EMEs.
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 Section A.4 of 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 $\alpha_e$ and $\phi_y$, do not change any of our main conclusions.

**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 all consistent with EME averages per Table 1 in Section 2.\(^{14}\)

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 = $\(^{14}\) 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 do in the data in Section 2.
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 in total employment, $n_i/(n_e+n_i) = 0.42$, lies within the range of 31-44 percent of total employment for EMEs in the data (recall the discussion in Section 2).

4.2 Baseline (EME) Business Cycle Moments

Table 3 compares select business cycle moments generated by the model to their empirical counterparts based on EME averages from Table II in Section 2. Unless otherwise noted, all model-generated moments are based on our model’s data-consistent variables (denoted by $d$ subscripts per Section 3.5).

By construction, the model quantitatively matches the volatility of output, the relative volatility of consumption and investment, and the countercyclicality of the trade balance-output ratio. The relative volatility of consumption is greater than 1, as is well-known to be the case in EMEs. Focusing on the remaining moments, quantitatively the model-generated correlation of consumption with output is nearly identical to the data. Also, while not shown, the model generates a cyclical correlation between country interest rates and output is -0.42. The strong countercyclicality of country interest rates is a well-documented empirical fact in the EME business cycle literature, and a characteristic of EMEs that our model can also capture (see Neumeyer and Perri, 2005, and Fernández and Gulan, 2015, among others).
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>$\sigma_{\text{inv}<em>{d,t}}/\sigma</em>{Y_{d,t}}$</td>
<td>3.28</td>
<td>3.28*</td>
</tr>
<tr>
<td>$\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$</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>$corr(\text{inv}<em>{d,t},Y</em>{d,t})$</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.

Turning labor market variables, the model-generated relative volatility of wages and unemployment are lower than in the data. These quantitative limitations are well-known features of search-and-matching models (see, for instance, Shimer, 2005, and Hagedorn and Manovskii, 2008), and our model is no exception. Importantly, given our interest in understanding the changes in labor market and business cycle dynamics in response to greater domestic financial participation and not in solving the Shimer puzzle, this particular feature of standard search models is not, by itself, a limiting factor for our main analysis. In fact, as part of our robustness analysis, Section 4.7 discusses an extension of our baseline framework that endogenizes the extensive margin of households’ financial participation via endogenous labor force participation. This richer version of our baseline model improves the fit of the benchmark model with regards to the relative volatilities of wages and unemployment significantly, all while delivering the same conclusions regarding the effects of
greater domestic financial participation as our baseline (and simpler) model. Thus, this robustness check confirms that: (1) using a model where the fraction of household financial participation is exogenous, as is the case in our benchmark model, and (2) not capturing the baseline volatility of wages and unemployment in EMEs, does not affect our main findings and conclusions.\footnote{We note that a calibration of the baseline model with a high contemporaneous value of unemployment in the spirit of Hagedorn and Manovskii (2008) is still unable to match the volatility of unemployment in the data. Finkelstein Shapiro (2018) shows that a SOE RBC model with labor search that incorporates both self-employment and endogenous labor force participation can quantitatively generate the volatility of unemployment and wages in EMEs under aggregate productivity and foreign interest rate shocks. Introducing frictional self-employment in a way that is empirically-consistent with its cyclical behavior in an environment such as ours that features endogenous firm entry and household and firm heterogeneity is beyond the scope of our work. Our focus in this paper is on the labor market and business cycle implications of greater domestic financial participation on the extensive margin in EMEs, an issue that Finkelstein Shapiro (2018) does not address.}

All told, we conclude that given the evidence in Table 3 and the issues just discussed, our benchmark model is an adequate framework within which we can study our issues of interest.

### 4.3 Main Results: Domestic Financial Participation and Cyclical Dynamics

We first summarize our main findings on the impact of greater domestic financial participation on cyclical dynamics in EMEs. Then, we discuss the economic mechanisms and intuition behind these findings in detail.

In what follows, changes in the share of $i$ households, only—which we refer to as changes in household financial participation—are obtained via changes in $\lambda$, holding $\psi_i$ at its baseline (EME) value. In turn, direct changes in the share of $i$ firms, only—which we refer to as changes in firm financial participation—are obtained via changes in the sunk-entry cost of $i$-firms $\psi_i$, holding $\lambda$ constant (recall that the number of financially-included firms $N_i$ is decreasing in $\psi_i$). Finally, joint changes in $\lambda$ and $\psi_i$ are referred to as a joint change in financial participation. Recall that changes in $\lambda$ and/or $\psi_i$ directly target the extensive margin of financial participation. In the experiments we discuss below, all parameters other than $\lambda$ and/or $\psi_i$ are held at their baseline (EME) values per Section 4.1.
Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and lowest $\psi_i$. Model variables with $d$ subscripts represent data-consistent variables.

Figure 2 shows the impact on the relative volatility of consumption (top left panel), the relative volatility of unemployment (top right panel), the relative volatility of wages (bottom left panel), and the cyclical correlation of the trade balance-output ratio with output (bottom right panel) (all model-generated moments continue to be based on our model’s data-consistent variables, denoted by $d$ subscripts per Section 3.5). The red square in each of the panels marks our benchmark EME under the baseline calibration. The second moments we focus on are plotted as a function of $\lambda$ and the share of $i$ firms relative to all firms (“$N_i$ Share”), where changes in the $N_i$ Share for a given value for $\lambda$ are obtained by changing the sunk entry cost of $i$ firms. The black square in Figure 2 marks the second moments.
that result from increasing $\lambda$ to 0.96 (which corresponds to the average share of household financial participation in AEs; see Table 2 in Section 2) and reducing $\psi_i$ such that the model matches a cost of registering firms of 0.7 percent of income per capita (which is the median cost in AEs per World Bank Enterprise Survey data; recall that the corresponding median cost in EMEs, which is one of the targets in our baseline (EME) calibration, is 15 percent of income per capita; of note, the lowest value of $\psi_i$ we consider as part of our quantitative experiments never reaches a value below that of $\psi_e$. As such, the changes in both $\lambda$ and $\psi_i$ are disciplined by the data.

The main highlights of Figure 2 are as follows. Starting from the benchmark EME equilibrium, increasing $\lambda$ only: generates an increase in the relative volatility of consumption (which, incidentally, remains greater than 1); marginally reduces the countercyclicality of the trade balance; leads to negligible reductions in the relative volatility of unemployment; and marginally reduces the relative volatility of wages. In turn, starting from the benchmark EME equilibrium, increasing the share of $i$ firms only via reductions in $\psi_i$ under the baseline (EME) $\lambda = 0.42$: reduces all relative volatilities and the countercyclicality of the trade balance, and brings down the relative volatility of wages to nearly 1.

Finally, starting from the benchmark EME equilibrium, only a joint increase in $\lambda$ and the share of $i$ firms (obtained via disciplined reductions in $\psi_i$) puts the model-generated second moments at the black square in Figure 2. In this case: the relative volatility of consumption decreases from a baseline of 1.26 to 0.90 (per Table 1 in AEs, this relative volatility is 0.92); and the correlation of the trade balance-output ratio with output rises from a baseline of -0.31 to 0.04, thus becoming acyclical (per Table 1 the corresponding correlation in AEs is 0.01). Furthermore, these joint changes: put the relative volatility of wages near 1 (qualitatively in line with the evidence in Table 1 by which in AEs the relative volatility of wages is smaller than in EMEs); and roughly halves the relative volatility of unemployment, thereby widening this second moment’s difference between AEs and EMEs. We note that throughout, the reductions in the relative volatilities in Figure 2 take place because of reductions in the absolute volatility of consumption, unemployment, and wages, and not because output becomes more volatile.

Table 4 summarizes the main results noted above by showing once more the empirical
second moments for AEs (first column) and EMEs (second column), and comparing them to the second moments generated by: our model under the baseline (EME) calibration (third column); by the model under a greater $\lambda$ consistent with AEs, only (fourth column); by the model under a lower $\psi_i$ (and hence a greater firm participation share) consistent with AEs, only (fifth column); and by the model under a joint increase in $\lambda$ and reduction in $\psi_i$ to AE levels (sixth column, corresponding to the black squares in Figure 2).

Figure 2 and Table 4 suggest that the relative degree of domestic financial participation can be an important driver of key defining differences between AE and EME business cycles, mainly the behavior of the relative volatility of consumption and wages and the cyclical correlation of the trade balance-output ratio with output. In particular, joint increases in both household and firm financial participation bring these moments in EMEs closer to those of AEs. In contrast, the joint change in domestic financial participation reduces the relative volatility of unemployment, thereby widening the relative differences in this second moment between EMEs and AEs. This finding suggests that other structural factors beyond domestic financial participation may be relevant for the differences in unemployment dynamics between country groups. Briefly, one such factor are labor market institutions in each country group.

In particular, the role of the value of unemployment in shaping unemployment volatility in search models is well known (Hagedorn and Manovskii, 2008). Differences in unemployment benefits (UB) are therefore a natural candidate to understand differences in labor market dynamics. In fact, average replacement rates in our AE sample represent 65 percent of average wages; in contrast, EMEs have negligible unemployment benefits (UB) compared to AEs. For completeness, the last column of Table 4 shows results from jointly increasing $\lambda$ and decreasing $\psi_i$ to AE levels while simultaneously setting UB at AE levels. The inclusion of UB at these AE levels generates an increase in the relative volatility of unemployment compared to the baseline EME, consistent with AEs having greater relative unemployment volatility compared to EMEs. These results suggest that labor market institutions may play a non-trivial role for understanding unemployment-volatility differences between AEs and EMEs,

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16The negative relationship between unemployment volatility and domestic financial participation is broadly consistent with the negative link between average bank credit-GDP ratios and unemployment volatility in the data (see Epstein and Finkelstein Shapiro, 2019).
with greater domestic financial participation putting downward pressure on unemployment volatility.

More broadly, to the extent that lower relative volatilities may be a desirable objective for EMEs, our baseline analysis suggests that: bolstering greater joint household and firm financial participation in EMEs, and not household financial participation alone, can be a means to achieve this objective.

Table 4: Business Cycle Moments–AE and EME Data, Benchmark (EME) Model, and Benchmark Model with Greater Financial Participation

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Data AE</th>
<th>Data EME</th>
<th>Benchmark (EME) Model</th>
<th>AE $\lambda$</th>
<th>EME $\lambda$</th>
<th>AE $\psi_i$</th>
<th>EME $\psi_i$</th>
<th>AE UI Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_{c_{d,t}}/\sigma_{Y_{d,t}}$</td>
<td>0.92</td>
<td>1.21</td>
<td>1.26*</td>
<td>1.29</td>
<td>1.07</td>
<td>0.90</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>$\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}}$</td>
<td>3.63</td>
<td>3.28</td>
<td>3.28*</td>
<td>3.13</td>
<td>2.52</td>
<td>1.98</td>
<td>1.98</td>
<td></td>
</tr>
<tr>
<td>$\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$</td>
<td>0.87</td>
<td>2.67</td>
<td>1.27</td>
<td>1.20</td>
<td>1.15</td>
<td>1.06</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>$\sigma_{u_{t}}/\sigma_{Y_{d,t}}$</td>
<td>7.47</td>
<td>3.41</td>
<td>0.29</td>
<td>0.28</td>
<td>0.22</td>
<td>0.16</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>corr$(c_{d,t}, Y_{d,t})$</td>
<td>0.52</td>
<td>0.72</td>
<td>0.77</td>
<td>0.72</td>
<td>0.83</td>
<td>0.86</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>corr$(inv_{d,t}, Y_{d,t})$</td>
<td>0.68</td>
<td>0.71</td>
<td>0.87</td>
<td>0.88</td>
<td>0.90</td>
<td>0.94</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>corr$(u_{t}, Y_{d,t})$</td>
<td>-0.61</td>
<td>-0.39</td>
<td>-0.62</td>
<td>-0.64</td>
<td>-0.63</td>
<td>-0.67</td>
<td>-0.43</td>
<td></td>
</tr>
<tr>
<td>corr$(tb_{t}, Y_{d,t})$</td>
<td>0.01</td>
<td>-0.31</td>
<td>-0.31*</td>
<td>-0.29</td>
<td>-0.19</td>
<td>0.04</td>
<td>0.12</td>
<td></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). $\sigma_{x_{t}}$ 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, Sweden, and Switzerland 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. $tb_{t}$ 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.

Robustness For completeness and robustness, the Appendix presents a comprehensive set of our financial participation results for versions of the baseline model: (1) calibrated
to a higher elasticity of substitution between output categories (Figure A1); (2) with firm-
category differences in vacancy posting costs (Figure A2); (3) with firm-category differences
in employment separation probabilities (Figure A3), and (4) with a higher capital share for
e firms (which incidentally reduces the steady-state labor productivity differential between
firm categories) (Figure A4). Our main findings remain unchanged under these alternatives
to our baseline calibration.

4.4 Steady State and Economic Intuition

To understand the results in the previous section, we first focus on how greater financial
participation changes the steady state. Figure 3 shows the steady-state changes of select
variables for the same changes in $\lambda$ and $\psi_i$ used to generate Figure 2. The red square in
Figure 3 once again denotes our baseline EME equilibrium, and the black square once again
denotes the resulting equilibrium when both $\lambda$ and $\psi_i$ are at their average AE levels.
Figure 3: Steady-State Participation Equilibria

Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and and lowest $\psi_i$.

As a complement to Figure 3, Table 5 summarizes the most relevant steady-state findings that will help to understand the business cycle effects of greater domestic financial participation. Specifically, Table 5 shows the percent change in $i$-firms’ and $e$-firms’ labor productivity when, similar to the results in Table 3, we: (1) increase household financial participation only from its baseline (EME) level to its AE level (via an increase in $\lambda$; column (2)); (2) increase firm financial participation only from its baseline (EME) level to its AE level (via empirically-consistent reductions in $\psi_i$, column (3)); and (3) implement a joint increase in financial participation to AE levels (column (4)). The table also shows: the difference between the percent change in $i$ firms’ labor productivity and the percent change in $e$ firms’ labor productivity; the percent change in aggregate labor productivity; and the
percent change in the credit-output ratio under each scenario.

Table 5: Domestic Financial Participation and Steady-State Percent Changes in Firm-
Category and Aggregate Labor Productivity, and in Credit-Output Ratios

<table>
<thead>
<tr>
<th></th>
<th>AE $\lambda$</th>
<th>EME $\lambda$</th>
<th>AE $\psi_i$</th>
<th>EME $\psi_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Δ i-firm labor prod.</td>
<td>-2.18</td>
<td>124.9</td>
<td>153.9</td>
<td></td>
</tr>
<tr>
<td>%Δ e-firm labor prod.</td>
<td>20.5</td>
<td>16.8</td>
<td>59.2</td>
<td></td>
</tr>
<tr>
<td>(%Δ i-firm labor prod.)</td>
<td>-22.7</td>
<td>108.1</td>
<td>94.7</td>
<td></td>
</tr>
<tr>
<td>%Δ Agg. labor prod.</td>
<td>10.6</td>
<td>68.5</td>
<td>181.6</td>
<td></td>
</tr>
<tr>
<td>%Δ Credit-output ratio</td>
<td>44.1</td>
<td>14.7</td>
<td>45.8</td>
<td></td>
</tr>
</tbody>
</table>

Notes: %Δ denotes a percent change. Aggregate labor productivity is defined as total output divided by total employment, $Y/(L_e + L_i)$. The credit-output ratio is defined as $\xi_b (\psi N_{E,i} + \text{inv}) / Y$.

Two main results from Figure 3 and Table 5 are worth noting. First, an increase in $\lambda$ only generates an endogenous increase in the share of firm financial participation (that is, an increase in the share of $i$ firms $N_i/N$), even as $\psi_i$ is held at its baseline (EME) value; this result arises as a byproduct of the reallocation of resources towards $i$ households, which influences $i$-households’ allocation of resources across firm categories.\(^{17}\) Second and most critically, the consequences for the relative changes in firms’ labor productivity differ dramatically depending on whether greater household financial participation $\lambda$ is accompanied by a joint reduction in $\psi_i$ that bolsters firm financial participation independently from the change in $\lambda$ (that is, a joint-participation scenario) or not. We delve deeper into these two outcomes and their importance below.

Intuitively, a larger $\lambda$ alone increases the resources that are made available to $i$ firms via $i$ households (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,

\(^{17}\)In particular, 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.
the reduction in $u_e$ puts upward pressure on $e$ firms’ wages via a sharp increase in $e$-category market tightness that is driven by the fall in $u_e$. $e$ firms respond by reducing vacancies (and hence employment) and capital demand, which leads to a sharp equilibrium reduction in the number of $e$ firms and $e$-category output.

Under the baseline EME share of $i$ firms, $e$ 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 induced by greater household participation is strong enough to partially offset the benefits to $i$ firms from having more individuals from $i$ households as workers (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, and unemployment, which remains very close to its baseline (EME) level despite the rise in labor demand by $i$ firms.¹⁸

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 steady-state value to $i$ firms of having a worker), but also results in a non-trivial increase in $e$-firm labor productivity (more specifically, in Figure 3, $i$-firm labor productivity falls slightly from a baseline of 4.088 to 3.99). The response of $i$ firms’ labor productivity is rooted in the fact that the change in $i$-firm employment is quantitatively larger than the increase in $i$-firm capital under a greater $\lambda$ only. Along similar lines, $e$-firm labor productivity increases considerably since the number of $e$ workers drops sharply and by more than the reduction in $e$-firm capital. These outcomes take place even though an increase in $\lambda$ only is reflected in higher total consumption and output. Then, in relative terms, $e$ firms’ exhibit a gain in labor productivity compared to $i$ firms. This is summarized in Table 5 which shows that the difference between the percent change in $i$ firms’ labor productivity and the percent change in $e$ firms’ labor productivity is negative.

Now consider the steady-state changes from a joint increase in financial participation (that is, an increase in $\lambda$ accompanied by a concurrent reduction in $i$-firms’ sunk-entry costs

¹⁸Specifically, the total number of firms in our baseline EME calibration is 63.6. An increase in $\lambda$ only 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 indirectly with a greater $\lambda$ as resources are reallocated from $e$ to $i$ households. Therefore, the equilibrium reduction in the total number of firms is driven by the fall in $e$ firms.
\( \psi_i \) such that the share of \( i \) firms increases directly as a result of lower sunk-entry costs. While the number of \( i \) firms increases and the number of \( e \) firms falls, the most critical outcome is that steady-state firm-category labor productivity (and hence the value of having an additional worker to firms) increases in the two firm categories and not in \( e \) firms alone. Moreover, the percent increase in \( i \)-firm labor productivity is considerably greater than the corresponding percent increase in \( e \)-firm labor productivity. Put differently, as shown in Table 5, the difference between the percent change in \( i \) firms’ labor productivity and the percent change in \( e \) firms’ labor productivity is positive. This stands in stark contrast with the outcome under greater household participation alone.

To understand why \( i \) firms’ labor productivity increases by more compared to \( e \) firms under a joint increase in financial participation, and what the cyclical-volatility implications are, note that under endogenous firm entry, firms are seen as an asset. Then, \( i \) households have three different non-financial 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 steady-state individual-firm profits \( d_i \) for incumbent \( i \) 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 (not individual) firm 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 (with the increase in \( i \)-firm capital being considerably greater than what would take place under an increase in \( \lambda \) alone). This leads to a greater number of \( i \) firms and \( e \) firms, greater consumption among both households, firm-category labor productivity, total consumption and output, and to somewhat lower unemployment. Of note, the concurrent increase in \( \lambda \) that accompanies a lower \( i \)-firm sunk-entry cost partially offsets some of these effects by reallocating a larger share of individuals towards \( i \) firms (which all else equal puts downward pressure on \( i \)-firm labor productivity for a given level of \( i \)-firm capital). Ultimately, though, the greater equilibrium increase in \( i \)-firm labor productivity relative to \( e \)-firm labor productivity remains as a result of the much greater increase in \( i \)-firm capital under a joint increase in financial participation.
Steady-State Effects of Financial Participation on Firms’ Labor Productivity

All told, the three most noteworthy findings from Figure 3 and Table 5 are as follows. First, both individual and joint improvements in financial participation raise aggregate labor productivity, but an explicit increase in firm financial participation (via a lower $\psi_i$) is crucial for $i$ firms’ labor productivity to increase proportionately more relative to the change in $e$ firms’ labor productivity (as we discuss in the next section, this net positive effect on $i$ firms’ labor productivity plays an important stabilizing role amid shocks). Second, 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. Third, from a qualitative standpoint, both greater firm financial participation only or greater household participation only lead to an increase in the credit-GDP ratio and in aggregate labor productivity, even though the proportional changes in $i$ firms’ labor productivity relative to $e$ firms’ labor productivity differ dramatically depending on the underlying source of the change in the credit-output ratio.

Given this last fact, Table 5 makes clear that aggregate measures of financial participation—the credit-output ratio being one of them—provide an incomplete picture of the connection between domestic financial participation and firms’ labor productivity changes (especially for $i$ firms). As such, differentiating between changes in household participation and changes in firm participation—both of which shape the credit-output ratio in similar ways but impact firms’ labor productivity differentially—is important.

Steady State Results and Empirical Corroboration  The qualitative positive change in aggregate labor productivity associated with greater domestic financial participation is broadly consistent with existing empirical evidence for EMEs (Dabla-Norris, Ho, and Kyobe, 2016; Kouamé and Tapsoba, 2018). To give further empirical validation to our model-based outcomes, note that Figure 3 suggests the following aggregate outcomes. First, greater household financial participation is associated with greater output, consumption, aggregate labor productivity, a greater share of $i$ firms, and no change in unemployment. Second, lower $i$-firm entry costs by themselves are associated with greater output, consumption, aggregate labor productivity, a greater share of $i$ firms, and a marginal reduction in unemployment.
Figures A5 and A6 in Appendix A.5 show that these model-based aggregate outcomes are, from a comprehensive standpoint, broadly consistent with the corresponding empirical patterns based on a comprehensive sample economies (firm-category labor productivity based on our two firm categories is not available in the data; hence our focus on aggregate measures of labor productivity in Figures A5 and A6).

4.5 Impulse Response Functions and Economic Intuition

The increase in $i$ firms’ steady-state labor productivity in response to a joint increase in domestic financial participation noted earlier plays a central role in understanding the business cycle effects of greater participation.

Figures 4 and 5 shed light on the economic mechanisms behind the volatility results by considering 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 $\lambda = 0.96$ (the average AE level of household participation, green solid line with circles), and (3) the same economy with both $\lambda = 0.96$ and lower sunk entry costs for $i$ firms that match the median cost of registering a firm in AEs (blue solid line).\(^\text{19}\) The magnitude of the shocks is identical across economies.

Negative Aggregate Productivity Shock  As shown in Figure 4, greater household participation $\lambda$ alone has marginal effects on the response to an identical adverse aggregate productivity shock: the economy under a greater household participation alone exhibits a somewhat more persistent contraction in output but otherwise very similar dynamics relative to the baseline (EME) economy. In fact, the red dashed line (representing the baseline EME) and the green solid line with circles (representing the EME with greater household participation) appear to be almost always superimposed.

In contrast, a joint increase in domestic financial participation (that is, greater household participation alongside greater firm participation obtained via lower sunk entry costs for $i$

\(^{19}\text{As is the case throughout our analysis, versions (2) and (3) use the same parameter values as (1) except for those parameters that change as part of the experiments (i.e., $\lambda$ only or both $\lambda$ and $\psi_i$). Using recalibrated versions of the baseline model under a higher $\lambda$ or a higher $\lambda$ and lower $\psi_i$ delivers identical conclusions.}\)
firms) sharply curtails the responses of sectoral and total unemployment, consumption, and investment and, to a lesser extent, total output.

Figure 4: Response to a One Standard Deviation Reduction in Aggregate Productivity (Quarters after Shock)

The economic intuition is straightforward: as noted in the discussion of the steady-state equilibria, 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 vacancy and employment decisions 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 an identical 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 5, the response of the economy to a temporary increase in foreign interest rates is qualitatively similar to the response to aggregate productivity shocks in Figure 4. However, as is well known from the EME business cycle literature, these shocks are of fundamental importance for generating several facts that make business cycles in EME distinct from those in AEs.

Figure 5: Response to a One Standard Deviation Increase in the Foreign Interest Rate (Quarters after Shock)

With greater household participation alone (green solid line with circles), total con-
sumption 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 as well. Intuitively, while greater household participation alone generates an endogenous increase in the number of $i$ firms as a byproduct of the greater share of $i$-household members, recall that steady-state $i$-firm labor productivity falls slightly relative to the baseline (EME) economy. Then, 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 steady-state $i$-firm labor productivity. The net effect on steady-state labor productivity from increasing $\lambda$ to AE levels ultimately explains why the response of equilibrium sectoral vacancies (and employment), wages, and firms under a greater $\lambda$ alone 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 2). Moreover given that $i$-firm output accounts for the bulk of total output under a greater $\lambda$ alone, the recovery in total output after an interest rate shock becomes more sluggish.

In stark contrast, a joint increase in household participation (via a higher $\lambda$) and firm participation (via lower sunk-entry costs $\psi_i$) increases steady-state firm-category labor productivity and the value to firms of having a worker across the board (recall Figure 3). This higher steady-state labor productivity stabilizes firms’ hiring and capital demand decisions in the presence of shocks. As a result, 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, with a greater $\lambda$ 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.$^{20}$

### 4.6 Endogenous Household Financial Participation (EHFP)

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.6 of the Appendix presents the details of a much richer version of our baseline framework where the household financial participation share is endogenized (we refer to this endogenous household-participation share as $\lambda_i$, and to the model with *Endogenous Household* Financial Participation as the EHFP model, below). Doing so is not trivial. Standard labor search frictions naturally introduce an extensive margin by having a measure of household members. However, this margin is still constant, as it is in our baseline model, if we (correctly) consider both employed and unemployed individuals as comprising the measure of members in each household.

We exploit the presence of labor search frictions to introduce an *endogenous* extensive margin of *household financial participation* via endogenous labor force participation in both household categories. In essence, in this modified model, the now endogenous labor force of each household category represents the endogenous extensive margin of household financial participation. Critically, the direct mapping from labor force participation to household financial participation we adopt is completely consistent with the empirical extensive-margin measure of household financial participation presented in Table 2 of Section 2. Specifically, the extensive-margin measure of household financial participation in the data is based on the share of individuals ages 15+ who have an account at financial institutions. Critically, per ILO international-comparison criteria, the working-age population (which is used to compute labor force participation rates across countries) is based on the population ages 15+ as well. As such, our model delivering a perfectly consistent mapping between endogenous labor force participation rates and endogenous household financial participation rates. As discussed in

$^{20}$Were we to include unemployment benefits (UB) as part of the joint increase in household and firm financial participation, unemployment would become more responsive to shocks relative to the baseline (EME) economy, 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 this same baseline, thereby delivering both unemployment and aggregate volatility consistent with AEs.
detail in Section A.6 of the Appendix, this richer framework 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. Then, relative to our baseline model, this environment accommodates endogenous changes in the share of individuals (or household members) who participate in the banking system, thereby delivering a highly tractable framework with both endogenous household and firm financial participation.

Table 6: Business Cycle Moments: Data, Endogenous Household Financial Participation (EHFP) Model, and EHFP Model under Greater Financial Participation

<table>
<thead>
<tr>
<th>Second Moments</th>
<th>Data</th>
<th>Data</th>
<th>EHFP Model</th>
<th>EHFP Model</th>
<th>EHFP Model</th>
<th>EHFP Model</th>
<th>EHFP Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AE</td>
<td>EME</td>
<td>AE λ</td>
<td>EME λ</td>
<td>AE λ</td>
<td>AE λ</td>
<td>AE ψ_i</td>
</tr>
<tr>
<td>(\sigma_{c,t}/\sigma_{Y_{d,t}})</td>
<td>0.92</td>
<td>1.21</td>
<td>1.71</td>
<td>1.54</td>
<td>1.33</td>
<td>0.96</td>
<td>0.87</td>
</tr>
<tr>
<td>(\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}})</td>
<td>3.63</td>
<td>3.28</td>
<td>3.28</td>
<td>2.95</td>
<td>2.48</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>1.71</td>
<td>1.71</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>2.60</td>
<td>3.11</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>0.55</td>
<td>0.68</td>
<td>0.68</td>
<td>0.71</td>
</tr>
<tr>
<td>(corr(inv_{d,t},Y_{d,t}))</td>
<td>0.68</td>
<td>0.71</td>
<td>0.88</td>
<td>0.87</td>
<td>0.90</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>-0.70</td>
<td>-0.76</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>-0.14</td>
<td>-0.13</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 6 summarizes the results from conducting the same experiments outlined in Section 4.3 using this richer framework (Section A.6.3 in Appendix A.6 presents the relevant calibra-
tion details of this richer model). We exploit the inclusion of the labor force participation margin by calibrating the model to match the relative volatility of unemployment in the baseline (EME) model. This approach allows us to explicitly explore whether quantitatively capturing the volatility of unemployment is important for our findings.

Inspection of Table 6 shows that all our main results and conclusions, including the fact that a joint increase in household and firm financial participation reduces the relative volatility of unemployment, continue to hold. More broadly, this robustness experiment confirms that neither assuming an exogenous household financial participation share nor being unable to quantitatively capture the empirical volatility of unemployment in our baseline model is a limiting factor for our main conclusions (for completeness, Figure A7 in Appendix A.6 presents the counterpart of Figure 2 for the model with endogenous firm and household participation, and confirms that our main findings hold).

Table 6 also shows that increasing unemployment benefits (UB) at the level of AEs alongside a joint increase 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 the baseline EME, greater joint financial participation delivers relative volatilities of wages and consumption smaller than 1, a procyclical trade balance-output ratio, and greater relative unemployment volatility. Moreover, the joint increase in household and firm participation alongside AE-level UB generates non-targeted relative volatilities of unemployment and wages that are very close to the ones in AEs (mainly, 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, from a comprehensive standpoint, quantitatively better without altering any of the key channels or findings that we highlighted using our simpler benchmark model.

The model generates all well-known features of EME business cycles, chief among which are a relative volatility of consumption greater than one, albeit somewhat higher than in the data, and a countercyclical trade balance-output ratio. The maximum share of household financial participation in these quantitative experiments is 0.80, which is well within the empirical range for AEs and outside the range for EMEs (see Table 2). Increasing $\lambda_i$ further would only strengthen our quantitative results by bringing down the volatilities under a joint increase in financial participation even further.
5 Conclusion

In recent years, emerging economies (EMEs) have sought to increase the shares of household and firm participation in the domestic banking system. These efforts are important since, compared to advanced economies (AEs), EMEs have drastically lower shares of both firm and household domestic financial participation, but their recentness limit our ability to understand their implications for cyclical dynamics in an empirical context. This paper explores the impact on EME labor market and business cycle dynamics of raising the shares of household and firm domestic financial participation in EMEs to AE levels using a theoretical approach and quantitative analysis.

To this end, 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 key defining characteristics of EMEs’ business cycles and domestic financial participation. Our analysis shows that a joint increase in the share of households and firms that participate in the domestic banking system from EME to AE levels narrows the differences between EMEs and AEs regarding the relative volatility of consumption and wages and the correlation of the trade balance-output ratio with output. In particular, these joint changes yield an acyclical trade balance, and a reduction in all noted relative volatilities. However, the same joint change in domestic financial participation widens the difference between EME and AEs regarding the relative volatility of unemployment. Critically, increasing only household or only firm financial participation delivers a similar increase in credit-output ratios (an aggregate measure of financial participation) but yields very different volatility results, thereby highlighting the importance for smoother aggregate fluctuations of comprehensive improvements in domestic financial participation that take into account all extensive margins of participation in tandem.

Our work makes three contributions. First, we show that the extensive margin of both firm and household domestic financial participation can have nontrivial effects on business cycles, and that the type of extensive margin matters for the labor market and aggregate volatility consequences of greater domestic financial participation. Second, to the extent that lower relative volatilities may be a desirable objective in EMEs, we find that imple-
menting greater joint firm and household domestic financial participation can be a means to achieve this objective, with greater firm participation being a critical factor. Third, our work highlights the limitations of aggregate measures of domestic financial participation for understanding the volatility consequences of bolstering domestic financial participation in EMEs. An important issue that remains unexplored is the potential asymmetric impact of greater firm and household financial participation on domestic financial stability in EMEs.
References


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.

Figure 1 The list of economies included in Figure 1 is determined based on data availability and is comprised of: Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Belarus, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Chile, Colombia, Republic of Congo, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Gabon, Georgia, Ghana, Guatemala, Guinea, Honduras, Hungary, Indonesia, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Latvia, Lesotho, Liberia, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Romania, Russia, Rwanda, Senegal, Serbia, Sierra Leone, Slovak Republic, Slovenia, South Africa, Sri Lanka, Tajikistan, Tanzania, Thailand, Turkey, Uganda, Ukraine, Uruguay, Venezuela, Vietnam, and Zambia.

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

\[
P_{j,t} = \left( \int_{\omega_j \in \Omega_j} p_{j,t}(\omega_j)^{1-\epsilon} d\omega_j \right)^{\frac{1}{1-\epsilon}}.
\]
Dividing both sides by $P_t$, we have

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

Imposing symmetry, we have

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

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

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

which can be rewritten as

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

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

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

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

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

### 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

\[
Y_t = \left[ (1 - \alpha_g) \frac{1}{\phi_y} (Y_{i,t})^{\phi_y-1} + \alpha_g \frac{1}{\phi_y} (Y_{e,t})^{\phi_y-1} \right]^{\phi_y}, \tag{22}
\]

\[
\rho_{i,t} = (\varepsilon/(\varepsilon - 1)) mc_{i,t}, \tag{23}
\]

\[
\rho_{e,t} = (\varepsilon/(\varepsilon - 1)) mc_{e,t}, \tag{24}
\]

\[
\psi_i [1 - \xi_b + \xi_b R_{t}] = (1 - \delta) \mathbb{E}_t \Xi_{t+1}^i \left[ d_{i,t+1} + \psi_i [1 - \xi_b + \xi_b R_{t+1}] \right], \tag{25}
\]

\[
\psi_e = (1 - \delta) \mathbb{E}_t \Xi_{t+1}^i \left[ d_{e,t+1} + \psi_e \right], \tag{26}
\]

\[
[1 - \xi_b + \xi_b R_t] = \mathbb{E}_t \Xi_{t+1}^i \left[ r_{t+1} + (1 - \delta) [1 - \xi_b + \xi_b R_{t+1}] \right], \tag{27}
\]

\[
N_{i,t} = (1 - \delta) (N_{i,t-1} + N_{i,t-1}), \tag{28}
\]

\[
N_{e,t} = (1 - \delta) (N_{i,t-1} + N_{e,t-1}), \tag{29}
\]

\[
n_{i,t+1} = (1 - \rho_n^i) \left( n_{i,t} + v_{i,t} q(\theta_{i,t}) \right), \tag{30}
\]

\[
n_{e,t+1} = (1 - \rho_n^e) \left( n_{e,t} + v_{e,t} q(\theta_{e,t}) \right), \tag{31}
\]

\[
r_{i,t} = \alpha_i mc_{i,t} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i-1}, \tag{32}
\]

\[
r_{e,t} = \alpha_e mc_{e,t} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e-1}, \tag{33}
\]

\[
k_t = k_{i,t} + k_{e,t}, \tag{34}
\]

\[
r_{e,t} = r_{i,t} = r_t, \tag{35}
\]

\[
\frac{\kappa}{q(\theta_{i,t})} = (1 - \delta)(1 - \rho_n^i) \mathbb{E}_t \Xi_{t+1}^i \left\{ (1 - \alpha_i) mc_{i,t+1} z_{i,t+1} n_{i,t+1}^{\alpha_i} k_{i,t+1}^{1-\alpha_i} - w_{i,t+1} + \frac{\kappa}{q(\theta_{i,t+1})} \right\}, \tag{36}
\]

\[
\frac{\kappa}{q(\theta_{e,t})} = (1 - \delta)(1 - \rho_n^e) \mathbb{E}_t \Xi_{t+1}^i \left\{ (1 - \alpha_e) mc_{e,t+1} z_{e,t+1} n_{e,t+1}^{\alpha_e} k_{e,t+1}^{1-\alpha_e} - w_{e,t+1} + \frac{\kappa}{q(\theta_{e,t+1})} \right\}, \tag{37}
\]

\[
w_{i,t} = \eta \left[ (1 - \alpha_i) mc_{i,t} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i-1} + \kappa \theta_{i,t} \right] + (1 - \eta) \chi_t, \tag{38}
\]

\[
w_{e,t} = \begin{bmatrix} \eta \left[ (1 - \alpha_e) mc_{e,t} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e-1} \right] + (1 - \eta) \chi_e \\ + \eta \left[ \frac{\kappa}{q(\theta_{e,t})} - (1 - \delta)(1 - \rho_n^e) (1 - f(\theta_{e,t})) \mathbb{E}_t \Xi_{t+1}^i \right] \end{bmatrix}, \tag{39}
\]

\[57\]
\[ u'(c_{i,t}) = R_{t+1} \beta \mathbb{E}_t u'(c_{i,t+1}), \]  

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

\[ \rho_{i,t} = \frac{P_{t}}{P_t} N_{i,t}^{-\frac{1}{\phi_y}}, \]  

\[ \rho_{e,t} = \frac{P_{e,t}}{P_t} N_{e,t}^{-\frac{1}{\phi_y}}, \]  

\[ c_{e,t} = w_{e,t} n_{e,t} + \chi u_{e,t}, \]  

\[ Y_{i,t} = N_{i,t}^{\frac{1}{\phi_y}} y_{i,t} = N_{i,t}^{\frac{1}{\phi_y}} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i}, \]  

\[ Y_{e,t} = N_{e,t}^{\frac{1}{\phi_y}} y_{e,t} = N_{e,t}^{\frac{1}{\phi_y}} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e}, \]  

\[ Y_t = c_{e,t} + c_{i,t} + \text{inv}_t + \kappa V_{e,t} + \kappa V_{i,t} + \psi E_{E,et} + \psi E_{E,it} + R_{e,t} b_t^* - b_{t+1}^* + \frac{\eta b_t^*}{2} (b_{t+1}^*)^2, \]

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

\[ P_{e,t}/P_t = \alpha_y \frac{1}{\phi_y} (Y_t/Y_{e,t})^{\frac{1}{\phi_y}}, \]  

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

where \( J_{e,t} = (1 - \alpha_e) m e_{e,t} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e} - w_{e,t} + (1 - \delta)(1 - \rho_n^e) \mathbb{E}_t \Xi_{t+1}^i J_{e,t+1} \) and given the definitions of the households’ 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.
Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and lowest $\psi_i$.

**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.
Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and and lowest $\psi_i$.

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 $\rho_{n}^i = 0.03$. 

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Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_l$. The black square corresponds to the EME economy under the highest $\lambda$ and lowest $\psi_l$.

**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

Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and and lowest $\psi_i$. 
A.5 Household Financial Participation, Firm Entry Costs, and Macroeconomic Outcomes

The list of countries in Figures A5 and A6 below is dictated by the availability of data on the share of firms with bank credit and is comprised of: Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chile, Colombia, Republic of Congo, Democratic Republic of Congo, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Gabon, Georgia, Ghana, Guatemala, Honduras, Hungary, Indonesia, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Nepal, Nicaragua, Nigger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Romania, Russia, Rwanda, Senegal, Serbia, Sierra Leone, Slovak Republic, Slovenia, South Africa, Sri Lanka, Tajikistan, Tanzania, Thailand, Turkey, Uganda, Ukraine, Uruguay, Venezuela, Vietnam, and Zambia.
Figure A5: Household Financial Participation and Macroeconomic Outcomes: Empirical Facts

![Graphs showing the relationship between household financial participation and macroeconomic outcomes.](image)

Sources: World Bank World Development Indicators, World Bank Global Financial Development Report 2015, IFC Enterprise Finance Database 2010. Notes: In GDP PPP denotes the log of average real GDP PPP (in constant 2011 international $) from 2000 to 2017, ln Consumption PPP denotes the log of average real household and NPISH consumption expenditures PPP (in constant 2011 international $) from 2000 to 2017, Labor Productivity denotes average real GDP PPP per person employed from 2000 to 2017, the share of firms with bank credit corresponds to the share of firms with bank loans or lines of credit in 2011, and Ave. Unempl. Rate denotes the average unemployment rate from 2000 to 2017. The lines in each of the subfigures represent regression lines. Each observation represents a country, where the countries included in the figure being listed above. ***, **, and * denote significance at the 1, 5, and 10 percent levels.
Figure A6: Firm Entry Costs and Macroeconomic Outcomes: Empirical Facts

Sources: World Bank World Development Indicators, World Bank Global Financial Development Report 2015, IFC Enterprise Finance Database 2010, World Bank Doing Business Report. Notes: In GDP PPP denotes the log of average real GDP PPP (in constant 2011 international $) from 2000 to 2017, In Consumption PPP denotes the log of average real household and NPISH consumption expenditures PPP (in constant 2011 international $) from 2000 to 2017, Labor Productivity denotes average real GDP PPP per person employed from 2000 to 2017, the share of firms with bank credit corresponds to the share of firms with bank loans or lines of credit in 2011, and Ave. Unempl. Rate denotes the average unemployment rate from 2000 to 2017. The lines in each of the subfigures represent regression lines. Each observation represents a country, where the countries included in the figure being listed above. ***, **, and * denote significance at the 1, 5, and 10 percent levels.
A.6 Endogenizing Household Financial Participation

A.6.1 Model Structure

Recall that the baseline model in the main text 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, the population is of unit mass. An exogenous fraction of individuals in the economy $0 < \lambda < 1$ belongs to financially-included ($i$) households, with the remaining fraction $1 - \lambda$ belonging to financially-excluded ($e$) households, while the share of $i$ firms is endogenously determined. To determine whether having an exogenous share of household domestic financial participation is important for our main findings, we modify our baseline model to explicitly endogenize this share.

To do so tractably, we expand our baseline model to incorporate endogenous labor force participation into both household categories. We do so in the spirit of the one-household search model with endogenous labor force participation in Arseneau and Chugh (2012). 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 endogenous 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 in each household category 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. Importantly, as noted in Section 4.6 of the main text, our direct mapping from labor force participation rates to household domestic financial participation rates is completely consistent with the way both labor force participation rates and household financial participation rates are measured in the data.
A Note on the Production Structure  In what follows, we describe the changes we make to the baseline model only and ignore the features of the model that remain unchanged. To keep notation tractable and avoid excessive subscripts in a much richer environment, we assume that representative perfectly-competitive intermediate-goods firms use capital and labor to produce in each category $j \in \{e, i\}$, where each firm category is subject to standard search and matching frictions in the labor market. These firms sell their output to monopolistically-competitive firms, whose entry is endogenous, in their respective categories at price $mc_{j,t}$. This separation of labor search frictions and endogenous firm entry is similar to Cacciatore, Duval, Fiori, and Ghironi (2016a,b) and does not change our main conclusions compared to writing a model that merges intermediate-goods and monopolistically-competitive firms that enter the market endogenously, but makes the exposition of the labor market amid endogenous labor force participation more transparent.

A.6.2 Households

Following Arseneau and Chugh’s (2012) one-household environment, households in each category $i$ and $e$ 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 active within the same period. This assumption is inconsequential for our main conclusions but makes our labor market structure readily comparable to Arseneau and Chugh (2012). The total population is fixed and normalized to 1, so the labor force participation level is also the labor force participation rate, which are now endogenous.

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 Survey).

Formally, in addition to $i$ households choosing consumption $c_{i,t}$, total capital accumulation $k_{t+1}$, 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, \( N_{E,e,t} \) and \( N_{E,i,t} \), needed to reach the desired firm targets, they also choose their desired target for employed household members \( n_{i,t} \) in firm category \( i \) and the measure of searchers \( u_{i,t} \) needed to reach that target to maximize \( \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t [u(c_{i,t}) - h(lfp_{i,t})] \) subject to the budget constraint:

\[
c_{i,t} + b_{t+1} + R_{c,t}b_t^* + \frac{\psi_t}{2}(b_{t+1}^*)^2 + (\psi_t N_{E,i,t} + inv_t) [1 - \xi_b + \xi_b R_t] + \psi_e N_{E,e,t} = R_t b_t + b_{t+1}^* + u_{i,t} n_{i,t} + \chi_i (1 - f(\theta_{i,t})) u_{i,t} + d_{i,t} N_{i,t} + d_{e,t} N_{e,t} + r_t k_t, \tag{51}
\]

the laws of motion for \( i \) and \( e \) firms

\[
N_{i,t+1} = (1 - \delta)(N_{i,t} + N_{E,i,t}), \tag{52}
\]

and

\[
N_{e,t+1} = (1 - \delta)(N_{e,t} + N_{E,e,t}), \tag{53}
\]

and their perceived evolution of employment (following Arseneau and Chugh (2012)’s timing)

\[
n_{i,t} = (1 - \rho_n^i) n_{i,t-1} + u_{i,t} f(\theta_{i,t}), \tag{54}
\]

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 optimality conditions for the variables in the baseline model remain unchanged. In turn, the optimality condition that determines \( i \) household members’ participation is given by

\[
\frac{h'(lfp_{i,t})}{u'(c_{i,t})} = \left[ f(\theta_{i,t}) \left[ w_{i,t} + (1 - \rho_n^i) \mathbb{E}_t \Xi^i_{t+1|t} \left( \frac{1 - f(\theta_{i,t+1})}{f(\theta_{i,t+1})} \right) \left( \frac{h'(lfp_{i,t+1})}{u'(c_{i,t+1})} - \chi_i \right) \right] + (1 - f(\theta_{i,t})) \chi_i \right], \tag{55}
\]

where \( \Xi^i_{t+1|t} = \beta u'(c_{i,t+1})/u'(c_{i,t}) \) and \( h'(lfp_{i,t}) \) 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, recall from Section 4.6 of the main text that, per ILO measurement criteria,
the working-age population is based on individuals ages 15+, implying that the labor force participation rate is computed based on individuals ages 15+. Also, recall per Section 2 of the main text that the extensive margin of household financial participation is based on the share of individuals ages 15+ that have an account at financial institutions. Then, given these facts, the relevant and now endogenous measure of financially-included (i) household members that matters for our purposes is $lfp_{i,t}$.

Financially-Excluded (e) Households Financially-excluded (e) households consume their labor income. They choose consumption $c_{e,t}$, the desired number of household members employed in e firms, $n_{e,t}$, and the searchers needed to reach that employment target $u_{e,t}$ to maximize $E_0 \sum_{t=0}^{\infty} \beta^t [u(c_{e,t}) - h(lfp_{e,t})]$ subject to the budget constraint

$$c_{e,t} = w_{e,t}n_{e,t} + \chi_e (1 - f(\theta_{e,t}))u_{e,t}, \quad (56)$$

and their perceived evolution of employment (following Arseneau and Chugh’s timing)

$$n_{e,t} = (1 - \rho_n^e)n_{e,t-1} + u_{e,t}f(\theta_{e,t}), \quad (57)$$

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

$$\frac{h'(lfp_{e,t})}{u'(c_{e,t})} = \left[ f(\theta_{e,t}) \left( w_{e,t} + (1 - \rho_n^e)E_{t+1}^{\Xi_{t+1}^e} \left( \frac{1 - f(\theta_{e,t+1})}{f(\theta_{e,t+1})} \right) \left( \frac{h'(lfp_{e,t+1})}{u'(c_{e,t+1})} - \chi_e \right) \right) + (1 - f(\theta_{e,t}))\chi_e \right] \Xi_{t+1}^e, \quad (58)$$

where $\Xi_{t+1}^e = \beta u'(c_{e,t+1})/u'(c_{e,t})$ and $h'(lfp_{e,t})$ 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 $lfp_{e,t}$. 

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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-\( j \) 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 \( f(\theta_{j,t}) = v_{j,t}/(u_{j,t}^\xi + v_{j,t}^\xi)^{1/\xi} \) and \( q(\theta_{j,t}) = u_{j,t}/(u_{j,t}^\xi + v_{j,t}^\xi)^{1/\xi} \), respectively, where market tightness \( \theta_{j,t} \equiv v_{j,t}/u_{j,t} \).

With this in mind, the perceived evolution of total employment in each firm category is

\[
n_{j,t} = (1 - \rho_n^j)n_{j,t-1} + v_{j,t}q(\theta_{j,t}), \quad (59)
\]

for \( j \in \{e, i\} \), where \( 0 < \rho_n^j < 1 \) 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

\[
W_{j,t} - U_{j,t} = \frac{\eta}{1 - \eta} J_{j,t}, \quad (60)
\]

where

\[
\kappa/q(\theta_{j,t}) = J_{j,t}, \quad (61)
\]

\[
J_{j,t} = (1 - \alpha_j)mc_{j,t}z_t [n_{j,t}]^{-\alpha_j} [k_{j,t}]^{\alpha_j - 1} - w_{j,t} + (1 - \rho_n^j)\mathbb{E}_t Z_{t+1}^i J_{j,t+1}, \quad (62)
\]

and

\[
W_{j,t} - U_{j,t} = [h'(lfp_{j,t}) - \chi_j u'(c_{j,t})] / [f(\theta_{j,t})u'(c_{j,t})]. \quad (63)
\]

The expressions for the firms’ and workers’ value functions are identical to those in Arseneau and Chugh (2012). 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 \( lfp_t = lfp_{e,t} + lfp_{i,t} \). Then, recalling that the measure of \( i \) households’ employed and unemployed members represents the relevant measure of individuals who are categorized as being domestic financial participants, the model counter-
part of the share of individuals who have a bank account at financial institutions—that is, our extensive-margin measure of household financial participation in the data—is given by \( \lambda_{i,t} = \frac{lp_i}{lp_t} \) in the model.

A.6.3 Quantitative Analysis

**Calibration** Following Arseneau and Chugh (2012), we assume that the disutility of participation is

\[
h(lfp_{j,t}) = \left(\psi_j^e n_{1+1/\iota_j}\right) lfp_{j,t}^{1+1/\iota_j} \quad \text{for} \quad j \in \{e, i\}.
\]

In addition to the same parameter values and calibration targets we adopted in the baseline model’s quantitative analysis, we calibrate \( \psi_e^e \) to match a steady-state total labor force participation rate of 0.70 (consistent with our EME sample), and \( \psi_i^i \) to match \( \lambda_i = \frac{lp_i}{lp} = 0.42 \) in steady state, which is consistent with the household financial participation share in our EME sample (recall Table 2 in Section 2). Finally, we assume that \( \iota_e = \iota_i = \iota \) and set this parameter 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 the costs of participation for \( i \)-household members while simultaneously increasing the cost of participation for \( e \)-household members, \( \psi_i^i (\psi_e^e) \), such that total participation remains at its baseline level of 0.70 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, that is, via a disciplined reduction in \( i \) firms’ sunk entry cost \( \psi_i \) such that the lowest \( \psi_i \) replicates the average cost of creating a firm as a share of income per capita in our AE sample.

Of note, the model generates all well-known features of EME business cycles, chief among which are a relative volatility of consumption greater than one, albeit somewhat higher than in the data, and a countercyclical trade balance-output ratio. We also note that the maximum share of household financial participation in these quantitative experiments is
0.80, which is well within the empirical range for AEs and outside the range for EMEs (see Table 2). Increasing $\lambda_i$ further would only strengthen our quantitative results by bringing down the volatilities under a joint increase in financial participation even further, thereby validating our main findings.

Figure A7: Household Financial Participation, Firm Participation, and Cyclical Dynamics, Model with Endogenous Household Financial Participation

Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda_i$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda_i$ and lowest $\psi_i$. Model variables with _d_ subscripts represent data-consistent variables.