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Labor Market Institutions and the Effects of Financial Openness *

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Abstract

We propose a new channel to explain why developing countries may fail to benefit from financial globalization, based on labor market institutions. In our model, financial openness in a developing country with a rigid labor market leads to capital outflow, and both employment and output fall. In contrast, financial openness in a developing country with a flexible labor market benefits the country. Our model suggests that enhancing labor market flexibility is a complementary reform for developing countries opening capital accounts.

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

This paper aims to enrich our understanding of why developing countries do not always benefit from financial globalization. It proposes a new channel for such an outcome based on labor market institutions.

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 over the period 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 might still improve efficiency, but not necessarily.

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 capital inflows to developing countries, which in turn stimulates economic growth. Second, consumers should desire to use financial markets to insure against income risk. This benefit should be more important for developing countries given that they have higher output volatility than advanced countries.

Empirically, however, the results are mixed regarding the effects of capital account liberalization (or financial globalization). In particular, there is no robust support for a positive growth effect or a lower consumption volatility effect from capital account liberalization for developing countries (see extensive surveys by Kose, Prasad, Rogoff, and Wei, 2009). 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. On the effect of reducing consumption volatility, 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.

Researchers have proposed four channels through which financial globalization may fail to lead to greater economic efficiency 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 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 reason for lower 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 let domestic savings leave the country, producing the paradox of capital flowing from poor to rich countries. Poor governance could also allow corporate insiders to appropriate outside investors for private benefits, and 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 may also shorten the maturity of external debt (Wei and Zhou, 2017). Third, with the existence of credit constraints, 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 crisis. Raising the cost of borrowing during tranquil times in this case restores constrained efficiency. Fourth, in a recent paper, Luo, Nie, and Young (2018) show that the larger model uncertainty faced by developing countries compared with developed countries may cause the former to experience losses in growth and welfare after financial integration. They follow the robustness literature proposed by Hansen and Sargent (2007) to assume that the agent in the model economy has certain doubts as to whether the model he or she uses represents the true data generating process. Their estimation shows that developing countries do in fact face a larger model uncertainty, which means such countries may fail to benefit from financial globalization.

In this paper, we explore a new channel for the failure of developing countries to benefit from capital account liberalization based on domestic labor market frictions. We know that labor market rigidity raises the cost for firms to adjust labor inputs in response to changes in the economic environment. We investigate how this feature in turn affects the macroeconomic response of the economy to financial openness. We show that the macroeconomic outcomes could be made worse by financial openness in a country with a rigid labor market. Additionally, we show that this problem is more acute for developing countries (which are characterized by relatively low overall productivity) than for developed countries (with relatively high overall productivity). To the best of our knowledge, this is the first paper that systematically explores the implications of labor market institutions for the macroeconomic response to financial openness.

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 are conditional on an initial income (one year lag of log GDP per capita), change in inflation, change in trade openness,
change in institutional quality, country fixed effects and year fixed effects. For those countries with a flexible labor market, we can see a negative relationship, suggesting increased financial openness and reduced unemployment tend to go together. In contrast, for those countries with a rigid labor market, the relationship reverses.

We build a model in which domestic labor market rigidity plays a significant role in a country's macroeconomic response to an increase in financial openness. To focus our attention on this channel, we assume away distortions in the domestic financial system, and 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 autarky level domestic interest rate, which in turn determines the direction of capital flows when the economy removes restrictions on cross-border capital flows. A worker in our model can be unemployed, self-employed, or employed by a firm (which uses a more capital-intensive technology than self-employment activities). Greater labor market frictions in the form of higher labor adjustment costs discourage firms from hiring labor, leading to a lower output level and a lower demand for capital as well. This generates downward pressure on the domestic autarky level interest rate. Whether or not the autarky level interest rate is lower than the international interest rate also depends on the economy-wide productivity level (which can be interpreted broadly as reflecting the quality of public institutions and the sufficiency of public goods).

In a developing economy, defined as one with relatively low economy-wide productivity, the demand for capital could be depressed by both low productivity and labor market distortions. The domestic autarky interest rate could therefore be lower than the international level. Once restrictions on capital flows are eased, there could be capital outflow and an increase in the domestic cost of capital. This would lead firms to reduce demand for labor, resulting in an increase in the unemployment rate in the economy. However, if a developing country has a sufficiently flexible labor market, the demand for labor 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 a removal of cross-border capital flows, there will be a net inflow of capital and a reduction in the domestic cost of capital. This will help to expand the firm’s output and raise the demand for labor. As a result, the unemployment level goes down.

In comparison, in a developed economy, defined as one with a relatively high level of productivity, the increased demand for capital from high productivity helps to offset the reduced demand for capital from labor market frictions, and thus the autarky interest rate is not necessarily lower than the international interest rate. A removal of capital account restrictions may not then lead
to capital outflow, so there may not be an increase in the domestic cost of capital and a deterioration in employment. If a developed country has a sufficiently flexible labor market, the autarky level of domestic interest rate can more easily exceed the international level than a corresponding developing country due to the higher productivity. In fact, both the higher productivity level and the lower frictions in the labor market act to boost the demand for capital. As a result, a removal of capital account restrictions would lead to a net inflow of capital, a lower cost of capital at home, and more employment.

The above discussions can be summarized 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 openness can produce capital outflow and an increase in unemployment. With low labor market frictions, financial openness can produce more desirable labor market outcomes. Second, the effect of financial openness on a country with high labor market frictions depends on the country’s level of economic development (or the level of economy wide productivity). In a developed country, the effect of a high productivity offsets the effect of high labor market frictions in terms of demand for capital and autarky level of interest rate. This renders the net effect of greater financial openness ambiguous. In comparison, in a 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 openness leads to capital outflow, an increase in the domestic cost of capital, and a rise in the domestic unemployment rate. The second asymmetry appears to be consistent with the observed empirical patterns. In particular, while many developing countries are hesitant toward greater financial openness, all developed countries in recent decades have embraced financial openness.

To quantitatively understand the effects of labor-market rigidity and financial openness on a developing country, we calibrate our model to Peru, a developing country with both rigid labor market regulations and low economy-wide productivity. Peru substantially reduced capital account restrictions in the early 1990s, and we use our model to understand the changing economic patterns in the country. We find that our quantitative results are broadly consistent with the patterns of changes in Peru subsequent to the financial opening. In particular, qualitatively, our model predicts that financial openness in an economy like Peru does not deliver an improvement in the macroeconomic outcomes. Quantitatively, our model predicts an increase in the unemployment rate by more than 0.6 percentage points, which represented more than 40 percent of the observed increase in the unemployment rate in the data. At the same time, total output fell by around 5 percent.

The rest of the paper is organized as follows. In Section 2, we describe the model and show how
capital account liberalization affects the long run unemployment. Section 3 presents calibration and quantitative results. Section 4 concludes.

2 Model

2.1 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

$$a_{t+1} + \frac{\phi}{2} \tilde{y}_t \left( \frac{a_{t+1}}{y_t} - \chi_t^* \right)^2 = (1 + r_t) a_t + I_t^c + \Pi_t - c_t - T_t$$

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, self-employment income, and unemployment benefits. $\Pi_t$ is the aggregate profit earned by firms. We assume that firms are owned by households and hence, $\Pi_t$ is part of the household income. $T_t$ is the tax. We assume that holding asset is costly and we denote such cost by $\frac{\phi}{2} \tilde{y}_t \left( \frac{a_{t+1}}{y_t} - \chi_t^* \right)^2$, where $\chi_t^*$ is the desired wealth-to-income ratio by households and $\tilde{y}_t$ is the GDP per capita in Home. Solving the optimization problem of the representative household, we obtain the Euler equation

$$1 + \phi \left( \frac{a_{t+1}}{\tilde{y}_t} - \chi_t^* \right) = \beta E_t \left[ \frac{u'(c_{t+1})}{u'(c_t)} (1 + r_{t+1}) \right]$$

By (2), we can see that, with the asset holding cost, the steady state interest rate $r_t$ can differ from the standard value $1/\beta - 1$ suggested by the literature. In our numerical example, we choose proper value of parameter $\phi$ such that the asset holding cost is small which does not have significant impact on household consumption.

2.2 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 slightly enrich this framework to include self-employment as self-employment is high especially in developing countries.\(^1\) In the model, an individual can

\(^1\)According to the World Bank data (2019), the world’s share of self-employment in total employment is 47.8% in 2019. In Peru, which we will calibrate our model to, the self-employment share is 54.5% in 2019.
be in one of the three employment statuses: unemployed, self-employed, and employed by a firm. Under 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 normalize the measure of total workers to be 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 \( 1 - n_t \). We assume that the aggregate number of new hires is a function of job seekers \( 1 - n_t \) and vacancies posted by firms \( v_t \). Let \( m(1 - n_t, v_t) \) denote this matching function, which is assumed to be homogenous of degree one (as is standard in the labor search literature). 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:

\[
q_t = m \left( \frac{1 - n_t}{v_t} \right) = m \left( \frac{1}{\theta_t} \right)
\]

\[
s_t = m \left( \frac{1 - n_t}{1 - n_t} \right) = n_t \left( \frac{1}{\theta_t} \right)
\]

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 \( m(1, \theta_t) \).

2.3 Firms

Consider a representative firm, which can hire multiple workers. The production function is

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

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

Following Gertler and Trigari (2009), we use labor adjustment cost to represent labor market frictions, and define the labor adjustment rate \( x_t \) as

\[
x_t = \frac{q_t v_t}{n_t}
\]

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 \( \rho \) represents the probability a worker survives with the firm until the next period. Hence, the evolution of employment of the firm is given by:

\[
n_{t+1} = (\rho + x_t) n_t
\]
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.

\[
F_t = \max_{k_t, x_t} \left\{ z_t k_t^{\alpha} n_t^{1-\alpha} - w_t n_t - (r_t + \delta) k_t - \frac{\gamma \bar{w}}{2} x_t^2 n_t + E_t [Q_{t, t+1} F_{t+1}] \right\} \tag{4}
\]

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 \( \delta \) is the capital depreciation rate. \( \frac{\gamma \bar{w}}{2} x_t^2 n_t \) is the labor adjustment cost. We assume the labor adjustment cost \( \gamma \bar{w} \) to be proportional to the long run equilibrium wage rate \( \bar{w} \), where parameter \( \gamma \) captures the degree of labor market rigidity. \( Q_{t, t+1} \equiv \beta u'(c_{t+1}) / u'(c_t) \) 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:

\[
r_t + \delta = \alpha z_t \left( \frac{n_t}{k_t} \right)^{1-\alpha} \tag{5}
\]

\[
\gamma \bar{w} x_t = E_t \left[ Q_{t, t+1} \frac{\partial F_{t+1}}{\partial n_{t+1}} \right] \tag{6}
\]

By the Envelope theorem,

\[
\frac{\partial F_t}{\partial n_t} = (1 - \alpha) z_t k_t^{\alpha} n_t^{1-\alpha} - w_t + \frac{\gamma \bar{w}}{2} x_t^2 + \rho \gamma \bar{w} x_t \tag{7}
\]

By (6) and (7), we obtain

\[
\gamma \bar{w} x_t = E_t \left[ Q_{t, t+1} \left( (1 - \alpha) z_{t+1} k_{t+1}^{\alpha} n_{t+1}^{1-\alpha} - w_{t+1} + \frac{\gamma \bar{w}}{2} x_{t+1}^2 + \rho \gamma \bar{w} x_{t+1} \right) \right] \tag{8}
\]

By (5), we have

\[
k_t = \left( \frac{\alpha z_t}{r_t + \delta} \right)^{\frac{1}{1-\alpha}} n_t \tag{9}
\]

Plugging (9) into (4), and define \( J_t = F_t / n_t \), we can obtain

\[
J_t = (1 - \alpha) \alpha^{1-\alpha} z_t^{1-\alpha} (r_t + \delta)^{-\alpha} - w_t - \frac{\gamma \bar{w}}{2} x_t^2 + (\rho + x_t) E_t [Q_{t, t+1} J_{t+1}] \tag{10}
\]

By (6), (8) and (10), we can obtain

\[
\gamma \bar{w} x_t = E_t \left[ Q_{t, t+1} J_{t+1} \right] \tag{11}
\]

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 \( J_t \).
2.4 Wage Earners

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.

\[ V_t = w_t + E_t \left[ Q_{t,t+1} \left( (1 - \rho) V_{t+1}^N + \rho V_{t+1} \right) \right] \tag{12} \]
\[ V_t^N = \tilde{b}_t + E_t \left[ Q_{t,t+1} \left( s_t V_{t+1} + (1 - s_t) V_{t+1}^N \right) \right] \tag{13} \]

where $\tilde{b}_t$ represents the outside option of a non-wage-earner (which is an weighted average of self-employed income and the unemployment benefit). The worker’s surplus is

\[ H_t = V_t - V_t^N \]

Then,

\[ H_t = w_t - \tilde{b}_t + (\rho - s_t) E_t \left[ Q_{t,t+1} H_{t+1} \right] \tag{14} \]

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

\[ \max_{w_t} J_t^{1-\eta} \]

where $\eta$ denotes the bargaining power of the workers. The solution to the Nash bargaining problem satisfies

\[ \eta J_t = (1 - \eta) H_t \tag{15} \]

By (10), we can obtain

\[ w_t = \eta \left( (1 - \alpha) \alpha \frac{\alpha}{1-\alpha} z_t^{1-\alpha} (r_t + \delta) - \frac{\alpha}{1-\alpha} \bar{w} + \frac{\gamma \bar{w}}{2} x_t^2 + \gamma \bar{w} s_t x_t \right) + (1 - \eta) \tilde{b}_t \tag{16} \]

Substitute (16) into (11) and using (10), we can obtain

\[ \gamma \bar{w} x_t = E_t \left[ Q_{t,t+1} \left( (1 - \eta) \left( (1 - \alpha) \alpha \frac{\alpha}{1-\alpha} z_{t+1}^{1-\alpha} (r_t + \delta) - \frac{\alpha}{1-\alpha} \bar{w} + \frac{\gamma \bar{w}}{2} x_{t+1}^2 - \tilde{b}_t \right) \right) \right] \tag{17} \]

2.5 Self-employed and unemployed

For a worker who fails to obtain a wage job from any firm, she attempts to self-employment. We assume that such a person takes a productivity draw $\varphi_t$ in each period, which is her idiosyncratic productivity of self-employment and follows an independent and identical distribution across individuals and periods. To produce $\varphi_t$ units of output, she needs to rent a small fixed amount of capital $k_t^0$.

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\footnote{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.}
A person not hired by firms will decide her choice by comparing the self-employment payoff \((\varphi_t - (r_t + \delta) k^0)\) and the unemployment benefit \((b)\) in each period. In equilibrium, there exists a threshold \(\varphi_t^{se}\) above which she chooses to be self-employed, and the threshold is determined by:

\[
\varphi_t^{se} - (r_t + \delta) k^0 = b
\]  

(18)

We can compute the outside option of a wage earner as

\[
\tilde{b}_t = \int_{\varphi_t^{se}} (\varphi - (r_t + \delta) k^0) dG(\varphi) + bG(\varphi_t^{se})
\]  

(19)

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

\[
u_t = (1 - n_t) G(\varphi_t^{se})
\]  

(20)

2.6 Equilibrium

In equilibrium, re-writing (1), we obtain the resource constraint

\[
a_{t+1} = (1 + r_t) a_t + \tilde{y}_t - (r_t + \delta) \tilde{k}_t - \frac{\gamma \tilde{w}}{2} \tilde{x}_t n_t - c_t - \frac{\phi}{2} \tilde{y}_t \left( \frac{a_{t+1} \tilde{y}_t}{\tilde{y}_t} - \chi^* \right)^2
\]  

(21)

where total output \(\tilde{y}_t\) is

\[
\tilde{y}_t = y_t + (1 - n_t) \int_{\varphi_t^{se}} \varphi dG(\varphi)
\]  

(22)

and \(y_t\) is the output of the firm

\[
y_t = \alpha^{1-\alpha} z_t^{\frac{\alpha}{1-\alpha}} (r_t + \delta)^{-\frac{\alpha}{1-\alpha}} n_t
\]  

(23)

The aggregate capital stock, \(\tilde{k}_t\), consists of two parts: the capital input used by firms and the fixed capital investment by self-employed workers, \(\tilde{k}_t = k_t + n_t^{se} k^0\) where \(n_t^{se}\) is the measure of self-employed workers.

Let \(r^*\) denote the world interest rate. Capital account frictions prevent equalization between domestic and world interest rates. For technical convenience, we assume that the domestic interest rate \(r_t\) is determined by the direction of net capital flows as follows

\[
1 + r_t = (1 + r^*) \exp \left( -\tau \left( \frac{NA_t}{GDP_t} \right) \right)
\]  

(24)

Parameter \(\tau(>0)\) governs the gap between the Home interest rate and the world interest rate. A reduction in the value of \(\tau\) is interpreted as a relaxation of capital account restrictions or an increase in financial openness.
2.7 Steady state

We now consider the steady state of Home. We 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

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

(25)

In the steady state, (16) and (17) become

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

and

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

(26) (27)

where

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

and

$$\bar{\tilde{b}} = \int_{\varphi^{se}} (\varphi - (\tilde{\tilde{r}} + \delta) k^0) dG (\varphi) + bG (\varphi^{se})$$

(28)

In the rest of our analysis, we make the following assumptions.

**Assumption 1:** $\beta (1 + r^*) = 1$.

**Assumption 2:** The desired wealth-to-output ratio is proportional to the firm’s capital-to-output ratio: $\chi_t^* = \xi^* \kappa_t$ where $\kappa_t$ is the firm’s capital-to-output ratio.

Assumption 1 is common in the open economy macroeconomics literature. Assumption 2 is a technical assumption. Relaxing both assumptions will not change any of the qualitative results in our model. As we will show later, the economy-wide capital-to-output ratio depends largely on firms’ capital-to-labor ratio $\kappa_t$ if $k^0$ used in self-employment is sufficiently small. Hence, we adopt a simple assumption that the households’ wealth accumulation target is proportional to firms’ capital-to-output ratio. This means that a household’s total wealth is positively correlated with the economy-wide capital demand.³ (Alternatively, if the households are assumed to target a constant wealth-to-output ratio, the results are the same qualitatively.)

We define

$$\gamma_0 (z) \equiv \arg \left\{ \alpha \frac{\alpha}{\alpha 1 - \alpha + \frac{1 - \rho}{m(\theta)} \left( \int_{\varphi} \varphi dG (\varphi) \right) (r^* + \delta) \frac{\alpha}{1 - \alpha} r^* + \delta} \right\} = \xi^*$$

(29)

³If the household’s target ratio of wealth-to-output were the capital-to-output ratio, the steady state net foreign asset would have been zero and domestic interest rate would have been equal to the world interest rate. This is undesirable as it will not allow us to analyze how labor market institutions affect capital flows after financial openness.
and

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

(30)

Now we can show our main proposition.

**Proposition 1** Under Assumptions 1 and 2, if $k^0$ is sufficiently small and

$$\xi^* < \frac{\alpha^{1 - \alpha}}{\alpha^{1 - \alpha} + \frac{1 - \rho}{\Lambda} \left( \int f \varphi dG(\varphi) \right) (r^* + \delta)^{1 - \alpha}}$$

(31)

there exists a threshold $z_H$ such that

1. For $\bar{z} < z_H$, if $$\gamma_0(\bar{z}) \in (\gamma_{\min}, \gamma_{\max})$$
   we can show that $$\frac{d\bar{u}}{d\tau} = \begin{cases} > 0 & \text{if } \gamma < \gamma_0(\bar{z}) \\ < 0 & \text{if } \gamma > \gamma_0(\bar{z}) \\ = 0 & \text{if } \gamma = \gamma_0(\bar{z}) \end{cases}$$

2. For $\bar{z} \geq z_H$, $$\frac{d\bar{u}}{d\tau} \geq 0 \text{ for all } \gamma$$

**Proof.** (See Appendix A). ◼

A few remarks are in order. First, since firm production is more capital intensive than self-employment, the demand for capital rises as a share of total output as the number of wage earners increases. This leads to a higher interest rate in financial autarky, as long as the supply of capital relative to total output does not change much. Opening the capital account in this case attracts a net capital inflow, which lowers the domestic interest rate and encourages firms to expand, leading to a rise in the overall employment.

Second, firms’ productivity ($z$) and labor-market rigidity ($\gamma$) are two important factors that jointly determine the share of wage earners in equilibrium, and hence the 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.

Third, 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.

Fourth, based on the first three remarks, capital account openness in low productivity countries with rigid labor markets lowers the number of wage earners. Note that average self-employment output is close to unemployment benefit (if $k^0$ is sufficiently small) which is lower than firms’ output, hence opening capital account yields lower total output. However, the impact on consumption is ambiguous: On one hand, lower total domestic output leads to lower income which may reduce households’ consumption. On the other hand, households can earn higher interest income from foreign asset after openness which in turn may result in higher consumption. The net effect is ambiguous theoretically. We leave the analysis of consumption changes to numerical analysis.

Fifth, (31) 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, (31) holds.

The results in Proposition 1 are graphically presented in Figure 2 which shows how productivity and labor market rigidity jointly affect the relationship between capital account openness and unemployment. The blue area denotes the region that unemployment falls 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.

3 Quantitative Analysis

To derive a sense of quantitative importance of our mechanism, we calibrate our model to an emerging market economy. We choose Peru for this purpose for three reasons. First, Peru is a developing country; Second, Peru has a very rigid labor market according to the Doing Business Report conducted by the World Bank; and Third, Peru has experienced a big change in its capital
account in the early 1990s. Before year 1990, Peru’s capital account was relatively closed and capital flows were near zero (Figure 3). However, the situation changed in 1990s as Peru began to increase its capital account openness around 1990. By the end of 1990s, Peru had achieved a very open capital account. During the same period, Peru’s unemployment rate rose significantly.

Our quantitative analysis includes both steady-state comparisons and transition dynamics. First, we compare 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 in Peru.

3.1 Calibration

The model parameters are calibrated in two steps. We calibrate the model 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. In selecting key moments, we target the Peruvian economy as later we will stimulate transitional dynamics to study Peru’s experience of opening its capital account in early 1990s.

Before explaining our calibration strategy in detail, we specify our function forms in the model. On the function specification, we assume log utility, \( u(c) = \log c \).\(^4\) We adopt the matching function used in den Haan et al (2000),

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

Our first group of parameters includes five parameters as reported in Panel A of Table 1. We set the world interest rate, \( r^* \), to be 0.016, which is the average real interest rate in the U.S. in the period of 1981-2000.\(^5\) We set \( \beta \) to be equal to \((1 + r^*)^{-1}\). The wealth adjustment cost parameter in households’ budget constraint \( \phi \) is set to a small value (\( \phi = 0.01 \)) in order to let the impact of the adjustment cost be quantitatively small.\(^6\) On the Nash bargaining between firms and workers, we assume equal bargaining powers of workers and firms, hence \( \eta = 0.5 \). The unemployment benefit parameter \( b \) is set to 0 reflecting the fact that Peru did not formally have

\(^4\)In robustness check, we adopt Constant Relative Risk Aversion (CRRA) utility with different degrees of risk aversion and results are quite similar.

\(^5\)As in Uribe and Yue (2006), we adopt the U.S. real interest rate as the world interest rate in our numerical analysis.

\(^6\)The bond adjustment cost is lower than one percent of GDP when we set \( \phi \) to 0.01.
an unemployment insurance program before 2017.\textsuperscript{7}

Next, we turn to the second group of parameters, which include ten parameters, \(\{\alpha, \delta, \rho, l, \gamma, k^0, \xi^*, z, \sigma, \tau\}\), as reported in Panel B of Table 1. We jointly calibrate these parameters by match ten moments as shown below. As Table 2 shows, our model can exactly match these moments.

1. The unemployment rate is around 6.6 percent (the average level in 1986-1990 right before Peru opened its capital account);
2. The annual job finding rate for one job seeker is around 0.42 (Table 3 in Herrera et al. (2003));
3. The labor share is around 40 percent of total output;\textsuperscript{8}
4. NFA to GDP ratio is around 2.8% (the average level in 1986-1990);
5. Self-employed workers represent around 52 percent of total employment (Table 2 in Abeles, Amarante and Vega (2014));
6. Self-employment output is about 75% of wage income (Table 2 in Abeles, Amarante and Vega (2014));
7. Total investment is around 21 percent of total output (the average level in 1986-1990 in Peru);\textsuperscript{9}
8. Capital to GDP ratio is 4.14, which is the average level in the five years (1986-1990) prior to its capital account opening up (statistics based on the data from the Penn World Table);
9. Capital input by self-employed workers is around 1 percent of total self-employment output;\textsuperscript{10}
10. Job filling rate \(q\) is 0.71 (as in den Haan et al (2000)).\textsuperscript{11}

\textsuperscript{7}We conduct robustness check by using different values of \(b\) and main results hold.
\textsuperscript{8}In the literature, there exists disagreement on how to compute the labor share. In our model, we choose proper parameters to match the baseline labor share, the share of total compensation of employees which does not include self-employment income. Data is obtained from the report by Federal Reserve Bank of St Louis (https://www.stlouisfed.org/publications/regional-economist/first-quarter-2018/measuring-labor-share-countries)
\textsuperscript{9}Total investment in the steady state implied by our model is \(\delta k\).
\textsuperscript{10}We simply assume that \(k^0\) takes a small value. In robustness checks, we vary the value of \(k^0\) and find that our results do not change much.
\textsuperscript{11}We do not have this measure for Peru, 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.
3.2 Long-Run Relationships Between Unemployment and Financial Openness

We quantitatively show how the relationship between unemployment and capital account openness in the steady state depends on the degree of labor market rigidity ($\gamma$) and productivity ($z$). We define the normalized level of capital account openness measure as $\varepsilon = 1 - \frac{\tau}{\tau_0}$, where $\tau_0$ is the degree of capital control in the calibrated steady state and $\tau$ is the new steady-state level. Thus, $\varepsilon$ measures the relative capital-account openness to the old steady state, where $\varepsilon = 0$ refers to the same openness level as in the old steady state and $\varepsilon = 1$ means completely open (i.e., $\tau = 0$).

Figures 4 to 6 show the numerical results of how variations in capital account openness $\varepsilon$ affects unemployment and other macro and labor-market variables in three scenarios. The first scenario is our benchmark case in which the labor market is rigid ($\gamma = 6.81$) and productivity is relatively low ($z = 5.05$). As shown in Figure 4, a rise in capital account openness yields lower capital (as a share of GDP) and greater capital outflows (a higher net foreign asset to GDP ratio). At the same time, both employment in the wage-earner sector and self-employment fall. It is intuitive that when capital flows out of the country, the domestic interest rate rises and firms shrink by posting fewer vacancies. Hence, the number of wage earners falls and more workers become either self-employed or unemployed. We can also see that, both output and consumption fall when a country with rigid labor market opens its capital account. Quantitatively, when capital account becomes sufficiently open, that is, $\varepsilon$ approaches one, unemployment will rise significantly by about 0.8 percentage points and output falls about 7 percent.

Second, if we lower the labor adjustment cost degree by two thirds ($\gamma = 2.27$), Figure 5 shows that an increase in capital account openness leads to capital inflow (a lower net foreign asset to GDP ratio), then interest rate and unemployment fall. The decline in unemployment is mainly due to the increase in employment in firms while self-employment falls. Both output and consumption in this scenario rise. By comparing the flexible labor market scenario to the rigid labor market scenario, we see that, a more flexible labor market can yield lower unemployment, higher consumption and output.

The two numerical examples discussed above, one on a flexible labor market and the other on a rigid labor market, generate the same predictions from our theoretical results for low-productivity countries in Proposition 1. Now we consider the third scenario in which the country in our numerical analysis has a higher economy-wide productivity $\bar{z}$. If productivity $\bar{z}$ increases by 25 percent, Figure 6 shows that unemployment falls and output rises when opening the capital account, despite the existence of high labor-market rigidity. The decline in total unemployment is mainly due to the increase in wage earners. Although self-employment in this scenario falls as capital account becomes more open, the increase in firms’ employment dominates which leads to higher total employment in this economy.
Our numerical examples in this section focus on the long-run relationships by comparing different steady states, while the dynamics of an economy following a shock to the capital account is not explored. In the following section, we study the transitional paths of unemployment (as well as other macro variables) to when capital account policies change.

3.3 Dynamics Following A Change in Financial Openness

We consider the steady-state in our previous calibration as the initial period which has relatively low capital account openness. Given the initial steady state, the new steady state is generated by raising the capital account openness parameter $\varepsilon$ to a higher level which represents an economy with a more open capital account. Our theoretical model predicts that an increase in capital account openness in a country with rigid labor market will yield a net capital outflow as well as an increase in unemployment. To examine how our model explains the changes employment in Peru, we calibrate the change in capital account openness as follows. We start with the initial capital account openness $\varepsilon_0 = 0$ (corresponding to $\tau = 0.21$) as in our calibration, and choose the level of capital account openness in the new steady state $\varepsilon_1$ (or $\tau_1$ so the model implied decline in the domestic capital to GDP ratio can match the data. According to our model, $\varepsilon_1 = 0.986$ leads the capital to GDP ratio to decline from 4.14 (the average level in 1986-1990) to 3.67, the average level in the five years around 2000 (i.e., 1998-2002).

The transitional path for the key variables in the benchmark case are shown in Figure 7. As $\varepsilon$ jumps from 0 to 0.986 (or $\tau$ jumps from 0.21 to 0.003), we see that the unemployment rate goes up. During the first 4 quarters after the shock, the unemployment rate rises by more than 0.3 percentage points, and then more gradually increases to a level over 7.2 percent in ten years (40 quarters). Our numerical analysis can explain more than 40 percent of the observed increase in Peru’s unemployment in that period, which rose from 6.6 percent (the average level in 1986-1990 when Peru was in financial autarky) to 8.1 percent (the average level in the period of 1991-2000). The increase in unemployment is mainly due to the decline in firms’ employment which decreases about 3 percentage points. At the same time, we observe that self-employment first declines and then increases.

Consistent with our theoretical prediction, the change in unemployment is positively associated with the change in the net foreign asset position. Financial openness leads to a rapid capital outflow in Peru. The surge in capital outflow then yields a higher domestic interest rate in Peru which discourages firms from investment and hiring. As a result, firms’ employment falls. At the same time, those who fail to get hired by a firm may choose to become self-employed. In general, the change in self-employment is ambiguous. On one hand, more workers cannot be matched with firms and they would pursue self-employment. On the other hand, the rise in domestic interest
rate also raises the entry barrier for self-employment because of the higher costs of satisfying the instal capital requirement which may reduce self-employment. The net effect is then unclear. Our numerical example shows that the first channel dominates the second and self-employment rises. For consumption and output, they both fall during this transitional period. In particular, output falls by around 5 percent during this transition path and consumption drops around 1 percent. The reason that consumption declines much less than output is due to the positive wealth effects coming from the increase in the interest rate during the transitional path which support household consumption. As a note, the model predicted change in net foreign asset is much larger than the data. Our numerical analysis shows that the financial openness leads net foreign asset to reach around 55 percent of Peru’s GDP, while in the data the net foreign asset to GDP ratio in early 2000 was around 16 percent. The main reason for such result is that, households’ optimization problem in our model does not generate a proper domestic capital supply function that is close to what data suggests. We leave this to future research.

Our results above are quite robust to several key assumptions we made in calibrating the model. We present five sets of robustness check to show this. First, we vary the value of the job filling rate \((q)\) to see how results will change. We do this because this statistic we use in our calibration is taken from the literature based on the U.S. data and not calibrated to Peru. However, as Figure 8 shows, our results are very robust to different values of \(q\). In particular, unemployment, net foreign asset to GDP ratio and output respond to the capital account openness shock very similarly in different scenarios. It turns out the only variable that is more sensitive to this moment is the market tightness \(\theta\) (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 initial capital requirement for self-employed workers \((k_0)\) in our calibration. As Figure 9 shows, the magnitudes of impulse responses of several variables such as output, capital, and consumption do change. 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 very little compared to our benchmark. In other words, our key results on the unemployment/employment effects of the capital account liberalization are robust to the value of this parameter.

In Figures 10 - 12 we allow the unemployment benefit level, household’s degree of risk aversion, and asset holding costs to change. As these figures show, our main results still go through and quantitatively the changes are very small. The only exception is that the consumption dynamics look slightly differently when we increase or decrease the asset holding cost parameter \(\phi\), as shown in Figure 12. In particular, when this asset holding cost is high, consumption initially rises more
but also drops more eventually. Similarly, when the asset holding cost is smaller, consumption could first decline and then increase and converges to a level below the benchmark level.

Overall, our dynamic analysis suggests that the reform in Peru’s capital-account policy in the early 1990s was not successful. And the policy insight from our analysis is that policy makers in Peru should consider complementary reforms aiming to make Peru’s labor market more flexible prior to opening the capital account.

4 Concluding remarks

Recent empirical evidence suggests 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. We contribute to this literature by providing a new channel focusing on domestic labor market institutions. Our model suggests 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 (26) and (27), we can show that

\[
1 - \frac{\eta \gamma}{\gamma \left( \frac{1}{\beta} - \rho + \eta m \left( \theta \right) - \frac{(1-\eta)(1-\rho)}{2} \right)} = 1 - \rho \left( \frac{\eta}{1-\eta} + \int_{\varphi = \varphi_{ec}} \left( \varphi - (\bar{r} + \delta) k^0 \right) dG \left( \varphi \right) + bG \left( \varphi_{ec} \right) \right) \Omega \left( \bar{z}, \bar{r}, \bar{b} \right) \tag{32}
\]

and

\[
\left( 1 - \frac{\eta \gamma}{2} \right) (1-\rho)^2 - \gamma (1-\rho) m \left( \theta \right) \frac{\Omega \left( \bar{z}, \bar{r}, \bar{b} \right)}{\left( \frac{1}{\beta} - \rho + \eta m \left( \theta \right) - \frac{(1-\eta)(1-\rho)}{2} \right)} \gamma \left( \frac{1-\rho}{1-\eta} \right) = \eta \Omega \left( \bar{z}, \bar{r}, \bar{b} \right) + \bar{b} \tag{33}
\]

and

\[
\left( \frac{1}{\beta} - \rho + \eta m \left( \theta \right) - \frac{(1-\eta)(1-\rho)}{2} \right) \gamma \left( \frac{1-\rho}{1-\eta} \right) \bar{w} = \Omega \left( \bar{z}, \bar{r}, \bar{b} \right) \tag{34}
\]

\[
\Omega \left( \bar{z}, \bar{r}, \bar{b} \right) \equiv (1 - \alpha) \alpha \beta^{-\alpha} \bar{z}^{-1-\alpha} (\bar{r} + \delta)^{-\gamma \alpha} - \bar{b}
\]

\[\text{12}^{\text{The chart only shows 40 quarters. Indeed, in the new steady state, the consumption level associated with a higher } \phi \text{ is significantly lower than the benchmark level.}\]
\[
\bar{b} = \int_{\varphi^{se}} (\varphi - (r_t + \delta) k^0) \, dG(\varphi) + b G(\varphi^{se})
\]  
(35)

\[\varphi^{se} - (r_t + \delta) k^0 = b\]  
(36)

Clearly, the left-hand-side (LHS) in (32) is decreasing in \(\bar{\theta}\) and \(\gamma\),

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

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

We can show that

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

\[
\frac{\partial \Omega(\bar{z}, \bar{r}, \bar{b})}{\partial \bar{r}} = -\alpha \frac{1}{1-\alpha} \bar{z}^{1-\alpha} (\bar{r} + \delta)^{-1-\alpha} + k_0 (1 - G(\varphi^{se}))
\]

On the right-hand-side (RHS) of (32), we can show that

\[
\frac{\partial \text{RHS}}{\partial \bar{z}} = -\frac{1 - \rho}{1 - \eta} \int_{(\bar{r} + \delta) k^0} (\varphi - (\bar{r} + \delta) k^0) \, dG(\varphi) \frac{\partial \Omega(\bar{z}, \bar{r}, \bar{b})}{\partial \bar{z}} < 0
\]

and

\[
\frac{\partial \text{RHS}}{\partial \bar{r}} = -\frac{1 - \rho}{1 - \eta} \Omega(\bar{z}, \bar{r}, \bar{b})^{-2} \left( \int_{(\bar{r} + \delta) k^0} \varphi dG(\varphi) \frac{\Omega(\bar{z}, \bar{r}, \bar{b})}{\partial \bar{r}} - \Omega(\bar{z}, \bar{r}, \bar{b}) \left( 1 - G((\bar{r} + \delta) k^0) \right) k^0 \right)
\]

Under the assumption \(k^0\) is sufficiently small such that \(k^0 \to 0\), \(\frac{\partial \Omega(\bar{z}, \bar{r}, \bar{b})}{\partial \bar{r}} < 0\) and \(\frac{\partial \text{RHS}}{\partial \bar{r}} > 0\). 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,

\[\bar{n}^{aut} = \frac{m (\bar{\theta}^{aut})}{1 - \rho + m (\bar{\theta}^{aut})}\]

we can show that

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

20
Now we show that there exists a threshold $z_H$ of productivity such that, for $z > z_H$, $\bar{r}^{aut} > r^*$. By (2), domestic capital supply satisfies
\[
\frac{\bar{a}^{aut}}{\bar{y}^{aut} + (1 - \bar{n}^{aut}) \int_{(\bar{r} + \delta)k_0} \varphi dG(\varphi)} = \xi \frac{\bar{k}^{aut}}{\bar{y}^{aut}} + \frac{1 + \bar{r}^{aut} - 1}{\phi} \tag{39}
\]

The capital market clearing condition $\bar{a}^{aut} = \bar{k}^{aut}$ implies
\[
\beta \left(1 + \bar{r}^{aut}\right) - 1 = \left(\frac{\bar{y}^{aut} - \bar{n}^{aut}}{\bar{y}^{aut} + (1 - \bar{n}^{aut}) \int_{(\bar{r} + \delta)k_0} \varphi dG(\varphi)} - \xi \right) \frac{\bar{k}^{aut}}{\bar{y}^{aut}} \tag{40}
\]

Note that
\[
\frac{\bar{k}^{aut}}{\bar{y}^{aut}} = \frac{\alpha}{\bar{r}^{aut} + \delta}
\]

by (5), and $\bar{y}^{aut} = \alpha \bar{n}^{aut} (\bar{r} + \delta) - \frac{\alpha}{\bar{r}^{aut} + \delta} \bar{n}^{aut}$, then (40) becomes
\[
\beta \left(1 + \bar{r}^{aut}\right) - 1 = \left(\frac{\alpha \bar{n}^{aut} (\bar{r}^{aut} + \delta) - \frac{\alpha}{\bar{r}^{aut} + \delta} \bar{n}^{aut}}{\alpha \bar{n}^{aut} (\bar{r}^{aut} + \delta) - \frac{\alpha}{\bar{r}^{aut} + \delta} \bar{n}^{aut} + \frac{1}{\bar{n}^{aut}} \int_{f} \varphi dG(\varphi)} - \xi \right) \frac{\alpha}{\bar{r}^{aut} + \delta} \tag{41}
\]

Given $\bar{r} \geq 0$, as $\bar{z} \to \infty$, $\Omega(\bar{z}, \bar{r}) \to \infty$. Hence
\[
m(\bar{y}^{aut}) \to \min \left\{1, \frac{1 - \eta}{1 - \eta + \eta^2} \left(\frac{1}{\gamma (1 - \rho)} - \frac{\eta (1 - \rho)}{2} - \frac{(1 - \beta \rho - (1 - \eta) (1 - \rho))}{\beta} \right) \right\}
\]

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

If
\[
\xi^* < \frac{\alpha^{\frac{\alpha}{1 - \alpha}}}{\alpha^{\frac{\alpha}{1 - \alpha}} + \frac{1 - \eta}{\Lambda} \frac{1}{\alpha} \int_{f} \varphi dG(\varphi)} \left(\frac{r^{*} + \delta}{\alpha^{\frac{1}{1 - \alpha}}} \right)^{\frac{1}{1 - \alpha}}
\]

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 $\gamma$, then the right-hand-side of (41) is decreasing in $\gamma$. Hence, if for all $\bar{z}s$, we can find $r^{aut} \leq r^*$ hold under certain values of $\gamma$, $\bar{r}^{aut} \leq r^*$ must hold when $\gamma = \gamma^{\text{max}}$. Then, as $\bar{z} \to \infty$,
\[
\begin{align*}
\alpha^{\frac{\alpha}{1 - \alpha}} \left(\bar{r}^{aut} + \delta\right)^{-\frac{\alpha}{1 - \alpha}} & \geq \alpha^{\frac{\alpha}{1 - \alpha}} + \frac{1 - \bar{n}^{aut}}{\bar{n}^{aut} - r^*} \left(\int_{f} \varphi dG(\varphi) \right) \frac{r^{*} + \delta}{\alpha^{\frac{1}{1 - \alpha}}} \\
& = \frac{\alpha^{\frac{\alpha}{1 - \alpha}}}{\alpha^{\frac{\alpha}{1 - \alpha}} + \frac{1 - \rho}{\Lambda} \int_{f} \varphi dG(\varphi)} \left(\frac{r^{*} + \delta}{\alpha^{\frac{1}{1 - \alpha}}} \right)^{\frac{1}{1 - \alpha}} \alpha > \xi^* 
\end{align*}
\]

21
which implies that (41) does not hold. Contradiction! As a result, there exists a threshold $z_H$ such that, for $z > z_H$, $\bar r^\text{aut} > r^*$.

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

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

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

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

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

$$\bar u = (1 - \bar n) G \left( (\bar r + \delta) k^0 \right) = \frac{(1 - \rho) G \left( (\bar r + \delta) k^0 \right)}{1 - \rho + m(\bar \theta)}$$

and

$$\frac{d\bar u}{d\tau} = -\frac{(1 - \rho) G \left( (\bar r + \delta) k^0 \right) m'(\bar \theta) d\theta d\bar r}{(1 - \rho + m(\bar \theta))^2 d\bar r d\tau}$$

Note that, by (24)

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

we can show that, under the condition

$$\xi^* < \frac{\alpha^\alpha \bar \theta^\alpha}{\alpha^\alpha + \frac{1 - \mu}{\lambda} \left( \int f \varphi dG(\varphi) \right) (r^* + \delta)^\alpha}$$

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

$$\gamma_0(\bar z) \in (\gamma_{\text{min}}, \gamma_{\text{max}})$$

we have

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

2. For $\bar z > z_H$,

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

$\blacksquare$
References


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<thead>
<tr>
<th>Model Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td><strong>Panel A: Separately Calibrated</strong></td>
<td></td>
</tr>
<tr>
<td>World Interest Rate</td>
<td>$r^*\ 0.016$</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>$\beta\ 0.984$</td>
</tr>
<tr>
<td>Asset Adjustment Cost</td>
<td>$\phi\ 0.01$</td>
</tr>
<tr>
<td>Nash Bargaining Power</td>
<td>$\eta\ 0.5$</td>
</tr>
<tr>
<td>Unemployment Benefits</td>
<td>$b\ 0$</td>
</tr>
<tr>
<td><strong>Panel B: Jointly Calibrated</strong></td>
<td></td>
</tr>
<tr>
<td>Job Survival Rate</td>
<td>$\rho\ 0.826$</td>
</tr>
<tr>
<td>Matching Function Parameter</td>
<td>$l\ 0.75$</td>
</tr>
<tr>
<td>Capital Share</td>
<td>$\alpha\ 0.36$</td>
</tr>
<tr>
<td>Depreciation Rate</td>
<td>$\delta\ 0.051$</td>
</tr>
<tr>
<td>Labor Market Rigidity</td>
<td>$\gamma\ 6.81$</td>
</tr>
<tr>
<td>Wealth-Income Ratio Parameter</td>
<td>$\xi^*\ 0.81$</td>
</tr>
<tr>
<td>Productivity Level</td>
<td>$z\ 5.05$</td>
</tr>
<tr>
<td>Initial Capital Required</td>
<td>$k^0\ 1.20$</td>
</tr>
<tr>
<td>Std of SE Production Distribution</td>
<td>$\sigma\ 2.22$</td>
</tr>
<tr>
<td>Capital Account Openness $(1 - \tau)$</td>
<td>$\tau\ 0.21$</td>
</tr>
</tbody>
</table>
Table 2: Model and Data Moments

<table>
<thead>
<tr>
<th>Moments</th>
<th>Model</th>
<th>Data</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment Rate</td>
<td>6.6%</td>
<td>6.6%</td>
<td>average level in 1986-1990</td>
</tr>
<tr>
<td>Annual Job Finding Rate</td>
<td>0.42</td>
<td>0.42</td>
<td>Herrera et al. (2003)</td>
</tr>
<tr>
<td>Labor Share</td>
<td>0.40</td>
<td>0.40</td>
<td>Reinbold et al. (2018)</td>
</tr>
<tr>
<td>NFA-to-GDP Ratio</td>
<td>2.8%</td>
<td>2.8%</td>
<td>average level in 1986-1990</td>
</tr>
<tr>
<td>Share of Self-Employ. in Total Employ.</td>
<td>0.52</td>
<td>0.52</td>
<td>Abeles et al. (2014)</td>
</tr>
<tr>
<td>SE Output to Wage Income</td>
<td>0.75</td>
<td>0.75</td>
<td>Abeles et al. (2014)</td>
</tr>
<tr>
<td>Investment-to-GDP Ratio</td>
<td>0.21</td>
<td>0.21</td>
<td>average level in 1986-1990</td>
</tr>
<tr>
<td>Job Filling Rate</td>
<td>0.71</td>
<td>0.71</td>
<td>den Haan et al. (2000)</td>
</tr>
<tr>
<td>Capital Input to SE Output Ratio</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>
Unemployment vs Capital Account Openness (KAOPEN)

Flexible Labor Market (Developing Countries)  Rigid Labor Market (Developing Countries)

Figure 1: Changes in Unemployment vs Changes in Financial Openness, Developing Countries. Scatter plots are conditional on lagged values of log GDP per capita, government expenditure (% of GDP), financial market development, log inflation, institutional quality, trade openness country fixed effects and year fixed effects. 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 database. The institutional quality measure is obtained from the International Country Risk Guide (ICRG) database. We drop observations with very large unemployment changes (excluding those observations with an absolute change in unemployment of more than 5 percentage points).
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 rigidity is above this threshold (the orange area).
Figure 3: The orange line plots the capital account openness index for Peru. The blue line shows Peru’s net foreign assets (NFA) as a ratio of GDP. Positive NFA means capital outflows. This figure shows that, as Peru opened its capital account in the 1990s, Peru experienced a large increase in capital outflows.
Rigid Labor Market and Low Productivity

Figure 4: This figure shows how steady-state variables change with the degree of financial openness in the case of a rigid labor market ($\gamma = 6.81$) and low productivity ($z = 5.05$).
Flexible Labor Market and Low Productivity

Figure 5: This figure shows how steady-state variables change with the degree of financial openness in the case of a flexible labor market (γ = 2.27, two-third lower than the rigid labor market case) and low productivity (z = 5.05).
Figure 6: This figure shows how steady-state variables change with the degree of financial openness in the case of a rigid labor market ($\gamma = 6.81$) and high productivity ($z = 6.32$, 25% higher than the low productivity case).
Simulated Transitional Paths for Peru (1990-1999)

Figure 7: This figure plots simulated transitional paths generated from the model. The capital account policy parameter $\tau$ is calibrated to generate the decline in capital-to-output ratio as in the data. Horizontal axis is in quarters.
Robustness Check: Varying $q$

Figure 8: This figure plots different transitional paths at different values of the job-filling rate ($q$).
Robustness Check: Varying $k_0$

Figure 9: This figure plots different transitional paths at different values of capital requirement for self-employed ($k_0$). In the “higher $k_0$” scenario we set the initial capital requirement for a self-employed worker to be 2 percent of average self-employed output. (In the benchmark, it is set to be 1 percent.)
Robustness Check: Varying b

Figure 10: This figure plots different transitional paths at different unemployment benefit levels $(b)$. 
Robustness Check: Varying $rra$

Figure 11: This figure plots different transitional paths assuming different degrees of risk aversion ($rra$) in the household utility function.
Robustness Check: Varying $\phi$

Figure 12: This figure plots different transitional paths assuming different values of asset holding costs in the household budget constraint.