Financial Frictions, Allocative Efficiency, and Unemployment: A Quantitative Analysis for Argentina*

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Abstract

Argentina is characterized by low levels of private credit and persistent labor market rigidities. Furthermore, financial development remained stagnant in Argentina even during episodes of fast economic growth, in stark contrast with the experience of sustained growth accelerations around the world. The goals of the paper are twofold. Firstly, it is concerned with quantifying the productivity losses associated with such low levels of private credit penetration and characterizing its implications for different subsets of firms in the economy. The latter is important in light of various policy interventions aimed at mitigating the impact of low access to credit based on firm-size thresholds. Secondly, it studies the dynamics of hypothetical reforms to credit markets in a context of rigid labor markets, which seems to be the adequate scenario in which structural reforms will have to be implemented, given the stickiness that labor market regulations have shown to reform efforts in the past. It finds sizable productivity losses from financial frictions, in the order of 13%. At the micro level it finds that it is the youngest firms, whose average marginal return to capital is far above the risk-free rate in the economy, that are more prone to become financially constrained. Turning to reform scenarios, we investigate sudden reforms that are implemented abruptly and more plausible reform paths that gradually dismantle financial frictions. In the former, productivity and the investment rate rise sharply on impact, while it also does the rate of unemployment, going from 5 to almost 12%. In the latter, the rise of unemployment is more gradual and less sharp, peaking at 7%. On the flipside, the investment rate declines on impact, although the contraction is short-lived.

1 Introduction

Credit markets in Argentina are notably underdeveloped given its relatively high level of income per-capita. As shown in figure 1, the private credit to GDP ratio is the lowest among the countries with comparable economic development, notably below, for instance, Chile, where credit penetration is about 4 times as large. This fact motivates the first set of questions in our paper. What are the macroeconomic consequences of poorly functioning credit markets? What type of firms are more prone to be financially constrained in an economy with such a low level of financial development? We

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*This paper is prepared for internal communication among participants in the ongoing report “Argentina: Understanding and Promoting Firm-level Productivity and Growth in Argentina”. It is not intended for circulation beyond the team members and peer reviewers of the report.
investigate these questions with the aid of a standard general equilibrium model of financial frictions and heterogeneous firms, calibrated to match the credit to GDP ratio evidenced in Argentina. We derive aggregate implications and validate the mechanisms in the model contrasting its prediction regarding the firm-size and the firm-age distribution against firm-level data in Argentina.

Figure 1: Private Credit and Development: Argentina’s puzzle
NOTE: The figure shows the ratio of external finance to GDP for the average between 1991 and 2000 on the vertical axes, and a measure of economic development of the country defined as the fraction of their respective income per-capita relative to the USA in 1996. The figure is taken from Francisco Buera’s article in Foco Economico, dated November 10th, 2010 http://focoeconomico.org/2010/11/17/argentina-un-pais-sin-credito/

Argentina also distinguishes itself from other middle income countries in the remarkable stagnation of private credit to GDP ratios even during periods of fast economic growth (1991-1995, 2003-2011), which is in stark contrast with what was observed during other episodes of growth accelerations. Figure 2 plots the evolution of private credit to GDP ratios in Argentina vis-à-vis a selection of Post-Communist countries and Chile between 1990 and 2018. These countries have not only ignited a growth acceleration at some point in their transitions but have also undergone substantial liberalization to the functioning of product, credit, and international markets in this period. Unlike the comparison group, where the private credit to GDP more than doubled, credit penetration has only mildly accompanied the growth accelerations in Argentina. We take this evidence as motivation for the second set of experiments in the paper, which go beyond the characterization of an equilibrium with poor credit to studying growth accelerations. Engineering an acceleration as the outcome of improvements in the degree of financial frictions in the model, what are the macroeconomic properties of these transitions and how do they line-up with the dynamics of successful growth accelerations in the data?
Figure 2: Private Credit to GDP between During Growth Acceleration Episodes

NOTE: Private Credit to GDP is drawn from the World Bank’s FinTech database. The Post Communist accelerations comprise: Russian Federation, China, Poland, Vietnam, Albania, Czech Republic, Slovenia, Latvia, Hungary, and Bulgaria. We take the simple average of the private credit to GDP ratio across each country’s series.

A final piece of evidence that we consider seriously in this paper pertains to the relative progress in the implementation of financial reforms vis-a-vis other markets in the economy. Figure 3 shows that despite failing at triggering a catch-up in financial development, notable progress was made in terms of liberalizing financial markets. This is in stark contrast with the lack of progress in labor markets reform.
We center the attention on labor market reform because, as we learn from the theory, there is a non-trivial interaction between financial and labor market frictions. A key insight from the model is that the mechanisms through which a financial reform increases aggregate productivity operates primarily through the reallocation of labor and capital from wealthy but untalented entrepreneurs towards productive but poor businesses. Such reallocation, however, involves enhanced “traffic” of workers in the labor market. If such markets are rigid, not only the reallocation is delayed, but it may also lead to a temporary spike in the rate of unemployment, which could stall the growth acceleration altogether by eroding the political support for the reform agenda. In fact, figure 4 shows that growth accelerations are indeed accompanied with an increase in the rate of unemployment. We integrate this evidence into our quantitative exploration by endowing our theory with a labor market friction alongside the financial constraints. In such environment of interacting frictions, we ask the following question: what are the properties of the dynamics following an asymmetric reform that dismantles financial frictions but preserves labor market rigidity? What are the implications of the unemployment rate and the speed of convergence?
We pursue our study with the aid of a standard model of heterogeneous firms with frictional credit and labor markets. More specifically, we work with the model proposed in Buera, Fattal-Jaef, and Shin(2013). The key ingredients of the model are the consideration of internal and external sources of finance, and the possibility of firms to accumulate internal finance to overcome financial constraints. These are realistic ingredients to be taken into account for the proper quantification of the losses from financial frictions which are also at the heart of the heterogeneity of exposure to financial frictions. Such heterogeneity is key for our analysis for it postulates misallocation and reallocation as the driving forces for the long run losses from financial frictions and the short run gains from financial liberalization respectively. The reallocation, in turn, is the key driver of the interaction between financial development and subsisting frictional labor markets.

Calibrating the financial frictions to Argentina’s private credit to GDP ratio, we find TFP losses in the order to 13% relative to an economy with external finance dependence as in the U.S. At the micro level we show that young firms exhibit the highest probability of being financially constraint and the ones that show the highest marginal unrealized return to capital. We then compare the predictions of the theory in terms of the firm age and firm size distribution with the age-size distribution of firms in the Argentine data, and show that the theory does a good job in replicating the empirical distributions. While we do not count with the required information to further validate the prediction that young firms, particularly the young and large, are the ones that would benefit the most
from programs that alleviate financial frictions, the consistency of the theory with the observed age-
size distribution provides reassurance that this is the type of firms that would benefit the most from
targeted interventions.

The next step in the analysis is to move towards a characterization of transitional dynamics that
emerge from an improvement in the credit market frictions. For this purpose, we implement a reform
that improves financial deepening in the long run, from the starting 55% ratio of external finance to
GDP in Argentina, to a 200% ratio, comparable to the one in advanced economies. We evaluate two
types of reforms. We first investigate an unexpected, permanent, once and for all increase in $\lambda$
from 1.5 to 3.5. While this is likely unrealistic in terms of feasible speed of implementation, it is a useful
thought experiments to appreciate the mechanisms. Then, we perform a gradual reform in which $\lambda$
is increased smoothly from the initial to the terminal value. We calibrate the speed of the reform so
that it takes a decade for the external finance to GDP ratio to almost double.

The reforms differ most notably in the implied dynamics of the unemployment rate and the rate of
investment. The immediate reform increases GDP sharply on impact, driven by a sudden rise in TFP
and an investment boom. Since financial markets are improved abruptly, resources are reallocated
quickly to their most efficient use, so productivity goes up. With it, also rises the rate of return to
capital, which induces the economy to postpone consumption and increase the rate of investment.
The abruptness of the reallocation, however, takes a toll on the labor market. The unemployment
rate, which was conservatively calibrated to 4% in the stationary equilibrium, raises to almost 12%
within a couple of years of the reform. The gradual reform, on the contrary, brings about mild output
gains in the short run, although it shows a more sluggish response in the rate of unemployment.
Productivity goes up, again, as a result of enhanced, albeit more protracted, reallocation. On the flip-
side, the rate of investment contracts. This contraction is due to the fact that productive but currently
financially constrained entrepreneurs, whose incentives to accumulate internal finance are high prior
to the reform, slow down their savings rates in anticipation of better opportunities to access external
finance in the future. On impact, then, the investment rate falls. In the near future, as credit markets
get better and resources are efficiently reallocated, the rate of return to capital goes up and so does
the rate of investment.

Our results give rise to a number of policy considerations. First and foremost, it raises awareness
of the macroeconomic costs of imperfections in credit markets and the importance of their improve-
ment for the sustainability of growth accelerations. While not being able to pinpoint to a specific
instrument, we hope to induce policy makers to think about financial market improvements as a neces-
sary conditions for sustained growth. Our results, however, do support the conclusion that the
alleviation of credit constraints targeting small firms, as is typical of various subsidized credit pro-
grams in Argentina, are likely to backfire in terms of increasing productivity and investment. It is
the young firms that offer the highest marginal returns to capital. Secondly, it warns about the con-
sequences of the asymmetries that have characterized reform efforts in the past, particularly with
respect to stickiness of labor market frictions and regulations. We acknowledge that labor markets
are politically more costly to reform and hence the persistence of its rigidity is endogenous to the
political and institutional environment in Argentina. Our objective in this regard, is to call for a more
careful consideration of a menu of social safety nets or other labor-market interventions aimed at
mitigating the inevitable stress on the rate of unemployment. What type of unemployment insurance programs have been implemented elsewhere to deal with similar pressures on the labor market? For instance, while a cyclical event, the experience of countries in battling against spikes in the rate of unemployment following the financial crisis of 2007-2008 could provide ideas on how to protect workers from the disruptions induced by reallocation shocks. We just want to remind policy makers of the downside risks associated with structural reforms when it comes to social indicators.

2 Outline of Theory

We model an economy populated by a continuum of individuals, who are heterogeneous with respect to their wealth, entrepreneurial productivity, and access to employment opportunity. In each period, an individual with an employment opportunity chooses whether to work for a wage or to operate an individual-specific technology (entrepreneurship). Those without an employment opportunity choose between searching for a job and operating their individual-specific technology.

Access to capital is determined by entrepreneurs’ wealth through a simple collateral constraint, motivated by the imperfect enforceability of capital rental contracts. One entrepreneur can operate only one production unit (establishment) in a given period. Entrepreneurial ideas are inalienable, and there is no market for managers or entrepreneurial talent.

We assume that there is a centralized labor market where hiring entrepreneurs compete for available workers. The arrival of unemployed workers to the centralized hiring market is modeled with a simple matching function. We restrict wage contracts to be the same across workers and entrepreneurs. In the benchmark exercise, we assume that workers are paid in each period the wage that clears the current hiring market and entrepreneurs may terminate the employment relationship at any time.

Heterogeneity and Demographics  Individuals live indefinitely and are heterogeneous in their wealth \( a \), entrepreneurial productivity \( z \in Z \), and employment opportunity. Their wealth is chosen endogenously by forward-looking saving decisions and their entrepreneurial productivity follows a stochastic process. In particular, an individual retains his entrepreneurial productivity from one period to the next with probability \( \psi \). With probability \( 1 - \psi \), he loses the current productivity and has to draw a new entrepreneurial productivity. The new draw is from a time-invariant distribution with a cumulative density \( \mu(z) \) and is independent of his previous productivity level.\(^1\)

As for individuals’ access to employment opportunities, throughout the paper, we maintain the assumption that unemployed workers receive unemployment benefits that are equal to the market wage in each period, and that leisure does not enter the utility function. As a result, individuals are indifferent between being employed and unemployed. However, the unemployment rate is an important variable for the equilibrium definition and the aggregate dynamics of the model.

The population size of the economy is normalized to one, and there is no population growth.

\(^1\)We use this specification rather than the more standard AR(1) specification to help better match the Pareto-like establishment size distribution in the data. Given the persistence built into \( \psi \), however, our results are qualitatively similar to those obtained with an AR(1) process for \( \log z \).
Preferences Individual preferences are described by the following expected utility function over sequences of consumption, $c_t$:

$$U(c) = \mathbb{E} \left[ \sum_{t=0}^{\infty} \beta^t u(c_t) \right], \quad u(c_t) = \frac{c_t^{1-\sigma}}{1-\sigma}$$

where $\beta$ is the discount factor and $\sigma$ is the coefficient of relative risk aversion. The expectation is taken over the realizations of the entrepreneurial productivity $z$.

Technology At the beginning of each period, an individual chooses whether to operate his own business or not. An entrepreneur with talent $z$ produces using capital $k$ and labor $l$ according to:

$$Az f(k, l) = Azk^\alpha l^\theta,$$

where $\alpha$ and $\theta$ are the elasticities of output with respect to capital and labor with $\alpha + \theta < 1$, implying diminishing returns to scale in variable factors at the establishment level. Notice that firm-level productivity consists of an aggregate component $A$, which acts as a source of business cycles in one of our experiments, and the idiosyncratic entrepreneurial productivity $z$.

Taxes and Unemployment Benefits We assume that unemployed workers receive a transfer equal to the period wage, which is financed with a lump-sum tax $\tau_t$ on all individuals. Given this assumption, from an individual's point of view, there is no difference between being a wage earner and being an unemployed worker. This allows us to formulate the individual problem (Section 2.1) as if they are in one of two mutually exclusive states: a worker (employed/unemployed) or an entrepreneur.

Financial Markets Productive capital is the only asset in the economy. There is a perfectly-competitive financial intermediary that receives deposits and rents out capital to entrepreneurs. The return on deposited assets—i.e. the interest rate in the economy—is $r_t$. The zero-profit condition of the intermediary implies that the rental price of capital is $r_t + \delta$, where $\delta$ is the depreciation rate.

We assume that entrepreneurs’ capital rental $k$ is limited by a collateral constraint $k \leq \lambda a$, where $a \geq 0$ is individual financial wealth and $\lambda$ measures the degree of credit frictions, with $\lambda = +\infty$ corresponding to perfect credit markets and $\lambda = 1$ to financial autarky where all capital has to be self-financed by entrepreneurs. The same $\lambda$ applies to everyone in a given economy.

Our specification captures the common prediction from models of limited contract enforcement: The amount of credit is limited by an individual’s wealth. At the same time, its parsimoniousness—the fact that financial frictions are captured by one single parameter, $\lambda$—enables us to analyze the quantitative effects of financial frictions on aggregate transitional dynamics without losing tractability.\(^3\)

\(^2\)This assumption thereby lightens the computational burden somewhat. If we were to assume that the unemployment benefit is strictly less than the market wage, holding other things equal, an additional set of unemployed individuals whose productivity is marginal will turn into entrepreneurship because their opportunity cost of entrepreneurship (i.e., forgone unemployment benefits) is now lower.

\(^3\)Our collateral constraint can be derived from the following limited enforcement problem. Consider an individual with
Labor Markets Entrepreneurs hire workers in a centralized and competitive hiring market. We restrict labor contracts that entrepreneurs can offer to have the following properties: (i) all workers must be paid the wage that clears the hiring market in each period and (ii) employers may terminate the employment relationship at any time. In particular, all entrepreneurs, irrespective of their current state, are restricted to offer the same labor contract. A worker whose employment is terminated becomes unemployed and must re-enter the hiring market before finding another job.

We make the labor market frictional by introducing a matching friction that interferes with the (re-)entry of unemployed workers into the centralized hiring market. More specifically, we assume that instead of matching unemployed workers directly with firms, a matching function determines the fraction of the currently unemployed that can enter the centralized hiring market. (All unemployed workers face the same probability of entering the hiring market.) For those in the centralized hiring market, wages adjust to make supply meet demand.  

More formally, letting $M_t$ denote the number of unemployed workers that enter the hiring market in period $t$, our assumptions about the matching function can be written as:

$$M_t = \gamma (U_t + JD_t)$$  

(2)

where $U_t$ is the number of unemployed workers at the end of the previous period and $JD_t$ stands for the job destruction at the beginning of the current period. To be more specific,

$$JD_t = \int [\max \{l_{-1} - l_t(a,z), 0\} + \mathbb{1}\{l_{-1} > 0\}\mathbb{1}\{l_t(a,z) = 0\}]G_t(da,dl_{-1},dz)$$  

where $l_t$ is labor demand of an individual (positive only for entrepreneurs and a function of one’s financial wealth, $a$, and entrepreneurial productivity, $z$) and $G_t$ is the joint cumulative distribution function of wealth ($a$), previous period employment ($l_{-1}$), and current entrepreneurial productivity ($z$). With $\mathbb{1}$ denoting the indicator function, the second term in the integral captures exiting entrepreneurs, who enter the pool of unemployed workers. (The employees of exiting entrepreneurs are accounted for by the first term of the integral.)

It is critical for the dynamic stability of the $U_t$ series that a fraction of the laid-off workers and exiting entrepreneurs can enter the hiring market and be employed within the period, as implied by the $JD_t$ term appearing in the right-hand side of equation (2).

The evolution of unemployment is governed by the following law of motion:

$$U_{t+1} = U_t + JD_t - M_t - UB_t,$$  

(3)

where the last term $UB_t$ is the number of new entrepreneurs in period $t$ who were unemployed financial wealth $a \geq 0$ deposited in the financial intermediary at the beginning of a period. Assume that he rents $k$ units of capital and then he can abscond with fraction $1/\lambda$ of the rented capital. The only punishment is that he will lose his financial wealth $a$ deposited in the intermediary. In particular, he will not be excluded from any economic activity in the future. In fact, he is allowed to instantaneously deposit the stolen capital $k/\lambda$ and continue on as a worker or an entrepreneur. Note that $\lambda$ in this context measures the degree of capital rental contract enforcement, with $\lambda = +\infty$ corresponding to perfect enforcement and $\lambda = 1$ to no enforcement. In the equilibrium, the financial intermediary will rent capital only to the extent that no individual will renege on the rental contract, which implies a collateral constraint $k/\lambda \leq a$ or $k \leq \lambda a$.

4Our modeling of the labor market closely follows [?]. Our model can also be interpreted as a simplified version of the Walrasian equilibrium theory of establishment dynamics and matching frictions in [?].
workers at the end of period $t - 1$.

2.1 Individuals’ Problem

At the beginning of a period, an individual’s state is summarized by his financial wealth $a$ and entrepreneurial productivity $z$. To be precise, the state of an individual also includes his access to an employment opportunity. However, because we assume that unemployed workers receive a transfer equal to the market wage, this information is irrelevant for an individual’s problem. The value for him at this stage, $v_t (a, z)$, is the larger of the value of being an employed/unemployed worker, $v_t^W (a, z)$, and the value of being an entrepreneur, $v_t^E (a, z)$:

$$v_t (a, z) = \max \left\{ v_t^W (a, z), v_t^E (a, z) \right\}$$

(4)

As an employed or unemployed worker, an individual chooses consumption $c$ and next period’s asset $a’$ to maximize his utility, subject to the period budget constraint.

$$v_t^W (a, z) = \max_{c, a'} u(c) + \beta \mathbb{E} \left[ v_{t+1} \left( a', z' \right) \right]$$

(5)

$$s.t. \quad c + a' = w_t + (1 + r_t) a - \tau_t$$

Alternatively, individuals can choose to be entrepreneurs. The value function of being an entrepreneur is as follows.

$$v_t^E (a, z) = \max_{c, k, l, a'} u(c) + \beta \mathbb{E} \left[ v_{t+1} \left( a', z' \right) \right]$$

(6)

$$s.t. \quad c + a' = A_t z k^\alpha t^\beta - w_t l - (r_t + \delta) k + (1 + r_t) a - \tau_t$$

$$k \leq \lambda_t a$$

(Collateral constraint)

The occupation choice of an individual is denoted by $o_t (a, z) \in \{W, E\}$. The labor and capital demands of an entrepreneur are denoted by $l_t (a, z)$ and $k_t (a, z)$, both of which take on the value of zero for employed/unemployed workers.

2.2 Competitive Equilibrium

Given an initial distribution of individual wealth, previous period’s labor input, and entrepreneurial productivity $G_0 (a, l_{-1}, z)$ and a sequence of collateral constraint parameters $\{\lambda_t\}_{t=0}^\infty$, a competitive equilibrium comprises prices $\{w_t, r_t\}_{t=0}^\infty$, the number of unemployed workers $\{U_t\}_{t=0}^\infty$, allocations $\{c_t (a, z), a_t+1 (a, z), k_t (a, z), l_t (a, z), o_t (a, z)\}_{t=0}^\infty$, and lump-sum taxes $\{\tau_t\}_{t=0}^\infty$ such that:

1. Given prices $\{w_t, r_t\}_{t=0}^\infty$, the allocations are solutions to the individual problems (4), (5), and (6) for all $t \geq 0$;

$^5$To be absolutely precise, one needs to define a binary variable $j$ which takes the value of one if the individual is an unemployed worker and zero otherwise. The proper cumulative distribution function is then $G_t (a, l_{-1}, z, j)$. We can then define $G_t (a, l_{-1}, z) = \sum_{j=0}^1 G_t (a, l_{-1}, z, j)$. This new variable $j$ and the associated c.d.f. $G_t (a, l_{-1}, z, j)$ are necessary for spelling out equation (3) but $G_t (a, l_{-1}, z)$ suffices for the other elements of the equilibrium definition. In our numerical analysis, we do keep track of $G_t (a, l_{-1}, z, j)$. 

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2. The number of unemployed workers follows the equilibrium law of motion (3);

3. The government budget is balanced for all $t \geq 0$

$$\tau_t = w_t U_{t+1};$$

4. Capital markets clear for all $t \geq 0$:

$$K_t \equiv \int k_t (a, z) G_t (da, dl_{t-1}, dz) = \int a G_t (da, dl_{t-1}, dz);$$

5. Labor markets clear for all $t \geq 0$:

$$\int l_t (a, z) G_t (da, dl_{t-1}, dz) = 1 - \int \mathbb{I}\{a_t = E\} G_t (da, dl_{t-1}, dz) - U_{t+1},$$

where the left-hand side is the demand for labor and the right-hand side is the number of eligible workers, which is the total population minus the number of entrepreneurs and unemployed workers;

6. The joint distribution of wealth, previous period’s labor input, and entrepreneurial productivity $\{G_t (a, l_{t-1}, z)\}_{t=0}^{\infty}$ evolves according to the following equilibrium mapping:

$$G_{t+1} (a, l_{t-1}, z) = \psi \int a_{t+1} (a, z) \leq a, l_{t-1}, G_t (d\tilde{a}, d\tilde{l}_{t-1}, d\tilde{z}) + (1 - \psi) \mu (z) \int a_{t+1} (a, z) \leq a, l_{t-1}, G_t (d\tilde{a}, d\tilde{l}_{t-1}, d\tilde{z}).$$

### 3 Quantitative Analysis

The expected application of the theory is the following. First, we shall characterize the implications of the theory in a stationary equilibrium calibrated with the level of credit evidenced in Argentina, which according to the data amounts to 25% of GDP. In the model, having calibrated structural parameters of preferences, technology, and stochastic processes of entrepreneurial abilities, matching the calibration targets involves adequately parameterizing the parameter $\lambda$ that characterizes the financial friction. At the aggregate level, we will quantify the $TFP$ losses associated with the observed degree of financial frictions, and the associated rate of unemployment. At the micro level, we will explore the extent to which the financial friction bites for different subsets of the population of firms, according to some observable characteristic in the data, such as age and size.

Once we have understood the properties of the initial condition we shall engineer a financial reform, which we expect to calibrate to match the observed path of credit market deepening in the average of growth accelerations in the data, in order to trace out the macro and micro adjustment of the economy along the transitional dynamics. We will investigate alternative scenarios of reforms with varying degrees of accompanying improvement in the labor market, so as to clarify the trade-off implied by efficient reallocation and increasing unemployment.
3.1 Calibration

Our model is parameterized so that the stationary equilibrium matches relevant aggregate and establishment-level moments in the United States (US) economy. We assume a time period in the model to be one year. Following the standard practices, we set the coefficient of relative risk aversion $\sigma$ to 1.5, the annual depreciation rate $\delta$ to 0.06, and the ratio $\alpha / (\alpha + \theta)$ to 0.33 (to match the aggregate capital income share). In terms of the parameter for the hiring market matching function, we set $\gamma = 0.667$ so as to obtain an unemployment rate of 5 percent in the stationary equilibrium.

Entrepreneurial productivity is assumed to follow a Pareto distribution, with cumulative density given by $\mu(z) = 1 - z^{-\eta}$ for $z \geq 1$. Each period, an individual retains his $z$ with probability $\psi$, while a new entrepreneurial productivity should be drawn with the complementary probability $1 - \psi$.

The remaining parameters to be calibrated are $\alpha + \theta$, $\eta$, $\psi$, $\beta$ and the collateral constraint $\lambda$ of the initial stationary equilibrium. To do so, we target the following moments in the US data: employment share of the top decile of establishments, the share of earnings generated by the top 5 percent of the population, the annual exit rate of establishments, the real interest rate, and the ratio of external finance to total non-financial assets of the non-financial business sector.

<table>
<thead>
<tr>
<th></th>
<th>US data</th>
<th>Model</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 10% employment</td>
<td>0.69</td>
<td>0.69</td>
<td>$\eta = 5.25$</td>
</tr>
<tr>
<td>Top 5% earnings share</td>
<td>0.3</td>
<td>0.3</td>
<td>$\alpha + \theta = 0.79$</td>
</tr>
<tr>
<td>Annual Establishment exit rate</td>
<td>0.1</td>
<td>0.1</td>
<td>$\psi = 0.89$</td>
</tr>
<tr>
<td>Annual real interest rate</td>
<td>0.02</td>
<td>0.02</td>
<td>$\beta = 0.93$</td>
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<tr>
<td>Credit market instruments to non-financial assets</td>
<td>0.7</td>
<td>0.7</td>
<td>$\lambda = 3.5$</td>
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</tbody>
</table>

Table 1: Calibration

Table 1 shows the moments in the US data and their counterparts in the calibrated model. The decile of the largest establishments (in terms of employment) accounts for 69 percent of total employment in 2000. The earnings share of the top 5 percentiles is 30 percent in 1998. The annual establishment exit rate is 10 percent in the Business Dynamics Statistics from the US Census. We assume that the annual interest rate is 2 percent. Lastly, we target the ratio of credit market instruments to total non-financial fixed assets in the non-financial business sector of 0.7, a level attained one year before the 2008 financial crisis.

Although all parameters are jointly pinned down in the model equilibrium, we can identify which objects in the data are mostly related to which parameters. For instance, the tail parameter of the Pareto distribution of entrepreneurial productivity, holding other values constant, controls the fraction of employment accounted for by the decile of largest establishments. Similarly, $\alpha + \theta$ can be mapped into the earnings share of the top 5 percent of the population, who, as in the data, are mostly entrepreneurs in the model. There is also a direct link from the persistence of the ability process $y$ to the probability that an entrepreneur exits from production and hence the annual establishment exit rate in the data. The discount factor, unsurprisingly, is closely tied to the target interest rate. The
collateral constraint parameter $\lambda$ is primarily responsible for the ratio of external finance to capital,

$$\frac{\int \max \{k_t (a,z) - a,0\} G_t (da, dl_{-1}, dz)}{K_t}$$

which is the model counterpart of the ratio of credit market instruments to total non-financial assets in the non-financial business sector in the Flow of Funds data.

### 3.2 Equilibrium with Low Credit Ratios

Below we present results of the model calibrated to replicate an initial allocation that seeks to resemble the credit and labor market conditions of Argentina. This is the starting point for the hypothetical reforms of the financial system that we shall consider in forthcoming exercises.

The calibrated value of $\lambda$, the parameter controlling the financial friction, delivers a ratio of external finance to GDP of 56%, in the ball-park of the value evidence by Argentina, as reported in the Financial Statistics database of the World Bank. Calibrating $\lambda$ to the U.S. economy would yield an external finance to GDP ratio of 200%

<table>
<thead>
<tr>
<th>$\lambda = 1.25$</th>
<th>$\lambda = 3.5$</th>
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<tbody>
<tr>
<td>Ext/Fin</td>
<td>0.55</td>
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<td>Ext/Fin</td>
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<tr>
<td>Unemp</td>
<td>0.04</td>
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<tr>
<td>Unemp</td>
<td>0.05</td>
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</tbody>
</table>

Table 2: Aggregate Implications Financial Frictions

The stark underdevelopment of the financial system is costing Argentina sizable TFP losses. Compared to exhibiting the degree of financial development of the U.S, Argentina is confronting a 13% decline in TFP purely from the mis-allocative channel induced by financial frictions. With poor credit, collateral constraints bind for talented but poor entrepreneurs, who are not able to produce at the optimal scales or are forced out of the market. Untalented but wealthy ones can bypass the financial frictions and attract too many resources.

In terms of the labor market, financial frictions are somewhat neutral to the level of unemployment in the steady state. In fact, under the calibrated value of the labor market friction, we see the unemployment rate to be lower in the allocation with tighter collateral constraints. The reason for this is that with restricted credit, job flows are undermined and hence fewer workers are displaced from one establishment to the other, reducing the traffic in the labor market. Financially constrained firms, for instance, will only by able to scale up their sizes if confronted with a further improvement in their entrepreneurial abilities to the extent allowed by the accumulation of internal funds. It is along the transitional dynamics following a financial reform that the interplay between labor and financial frictions gains importance. We shall reveal the importance of this interaction in the forthcoming numerical exercises.
Table 3.2 reports the micro implications of the equilibrium calibrated to Argentina’s credit markets. Following the literature investigating observable characteristics of firms that could represent accurate predictors of the likelihood of the firm being constrained, we classify the universe of firms into 4 age-size categories: small-young (SY), small-old (SO), large-young (LY), and large-old (LO). We consider a firm to be young if it is 5 years of old or less, and consider it to be small if its below the median size in the firm-size distribution. We see that, despite financial frictions, the skewness of the firm-size distribution that characterizes the U.S. is still reflected in the prediction for the Argentine economy. This can be noticed in that the vast majority of firms are small, yet about half of total employment is accounted for by large firms.

In terms of predicting the probability of being constrained, it follows that young firms are the ones showing signs of binding collateral constrained. For SY and LY, the average marginal product of capital is 0.34 and 0.32, well above the gross return given by the sum of the real interest rate plus the rate of depreciation, and also higher than the average MPK of old firms.

Table 3: Micro-Implications Financial Frictions

<table>
<thead>
<tr>
<th></th>
<th>Fraction Not Constrained</th>
<th>Share of Total Employment</th>
<th>Fraction of Firms</th>
<th>Average MPK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-Young (SY)</td>
<td>0.02</td>
<td>0.12</td>
<td>0.4</td>
<td>0.34</td>
</tr>
<tr>
<td>Large-Young (LY)</td>
<td>0</td>
<td>0.02</td>
<td>0.004</td>
<td>0.32</td>
</tr>
<tr>
<td>Small-Old (SO)</td>
<td>0.13</td>
<td>0.38</td>
<td>0.51</td>
<td>0.07</td>
</tr>
<tr>
<td>Large-Old (LO)</td>
<td>0</td>
<td>0.48</td>
<td>0.08</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Figure 5 contrasts the predictions of the theory with respect to the joint size and age distributions against the empirical distribution in the firm-level data for Argentina. Given that our model is calibrated to the manufacturing sector, we restrict the analysis to the universe of manufacturing firms. Consistently with the theory, we define young firms to be those that are 5 years old or less, and classify firms into small or large based on them being smaller or bigger than the average manufacturing plant of 20 workers. The top row reports the fraction of firms in each age-size category, the left panel corresponding to the data and the right panel corresponding to the model. The bottom row reports the shares of total manufacturing employment accounted for by each group, again the data being in the left panel and the model in the one to the right. Both right panels also show the average marginal returns to capital that we have identified for each group in the model. Ideally we would also be able to contrast the theoretical marginal returns with the data. Unfortunately the firm-level data is not rich enough to allow such comparison. However, to the extent that the theory follows closely the data in terms of the age-size distributions, we can take this proximity as reassurance that the model-based estimates of marginal returns are trustworthy as guidance for the design of public policy.
Figure 5: Age-Size Distributions: Argentina Data vs Model

Data Source: SIPA

Figure 5 shows that the theory does a good job at replicating the age-size distribution of firms and employment in the Argentina data. Perhaps the most notable weakness relates to the model’s under prediction of the share of employment accounted for by the large and old firms, and the over-prediction of the shares accounted for by small and young and small and old. In the model there seems to be more churning of firms, with higher entry and exit rates. Another contributing factor is that financial frictions seems to make it harder for old firms to scale up and attract workers, which ultimately manifests in reducing the share of employment amongst the large and old.

We interpret the comparisons of the model’s micro-implications with Argentina’s firm-level data as supporting evidence in favor of the mechanisms highlighted in the model. This is not only reassuring for the validity of the reform counter-factuals that we perform below, but it also allows us to rely on the theory to extract policy implications. Looking at the distribution of average marginal returns to capital it follows from the theory that any policy intervention that is targeted to benefit firms based on size is likely not to payoff in terms of raising TFP. While size has some predictive power in terms of the likelihood of being financially constrained, the theory attributes the highest predictive power to the age of the firm. It’s the young firms that show the highest marginal returns to capital. For instance, subsidizing credit to small firms would imply that there is a 50% chance (the share of firms
in the small and old category) that public funds will end up in firms with the lowest marginal return to capital.

3.3 Transition Dynamics from Financial Liberalization

We proceed with the characterization of transitional dynamics following a reform that improves financial deepening in the long run, from the starting 55% ratio of external finance to GDP, to a 200% ratio, comparable to the one in advanced economies. We evaluate two types of reforms. We first investigate an unexpected, permanent, once and for all increase in $\lambda$ from 1.5 to 3.5. While this is likely unrealistic in terms of feasible speed of implementation, it is a useful thought experiments to appreciate the mechanisms. Then, we perform a protracted reform in which $\lambda$ is increased smoothly from the initial to the terminal value. We calibrate the speed of the reform so that it takes a decade for the external finance to GDP ratio to almost double.

![Graphs of GDP, External Finance to GDP, Investment Rate, and Unemployment Rate](image)

**Figure 6: Unexpected Financial Liberalization**

Figure 3.3 illustrates transition dynamics for GDP, external finance to GDP ratio, the investment rate, and the unemployment rate. GDP is reported as ratio with respect to its value in the allocation with $\lambda = 1.5$, while the reminder of the ratios are reported as differences from their respective values in the same allocation.

The abruptness of the reform can be readily seen in that the external finance ratio increases by
almost 100 pp on impact, increase another 50pp in the reminder of the transition. As a result of the sudden improvement in credit conditions, GDP increases by 10% on impact, and continues to do so smoothly as the spike in the investment rate translates into an increase in the capital stock in the economy.

The financial reform has a strong detrimental effect on the unemployment rate in the economy. Underlying the fast, productivity-enhancing reallocation, there is a notable increase in labor turnover, as workers are being reallocated from constrained to unconstrained entrepreneurs. Because the reform is sizable and implemented abruptly, job turnover rises in comparable strength. Then, as the labor market friction takes time to accommodate the more intense transition of workers across firms, the unemployment rate needs to go up. Notice that the stark rise in unemployment happens despite a mild calibrated value of the labor market distortion, $\gamma$. It is the strength of the reallocation that leverages the mild friction.

Consider now the dynamics emerging from a gradual financial liberalization. These are reproduced in figure 3.3

![Graphs showing GDP, External Finance to GDP, Investment Rate, and Unemployment Rate over time.](image)

**Figure 7: Gradual Financial Liberalization**

Under the gradual reform it takes about a decade for the external finance to GDP ratio to double its value. This has a notorious effect on the shape and speed of the transition. The investment rate now falls on impact and follows a hump-shape during its recovery, property that is consistent with the observed dynamics of investment in successful growth accelerations. The decline in investment is
that entrepreneurs foresee an improvement in credit conditions, so constrained entrepreneurs reduce the pace of their savings rate, which was held high to accumulate internal funding. Thereafter, as the rate of return to capital starts to recover, so does the rate of investment.

The most notorious effect is on the rate of unemployment. Contrary to the abrupt reform, the gradual one never reaches such high levels of unemployment, although it remains longer at an albeit slightly higher rate. The explanation is again inherently linked to the weakening of the pace of labor and capital reallocation induced by the gradual reform vis a vis the abrupt one. Put differently, the economy can successfully implement a financial liberalization with arguably more tolerable levels of unemployment, at the price of a tolerating a longer wait-period for the reform to payoff and the expense of a temporary investment slowdown.

4 Concluding Remarks

We started this paper laying out a series of facts concerning the lack of financial development in Argentina and the importance of improving credit market institutions for the sustainability of growth accelerations. We have also warned that labor market rigidity and regulations have been traditionally stickier to reform in Latin America. This is important for the goal of achieving higher levels of financial development because it is inherent to the efficient reallocation of credit that workers will be displaced from one job to another, and fluid labor markets will be required to accomplish this reallocation at minimum costs.

We evaluated the macro and micro consequences of poor credit markets and entertained a few counter-factual financial reforms with the aim of understanding the importance of underlying labor market frictions in shaping the dynamics of such reforms. We have quantified sizable losses in $TFP$ from financial frictions due to the misallocation of resources it induces. At the micro-level, we have shown that the model can account for the observed joint size-age distribution of firms in the Argentina data, a validation that provides reassurance about the plausibility of the conclusions that we extract from the reform counterfactuals. In terms of reform dynamics, we have established that policy makers confront a trade-off when it comes to deciding about the pace of financial reforms. Sudden reforms create a boom in investment and $TFP$ in the short run, but are also associated with a sharp increase in the rate of unemployment. Gradual reforms, like the ones evidenced in the data, take longer to materialize, suffer a contraction in the investment rate in the short run, but have a weaker increase in unemployment, about have the size implied by the sudden reform.

Altogether we can extract the following set of policy implications from the analysis. In terms of policies aimed at alleviating financial frictions that involve targeted interventions instead of comprehensive reforms, targeting based on size seems to be the wrong course of action. Age is a better predictor of the probability of being financially constrained and hence represents a more profitable dimension on which to condition the intervention. Turning to financial reform, either in the financial sector or more broadly involving the dismantlement of a wider array of distortions in the economy, these are necessarily associated with stress on the labor market institutions. Provided dealing with labor rigidity is difficult, policy makers should carefully consider social safety nets and unemployment insurance schemes aimed at mitigating the unavoidable impact of the reforms on the rate of
unemployment.

References