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GROWTH AND RISK AT THE INDUSTRY LEVEL: THE REAL EFFECTS OF FINANCIAL LIBERALIZATION

Andrei Levchenko, Romain Ranciere, and Mathias Thoenig
International Monetary Fund, International Monetary Fund, Université de Genève, PSE, and CEPR

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Growth and Risk at the Industry Level: the Real Effects of Financial Liberalization*

Andrei A. Levchenko
International Monetary Fund

Romain Rancière
International Monetary Fund

Mathias Thoenig
Université de Genève, PSE, and CEPR

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Abstract

This paper analyzes the effects of financial liberalization on growth and volatility at the industry level in a large sample of countries. We estimate the impact of liberalization on production, employment, firm entry, capital accumulation, and productitity, using both *de facto* and *de jure* measures of liberalization. In order to overcome omitted variables concerns, we employ a number of alternative difference-in-differences estimation strategies. We implement a propensity score matching algorithm to find a control group for each liberalizing country. In addition, we exploit variation in industry characteristics to obtain an alternative set of difference-in-differences estimates. Financial liberalization is found to have a positive effect on the growth of production across industries. The positive growth effect comes from increased entry of firms, higher capital accumulation, and an expansion in total employment. By contrast, we do not detect any effect of financial liberalization on measured productivity. There is also evidence that financial liberalization increases the volatility of production. We provide a simple theoretical model which gives a unified treatment to the various effects of liberalization that we uncover.

JEL Classification Codes: F02, F21, F36, F4.

Keywords: financial liberalization, growth, volatility, industry-level data, difference-in-differences estimation, propensity score matching.

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1 Introduction

Financial markets have been liberalized dramatically in many countries over the last three decades. Most *de jure* measures of restrictions on domestic capital allocation or international capital flows show a strong trend towards liberalization. Indeed, capital flows across borders have correspondingly grown at a higher pace than the expansion of goods trade, and much faster than GDP. What are the effects of financial liberalization? In spite of a strong theoretical case that financial liberalization should improve the allocation of capital and increase growth, the growth effects of financial liberalization have not been easy to demonstrate in cross-country data. At the same time, worries persist that financial liberalization may result in higher volatility. Kose, Prasad, Rogoff, and Wei (2006) provide a comprehensive exposition of basic facts about the current wave of financial globalization, and review existing literature on its effects on growth and volatility.

In this paper, we examine the relationship between financial liberalization, growth, and volatility using a large panel dataset of countries and sectors. Our results can be summarized as follows: financial liberalization increases growth of output across sectors. This effect is robust to a variety of specifications and estimation strategies. Decomposing the positive growth effect into channels, it turns out that financial liberalization raises entry of firms, total employment, and capital accumulation. By contrast, we do not detect any impact of financial liberalization on productivity growth. At the same time, liberalization increases volatility of output. Finally, we demonstrate that the impact is temporary rather than permanent: for the growth of output, firm entry, and employment, the effect decreases in magnitude over time, and becomes insignificant after 6 years, while the impact on capital accumulation is slightly more long-lasting. The only persistent effect we find is on competition: the impact of financial liberalization on the price-cost margin – a measure of markups – increases progressively for the first few post-liberalization years, and remains significantly negative throughout the period we analyze.

How should we interpret these results? Gourinchas and Jeanne (2006) argue that the gains from liberalization in a neoclassical framework – emphasizing capital accumulation – are actually quite small. Therefore, if financial liberalization is to have appreciable growth effects, it must somehow raise productivity growth as well. In this paper, we find that the effects of financial liberalization appear rather neoclassical: growth of output, employment, and capital accumulation increases, but temporarily. By contrast, there is no evidence in our data that productivity growth is affected. This may explain why the pro-growth effect of financial liberalization has been so difficult to detect empirically in cross-country

data: increased capital accumulation simply cannot generate a large enough growth effect on its own. At the same time, not all of our results are easily rationalized within a basic neoclassical framework. Entry of firms increases, and so does competition. Furthermore, the volatility of output goes up as well. This suggests that there could be some restructuring in the economy following liberalization, whose effects we may still not fully understand.

In particular, we view it as something of a puzzle that while entry increases, TFP growth does not follow. In the last section of the paper, we present a simple theoretical model intended to rationalize all of our empirical findings together. We propose two possible explanations for the lack of TFP growth following liberalization. First, the relaxation of financial constraints resulting from liberalization leads to entry by firms which are less productive than the average. This is an intuitive result: it relies on the notion that the most productive firms are not financially constrained to begin with, and thus were able to operate even before financial liberalization. Financial liberalization matters most for the less productive firms, which are financially constrained. The second explanation relies on our empirical finding that markups decrease significantly with liberalization. If innovation occurs through prospective entrepreneurs attempting to undertake projects, the reduction in markups and therefore profits also lowers the incentive to innovate. Through this pro-competitive mechanism, relaxation of financial constraint has the effect on TFP growth that is opposite of what is normally presumed.

A key feature of our empirical approach is that we employ a variety of empirical strategies, based on both *de facto* and *de jure* measures of financial liberalization, in order to obtain reliable estimates. In the first exercise, we estimate the relationship between *de facto* measures of financial liberalization, such as those used by Kose, Prasad, and Terrones (2003) and Lane and Milesi-Ferretti (2006) and growth and volatility. In addition, we exploit differences in sector characteristics in the spirit of Rajan and Zingales (1998) to identify a causal link between liberalization and growth and volatility. The second exercise is based on *de jure* measures and a difference-in-differences methodology. We isolate a number of financial liberalization episodes using the liberalization indices developed by Kaminsky and Schmukler (2003). For each episode, we compare the volatility and growth of a variety of outcomes, such as output and employment, during the 10 years immediately before and after the liberalization date, using as the control group countries which did not liberalize in the same period. To overcome a selection problem, we develop a propensity score matching procedure to select a suitable control group for each liberalizing country. This approach is much more demanding on the data than the simple panel estimation. For

instance, a great deal depends on the precise dating of liberalization episodes. Nonetheless, and in spite of the important differences in the independent variables and approaches, the findings are remarkably similar across the two empirical models.

There are several advantages to using industry-level rather than country-level data to analyze this question. First, and most importantly, if financial markets are not perfect within the country, the economy does not behave like a representative agent. Indeed, there is strong evidence that risk sharing between agents within a country is far from complete even in the most advanced economies like the US (Attanasio and Davis, 1996, Hayashi, Antonji, and Kotlikoff, 1996). For developing countries as well, there is a large amount of evidence, surveyed in Banerjee and Duflo (2005), that the representative agent assumption is strongly violated. When that is the case, analyzing aggregate data may in some cases lead us to miss the most important effects of financial liberalization, and in others produce estimates which are not informative about welfare implications for the average individual in the economy (Levchenko, 2005, Broner and Ventura, 2006). Using sector-level data therefore allows us to get a deeper understanding of how financial liberalization affects the typical agent. Second, industry-level data allows us to exploit variation in sector characteristics in the spirit of Rajan and Zingales (1998) to identify a causal link between liberalization and growth and volatility. Third, we can analyze a variety of outcomes which are not possible to explore using country-level data, such as the effect of liberalization on employment, wages, entry of firms, and productivity. And finally, our three-dimensional panel of countries, sectors, and years allows the use of a large battery of fixed effects, which helps to overcome many omitted variables problems.

Another strength of this paper is in using both *de jure* and *de facto* measures of financial integration. The advantage of *de jure* measures is that they reflect policy levers, and thus results based on them may have clearer policy implications for reforms that a government might consider. Their disadvantage is that they may capture quite poorly the actual degree of financial integration, either because the true nature of legal restrictions is mismeasured, or because these restrictions are imperfectly enforced. *De facto* indicators of integration do not suffer from this shortcoming.

This paper is related to the large literature on the growth and volatility effects of financial liberalization, surveyed comprehensively by Kose, Prasad, Rogoff, and Wei (2006). While most existing papers in this literature use cross-country data, the two papers most closely related to ours use sector-level data as well. Galindo, Micco, and Ordoñez (2002), and Gupta and Yuan (2006) employ industry-level data and the Rajan and Zingales (1998) methodology

to analyze the effects of financial liberalization on growth. Our paper differs from these two contributions in several important respects. First, we investigate the volatility effects of financial liberalization, doing so within the same empirical framework as the growth effects. Second, we use other techniques in addition to the Rajan-Zingales identification to evaluate the effects of liberalization. In particular, the various difference-in-differences approaches we adopt allow us to estimate the overall effect of financial liberalization across sectors, something which cannot be done with the Rajan-Zingales methodology. Third, we use both *de jure* and *de facto* measures of financial liberalization to assess robustness of results. And finally, in contrast to these two papers, we refrain from using yearly data, because at this frequency the variation over the business cycle can contaminate inference.

The rest of the paper is organized as follows. Section 2 describes our data. Section 3 lays out the empirical methodology and presents the estimating equations. In particular, we detail two alternative estimation strategies. One is based on *de facto* measures of liberalization, while the other relies of dating liberalization events, and therefore on *de jure* measures. Section 4 describes the results. A simple theoretical model is presented in Section 5, and Section 6 concludes.

2 Data

Industry-level production, value added, employment, and wages at the sector level come from the 2006 UNIDO Industrial Statistics Database. We use the version that reports data according to the 3-digit ISIC Revision 2 classification for the period 1963–2003 in the best cases. There are 28 manufacturing sectors in total, plus the information on total manufacturing. We use data reported in current U.S. dollars, and convert them into constant international dollars using the Penn World Tables.[1] We also correct inconsistencies between the UNIDO data reported in U.S. dollars and domestic currency. We dropped observations which did not conform to the standard 3-digit ISIC classification, or took on implausible values, such as a growth rate of more than 100% year to year. The resulting dataset is an unbalanced panel of 56 countries, but we ensure that for each country-year we have a minimum of 10 sectors, and that for each country, there are at least 10 years of data. Appendix Table A1 lists the countries in our sample.

We use two measures of *de facto* financial liberalization. The first is in the gross capital

[1] Using the variable name conventions from the Penn World Tables, this deflation procedure involves multiplying the nominal U.S. dollar value by $(100/P) * (RGDPL/CGDP)$ to obtain the constant international dollar value.

flows, which is the sum of gross inflows and gross outflows, obtained from the IMF's Balance of Payments Statistics. This measure, which is parallel to the aggregate trade openness (exports plus imports), has been used by Kose, Prasad, and Terrones (2003), as well as several subsequent papers. The second is a measure of gross foreign assets and liabilities from Lane and Milesi-Ferretti (2006). Both are normalized by total GDP throughout.

The data on *de jure* financial liberalization come from Kaminsky and Schmukler (2003) (henceforth KS), who provide indices of the extent of liberalization in the stock market, the banking system, and freedom of international transactions for 28 countries. Along each of the three dimensions of liberalization, KS assign a value of 1, 2, or 3 for each country and year, with 3 indicating the most liberalized. They also provide a composite index, which is a mean of the three subcomponents.

Finally, in order to test for the differential effect of financial liberalization across industries, we employ the dependence on external finance measure introduced by Rajan and Zingales (1998). The Rajan and Zingales measure is defined as capital expenditure minus cash flow, divided by capital expenditure, and is constructed based on US firm-level data. Intuitively, this measure is intended to capture the share of investment which must be financed with funds external to the firm. We use the version of the variable assembled by Klingebiel, Kroszner, and Laeven (2007), in which industries are classified according to the 3-digit ISIC Revision 2 classification. We also make use of the industry-level measure of liquidity needs compiled by Raddatz (2006), defined as inventories as a share of sales. It captures the fraction of inventory investment which can be financed with the current revenue. That is, a sector has a higher need for liquidity a smaller fraction of inventory accumulation can be financed by ongoing cash flow. Appendix Table A2 lists the sectors used in our analysis, as well as the values of external finance dependence and liquidity needs.

As one of the control variables we use international trade flows from the World Trade Database (Feenstra et al., 2005). This database contains bilateral trade flows between some 150 countries, accounting for 98% of world trade. Trade flows are reported using the 4-digit SITC Revision 2 classification. We aggregate bilateral flows across countries to obtain total imports and exports in each country and manufacturing sector. We then convert the trade flows from SITC to ISIC classification and merge them with production data.

3 Empirical Methodology

3.1 The Model Based on *De Facto* Measures

We estimate the following specification in the panel of countries, sectors, and time:

$$GROWTH_{ict} = \beta FINLIB_{ct} + \gamma X_{ict} + \Delta + \varepsilon_{ict} \quad (1)$$

$$VOLATILITY_{ict} = \beta FINLIB_{ct} + \gamma X_{ict} + \Delta + \varepsilon_{ict}, \quad (2)$$

where c indexes countries, i industries, and t time periods. We estimate these equations on a non-overlapping panel of 10-year averages, 1970-79, 1980-89, 1990-99, thus the subscript t refers to decades. On the left-hand side is either the 10-year average growth rate of a variable ($GROWTH_{ict}$), or the standard deviation of that growth rate calculated over the 10 year span ($VOLATILITY_{ict}$). X_{ict} is a vector of controls, in which we include the share of the sector in total output, log of output per worker in the sector, and the overall trade openness (exports plus imports as a share of output) in the sector.

Both specifications include a set of fixed effects Δ. The ability to employ a variety of fixed effects is a major strength of our empirical approach. Specifically, the fixed effects greatly help in alleviating simultaneity issues by controlling for omitted variables in these regressions. In the panel specifications, country fixed effects will control for any potential omitted variable that varies at country level, such as overall macroeconomic volatility, level of development, or institutions. Sector fixed effects will do the same for any sector characteristics correlated across countries, such as inherent volatility, factor intensity, reliance on external finance, liquidity needs, or tradability. Time effects will pick up changes in the global environment from decade to decade. Because our panel has three dimensions, the use of fixed effects becomes even more powerful. In addition to country, sector, and decade fixed effects, we also employ interacted fixed effects rich enough to control for a wide variety of omitted variables. For instance, the use of country×sector effects allows us to control for unobservable characteristics of each individual sector in each country, and identify the effect of financial liberalization purely from the time variation in financial integration. Sector×time effects absorb any variation in sector characteristics over time, such as global demand and supply shocks in a sector.

Because our financial liberalization variable varies at the country×time level, in the specification above we cannot include country×time effects which would capture other time-varying country characteristics. An alternative approach is to exploit sector-level characteristics in the spirit of Rajan and Zingales (1998) to identify a causal relationship between

financial liberalization and outcomes. We therefore estimate the following specifications:

$$GROWTH_{ict} = \beta CHAR_i * FINLIB_{ct} + \gamma X_{ict} + \delta_{ct} + \delta_{it} + \varepsilon_{ict} \quad (3)$$

$$VOLATILITY_{ict} = \beta CHAR_i * FINLIB_{ct} + \gamma X_{ict} + \delta_{ct} + \delta_{it} + \varepsilon_{ict}, \quad (4)$$

where c indexes countries, i industries, and t time periods. Just as above, $GROWTH_{ict}$ and $VOLATILITY_{ict}$ are the average growth rates over the 10-year period, and the standard deviation of the growth rate over the same period, respectively. $CHAR_i$ refers to the industry characteristic used in estimation. As we mention above, $CHAR_i$ is either the Rajan and Zingales measure of dependence on external finance, or the Raddatz measure of liquidity needs. X_{ict} is a vector of controls. All of the specifications include a full set of country×time effects δ_{ct}, as well as sector×time effects δ_{it}. These fixed effects absorb any omitted time-varying country characteristics, such as reforms, changes in political regimes or governments, growth accelerations or slowdowns, and many others. Thus, in this empirical model we identify the effect of financial liberalization purely from the differential effects across industries within a country.

The Rajan and Zingales-type approach is a common one in the literature, indeed we are not the first to analyze the growth effects of financial liberalization with this strategy (though we are the first, to our knowledge, to address the issue of volatility). It is important to emphasize the pros and cons of model (1)-(2) compared to (3)-(4). The disadvantage of the former is that it may suffer from an omitted variables problem, because of our inability to include country×time effects. Its main advantage is that it allows us to estimate the direct effect of financial liberalization on the average growth and volatility across sectors within a country. By contrast, the omitted variables problem is overcome in the Rajan-Zingales-type model. However, its key shortcoming is that because it relies solely on the within-country cross-industry variation, it does not allow the researcher to identify the magnitude of the overall effect. That is, the growth effect of financial liberalization – the object of much study using cross-country regression approach – is subsumed in the country×time fixed effect. The Rajan-Zingales regression can only provide evidence that some sectors react to financial liberalization differently from others. But it cannot distinguish between a case in which the effect on some sectors is zero while on others it is positive, and a case in which the effect on some sectors is zero while on others it is negative.

3.2 The Model Based on *De Jure* Measures

We now discuss our second approach to analyzing the effects of financial liberalization. In this strategy, we date the liberalization episodes in a sample of countries, and then compare outcomes before and after liberalization. This approach is based on *de jure* indicators. We identify the liberalization episodes based on the KS classification. Because we require precise liberalization dates, we must set a threshold for the KS index, above which the country is considered liberalized, and below which it is not. Whenever the financial liberalization index used is not binary, an important question is how to define a financial liberalization event. In the baseline regressions we classify a country as liberalized whenever all three components of the index – domestic, capital account, and stock market – indicate full liberalization. This approach emphasizes the complementarities between the different financial liberalization reforms. The resulting set of liberalization episodes is listed in Appendix Table A3. For each episode, we compute the left-hand side variable, as well as the relevant controls, for the 10-year period before, and the 10-year period after the liberalization dates.

In order to analyze the effects of financial liberalization on economic outcomes, we employ two empirical strategies parallel to the *de facto* approach above. The first approach seeks to determine the average level effect across sectors using a conventional difference-in-differences model. In particular, for each liberalization episode, we identify a control group of countries from among those which did not liberalize during the 20-year period around the liberalization date. Intuitively, while the Rajan-Zingales-type model uses non-financially intensive sectors as a control group for the financially intensive sectors, this empirical strategy uses non-liberalizing countries as a control group for the liberalizing country. In particular, we estimate the following set of specifications:

$$GROWTH_{ict} = \beta_0 POST_t + \beta_1 TREATED_{ct} + \gamma X_{ict} + \Delta + \varepsilon_{ict} \tag{5}$$

$$VOLATILITY_{ict} = \beta_0 POST_t + \beta_1 TREATED_{ct} + \gamma X_{ict} + \Delta + \varepsilon_{ict}, \tag{6}$$

where $POST_t$ is the variable taking on the value of 0 before the liberalization episode, and 1 after. $TREATED_{ct}$ is a binary indicator for whether a country is liberalized in a given period. The various specifications will include different configurations of fixed effects Δ. Note that by construction, in this model t takes on only two values: before liberalization, and after it. Equations (5) and (6) are the "classic" difference-in-differences specifications. The left-hand side variable is measured in two periods, before and after treatment. The right-hand side includes a variable $POST_t$, which indicates whether the observation is from

before or after treatment. It is common to both treated and control observations. Finally, the coefficient of interest β_1 is on the variable $TREATED_{ct}$.

The key question is what countries to assign to the control group for each liberalization episode. In this paper, we pursue two strategies. First, for each episode we use as the control group all of the countries which did not liberalize around the same time as the liberalizing country. This procedure can result in a large number of heterogeneous countries constituting each control group. To refine this procedure one step, we only use OECD countries as available controls for the OECD liberalizers, and non-OECD countries as possible controls for the non-OECD liberalizers. The advantage of this overall approach is that it uses a large amount of information for what is happening in various non-liberalizing countries around the time of each liberalization episode. The disadvantage is that besides the coarse OECD/non-OECD refinement, no attempt is made to use country characteristics in picking the control groups. Potentially, this can result in the control group countries having very different characteristics from the treated ones for each episode. Note that the large size of the control groups should help in this respect, since the country heterogeneity would be averaged out among the large number of control countries. Also, many of the obvious differences, such as the overall level of development, which can arise between a treated country and its control, would be accounted for by the country fixed effects which we include in the estimation. Nonetheless, potential selection concerns remain. In order to overcome them, we also employ a propensity score matching procedure to find a suitable control group. We describe it in section 3.2.1 below.

Another difference-in-differences strategy, the most common in the literature, is to use sectoral characteristics. Once again, we rely on the variation in the dependence on external finance introduced by Rajan and Zingales (1998), as well as the liquidity needs measure from Raddatz (2006). In particular, we estimate the following specifications on the sample of liberalizing countries:

$$GROWTH_{ict} = \beta CHAR_i * TREATED_{ct} + \gamma X_{ict} + \delta_{ct} + \delta_i + \varepsilon_{ict} \tag{7}$$

$$VOLATILITY_{ict} = \beta CHAR_i * TREATED_{ct} + \gamma X_{ict} + \delta_{ct} + \delta_i + \varepsilon_{ict}, \tag{8}$$

where c indexes countries, i industries, and t time periods. $GROWTH_{ict}$ and $VOLATILITY_{ict}$ are the average growth rates over the 10-year period, and the standard deviation of the growth rate over the same period, respectively. $TREATED_{ct}$ is defined identically to the above specification: it is zero except in the post-liberalization period for the country which liberalized. $CHAR_i$ refers to the industry characteristic used in estimation. Same as in

the empirical model (3)-(4), it is either the Rajan and Zingales measure of dependence on external finance, or the Raddatz measure of liquidity needs. X_{ict} is a vector of controls. All of the specifications include a full set of country×time effects δ_{ct}, as well as sector effects δ_i. Thus, in this model we identify the effect of financial liberalization purely from the differential effects across industries within a country. As discussed above, this methodology does not allow us to identify the magnitude of the overall effect of financial liberalization on growth or volatility.

3.2.1 Propensity Score Matching

In order to overcome the selection on observables problem in the difference-in-differences model (5)-(6), we implement a propensity score matching procedure (hereafter PSM) to identify a control country for each treated one. The PSM procedure seeks to use information on observable characteristics of subjects to estimate a probability model for being treated. Then, for each instance of a treated observation, it uses the information on the observables to identify a non-treated observation which is closest to the treated one. That non-treated observation then becomes the control group for the treated one.

The basic idea of propensity score matching is to *simulate a randomized experiment*. We want to pair together countries with similar characteristics. To do so, we use a vector of covariates X, and assume that conditional on the vector X, the expected value of the variable of interest (in our case, output growth or output volatility) in the absence of financial liberalization would be the same for the treated and the control countries which have been paired together. If this assumption holds, it is legitimate to see the control country as an identical twin of the treated country if the latter *had not received treatment*. Thus, the difference between the treated and control countries will be an appropriate estimate of the effect of financial liberalization – the treatment effect.

The relevant set of covariates, X, should include variables that are co-determinants of the financial liberalization treatment and of the outcome variables of interest. Since the treatment happens at the country-level, we consider a set country-level variables for X. An obvious difficulty in performing a matching based on X is the multi-dimensionality of the information set. As shown by Rosenbaum and Rubin (1983), it is possible to match instead on the probability of liberalization conditional on the vector X, which is a scalar quantity. We therefore define the *propensity score* as the conditional probability of receiving the liberalization treatment for country c in year t given X:

$$p_{ct}(X) = \Pr(z_{ct} = 1|X), \tag{9}$$

where $z_{ct} = 1$ if country c is fully liberalized at time t and $z_{ct} = 0$ otherwise. The basic econometric results supporting the PSM approach are derived in Rosenbaum and Rubin (1983). In particular, Theorem 1 in Rosenbaum and Rubin (1983) states that, under some conditions, exposure to the treatment and the observed covariates are conditionally independent given the propensity score ($z \perp X|p(X)$). The first economic applications of the propensity score techniques are due to Dehejia and Wahba (1999, 2002).[2]

The propensity matching procedure follows three steps. In the first step, we use a logit model estimate the probabilities of financial liberalization, which we call the propensity scores, for a sample of countries and years. Next, following Dehejia and Wahba (2002), we group observations into intervals with similar propensity score – referred to as propensity score strata – and test whether the means of each right-hand side variable do not differ between treated and non-treated units within each stratum.[3] In the third step, we construct the relevant control group for each treated country using a proximity measure based on propensity scores.

In our case, the first step involves estimating the following logit model:

$$\begin{aligned} TREATED_{ct} &= \alpha_0 + \alpha_1 INCOME_{ct} + \alpha_2 VOLATILITY_{ct} + \alpha_3 OPEN_{ct} + \\ &\quad \alpha_4 LIFE\_EXP_{ct} + \alpha_5 YRS\_OFFC_{ct} + \alpha_6 VOICE_c + \varepsilon_{ct}, \end{aligned}$$

where $TREATED_{ct}$ is the indicator for whether or not the country is liberalized, $INCOME_{ct}$ is the log of PPP-adjusted per capita income, and $VOLATILITY_{ct}$ is the volatility of the per capita GDP growth over the previous 5 years. $OPEN_{ct}$ is the trade openness, defined as imports plus exports as a share of GDP. These three variables come from the Penn World Tables (Heston, Summers, and Aten, 2002). $LIFE\_EXP_{ct}$ is the life expectancy, obtained from the United Nations population data. YRS_OFFC_{ct} is the number of years the current government has been in office, sourced from the World Bank's Database of Political Institutions (Beck et al., 2001). $VOICE_c$ is the index of voice and accountability from Kaufmann, Kraay and Mastruzzi (2005) Governance Matters database.

The selection of the logit specification borrows from a small literature on the determinants of financial liberalization and, in particular, from Abiad and Mody (2005). It includes economic, political, and institutional variables. Notice that the objective of the logit estimation is not to predict financial liberalization but to obtain a distribution of propensity

[2] PSM methods have been first used in international economics by Persson (2001) and Glick, Guo and Hutchinson (2006).

[3] This is a test of the *balancing hypothesis* which needs to be verified for the Rosenbaum and Rubin (1983) theorem to be valid.

scores that allows to match treated with control countries. For this reason, we favor a parsimonious specification which includes variables that are significant determinants of financial liberalization and, at the same time, passes the Dehejia and Wahba (2002) tests of equality of means within strata referred to above. In our final specification, more than 90 percent of tests fail to reject equality of means within strata. We also experimented with a wide variety of other country variables, capturing the level of development, human capital, various aspects of institutions, the incidence of financial and currency crises, and the composition of trade and output. In addition, we included measures of global growth opportunities developed by Bekaert, Harvey, Lundblad and Siegel (2006) to control for the possible simultaneity between the decision to financially liberalize and a change in the country's growth potential. Many of these variables turned out to be insignificant.

Having estimated this logit model, the last step consists of exploiting the propensity score information to construct control groups. For each liberalization episode, we calculate the probability of liberalization during the five years immediately preceding the actual liberalization. We then compare these probabilities to those of all the other potential control countries, defined as all the countries which did not liberalize during the 20-year window around the episode in question. Let C be the set of all countries, we define the *proximity* between the liberalized country $c \in C$ and another country d as the average of the square of the difference between p_{dt} and p_{ct} for the five year period prior to financial liberalization:

$$\text{proximity}_{dc} = \frac{1}{5} \sum_{t=t_c-5}^{t_c} \left(p_{dt} - p_{ct}\right)^2, \tag{10}$$

where t_c is the year country c liberalized.[4] We use the *first neighbor* matching method and define the control group of the liberalized country c as:

$$CG_c = Arg \min_{\substack{d \in C \\ |t_c - t_d| \geq 10}} \text{proximity}_{dc}, \tag{11}$$

where the additional restriction of 10 years difference between liberalization dates of c and d, required to prevent countries that liberalized nearby c to be included in its control group, is arbitrary.[5] The list of control countries for each liberalization episode is presented in Appendix Table A3. In addition to the tests of equality of means within each stratum, we perform the following robustness check suggested by Glick, Guo and Hutchinson (2006): a

[4] Missing data may lead to missing years in the p_{ct} set. When this happens, we adapt the equation 10 to be an average over the propensity scores available.

[5] We also used alternative matching methods based on the first and second neighbor or on the radius, and the results were robust.

two-sample test of equality of means between the sample of treated and control countries for each variable measured at the time of financial liberalization. Each variable in our specification satisfies this test. Once the control group has been constructed, it is used in the estimation of equations (5) and (6) described in this Section.

4 Results

4.1 Estimates Based on *De Facto* Measures

Table 1 reports the results of estimating equation (1), where the dependent variable is the average 10-year growth rate of total real output in a sector, and the independent variable of interest, $FINLIB$, is the average gross capital flows over the same 10-year period. Because $FINLIB$ is measured at country×time level, we cluster the standard errors at the country×time level as well. The first four columns add progressively more fixed effects. Column 1 includes country, sector, and time effects separately. Column 2 uses instead country and sector×time fixed effects. Column 3 adds country×sector and time effects. Note that in this column, identification comes purely from the time series variation in the variables of interest. Column 4 includes country×sector and sector×time fixed effects. This is the most stringent possible array of fixed effects (in terms of remaining degrees of freedom) that can be included in this specification. We can see that the financial openness variable has a significantly positive effect on the growth rate of total output. In order to go further in identifying the causal impact of financial liberalization on volatility, we next estimate a version of equation (3). In this specification, $FINLIB$ is interacted with the Rajan-Zingales measure of dependence on external finance. We include sector×time and country×time fixed effects, controlling for other changes – such as reforms – which occur at country level and differ across time. Note that this makes it impossible to estimate the effect of $FINLIB$ on growth, but enables us to make a statement about its differential impact across sectors. When we do so, the coefficient on the interaction term is highly significant. It does seem to be the case that more financially dependent sectors grow faster as a result of liberalization than less financially dependent sectors. When we do the same with the Raddatz measure of liquidity needs, we find a positive coefficient but it is not significant.

We next investigate the channels through which $FINLIB$ increases the growth rate of output. We would like to know whether financial liberalization is associated with increased entry (the number of firms). Furthermore, as in a standard growth accounting framework, growth in total production can come from increased employment, capital accumulation, and growth in total factor productivity (TFP). We use the standard techniques to construct the

capital stock and a TFP series for each country and sector.[6] In Table 2, we investigate the effect of financial liberalization on each of these components of overall growth. Column 1 presents the estimates of equation (1) in which the dependent variable is the growth rate in the number of establishments. The column includes the most stringent set of fixed effects – country×sector and sector×time – and clusters the standard errors at country×time level. Column 2 estimates equation (3) with the same left-hand side variable. We can see that a higher level of $FINLIB$ has a positive and significant effect on the growth rate of the number of establishments. Also, the effect seems stronger in more financially intensive sectors, as evidenced in Column 2. Columns 3 and 4 repeat the exercise for the growth rate of employment. Similarly to the number of establishments, $FINLIB$ is associated with higher total employment growth, and there is some evidence that more financially dependent sectors experience a relatively higher employment growth. Columns 5 and 6 examine instead the capital accumulation, defined as the growth rate of the capital stock. It is clear that the effect of financial liberalization on capital accumulation is strong, and it does affect the more financially dependent sectors differentially. Finally, columns (7) and (8) examine TFP growth. The coefficients are close to zero and not statistically significant.[7] Thus, to the extent that financial liberalization affects growth of output, the channels seem to be expansion of overall employment and increased capital accumulation, rather than productivity growth. This expansion of the total productive capacity is achieved at least in part through increased entry.

We now move on to analyze the effect of $FINLIB$ on volatility. The first 4 columns of Table 3 present the results of estimating equation (2), with the standard deviation of the growth rate of output as the dependent variable. We can see that $FINLIB$ has a positive effect on volatility for all configurations of fixed effects, though the level of significance is at 10% level in most specifications. We then move on to estimating equation (4), in which we interact $FINLIB$ with the Rajan and Zingales measure of dependence on external finance and the Raddatz measure of liquidity needs. For both sector characteristics, the results are significant. Higher levels of $FINLIB$ increase volatility more in sectors which depend more on external finance, or with higher liquidity needs.

To summarize, it appears that increased *de facto* financial liberalization raises both the

[6] See, for example, Hall and Jones (1999). The capital stock in each year t is given by $K_{ict} = (1 - \delta)K_{ict-1} + I_{ict}$. We take a depreciation rate $\delta = 0.08$, and adopt the standard assumption that the initial level of capital stock is equal to I_{ic0}/δ. Total factor productivity in year t is then equal to $TFP_{ict} = Y_{ict} - (1 - \alpha_{ic})L_{ict} - \alpha_{ic}K_{ict}$, where Y_{ict} is the total output, and L_{ict} is the total employment in the sector. Each sector has its own labor share α_{ic}, which is computed in our data as the average of the total wage bill divided by value added within each sector in each country.

[7] We also used labor productivity (value added per worker) instead of TFP. The results were unchanged.

growth and volatility of production. The growth effect comes from increased entry, total employment, and capital accumulation, but not TFP. We now move on to analyzing the effects of liberalization using instead *de jure* indicators. As we will see below, the results are remarkably similar, though the methodologies and data differ a great deal.

4.2 Estimates Based on *De Jure* Measures

We first present the results for the conventional difference-in-differences model. We estimate equation (5), with the average growth rate of output over the 10-year period as the dependent variable. As we cannot use country×time effects, we experiment with various configurations of fixed effects to control for omitted variables. Because financial liberalization occurs as country×time level, we cluster the standard errors at country×time level as well, in order to avoid biasing our standard errors downwards. Table 4 presents the results. The first four columns present the results of using all available countries as control groups. The last four columns use the PSM procedure to select for each liberalizing country a control country based on observable characteristics. Column 1 presents estimation results with country fixed effects, while column 2 uses country×sector fixed effects. Column 3 uses country and group×time fixed effects, where we define a "group" to be a single liberalizing country plus all its control countries. The group×time effects control for the time variation in the variables affecting both the treated and the control countries, such as the changes in the global conditions. Finally, column 4 uses the country and group×sector fixed effects. The latter is the same as using sector fixed effects, but within each individual group (as, for example, the sector effects may change over time). We can see that financial liberalization has a robust positive effect on growth of output across sectors. This effect is present across all configurations of fixed effects, and its magnitude is stable as well. The last four columns present the results of using only the one control country for each liberalization episode, identified using the propensity score matching algorithm. The different columns include different configurations of fixed effects, in the same sequence as the first four columns. Using the PSM control group, we still find a robust positive effect, significant at 1% in all cases. While the choice of control group methodology changes the sample size, the coefficient estimates are reliably significant and similar across samples.

As we had done in the previous empirical exercise, we now investigate the mechanisms behind this positive growth effect. Table 5 presents the results. All of the specifications are presented only with country and group×time fixed effects, though the results are robust across the various fixed effects configurations. The first two columns present the results for

the growth rate in the number of firms. The evidence here is mixed. While the full control group sample produces zero effect, when we select the control group with the propensity score procedure, it turns out that the effect of financial liberalization on entry is strongly positive. When it comes to employment (columns 3 and 4), we see that here we have our most robust results: the growth rate of sector-level employment increases with financial liberalization. These results are robust to the alternative control groups, and to all configurations of fixed effects, which we do not report here. Columns (5) and (6) investigate the effect of financial liberalization on capital accumulation. We can see that the effect is positive and robustly significant. Finally, once again there does not appear to be a robust positive effect of financial liberalization on TFP. In one of the specifications it is not significant, while in the other there is a positive and marginally significant coefficient. This runs counter to the standard intuition, as financial liberalization is expected to channel funds to the most productive firms. However, the key question is who is the marginal firm able to obtain finance due to liberalization? We provided some evidence that financial liberalization increases entry. If the marginal entrant is less productive than the existing firms in the economy, enough entry can actually reduce measured productivity at sector level.

We next use this model to examine the effect of financial liberalization on volatility. Table 6 presents the results of estimating equation (6) using the volatility of the growth rate of output. The first four columns use the full control group, while the second column uses the propensity score matched group. The columns differ in their use of fixed effects, identically to the estimates of growth effect of financial liberalization in Table 4. Financial liberalization does seem to raise volatility, as the coefficients of interest with both the full and the propensity score matching control groups are positive and significant in all but two cases. The coefficient is stable across the control groups and fixed effects configurations.

Finally, we present the results of estimating the empirical model (7)-(8), which exploits the variation in sector characteristics. The results of estimating equation (7) are presented in Table 7. In the first two columns, the dependent variable is the growth rate of output by sector, calculated over the 10-year periods immediately before and after liberalization. All of the specifications include the full set of country×time effects, and sector effects. As we mention before, while the country×time effects control for a wide variety of time-varying country characteristics, their inclusion implies that these specifications cannot tell us whether financial liberalization increases growth. They can only establish whether financial liberalization affects certain sectors differently from others.

It appears that financial liberalization does affect growth by more in sectors which rely

more on external finance, as shown in column 1. There also appears to be a significant effect when it comes to variation in liquidity needs (column 2), with the coefficient is positive and statistically significant. Columns 3 and 4 present results for volatility instead. Financial liberalization does affect the volatility of more financially dependent sectors disproportionately, and it seems to increase the volatility of sectors with higher liquidity needs. In Table 8 we investigate the growth effects further. We attempt to establish whether the differential effect is due to higher entry, employment, capital accumulation, or productivity growth. Column 1 of Table 8 reports the results of using the growth rate of the number of establishments as the dependent variable. We can see that the results are not significant. When we use the growth rate of total employment, as we do in column 2, we find that employment does grow significantly more in sectors which rely more on external finance. Column 3 shows that financial liberalization affects capital accumulation differentially, with more financially dependent sectors receiving more investment. Finally, in column 4 we examine TFP growth, constructed as in the section above. We see that there does not appear to be any effect on productivity.

Overall, these results do suggest that financial liberalization has an important effect on the economy. Exploiting the variation in sectoral characteristics allows us to have a robust identification strategy to establish the existence of a causal effect of financial liberalization on economic outcomes. Indeed, these results are in line with existing literature which employs the same strategy, such as Galindo, Micco, and Ordoñez (2002) and Gupta and Yuan (2006). However, it does not let us estimate the overall growth or volatility effects of financial liberalization.

4.3 Effects of Financial Liberalization Over Time

In this paper, we used a variety of empirical strategies to document the effect of financial liberalization on growth, volatility, and the various subcomponents of output at a 10-year horizon. Going much beyond 10 years would be impractical, as we do not have many liberalization episodes in our sample which occurred more than 10 years before our data ends. However, we can still investigate whether the magnitude of the effect of financial liberalization changes over time. This will allow us to answer whether the impact of liberalization on various outcomes is short-lived, or has a chance to be long-lasting.

In this section, we break the post-liberalization periods into 3-year intervals: 0-2 years, 3-5 years, and so on, and use the difference-in-difference model (5)-(6) with the PSM control group estimate the treatment effect (β_1) for each 3-year period after liberalization.

Examining these coefficients will tell us at which lag the effect of financial liberalization is at its strongest. Figure 1 presents the results. It plots β_1 over time, along with the 90% confidence intervals, for a variety of outcomes. The first panel presents the effect on total output growth. It is clear that the positive effect of financial liberalization occurs early in the sample: the first 6 years. At longer lags, the effect of financial liberalization becomes muted and not statistically significant.

It is clear therefore that the positive effect on output is short-run. How does financial liberalization affect the subcomponents of total output that we analyzed in this paper? The second panel presents the treatment effect on the number of establishments. There is a positive effect in the short run, same as for the total output. However, the coefficient turns negative and significant at longer lags. While we are not sure what is responsible for the negative estimates at longer lags, it is clear that financial liberalization stimulates entry, but only in the short run. Panel 3 presents the results on employment. These mirror the overall output results: a positive and significant short-run effect, becoming muted at longer lags. The results for capital accumulation are presented in Panel 4. What is interesting here is that the effect of financial liberalization is both longer-lasting, and increasing over time, until the 9th year or so after liberalization. Thus, the capital accumulation effects are more persistent than the other outcomes, and, since capital apparently adjusts slowly, take longer to attain the full effect. Unlike the output and employment effects, the effect of financial liberalization on capital accumulation is still positive at the longest lag, but it is not significant due to substantially widened error bands. Panel 5 presents the TFP chart. Consistent with the regression results from virtually all of our specifications, there is virtually no TFP effect. Only in the first there years is there a modestly significant coefficient, but the positive effect quickly disappears. Finally, the bottom right panel considers another outcome, the price-cost margin. It is defined as follows:

$$PCM = \frac{value\ of\ sales - wages - cost\ of\ inputs}{value\ of\ sales},$$

and is meant to capture the size of markups, and thus the competitiveness of the industry (see Braun and Raddatz, 2005). The effect of financial liberalization on the price-cost margin is negative, significant, and quite pronounced. What is remarkable is that it is virtually the only outcome we analyzed which persists in the long run. Furthermore, the impact of financial liberalization on competition actually increases over time according to our estimates, for the first 9 years. Unlike output, entry, or employment, which experience their largest effects on impact, the pro-competition effect of financial liberalization takes time to work through.

5 A Simple Model

In this section, we present a simple model of the pro-competitive effects of financial liberalization that rationalizes the empirical findings of the previous section. In particular, we would like to understand why increased entry does not lead to TFP growth. We use the model to highlight two possible explanations for this effect. First, the relaxation of financial constraints resulting from liberalization leads to entry by firms which are less productive than the incumbents. This is a sensible result: it relies on the notion that the most productive firms are not financially constrained to begin with. Thus, financial liberalization matters most for the less productive firms, which are financially constrained. The second explanation relies on our empirical finding that markups decrease significantly with liberalization. If innovation occurs through prospective entrepreneurs attempting to undertake projects, the reduction in markups and therefore profits also reduces the incentive to innovate.

The pro-competitive mechanism results from the interaction of two market imperfections: borrowing constraints affecting the ability of entrepreneurs to create firms and monopolistic competition inducing markup pricing. In this setup, financial liberalization, by relaxing borrowing constraints, increases firms' entry which in turn fosters employment and output in the production sector but reduces profits and markups.

5.1 The Setup

Our setup embeds the monopolistic competition framework proposed by Behrens and Murata (2007) in an economy with endogenous entry and borrowing constraints.

5.1.1 Agents and Preferences

In this economy, there are L workers each endowed with one unit of labor. Each worker maximizes its utility by consuming goods over a range $(0, N)$ of different varieties according to the following preferences and budget constraint:

$$\begin{aligned} Max_{q_i} U &= \int_0^N \left(1 - e^{-\alpha q_i}\right) di \\ \int p_i q_i di &= E \end{aligned} \tag{12}$$

where q_i is agent individual consumption of variety i priced p_i and E the agent's income. Each variety is produced by a different firm. The economy is also populated with a large

number of entrepreneurs and a large number of lenders. We assume that all profits made by entrepreneurs and lenders are rebated to workers as dividends.

5.1.2 Firms

In order for an entrepreneur to setup a firm, she needs first to spend one unit of labor as a *prospective investment.* She can then uncover the *setup cost* $\widetilde{F}$ of creating a firm, that is the number of labor units that the firm would have to spend before starting production. The level of the *setup cost* is specific to each entrepreneur and is drawn from a uniform distribution over $(0, 2F^*)$. Each firm produces a different variety by using m units of labor. Each entrepreneurs set his price to maximize profits taking as given the individual demand for her variety and the unit labor cost w:

$$\begin{aligned} & \max_{p_i} \pi = q_i \left(p_i - mw\right) \\ s.t \quad : \quad & q_i = q_i(p) \end{aligned}$$

The total net profit of an entrepreneur who has created a firm is then given by:

$$\Pi = \underbrace{\pi}_{\text{profit}} - \underbrace{\tilde{F}w}_{\text{setup cost}} - \underbrace{w}_{\text{prospective investment}}$$

5.1.3 Credit Markets

Each entrepreneur that have spent w in prospective investment can apply for a loan in order to setup a firm. The loan contract specifies the amount of financing b and the interest rate $(1+R)$. We assume that financial contracts are imperfectly enforced. Each entrepreneur by incurring a non-pecuniary cost proportional to the sum of her prospective investment (w) and borrowed funds (b) can *divert* and avoid repayment of the loan. Competitive lenders are willing to lend to entrepreneurs as long as they can recoup their opportunity cost of funds $1+r$. If contract enforceability problems are severe enough $(h < 1+r)$, loan contracts will have to satisfy the following incentive-compatibility constraint:[8]

$$\underbrace{(1+r)b}_{\text{cost of repayment}} \leq \underbrace{h(w+b)}_{\text{cost of diverting}}$$

which is equivalent to a borrowing constraint:

$$b \leq \mu w \equiv \frac{1}{(1+r)h^{-1} - 1} w \tag{13}$$

[8] Formally, the contract must also respect the participation constraint for lenders: $(1+R) \leq 1+r$. Since the lenders are competitive and make zero profits, this constraint will always be binding and $R = r$.

5.1.4 Entry Decision

A prospective entrepreneur will pay the setup cost $\widetilde{F}w$ to start a firm if she finds it profitable ($\widetilde{F}w \leq \pi$)and if she can raise enough funds to cover the setup cost ($\widetilde{F}w \leq \mu w$). The condition for an entrepreneur with cost $\widetilde{F}$ to setup a firm is then given by :

$$\widetilde{F}w \leq \min(\mu w, \pi)$$

The range of prospective entrepreneurs that can create firms is either determined by borrowing constraints - the *financially constrained regime* - or by the level of profits - the *financially unconstrained regime*. In order to focus on the constrained regime, we assume that the maximum setup cost is large enough so that there is always a mass of financially constrained firms in the economy:[9]

$$2F^* > \frac{\mu^2}{2} \qquad \text{(Assumption A1)}$$

In the financially constrained regime, entrepreneurs with a $\tilde{F}$ below μw create a firm and enter the product market. Ex-ante, entrepreneurs decides to prospect if they can expect a positive profit net of setup costs and prospective investments:

$$\frac{1}{2F}\int_0^{\mu}\left(\pi - \tilde{F}w\right) - w \geq 0 \tag{14}$$

Since there is a large number of entrepreneurs that can start prospection, equation (14) binds at zero as a *free-entry condition* into prospection and yields:

$$\pi = w\left(\frac{2F^*}{\mu} + \frac{\mu}{2}\right) \tag{15}$$

In the next section, we solve for the level of profit conditional on the number of firms in the economy. Solving backwards, one will then use (15) in order to solve for the equilibrium number of firms, output, prices and the distribution of the workforce in the economy.

5.2 Product Market Equilibrium

Using Behrens and Murata (2007) to solve the consumer program (12) and imposing a symmetric equilibrium($\forall j, k, p_j = p_k$), one obtains the demand schedule faced by firms as:

$$q_i = \frac{E}{P} - \frac{1}{\alpha}\left[\ln\left(\frac{p_i}{P}\right) + \ln N\right] \tag{16}$$

where the price index is equal to $P \equiv \int_0^N p_j dj$.

[9] The analysis of the unconstrained regime is left to the appendix.

Solving the firm pricing problem given the demand schedule (16) yields the optimal level of the markup:

$$p_i - mw = \frac{\alpha E}{N} \tag{17}$$

Notice that the markup is negatively related with the number of firms. Hence, in contrast with the standard Dixit-Stiglitz (1977) framework, a higher number of firms and the associated increase in the number of varieties available to consumers forces each firm to reduce its markup and its level of profits. In our setup, an increase in firms' entry will therefore have a *pro-competitive effect*.

Using the markup and the resulting demand gives the profit of the individual firm:

$$\pi_i = \frac{\alpha L}{N\left[Nm\frac{w}{E} + \alpha\right]}E \tag{18}$$

and aggregating demand yields the total output of each firm :

$$Q_i \equiv Lq_i = \frac{L}{[Nm + \alpha]} \tag{19}$$

5.3 Macroeconomic equilibrium:

The economy-wide resources constraint states that total expenditures should equate total wages plus any net profits paid as dividend to workers by firms or lenders. Lenders are competitive and make zero profits while the free-entry condition for prospective entrepreneurs implies that $\int_0^N \Pi_i di = 0$. Hence total expenditures are equal to:

$$EL = w + \underbrace{\int_0^N \Pi_i di}_{dividends=0} = wL \Leftrightarrow w = E$$

Substituting the resource constraint into the profit equation implies that

$$\pi = \frac{\alpha L}{N\left[Nm + \alpha\right]} \tag{20}$$

By combining (20) which gives the profit conditional to the number of firms operating in the economy and (15) which gives the number of firms conditional on the level of profits, we obtain implicitly the equilibrium number of firms:

$$\frac{\alpha L}{N\left[Nm + \alpha\right]} = w\left(\frac{2F^*}{\mu} + \frac{\mu}{2}\right) \tag{21}$$

Equation (21) indicates that a relaxation of the borrowing constraint - an increase in μ - implies a higher entry of firms. Solving (21) yields the equilibrium number of firms N^*.[10] By substituting N^* into (17), (19) and (20), we obtain the equilibrium level of price, output and profit. Finally, we use the labor market clearing condition to analyze the distribution of the workforce between prospection, the setup of firms and production:

$$L = \underbrace{\left(\int_0^N mQ_i di\right)}_{\text{production}} + \underbrace{N.\frac{1}{2F^*}\int_0^\mu \tilde{F}\, dF}_{\text{setup}} + \underbrace{\frac{N}{\frac{1}{2F^*}\int_0^\mu dF}}_{\text{prospection}} \tag{22}$$

$$L = \frac{L}{1+(\alpha/mN)} + \frac{N\mu^2}{2} + \frac{N2F^*}{\mu} \tag{23}$$

An increase in the number of firms entering the market after a relaxation of the borrowing constraints increases the number of workers used for setting up firms. It also increases the number of workers employed in the production of goods. As a consequence, the share of the workforce devoted to prospection has to fall. The latter implies that the net value of prospection must decrease. We illustrate this point on Figure 2. A relaxation of the borrowing constraint by lifting the financial barriers to entry makes more likely that prospection will lead to actual firm creation. In the mean time, profit generating by each firm is going down, reducing the incentive to prospect. The latter effect dominates and explains the reduction in the intensity of prospection observed in equilibrium.

5.4 The effects of financial liberalization.

5.4.1 The leverage effect

In our simple model, we identify financial liberalization with a reduction in the cost of funds for lenders $(1+r)$. A possible interpretation is that entrepreneurs can now issue debt to foreign investors who finance themselves at the world interest rate $(1+r^*)$, which is assumed to be lower that the domestic interest rate in the financially closed economy.[11] The effect of a reduction of the interest rate is transmitted to the entrepreneurs through a *leverage effect* induced by the relaxation of the borrowing constraint (13). By reducing the incentive to divert, a reduction of the interest rate allows entrepreneurs to leverage their prospective investment (w) with a higher level of debt (b).

[10] $N^* = (2m)^{-1}\left(\sqrt{4\alpha m\left(w\frac{2F^*}{\mu}+w\frac{\mu}{2}\right)^{-1}L+\alpha}-\alpha\right)$

[11] In a slightly different setup where lenders have some monopolistic power, we could identify financial liberalization with a reduction in the borrowing costs of entrepreneurs that result from increased competition in the financial sector.

5.4.2 Entry and the pro-competitive effect

The relaxation of the borrowing constraint allows a larger range of firms to be able to finance the setup cost. This leads a higher number of prospective entrepreneurs to become producers. Using the equilibrium results presented in the previous section (5.3), we can then summarize the effects of financial liberalization in the following proposition.

Proposition 1 (The pro-competitive effect of financial liberalization) *Financial liberalization relaxes borrowing constraints faced by entrepreneurs in the credit market. As a consequence, entry in the product market and the equilibrium number of firms increase. Higher entry increases output and employment in the producing sector but decreases markups, profits and prospective investment.*

5.4.3 Total factor productivity without externalities

An important question is how the relaxation of the borrowing constraints by allowing new firms to enter in the product markets affects the observed level of total factor productivity in the economy. In our setup, in order to produce q units of output, the firm with setup cost $\tilde{F}$ must employ $mq + \tilde{F}$ workers and thus displays the following total factor productivity:

$$\frac{q}{mq + \tilde{F}} = \frac{1}{m + \frac{\tilde{F}}{q}} \equiv \frac{1}{uc}.$$

Firm's TFP is equivalent to labor productivity and can be expressed as the inverse of the unit cost of production $m + \frac{\tilde{F}}{q}$. For a given marginal productivity of labor (m), the unit cost of production increases in the setup cost $\tilde{F}$ and decreases with the scale of production (q) since production exhibits increasing returns to scale. In order to compute average TFP in the economy, one need to compute first the average unit cost across heterogenous firms:

$$\overline{uc} = \frac{1}{2F^*} \int_0^{\mu} \left(m + \frac{\tilde{F}}{q} \right) d\tilde{F} = \frac{1}{2F^*} \left(m\mu + \frac{1}{2q}\mu^2 \right) \tag{24}$$

By combining (24) with the scale of production $q = \frac{1}{mN+\alpha}$, we obtain the average level of TFP:

$$TFP = \frac{1}{\overline{uc}} = 2F^* \left[m\mu + \frac{1}{2} \left(mN^* + \alpha \right) \mu^2 \right]^{-1} \tag{25}$$

where N^* is given the equilibrium number of firms and is increasing in μ.

The last expression indicates that a relaxation of the borrowing constraint leads to *a reduction* in total factor productivity. This reduction operates through two channels. First,

as you relax the credit constraint, the firms that enter are the relatively inefficient ones, i.e. with higher than average $\tilde{F}$. Since the average firm uses more labor to cover fixed costs, measured productivity decreases. Second, while the total number of firms increases, the scale of production of each individual firm goes down ($q = \frac{1}{mN^* + \alpha}$) and thus firms are less able to take advantage of increasing returns:the fixed cost per unit of output, $\frac{\tilde{F}}{q}$, increases. We can summarize our findings in the following proposition.

Proposition 2 (TFP) *In absence of any knowledge or production externalities, financial liberalization by increasing the number of firms decreases total factor productivity as (i) less efficient firms enter the product market (ii) the average size of each firm decreases.*

The results presented in the proposition may be surprising at first. The previous literature on finance as a barrier to entry (e.g. Rajan and Zingales (2003)) suggest that financial constraints are detrimental to the emergence of new firms with better ideas and better products and beneficial to entrenched firms with aging productivity. For this later argument to be valid, however, there must be a mechanism that disconnects the ability for firms to cover their financing needs from their actual level of productivity. In contrast in our setup, the most productive firms are also the ones that can finance their setup cost more easily and are thus less affected by the existence of credit rationing in the loan market. Hence, the presence of borrowing constraints has a *selection effect*: it drives out the less productive firms from the product market . Notice that such a link between market regulation and productivity has been observed elsewhere. For example, several studies have related the high observed labor productivity of workers in France to strong labor market regulations that leave the less productive workers out of the workforce.

5.4.4 Total factor productivity with knowledge externalities

In the analysis above, changes in total factor productivity are driven by endogenous changes in the mix and size of firms operating in the economy after financial liberalization. In this section, we extend the basic model to analyze the effect of financial liberalization on the marginal productivity of labor (m) and TFP under two alternative forms of knowledge spillover.[12]

[12]Notice that an increase in the productivity of labor (a reduction in m) has two effects on total factor productivity (2): a direct positive effect associated with efficiency gains in production and an indirect effect through a change in the equilibrium number of firms.

We now assume that the productivity of labor is endogenous and depends either on the stock of ideas (or any form of non-proprietary innovations) that have been developed by prospective entrepreneurs or on the stock of ideas that have been implemented by firms entering the product market. We refer to the first case as *strong knowledge spillover* and the second case as *light knowledge spillover.* For simplicity we assume a linear relationship between marginal labor productivity and either the number of prospective entrepreneurs and the number of firms:

$$\begin{aligned} \text{hard knowledge spillover} \quad &: \quad \frac{1}{m} = \frac{N}{\frac{1}{2F^*}\int_0^{\mu} dF} \\ \text{light knowledge spillover} \quad &: \quad \frac{1}{m} = N \end{aligned}$$

We show in the appendix that in the case of hard knowledge spillover, financial liberalization by discouraging prospection hinders the production of the stock of ideas and thus decreases marginal productivity of labor. Moreover if the maximum setup cost F^* is large enough, the number of firms increases and then a reduction in the marginal productivity of labor unambiguously translates into lower total factor productivity. In the case of light spillover, financial liberalization by favoring entry increases the marginal productivity of each firm. Since higher entry also increases the other cost factors (the average setup cost and firm size), the total effect on TFP is ambiguous and this scenario is indeed consistent with the empirical evidence of no significant change in productivity after financial liberalization.

5.4.5 Sectoral heterogeneity

It is relatively straightforward to extend the framework above to allow for multiple and heterogeneous sectors. Assume for instance that the quality of contract enforceability measured by the parameter h varies across sector as a consequence, for instance, of differences in the tangibility of assets. Two sectors with different h, will have then different leverages *prior* to financial liberalization. Letting h_j and h_k be the level contract enforceability in sector j and sector k respectively and using the borrowing constraint equation (13), we observe that:

$$h_j > h_k \Leftrightarrow \mu_j > \mu_k$$

Hence sectors with better enforceability of contract (higher h) are more leveraged before liberalization. We must then observe that firms in these sectors,on average, rely more on

external finance. What happens next with financial liberalization? It is easy to show that:

$$\frac{\partial^2 \mu}{\partial h(-\partial r)} > 0$$

The leverage effect associated with financial liberalization ($\frac{\partial \mu}{\partial(-r)}$) is exacerbated for firms that were already more leveraged to start with. Hence the effects of financial liberalization described above will be stronger in sectors that rely more on external finance.

6 Conclusion

It is often argued, both theoretically and empirically, that financial liberalization should affect economic growth. At the same time, claims that financial liberalization increases volatility are made just as often. This paper uses a large panel of industry-level data to analyze both growth and volatility effects within the same empirical framework. A key strength of our approach is the number of alternative strategies we use to estimate these relationships. We use both de facto and de jure measures of liberalization, and employ a variety of difference-in-differences estimates. We exploit sector characteristics, use other countries as controls, develop a propensity score matching procedure to overcome selection on observables, and use a variety of fixed effects throughout to control for omitted variables. What is remarkable is that the conclusions we reach are virtually the same across all empirical strategies.

There is strong evidence that financial liberalization increases both growth and volatility of output. A striking result is that those effects are not long-lasting: they typically vanish after 6 years. In addition, our dataset allows us to look deeper into the channels for the overall effect of liberalization, and analyze a variety of outcomes besides output growth. We observe an increase in the growth of employment and capital formation. We also find that liberalization exerts procompetitive pressures on the product market: we observe a transitory increase in the entry of firms and a permanent drop in the price to cost margin. Finally the growth rate of TFP does not seem to be affected by liberalization.

There are several fruitful directions for future work. A theoretical framework should be developed in order to offer a integrated view of our empirical results: while evidence on the short-run effect of financial liberalization is compatible with a pure neoclassical growth model, the procompetitive effect involves different theoretical channels. In particular the fact that this procompetitive effect does not translate into a productivity boom should be accounted for. A related question is whether we can establish the welfare implications of

financial integration. Higher growth and volatility simultaneously have conflicting implications, and it is important to sort out which one dominates. Finally, we would like to better understand how country characteristics, such as financial development, institutions, labor and product market regulations, affect the response to financial liberalization.

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Figure 1: The Time Evolution of the Effect of Financial Liberalization

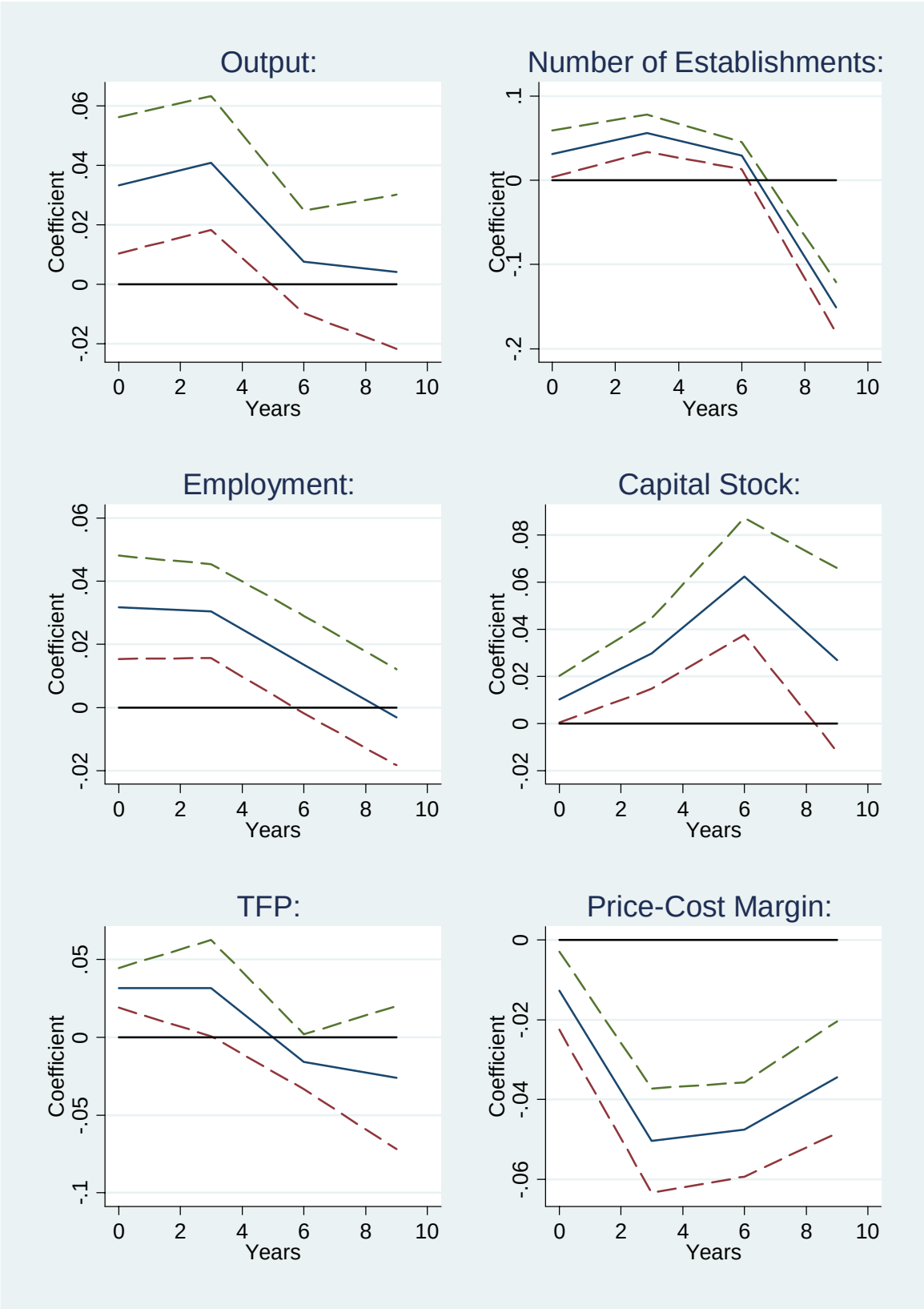

Figure 2 : Effect of an increase in μ on the expected Value of prospective investment

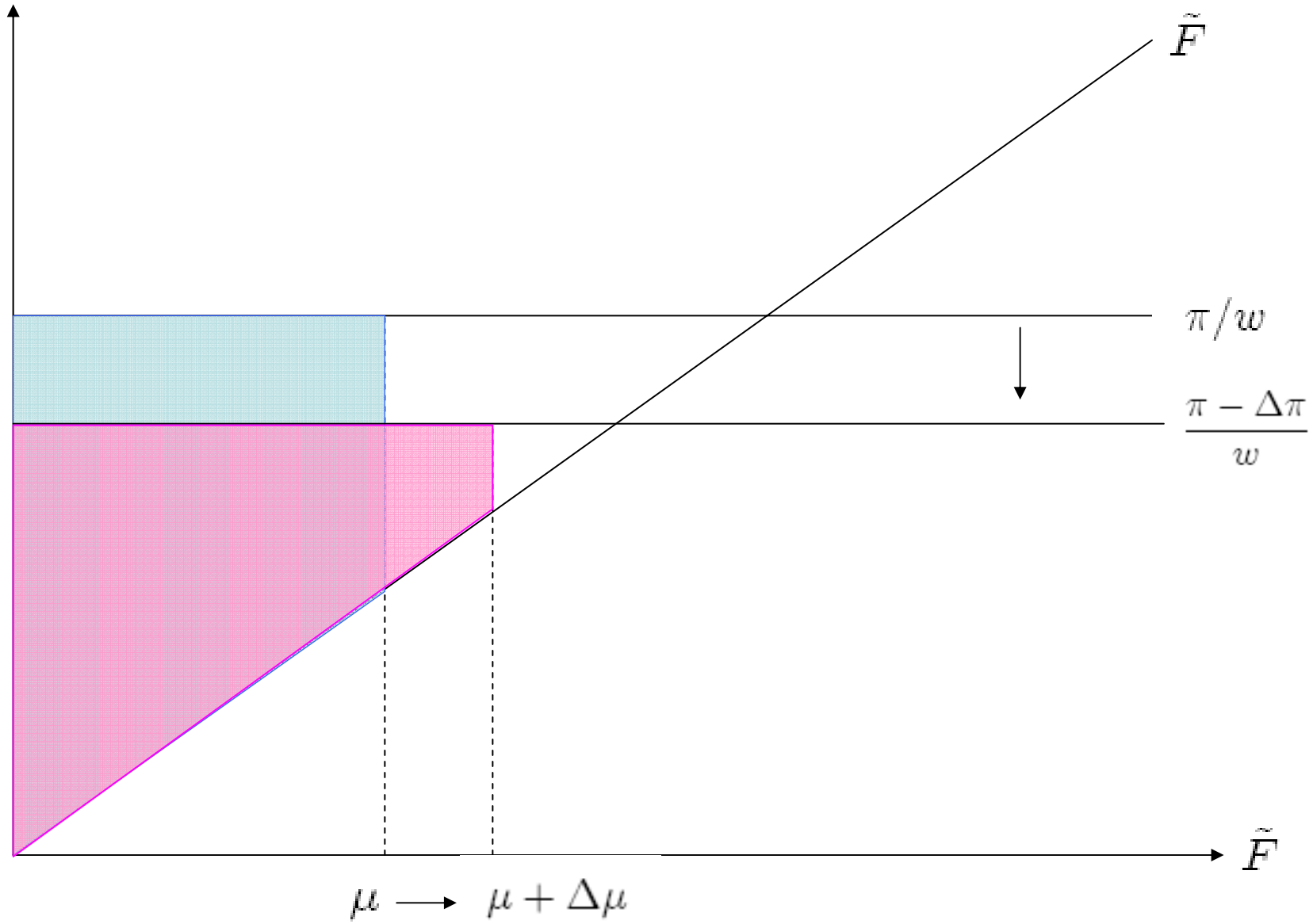

Table 1: De Facto Financial Liberalization and Growth, 10-year Panel Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.: Growth Rate of Output						
FINLIB	0.243***	0.245***	0.229**	0.236**		
	[0.071]	[0.071]	[0.102]	[0.102]		
Log(Output/Worker)	0.016***	0.016***	0.031***	0.030**	0.015***	0.015***
	[0.004]	[0.004]	[0.011]	[0.012]	[0.004]	[0.004]
Share	0.034	0.032	0.032	-0.021	0.019	0.027
	[0.031]	[0.031]	[0.133]	[0.144]	[0.029]	[0.029]
Trade/Output	-0.008	-0.007	0.000	0.002	-0.012	-0.012
	[0.022]	[0.021]	[0.027]	[0.027]	[0.019]	[0.018]
Extern.Fin*FINLIB					0.212***	
					[0.058]	
Liq.Needs*FINLIB						0.39
						[0.383]
Country FE	yes	yes	no	no	no	no
Sector FE	yes	no	no	no	no	no
Time FE	yes	no	yes	no	no	no
Country*Sector FE	no	no	yes	yes	no	no
Sector*Time FE	no	yes	no	yes	yes	yes
Country*Time FE	no	no	no	no	yes	yes
Observations	3801	3801	3801	3801	3801	3801
R-squared	0.32	0.34	0.56	0.59	0.41	0.41

Notes: Robust standard errors in brackets; standard errors are clustered at country-time level in columns (1)-(4); * significant at 10%; ** significant at 5%; *** significant at 1%. The sample is a panel of three decades, 1970-79, 1980-89 and 1990-99; all of the variables are 10-year averages. The dependent variable is the growth rate of output. *FINLIB* is gross capital flows, defined as the absolute value of total inflows plus the absolute value of total outflows. *Log(Output/Worker)* is the log of output per worker in a sector. *Share* is the share of output in a sector in total manufacturing output. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Extern.Fin.* is the sector-level measure of reliance on external finance. *Liq. Needs* is the sector-level measure of liquidity needs. All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 2: De Facto Financial Liberalization and Growth, 10-year Panel Estimates, Channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Number of Establishments		Employment		Capital Accumulation		Total Factor Productivity	
FINLIB	0.229*		0.248**		0.236***		-0.072	
	[0.118]		[0.097]		[0.079]		[0.086]	
Extern.Fin*FINLIB		0.132**		0.207***		0.182***		0.022
		[0.055]		[0.048]		[0.050]		[0.066]
Log(Output/Worker)	0.000	0.005	0.001	0.006*	0.019*	0.010***	0.010	0.010*
	[0.022]	[0.004]	[0.011]	[0.003]	[0.010]	[0.003]	[0.012]	[0.006]
Share	-0.23	0.038	-0.071	0.021	0.294***	0.081***	-0.12	-0.039
	[0.250]	[0.032]	[0.119]	[0.022]	[0.078]	[0.029]	[0.089]	[0.035]
Trade/Output	0	0.055*	0.025	0.029	0.002	0.009***	-0.001	-0.013
	[0.035]	[0.031]	[0.023]	[0.023]	[0.020]	[0.003]	[0.014]	[0.009]
Country*Sector FE	yes	no	yes	no	yes	no	yes	no
Sector*Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Country*Time FE	no	yes	no	yes	no	yes	no	yes
Observations	2254	2254	3803	3803	3032	3032	3023	3023
R-squared	0.63	0.4	0.58	0.44	0.66	0.5	0.52	0.2

Notes: Robust standard errors in brackets; standard errors are clustered at country-time level in columns (1), (3), and (5); * significant at 10%; ** significant at 5%; *** significant at 1%. The sample is a panel of three decades, 1970-79, 1980-89 and 1990-99; all of the variables are 10-year averages. The dependent variable is the growth rate of the number of establishments, total employment, or labor productivity (value added per worker), in a sector. *FINLIB* is gross capital flows, defined as the absolute value of total inflows plus the absolute value of total outflows. *Log(Output/Worker)* is the log of output per worker in a sector. *Share* is the share of output in a sector in total manufacturing output. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Extern.Fin.* is the sector-level measure of reliance on external finance. All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 3: De Facto Financial Liberalization and Volatility, 10-year Panel Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.: Standard Deviation of the Growth Rate of Output						
FINLIB	0.254**	0.260**	0.244*	0.254*		
	[0.104]	[0.106]	[0.144]	[0.146]		
Log(Output/Worker)	-0.007	-0.007*	0.003	0.001	-0.005	-0.005
	[0.004]	[0.004]	[0.014]	[0.014]	[0.005]	[0.005]
Share	-0.239***	-0.242***	-0.046	-0.064	-0.248***	-0.245***
	[0.038]	[0.039]	[0.138]	[0.157]	[0.040]	[0.040]
Trade/Output	0.001	0.002	-0.007	-0.003	0.000	0.000
	[0.025]	[0.023]	[0.023]	[0.023]	[0.023]	[0.023]
Extern.Fin*FINLIB					0.160**	
					[0.079]	
Liq.Needs*FINLIB						1.345**
						[0.574]
Country FE	yes	yes	no	no	no	no
Sector FE	yes	no	no	no	no	no
Time FE	yes	no	yes	no	no	no
Country*Sector FE	no	no	yes	yes	no	no
Sector*Time FE	no	yes	no	yes	yes	yes
Country*Time FE	no	no	no	no	yes	yes
Observations	3785	3785	3785	3785	3785	3785
R-squared	0.39	0.41	0.65	0.66	0.48	0.48

Notes: Robust standard errors in brackets; standard errors are clustered at country-time level in columns (1)-(4); * significant at 10%; ** significant at 5%; *** significant at 1%. The sample is a panel of three decades, 1970-79, 1980-89 and 1990-99; all of the variables are 10-year averages. The dependent variable is the standard deviation of the growth rate of output over the 10-year period. *FINLIB* is gross capital flows, defined as the absolute value of total inflows plus the absolute value of total outflows. *Log(Output/Worker)* is the log of output per worker in a sector. *Share* is the share of output in a sector in total manufacturing output. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Extern.Fin.* is the sector-level measure of reliance on external finance. *Liq. Needs* is the sector-level measure of liquidity needs. All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 4: Difference-in-Differences Results Based on Control Countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.: Growth Rate of Output								
Treated	0.020**	0.020**	0.018***	0.020**	0.035***	0.034***	0.027***	0.035***
	[0.008]	[0.008]	[0.006]	[0.009]	[0.009]	[0.008]	[0.005]	[0.010]
Post	-0.011***	-0.010***	-0.095***	-0.011***	-0.027***	-0.026***	-0.046***	-0.026***
	[0.004]	[0.004]	[0.013]	[0.004]	[0.005]	[0.004]	[0.000]	[0.005]
Trade/Output	-0.001	-0.007	-0.001	-0.002***	0.002	0.009	0.002	-0.005**
	[0.001]	[0.008]	[0.001]	[0.001]	[0.001]	[0.011]	[0.001]	[0.002]
Share	0.115***	0.824*	0.114***	0.119***	0.186***	2.841***	0.185***	0.276***
	[0.017]	[0.419]	[0.017]	[0.043]	[0.030]	[0.504]	[0.030]	[0.064]
Country FE	yes	no	yes	yes	yes	no	yes	yes
Country*Sector FE	no	yes	no	no	no	yes	no	no
Group*Time FE	no	no	yes	no	no	no	yes	no
Group*Sector FE	no	no	no	yes	no	no	no	yes
Control Group	ALL	ALL	ALL	ALL	PSM	PSM	PSM	PSM
Observations	3806	3806	3806	3806	1724	1724	1724	1724
R-squared	0.31	0.69	0.36	0.48	0.39	0.76	0.43	0.63

Notes: Robust standard errors clustered at country*time level in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the average growth rate of output during the 10 years immediately before or immediately after an episode of financial liberalization. *Treated* takes on the value of 1 if a liberalization event took place in a country, and zero otherwise. *Post* takes on the value of zero before the liberalization event, and 1 after, for all countries irrespective of whether they liberalized. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Share* is the share of output in a sector in total manufacturing output. In the first 4 columns the control group consists of all countries (within the group of OECD/non-OECD) which did not liberalize within the 20-year period. In the last four columns the control group is the country selected by the propensity score matching procedure (PSM). All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 5: Difference-in-Differences Results Based on Control Countries, Channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Number of Establishments		Employment		Capital accumulation		Total factor productivity	
Treated	0.003	0.031***	0.013**	0.024***	0.029***	0.040***	0.008	0.010*
	[0.005]	[0.006]	[0.005]	[0.004]	[0.010]	[0.010]	[0.007]	[0.006]
Post	0.034***	-0.026***	0.001	-0.050***	-0.043***	-0.054***	-0.004	-0.041***
	[0.012]	[0.000]	[0.006]	[0.000]	[0.010]	[0.010]	[0.007]	[0.006]
Trade/Output	0.000	0.002	0.000	0.003**	0.001	0.006***	-0.001	-0.002
	[0.000]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]
Share	0.040**	0.082***	0.100***	0.168***	0.146***	0.175***	-0.01	0.029
	[0.019]	[0.024]	[0.017]	[0.020]	[0.013]	[0.022]	[0.012]	[0.023]
Country FE	yes	yes	yes	yes	yes	yes	yes	yes
Group*Time FE	yes	yes	yes	yes	yes	yes	yes	yes
Control Group	ALL	PSM	ALL	PSM	ALL	PSM	ALL	PSM
Observations	2874	1496	3839	1745	3295	1530	3276	1526
R-squared	0.38	0.43	0.35	0.43	0.54	0.61	0.19	0.15

Notes: Robust standard errors clustered at country*time level in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the average growth rate of the number of establishments, total employment, and labor productivity (value added per worker) during the 10 years immediately before or immediately after an episode of financial liberalization. *Treated* takes on the value of 1 if a liberalization event took place in a country, and zero otherwise. *Post* takes on the value of zero before the liberalization event, and 1 after, for all countries irrespective of whether they liberalized. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Share* is the share of output in a sector in total manufacturing output. In columns (1), (3) and (5) the control group consists of all countries (within the group of OECD/non-OECD) which did not liberalize within the 20-year period. In columns (2), (4), and (6) the control group is the country selected by the propensity score matching procedure (PSM).

All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 6: Difference-in-Differences Results Based on Control Countries, Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.: Standard Deviation of the Growth Rate of Output								
Treated	0.019**	0.021**	0.011	0.020*	0.020*	0.023*	0.022***	0.023
	[0.010]	[0.010]	[0.007]	[0.010]	[0.012]	[0.012]	[0.007]	[0.014]
Post	-0.002	-0.002	-0.015*	-0.001	-0.003	-0.003	0.020***	-0.003
	[0.005]	[0.005]	[0.008]	[0.005]	[0.008]	[0.008]	[0.000]	[0.010]
Trade/Output	0.006***	0.017***	0.006***	0.004***	0.008***	-0.002	0.008***	0.001
	[0.002]	[0.006]	[0.002]	[0.001]	[0.003]	[0.014]	[0.003]	[0.002]
Share	-0.225***	0.15	-0.225***	-0.058	-0.156***	1.105	-0.156***	0.047
	[0.027]	[0.498]	[0.027]	[0.050]	[0.047]	[1.001]	[0.047]	[0.089]
Country FE	yes	no	yes	yes	yes	no	yes	yes
Country*Sector FE	no	yes	no	no	no	yes	no	no
Group*Time FE	no	no	yes	no	no	no	yes	no
Group*Sector FE	no	no	no	yes	no	no	no	yes
Control Group	ALL	ALL	ALL	ALL	PSM	PSM	PSM	PSM
Observations	3806	3806	3806	3806	1724	1724	1724	1724
R-squared	0.27	0.71	0.28	0.49	0.28	0.72	0.31	0.57

Notes: Robust standard errors clustered at country*time level in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the average growth rate of output during the 10 years immediately before or immediately after an episode of financial liberalization. Treated takes on the value of 1 if a liberalization event took place in a country, and zero otherwise. Post takes on the value of zero before the liberalization event, and 1 after, for all countries irrespective of whether they liberalized. Trade/Output is the imports plus exports in the sector divided by the total output in the sector. Share is the share of output in a sector in total manufacturing output. In the first 4 columns the control group consists of all countries (within the group of OECD/non-OECD) which did not liberalize within the 20-year period. In the last four columns the control group is the country selected by the propensity score matching procedure (PSM). All specifications are estimated using OLS, and including the fixed effects specified in the table. Variable definitions and sources are described in detail in the text.

Table 7: Difference-in-Differences Results Based on Industry Characteristics

	(1)	(2)	(3)	(4)
	Output			
	Growth		Volatility	
Extern.Fin*treated	0.020**		0.028*	
	[0.009]		[0.015]	
Liq.Needs*treated		0.133**		0.201**
		[0.065]		[0.096]
Trade/Output	-0.005***	-0.005***	0.002	0.002
	[0.002]	[0.002]	[0.004]	[0.004]
Share	0.175***	0.174***	-0.026	-0.034
	[0.067]	[0.066]	[0.151]	[0.148]
Country*Time FE	yes	yes	yes	yes
Sector FE	yes	yes	yes	yes
Observations	847	847	847	847
R-squared	0.56	0.56	0.46	0.46

Notes: Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the average growth rate, or the standard deviation of the growth rate of output during the 10 years immediately before or immediately after an episode of financial liberalization. *Treated* takes on the value of 1 if a liberalization event took place, and zero otherwise. *Extern.Fin* . is the sector-level measure of reliance on external finance. *Liq. Needs* is the sector-level measure of liquidity needs. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Share* is the share of output in a sector in total manufacturing output. All specifications are estimated using OLS, and including country*time and sector fixed effects. Variable definitions and sources are described in detail in the text.

Table 8: Difference-in-Differences Results Based on Industry Characteristics, Channels

	(1)	(2)	(3)	(4)
	Growth			
	Number of firms	Employment	Capital accumulation	Total factor productivity
Extern.Fin*treated	-0.005	0.020***	0.014*	0.009
	[0.008]	[0.007]	[0.007]	[0.009]
Trade/Output	-0.004***	-0.001	0.003	-0.003
	[0.001]	[0.002]	[0.002]	[0.003]
Share	-0.009	0.201***	0.150***	0.049
	[0.045]	[0.069]	[0.053]	[0.058]
Country*Time FE	yes	yes	yes	yes
Sector FE	yes	yes	yes	yes
Observations	701	872	776	773
R-squared	0.44	0.58	0.68	0.23

Notes: Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the average growth rate of the number of establishments, total employment, and labor productivity (value added per worker) during the 10 years immediately before or immediately after an episode of financial liberalization. *Treated* takes on the value of 1 if a liberalization event took place, and zero otherwise. *Extern.Fin* . is the sector-level measure of reliance on external finance. *Liq. Needs* is the sector-level measure of liquidity needs. *Trade/Output* is the imports plus exports in the sector divided by the total output in the sector. *Share* is the share of output in a sector in total manufacturing output. All specifications are estimated using OLS, and including country*time and sector fixed effects. Variable definitions and sources are described in detail in the text.

Appendix Table A1: Country Sample and Summary Statistics

	Total Manufacturing Output		Gross Capital		Total Manufacturing Output		Gross Capital
Country	Growth	St. Dev.	Flows	Country	Growth	St. Dev.	Flows
Australia	0.017	0.033	0.065	Korea, Rep.	0.105	0.075	0.068
Austria	0.020	0.048	0.123	Malawi	0.057	0.117	0.080
Bangladesh	0.072	0.211	0.033	Malaysia	0.122	0.078	0.092
Canada	0.035	0.062	0.099	Malta	0.044	0.088	0.514
Chile	0.051	0.122	0.107	Mauritius	0.051	0.062	0.048
Colombia	0.037	0.044	0.044	Mexico	0.042	0.114	0.046
Costa Rica	0.011	0.080	0.055	Netherlands	0.014	0.084	0.162
Cyprus	0.079	0.097	0.112	New Zealand	0.017	0.049	0.050
Denmark	0.006	0.032	0.099	Norway	0.025	0.057	0.101
Ecuador	0.066	0.107	0.079	Pakistan	0.078	0.054	0.041
Egypt, Arab Rep.	0.045	0.071	0.069	Peru	-0.017	0.105	0.069
Fiji	0.040	0.103	0.068	Philippines	0.055	0.087	0.082
Finland	0.029	0.068	0.102	Poland	0.013	0.119	0.071
France	0.022	0.054	0.105	Portugal	0.054	0.089	0.110
Germany	0.020	0.048	0.082	Senegal	0.032	0.143	0.072
Greece	0.013	0.048	0.041	Singapore	0.110	0.119	0.326
Guatemala	0.044	0.120	0.049	South Africa	-0.004	0.076	0.051
Honduras	0.056	0.058	0.067	Spain	0.032	0.073	0.076
Hungary	-0.011	0.080	0.078	Sri Lanka	0.086	0.182	0.061
Iceland	0.031	0.059	0.051	Sweden	0.017	0.068	0.111
India	0.069	0.065	0.017	Syrian Arab Republic	0.104	0.201	0.043
Indonesia	0.114	0.066	0.054	Tanzania	-0.015	0.109	0.033
Ireland	0.052	0.065	0.149	Trinidad and Tobago	0.050	0.137	0.067
Israel	0.048	0.121	0.122	Turkey	0.068	0.074	0.030
Italy	0.040	0.089	0.084	United Kingdom	0.020	0.083	0.114
Jamaica	0.029	0.076	0.062	United States	0.024	0.052	0.053
Japan	0.018	0.057	0.047	Uruguay	0.014	0.124	0.080
Jordan	0.116	0.154	0.113	Zimbabwe	0.064	0.098	0.033

Notes: The first two columns report the average growth rate and the standard deviation of the growth rate of total manufacturing output (source: UNIDO database, 2006). The last column reports the average gross capital flows -- absolute value of inflows plus the absolute value of outflows as a share of GDP (source: IMF Balance of Payments Statistics) -- which is used in this paper as a de facto measure of financial integration.

Appendix Table A2: Measures of External Dependence and Liquidity Needs

ISIC code	Industrial sector	External dependence	Liquidity needs
311	Food products	0.14	0.11
313	Beverages	0.08	0.09
314	Tobacco	-0.45	0.24
321	Textile	0.19	0.16
322	Apparel	0.03	0.20
323	Leather	-0.14	0.27
324	Footwear	-0.08	0.22
331	Wood products	0.28	0.13
332	Furniture	0.24	0.16
341	Paper and products	0.17	0.11
342	Printing and publishing	0.2	0.08
351	Industrial chemicals	0.25	0.13
352	Other chemicals	0.75	0.15
353	Petroleum refineries	0.04	0.06
354	Petroleum and coal products	0.33	0.15
355	Rubber products	0.23	0.14
356	Plastic products	1.14	0.14
361	Pottery	-0.15	0.17
362	Glass	0.53	0.16
369	Nonmetal products	0.06	0.15
371	Iron and steel	0.09	0.16
372	Nonferrous metal	0.01	0.15
381	Metal products	0.24	0.18
382	Machinery	0.6	0.21
383	Electric machinery	0.95	0.21
384	Transportation equipment	0.36	0.15
385	Professional goods	0.96	0.22
390	Other industries	0.47	0.21

Source: Klingebiel, Kroszner, and Laeven (2007) and Raddatz (2006). External dependence is defined as capital expenditure minus cash flow, divided by capital expenditure. Liquidity needs are defined as inventories/sales. Both measures are constructed based on US firm-level data

Appendix Table A3: Liberalization Episodes

Liberalizing Country	Liberalization year	Control Country
Canada	1976	Denmark
United Kingdom	1981	Spain
Germany	1982	Japan
United States	1982	Japan
Denmark	1989	Canada
Norway	1989	Canada
Sweden	1989	Chile
Finland	1990	Canada
France	1990	Canada
Indonesia	1990	Korea, Rep.
Ireland	1992	Korea, Rep.
Italy	1992	Germany
Japan	1992	Germany
Mexico	1992	Korea, Rep.
Peru	1992	Korea, Rep.
Portugal	1993	Korea, Rep.
Spain	1993	Germany
Chile	1999	Malaysia
Taiwan Province of China	1999	Malaysia

Notes: This table reports the countries and years of liberalization episodes, defines as the year in which the Kaminsky and Schmukler (2004) index starts taking on the value of 3. The last column reports the control country identified in the propensity score matching procedure, and used in the regressions specifications market "PSM."