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On the Perverse Effect of Capital Account Liberalization: the Role of Labor Market Rigidity *

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Abstract

We propose a new explanation for why developing countries may fail to benefit from financial globalization, based on labor market institutions. In our model, a combiation of a rigid labor market and a low economywide productivity generates a low domestic interest rate in financial autarky. With financial openness, there is a net capital outflow and a worsening of domestic unemployment rate. In comparison, financial opening in a developing country with labor market flexbility produces improved employment. Similarly, financial opening in a developed country need not produce a worsening unemployment even with labor market rigidity. We show such predictions are broadly consistent with the patterns in the data.

JEL Classification Numbers: *E24; J08; F41; F44.*

Keywords: Unemployment, Labor Market Rigidity, Capital Account Liberalization, Developing Countries, Financial Openness.

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1 Introduction

In preparing a formal advice for the International Monetary Fund to its member countries on the desirability of pursuing capital account openness, Prasad, Rogoff, Wei, and Kose (2003) took stock of all empirical studies on the subject up to that date. In particular, they examined what the empirical literature had produced in terms of the effect of capital account openness on economic growth in developing countries. A key conclusion is that it is very hard to find a strong and robustly positive effect. Indeed, capital account openness in some countries appears to be associated with a worsening of macroeconomic outcomes (lower growth, higher unemployment, and greater consumption volatility).

That review of the literature has since been updated in Kose, Prasad, Rogoff, and Wei (2009). The additional empirical studies reviewed in that update and many subsequent review articles do not change the main conclusion that capital account openness can sometimes hurt rather than help developing countries. At the time when Prasad et al (2003) was being prepared, the view that the benefit/cost ratio associated with capital account openess could be unfavorable for developing countries was considered somewhat unorthodox within the IMF. Given the accumulation of evidence, however, the IMF has by now officially adopted a cautious or more nuanced view towards capital account openness as reflected in "The IMF's Institutional View on Capital Flows in Practice" (IMF, 2018).

Why don't developing countries benefit from capital account openness? The existing literature has emphasized the roles of imperfections in domestic financial system, imperfections in international capital market, and problematic domestic governance institutions such as a lack of control of rampant corruption. We will review them in more detail below. In this paper, we aim to investigate the relevance of a potentially new channel - domestic labor market ridigity, a feature common in many developing countries - in the perverse effect of capital account openness.

Labor market rigidity is not unique to the developing world. Many high-income countries also have relatively rigid labor market institutions in terms of relatively high legally mandated severance payment and other employment protection provisions, but almost all of them have a high degree of capital account openness. So something is different between developing and developed countries that also causes the consequence of capital account opening to be different. The mechanism we will explore involve interactions between labor market rigidity and economy-wide productivity. In particular, when the economy-wide productivity is sufficiently low - a characteristic of developing countries, labor market rgidity translates into a low demand for capital and therefore a low domestic interest rate in financial autarky. In this case, capital account opening can lead to capital outflow, and the ensuring increase in the cost of capital produces a worsening

macroeconomic outcomes including a worsening of unemployment rate. In comparison, the same degree of labor market rigidity in a high-income country need not produce the same outcome because the higher economy-wide productivity helps to boost the demand for capital and the domestic interest rate in financial autarky. Hence, the perverse effect of capital account openness associated with a rigid labor market is more severe for developing countries than for high-income countries. As far as we know, this mechanism has not been articulated in the existing literature. Our contribution is to investigate how this may work in theory and whether such pattern exists in the data.

We note that, to understand the perverse effect of capital account opening for some developing countries, the labor market mechanism investigated in our paper and other mechanisms proposed in the literature are not mutually exclusive. A given developing country can certainly suffer from multiple problems. We propose the labor market rigidity as one additional distortion rather than as a competing explanation.

Restrictions on capital account transactions are common, especially among emerging market economies and low-income developing countries. According to Klein and Olivei (2008), 58 out of 74 non-OECD countries in their sample had restricted capital account transactions over the period from 1986 to 1996. If these restrictions are the only distortions in the economy, removing them would improve economic efficiency and welfare. If they co-exist with other distortions, the logic of the theorem of the second best suggests that removing them could lead to a worse outcome.

In theory, there exist several potential benefits of financial openness to developing countries. First, standard Neo-classical growth models suggest that developing countries are usually associated with higher capital returns at financial autarky and hence, opening the capital account will lead to a capital inflow to developing countries, which in turn stimulates economic growth. Second, consumers should desire to use financial markets to insure against income risks. This benefit should be more important for developing countries given their higher output volatility than advanced countries.[1]

The existing literature has proposed four channels through which financial globalization may produce perverse outcomes for developing countries. First, a distorted domestic financial system within the country could be a problem. If the distorted financial system channels domestic savings toward less efficient firms or sectors before the capital account is opened, additional finance from

[1]Some papers find that capital account openness could be associated with higher output growth (Quinn, 1997, Quinn and Toyoda, 2008). However, Grilli and Milesi-Ferretti (1995), Rodrik (1998), and Edwards (2001) find either no effects of financial openness on average or at best mixed effects. Additionally, Kose, Prasad, and Terrones (2003) find a striking result that the volatility of consumption rises by more than income volatility for emerging market economies when financial integration increases. In other words, capital account liberalization appears to hurt these countries.

a more open capital account could exacerbate the misallocation of resources (Eichengreen, 2001).

Second, poor governance at either the national or the firm level could also turn capital account liberalization into a source of reduced efficiency. For example, the poor quality of domestic institutions could drive down the return to domestic savings in a developing country even when the country is scarce in capital (Ju and Wei, 2010 and 2011). In that case, capital account openness would simply facilitate domestic savings to leave the country, producing the paradox of capital flowing from poor to rich countries. Poor governance could also allow corporate insiders to expropriate outside investors for private benefits, or state rulers (and bureaucrats) may take actions to improve their personal welfare by reducing returns to corporate investors. While financial globalization may constrain the extent of these "twin agency problems" (Stultz, 2005), it might also nudge the composition of cross-border capital inflows to consist of less foreign direct investment (Wei, 2000), and more volatile types of capital flows (Wei, 2001; and Ma and Wei, 2020), and may also shorten the maturity of external debt (Wei and Zhou, 2017; and Ma and Wei, 2020).

Third, with the existence of credit constraints in the international capital market, private agents tend to over-borrow when capital account is more open (Jeanne and Korinek, 2010, Bianchi, 2011, and Benigno et al., 2016), which could increase the incidence and severity of financial crises. Raising the cost of borrowing during tranquil times in this case restores constrained efficiency.

Fourth, if there is greater model uncertainty faced by agents in developing countries than their counterparts in developed countries, there will be a stronger negative association between volatility and growth (Luo, Nie, and Young, 2018). Financial opening, by generating more volatility in developing countries, may discourage investment and reduce growth.

We zoom in on the role of domestic labor market frictions, a factor that has not been examined systematically in the context of understanding the elusive gains from capital account opening. To motivate our story, Figure 1 plots the conditional relationship between changes in unemployment and changes in capital account openness in two types of developing countries: those with a flexible labor market and those with a rigid labor market. The scatter plots control for lagged income, change in inflation, change in trade openness, change in institutional quality, nominal exchange rate regimes, country fixed effects and year fixed effects. For those countries with a flexible labor market, we can see a (modestly) negative relationship, suggesting that financial opening tends to be associated with reduced unemployment. In comparison, for those countries with a rigid labor market, the relationship reverses, and financial opening tends to be associated with a worsening of unemployment.

We build a model in which domestic labor market rigidity, together with economywide productivity, plays a significant role in a country's macroeconomic consequences following capital

account liberalization. To focus our attention on this channel, we assume away distortions in the domestic financial system and international capital away, and abstract from the "twin agency problem" of high expropriation risks by either managers, entrepreneurs, majority shareholders, or by the state.

The key mechanism in our model is that labor market frictions and economy-wide productivity jointly determine an economy's demand for capital and the domestic interest rate in financial autarky, which in turn determines the direction of capital flows when the economy removes restrictions on cross-border capital flows. The labor market features searches and matches with frictions, so we can meaningfully talk about unemployment. Holding the economywide productivity constant, more rigidity in the labor market discourages firms from hiring labor, and in turn lowers the economywide demand for capital. For an economy with both a low overall productivity (i.e., a typical developing country) and a rigid labor market, the domestic interest rate in financial autarky is lower than the international interest rate. Financial opening causes capital outflow and an increase in the domestic cost of capital. The employment falls and the unemployment rises.

In contrast, with a sufficiently flexible labor market, the demand for labor in the developing country would be stronger which raises the representative firm's output and demand for capital. This could push the autarky-level interest rate above the international level. In response to easing of restrictions on cross-border capital flows, there is a net inflow of capital and a reduction in the domestic cost of capital. This will help to expand the firm's output further and raise the demand for labor. As a result, the unemployment level goes down.

Note that the demands for labor and capital are also a function of the economy-wide productivity. For an economy with a high level of productivity (e.g., a typical developed country), the demand for capital may not be low in financial autarky even if the country has a rigid labor market. For such an economy, going from financial autarky to financial openness need not lead to capital outflow nor worsening of unemployment.

In our baseline model, a labor either works in a formal sector or is unemployed. Another prominent feature of labor markets in developing countries is the existence of a relatively large self-employment sector. Such sector escapes from many of the frictions in the formal labor market. The existence of a large self-employment sector raises the possibility that it can buffer the shock of financial opening even if the country has a rigid formal labor market.

We consider an extension to our baseline model which adds the self-employment sector, which differs from the formal sector by not using capital in its production and by not being subject to the same kind of labor market rigidity. In other words, a labor in the extended model can be either unemployed, self-employed, or employed in the formal sector. We note from the World Bank WDI data on the job market performance of its developing country members, there still

exists a sizable unemployment rate (8% on average in the group of countries listed in Appendix B) coexisting with a large self-employment sector. In other words, there is still some cost to be self-employed. We incorporate a cost of being self-employed in the extended model. People who fail to find a job in the formal sector and also have a low productivity draw relative to the cost of going into self-employment would be unemployed. Interestingly, we find that, for an economy with a low productivity and a rigid labor market, the existence of a self-employment sector can amplify rather than moderate the negative effect of financial opening.

The results from our theory can also be re-stated by two asymmetries. First, the effect of financial openness on a developing country depends on its labor market frictions. With high labor market frictions, financial opening can produce capital outflow and a worsening of unemployment. On the other hand, with a more flexible labor market, financial opening can produce a more desirable labor market outcome. Second, the effect of financial opening on a country with high labor market frictions depends on the country's productivity (or the stage of economic development). For a typical developed country, its high productivity offsets the effect of labor market frictions in terms of demand for capital and autarky-level interest rate. This renders the net effect of greater financial openness less harmful. In contrast, for a typical developing country, the effect of a low productivity reinforces the effect of high labor market frictions, leading to an unambiguous reduction in the demand for capital and a reduction in the autarky-level interest rate. Consequently, financial opening leads to capital outflow, an increase in the domestic cost of capital, and a rise in the unemployment rate.

To quantitatively assess the economic significance of the labor market channel, we calibrate our model to a composite developing country - based on a group of developing countries with relevant data - that feature both rigid labor market regulations and low economy-wide productivity. The numerical analysis shows that financial opening leads to a worsening of the domestic job market. Quantitatively, our model with self-employment predicts an increase in the unemployment rate by more than 0.5 percentage points and a decline in total output by around 9 percent. The much larger decline in output reflects a compositional change in employment which increases the relative share in self employment and thus lowers average productivity.

The rest of the paper is organized as follows. In Section 2, we present more data patterns as a motivation for the subsequent theory. In particular, we show that the unemployment rate tends to be higher following financing opening for developing countries with a rigid labor market. In section 3, we present a labor search-and-matching model and show how capital account liberalization affects the unemployment. In section 4, we extend our model by incorporating a self-employment sector. Section 5 presents calibration and quantitative results. Section 6 concludes.

2 Data pattern

This section presents some data patterns linking labor market rigidity to the effect of capital account openness. We will pay attention to potential differences between developing and developed countries in this context.

2.1 Unemployment regressions

We divide the sample into two groups based on income levels: developing countries and developed countries. In each group, we run the following regression

$$\Delta u_{it} = \gamma_0 + \gamma_1 \cdot \Delta openness_{it} + \gamma_2 \cdot (\Delta openness_{it} \cdot Rigid_{it}) + Z \cdot \Gamma + f_i + f_t + \varepsilon_{it} \qquad (1)$$

where Δu_{it} and $\Delta openness_{it}$ represent the changes in country i's unemployment rate and capital account openness at time t, respectively. $rigid_{it}$ is a dummy variable which takes value one if country i has a rigid labor market at time t, and zero otherwise.

We obtain the unemployment rate data from the World Bank's WDI database.[2] For capital account openness ($openness$), we use the Chinn-Ito (2006) index ($KAOPEN$), which is the first principal component of the various restrictions on cross-border financial transactions as reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This covers 182 countries in the world since 1970.

$rigid_{it}$ is a dummy variable for countries with a rigid labor market, and is constructed to take the value of one if the labor market rigidity index from Campos and Nugent (2012) exceeds the median value. The Campos and Nugent (2012) index extends the original labor market rigidity index by Botero et al. (2004) from 85 to 169 countries, and from a one-time cross section (around 1997) to a longer period of 1945-2004. As these authors point out, on average, countries that have an English common law system tend to have less restrictive labor laws and regulations than those with a French legal tradition or civil law systems. The civil law tradition is associated with more rigid, more detailed, more complicated, all-encompassing labor laws which are more difficult to change (i.e., less flexible).

Z is the set of other control variables including a country's initial income level (lagged log GDP per capita), change in financial market development (proxied by the credit to private sector in percent of GDP), change in institutional quality, change in trade openness (sum of export and import in percent of GDP), change in inflation,[3], and exchange rate regimes. GDP per capita and trade openness measures are obtained from Penn World Table 7. Financial market

[2]The link for WDI database is https://databank.worldbank.org/source/world-development-indicators

[3]In our regressions, we use $\log(100 + inflation\ rate)$.

development, inflation and government consumption indices are obtained from the World Bank's WDI database. The institutional quality measure is obtained from the International Country Risk Guide (ICRG) database; we use the composite index to measure a country's institutional quality. Missing observations in the insitutional quality index may significantly reduce the sample size. To avoid the impact of smaller sample size, we construct a dummy variable $DummyInst_{it}$ which equals one if changes in institutional quality information is available in country i at time t, and control for the dummy and its interaction with change in institutional quality in regressions.

For exchange rate regimes, we consider three de facto classifications: IMF classification, Reinhart and Rogoff classification, and Levy-Yeyati and Sturzenegger classification. Data can be obtained from Reinhart and Rogoff (2004) and Levy-Yeyati and Sturzenegger (2004). In (1), f_i and f_t represent country fixed effect and time fixed effects, respectively.

Since the labor market rigidity index takes a value once every five years, we take five years as one period for other variables as well. As we focuse on the steady state of the model, the corresponding empirical work consider average impact of capital account openness on unemployment on a five-year period. Our panel data consist of five five-year periods: 1980-1984, 1985-1989, 1990-1994, 1995-1999, and 2000-2004.

Tables 1 and 2 examine changes in the unemployment following an increase in a country's capital account openness for developing and developed countries, respectively. The key coefficient is the one for the interaction term ($\Delta openness_{it} \cdot Rigid_{it}$) between an increase in the capital account openness and a dummy for countries with a rigid labor market. The four columns correspond to the use of four different ways to classify nominal exchange rate regimes (which enter the regressions as control variables). For developing countries, we can see that in all columns in Table 1a, the coefficients on the interaction term are all positive and statistically significant. In comparison, the coefficients on the increase in capital account openness itself are all negative although not statistically different from zero. This suggests that the rigidity of local labor market systematically influences how financial openness affects local unemployment. Greater financial openness tends to worsen a developing country's unemployment problem if the local labor market is rigid.

These regressions control for local income level, change in domestic financial development, change in inflation, change in trade openness, and change in institutional quality. We see that improvement in domestic financial development and improvement in domestic institutional quality both tend to be associated with a reduction in unemployment. The regressions also control for the nominal exchange rate regimes, and include both period fixed effects and country fixed effects.

The same regression results for the developed country sample, reported in Table 1b, make an interesting contrast. For these countries, labor market rigidity does not seem to dramatically

alter the consequence of greater financial openness. In other words, it is the combination of being a developing country and having a rigid labor market that seems to produce a perverse effect of financial openness. This is something we seek to explore more formally in our theory.

We also provide conditional scatter plots on these relationships. We divide all observations into two groups: observations with flexible labor markets ($rigid_{it} = 0$) and observations with rigid labor markets ($rigid_{it} = 1$). Conditional on lagged values of log GDP per capita, change in government expenditure (% of GDP), change in financial market development, change in inflation, change in trade openness, change in institutional quality, country fixed effect and year fixed effect, we show in Figure 1 that for developing countries with flexible labor markets, there is no statistically significant relationship between unemployment and financial openness. In comparison, for developing countries with a rigid labor market, there is a significant positive relationship: greater financial openness is associated with larger unemployment rate. This pattern does not seem to be driven by outliers.

2.2 Capital flow regressions

We now examine possible linkages between capital outflows and financial openness. We pay special attention to how the relationship may depend on local labor market condition.

Similar to the unemployment estimations, we divide countries into developing and developed countries, respectively, and run the following regression:

$$\Delta nfa_{it} = \gamma_0' + \gamma_1' \cdot \Delta openness_{it} + \gamma_2' \cdot (\Delta openness_{it} \cdot Rigid_{it}) + Z \cdot \Gamma' + f_i + f_t + \varepsilon_{it} \qquad (2)$$

where Δnfa_{it} represents increase in net foreign asset position in percent of GDP in country i at time t. The net foreign asset and GDP indices are obtained from World Bank WDI database. For control variables, we adopt the same group of regressors as in (1).

Tables 3 and 4 report the regression results for the developing and developed countries, respectively. For developing countries, we can see that the coefficients on the interaction term ($\Delta openness_{it} \cdot Rigid_{it}$) in Table 2a are all positive and statistically significant. This implies that greater financial openness is associated with more capital outflows in countries with a rigid labor market. In contrast, for developed countries, we do obtain the same result. The coefficients on the interaction term in Table 2b are not statistically different from zero. The sign of the point estimates is negative, suggesting a tendency for capital inflow on net following an increase in financial openness.

In sum, a combination of being a developed country and having a rigid labor market produces a capital outflow following an increase in capital account openness.

3 Model

3.1 Households

We consider a small open economy labeled as Home. A representative household in Home maximizes the life-time utility as

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t)$$

subject to the budget constraint

$$a_{t+1} + \frac{\phi}{2}(a_{t+1} - \chi)^2 = (1 + r_t) a_t + I_t^c + \Pi_t - c_t - T_t \tag{3}$$

where a_t is the household wealth at the end of period t. c_t represents consumption. r_t is the interest rate from period t to period $t+1$. I_t^c represents the household labor income which includes wage income if a worker is hired by a firm, and unemployment benefits. Π_t is the aggregate profit earned by firms. We assume that firms are owned by households and hence, Π_t is part of the household income. T_t is the tax.[4]

We assume that holding asset is costly and we denote such cost by $\frac{\phi}{2}(a_{t+1} - \chi)^2$, where χ is the desired wealth by households. Schmitt-Grohe and Uribe (2003) show that similar adjustment cost on foreign debt ensures small open economy models to have stationary solutions. In our model, the adjustment cost not only helps closing small open economy models, we also can obtain endogenous steady state interest rate r_t (which differs from the standard value $1/\beta - 1$ suggested by the literature). In our numerical example, we choose proper value of parameter ϕ such that the asset holding cost is small which does not have significant impact on household consumption.

Solving the optimization problem of the representative household, we obtain the Euler equation

$$1 + \phi(a_{t+1} - \chi) = \beta E_t \left[\frac{u'(c_{t+1})}{u'(c_t)} (1 + r_{t+1}) \right] \tag{4}$$

3.2 Unemployment, vacancies and matching

We follow the standard search and matching literature (Mortensen and Pissarides 1999; den Haan et al 2000) to model unemployment. We normalize the measure of total workers to be 1. Let n_t and u_t ($u_t = 1 - n_t$) denote the measure of employment and unemployment, respectively. In each period, unemployed workers search for jobs. The aggregate number of new hires is a function of job seekers u_t and vacancies posted by firms v_t. Let $m(u_t, v_t)$ denote this matching function, which is assumed to be homogenous of degree one (as is standard in the labor search literature).

[4]We assume balanced government that tax revenues earned from capital control tax will be fully rebated to households.

The probability that a firm fills a vacancy and the probability that an unemployed worker finds a job are denoted by q_t and s_t, respectively:

$$q_t = \frac{m(u_t, v_t)}{v_t} = m\left(\frac{1}{\theta_t}, 1\right)$$
$$s_t = \frac{m(u_t, v_t)}{1 - n_t} = m(1, \theta_t)$$

where $\theta_t \equiv v_t/(1 - n_t)$ is the market tightness. In the rest of our analysis, we use $m(\theta_t)$ denote $m(1, \theta_t)$.

3.3 The Firm

Consider a representative firm with the following production function:

$$y_t = z_t k_t^{\alpha} n_t^{1-\alpha}$$

where z_t represents total factor productivity (TFP henceforth) in Home. k_t and n_t are capital and labor inputs, respectively. α is the capital intensity in production.

For convenience, we define the hiring rate, x_t, as the ratio of new hires, $q_t v_t$, to the existing workforce, n_t:

$$x_t = \frac{q_t v_t}{n_t}$$

As in the standard labor search-and-matching literature, we assume that $1 - \rho$ fraction of its workers are separated exogenously from the firm in each period, where ρ represents the probability a worker survives with the firm until the next period. Hence, the evolution of employment of the firm is given by:

$$n_{t+1} = (\rho + x_t) n_t \tag{5}$$

Note that x_t can be negative when the firm fires workers.

The representative firm chooses capital and labor to maximize its profit. Let F_t denote the value of the firm.

$$F_t = \max_{k_t, x_t} \left\{ z_t k_t^{\alpha} n_t^{1-\alpha} - w_t n_t - (r_t + \delta) k_t - \frac{\gamma \bar{w}}{2} x_t^2 n_t + E_t \left[Q_{t,t+1} F_{t+1} \right] \right\} \tag{6}$$

The first term is the output produced by the representative firm, $z_t k_t^{\alpha} n_t^{1-\alpha}$. As in standard business cycle models, the firms rents capital from capital stock owners at the cost of $r_t + \delta$ where r_t is the interest rate and δ is the capital depreciation rate. $\frac{\gamma \bar{w}}{2} x_t^2 n_t$ is the labor adjustment cost. We assume that the labor adjustment cost is proportional to wage rate where parameter γ captures the degree of the labor market rigidity. Here we follow Gertler and Trigari (2009) to use the labor adjustment cost to represent labor market frictions. Alternatively, as in standard

search and matching literature, we could introduce a vacancy-posting cost and a firing cost to model labor market rigidity. As both hiring and firing costs measure costs of adjusting labor, the Gertler and Trigari (2009) specification is more convenient as it uses a single parameter, γ, to capture the labor market rigidity.[5] $Q_{t,t+1} \equiv \beta u'(c_{t+1})/u'(c_t)$ is the stochastic discount factor from period t to period $t+1$.

The first order conditions with respect to k_t and x_t are given by:

$$r_t + \delta = \alpha z_t \left(\frac{n_t}{k_t}\right)^{1-\alpha_i} \tag{7}$$

$$\gamma \bar{w} x_t = E_t \left[Q_{t,t+1} \frac{\partial F_{t+1}}{\partial n_{t+1}} \right] \tag{8}$$

By the Envelope theorem,

$$\frac{\partial F_t}{\partial n_t} = (1-\alpha) z_t k_t^{\alpha} n_t^{-\alpha} - w_t + \frac{\gamma \bar{w}}{2} x_t^2 + \rho \gamma \bar{w} x_t \tag{9}$$

By (8) and (9), we obtain

$$\gamma \bar{w} x_t = E_t \left[Q_{t,t+1} \left((1-\alpha) z_{t+1} k_{t+1}^{\alpha} n_{t+1}^{-\alpha} - w_{t+1} + \frac{\gamma \bar{w}}{2} x_{t+1}^2 + \rho \gamma \bar{w} x_{t+1} \right) \right] \tag{10}$$

By (7), we have

$$k_t = \left(\frac{\alpha z_t}{r_t + \delta} \right)^{\frac{1}{1-\alpha}} n_t \tag{11}$$

Plugging (11) into (6), and define $J_t = F_t/n_t$, we can obtain

$$J_t = (1-\alpha) \alpha^{\frac{\alpha}{1-\alpha}} z_t^{1-\alpha} (r_t + \delta)^{-\frac{\alpha}{1-\alpha}} - w_t - \frac{\gamma \bar{w}}{2} x_t^2 + (\rho + x_t) E_t \left[Q_{t,t+1} J_{t+1} \right] \tag{12}$$

By (8), (10) and (12), we can obtain

$$\gamma \bar{w} x_t = E_t \left[Q_{t,t+1} J_{t+1} \right] \tag{13}$$

We can clearly see that the value of the representative firm F_t is linear in its employee size n_t. In other words, the average value of the firm (per employee) does not depend on the size of the firm. As a result, in the bargaining process between workers and the firm, the firm will bargain over the average value J_t.

[5] This specification is also used in models studying business cycles and asset pricing with labor market frictions. For example, see Furlanetto and Groshenny (2012) and Donaldson and Kim (2011).

3.4 Wage Earners

Let V_t and U_t denote the value of being employed by a firm at time t and the value of failure to be employed by any firm, respectively.

$$V_t = w_t + E_t \left[Q_{t,t+1} \left((1-\rho) U_{t+1} + \rho V_{t+1} \right) \right] \tag{14}$$

$$U_t = b + E_t \left[Q_{t,t+1} \left(s_t V_{t+1} + (1-s_t) U_{t+1} \right) \right] \tag{15}$$

where b represents the unemployment benefit. The worker's surplus is

$$H_t = V_t - U_t$$

Then,

$$H_t = w_t - b + (\rho - s_t) E_t \left[Q_{t,t+1} H_{t+1} \right] \tag{16}$$

As in the standard literature, we assume that the wage is determined through Nash bargaining. That is, the equilibrium wage is a solution to the following problem

$$\max_{w_t} H_t^{\eta} J_t^{1-\eta}$$

where η denotes the bargaining power of the workers. The solution to the Nash bargaining problem satisfies

$$\eta J_t = (1-\eta) H_t \tag{17}$$

By (12), we can obtain

$$w_t = \eta \left((1-\alpha) \alpha^{\frac{\alpha}{1-\alpha}} z_t^{1-\alpha} (r_t + \delta)^{-\frac{\alpha}{1-\alpha}} + \frac{\gamma \bar{w}}{2} x_t^2 + \gamma \bar{w} s_t x_t \right) + (1-\eta) b \tag{18}$$

Substitute (18) into (13) and using (12), we can obtain

$$\gamma x_t = E_t \left[Q_{t,t+1} \left((1-\eta) \left((1-\alpha) \alpha^{\frac{\alpha}{1-\alpha}} z_{t+1}^{1-\alpha} (r_t + \delta)^{-\frac{\alpha}{1-\alpha}} + \frac{\gamma \bar{w}}{2} x_{t+1}^2 - b \right) - \eta \gamma \bar{w} s_t x_t + \rho \gamma \bar{w} x_{t+1} \right) \right] \tag{19}$$

3.5 Equilibrium

In equilibrium, re-writing (3), we obtain the resource constraint

$$a_{t+1} = (1 + r_t) a_t + y_t - (r_t + \delta) k_t - \frac{\gamma \bar{w}}{2} x_t^2 n_t - c_t - \frac{\phi}{2} (a_{t+1} - \chi)^2 \tag{20}$$

where y_t is the output of the firm

$$y_t = \alpha^{\frac{\alpha}{1-\alpha}} z_t^{1-\alpha} (r_t + \delta)^{-\frac{\alpha}{1-\alpha}} n_t \tag{21}$$

Let r^* denote the world interest rate. Capital account frictions prevent equalization between domestic and world interest rates. For technical convenience, we assume a debt-elastic interest rate similar to Schmitt-Grohe and Uribe (2003). The gap between Home and the world interest rates depends on the ratio of foreign debt to GDP (which is the negative net foreign asset to GDP ratio, $-NFA_t/GDP_t$), as well as the degree of restrictions on capital account transactions.[6]

$$1 + r_t = (1 + r^*) \exp\left(-\tau\left(\frac{NFA_t}{GDP_t}\right)\right) \tag{22}$$

Parameter $\tau(> 0)$ governs the capital control degree in our model. A reduction in the value of τ is interpreted as a relaxation of capital account restrictions or an increase in financial openness.

3.6 Steady state

We now consider the steady state for Home, and denote the steady state of Y by $\bar{Y}$. It is easy to show that $\bar{x} = 1 - \rho$. That is, the labor adjustment rate in each firm equals to the exogenous job separation rate. In the labor market, the aggregate employment satisfies

$$(1 - \rho)\,\bar{n} = \bar{s}\,(1 - \bar{n}) \Rightarrow \bar{n} = \frac{\bar{s}}{1 - \rho + \bar{s}} \tag{23}$$

In the steady state, (18) and (19) become

$$\left(1 - \frac{\eta\gamma}{2}(1 - \rho)^2 - \gamma\,(1 - \rho)\,m\left(\bar{\theta}\right)\right)\bar{w} - b = \eta\Omega\left(\bar{z}, \bar{r}, b\right) \tag{24}$$

and

$$\left(\frac{1}{\beta} - \rho + \eta m\left(\bar{\theta}\right) - \frac{(1 - \eta)\,(1 - \rho)}{2}\right)\frac{\gamma\,(1 - \rho)}{1 - \eta}\bar{w} = \Omega\left(\bar{z}, \bar{r}, b\right) \tag{25}$$

where

$$\Omega\left(\bar{z}, \bar{r}, b\right) \equiv (1 - \alpha)\,\alpha^{\frac{\alpha}{1-\alpha}}\bar{z}^{\frac{1}{1-\alpha}}\left(\bar{r} + \delta\right)^{-\frac{\alpha}{1-\alpha}} - b$$

In the rest of the analysis, we assume that $\beta\,(1 + r^*) = 1$, which is common in the open economy macroeconomics literature. Relaxing this assumption does not change any of the qualitative results. We define

$$\gamma_0\left(z\right) \equiv \arg\underset{\gamma}{}\left\{\alpha^{\frac{1}{1-\alpha}}\left(\bar{r} + \delta\right)^{-\frac{1}{1-\alpha}}\frac{m\left(\bar{\theta}\right)}{1 - \rho + m\left(\bar{\theta}\right)} = \chi\right\} \tag{26}$$

and

$$\Lambda \equiv \min\left\{1, \frac{1 - \eta}{1 - \eta + \eta^2}\left(\frac{1}{\gamma^{\max}(1 - \rho)} - \frac{\eta\,(1 - \rho)}{2} - \frac{\eta}{1 - \eta}\left(\frac{1 - \beta\rho}{\beta} - \frac{(1 - \eta)\,(1 - \rho)}{2}\right)\right)\right\} \tag{27}$$

We can show our main proposition as follows.

[6] Schmitt-Grohe and Uribe (2003) assume that the premium Home residents pay to hold foreign debt depends on the absolute size of foreign debt, not the foreign debt to GDP ratio. Following their assumption, we still obtain the same qualitative results.

Proposition 1 *Under Assumptions 1 and 2, if*

$$\chi < \alpha^{\frac{1}{1-\alpha}} \left(\bar{r}+\delta\right)^{-\frac{1}{1-\alpha}} \frac{\Lambda}{1-\rho+\Lambda} \tag{28}$$

there exists a threshold z_H such that

1. *For $\bar{z} < z_H$, if*

$$\gamma_0\left(\bar{z}\right) \in \left(\gamma^{\min}, \gamma^{\max}\right)$$

we can show that

$$\frac{d\bar{u}}{d\tau} = \begin{cases} > 0 & \text{if } \gamma < \gamma_0\left(\bar{z}\right) \\ < 0 & \text{if } \gamma > \gamma_0\left(\bar{z}\right) \\ = 0 & \text{if } \gamma = \gamma_0\left(\bar{z}\right) \end{cases}$$

2. *For $\bar{z} \geq z_H$,*

$$\frac{d\bar{u}}{d\tau} \geq 0 \text{ for all } \gamma s$$

Proof. (See Appendix A). ■

A few remarks are in order. First, firms' productivity (z) and labor-market rigidity (γ) are two important parameters that jointly determine the aggregate demand for capital. Intuitively, when the productivity increases, firms are more likely to expand hiring which raises the demand for capital. If the productivity is sufficiently high, under some conditions, no matter what labor market rigidity is, the domestic demand for capital is strong enough to yield a high interest rate in financial autarky. In this case, opening capital account yields a net capital inflow and lowers unemployment.

Second, for countries with a relatively low productivity, labor market rigidity plays a greater role in the direction of capital flows following increased capital account openness. With a low degree of labor market rigidity, the demand for capital is high in financial autarky, and opening capital account induces capital inflows and raises employment. The pattern reverses when the labor market is rigid. The economy moves toward production that requires less capital input. In this scenario, opening capital account then yields capital outflows and unemployment goes up.

Third, (28) is a sufficient condition to ensure that capital flows into countries with sufficiently high productivity, no matter how rigid their domestic labor markets are. If this condition is violated, there exists no threshold $\bar{z}$ above which opening capital account always yields net capital inflows. In this case, labor market rigidity matters for all countries, with a rigid labor market leading to a net capital outflow and a flexible labor market inducing a net capital inflow. In the numerical analysis, we can show that, with reasonable parameter combinations, (28) holds.

The key results in Proposition 1 are presented in Figure 2, which shows how productivity and labor market rigidity jointly affect the relationship between capital account openness and

unemployment. The shaded area denotes the region that unemployment rises after capital account liberalization. If the labor market rigidity is bounded from above, when productivity is sufficiently high, no matter how rigid the labor market is, opening capital account always leads to a lower unemployment rate. When productivity is relatively low, labor market rigidity plays an important role in determining the relationship between capital account openness and unemployment: opening capital account yields a lower unemployment rate when the labor market is flexible, while the opposite pattern holds if the labor market is rigid.

4 A model with self-employment

Since most developing countries have a large share of self employment, one interesting question to consider is whether this helps to buffer the negative effect of financial opening on local employment for a country with a rigid labor market. We will show that self employment can in fact augment rather than moderate the negative effect of financial opening.

We consider an extension to the baseline model by adding self-employment to the model. In this extension, a labor faces three possibilities: employed by a firm, self-employed, or unemployed. Under some simple assumptions, we will show that the average wage in a firm in equilibrium is greater than self-employment income, which in turn is greater than the unemployment benefit. At the beginning of each period, unemployed and self-employed workers search for jobs posted by firms. Those who fail to obtain a wage job from any firm will attempt self-employment. Some in this process are unlucky (as captured by an unfavorable random draw of their idiosyncratic home productivity), and become unemployed.

We again normalize the measure of total workers to 1. Let n_t denote the measure of wage earners (those employed by firms), and the total number of job seekers in our model is $1-n_t$ which includes unemployed workers and self-employed workers. We assume the same matching function but in the model with self-employment, the matching function takes the form $m\left(1-n_t, v_t\right)$.

Individual firms face the same optimization problem as in the baseline case. Hence, all optimization conditions for a representative firm in the previous section still hold here.

4.1 Wage Earners

We now consider the bargaining between a firm and a worker who gets matched with the firm. Let V_t and V_t^N denote the value of being employed by a firm at time t and the value of failure to

be employed by any firm, respectively.

$$V_t = w_t + E_t\left[Q_{t,t+1}\left(\left(1-\rho\right)V_{t+1}^N + \rho V_{t+1}\right)\right] \tag{29}$$

$$V_t^N = \widetilde{b}_t + E_t\left[Q_{t,t+1}\left(s_t V_{t+1} + \left(1-s_t\right)V_{t+1}^N\right)\right] \tag{30}$$

where $\widetilde{b}_t$ represents the outside option of a non-wage-earner (which is an weighted average of self-employed income and the unemployment benefit). The surplus of firms is obtained by (12). Then the Nash bargaining outcome is

$$w_t = \eta\left(z_t\left[\alpha\lambda_t^{\frac{\varepsilon-1}{\varepsilon}} + \left(1-\alpha\right)\right]^{\frac{\varepsilon}{\varepsilon-1}} - \left(r_t+\delta\right)\lambda_t + \frac{\gamma\bar{w}}{2}x_t^2 + \gamma\bar{w}s_t x_t\right) + \left(1-\eta\right)\widetilde{b}_t \tag{31}$$

and similar to the baseline model, we can obtain

$$\gamma\bar{w}x_t = E_t\left[Q_{t,t+1}\left(\begin{array}{c}\left(1-\eta\right)\left(z_{t+1}\left[\alpha\lambda_{t+1}^{\frac{\varepsilon-1}{\varepsilon}} + \left(1-\alpha\right)\right]^{\frac{\varepsilon}{\varepsilon-1}} - \left(r_{t+1}+\delta\right)\lambda_{t+1} + \frac{\gamma\bar{w}}{2}x_{t+1}^2 - \widetilde{b}_t\right)\\ -\eta\gamma\bar{w}s_t x_t + \rho\gamma\bar{w}x_{t+1}\end{array}\right)\right] \tag{32}$$

4.2 Self-employed and unemployed

For a worker who fails to obtain a wage job from any firm in the formal sector, she attempts self-employment. We assume that such a person takes a productivity draw φ_t in each period, which is her idiosyncratic productivity in self-employment and follows an independent and identical distribution across individuals and periods. To produce φ_t units of output, she needs to pay an entry cost f.[7]

A person not hired by firms will decide her choice by comparing the self-employment payoff $\left(\varphi_t - \left(r_t+\delta\right)f\right)$ and the unemployment benefit (b) in each period. In equilibrium, there exists a threshold φ_t^{se} above which she chooses to be self-employed, and the threshold is determined by:

$$\varphi_t^{se} - f = b \tag{33}$$

We can compute the outside option of a wage earner as

$$\widetilde{b}_t = \int_{\varphi_t^{se}}^{} \left(\varphi - f\right) dG\left(\varphi\right) + bG\left(\varphi_t^{se}\right)$$

where $G\left(\varphi\right)$ is the distribution function of random variable φ. In our model, total unemployment is

$$u_t = \left(1-n_t\right)G\left(\varphi_t^{se}\right)$$

[7]We could also allow for similar idiosyncratic productivity shocks to individual wage earners. However, due to the law of large number, there is no uncertainty in the overall labor productivity in all firms' production.

We now consider the steady state. As in the baseline model,

$$\left(1-\frac{\eta\gamma}{2}\left(1-\rho\right)^{2}-\gamma\left(1-\rho\right)m\left(\bar{\theta}\right)\right)\bar{w}-\overline{\widetilde{b}}=\eta\Omega\left(\bar{z},\bar{r},\overline{\widetilde{b}}\right) \tag{34}$$

and

$$\left(\frac{1}{\beta}-\rho+\eta m\left(\bar{\theta}\right)-\frac{\left(1-\eta\right)\left(1-\rho\right)}{2}\right)\frac{\gamma\left(1-\rho\right)}{1-\eta}\bar{w}=\Omega\left(\bar{z},\bar{r},\overline{\widetilde{b}}\right) \tag{35}$$

where

$$\Omega\left(\bar{z},\bar{r},\overline{\widetilde{b}}\right)\equiv\left(1-\alpha\right)\alpha^{\frac{\alpha}{1-\alpha}}\bar{z}^{\frac{1}{1-\alpha}}\left(\bar{r}+\delta\right)^{-\frac{\alpha}{1-\alpha}}-\overline{\widetilde{b}}$$

and

$$\overline{\widetilde{b}}=\int_{\varphi^{se}}\left(\varphi-f\right)dG\left(\varphi\right)+bG\left(\varphi^{se}\right)$$

Note that under the assumption f is a constant, (33) implies that the fraction of becoming self-employed workers $1-G\left(\varphi_{t}^{se}\right)$ does not change over time. Then the outside option for a worker who gets matched with a firm $\overline{\widetilde{b}}$ is a constant. Hence, the equilibrium equations in the model with self-employment are qualitatively the same as those in the baseline model. As a result, Proposition 1 still holds.

We can allow self-employed workers use capital to produce. In this case, the fraction of self-employed workers, $1-G\left(\varphi_{t}^{se}\right)$, is no longer a constant. In numerical analysis, we find that, as long as the share of capital used in self-employed production is lower than the capital share in firms' production, Proposition 1 holds.

5 Quantitative Analysis

To derive a sense of quantitative importance of our mechanism, we conduct numerical analysis in both models, the model without self-employment and the model with self-employment. We calibrate the model under financial autarky (with high τ) to a group of developing countries which have i) relatively closed capital account (below the median level of capital account openness in the world), and ii) rigid labor markets. Appendix B provides a list of these countries.

Our quantitative analysis includes both steady-state comparisons and transition dynamics. First, we compare the steady states under different degrees of labor market rigidity and productivity (while keeping other parameters unchanged). This exercise emphasizes the long-run relationship between unemployment and capital account openness. Second, we focus on transitional dynamics and examines and use our calibrated model to show how opening the capital account affects the dynamics of its unemployment rate, output, and other macro variables.

5.1 Calibration

The model parameters are calibrated in two steps. In the first step, we pin down a few parameters that can separately match some data statistics or can directly take values from the literature. In the second step, we jointly calibrate other parameters by matching a group of data moments.

Before explaining our calibration strategy in detail, we specify our functional forms in the model. On the function specification, we assume log utility, $u(c) = \log c$.[8] We adopt the matching function used in den Haan et al (2000),

$$m(u, v) = \frac{uv}{(u^l + v^l)^{1/l}}$$

Our first group of parameters includes seven parameters as reported in Panel A of Table 5. We set the world interest rate, r^*, to be 0.0125, which is the range of the values used for the US economy in the literature[9] We set β to be equal to $(1 + r^*)^{-1}$. The capital depreciation rate δ is set to 0.025, consistent with the standard business cycle literature. The parameter for wealth adjustment cost in households' budget constraint, ϕ, is set to a small value ($\phi = 0.01$) in order to let the impact of the adjustment cost be quantitatively small.[10] On the Nash bargaining between the firms and the workers, we assume equal bargaining powers between the two parties, hence $\eta = 0.5$.

The remaining parameters are jointly calibrated to match a set of key moments for a composite developing country based on a group of countries listed in Appendix B. As we will compare the numerical results in models with and without self employment, we calibrate the common parameters in the two models to match the same moments. In particular, as reported in Table 6, we choose parameter values for $\{\rho, l, b, \gamma, \xi^*, \tau\}$ by targetting the following moments: i) The job finding rate for a job seeker is around 0.45 (den Haan et al (2000));[11] ii) The job filling rate q is 0.71 (as in den Haan et al (2000));[12] iii) The ratio of unemployment benefit to wage is 0.1;[13] iv)

[8] In robustness check, we adopt Constant Relative Risk Aversion (CRRA) utility with different degrees of risk aversion and results are quite similar.

[9] As in Uribe and Yue (2006), we adopt the U.S. real interest rate as the world interest rate in our numerical analysis. Our the real interest rate level is in the middle range of the values in the literature. King and Rebelo (2000) uses 0.065 which is based on the average stock (S&P 500) return, while the average 1-year real treasury yield is around 0.025 in the period we calibrate the model.

[10] The bond adjustment cost is less than 0.1 percent of GDP when we set ϕ to 0.01.

[11] We do not have this measure for most developing countries, so we use the most cited value in the literature. However, as we show in the robustness check, changing this value does not influence our main results.

[12] We do not have this measure for most developing countries, so we use the most cited value in the literature. However, as we show in the robustness check, changing this value does not influence our main results.

[13] We do not have the data on unemployment insurance for developing countries. The unemployment benefit parameter (b) is set so that the benefit to the wage ratio is 0.1, lower than the level in the U.S. (0.45). This reflects

The unemployment rate is around 8 percent; v) Total investment is around 20 percent of total output;[14] vii) NFA to GDP ratio is around 3%.

In the baseline model without a self-employment sector, we calibrate parameter α to match the labor share in the composite developing country, which is around 2/3 (Guerriero (2019)).[15] For long run productivity level $\bar{z}$, we set it the same value as the one calibrated from the model with self-employment.[16]

In the extended model with self-employment, we set α to 0.36 which is consistent with den Haan et al (2000). Then the long run productivity level $\bar{z}$, entry cost of self-employment activity f and the standard deviation of self-employed productivity shock σ are jointly calibrated by targeting the moments: i) The labor share is around 2/3 percent of total output (Guerriero (2019));[17] ii) Self-employed workers represent around 53 percent of total employment (Worldbank WDI database); iii) Entry cost of self-employment on average is around 1 percent of self-employment output.[18] Table 7 reports the values of the parameters and Table 8 reports the data moments or targets we use to jointly calibrate the parameters for the model with self-employment.

5.2 Unemployment and financial openness in the long run

We examine how the relationship between unemployment and capital account openness in the steady state depends on labor market rigidity (γ) and productivity (z). We define the normalized level of capital account openness measure as $\varepsilon = 1 - \frac{\tau}{\tau_0}$, where τ_0 is the degree of capital control

the fact most developing countries lack unemployment insurance in 1990s (ILO's World Labor Report 2000). We provide sensitive analysis on this parameter value and find that it does not change our main results.

[14]Total investment in the steady state implied by our model is $\delta\tilde{k}$.

[15]Since it is difficult to precisely measure the compensation to labor in self-employed sectors, we set our target of labor share in between two standard measures in the literature. The first measure assumes all self-employed income goes to labor compensation which tends to overestimate labor share. Using this strategy, the average labor share across the group of countries in our calibration is around 0.70. The second labor share measure assumes the self-employment sector has the same labor-intensity as the rest of the economy such as manufacturing sectors. This measure may underestimate the labor share and we obtain average 0.62 for the group of countries in our calibration. We set the target of labor share to 0.67 which is between 0.62 and 0.70.

[16]We do not calibrate productivity to match any moment. Once we target the ratio of unemployment benefit to wage as one moment, the steady state productivity in the model without self-employment will not affect macro variables such as output, consumption, and unemployment. Hence, we simply let productivity $\bar{z}$ takes the same value as in the model with self-employment.

[17]The labor share in the model with self-employment is defined as the sum of wage compensation and self-employment income to GDP ratio.

[18]We do not observe the information of entry cost of self-employment activity in data. We assume this cost is about 1% of the output in this sector, which is the level Gertler and Trigari (2009) uses in calibrating the adjustment cost and is also in line with the level the literature uses to calibrate the vacancy-posting cost. We vary the entry cost parameter in the robustness checks and do not find big changes in our numerical results.

in the calibrated steady state and τ is the new steady-state level. Thus, ε measures the relative openness of the capital account compared to the old steady state, where $\varepsilon = 0$ refers to the same openness level as in the old steady state (financial autarky) and $\varepsilon = 1$ means no restrictions on capital account transactions.

5.2.1 Without self-employment

For the baseline model without self-employment, Figures 3 and 4 present the numerical results on how greater financial openness affects unemployment and other variables for two different degrees of labor market rigidity: $\gamma = 48.85$ (the case of a rigid labor market, where the value of γ is calibrated jointly with other parameters to a set of moments for the countries in Appendix B) and $\gamma = 27.51$ (a relatively flexible labor market, chosen to be 40% smaller than the value of γ in the case of a rigid labor market).

When labor market is rigid, the left panel of Figure 3 shows that capital account openness will yield an increase in unemployment and a decline in the labor market tightness. When Home switches from financial autarky to financial openness, unemployment rises by around 0.007 percentage points. Figure 4 shows that the rise of unemployment is accompanied by increases in the real interest rate and net foreign asset to GDP ratio, and decreases in output and consumption. Quantitatively, as ε moves from zero to one, output falls by around 0.7 percent. (We will provide more explanations on how other variables change in the next section.)

If we lower the degree of labor adjustment cost by 40%, $\gamma = 27.51$, we can see from the right panels of Figures 3 and 4, all variables react to increased financial openness in the opposite direction from the rigid-labor market-case. In particular, going from financial autarky to financial openness (as ε changes from zero to one), unemployment will fall by around 0.001 percentage point and output will rise by about 0.1 percent.

To see how things may be different for a more developed country, we re-do the experiments by using a higher value of productivity z while keeping all other parameters the same. The left panel of Figures 5 and 6 show that even with high labor market rigidity, capital account openness can still lower unemployment. During the capital liberalization, real interest rate and net foreign asset to GDP ratio both fall while consumption and output both go up. Quantitatively, if the productivity is 20% higher than our calibrated value, capital account liberalization lead to a fall in unemployment by 0.04 percentage points and an increase in output by around 5 percent.

5.2.2 With self-employment

We now study the consequence of capital account liberalization in the extended model with self-employment. Note, to achieve the same level of unemployment rate (about 8%) and the same size

of self employment sector (about 49%) as in the data, adding the self-employment sector means that the labor market rigidity would need to be lower than the model without self employment. Based on the calibrations in this case, we set $\gamma = 0.839$. Nonetheless, the unemployment response to greater financial openness is going to be larger not smaller. Figures 7 to 8 show the numerical results. For ease of comparison, we report the case of the rigid labor market on the left panel and that of a more flexible labor market on the right panel.

As shown in Figure 7, when labor market is rigid ($\gamma = 0.839$), a rise in capital account openness yields lower employment in the formal sector and an increase in self-employment. The decline in the formal sector employment dominates the increase in self employment, hence the overall unemployment rises.

In Figure 8, we can also see that, the capital account liberalization in the case of a rigid labor market leads to an increase in the real interest rate and capital outflow (the net foreign asset to GDP ratio rises), which raise the borrowing cost of firms and reduces vacancy posting. Indeed, as shown in the bottom left panel of Figure 7, the market tightness declines with the degree of financial openness, meaning the job finding rate for unemployed workers declines. Due to higher unemployment, both output and consumption fall.

The negative impact of capital account liberalization on overall jobs is quantitatively much bigger with self employment in the model than that in the baseline model without self employment. In particular, going from financial autarky to openness (τ changes from 1 to 0), unemployment will rise by more than 0.5 percentage points and output falls by 6 percent. To understand the intuition behind the difference, we note again that accommodating the large self-employment sector (which is paid at a lower rate than the formal sector) means that the average gain from employment is lower now compared to an economy without self employment. In other words, the outside option for a job seeker who gets matched with a firm in the formal sector has increased relatively (i.e., since the income from self employment is lower than being formally employed). When workers are closer to being indifferent between employment and unemployment, the same increase in the interest rate from capital account liberalization would generate larger responses in labor market variables including job finding rate and vacancy-posting. This is similar to the insight by Hagedorn and Manovskii (2008) in solving the Shimer puzzle (to generate more employment volatility from a search and matching model).

Consider now the case of a more flexible labor market case (in which the labor adjustment cost is reduced by 30% to $\gamma = 0.587$). The right panel of Figure 7 shows that greater capital account openness yields lower unemployment, driven mainly by an increase in the formal sector's employment. At the same time, the real interest rate falls as well as the net foreign asset to GDP ratio (in Figure 8). Both output and consumption go up. Again, the two-sector model with self-

employment generates a bigger effect of capital account liberalization than the one-sector model without self-employment. In particular, from financial autarky to an open capital account, the unemployment rate falls by about 0.2 percentage points and output rises by more than 4 percent.

Consider a third scenario when productivity z increases by 20 percent (a more developed economy). Figure 9 shows that, following capital account liberalization, unemployment falls and output rises even with high labor-market rigidity. Although self employment in this scenario falls, the formal sector employment increases by a greater amount, and the total employment increases.

To summarize, a combination of a rigid labor market and a low productivity is a recipe for a perverse effect of capital account liberalization. Greater financial openness leads to a deterioriation in the domestic job market. Such effect is stronger in a model with self employment than one without.

5.3 Dynamics Following An Increase in Financial Openness

We consider the steady state in our previous calibration as the initial period which has a low capital account openness. The new steady state is generated by reducing the capital control degree τ to zero. Our theoretical model predicts that an increase in capital account openness in a low-productivity country with a rigid labor market will yield a net capital outflow and an increase in unemployment.

The transitional path for the key variables in the benchmark case are shown in Figures 10 and 11. In the model without self-employment, as τ falls from 0.021 to 0, the unemployment rate goes up. Consistent with the theoretical prediction, the increase in unemployment is positively associated with a capital outflow. Financial openness leads to a rapid capital outflow. The surge in capital outflow then yields a higher domestic interest rate which discourages firms from investment and hiring. As a result, firms' employment falls. At the same time, those who fail to be hired by a firm may choose to become self-employed. Both consumption and output fall during this transitional period (by 0.8% and 0.6%, respectively).

In the model with self-employment, the response of unemployment is much larger than that in the baseline model without self-employment. As τ falls from 0.129 to 0, the unemployment rate rises from 8 percent to 8.5 percent, while output and consumption decline by nearly 9 percent and 6 percent, respectively.

Our results above are robust to several key assumptions made to calibrate the model. We present several robustness checks (in the extended model with self-employment). First, we vary the value of the job finding rate (s) to see how results will change. With the target $s = 0.45$, the model implies a low job survival rate. If we lower the job finding rate further to $s = 0.25$, the job survival rate becomes higher, $\rho = 0.78$. As Figure 12 shows, our results are very robust

to different values of s. In particular, unemployment, net foreign asset to GDP ratio and output all respond to greater capital account openness very similarly. The only variable that we find sensitive to this moment is the market tightness θ (or job vacancy). This makes sense as changing the job filling rate will change firm's vacancy posting decision and thus the market tightness.

In our second robustness check, we consider a much larger value of fixed cost for self-employment activity (f) in our calibration. As Figure 13 shows, the levels of output and consumption are lower relative to the benchmark case. However, qualitatively, they still show the same pattern as in the benchmark numerical analysis. In addition, the paths of the unemployment rate, the capital-to-output ratio and the interest rate change little compared to our benchmark case. In other words, our key results on the unemployment/employment effects of the capital account liberalization are robust to the value of this parameter.

Finally, in Figures 14 and 15 we allow the calibrated unemployment benefit level to be either 50% higher or 50% lower than the case in the benchmark model. In either case, as these figures show, our main results go through, and the differences in the results are quantitatively small.

6 Concluding remarks

It has been recognized in the literature that developing countries may not always benefit from greater financial globalization. The standard explanations emphasize distortions in either the international or the domestic capital market or domestic governance institutions. We contribute to this literature by investigating a new channel based on domestic labor market institutions. We show that the perverse effect of capital account liberalization can result from a combination of a rigid labor market and a low economy-wide productivity.

This means that labor market institutions are more important for developing countries than for developed countries. For developing countries, labor market reforms and capital account openness are complements: with a flexible labor market, a more open capital account implies more employment (lower unemployment); but with a rigid labor market, more capital account openness leads to the opposite result. For developed countries, the effect of financial openness may not depend on domestic labor market frictions.

A Proof of Proposition 1

Proof. By (24) and (25), we can show that

$$\frac{1-\frac{\eta\gamma}{2}(1-\rho)^2-\gamma(1-\rho)m\left(\bar{\theta}\right)}{\gamma\left(\frac{1}{\beta}-\rho+\eta m\left(\bar{\theta}\right)-\frac{(1-\eta)(1-\rho)}{2}\right)}=\frac{1-\rho}{1-\eta}\left(\eta+\frac{b}{\Omega\left(\bar{z},\bar{r},\bar{\bar{b}}\right)}\right) \tag{36}$$

where

$$\Omega\left(\bar{z},\bar{r},b\right)\equiv\left(1-\alpha\right)\alpha^{\frac{\alpha}{1-\alpha}}\bar{z}^{\frac{1}{1-\alpha}}\left(\bar{r}+\delta\right)^{-\frac{\alpha}{1-\alpha}}-b$$

Clearly, the left-hand-side (LHS) in (36) is decreasing in $\bar{\theta}$ and γ,

$$\frac{\partial LHS}{\partial\bar{\theta}}=-\frac{\gamma\left(1-\rho\right)\left(\frac{1}{\beta}-\rho-\frac{(1-\eta)(1-\rho)}{2}\right)+\eta\left(1-\frac{\eta\gamma}{2}\left(1-\rho\right)^{2}\right)}{\gamma\left(\frac{1}{\beta}-\rho+\eta m\left(\bar{\theta}\right)-\frac{(1-\eta)(1-\rho)}{2}\right)^{2}}m'\left(\bar{\theta}\right)<0 \tag{37}$$

$$\frac{\partial LHS}{\partial\gamma}=-\frac{1}{\gamma^{2}\left(\frac{1}{\beta}-\rho+\eta m\left(\bar{\theta}\right)-\frac{(1-\eta)(1-\rho)}{2}\right)}<0 \tag{38}$$

We can show that

$$\frac{\partial\Omega\left(\bar{z},\bar{r},b\right)}{\partial\bar{z}}=\left(1-\alpha\right)^{2}\alpha^{\frac{\alpha}{1-\alpha}}\bar{z}^{-\alpha}\left(\bar{r}+\delta\right)^{-\frac{\alpha}{1-\alpha}}>0$$

$$\frac{\partial\Omega\left(\bar{z},\bar{r},b\right)}{\partial\bar{r}}=-\alpha^{\frac{1}{1-\alpha}}\bar{z}^{1-\alpha}\left(\bar{r}+\delta\right)^{-\frac{1}{1-\alpha}}<0$$

On the right-hand-side (RHS) of (36), we can show that

$$\frac{\partial RHS}{\partial\bar{z}}=-\frac{1-\rho}{1-\eta}\frac{b}{\Omega\left(\bar{z},\bar{r},b\right)^{2}}\frac{\partial\Omega\left(\bar{z},\bar{r},b\right)}{\partial\bar{z}}<0$$

and

$$\frac{\partial RHS}{\partial\bar{r}}=-\frac{1-\rho}{1-\eta}\frac{b}{\Omega\left(\bar{z},\bar{r},b\right)^{2}}\frac{\partial\Omega\left(\bar{z},\bar{r},b\right)}{\partial\bar{r}}>0$$

Then, at financial autarky, we can show that

$$\frac{d\bar{\theta}^{aut}}{d\bar{r}^{aut}}<0,\frac{d\bar{\theta}^{aut}}{d\gamma}<0,\frac{d\bar{\theta}^{aut}}{d\bar{z}}>0$$

Since in steady state,

$$\bar{n}^{aut}=\frac{m\left(\bar{\theta}^{aut}\right)}{1-\rho+m\left(\bar{\theta}^{aut}\right)}$$

we can show that

$$\frac{d\bar{n}^{aut}}{d\bar{r}^{aut}}<0,\frac{d\bar{n}^{aut}}{d\gamma}<0,\frac{d\bar{n}^{aut}}{d\bar{z}}>0$$

Now we show that there exists a threshold z_H of productivity such that, for $z>z_H$, $\bar{r}^{aut}>r^*$. By (4), domestic capital supply satisfies

$$\bar{a}^{aut}=\chi+\frac{\beta\left(1+\bar{r}^{aut}\right)-1}{\phi} \tag{39}$$

The capital market clearing condition $\bar{a}^{aut}=\bar{k}^{aut}$ implies

$$\frac{\beta\left(1+\bar{r}^{aut}\right)-1}{\phi}=\bar{k}^{aut}-\chi \tag{40}$$

Note that $\bar{k}^{aut} = \alpha^{\frac{1}{1-\alpha}} (\bar{r} + \delta)^{-\frac{1}{1-\alpha}} \bar{n}^{aut}$, (40) becomes

$$\frac{\beta \left(1 + \bar{r}^{aut}\right) - 1}{\phi} = \alpha^{\frac{1}{1-\alpha}} (\bar{r} + \delta)^{-\frac{1}{1-\alpha}} \bar{n}^{aut} - \chi \tag{41}$$

Given $\bar{r} \geq 0$, as $\bar{z} \to \infty$, $\Omega(\bar{z}, \bar{r}) \to \infty$. Hence (36) implies

$$m\left(\bar{\theta}^{aut}\right) \to \min\left\{1, \frac{1-\eta}{1-\eta+\eta^2}\left(\frac{1}{\gamma(1-\rho)} - \frac{\eta(1-\rho)}{2} - \frac{\eta}{1-\eta}\left(\frac{1-\beta\rho}{\beta} - \frac{(1-\eta)(1-\rho)}{2}\right)\right)\right\}$$

Define

$$\Lambda \equiv \min\left\{1, \frac{1-\eta}{1-\eta+\eta^2}\left(\frac{1}{\gamma^{\max}(1-\rho)} - \frac{\eta(1-\rho)}{2} - \frac{\eta}{1-\eta}\left(\frac{1-\beta\rho}{\beta} - \frac{(1-\eta)(1-\rho)}{2}\right)\right)\right\}$$

we can show that, as $\bar{z} \to \infty$, $m\left(\bar{\theta}^{aut}\right) \geq \Lambda$. If

$$\chi < \frac{\Lambda}{1-\rho+\Lambda} \alpha^{\frac{1}{1-\alpha}} (r^* + \delta)^{-\frac{1}{1-\alpha}}$$

we can show by contradiction that, there exists a threshold z_H such that, for $z > z_H$, $\bar{r}^{aut} > r^*$. Suppose not, then for each z, under certain labor market conditions, we always can find a financial autarky such that $\bar{r}^{aut} \leq r^*$. Note that $\bar{n}^{aut}$ is decreasing in γ, then the right-hand-side of (41) is decreasing in γ. Hence, if for all $\bar{z}$s, we can find $\bar{r}^{aut} \leq r^*$ hold under certain values of γ, $\bar{r}^{aut} \leq r^*$ must hold when $\gamma = \gamma^{\max}$. Then, as $\bar{z} \to \infty$,

$$\begin{aligned}
0 &= \frac{\beta(1+r^*) - 1}{\phi} \geq \frac{\beta\left(1+\bar{r}^{aut}\right) - 1}{\phi} \\
&= \alpha^{\frac{1}{1-\alpha}} \left(\bar{r}^{aut} + \delta\right)^{-\frac{1}{1-\alpha}} \bar{n}^{aut} - \chi \geq \alpha^{\frac{1}{1-\alpha}} (r^* + \delta)^{-\frac{1}{1-\alpha}} \frac{m\left(\bar{\theta}^{aut}\right)}{1-\rho+m\left(\bar{\theta}^{aut}\right)} - \chi \\
&\geq \alpha^{\frac{1}{1-\alpha}} (r^* + \delta)^{-\frac{1}{1-\alpha}} \frac{\Lambda}{1-\rho+\Lambda} - \chi > 0
\end{aligned}$$

Contradiction! As a result, there exists a threshold z_H such that, for $z > z_H$, $\bar{r}^{aut} > r^*$.

For $z < z_H$, by the definition of $\gamma_0(\bar{z})$, it is easy to show that, at $\gamma = \gamma_0(\bar{z})$

$$\bar{k}^{aut} = \bar{a}^{aut} \Rightarrow \bar{r}^{aut} = r^*$$

Since $m\left(\bar{\theta}^{aut}\right)$ is strictly decreasing in γ, (40) implies that $\bar{r}^{aut}$ is strictly increasing in γ. Hence,

$$\bar{r}^{aut} - r^* = \begin{cases} > 0 & \text{if } \gamma < \gamma_0(\bar{z}) \\ < 0 & \text{if } \gamma > \gamma_0(\bar{z}) \\ = 0 & \text{if } \gamma = \gamma_0(\bar{z}) \end{cases}$$

In the steady state, unemployment $\bar{u}$ is

$$\bar{u} = (1 - \bar{n}) G(\varphi^{se}) = \frac{(1-\rho) G(\varphi^{se})}{1-\rho+m\left(\bar{\theta}\right)}$$

and

$$\frac{d\bar{u}}{d\tau} = -\frac{(1-\rho)\, G\left(\varphi^{se}\right) m'\left(\bar{\theta}\right)}{\left(1-\rho+m\left(\bar{\theta}\right)\right)^2} \frac{d\bar{\theta}}{d\bar{r}} \frac{d\bar{r}}{d\tau}$$

Note that, by (22)

$$sign\left\{\frac{d\bar{r}}{d\tau}\right\} = sign\left\{\bar{r}^{aut} - r^*\right\}$$

we can show that, under the condition

$$\chi < \frac{\alpha^{\frac{1}{1-\alpha}}}{\alpha^{\frac{\alpha}{1-\alpha}}\left(r^*+\delta\right) + \left(\frac{1-\rho}{\Lambda}\right)\int_{\varphi^{se}} \varphi dG\left(\varphi\right)\left(r^*+\delta\right)^{\frac{1}{1-\alpha}}}$$

1. For $\bar{z} < z_H$, if

$$\gamma_0\left(\bar{z}\right) \in \left(\gamma^{\min}, \gamma^{\max}\right)$$

we have

$$\frac{d\bar{u}}{d\tau} = \begin{cases} > 0 & \text{if } \gamma < \gamma_0\left(\bar{z}\right) \\ < 0 & \text{if } \gamma > \gamma_0\left(\bar{z}\right) \\ = 0 & \text{if } \gamma = \gamma_0\left(\bar{z}\right) \end{cases}$$

2. For $\bar{z} > z_H$,

$$\frac{d\bar{u}}{d\tau} > 0 \text{ for all } \gamma\text{s}$$

■

B Countries used in calibration

The countries we use for calibration include: Azerbaijan, Burundi, Benin, Burkina Faso, Bulgaria, Belarus, Brazil, China, Cameroon, Colombia, Costa Rica, Hungary, Kazakhstan, Moldova, Republic of North Macedonia, Mauritania, Niger, Romania, Rwanda, Senegal, Sierra Leone, Tunisia, Turkey, Tanzania and Ukraine.

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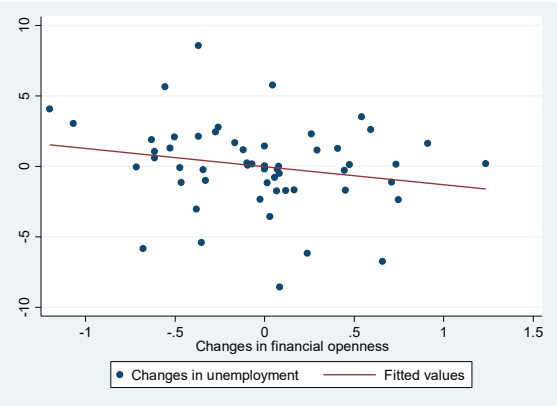
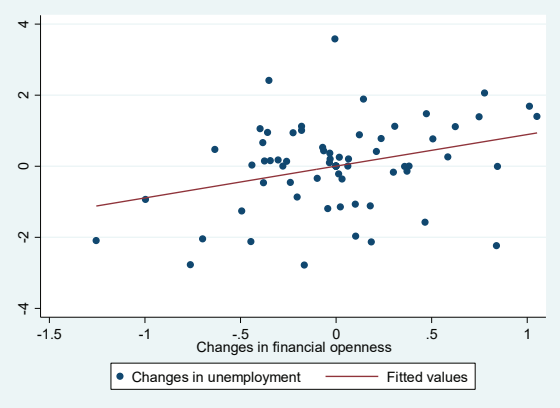


Developing countries, flexible labor market



Developing countries, rigid labor market

Figure 1: **Unemployment vs KAOPEN.** This figure shows changes in Unemployment vs Changes in Financial Openness, Developing Countries. Scatter plots are conditional on lagged values of log GDP per capita, change in government expenditure (% of GDP), change in financial market development, change in log inflation, change in institutional quality, change in trade openness, country fixed effect and year fixed effect. The financial openness is measured by *KAOPEN* in Chinn and Ito (2006), whereas labor market rigidity is measured by an index proposed by Campos and Nugent (2012). We consider non-overlapping five year intervals. Developing countries are based on World Bank's definition. GDP per capita and trade openness are obtained from Penn World Table 7. Financial market development, and inflation indices are obtained from the World Bank WDI database. The institutional quality measure is obtained from the International Country Risk Guide (ICRG) database.

Table 1: More Unemployment following Financial Opening? The Developing Country Sample.

Developing Countries				
	(1)	(2)	(3)	(4)
$\Delta KAOPEN \cdot Rigid$	1.589**	1.576**	1.705**	1.124*
	(0.720)	(0.685)	(0.800)	(0.655)
$\Delta KAOPEN$	-0.972	-0.915	-0.420	-0.408
	(0.691)	(0.654)	(0.689)	(0.581)
Rigid	1.230	2.050*	0.956	1.691*
	(0.776)	(1.183)	(0.590)	(0.921)
Lag log(GDP per capita)	1.954	1.793	2.354	1.614
	(1.788)	(1.678)	(2.090)	(1.845)
ΔFinancial market development	-0.040*	-0.033**	-0.039**	-0.040*
	(0.021)	(0.016)	(0.019)	(0.022)
$\Delta \log(100 + \text{inflation})$	-0.371	-0.098	-0.267	-0.249
	(0.443)	(0.384)	(0.405)	(0.440)
ΔTrade openness	0.003	0.009	0.005	0.006
	(0.019)	(0.021)	(0.022)	(0.018)
ΔInstitutional quality · DummyInst	-0.144**	-0.163***	-0.195***	-0.153**
	(0.056)	(0.051)	(0.049)	(0.069)
DummyInst	-0.018	1.212	0.180	1.007
	(1.235)	(1.364)	(1.378)	(1.471)
Exchange rate regime	No	IMF	RR	LYS
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
Observations	166	160	150	158
R-squared	0.18	0.25	0.22	0.21
Number of countries	57	56	55	55

Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country level. Increase in capital account openness is defined as the change in Chinn-Ito openness measure ($\Delta KAOPEN$). We consider three de facto classifications: IMF classification (IMF), Reinhart and Rogoff classification (RR), and Levy-Yeyati and Sturzenegger classification (LYS) in Columns (2) to (4). The missing observations of changes in institutional quality (ΔInstitutional quality) may significantly reduce the sample size. To avoid effect of smaller sample, we construct a dummy variable DummyInst which equals one when the observation of ΔInstitutional quality is available. We control for DummyInst and the interaction term between DummyInst and ΔInstitutional quality in regressions. We conduct the t test to examine the effect of capital account openness on unemployment when labor market is rigid. The null hypothesis is $\beta[\Delta KAOPEN] + \beta[\Delta KAOPEN * Rigid] = 0$. We can reject the null hypothesis at 10%, 5% and 10% significance level in Columns (2) (3) and (4), respectively. We cannot reject the null hypothesis in Column (1).

Table 2: More Unemployment following Financial Opening? The Developed Country Sample.

Developed Countries				
	(1)	(2)	(3)	(4)
$\Delta KAOPEN \cdot Rigid$	0.239	0.339	0.831	0.655
	(0.457)	(0.399)	(0.501)	(0.505)
$\Delta KAOPEN$	-0.249	-0.159	-0.450	-0.313
	(0.365)	(0.381)	(0.384)	(0.447)
$Rigid$	0.452	0.921	0.940	0.635
	(0.604)	(0.751)	(0.800)	(0.889)
Lag log(GDP per capita)	5.473***	5.728***	5.831***	5.280***
	(1.578)	(1.699)	(1.766)	(1.673)
ΔFinancial market development	-0.014	-0.012	-0.013	-0.013
	(0.011)	(0.012)	(0.015)	(0.011)
$\Delta \log(100 + \text{inflation})$	-1.901***	-2.135***	-1.956***	-1.973***
	(0.279)	(0.364)	(0.335)	(0.290)
ΔTrade openness	-0.004	-0.007	0.006	0.006
	(0.015)	(0.042)	(0.012)	(0.022)
ΔInstitutional quality $\cdot$ DummyInst	-0.115	-0.111	-0.100	-0.106
	(0.093)	(0.103)	(0.099)	(0.097)
DummyInst	0.680	0.446	0.371	0.883
	(0.985)	(1.022)	(1.096)	(1.048)
Exchange rate regime	No	IMF	RR	LYS
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
Observations	146	140	143	142
R-squared	0.42	0.50	0.46	0.46
Number of countries	37	37	37	37

Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country level. Increase in capital account openness is defined as the change in Chinn-Ito openness measure ($\Delta KAOPEN$). We consider three de facto classifications: IMF classification (IMF), Reinhart and Rogoff classification (RR), and Levy-Yeyati and Sturzenegger classification (LYS) in Columns (2) to (4). The missing observations of changes in institutional quality (ΔInstitutional quality) may significantly reduce the sample size. To avoid effect of smaller sample, we construct a dummy variable DummyInst which equals one when the observation of ΔInstitutional quality is available. We control for DummyInst and the interaction term between DummyInst and ΔInstitutional quality in regressions.

Table 3: Capital Outflow following Financial Opening? The Developing Country Sample.

Developing Countries				
	(1)	(2)	(3)	(4)
$\Delta KAOPEN \cdot Rigid$	0.036*	0.036*	0.037*	0.039*
	(0.022)	(0.021)	(0.021)	(0.023)
$\Delta KAOPEN$	-0.011	-0.013	-0.010	-0.011
	(0.015)	(0.015)	(0.015)	(0.016)
$Rigid$	-0.024	-0.028	-0.021	-0.037
	(0.030)	(0.036)	(0.036)	(0.037)
Lag log(GDP per capita)	-0.092*	-0.098*	-0.089	-0.100*
	(0.051)	(0.051)	(0.054)	(0.051)
ΔFinancial market development	-0.003***	-0.003***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
$\Delta \log(100 + \text{inflation})$	-0.013*	-0.014*	-0.018**	-0.017**
	(0.008)	(0.008)	(0.008)	(0.007)
ΔTrade openness	0.000	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
ΔInstitutional quality · DummyInst	0.004*	0.003*	0.002	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
DummyInst	0.032	0.018	0.024	0.029
	(0.110)	(0.129)	(0.126)	(0.109)
Exchange rate regime	No	IMF	RR	LYS
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
Observations	279	264	256	267
R-squared	0.29	0.33	0.32	0.30
Number of countries	81	81	78	79

Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Standard errors clustered at country level. Net increase in capital outflow is defined as the change in net foreign asset to GDP ratio, $\Delta(NFA/GDP)_t = (NFA/GDP)_t - (NFA/GDP)_{t-1}$. Increase in capital account openness is defined as the change in Chinn-Ito openness measure ($\Delta KAOPEN$). We exclude two outliers in our regressions. We consider three de facto classifications: IMF classification (IMF), Reinhart and Rogoff classification (RR), and Levy-Yeyati and Sturzenegger classification (LYS) in Columns (2) to (4). The missing observations of changes in institutional quality (ΔInstitutional quality) may significantly reduce the sample size. To avoid effect of smaller sample, we construct a dummy variable DummyInst which equals one when the observation of ΔInstitutional quality is available. We control for DummyInst and the interaction term between DummyInst and ΔInstitutional quality in regressions. We conduct the t test to test the null hypothesis is $\beta[\Delta KAOPEN] + \beta[\Delta KAOPEN * Rigid] = 0$. We can reject the null hypothesis at 10% significance level in Column (3) but we fail in rejecting the null hypothesis in the rest of columns.

Table 4: Capital Outflow following Financial Opening? The Developed Country Sample.

Developed Countries				
	(1)	(2)	(3)	(4)
$\Delta KAOPEN \cdot Rigid$	-0.020	-0.017	-0.022	-0.008
	(0.025)	(0.028)	(0.029)	(0.022)
$\Delta KAOPEN$	0.011	0.010	0.013	0.010
	(0.022)	(0.025)	(0.023)	(0.017)
$Rigid$	0.012	0.011	0.013	0.020
	(0.027)	(0.025)	(0.025)	(0.025)
Lag log(GDP per capita)	0.004	0.017	-0.022	0.020
	(0.064)	(0.076)	(0.072)	(0.059)
ΔFinancial market development	-0.003***	-0.002***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.001)	(0.001)
$\Delta \log(100 + \text{inflation})$	-0.005	-0.011	-0.002	-0.005
	(0.009)	(0.011)	(0.010)	(0.009)
ΔTrade openness	-0.001*	-0.000	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
ΔInstitutional quality · DummyInst	-0.001	0.002	-0.000	-0.001
	(0.003)	(0.004)	(0.004)	(0.003)
DummyInst	0.006	0.003	0.023	0.021
	(0.027)	(0.038)	(0.032)	(0.027)
Exchange rate regime	No	IMF	RR	LYS
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
Observations	153	144	150	148
R-squared	0.32	0.32	0.34	0.37
Number of countries	33	33	33	33

Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Standard errors clustered at country level. Net increase in capital outflow is defined as the change in net foreign asset to GDP ratio, that is, $\Delta(NFA/GDP)_t = (NFA/GDP)_t - (NFA/GDP)_{t-1}$. Increase in capital account openness is defined as the change in Chinn-Ito openness measure ($\Delta KAOPEN$). We consider three de facto classifications: IMF classification (IMF), Reinhart and Rogoff classification (RR), and Levy-Yeyati and Sturzenegger classification (LYS) in Columns (2) to (4). The missing observations of changes in institutional quality (ΔInstitutional quality) may significantly reduce the sample size. To avoid effect of smaller sample, we construct a dummy variable DummyInst which equals one when the observation of ΔInstitutional quality is available. We control for DummyInst and the interaction term between DummyInst and ΔInstitutional quality in regressions.

Table 5: Calibration of the One-Sector Model

Model Parameter		Value
Panel A: Separately Calibrated		
World Interest Rate	r^*	1.25%
Discount Rate	β	0.988
Asset Adjustment Cost	ϕ	0.01
Nash Bargaining Power	η	0.5
Depreciation Rate	δ	0.025
Panel B: Jointly Calibrated		
Job Survival Rate	ρ	0.961
Matching Function Parameter	l	1.290
Capital Share	α	0.30
Unemployment Benefits	b	0.241
Labor Market Rigidity	γ	45.85
Desired Wealth Level	ξ^*	26.77
Long run productivity	$\bar{z}$	1.35
Capital Account Openness $(1-\tau)$	τ	0.021

Table 6: One-Sector Model: Targets in the Joint Calibration

Moments	Model	Target	Source
Unemployment Rate	8.0%	8.0%	Average in the data (WDI, 1990-2004)
Job Finding Rate	0.45	0.45	den Haan et al. (2000)
Job Filling Rate	0.71	0.71	den Haan et al. (2000)
Labor Share	2/3	2/3	Guerriero (2019)
Unemployment benefit to wage ratio	0.1	0.1	Authors' assumption
NFA-to-GDP Ratio	3.0%	3.0%	Average in the data, (WDI, 1990-2004)
Investment-to-GDP Ratio	0.20	0.20	Average in the data, (WDI, 1990-2004)

Table 7: Calibration of the Two-Sector Model

Model Parameter		Value
Panel A: Separately Calibrated		
World Interest Rate	r^*	1.25%
Discount Rate	β	0.988
Asset Adjustment Cost	ϕ	0.01
Nash Bargaining Power	η	0.5
Depreciation Rate	δ	0.025
Panel B: Jointly Calibrated		
Job Survival Rate	ρ	0.409
Matching Function Parameter	l	1.290
Capital Share	α	0.36
Unemployment Benefits	b	0.339
Labor Market Rigidity	γ	0.839
Desired Wealth Level	ξ^*	28.78
Productivity Level	z	1.35
Entry Cost for SE	f	0.010
Std of SE Production Distribution	σ	0.978
Capital Account Openness $(1-\tau)$	τ	0.129

Table 8: Two-Sector Model: Targets in the Joint Calibration

Moments	Model	Target	Source
Unemployment Rate	8.0%	8.0%	Average in the data, (WDI, 1990-2004)
Annual Job Finding Rate	0.45	0.45	den Haan et al. (2000)
Job Filling Rate	0.71	0.71	den Haan et al. (2000)
Labor Share	2/3	2/3	Guerriero (2019)
Unemployment benefit to wage ratio	0.1	0.1	Authors' assumption
NFA-to-GDP Ratio	3.0%	3.0%	Average in the data, (WDI, 1990-2004)
Share of Self-Employ. in Total Employ.	0.52	0.52	Average in the data, (WDI, 1990-2004)
Investment-to-GDP Ratio	0.20	0.20	Average in the data, (WDI, 1990-2004)
Entry Cost to SE Output Ratio	0.01	0.01	Authors' assumption

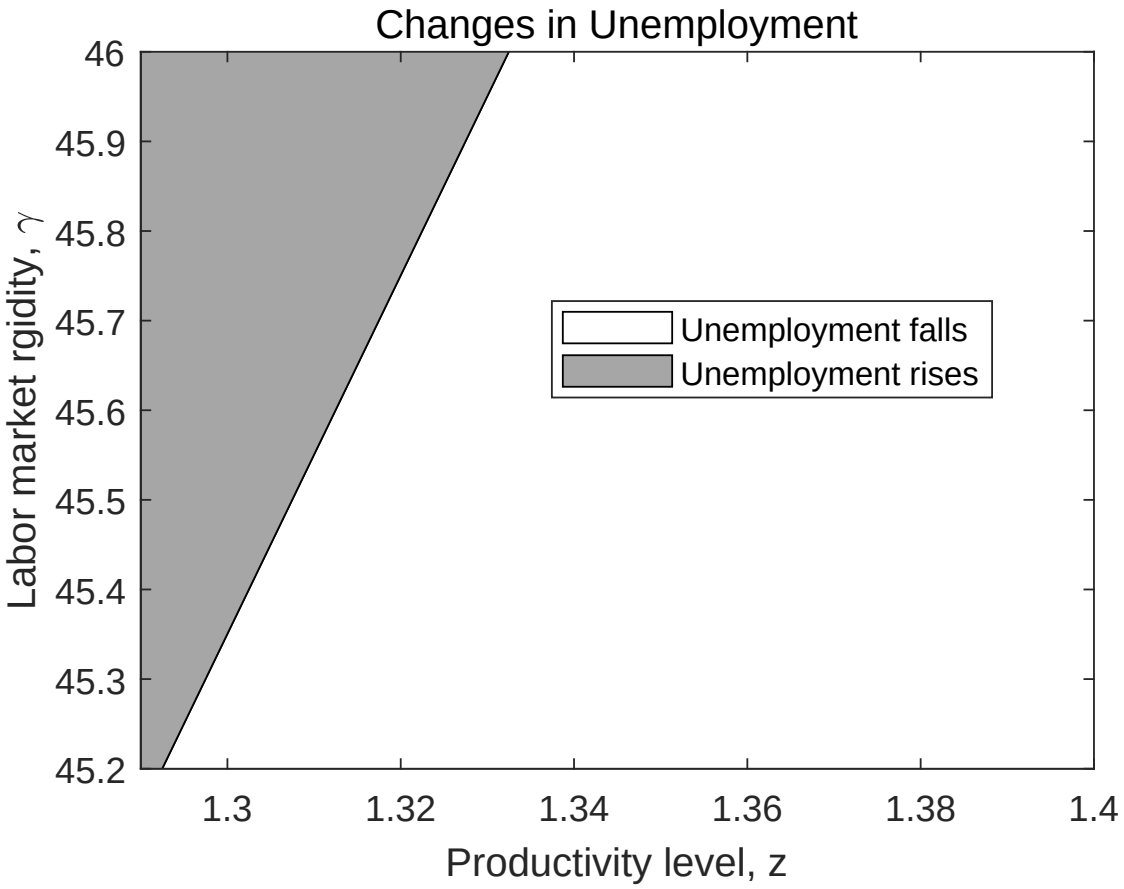


Figure 2: This figure shows when the unemployment rate falls or rises with the financial openness in the space of labor productivity rigidity and productivity. It shows that, when productivity is relatively low, there is a cut-off value of labor market rigidity such that the unemployment rate rises with financial openness when the labor market rigidty is above this threshold (the shaded area).

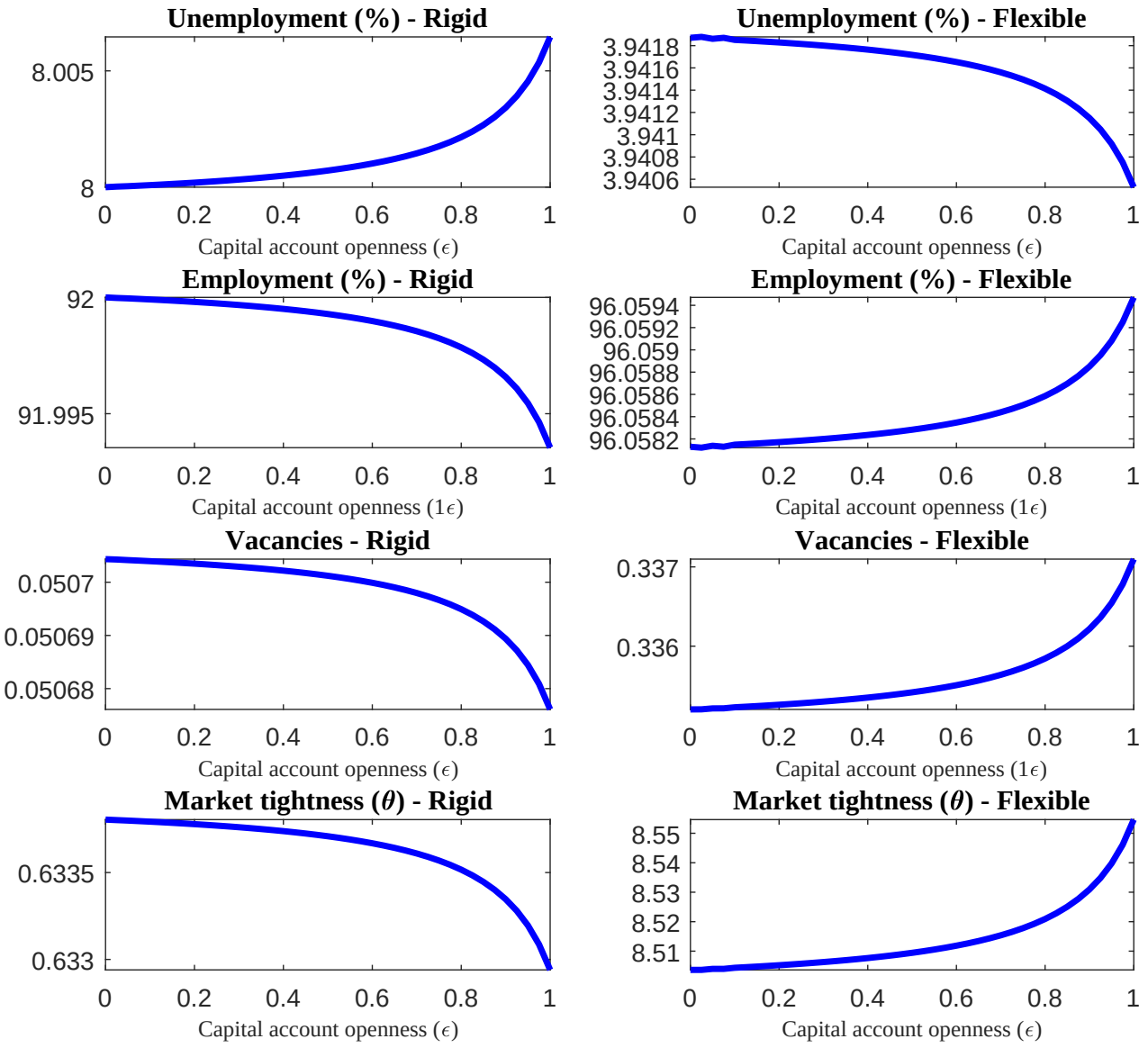


Figure 3: **Baseline Model (No Self-employment, Low Productivity, Part 1): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35, which can be thought to correspond to a developing country case. The left column reports the case of a rigid labor market ($\gamma_{rigid} = 48.85$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_{flexible} = 60\% \times \gamma_{rigid} = 27.51$).

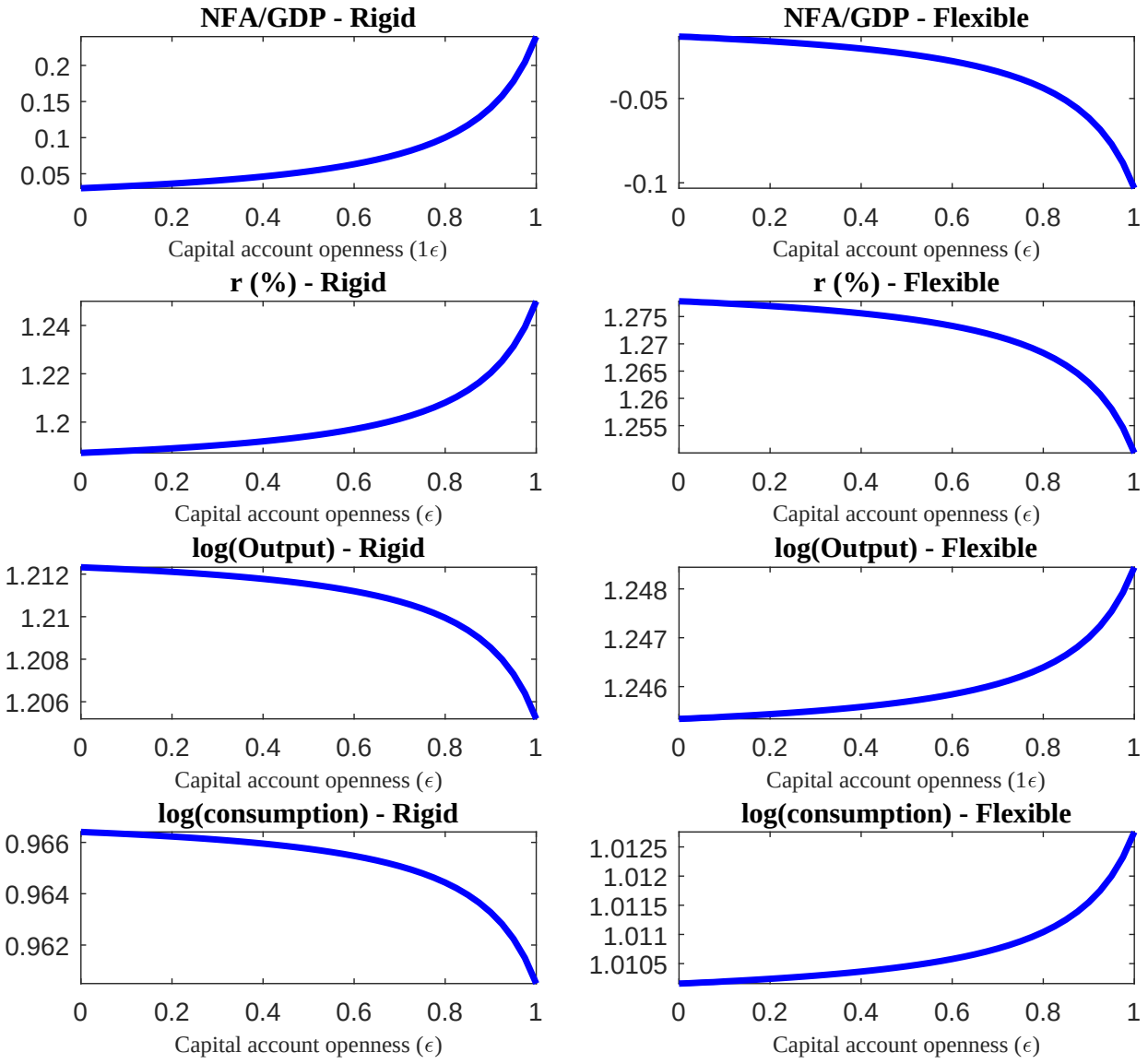


Figure 4: **Baseline Model (No Self-employment, Low Productivity, Part 2): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35, which can be thought to correspond to a developing country case. The left column reports the case of a rigid labor market ($\gamma_{rigid} = 48.85$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_{flexible} = 60\% \times \gamma_{rigid} = 27.51$).

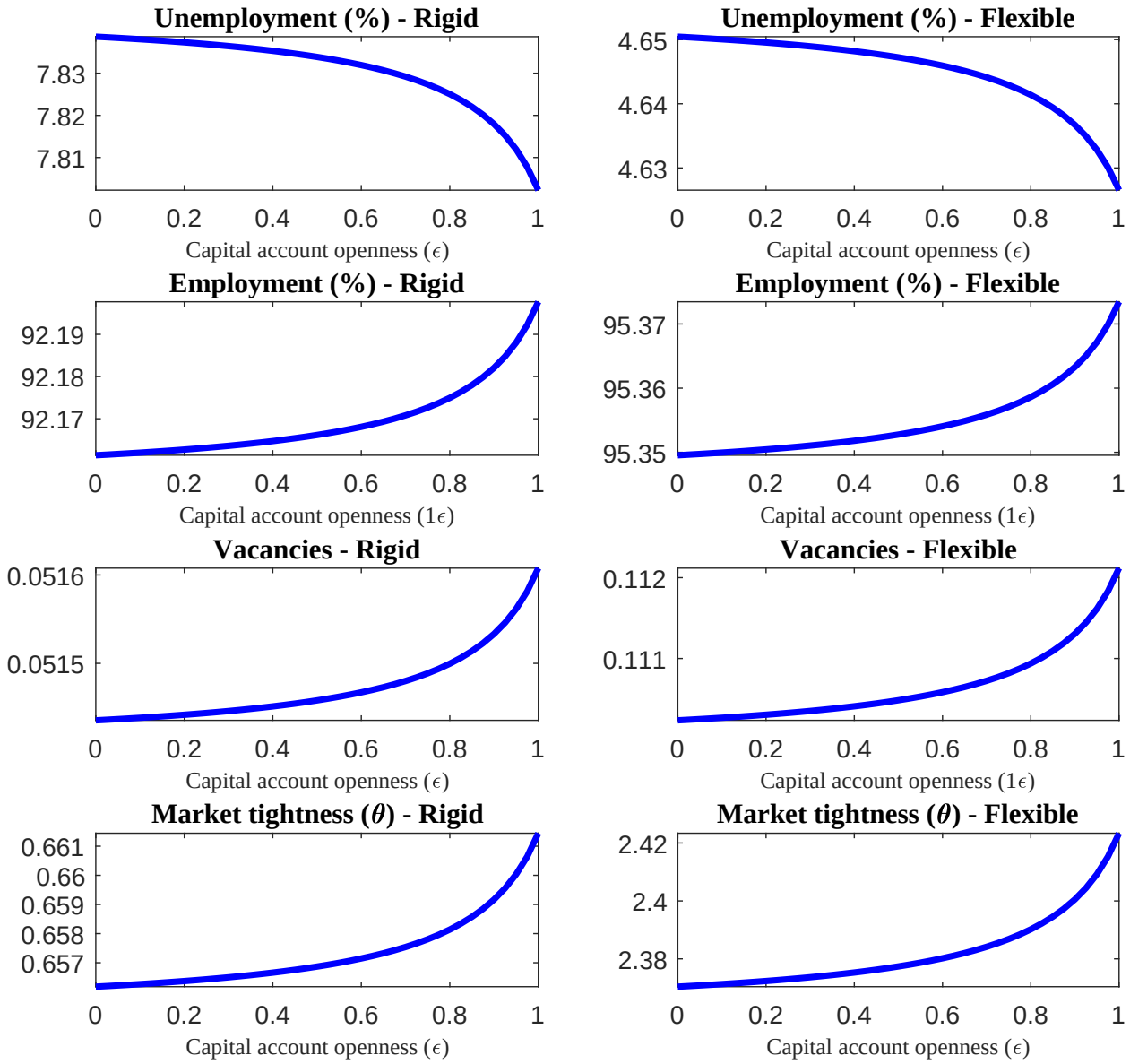


Figure 5: **Baseline Model (No Self-employment, High Productivity, Part 1): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization for a typical developed country (the calibrated value of z = 1.62). The left column reports the case of a rigid labor market ($\gamma_{rigid} = 45.85$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_{flexible} = 60\% \times \gamma_{rigid} = 27.52$).

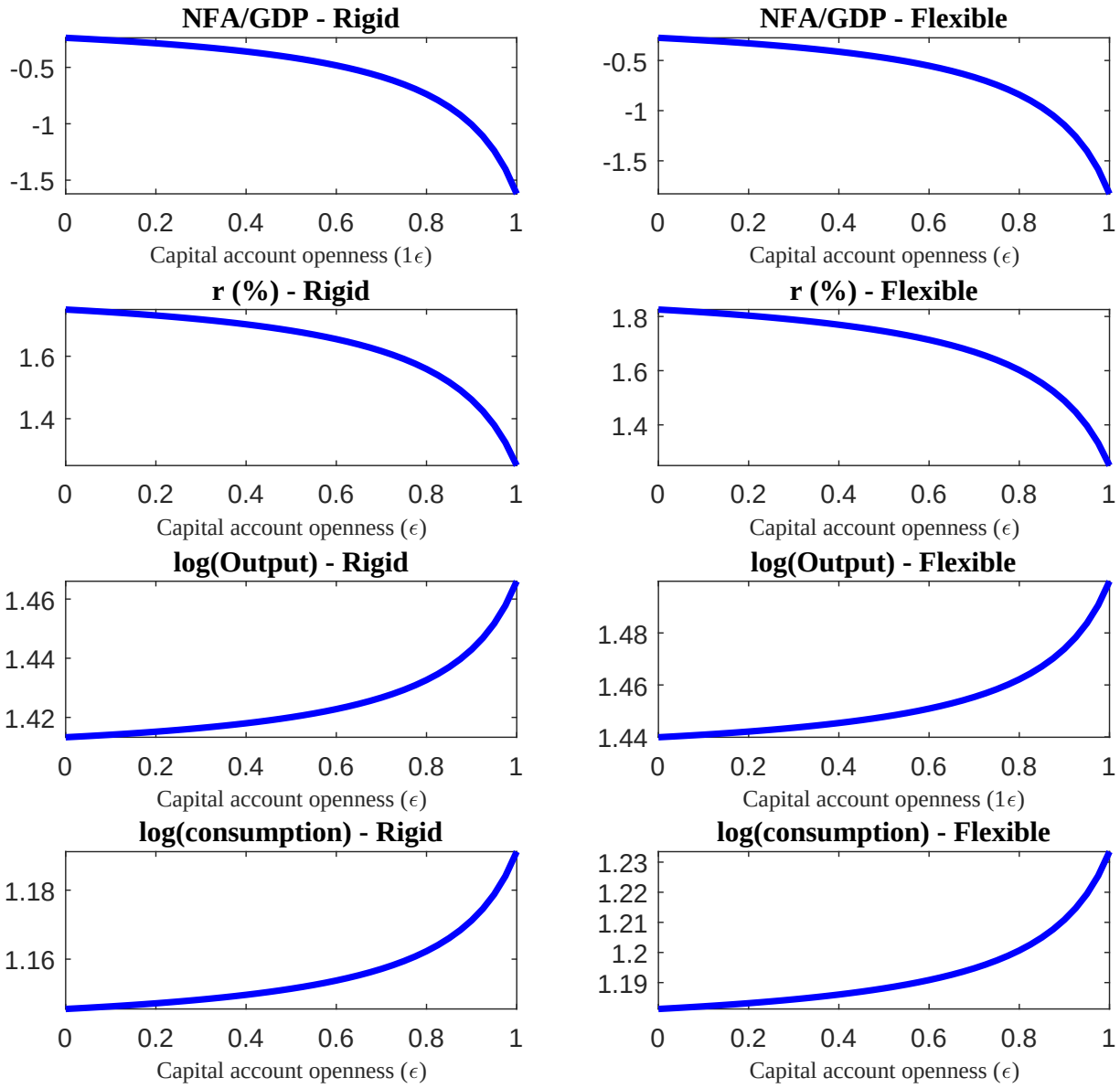


Figure 6: **Baseline Model (No Self-employment, High Productivity, Part 2): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization for a typical developed country (the calibrated value of z = 1.62). The left column reports the case of a rigid labor market ($\gamma_{rigid} = 45.85$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_flexible = 60\% \times \gamma_{rigid} = 27.52$).

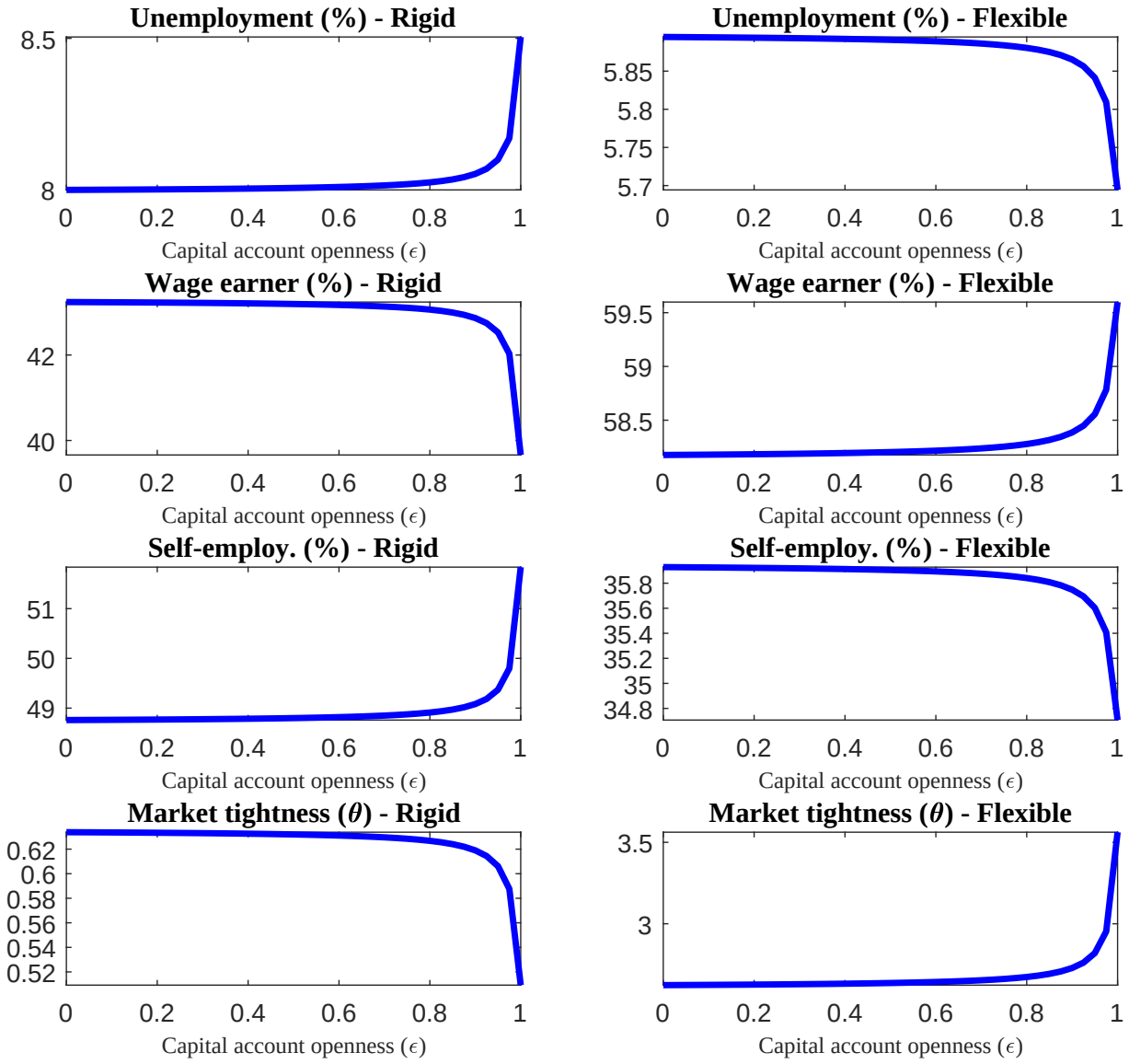


Figure 7: **Extended Model (with Self-employment, Low Productivity, Part 1): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35, which can be thought to correspond to a developing country case. The left column reports the case of a rigid labor market ($gamma_{rigid} = 0.84$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_{flexible} = 70\% \times \gamma_{rigid} = 0.58$).

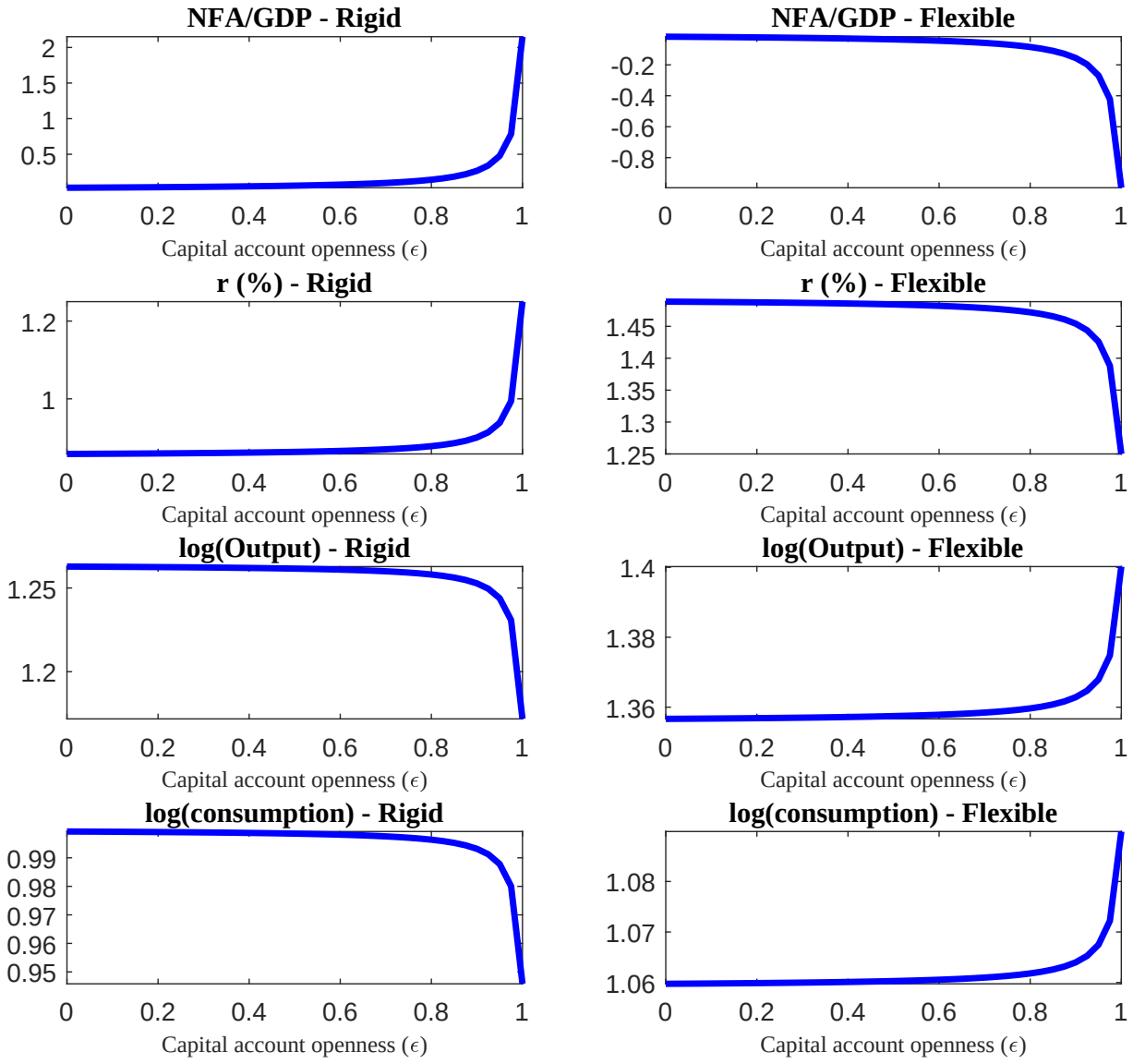


Figure 8: **Extended Model (with Self-employment, Low Productivity, Part 2): Rigid versus Flexible Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35, which can be thought to correspond to a developing country case. The left column reports the case of a rigid labor market ($gamma_{rigid} = 0.84$, calibrated with other parameters to match the moments for a group of countries in Appendix B). The right column reports the case of a more flexible labor market ($\gamma_{flexible} = 70\% \times \gamma_{rigid} = 0.58$).

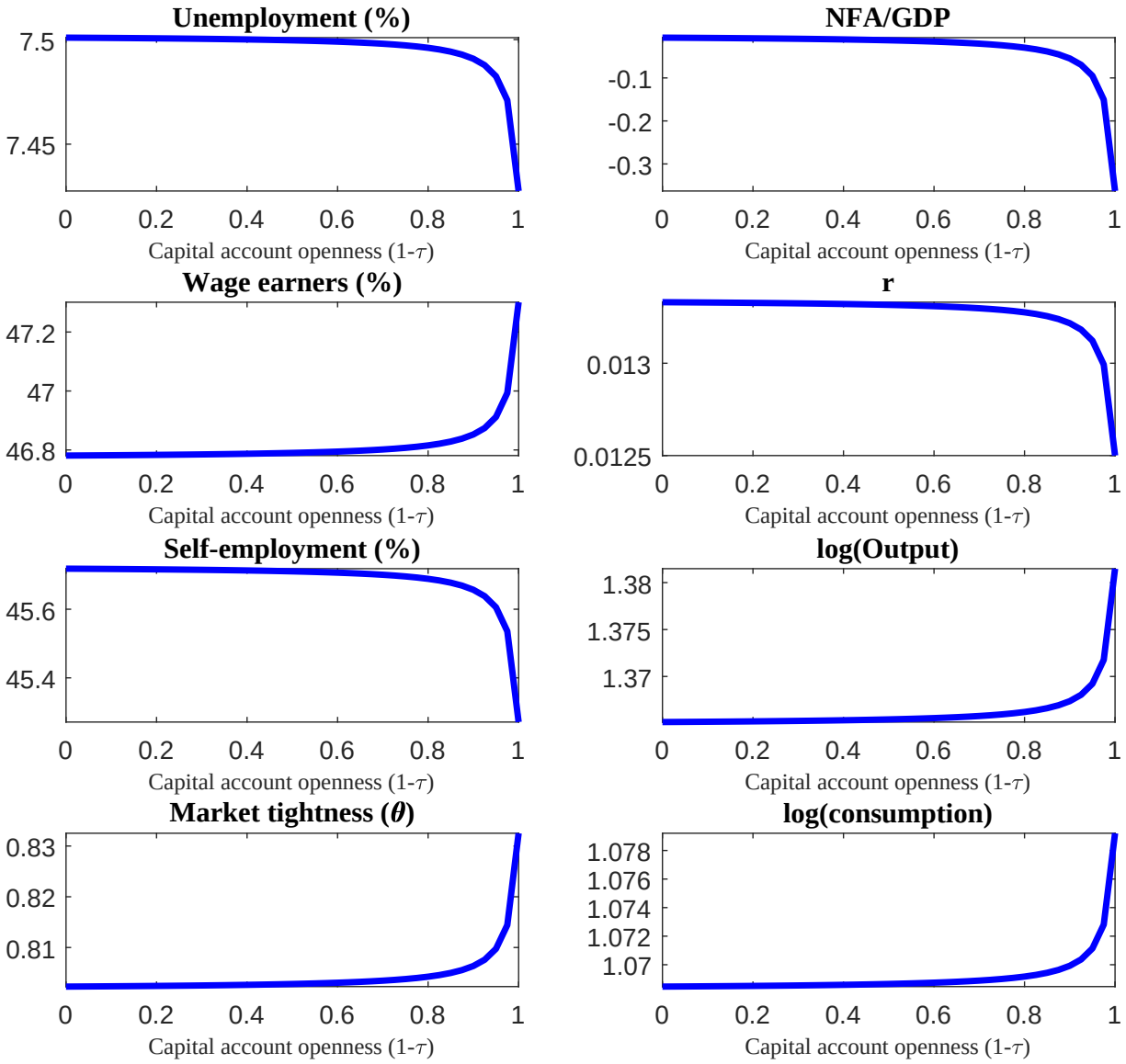


Figure 9: **Extended Model (with Self-employment): High Productivity and Rigid Labor Market** This set of graphs report the new steady state values of employment and other variables in response to capital account liberalization. The productivity level is assumed to be 20% higher than the calibrated value which can be thought to correspond to a developing country case. The labor market rigidity parameter ($gamma_{rigid} = 0.84$, calibrated with other parameters to match the moments for a group of countries in Appendix B).

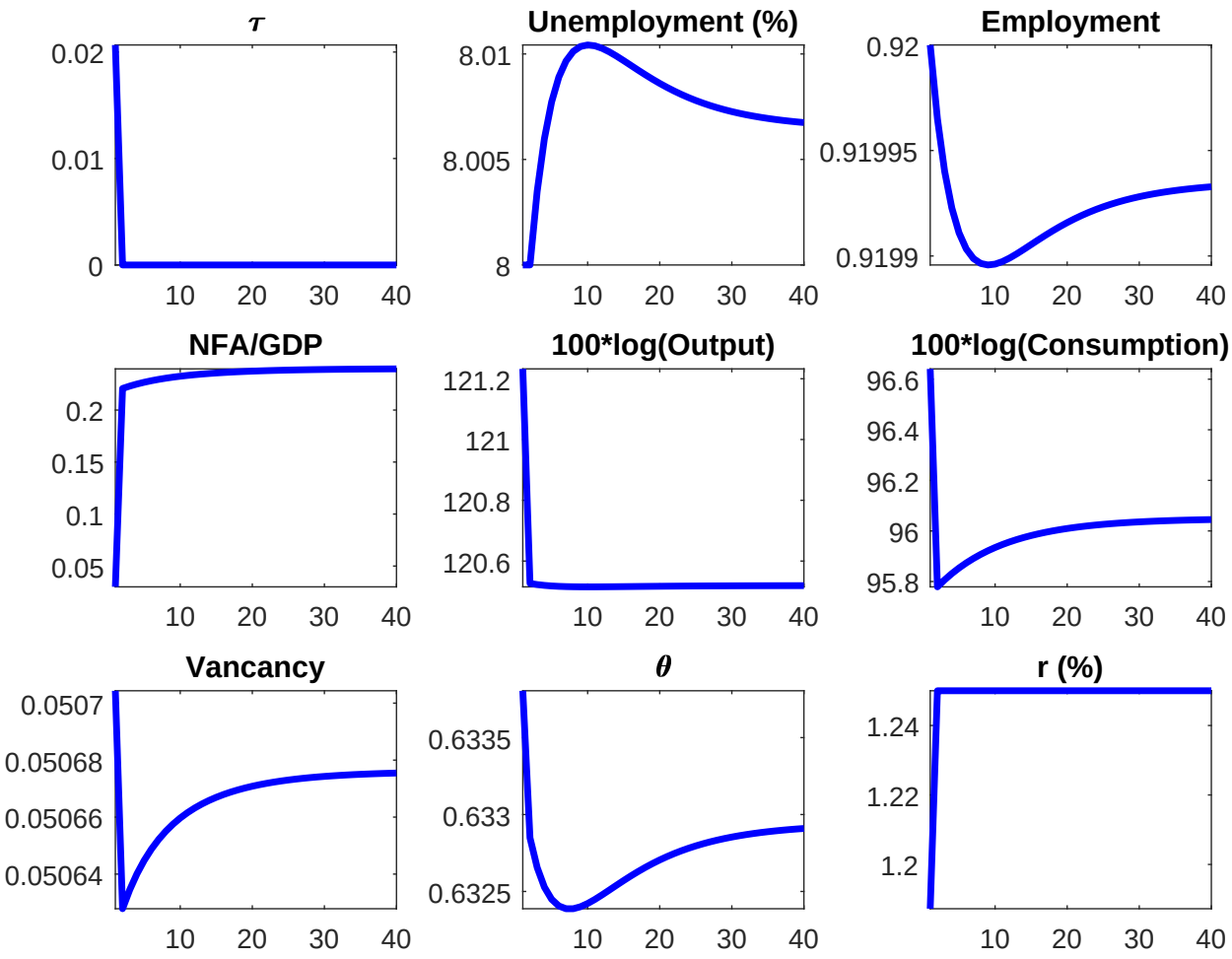


Figure 10: **Transitional Dynamics in the Baseline Model (No Self-employment, Low Productivity, Rigid Labor Market, and τ declines towards zero).** This set of graphs report the transitional paths of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35, which can be thought to correspond to a developing country case. $\gamma = 45.85$ (rigid labor market).

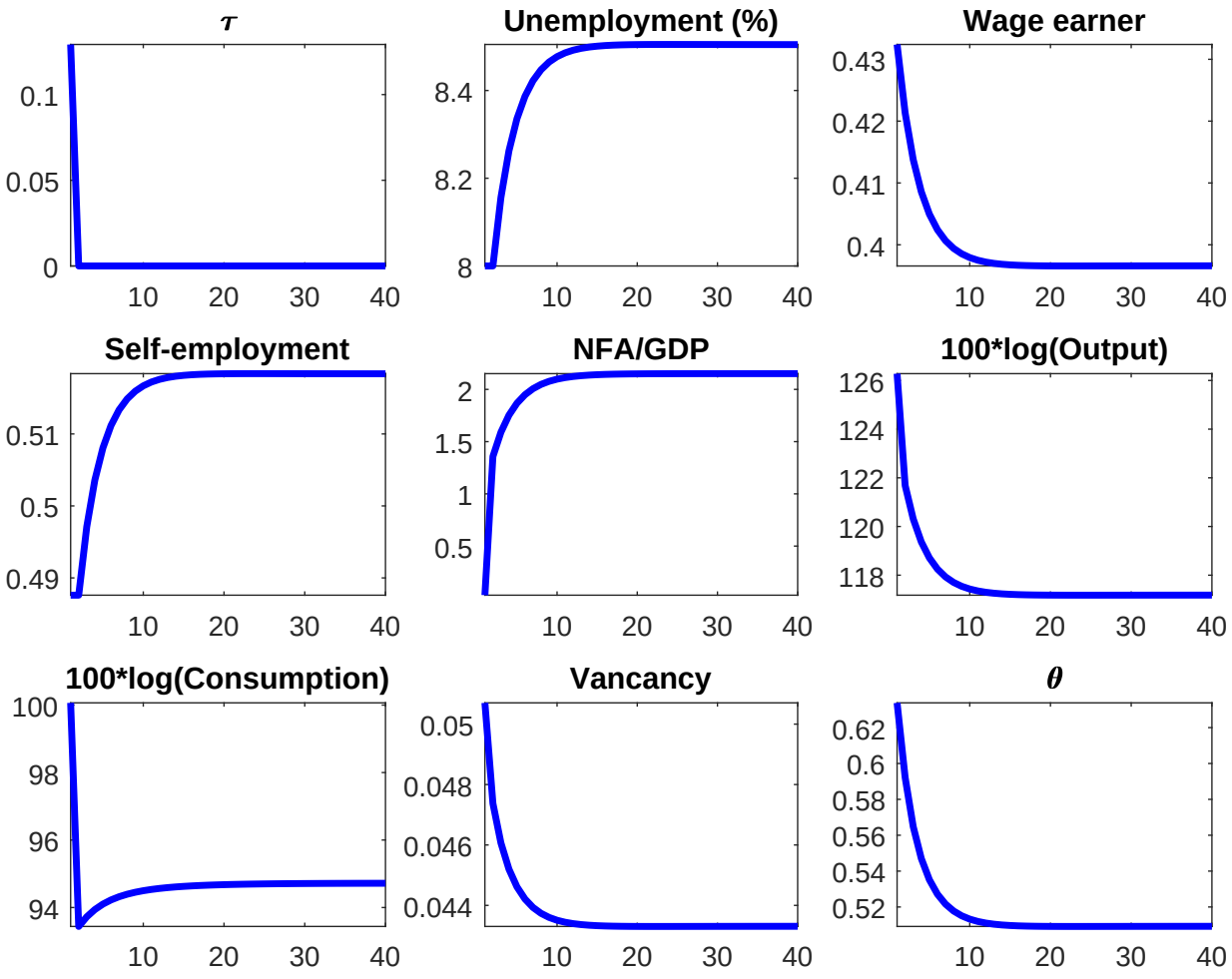


Figure 11: **Transitional Dynamics in the Extended Model (with Self-employment, Low Productivity, Rigid Labor Market, and τ declines towards zero).** This set of graphs report the transitional paths of employment and other variables in response to capital account liberalization. The calibrated value of z = 1.35 which can be thought to correspond to a developing country case. $\gamma = 0.84$ (rigid labor market).

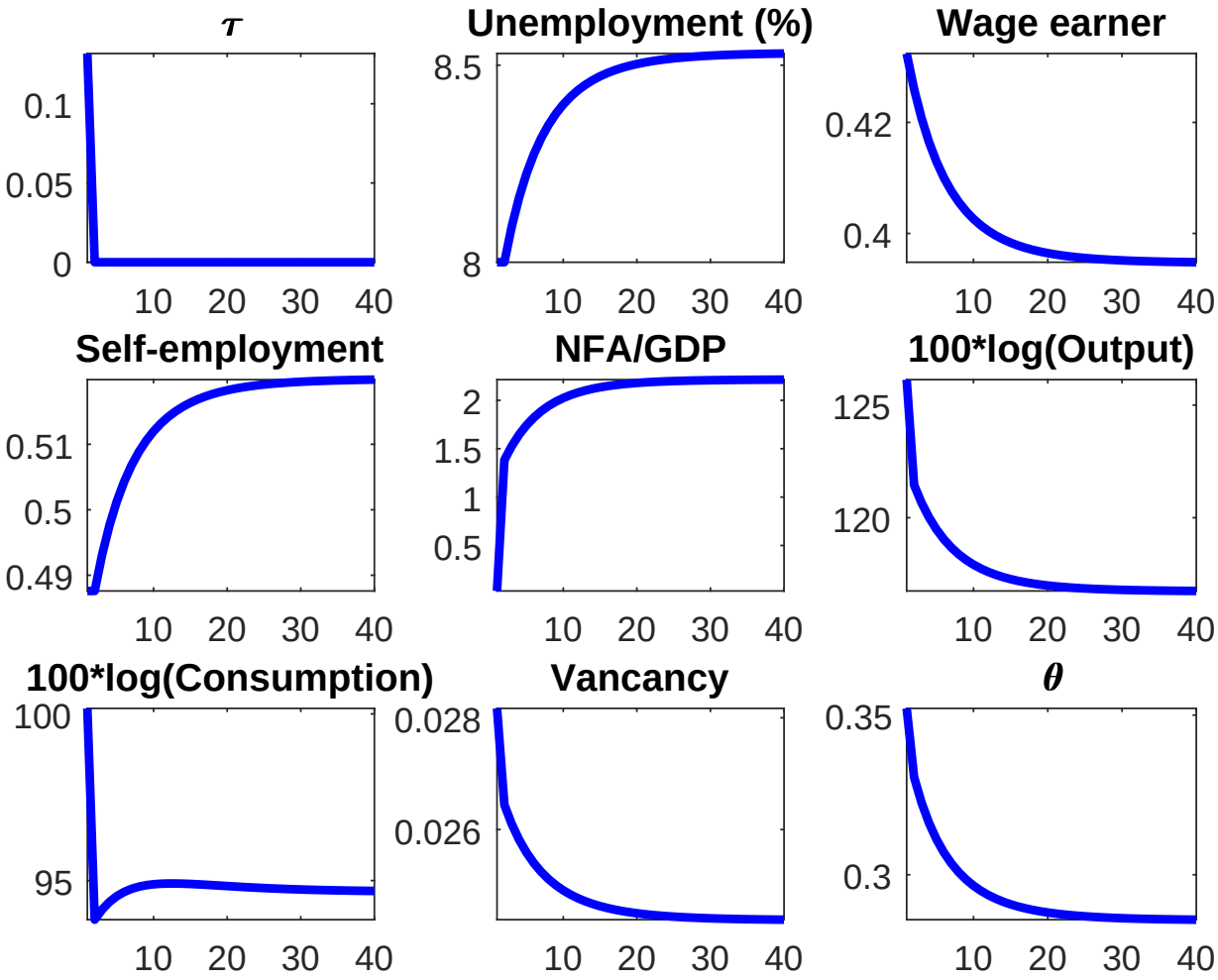


Figure 12: **Robustness Check 1 - Lower Job Finding Rate (at 25%) in the Model with Self-Employment for a Developing Country with a Rigid Labor Market** The figure plots model predicted transitional paths for key variables following capital account liberalization (i.e., τ declines to zero), when the job finding rate is lowered to 25%, in a developing country with a rigid labor market. The unit of time on the horizontal axis is a quarter.

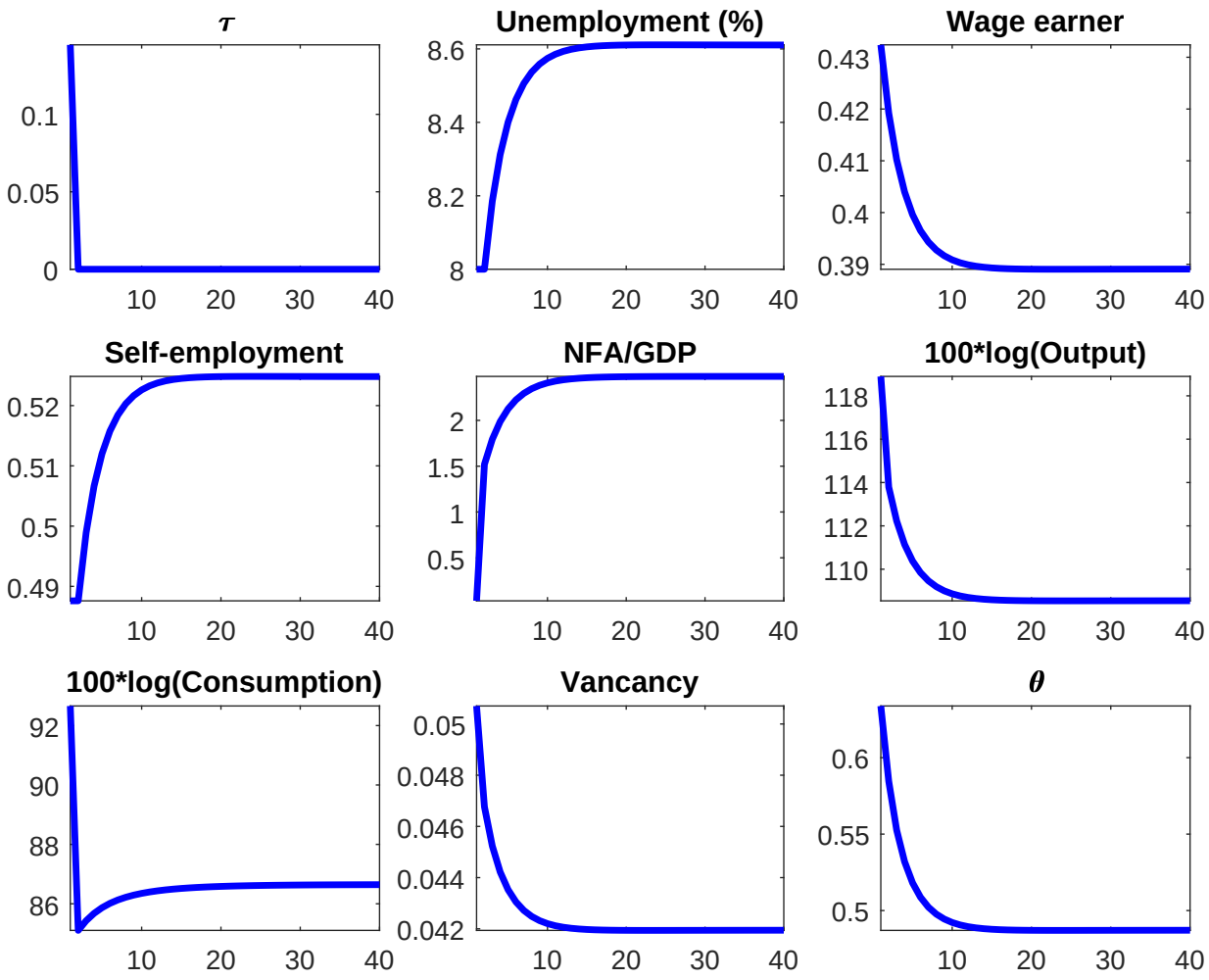


Figure 13: **Robustness Check 2 - Higher Entry Cost in the Self-employment Sector in the Extended Model for a Developing Country with a Rigid Labor Market** The figure plots model predicted transitional paths for key variables following capital account liberalization (i.e., τ declines to zero), when the entry cost in the self-employment sector is raised to 5% of the self-employment output, in a developing country with a rigid labor market. The unit of time on the horizontal axis is a quarter.

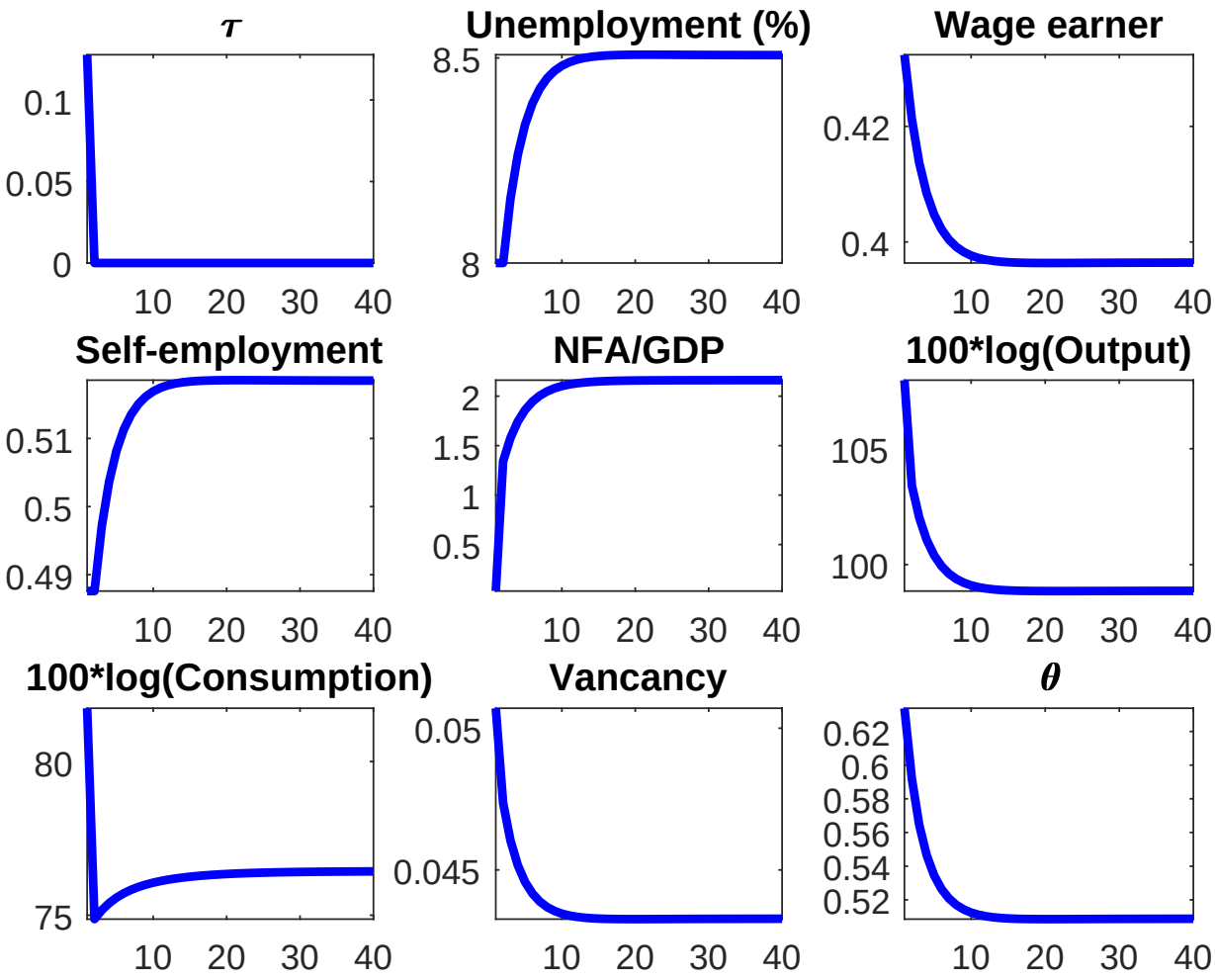


Figure 14: **Robustness Check 3 - Higher Unemployment Benefit in the Model with Self-Employment for a Developing Country with a Rigid Labor Market** The figure plots model predicted transitional paths for key variables following capital account liberalization (i.e., τ declines to zero), when the unemployment benefit is recalibrated to be 50% higher than the benchmark case, in a developing country with a rigid labor market. The unit of time on the horizontal axis is a quarter.

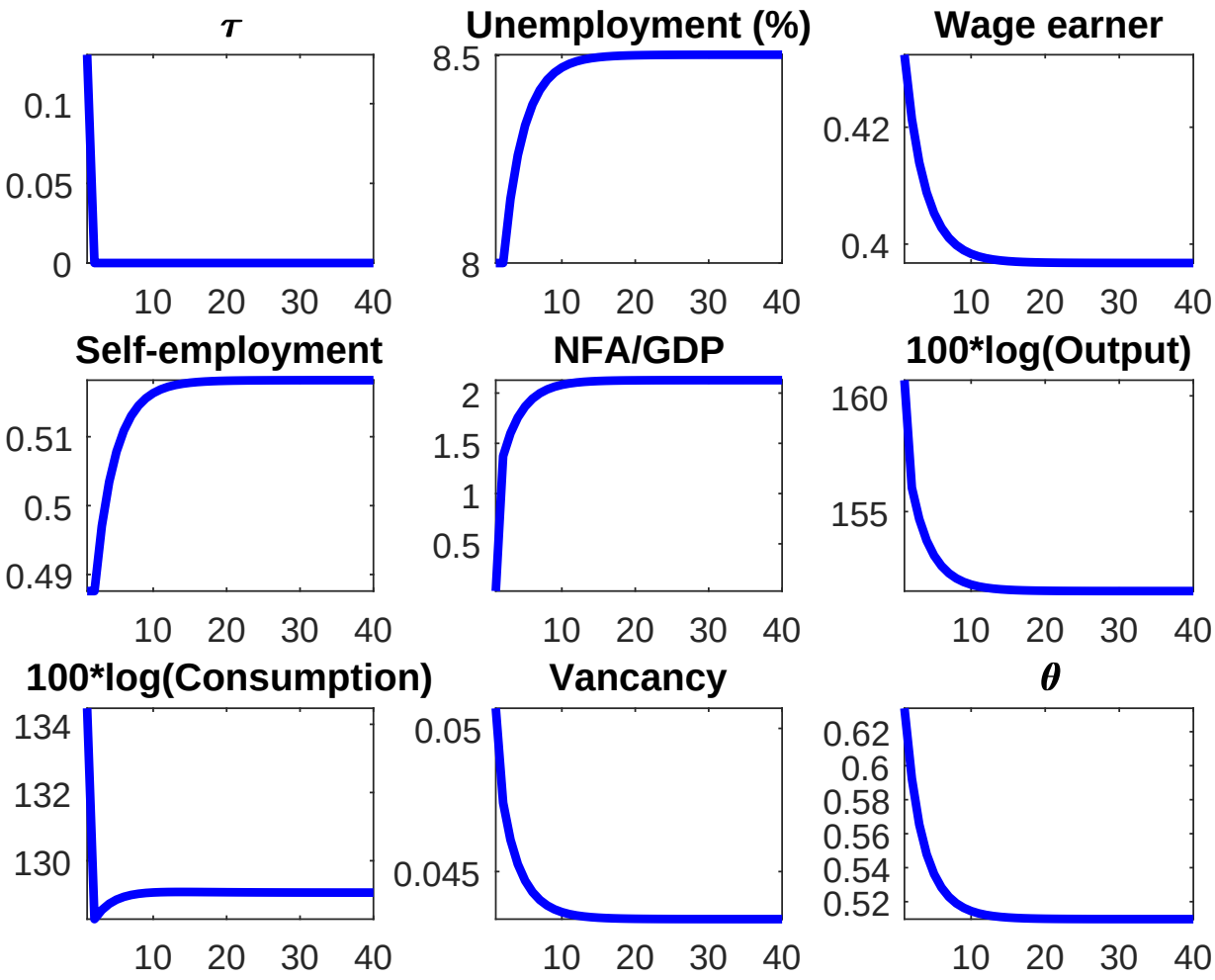


Figure 15: **Robustness Check 4 - Lower Unemployment Benefit in the Model with Self-Employment for a Developing Country with a Rigid Labor Market** The figure plots model predicted transitional paths for key variables following capital account liberalization (i.e., τ declines to zero), when the unemployment benefit is recalibrated to be 50% lower than the benchmark case, in a developing country with a rigid labor market. The unit of time on the horizontal axis is a quarter.