# ONLINE APPENDIX for "Increasing Domestic Financial Participation: Implications for Business Cycles and Labor Markets"

Brendan Epstein* Alan Finkelstein Shapiro†

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*Department of Economics, University of Massachusetts, Lowell, Falmouth Hall, 201 Riverside St., Lowell, MA 01854. E-mail: brendan_epstein@uml.edu.

†**Corresponding author**. Department of Economics, Tufts University, Braker Hall, 8 Upper Campus Road, Medford, MA 02155. E-mail: Alan.Finkelstein_Shapiro@tufts.edu.

# A Online Appendix

## A.1 Data Sources and Details

**Details Behind 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 A1: Countries and Sample Periods

| Country | Sample Period | Country | Sample Period | Sample Period UR |
|---|---|---|---|---|
| Australia | 1980Q1:2017Q4 | Brazil | 1995Q1:2017Q4 | 2001Q4:2017Q4 |
| Austria | 1996Q1:2017Q4 | Colombia | 2001Q1:2017Q4 | 2001Q1:2017Q4 |
| Belgium | 1995Q1:2017Q4 | Ecuador | 1991Q1:2017Q4 | 2001Q1:2017Q4 |
| Canada | 1980Q1:2017Q4 | Malaysia | 1991Q1:2017Q4 | 1998Q1:2017Q4 |
| Denmark | 1995Q1:2017Q4 | Mexico | 1990Q1:2017Q4 | 2002Q1:2017Q4 |
| Finland | 1990Q1:2017Q4 | Peru | 1990Q2:2017Q4 | 2001Q2:2017Q4 |
| Luxembourg | 1995Q1:2017Q4 | Philippines | 1990Q1:2017Q4 | 1998Q1:2017Q4 |
| Netherlands | 1996Q1:2017Q4 | South Africa | 1990Q1:2017Q4 | 2000Q1:2017Q4 |
| New Zealand | 1987Q1:2017Q4 | Thailand | 1993Q1:2017Q4 | 2001Q1:2017Q4 |
| Norway | 1980Q1:2017Q4 | Turkey | 1990Q1:2017Q4 | 2000Q1:2017Q4 |
| Sweden | 1993Q1:2017Q4 | | | |
| Switzerland | 1980Q1:2017Q4 | | | |

Source: International Monetary Fund International Financial Statistics.

**Details Behind Table 2** The facts in Table 2 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 (sample 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,

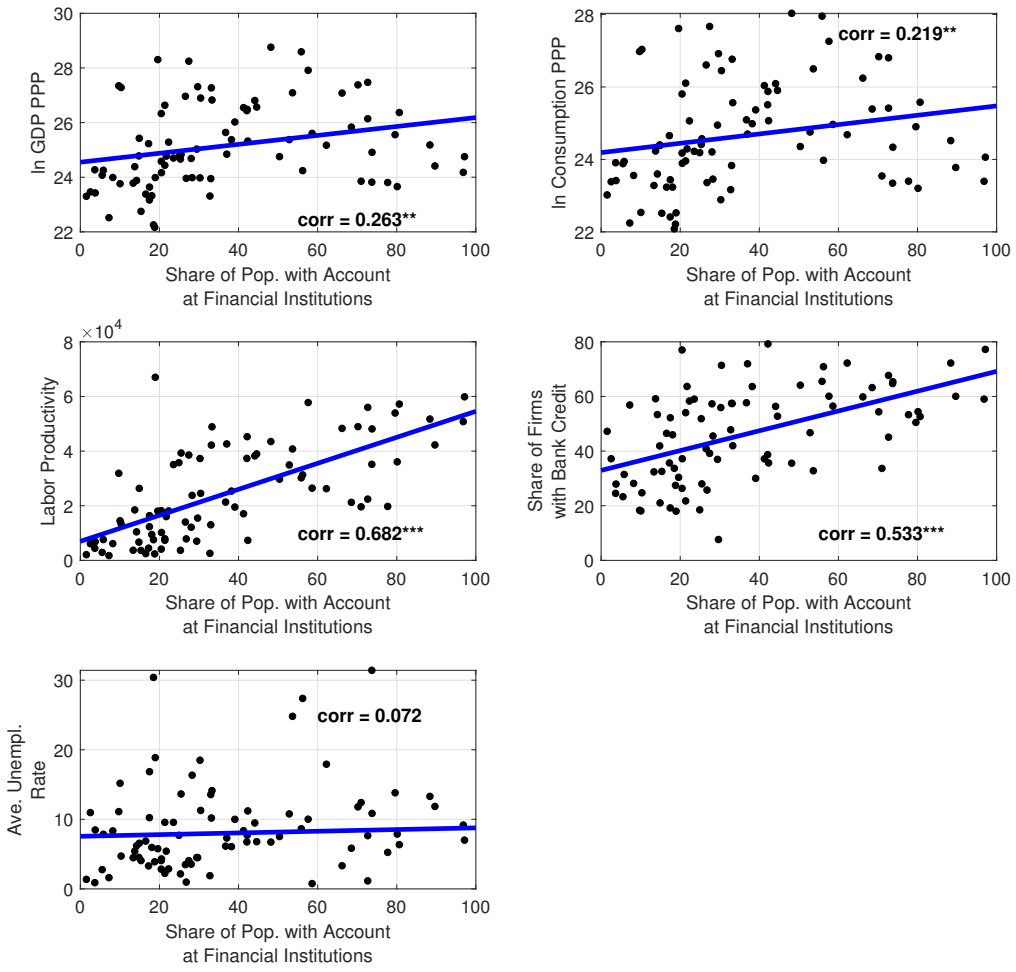
Thailand, and Turkey. We note that the data on the share of firms with bank loans from the SAFE and the IFC databases is not strictly comparable. As such, the evidence in Table 2 is only meant to illustrate the disparities in firms' access to bank finance in the two country groups. The share of firms 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.

**Details Behind Figure 1** The list of economies included in Figure 1 is dictated by 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 Household Financial Participation, Firm Entry Costs, and Macroeconomic Outcomes

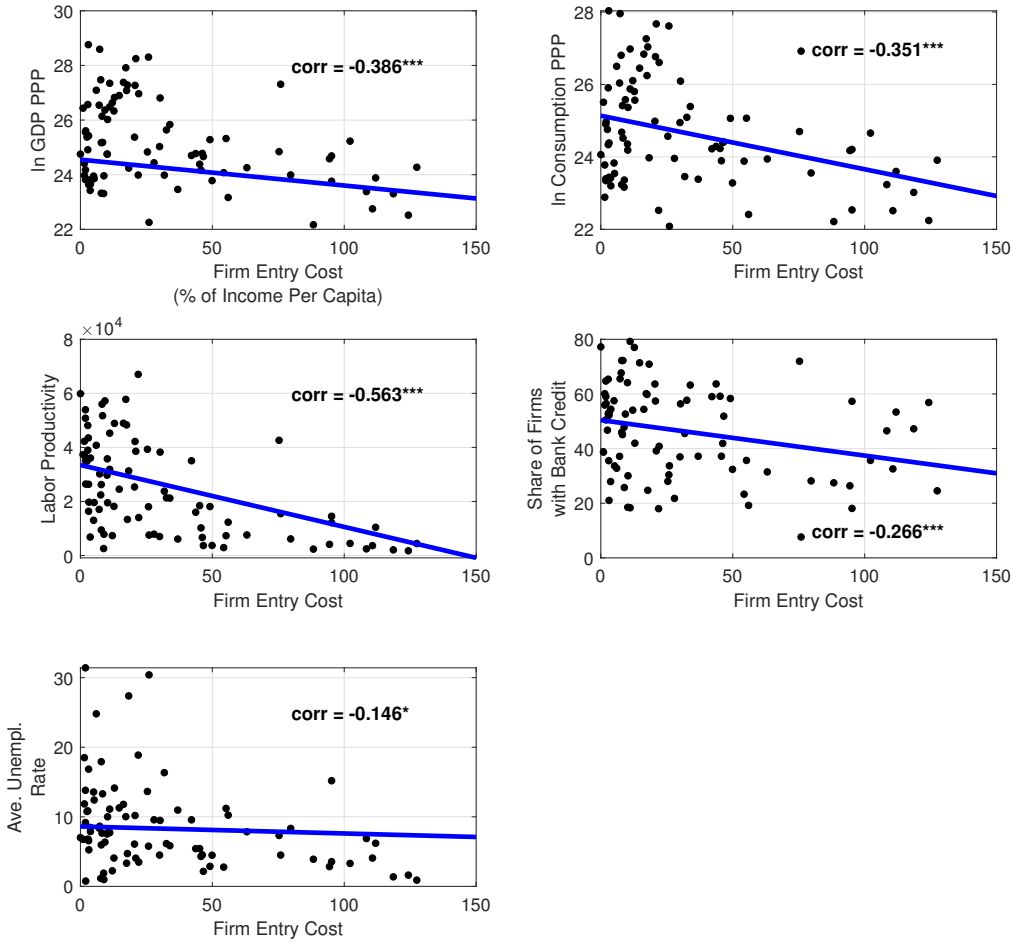
The list of countries in Figures A1 and A2 below is dictated by the availability of data on the share of firms with bank credit and is comprised of: Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, 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 A1: Household Financial Participation and Macroeconomic Outcomes: Empirical Facts




Sources: World Bank World Development Indicators, World Bank Global Financial Development Report 2015, IFC Enterprise Finance Database 2010. Notes: ln 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 A2: 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: ln 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.

## A.3 Aggregation in Benchmark Model

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

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

Dividing both sides by $P_t$, we have

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

Imposing symmetry, we have

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

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

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

which can be rewritten as

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

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

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

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

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

## A.4 Symmetric Equilibrium: Benchmark Model

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

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

$$\rho_{i,t} = (\varepsilon/(\varepsilon-1))\, mc_{i,t}, \tag{2}$$

$$\rho_{e,t} = (\varepsilon/(\varepsilon-1))\, mc_{e,t}, \tag{3}$$

$$\psi_i \left[1-\zeta+\zeta R_t\right] = (1-\delta)\mathbb{E}_t \Xi^i_{t+1|t} \left[d_{i,t+1} + \psi_i \left[1-\zeta+\zeta R_{t+1}\right]\right], \tag{4}$$

$$\psi_e = (1-\delta)\mathbb{E}_t \Xi^i_{t+1|t} \left[d_{e,t+1} + \psi_e\right], \tag{5}$$

$$\left[1-\zeta+\zeta R_t\right] = \mathbb{E}_t \Xi^i_{t+1|t} \left[r_{t+1} + (1-\delta)\left[1-\zeta+\zeta R_{t+1}\right]\right], \tag{6}$$

$$N_{i,t} = (1-\delta)\left(N_{i,t-1} + N_{E,it-1}\right), \tag{7}$$

$$N_{e,t} = (1-\delta)\left(N_{e,t-1} + N_{E,et-1}\right), \tag{8}$$

$$L_{i,t+1} = (1-\mu_i)\left(L_{i,t} + V_{i,t} q(\theta_{i,t})\right), \tag{9}$$

$$L_{e,t+1} = (1-\mu_e)\left(L_{e,t} + V_{e,t} q(\theta_{e,t})\right), \tag{10}$$

$$r_{i,t} = \alpha_i mc_{i,t} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i - 1}, \tag{11}$$

$$r_{e,t} = \alpha_e mc_{e,t} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e - 1}, \tag{12}$$

$$k_t = k_{i,t} + k_{e,t}, \tag{13}$$

$$r_{e,t} = r_{i,t} = r_t, \tag{14}$$

$$\frac{\kappa}{q(\theta_{i,t})} = (1-\delta)(1-\mu_i)\mathbb{E}_t \Xi^i_{t+1|t} \left\{(1-\alpha_i) mc_{i,t+1} z_{i,t+1} n_{i,t+1}^{-\alpha_i} k_{i,t+1}^{\alpha_i} - w_{i,t+1} + \frac{\kappa}{q(\theta_{i,t+1})}\right\}, \tag{15}$$

$$\frac{\kappa}{q(\theta_{e,t})} = (1-\delta)(1-\mu_e)\mathbb{E}_t \Xi^i_{t+1|t} \left\{(1-\alpha_e) mc_{e,t+1} z_{e,t+1} n_{e,t+1}^{-\alpha_e} k_{e,t+1}^{\alpha_e} - w_{e,t+1} + \frac{\kappa}{q(\theta_{e,t+1})}\right\}, \tag{16}$$

$$w_{i,t} = \nu \left[ (1-\alpha_i) mc_{i,t} z_t \left[ n_{i,t} \right]^{-\alpha_i} \left[ k_{i,t} \right]^{\alpha_i - 1} + \kappa \theta_{i,t} \right] + (1-\nu)\chi_i, \tag{17}$$

$$w_{e,t} = \begin{bmatrix} \nu \left[ (1-\alpha_e) mc_{e,t} z_t \left[ n_{e,t} \right]^{-\alpha_e} \left[ k_{e,t} \right]^{\alpha_e - 1} \right] + (1-\nu)\chi_e \\ +\nu \left[ \frac{\kappa}{q(\theta_{e,t})} - (1-\delta)(1-\mu_e) \left( 1 - f(\theta_{e,t}) \right) \mathbb{E}_t \Xi^e_{t+1|t} \mathbf{J}_{e,t+1} \right] \end{bmatrix}, \tag{18}$$

$$\mathbf{u}'(c_{i,t}) = R_{t+1} \beta \mathbb{E}_t \mathbf{u}'(c_{i,t+1}), \tag{19}$$

$$1 = R_{c,t+1} \beta \mathbb{E}_t \frac{\mathbf{u}'(c_{i,t+1})}{\mathbf{u}'(c_{i,t})} + \eta_b b^*_{t+1}, \tag{20}$$

$$\rho_{i,t} = \frac{P_{i,t}}{P_t} N_{i,t}^{\frac{1}{\varepsilon - 1}}, \tag{21}$$

$$\rho_{e,t} = \frac{P_{e,t}}{P_t} N_{e,t}^{\frac{1}{\varepsilon - 1}}, \tag{22}$$

$$c_{e,t} = w_{e,t} n_{e,t} + \chi_e u_{e,t}, \tag{23}$$

$$Y_{i,t} = N_{i,t}^{\frac{\varepsilon}{\varepsilon - 1}} y_{i,t} = N_{i,t}^{\frac{\varepsilon}{\varepsilon - 1}} z_t n_{i,t}^{1-\alpha_i} k_{i,t}^{\alpha_i}, \tag{24}$$

$$Y_{e,t} = N_{e,t}^{\frac{\varepsilon}{\varepsilon - 1}} y_{e,t} = N_{e,t}^{\frac{\varepsilon}{\varepsilon - 1}} z_t n_{e,t}^{1-\alpha_e} k_{e,t}^{\alpha_e}, \tag{25}$$

$$Y_t = c_{e,t} + c_{i,t} + inv_t + \kappa V_{e,t} + \kappa V_{i,t} + \psi_e N_{E,et} + \psi_i N_{E,it} + R_{c,t} b^*_t - b^*_{t+1} + \frac{\eta_b}{2} (b^*_{t+1})^2, \tag{26}$$

$$P_{i,t}/P_t = (1-\alpha_y)^{\frac{1}{\phi_y}} \left( Y_t / Y_{i,t} \right)^{\frac{1}{\phi_y}}, \tag{27}$$

$$P_{e,t}/P_t = \alpha_y^{\frac{1}{\phi_y}} \left( Y_t / Y_{e,t} \right)^{\frac{1}{\phi_y}}, \tag{28}$$

$$P_t = \left[ (1-\alpha_y) \left( P_{i,t} \right)^{1-\phi_y} + \alpha_y \left( P_{e,t} \right)^{1-\phi_y} \right]^{\frac{1}{\phi_y - 1}}, \tag{29}$$

where $\mathbf{J}_{e,t} = (1-\alpha_e) mc_{e,t} z_t \left[ n_{e,t} \right]^{-\alpha_e} \left[ k_{e,t} \right]^{\alpha_e - 1} - w_{e,t} + (1-\delta)(1-\mu_e) \mathbb{E}_t \Xi^i_{t+1|t} \mathbf{J}_{e,t+1}$, $n_{e,t} = L_{e,t}/N_{e,t}$, and $n_{i,t} = L_{i,t}/N_{i,t}$, 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.5 Additional Results: Benchmark Model

### A.5.1 Transitional Dynamics

Given the size of the shocks we consider, we follow the literature and solve for the transition path assuming perfect foresight. To do so, we solve the full system of non-linear equations using a Newton algorithm (for a similar computational approach, see, for example, Cacciatore and Fiori, 2016).

**Household Financial Participation Only** Narrowing the differences in household financial participation between EMEs and AEs entails increasing household participation over a wide range—from 0.42 to 0.96 (the average degree of household participation in AEs)—and adopting large shocks to do so. This introduces non-trivial computational challenges when solving the full system of nonlinear equations. Using a shorter range that is nevertheless empirically relevant is sufficient to highlight the short-term effects from greater household participation. This is the approach we adopt.

Before we present results for transitional dynamics, we note that large improvements in household financial participation may be gradual and therefore may not materialize immediately. Available data on the time-series evolution of household participation in developing and emerging economies suggests that, *on average*, financial participation can increase by up to 6 percentage points per year in the average developing economy (World Bank World Development Indicators), with larger improvements in upper-middle-income economies such as EMEs. This allows us to discipline the change in household participation that takes place *per period*. Given that we calibrate our model to a quarterly frequency and for illustrative purposes, we consider an increase in household participation of 1.38 percentage points per quarter for 10 quarters, which implies an increase in household participation from 0.42 to 0.64 over that period. This also implies roughly a 50 percent increase from the baseline household financial participation level. For reference, a $\lambda$ of 0.64 is close to the lower bound for AEs.

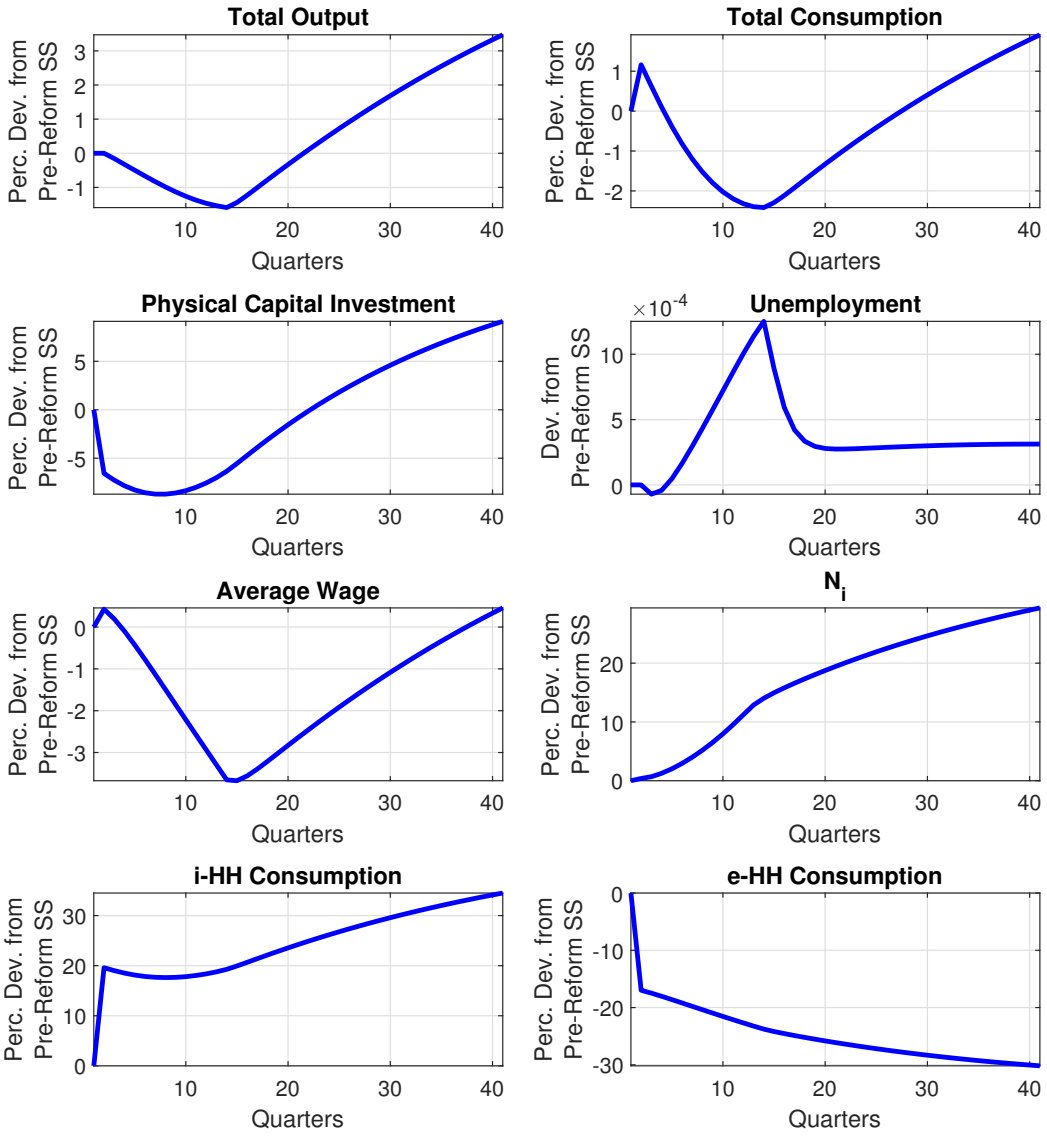
Figure A3 below shows transitional dynamics over 40 periods (quarters) as a result of a gradual improvement in household financial participation ($\lambda$) only (recall that when changing

$\lambda$ only, we hold all parameters at their baseline values). Given our baseline calibration, in the short term, the economy exhibits a decline in average wages, investment, and total output, a short-lived expansion in consumption followed by a decline below its pre-reform level, and a mild but persistent increase in unemployment. The expansion in the measure of $i$-household members is accompanied by an increase in the number of $i$ firms ($N_i$). In the medium term, investment, total consumption, average wages, and total output all rebound and rise above their pre-reform levels, while unemployment stays marginally above its pre-reform level.

Intuitively, for a given sunk entry cost for $i$ firms, an increase in $\lambda$ expands the amount of resources that $i$ households have available for, among other things, firm creation. At the same time, the expansion of searchers in $i$ households puts downward pressure on $i$-firm wages and increases the incentive to create more $i$ firms (the behavior of $i$-firm wages drives the response of average wages). To do so, $i$ households reallocate resources away from physical capital investment and towards $i$-firm creation, which results in a steady increase in $N_i$. As $N_i$ expands and output rebounds, $i$ households are able to reallocate resources towards physical capital investment (which is used by $i$ firms), and also towards consumption. The steady expansion of $i$ firms eventually puts upward pressure on $i$-firm wages (and average wages), which explains their medium-term recovery (note that wages are slower to recover in the medium term compared to consumption and output due to the presence of search frictions in the labor market).

The bottom two subfigures in Figure A3 shed light on the response of total consumption and highlight important compositional differences between household categories. In particular, the very-short-term increase in total consumption is driven by a sharp expansion in $i$-household consumption, whereas the short-term decline in total consumption is driven by a persistent and permanent reduction in $e$-household consumption. The latter is due to two forces. First, a reallocation of individuals in the economy away from $e$ households and into $i$ households. Second, a decline in labor demand by $e$ firms, and therefore a fall in $e$-firm labor income.

Figure A3: Transitional Dynamics: Household Financial Participation




Notes: For illustrative purposes, the improvement in household financial participation is reflected in an increase in $\lambda$ from its baseline level of 0.42 to 0.64 over a 10-quarter period and corresponds roughly to a 50 percent increase in household financial participation. This implies an increase in household participation of 1.83 percentage points per quarter for 10 quarters.

**Firm Financial Participation Only: Gradual and One-Time Reductions in $\psi_i$**

Improvements in firm financial participation only are the result of a reduction in the sunk

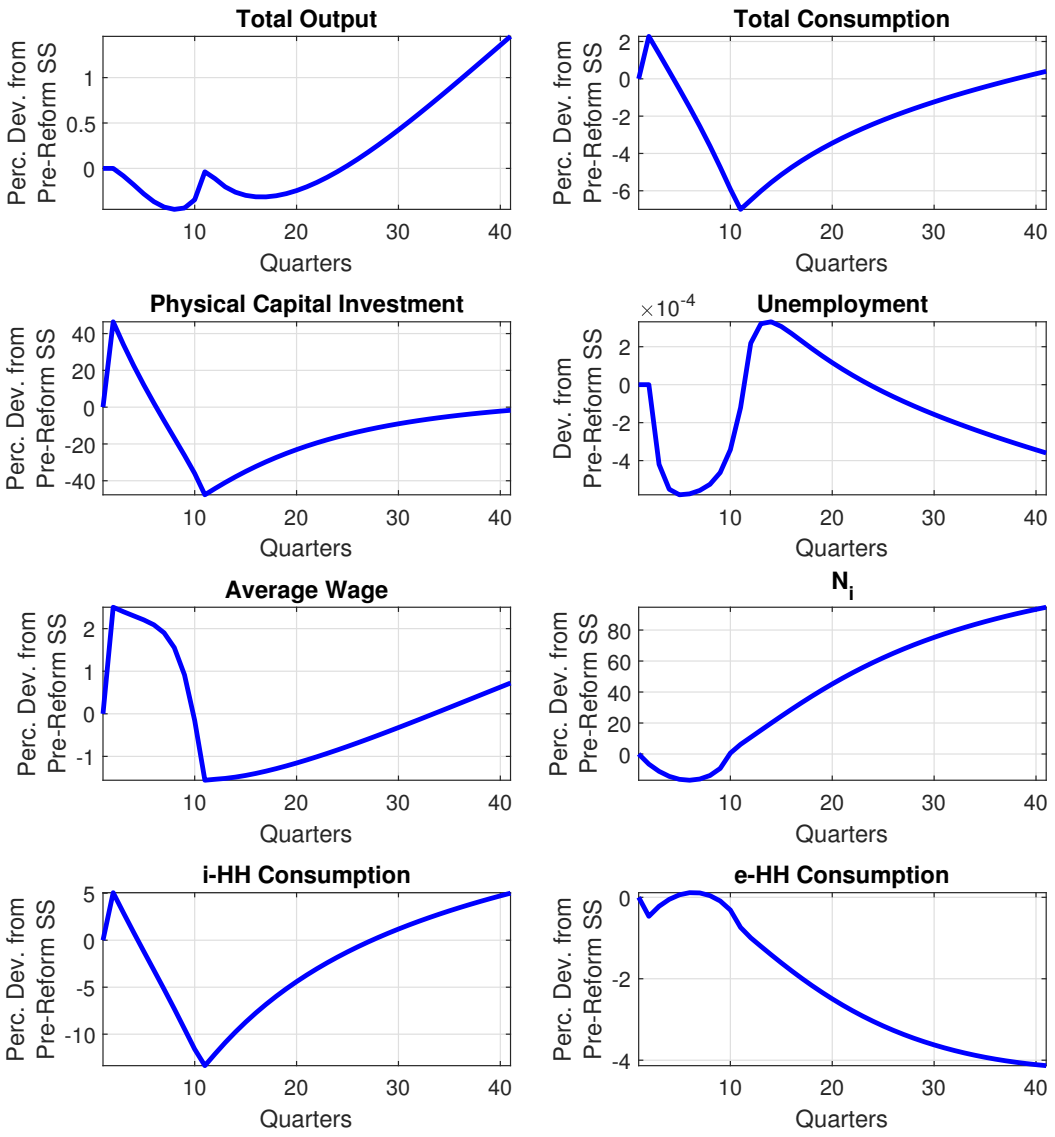
entry cost for $i$ firms, $\psi_i$, holding all other parameters at their baseline values, which bolsters the number of $i$ firms ($N_i$) and the share of $i$ firms in the economy. While improvements in $\lambda$ over time may be gradual, large reductions in $\psi_i$ can take place relatively quickly depending on the degree of regulatory effectiveness. For completeness, we consider transitional dynamics rooted in a *gradual and steady* reduction in $\psi_i$ (similar to the case of $\lambda$ above, where $\lambda$ increased gradually over several quarters), as well as transitional dynamics rooted in a large, *one-time* reduction in $\psi_i$.

Figure A4 below shows transitional dynamics over 40 periods (quarters) as a result of a *gradual* improvement in firm financial participation only. For illustrative purposes, we consider a reduction in $\psi_i$ from its baseline level of 0.5972 to 0.2972, which corresponds roughly to a 50 percent reduction in the cost, over a 10-quarter period (this implies a reduction in $\psi_i$ of 0.03 per quarter for 10 quarters). Similar to the case of greater household financial participation, total output exhibits a short-term decline before bouncing back above its pre-reform level. Unemployment for all intents and purposes falls marginally. In contrast to existing studies that analyze reductions in firm-entry costs amid equilibrium unemployment (see, for example, Cacciatore and Fiori, 2016, who have a one-firm-category framework), the reduction in $\psi_i$ generates a short-term reduction in output. We note that this result is unique to our environment and traces back to having household heterogeneity and a low baseline level of household financial participation in our EME calibration. In fact, recalibrating the model with a higher baseline $\lambda$ that is more consistent with AEs confirms that a reduction in $\psi_i$ leads to a short-term *and* medium-term expansion in total output, with no output reductions (results available upon request). This result is consistent with Cacciatore and Fiori (2016).

Another result that is at odds with existing work is the response of consumption, physical capital investment, and the number of firms in the very short term. In our environment, consumption and investment increase in the very short term, then fall below their pre-reform levels only to bounce back up above their pre-reform levels in the medium term. Conversely, the number of $i$ firms falls in the very short term, and gradually rises above its pre-reform level. In Cacciatore and Fiori (2016) and others, consumption and investment both fall in the short term as resources are reallocated towards firm creation, implying that the number

of firms expands steadily at the expense of consumption and investment.

Figure A4: Transitional Dynamics: Firm Financial Participation, Gradual Reduction in $\psi_i$




Notes: The improvement in firm financial participation is the direct consequence of a reduction in the sunk entry cost for $i$ firms, $\psi_i$. For illustrative purposes, we reduce $\psi_i$ from its baseline level of 0.5972 to 0.2972, which corresponds roughly to 50 percent reduction in the sunk entry cost of $i$ firms, over a 10-quarter period. This implies a reduction in $\psi_i$ of 0.03 per quarter for 10 quarters.

The discrepancy between their results and ours stems solely from the type of experiment

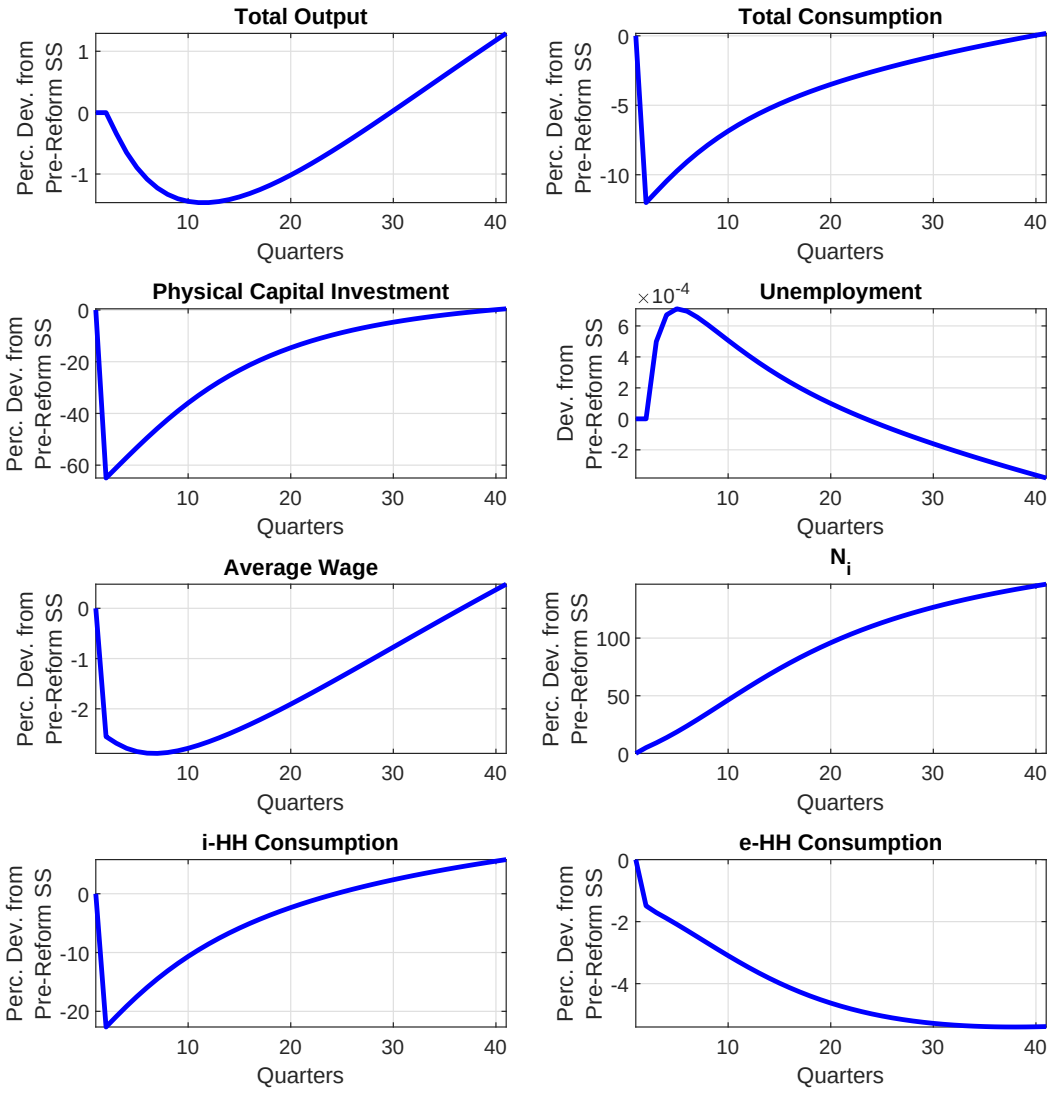
we perform in Figure A4. Indeed, while Cacciatore and Fiori (2016) and others consider a *one-time* reduction in the sunk entry cost of firms, Figure A4 shows the transition path that stems from a *gradual* reduction in entry costs that spans several periods. Amid this gradual decline, households have to establish a balance between investing in physical capital, creating firms, and consuming. In our case, given a *gradual* reduction in $i$-firm entry costs, $i$ households front-load on physical capital investment and increase consumption in the very short term. As the cost of creating $i$ firms continues to decline for several periods, households begin to reallocate resources towards $i$-firm creation and away from consumption and investment. This explains the behavior of $N_i$ in Figure A4. As the expansion in $i$ firms steadily takes hold, consumption and investment follow suit and bounce back. The short-term expansion in physical capital directly bolsters labor productivity and, as a result, explains the dynamic response of average wages, which increase in the short term, fall below their pre-reform levels (similar to investment), and slowly bounce back above those levels in the medium term.

To explicitly show how the way in which the reduction in entry costs for $i$ firms is implemented (gradual vs. one-time changes) affects transitional dynamics, Figure A5 shows the same firm-financial-participation experiment but now assuming a large, *one-time* reduction in $\psi_i$ as opposed to a gradual reduction. This experiment is therefore more comparable to Cacciatore and Fiori (2016) (recall, though, that our framework features both household and firm heterogeneity whereas theirs has a single household and firm category). Specifically, we consider a one-time reduction in $\psi_i$ from its baseline level of 0.5972 to 0.2972, where the latter is the same lower bound for $\psi_i$ used in the gradual-reduction experiment. Figure A5 shows a similar medium-term transition to the one described in Figure A4, except for the fact that with a one-time reduction in $\psi_i$, consumption, investment, and wages all fall in the short term and recover gradually in the medium term. The fact that output also falls once again traces back to the low baseline degree of household financial participation noted earlier.[1] More importantly, with a large, one-time reduction in $\psi_i$, the number of $i$ firms unambiguously expands in both the short and medium term. The intuition behind these

[1]Assuming a high baseline household financial participation share confirms that output would gradually expand without exhibiting short-term reductions. Results available upon request.

results is the same as in Cacciatore and Fiori (2016): a one-time reduction in $\psi_i$ makes firm creation more attractive and pushes households to cut back on consumption and physical capital investment to finance the creation of firms. Hence the decline in these variables immediately after the reduction in $\psi_i$. As the number of $i$ firms steadily grows, firms demand more capital and labor, which bolsters the recovery in investment, consumption, and wages.

Figure A5: Transitional Dynamics: Firm Financial Participation, One-Time and Large Reduction in $\psi_i$



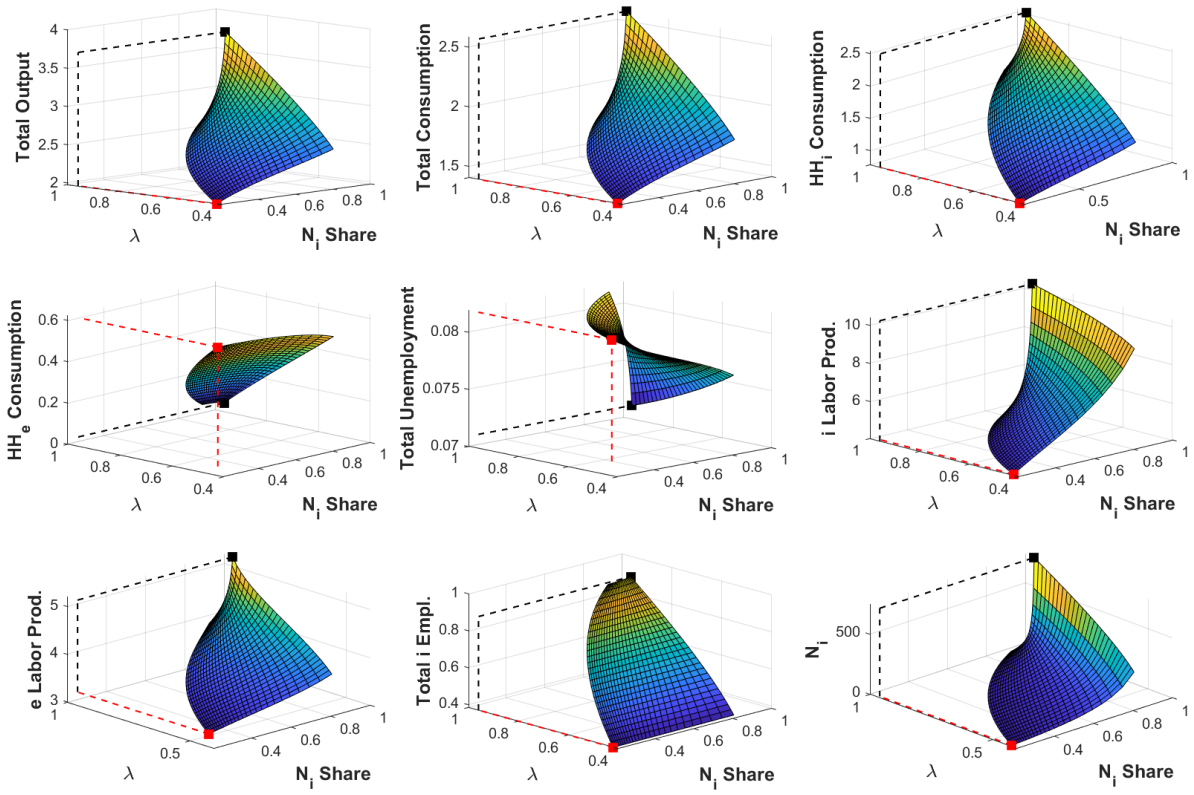

Notes: The improvement in firm financial participation is the direct consequence of a reduction in the sunk entry cost for $i$ firms, $\psi_i$. For illustrative purposes, we reduce $\psi_i$ from its baseline level of 0.5972 to 0.2972, which corresponds roughly to 50 percent reduction in the sunk entry cost of $i$ firms, in one period.

### A.5.2 Steady-State Participation Equilibria: Benchmark Model

Figure A6 shows the steady-state changes of select variables for the same changes in $\lambda$ and $\psi_i$. The red square in the figure denotes our baseline EME equilibrium, and the black square denotes the resulting equilibrium when both $\lambda$ and $\psi_i$ are at their average AE levels.

While we consider individual changes in household and firm financial participation, note that 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. 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.

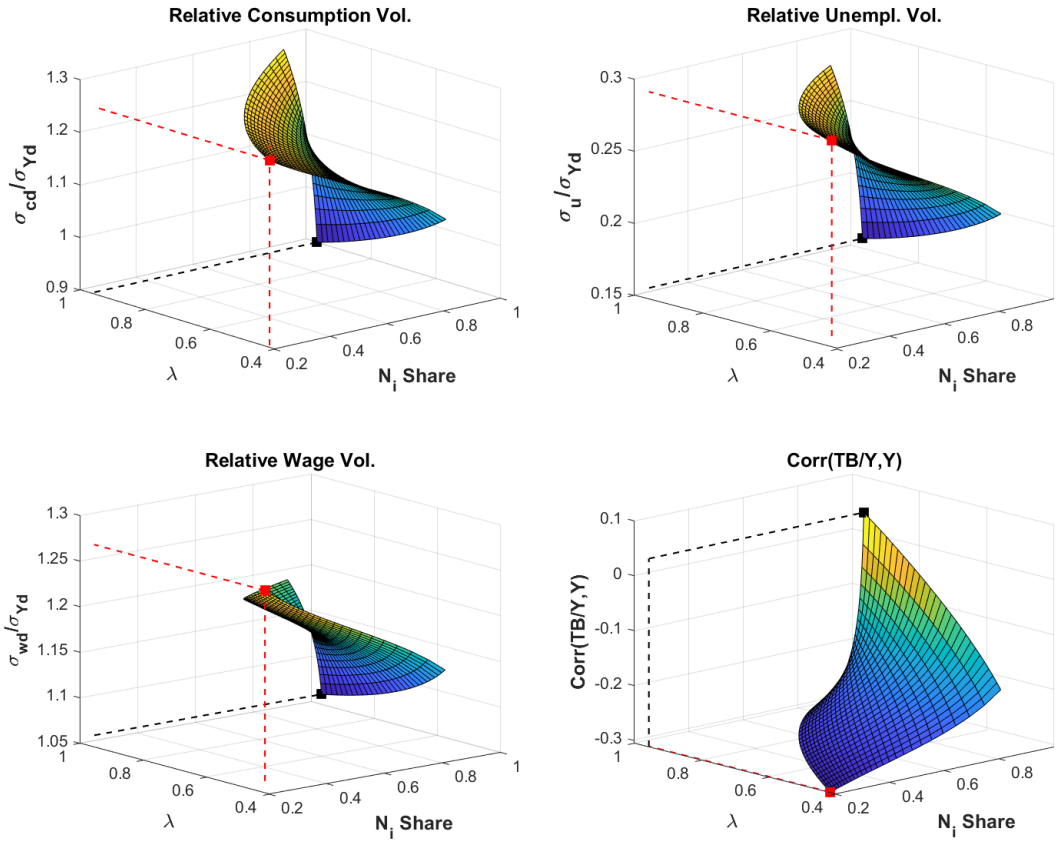
Figure A6: Steady-State Participation Equilibria




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 $\psi_i$.

### A.5.3 Cyclical Dynamics and Participation Equilibria: Benchmark Model

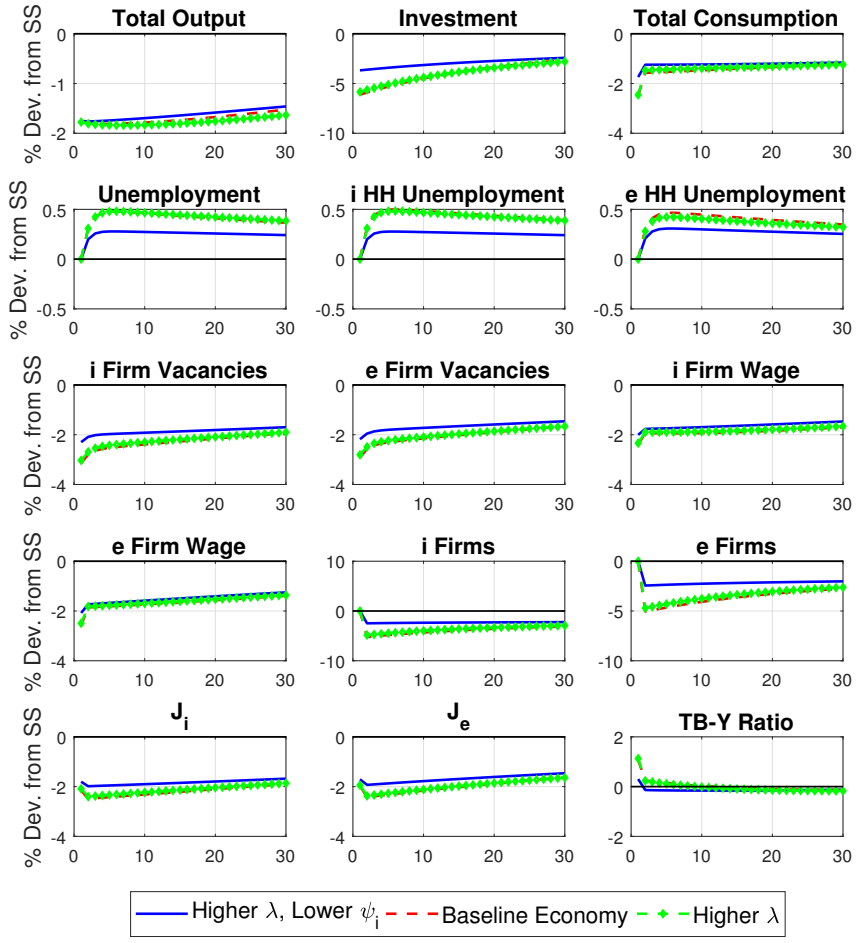
Figure A7: Household Participation, Firm Participation, and Cyclical Dynamics




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 $\psi_i$. Model variables with $d$ subscripts represent data-consistent variables.

### A.5.4 Impulse Response Functions: Aggregate Productivity Shocks

Figure A8: Response to a One Standard Deviation Reduction in Aggregate Productivity (Quarters after Shock)



### A.5.5 Benchmark Model: Domestic Financial Participation Experiments Holding Total Number of Firms Fixed

Table A2: Business Cycle Moments–AE and EME Data, Benchmark (EME) Model, and Benchmark Model with Greater Financial Participation, Fixed Total Number of Firms

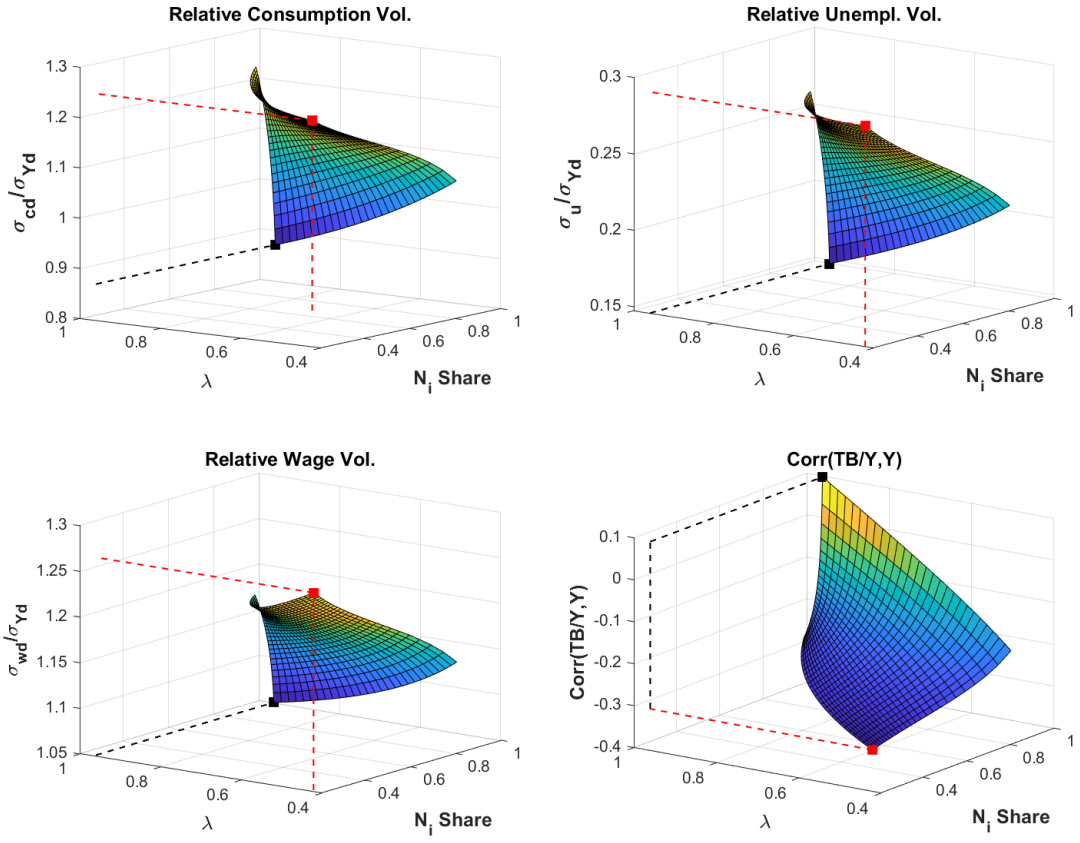
| Second Moments | Data AE | Data EME | Benchmark (EME) Model | AE $\lambda$ EME $\psi_i$ | EME $\lambda$ AE $\psi_i$ | AE $\lambda$ AE $\psi_i$ | AE $\lambda$ AE $\psi_i$ AE UI Level |
|---|---|---|---|---|---|---|---|
| $\sigma_{c_{d,t}}/\sigma_{Y_{d,t}}$ | 0.92 | 1.21 | 1.26* | 1.25 | 1.27 | 1.18 | 1.16 |
| $\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}}$ | 3.63 | 3.28 | 3.28* | 3.06 | 3.20 | 2.81 | 2.79 |
| $\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$ | 0.87 | 2.67 | 1.27 | 1.19 | 1.25 | 1.16 | 1.01 |
| $\sigma_{u_t}/\sigma_{Y_{d,t}}$ | 7.47 | 3.41 | 0.29 | 0.28 | 0.30 | 0.25 | 0.74 |
| $corr(c_{d,t}, Y_{d,t})$ | 0.52 | 0.72 | 0.77 | 0.72 | 0.77 | 0.75 | 0.73 |
| $corr(inv_{d,t}, Y_{d,t})$ | 0.68 | 0.71 | 0.87 | 0.88 | 0.88 | 0.89 | 0.89 |
| $corr(u_t, Y_{d,t})$ | -0.61 | -0.39 | -0.62 | -0.66 | -0.61 | -0.64 | -0.66 |
| $corr(tby_t, Y_{d,t})$ | 0.01 | -0.31 | $-0.31^*$ | -0.26 | -0.32 | -0.24 | -0.18 |

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 (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 AE sample is comprised of: Australia, Austria, Belgium, Canada, Denmark, Finland, Netherlands, New Zealand, Norway, Sweden, and Switzerland. The EME sample is comprised of: Brazil, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey. The relative volatility of wages is borrowed from Boz, Durdu, and Li (2015) and based on averages of Australia, Austria, Belgium, Canada, Denmark, Finland, New Zealand, Norway, and Sweden for the AE sample, and Brazil, Ecuador, Malaysia, Mexico, Philippines, and Turkey for the EME sample due to limited data availability on quarterly labor earnings series. $tby$ denotes the trade balance-output ratio. $x_{d,t}$ denotes variable $x$ expressed in data-consistent ($d$) terms (see, for example Cacciatore, Duval, Fiori, and Ghironi, 2016a). * denotes a targeted moment.

## A.6 Robustness Analysis

**Benchmark Model: 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. Figure A9 confirms that our main findings remain unchanged.

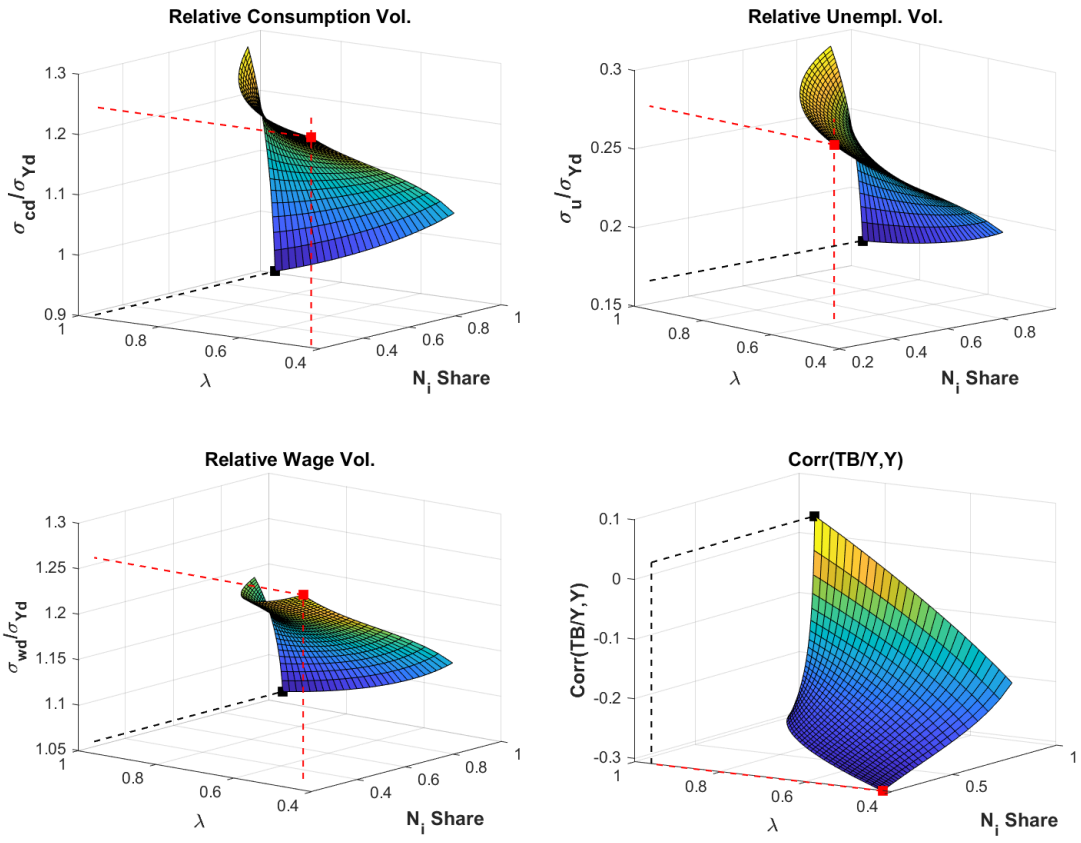
Figure A9: Business Cycle Volatility and Participation Equilibria ($\phi_y = 7$)




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 $\psi_i$.

**Benchmark Model: Firm-Category Vacancy-Cost Differences** Relative to the baseline calibration in the main text, we assume that the cost of posting vacancies for $e$ firms represents 50 percent of the cost faced by $i$ firms. This can reflect, among other things, the fact that smaller firms in EMEs often circumvent labor market regulations, thereby leading to lower hiring costs. Figure A10 confirms that our main findings remain unchanged.

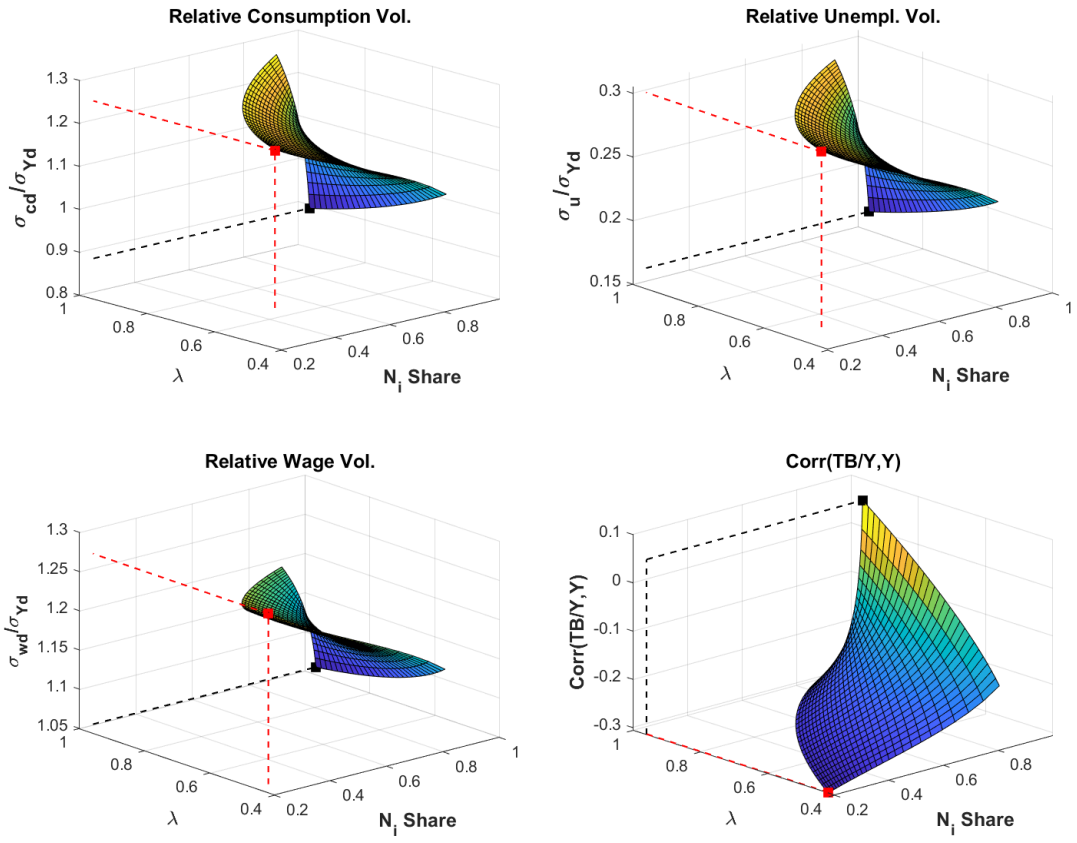
Figure A10: Business Cycle Volatility and Participation Equilibria ($\kappa_e < \kappa_i$)




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 $\psi_i$.

**Benchmark Model: 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 $\mu_e = 0.06$ and $\mu_i = 0.03$. Figure A11 confirms that our main findings remain unchanged.

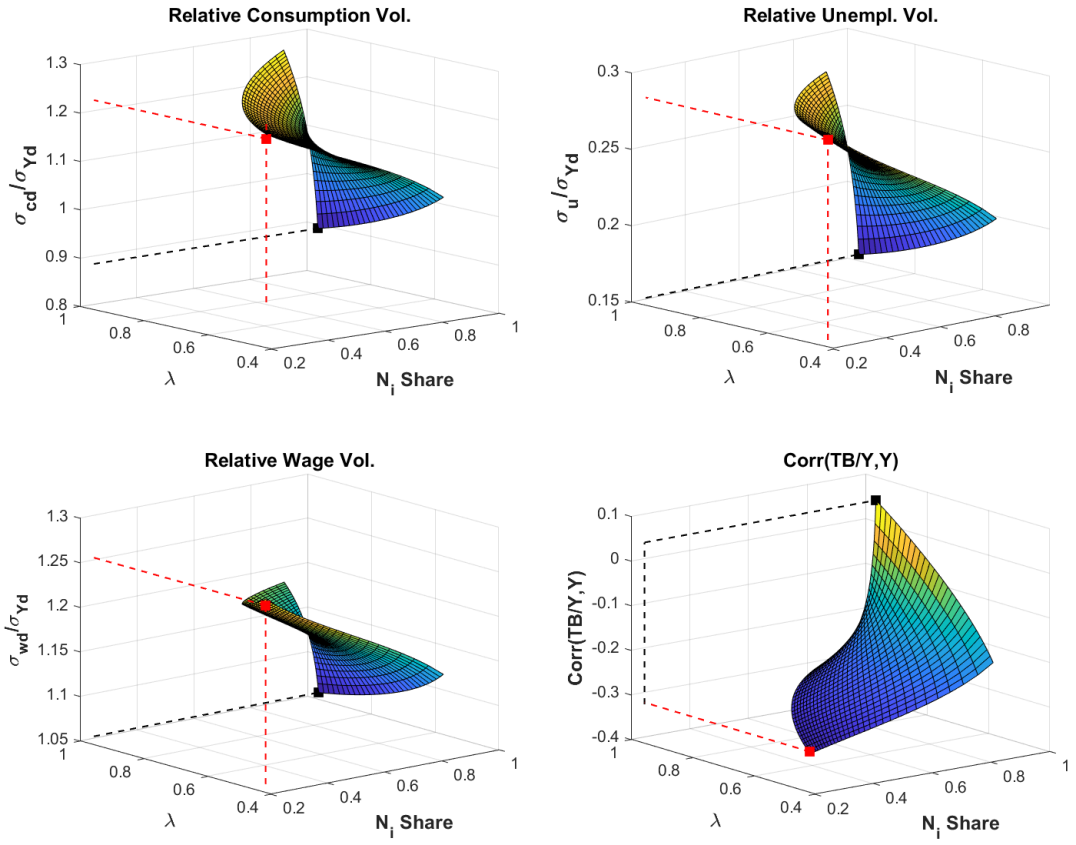
Figure A11: Business Cycle Volatility and Participation Equilibria, Different Employment Separation Probabilities




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 $\psi_i$.

**Benchmark Model: 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 A12 confirms that our main findings remain unchanged.

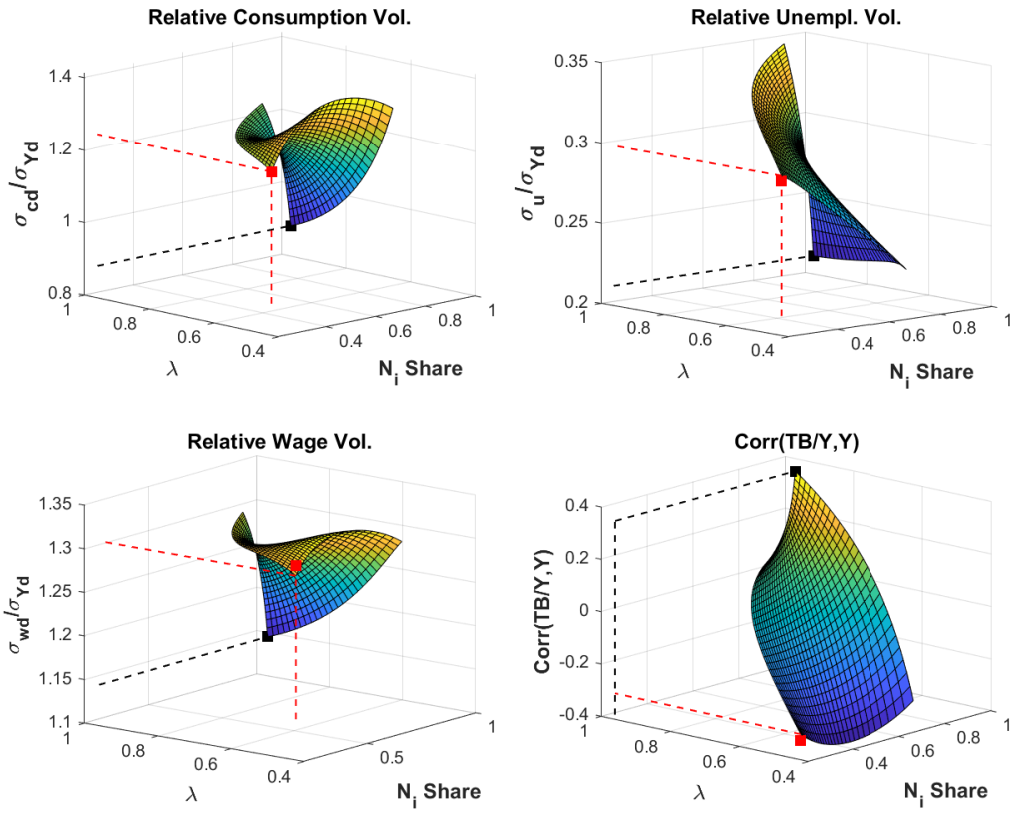
Figure A12: Business Cycle Volatility and Participation Equilibria, Higher Capital Share for $e$ Firms




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 $\psi_i$.

**Alternative Assumption: $e$ Households Own $e$ Firms** The baseline model in the main text assumes that $i$ households own all firms (and therefore make decisions over firm creation in each cateogory). For robustness, we assume that $e$ households own $e$ firms and therefore make $e$-firm-creation decisions. Similar to our main findings, Figure A13 shows that greater joint participation reduces consumption and wage volatility in EMEs to AE levels, lowers unemployment volatility, and makes the trade balance-GDP ratio procyclical.

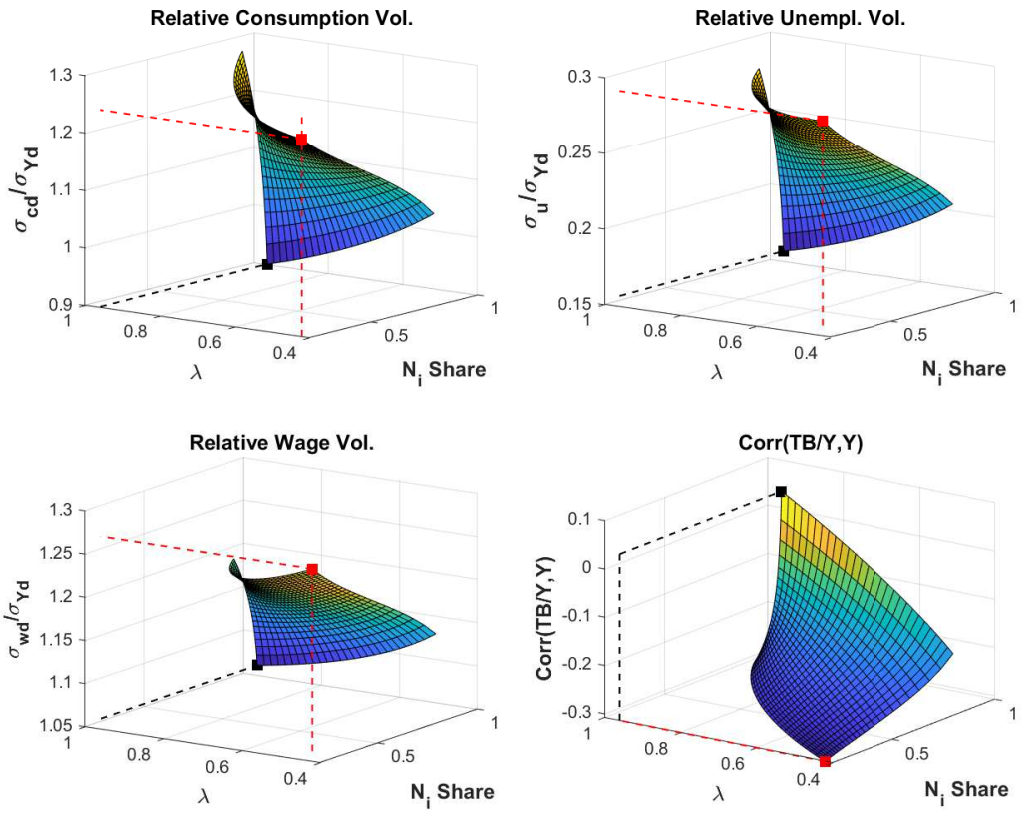
Figure A13: Business Cycle Volatility and Participation Equilibria, $e$ Households Own $e$ Firms




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 $\psi_i$.

**Alternative Assumption: Firm-Category-Specific Capital Accumulation** The baseline model in the main text assumes that $i$ households accumulate a single type of capital, which is then optimally allocated between $e$ and $i$ firms. For robustness, we assume two separate types of capital—one for each firm category. Figure A14 shows that our main findings remain unchanged.

Figure A14: Business Cycle Volatility and Participation Equilibria, Firm-Category-Specific Capital Accumulation

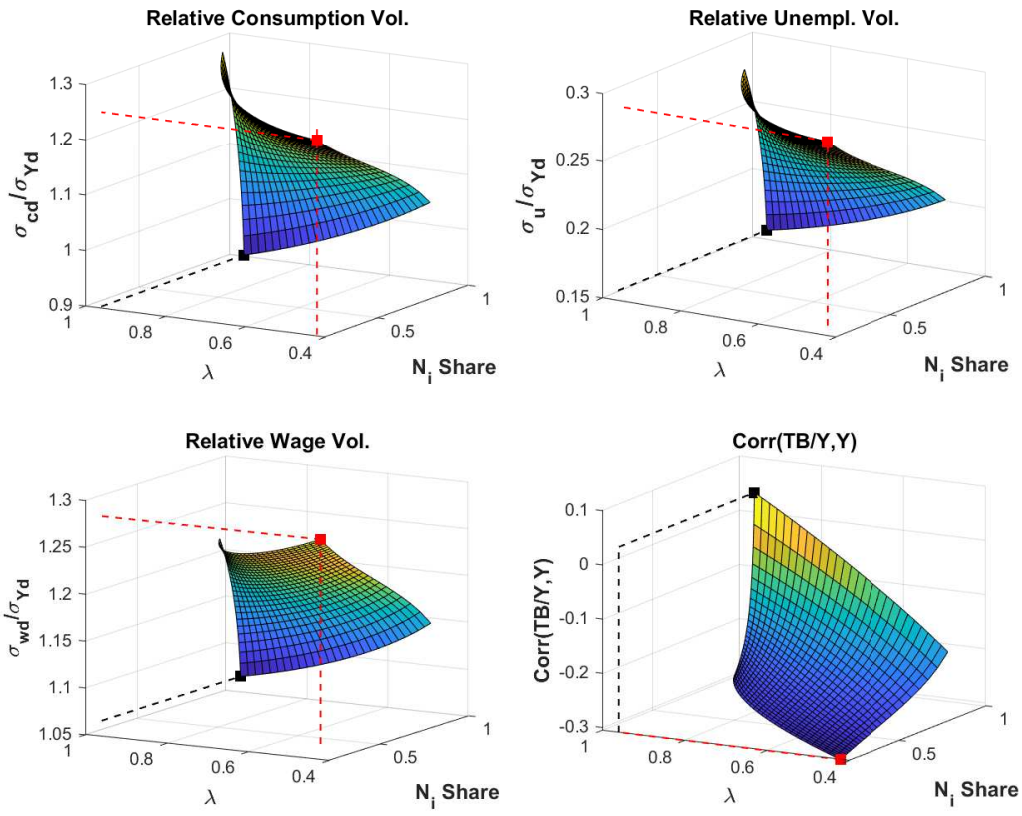



Notes: The red square corresponds to the EME economy under the baseline (EME) values for $\lambda$ and $\psi_i$. The black square corresponds to the EME economy under the highest $\lambda$ and and lowest $\psi_i$.

**Benchmark Model: Working Capital Constraint with Wage and Capital Bills**

The baseline model in the main text assumes that the working capital constraint—which introduces a tractable measure of aggregate credit—is comprised of physical capital investment and the total sunk entry costs of $i$ firms. As shown in Figure A15, our main findings remain unchanged.

Figure A15: Business Cycle Volatility and Participation Equilibria, Working Capital Constraint with Wage and Capital Bills




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 $\psi_i$.

**Richer Mabor Market Structure: Sectoral Labor Mobility** The baseline model in the main text assumes that $e$-household members work in $e$ firms and $i$-household members work in $i$ firms, without sectoral labor mobility. We extend the benchmark model to allow $e$-household members to search for work in both $e$ and $i$ firms, and for $i$-household members to search for work in both $e$ and $i$ firms as well. To do so, we introduce CES labor aggregators in both firm categories and, plausibly, assume a relatively high degree of substitutability between the two types of labor within each category.

Absent detailed micro data on the share of workers without access to the banking system that work in firms that do have access, and the share of workers with access to the banking system in firms that do not have access, we rely on plausible proxies of participation to calibrate the baseline shares of $i$ workers in $e$ firms and the share of $e$ workers in $i$ firms. Specifically, we use available data on unregistered, or informal, employment outside of the informal sector (mainly of informal employment in large firms), and data on formal employment in micro and small (and therefore mainly informal) firms for our EME sample. This allows us to obtain estimates of the share of $e$-household workers in $i$ firms and the share of $i$-household workers in $e$ firms, respectively.[2] The rest of the calibration is identical to the one in the benchmark model.

Table A3 shows that our main conclusions—mainly, the fact that greater firm financial participation is a critical margin that reduces aggregate volatility and brings EME business cycles closer to those of AEs—continue to hold in this richer labor market structure.

[2]Specifically, the share of $e$-household workers in $i$ firms is 17 percent of the labor force and the share of $i$-household workers in $e$ firms is 0.7 percent of the labor force.

Table A3: Business Cycle Volatility and Participation Equilibria, Sectoral Labor Mobility

| Second Moments | Data AE | Data EME | Benchmark (EME) Model | AE $\lambda$ EME $\psi_i$ | EME $\lambda$ AE $\psi_i$ | AE $\lambda$ AE $\psi_i$ | AE $\lambda$ AE $\psi_i$ AE UI Level |
|---|---|---|---|---|---|---|---|
| $\sigma_{c_{d,t}}/\sigma_{Y_{d,t}}$ | 0.92 | 1.21 | 1.35 | 1.38 | 0.96 | 0.94 | 0.90 |
| $\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}}$ | 3.63 | 3.28 | 3.27 | 3.24 | 2.09 | 2.16 | 2.11 |
| $\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$ | 0.87 | 2.67 | 1.47 | 1.40 | 1.22 | 1.19 | 1.02 |
| $\sigma_{u_t}/\sigma_{Y_{d,t}}$ | 7.47 | 3.41 | 0.45 | 0.45 | 0.26 | 0.25 | 0.70 |
| $corr(c_{d,t}, Y_{d,t})$ | 0.52 | 0.72 | 0.65 | 0.54 | 0.78 | 0.68 | 0.67 |
| $corr(inv_{d,t}, Y_{d,t})$ | 0.68 | 0.71 | 0.88 | 0.89 | 0.92 | 0.92 | 0.92 |
| $corr(u_t, Y_{d,t})$ | -0.61 | -0.39 | -0.70 | -0.69 | -0.68 | -0.68 | -0.69 |
| $corr(tby_t, Y_{d,t})$ | 0.01 | -0.31 | -0.20 | -0.13 | 0.05 | 0.15 | 0.21 |

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 (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 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).

## A.7 Endogenizing Household Financial Participation

Our baseline model follows much of the business cycle literature with household heterogeneity by assuming an exogenous measure of household members in each household category. We change this measure directly to understand the impact of greater household participation on cyclical dynamics.

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. In contrast, amid endogenous firm entry, the share of $i$ firms is endogenously determined. To study whether having an exogenous share of household domestic financial participation is important for our main findings, this section presents the details of a much richer version of our baseline framework where the household financial participation share is explicitly endogenized. We refer to this endogenous household-participation share as $\lambda_i$, and to the model with *E*ndogenous *H*ousehold *F*inancial *P*articipation presented below as the EHFP model.

Endogenizing household domestic financial participation is not trivial. We exploit the presence of labor search frictions, which explicitly feature an extensive margin of labor, to do so. Specifically, we introduce an *endogenous* extensive margin of *household financial participation* via endogenous labor force participation in both household categories. The rationale for this modeling approach is as follows. In essence, in this modified model, the now endogenous labor force of each household category represents the endogenous extensive margin of household financial participation as well. This direct mapping from labor force participation to household financial participation is completely consistent with the empirical extensive-margin measure of household financial participation in Table 2 of Section 2. Indeed, 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 delivers a perfectly consistent and valid mapping between endogenous labor force participation rates and endogenous household financial participation

rates. Most importantly, 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*. In contrast, a standard search model with constant labor force participation would be unable to do so if we assume, plausibly, that both employed and unemployed individuals *and not just employed individuals* in financially-included households participate in the domestic banking system.

We present the modifications to the baseline model and the quantitative results from endogenizing household domestic financial participation below.

### A.7.1 Model Structure

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* (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.

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 $mc_{j,t}$. *We stress that this separation of labor search frictions and endogenous firm entry is similar to Cacciatore, Duval, Fiori, and Ghironi (2016a,b) and does not change any of our main conclusions compared to those from a model that merges intermediate-goods and monopolistically-competitive firms that enter the market endogenously.* This innocuous modification in the production structure makes the exposition of the labor market amid endogenous labor force participation more transparent.

### A.7.2 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*, both of 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. Moreover, 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 assumption is consistent with evidence from the World Bank Enterprise Survey on firm entry by registered firms, which are more likely to participate in domestic credit markets).

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, $N_{E,et}$

and $N_{E,it}$, 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 $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\mathbf{u}(c_{i,t}) - \mathbf{h}(lfp_{i,t})\right]$ subject to the budget constraint:

$$\begin{aligned} c_{i,t} + b_{t+1} + R_{c,t} b_t^* + \tfrac{\eta_b}{2}(b_{t+1}^*)^2 + (\psi_i N_{E,it} + inv_t)\left[1 - \zeta + \zeta R_t\right] + \psi_e N_{E,et} \\ = R_t b_t + b_{t+1}^* + w_{i,t} n_{i,t} + \chi_i (1 - f(\theta_{i,t})) u_{i,t} + d_{i,t} N_{i,t} + d_{e,t} N_{e,t} + r_t k_t, \end{aligned} \tag{30}$$

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

$$N_{i,t+1} = (1 - \delta)(N_{i,t} + N_{E,it}), \tag{31}$$

and

$$N_{e,t+1} = (1 - \delta)(N_{e,t} + N_{E,et}), \tag{32}$$

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

$$n_{i,t} = (1 - \mu_i) n_{i,t-1} + u_{i,t} f(\theta_{i,t}), \tag{33}$$

where $lfp_{i,t} = (1 - f(\theta_{i,t}))u_{i,t} + n_{i,t}$ denotes the labor force participation of $i$ households and $\mathbf{h}(lfp_{i,t})$ is increasing and convex in $lfp_{i,t}$.

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

$$\frac{\mathbf{h}'(lfp_{i,t})}{\mathbf{u}'(c_{i,t})} = \left[ \begin{array}{c} f(\theta_{i,t}) \left[ w_{i,t} + (1 - \mu_i) \mathbb{E}_t \Xi_{t+1|t}^i \left( \frac{1 - f(\theta_{i,t+1})}{f(\theta_{i,t+1})} \right) \left( \frac{\mathbf{h}'(lfp_{i,t+1})}{\mathbf{u}'(c_{i,t+1})} - \chi_i \right) \right] \\ + (1 - f(\theta_{i,t}))\chi_i \end{array} \right], \tag{34}$$

where $\Xi_{t+1|t}^i = \beta \mathbf{u}'(c_{i,t+1}) / \mathbf{u}'(c_{i,t})$ and $\mathbf{h}'(lfp_{i,t})$ 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 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 given by $lfp_{i,t}$.

**Financially-Excluded ($e$) Households** Financially-excluded ($e$) households consume their labor income. They choose consumption $c_{e,t}$, the desired number of household members employed in $e$ firms, $n_{e,t}$, and the searchers needed to reach that employment target $u_{e,t}$ to maximize $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\mathbf{u}(c_{e,t}) - \mathbf{h}(lfp_{e,t})\right]$ subject to the budget constraint

$$c_{e,t} = w_{e,t} n_{e,t} + \chi_e (1 - f(\theta_{e,t})) u_{e,t}, \tag{35}$$

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

$$n_{e,t} = (1 - \mu_e) n_{e,t-1} + u_{e,t} f(\theta_{e,t}), \tag{36}$$

where $lfp_{e,t} = (1 - f(\theta_{e,t}))u_{e,t} + n_{e,t}$ is the labor force participation of $e$ households and $\mathbf{h}(lfp_{e,t})$ is increasing and convex in $lfp_{e,t}$.

The first-order condition that determines $e$ household members' participation is given by

$$\frac{\mathbf{h}'(lfp_{e,t})}{\mathbf{u}'(c_{e,t})} = \left[ \begin{array}{c} f(\theta_{e,t}) \left[ w_{e,t} + (1 - \mu_e) \mathbb{E}_t \Xi^e_{t+1|t} \left( \frac{1 - f(\theta_{e,t+1})}{f(\theta_{e,t+1})} \right) \left( \frac{\mathbf{h}'(lfp_{e,t+1})}{\mathbf{u}'(c_{e,t+1})} - \chi_e \right) \right] \\ + (1 - f(\theta_{e,t})) \chi_e \end{array} \right], \tag{37}$$

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

**Search Frictions and Evolution of Firm Employment** Let $m(u_{j,t}, v_{j,t}) = u_{j,t} v_{j,t} / (u^{\xi}_{j,t} + v^{\xi}_{j,t})^{1/\xi}$ 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 $v_{j,t}$, where $\xi > 0$. 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

$$n_{j,t} = (1 - \mu_j)n_{j,t-1} + v_{j,t}q(\theta_{j,t}), \tag{38}$$

for $j \in \{e, i\}$, where $0 < \mu_j < 1$ is the exogenous job separation probability.

**Wage Determination** We assume bilateral Nash bargaining between workers and individual firms. Denoting by $\nu$ 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

$$\mathbf{W}_{j,t} - \mathbf{U}_{j,t} = \frac{\nu}{1 - \nu}\mathbf{J}_{j,t}, \tag{39}$$

where

$$\kappa/q(\theta_{j,t}) = \mathbf{J}_{j,t}, \tag{40}$$

$$\mathbf{J}_{j,t} = (1 - \alpha_j)mc_{j,t}z_t \left[n_{j,t}\right]^{-\alpha_j} \left[k_{j,t}\right]^{\alpha_j - 1} - w_{j,t} + (1 - \mu_j)\mathbb{E}_t\Xi^i_{t+1|t}\mathbf{J}_{j,t+1}, \tag{41}$$

and

$$\mathbf{W}_{j,t} - \mathbf{U}_{j,t} = \left[\mathbf{h}'(lfp_{j,t}) - \chi_j\mathbf{u}'(c_{j,t})\right] / \left[f(\theta_{j,t})\mathbf{u}'(c_{j,t})\right]. \tag{42}$$

The expressions for the firms' and workers' value functions are identical to those in Arseneau and Chugh (2012).

**Share of Household Financial Participation in the Model** Define the economy's *total* labor force participation rate as $lfp_t = lfp_{i,t} + lfp_{e,t}$. Also, recall that the measure of $i$ households' employed and unemployed members represents the relevant measure of individuals who are categorized as being domestic financial participants. Then, the model counterpart of the share of individuals who have a bank account at financial institutions—that is, our extensive-margin, *endogenous* measure of household financial participation in the data—is

given by $\lambda_{i,t} = lfp_{i,t}/lfp_t$.

### A.7.3 Quantitative Analysis

**Calibration** Following Arseneau and Chugh (2012), we assume that the disutility of participation is $\mathbf{h}(lfp_{j,t}) = (\psi_n^j/(1+1/\iota_j))\, lfp_{j,t}^{(1+1/\iota_j)}$ for $j \in \{e, i\}$. In addition to the same parameter values from related literature and calibration targets we adopted for the baseline model's quantitative analysis, we calibrate $\psi_n^e$ to match a steady-state total labor force participation rate of 0.70 (consistent with our EME sample), and $\psi_n^i$ to match $\lambda_i = lfp_i/lfp = 0.42$ in steady state, which is consistent with the household financial participation share in our EME sample (recall Table 2 in Section 2 of the main text). Finally, 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. To do so, 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 utility costs of participation for $i$-household members, $\psi_n^i$, while simultaneously increasing the cost of participation for $e$-household members, $\psi_n^e$), 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. The rationale for this approach is simple: changing both parameters delivers results that are comparable with our baseline framework, where participation is constant. We note, though, that 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.

Table A4 summarizes the results from conducting the same experiments outlined in

Section 4 using this richer framework. The table shows that the model successfully generates cyclical dynamics that are consistent with EMEs, 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 in Section 2 of the main text). Increasing $\lambda_i$ further would only strengthen our quantitative results by bringing down the volatilities under a joint increase in firm and household financial participation even further, thereby validating our main findings even more.

Inspection of Table A4 also 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, the results from this richer model confirm that our baseline assumption of exogenous household financial participation is not a limiting factor for our main conclusions. A similar claim applies to the baseline model's inability to quantitatively capture the empirical volatility of unemployment: generating the volatility of unemployment in the data, which the model with endogenous household financial participation does, delivers the same conclusions as well. For completeness, Figure A16 further below plots the change in relevant volatilities and correlations as we vary household and firm financial participation. The figure visually confirms that our main findings hold.

Finally, we note that Table A4 shows that increasing unemployment benefits (UB) to the level of AEs *alongside* a joint increase in firm and household participation generates both labor market dynamics *and* business cycles that are now *quantitatively* consistent with those of AEs in a comprehensive way. Specifically, 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, which is what AEs exhibit. 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

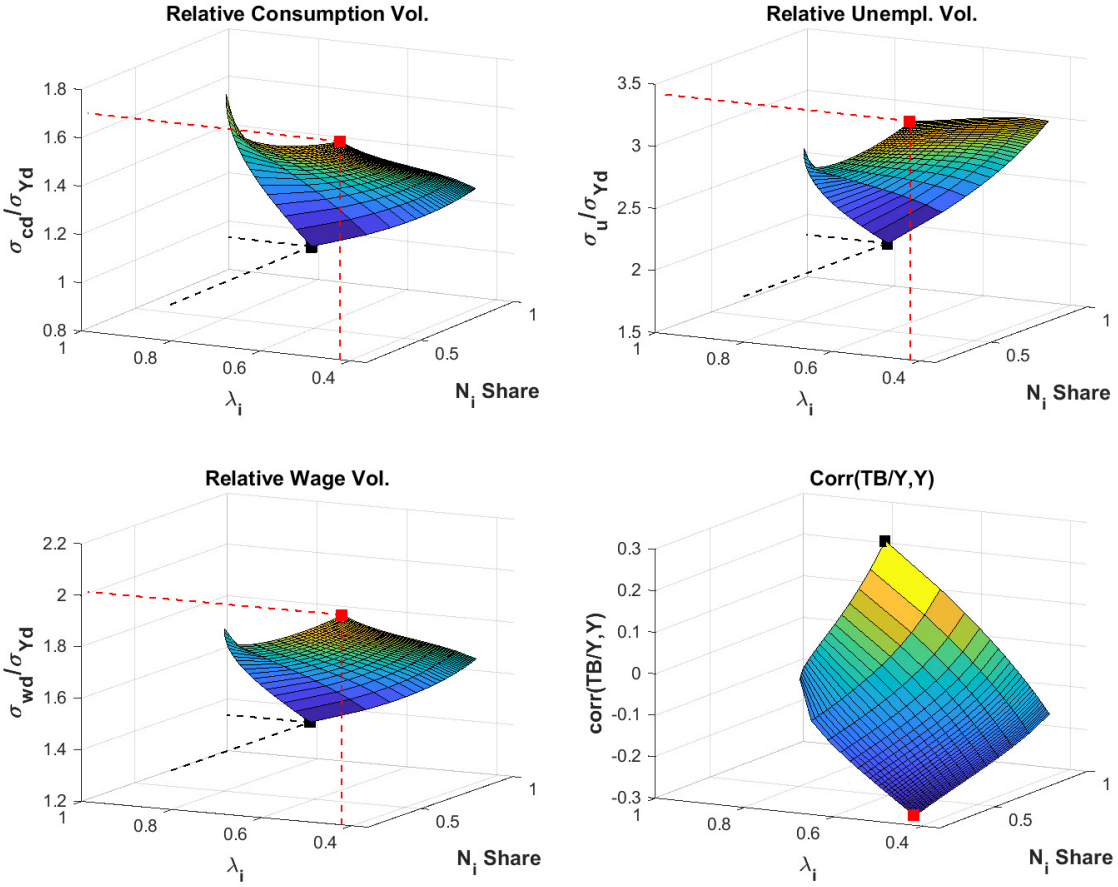
endogenous household financial participation performs, from a comprehensive standpoint, quantitatively better *without* altering any of the key channels or findings that we highlighted using our simpler benchmark model.

Table A4: Business Cycle Moments: Data, Endogenous Household Financial Participation (EHFP) Model, and EHFP Model under Greater Financial Participation

| Second Moments | Data AE | Data EME | EHFP Model EME Calib. | EHFP Model AE $\lambda$ EME $\psi_i$ | EHFP Model EME $\lambda$ AE $\psi_i$ | EHFP Model AE $\lambda$ AE $\psi_i$ | EHFP Model AE $\lambda$ AE $\psi_i$ AE UI Level |
|---|---|---|---|---|---|---|---|
| $\sigma_{c_{d,t}}/\sigma_{Y_{d,t}}$ | 0.92 | 1.21 | 1.71 | 1.54 | 1.33 | 0.96 | 0.87 |
| $\sigma_{inv_{d,t}}/\sigma_{Y_{d,t}}$ | 3.63 | 3.28 | 3.28 | 2.95 | 2.48 | 1.79 | 1.69 |
| $\sigma_{w_{d,t}}/\sigma_{Y_{d,t}}$ | 0.87 | 2.67 | 2.02 | 1.71 | 1.71 | 1.84 | 0.89 |
| $\sigma_{u_t}/\sigma_{Y_{d,t}}$ | 7.47 | 3.41 | 3.42 | 2.60 | 3.11 | 1.79 | 7.20 |
| $corr(c_{d,t}, Y_{d,t})$ | 0.52 | 0.72 | 0.64 | 0.55 | 0.68 | 0.68 | 0.71 |
| $corr(inv_{d,t}, Y_{d,t})$ | 0.68 | 0.71 | 0.88 | 0.87 | 0.90 | 0.92 | 0.88 |
| $corr(u_t, Y_{d,t})$ | −0.61 | −0.39 | −0.75 | −0.70 | −0.76 | −0.73 | −0.85 |
| $corr(tby_t, Y_{d,t})$ | 0.01 | −0.31 | −0.28 | −0.14 | −0.13 | 0.20 | 0.33 |

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).

Figure A16: 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 and lowest $\psi_i$. Model variables with $d$ subscripts represent data-consistent variables.