Output Growth and Fluctuations: The Role of Financial Openness*

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Abstract

I analyze output growth, volatility, and skewness as the joint outcomes of financial openness. Using an industry panel of 53 countries over 45 years, I find that financial openness increases simultaneously mean growth and the negative skewness of the growth process. The increase in negative output skewness appears to come from a more negatively skewed distribution of investment, TFP, and new business creation. The growth benefits of financial liberalization are augmented, and its costs associated with higher probability of rare large contractions are mitigated by deep credit markets and by strong institutions. The main result of the paper holds in aggregated data.

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1 Introduction

In an attempt to understand the benefits and costs of financial openness, economic research has focused intensely in recent years on the effect of openness on the rate and volatility of output growth. Scholars have provided robust empirical evidence that openness is associated, causally, with better prospects for future growth, especially in the case of stock market liberalization.[1] Regarding the effect of financial openness on volatility, the verdict is still out.[2]

The combined evidence generates two important issues. First, using the *volatility* of output growth to make inferences about welfare implications is questionable given arguments dating back to Lucas (1987) that the welfare benefits of removing all of the business cycle volatility are trivial. At the same time, Barro (2006, 2009) has recently demonstrated that within a class of models which replicate how asset markets price consumption uncertainty, individuals are willing to pay a high premium in exchange for eliminating all chances for rare, large, and abrupt macroeconomic contractions.[3] To the extent that output risk cannot be fully insured, the same increase in volatility would have considerably larger negative implications for consumer welfare if it came from one single large contraction than if it came from a series of small symmetric deviations from a stable growth path.

To illustrate this point, consider the growth pattern of two hypothetical countries A and B. Country A's GDP growth is normally distributed, with a mean of 0.01 and a standard deviation of

[1] Bekaert et al. (2005) show that equity market liberalization raises subsequent average annual real output growth by about 1%, and Gupta and Yuan (2009) find an effect of an even larger magnitude at the industry level. Evidence on the growth effect of capital accounts liberalization has traditionally been more mixed, with no effect in Rodrik (1998a), and a positive effect driven by developed economies in Edwards (2001). However, Quinn and Toyoda (2008) estimate a strong causal effect and argue that prior conflicting evidence is due to the use of insufficiently long time periods and to not accounting properly for measurement error and for collinearity among independent variables.

[2] For example, Stiglitz (2000), Kose et al. (2003), and Levchenko et al. (2009) argue that foreign capital increases volatility both in the financial markets and in the real economy. However, Kaminsky and Schmukler (2008) find that financial openness is followed by large booms and busts only in the short run; still others find no effect of financial openness on macroeconomic volatility (Easterly et al., 2001), or even a negative effect when openness is proxied by stock market liberalization (Bekaert et al., 2002). For a comprehensive review of the literature on the growth and volatility effects of financial liberalization, see Kose et al. (2006), Henry (2007), and Bekaert et al. (2011), among others.

[3] This framework was first suggested by Rietz (1988) and has lately been extended to incorporate time-varying disaster incidence (Gabaix, 2008) and recoveries (Gourio, 2008).

0.024. Country B exhibits a steady annual growth rate of 0.0126, with arbitrarily small symmetric deviations from that average, but once every century its GDP declines by 25%. Over a period of 100 years, country B attains the same mean growth rate and the same standard deviation of output growth as country A. However, with Epstein-Zin-Weil preferences and values for the intertemporal elasticity of substitution and the coefficient of relative risk aversion as in Barro (2009), society in the second country would willingly reduce GDP by around 10% each year to replace the country's long-term growth profile with that of country A (assuming that the government can insure none of the output shock away).[4] To address this consideration properly, one would need to look at the effect of financial openness on the *skewness* of output growth which captures such asymmetic and abnormal distributional patterns and is thus related to the concept of tail risk. The literature has not done that so far.

Second, the existing evidence has been derived from empirical tests where output growth and output risk are treated as independent outcomes of financial openness. From a theoretical standpoint, however, it makes more sense for the evolution of growth and risk to be jointly determined. Volatility and growth have been shown to be negatively correlated at the country level (Ramey and Ramey, 1995; Aghion and Banerjee, 2005; Aghion et al., 2010), for example because aggregate shocks are large and important in low-growth economies. Volatility and growth have also been shown to be positively correlated at the industry level (Imbs, 2007), for example because high returns technologies entail high risks as in a mean-variance framework. Finally, growth and skewness may be the joint outcomes of the process of risk taking that characterizes financially open economies, as in Ranciere et al. (2008). Therefore, a more convincing empirical test would allow for the simultaneous determination of the first three moments of output growth.[5]

Addressing these two conceptual issues is what I set to do in this article. In particular, I use

[4] The main feature of the preference specification developed by Epstein and Zin (1989) and Weil (1990) is that it delinks the IES from the coefficient of relative risk aversion.

[5] In a similar vein, Lundberg and Squire (2003) and Mobarak (2005) show that allowing for the joint determination of various growth outcomes yields significantly different results and hence has different consequences for policy from studies based on independent tests.

data on sector-level value added for a wide cross section of countries over the past 45 years to study the impact of financial liberalization on output growth, volatility, and skewness. I do so in a simultaneous equation framework which allows for the joint determination of the three moments of output growth. My main finding is that financial liberalization is followed by an increase in industry output growth and by an increase in the negative skewness of the output growth process. At the same time, the data suggest no statistical effect of financial openness on output volatility. These results are consistent with the view that financial constraints are reduced and investment is aligned with growth opportunities when financial markets are liberalized, as well as with the view that financial openness raises the probability of a collapse in industrial output following a sudden stop in capital flows. I also find that these effects are stronger in industries which are more externally dependent and which face better growth opportunities. I subject these findings to a wide variety of alternative experiments, including accounting for the endogeneity of liberalization, controlling for the channels through which concurrent policy reforms and macroeconomic developments affect the rate and the variability of the growth process, using different subsets of countries, and alternating between *de jure* and *de facto* measures of financial openness. My results remain remarkably robust.

Second, estimating growth and risk jointly allows me to separate the direct from the indirect effect of financial openness. I find that at the level of the industrial sector, higher growth leads to a more positively skewed distribution of growth rates. Financial openness thus has a negative direct effects on skewness, but this is offset by an indirect positive effect through the growth channel. This implies that liberalization increases tail risk more in the short run than in the long run.

Third, the growth effect of financial openness is primarily realized through a higher rate of TFP growth, while the increase in negative skewness is primarily realized through a more negatively skewed distribution of investment and TFP growth and of the rate of creative destruction. Employment growth seems to be relatively stable in the wake of financial market openness. These results expand on the analysis in Gupta and Yuan (2009) and Levchenko et al. (2009) by shedding light on the effect of liberalization on the asymmetric variability of the capital, productivity,

establishments, and employment growth process.

I also find that countries with deeper domestic credit markets and with more developed institutions, as well as Latin American economies, have benefited more from financial liberalization, both in terms of higher growth and in terms of lower tail risk. Finally, the negative effect of financial openness on skewness holds in the macro-level data as well, implying that it is not a feature of sectoral data which is averaged away in aggregation. While testing for whether the same pattern holds for consumption - in addition to output - growth is beyond the scope of this paper, my evidence tentatively suggests that in a world where agents are willing to pay high premia to avoid rare disasters, financial openness may be associated with a welfare cost that has not been identified before.

This paper is related to several recent papers which use data on sectoral output to study the real effects of financial openness. In particular, Gupta and Yuan (2009) use sectoral data to show that financial liberalization has a strong positive effect on output growth. Levchenko et al. (2009) look at the effect of liberalization on growth as well as on volatility at the sectoral level. I push this approach two steps further. First, I look at output skewness in addition to output volatility, in an attempt to capture better the asymmetric growth variability effect of financial openness. Second, I study the impact of liberalization on growth, volatility and skewness jointly. This empirical approach allows me to separate the direct from the indirect effect of liberalization. The results imply that relative to my approach, in an empirical strategy which estimates these effects independently, the direct growth effect of liberalization is likely to be overestimated, and its direct effect on tail risk is likely to be underestimated.

The empirical regularity investigated in this paper is most closely related to Ranciere et al. (2008) who study the link between financial liberalization, growth, and financial crises. In their model, in a financially liberalized economy with limited contract enforcement, systemic risk taking reduces the effective cost of capital and relaxes borrowing constraints. This allows greater investment and generates higher long-term growth, but it raises the probability of a sudden collapse in

financial intermediation when a crash occurs. Systemic risk thus increases mean growth even if crises have arbitrarily large output and financial distress costs. While the authors test empirically the link between long-term growth and financial fragility, proxied by the skewness of domestic credit growth, my paper presents the first direct test of the link between financial openness, output growth, and output skewness, and it does so using sectoral data in order to bypass the standard econometric shortcomings pertaining to cross-country studies. This is a paper about the pattern of economic fluctuations, not about financial crises.

The paper proceeds as follows. Section 2 describes the data. Section 3 presents the empirical methodology. Section 4 reports the main results, alongside a battery of robustness tests. Section 5 concludes.

2 Data

The main data used in the empirical analysis come from the 2010 UNIDO Industrial Statistics 2 Database. I use the version that reports data according to the 2-digit level of ISIC Revision 3 classification for the period 1963-2007. The data contain information on value added, capital, employment, and number of establishments for 21 manufacturing sectors in the best case, as well as for total manufacturing.[6] Similar to Levchenko et al. (2009) and following Heston et al. (2002), I use the data reported in current U.S. dollars and convert them into international dollars using the Penn World Tables.[7] I require that each sector contains data on at least 10 years before and at least 10 years after a liberalization event (for countries which experienced liberalization), and data on at least 10 years before and at least 10 years after the average liberalization year (for countries which did not), and that each country has at least 10 such sectors. The resulting dataset consists

[6] Data are not available for two additional industries, Motor vehicles, trailers, semi-trailers, and Recycling.

[7] The exact mechanism is as follows. 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) for output to obtain the deflated value. See Levchenko et al. (2009) for more details.

of 53 countries.[8]

For each country-industry-period, I calculate the first three moments of output growth. I calculate average real output growth in country c and industry s during period t, $\overline{g}_{cs}$, after taking differences in annual log output. Then, the sample standard deviation of real output growth in country c and industry s during period t is defined as $\left(\frac{1}{T}\sum_{\tau=1}^{T}(g_{cs\tau}-\overline{g}_{cs})^2\right)^{\frac{1}{2}}$, and the sample skewness of output growth of industry s in country c during period t is calculated as $\frac{\frac{1}{T}\sum_{\tau=1}^{T}(g_{cs\tau}-\overline{g}_{cs})^3}{\left(\frac{1}{T}\sum_{\tau=1}^{T}(g_{cs\tau}-\overline{g}_{cs})^2\right)^{\frac{3}{2}}}$, where $\tau = 1, ..., T$ are all years with observations in period t.

The literature on financial liberalization uses various measures of *de jure* and *de facto* liberalization. Quinn (1997), Bekaert et al. (2005), Bekaert et al. (2007), and most recently Kaminsky and Schmukler (2008) have dated various liberalization events pertinent to capital accounts, credit markets, and equity markets. Similar to Levchenko et al. (2009), I use the Kaminsky-Schmukler liberalization chronology, and I define a country as fully liberalized when all three indices of market liberalization - equity markets, credit markets, and international financial transactions - attain a value of 3 (fully liberalized). I complement this normative index with *de facto* measures of financial globalization, namely the gross capital flows measure from Lane and Milesi-Ferretti (2007), calculated as the sum of total foreign assets and total foreign liabilities, normalized by GDP.

Arguably, this definition of liberalization is rather noisy. From a neoclassical perspective, equity markets liberalization is expected to result in the largest effect on growth. Improved risk sharing post-liberalization should decrease the cost of equity capital (see, for example, Bekaert and Harvey, 2000) and increase investment (see, for example, Bekaert et al., 2005), therefore affecting the distribution of growth rates. In that sense, my results should be interpreted as a lower bound of the effect of liberalization on the distribution of growth rates. In the context of a more disaggregated

[8] In robustness tests, I require that the countries have data on at least 20 years for at least 3/4 and even 9/10 of all sectors, resulting in a further reduction in the number of countries available (reducing the cross section of countries to 45 and 20, respectively). See Section 4.4.2 for details.

analysis of the effect of stock market liberalization, Gupta and Yuan (2009) show that industries exhibit strictly higher growth rates in countries with liberalized equity markets. In (unreported) robustness tests, I use data from Bekaert et al. (2005) to investigate the research question at hand focusing exclusively on equity market liberalization episodes, but there are too few non-liberalized countries in the sample to make the results convincing.

Table 1 summarizes the three moments of output growth for the countries in the sample. It also contains information on the liberalization events that are used in the empirical exercises.

Countries with liberalized financial markets are usually more developed in a host of other dimensions: they tend to have better institutions, more developed domestic financial markets, higher human capital, and be more open to trade. All of these parallel macroeconomic circumstances may be affecting both the rate (see Acemoglu et al., 2003) and the variability (see Raddatz, 2006) of growth. Therefore, I collect data on institutional quality from Polity IV, on domestic credit to private institutions from Beck et al. (2010), on years of schooling from the Barro and lee database, on life expectancy and school enrollment from the World Development Indicators, and on population and trade openness from the World Penn Tables, to control directly for these effects. Table 2 summarizes the main control variables by country.

Finally, identification in the paper rests on carrying out the analysis at the industry level, which allows to control for various channels through which other concurrent macroeconomic processes - like financial development, trade openness, etc. - may affect the rate and variability of output growth. As argued by Rajan and Zingales (1998), the distribution of growth rates would be most sensitive to financial development in industries which are "naturally" dependent on external finance. Such "natural" dependence may arise due to variations in the scale of projects, gestation period, the ratio of hard vs. soft information, the ratio of tangible vs. intangible assets, follow-up investments, etc. I use the measure of external financial dependence originally proposed by Rajan and Zingales (1998) for SIC 3-digit industries and later adapted by Cetorelli and Strahan (2006) for SIC 2-digit industries. The benchmark is defined as the industry median value of the sum across years of

total capital expenditures minus cash flow from operations, divided by capital expenditures, for mature Compustat firms.[9] Industry growth rates also tend to be affected by growth opportunities at the country level (Fisman and Love, 2007; Bekaert et al., 2007). Sectors which face higher global growth opportunities should grow faster post-liberalization. To address that point, I use data from Fisman and Love (2007) on industry sales growth in the US to account for this channel. Also, the variability of growth is also negatively affected by financial development if industries exhibit naturally high liquidity needs (Raddatz, 2006), and so I use this measure aggregated at the SIC 2-digit level.[10] These three industry benchmarks are interacted with data on private credit to GDP from Beck et al. (2010). Finally, in order to account for the effect of international trade on output volatility and skewness, I re-weight the industry measures of the ratio of imports and exports to total output from di Giovanni and Levchenko (2009) for the SIC 2-digit level, and interact with data on trade openness from the Penn Tables.

Table 3 lists the industries included in the dataset and summarizes all industry benchmarks. For definitions of all variables included in the paper, alongside variable sources, see Appendix.

3 Econometric framework

I start by estimating the following system of equations:

$$Growth_{cst} = \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^1_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \tag{1}$$

$$Stdev_{cst} = \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^2_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \tag{2}$$

[9] The exact procedure involves subtracting from the sum across years of total capital expenditures (Compustat item #128) the cash flow from operations, i.e., revenues minus nondepreciation costs (Compustat item #110) for each firm in Compustat, and then taking the median industry value as the benchmark.

[10] The exact procedure involves dividing the value of total inventories (Compustat item #3) by the value of total sales (Compustat item #12) for each firm in Compustat, and then taking the median industry value as the benchmark.

$$Skewness_{cst} = \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^2_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \quad (3)$$

Post is a dummy variable equal to 1 after the liberalization event, for countries which liberalized their financial markets, and equal to 1 after the average liberalization year for the sample, for countries which did not. *Lib* is a dummy variable equal to 1 after the liberalization event, for countries which liberalized their financial markets. X^i_{cst}, $i = 1, 2$, are vectors of various controls which are predicted by theory to affect the distribution of output growth rates; the two sets of variables overlap but are not identical across the three equations. In particular, all three models include industry s's beginning-of-period share in total manufacturing value added in country c during period t; country c's beginning-of-period log GDP per capita and ratio of private credit to GDP during period t; and interactions of industry s's export and import intensity with beginning-of-period trade openness in country c during period t. In addition, X^1_{cst} contains interactions of industry s's dependence on external finance and growth opportunities with country c's beginning-of-period ratio of private credit to GDP during period t, and X^2_{cst} contains the log of country c's beginning-of-period population during period t and interactions of industry s's liquidity needs with country c's beginning-of-period ratio of private credit to GDP during period t and with the log of country c's beginning-of-period population during period t. ψ_{cst} is a matrix of country, sector, and time fixed effects which control for a variety of omitted unobservable factors. Finally, ε_{cst} is the idiosyncratic error. Because financial liberalization is measured at the country $\times$ time level, I cluster the standard errors at the country $\times$ time level as well, in order to avoid biasing the standard errors downwards.

The basic econometric test is one in which the three equations are estimated independently using ordinary least squares (OLS). In that sense, this test relates to two disjoint sets of literature: the one which has studied the effect of financial openness and domestic financial development on growth (Beck et al., 2000; Bekaert et al., 2005, 2007; Gupta and Yuan, 2009), and the one which has studied the effect of the same processes on the volatility of output or consumption growth (Easterly

et al., 2001; Bekaert et al., 2006; Raddatz, 2006). In addition, Levchenko et al. (2009) estimate the effect of financial liberalization on both output growth and volatility, but they treat the two processes independently. Neither approach is fully convincing from a theoretical standpoint: the evolution of growth and growth volatility, as well as skewness, may be the outcome of a similar process, and so they may be jointly determined by overlapping sets of factors.

To account for that possibility, I also estimate equations (1)-(3) simultaneously using a three-stage least square (3SLS) methodology. If there were no unobserved differences across countries and no endogeneity, the model could be estimated as a pair of seemingly unrelated regressions (SUR) on pooled data. However, one needs to allow for the possibility that the volatility of growth affects growth rates (Ramey and Ramey, 1995; Mobarak, 2005; Aghion et al., 2010). Furthermore, one needs to allow for the possibility that anticipated higher growth may affect the skewness of the distribution of growth rates through risk taking (Ranciere et al., 2008). Because in the joint estimation the standard deviation of growth appears as a regressor in the growth equation and average growth appears as a regressor in the skewness equation, they need to be instrumented using exclusion restrictions. This condition is satisfied by the fact that as in the OLS case, the interactions of credit to the private sector with the sector's external financial dependence and growth opportunities are excluded from the volatility and skewness equations, and the log of population size (our diversification measure), as well as the interactions of the log of population size and credit to the private sector with the sector's liquidity needs are excluded from the growth equation.

The 3SLS empirical procedure therefore takes the following form:

$$\begin{aligned} Growth_{cst} = &\quad \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^1_{cst} + \theta \cdot Stdev_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Stdev_{cst} = &\quad \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^2_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Skewness_{cst} = &\quad \alpha \cdot Post_t + \beta \cdot Lib_{ct} + \gamma \cdot X^2_{cst} + \theta \cdot Growth_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \end{aligned} \tag{4}$$

Finally, by applying a 3SLS procedure, I account for the possibility that the error terms in the three equations may have a nonzero covariance (which I expect them to, given that the three moments

of growth are jointly determined).

In various robustness tests, in both the OLS and the 3SLS case, I replace de jure liberalization with de facto liberalization to control for the possibility that de jure liberalization captures poorly the actual financial integration of the domestic economy in the world economy (Levchenko et al., 2009). To that end, I replace the de jure index of liberalization with a measure of capital flows from Lane and Milesi-Ferretti (2007).

The empirical approach so far is clearly based on a standard difference-in-differences analysis in which the coefficient of interest, β, measures the difference in change from pre- to post-liberalization between the treatment group and the control group. I choose two types of control groups for this exercise. First, I use all non-liberalized countries as a control group. This approach, however, does not account for the possible endogeneity of liberalization. Liberalization may be a strategic decision correlated with a variety of circumstances unobservable to the econometrician. For instance, it may be correlated with growth opportunities and thus made in anticipation of higher future growth (Bekaert et al., 2005). To control for that possibility, I borrow from the propensity score literature pioneered by Rosenbaum and Rubin (1983) and first run a first-stage logistic regression on a set of country level variables to determine what macro variables were correlated with the decision to liberalize.[11] Based on the propensity score, I choose for each treated country a country that is most similar to it, and run the second-stage regression on this subset of control countries. The idea is to eliminate the potential selection bias arising from the fact that countries were not assigned the "treatment" randomly - that is, only systematically different countries liberalized their financial markets, and these systematic differences cannot be perfectly dealt with through the inclusion of covariates in the OLS regression because the distribution of the covariates does not overlap sufficiently across the two groups. This approach relates to earlier work in international economics by Persson (2001), Glick et al. (2006), and Levchenko et al. (2009).

I also want to investigate the impact of financial liberalization across industries. To that end,

[11] The set includes pre-liberalization measures of economic development, financial development, institutional quality, human capital, and trade openness, among others.

I modify the empirical strategy to take further advantage of the disaggregated data. In particular, I estimate the system of simultaneous equations

$$\begin{aligned} Growth_{cst} = &\ \beta \cdot Fin\ lib_{ct} \cdot Benchmark_s^1 + \gamma \cdot X_{cst}^1 + \theta \cdot Stdev_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Stdev_{cst} = &\ \beta \cdot Fin\ lib_{ct} \cdot Benchmark_s^2 + \gamma \cdot X_{cst}^2 + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Skewness_{cst} = &\ \beta \cdot Fin\ lib_{ct} \cdot Benchmark_s^2 + \gamma \cdot X_{cst}^3 + \theta \cdot Growth_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \end{aligned} \tag{5}$$

In this modification, *Fin lib* is, alternatively, the *de jure* index *Lib* from systems (1) and (2), or a *de facto* measure of financial globalization in the shape of the gross capital flows measure from Lane and Milesi-Ferretti (2007). These variables are interacted with the industry benchmarks identified above. This robustness check allows me to establish whether the effect of liberalization on growth and risk is equally strong for various measures of liberalization, and more so for industries which are naturally more sensitive to financial market development. The specification also allows to include country $\times$ time fixed effects that capture other time-varying country characteristics that are not picked up by the controls.

Finally, I study which attributes of the macroeconomic environment tend to alleviate/exacerbate the positive/negative effects of financial liberalization in terms of growth and risk. To that end, I estimate the system of equations

$$\begin{aligned} Growth_{cst} = &\ \alpha \cdot Post_t + \beta \cdot Lib_{ct} \cdot Z_{ct} + \gamma \cdot X_{cst}^1 + \theta \cdot Stdev_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Stdev_{cst} = &\ \alpha \cdot Post_t + \beta \cdot Lib_{ct} \cdot Z_{ct} + \gamma \cdot X_{cst}^2 + \delta \cdot \psi_{cst} + \varepsilon_{cst} \\ Skewness_{cst} = &\ \alpha \cdot Post_t + \beta \cdot Lib_{ct} \cdot Z_{ct} + \gamma \cdot X_{cst}^3 + \theta \cdot Growth_{cst} + \delta \cdot \psi_{cst} + \varepsilon_{cst} \end{aligned} \tag{6}$$

Here, Z_{ct} is a matrix of country level variables including measures of financial development, economic development, institutional quality, human capital, etc. This model is consistent with tests of the heterogeneous effects of financial liberalization in Bekaert et al. (2005) and Kose et al.

(2006), among others.

4 Empirical results

This section discusses the results of estimating the above empirical models. I report the main results in Section 4.1. Section 4.2 presents my strategy for dealing with endogeneity concerns. In Section 4.3, I investigate the impact of liberalization across industries. Section 4.4 presents a battery of data robustness tests. In Section 4.5 I study the channels through which liberalization affects the distribution of growth rates. Section 4.6 investigates the heterogeneous effect of liberalization across countries. In Section 4.7, I check whether the main results hold in aggregate data.

4.1 Financial openness, growth, volatility, and skewness: Main results

I begin by taking the main model to the data. The first three columns of Table 4 report the estimates of equations (1)-(3) where the effect of liberalization on growth, volatility, and skewness is estimated individually. Columns (4)-(5) report the estimates from model (4) where the three equations are estimated simultaneously. In both cases, I apply a difference-in-differences approach where the control group is all countries that have not liberalized their equity markets, credit markets, and capital accounts during the sample period. The regressions include country, industry, and time fixed effects, as well as a host of covariates.

When I estimate the three equations individually, I find that financial openness increases the rate and variability of output growth, in the case of the latter both in terms of volatility and in terms of negative skewness. All three effects are economically significant too. A financial liberalization event, captured by moving the *Lib* variable from 0 to 1, is associated with a sector-level growth rate higher by 2.9 percentage points. This is equivalent to 0.36 of a standard deviation of the average sector-level growth rate observed in the sample. The same financial liberalization event is associated with a sector-level negative skewness higher by 0.19 of a standard deviation of the average sector-level skewness observed in the sample. In the dimension of volatility, the effect is

less economically significant (volatility increases by 0.11 of a sample standard deviation in the wake of liberalization).

In columns (4)-(6), I investigate to what degree the effects estimated from running models (1)-(3) are contaminated by the simultaneous determination of the three moments of growth. I include the volatility of growth in the growth equation, and average growth in the skewness equation, and then estimate the three equations in model (4) simultaneously. This allows me to dissect the effect of liberalization on the first three moments of growth into a direct effect (for example, liberalization affects the skewness of the distribution of growth) and an indirect effect (for example, liberalization affects growth, which in turn affects the skewness of the distribution of growth). I find once again a positive effect on growth and tail risk, but the magnitude of these effects changes somewhat. After controlling for the effect of financial liberalization on volatility, the effect on growth declines by about 1/3, and after controlling for the effect of liberalization on growth, the effect on skewness almost triples, to 0.52 of a sample standard deviation. The effect of openness on volatility is no longer significant.

These results suggest that previous empirical work which has focused on the effect of financial liberalization on output growth and risk separately, may have overestimated or underestimated the true effects. For example, we know that at the industry level higher growth is associated with higher volatility (Imbs, 2007). My tests imply that financial liberalization increases the volatility of growth at the sector level, and so tests which do not account for the indirect effect through volatility overstate the direct effect of liberalization on growth. Similarly, higher growth is associated with more positive skewness (Columns (3) and (6)). I find that the direct negative effect of financial liberalization on the skewness of the distribution of growth rates is counteracted by the indirect positive effect through the growth channel. The direct effect is thus much more pronouncedly negative than the total effect.

It is also informative to note the effect of the industry and country covariates on growth and output variability. Larger sectors tend to be less volatile, but they tend to have a lower skewness.

Importing sectors exhibit lower average growth rates. Countries with larger financial markets tend to have less volatile growth, especially for sectors with high liquidity needs, which is consistent with Raddatz (2006). Sectors with higher external financial needs and sectors which face higher growth opportunities exhibit lower growth rates in countries with more developed domestic financial markets. While this looks counterintuitive at first glance, going against the evidence in Rajan and Zingales (1998) and Fisman and Love (2007), the apparent contradiction is resolved by noticing that this effect is observed after netting out the effect of concurrent financial liberalization. Finally, diversification opportunities, proxied by population size, are associated with lower risk, especially for industries with high liquidity needs, which is consistent with Mobarak (2005) and Raddatz (2006).

4.2 Financial openness, growth, volatility, and skewness: Selection bias

Countries which liberalized their financial markets may have been systematically different, implying that liberalization may have been a strategic choice (Bekaert et al., 2005). In this section, I explicitly account for this possibility. Table 5 reports estimates from regressions where each liberalized country is first matched with a similar non-liberalized country based on a propensity score derived from a logistic regression. The variables used in the first stage to estimate the propensity score include pre-liberalization economic development (proxied by GDP per capita and GDP growth volatility), trade openness, institutional quality (proxied by creditors rights), human capital (proxied by secondary school enrollment), and financial development (proxied by the ratio of private credit to GDP). This procedure accounts for the possibility that, for example, countries liberalize in order to take advantage of a large pool of specialized human capital, and so the measured post-liberalization increase in growth rates is partly due to the independent effect of human capital on growth.

The estimates from the propensity-score matching procedure are not weakened in a statistical sense when I restrict the control sample to the group of countries that are pair-wise most similar to

the liberalized countries. When models (1)-(3) are estimated, I find that a financial liberalization event, captured by moving the *Lib* variable from 0 to 1, is associated with a sector-level growth rate higher by 1.7 percentage points, a sector-level volatility higher by 0.15 standard deviations, and a sector-level skewness lower by 0.38 standard deviations. (Columns (1)-(3)). As in the case when the full sample of non-liberalized countries is used as a control group, accounting for the indirect effect on growth through the volatility channel and on skewness through the growth channel results in a lower direct economic effect of liberalization on growth and a higher direct effect on the left skewness of the distribution of growth rates. I conclude that the estimated effects of financial liberalization are not due to liberalizing countries being systematically different from non-liberalizing ones over a range of observable macroeconomic characteristics.

4.3 Financial openness, growth, volatility, and skewness: Industry effects

While the empirical approach in the previous subsection should alleviate concerns about estimation bias caused by selection on observables, concerns about selection on unobservables still linger. Because in the empirical model financial openness varies at the country $\times$ time level, I cannot include country $\times$ time fixed effects that would capture any other time-varying characteristics not picked up by the controls. Recall, for example, the model in Ranciere et al. (2008) which implies that systemic risk taking increases the correlation between growth and crises. If countries liberalize when growth opportunities are abundant, regressions of future growth and skewness on a liberalization indicator will yield upward biased estimates. To that end, in this subsection I proceed to check whether the estimates so far are not driven by the fact that financial liberalization events may be correlated with other unobservable developments at the country level.

My approach to dealing with this potentially confounding problem is to employ a cross-country cross-industry methodology in the spirit of Rajan and Zingales (1998). In particular, I interact the main liberalization variable with industry benchmarks for external financial dependence, growth opportunities, and liquidity needs (Model (5)). The extant literature suggests that the following

three hypotheses can be formulated:

1) By lowering the cost of external capital (Henry, 2000; Bekaert and Harvey, 2000), financial liberalization will lead to higher growth in industries that are more dependent on external finance.

2) By improving the alignment between capital and growth opportunities (Fisman and Love, 2007; Bekaert et al., 2007), financial liberalization will lead to higher growth in industries that face better growth opportunities.

3) By reducing information asymmetries and alleviating firms' temporary cash flows and/or net worth problems (Caballero and Krishnamurty, 2001), financial liberalization will lead to lower output volatility in industries that have higher liquidity needs.

The first two hypothesis are identical to Gupta and Yuan (2009). In addition, Love (2003) shows that investment is less sensitive to internal funds at the firm level in financially developed countries. The third is consistent with the theory outlined and the evidence presented in Raddatz (2006).

The results from the set of regressions formulated in Model (5) are reported in Table 6. Consistent with hypothesis 1 and 2, I find that industries that are more dependent on external finance and/or face higher growth opportunities grow significantly faster following liberalization. This effect is statistically significant as well. Numerically, a financial liberalization event is associated with 0.4% higher growth if the industry is at the 75th rather than the 25th percentile of external financial dependence, and with 0.8% higher growth if the industry is at the 75th rather than the 25th percentile of growth opportunities.

Turning to output volatility and skewness, I find mixed results. Financial liberalization is associated with lower volatility in industries dependent on external finance (Column (2)), but with higher volatility for industries with high liquidity needs (Column (8)). However, financial liberalization is uniformly associated with more negative skewness. For example, a financial liberalization event is associated with 20.2% higher negative skewness if the industry is at the 75th rather than the 25th percentile of liquidity needs. The effect of the rest of the industry- and country-level

variables (unreported for brevity) is broadly consistent with previous estimates.

4.4 Financial openness, growth, volatility, and skewness: Data issues

4.4.1 De jure vs. de facto liberalization

It has been argued that *de jure* measures of liberalization capture poorly the actual degree of financial market integration (e.g., Lane and Milesi-Ferretti, 2007). While conducive to the increase in foreign investment in domestic securities, an act of market liberalization may result in different magnitudes of actual integration with the world's financial markets (Levchenko et al., 2009), and some non-liberalized countries could in reality be more integrated than some liberalized ones. I aim to partially counter this problem by replacing the de jure indicator of liberalization with a *de facto* measure of financial globalization based on the gross foreign assets measure from Lane and Milesi-Ferretti (2007). Essentially, this variable estimates the actual exposure of a country's economy to foreign investors. The advantage of this method is that it captures better the degree to which various degrees of financial globalization within the set of financially liberalized countries map into differences in growth and risk.

The results of this version of Model (4) are reported in Table 7. As before, I account for the natural characteristics of the sector, in particular for dependence on external finance, which - according to the results reported in Table 6 - is statistically most strongly associated with an effect of openness on growth and skewness. I find that higher gross foreign assets are associated with higher growth rates and with more negative skewness (Columns (1) and (3)). The same effect is recorded when I use data on foreign liabilities only, which may be a better proxy for foreign capital (Columns (4) and (6)). I conclude that main results of the paper are broadly consistent across alternative definitions of financial markets liberalization.

4.4.2 Alternative measures of tail risk and data issues

In Table 8, I perform another robustness check based on the hypothesis that output skewness may poorly capture tail risk. In particular, while I require that for each country-sector pair in the sample there are at least 10 data points, the higher moments of a distribution can be estimated with a substantial bias in small samples (Kendall and Stuart, 1977). I partially counter this concern by replacing my measure of output skewness with the largest negative deviation from the long-term average observed pre- and post-liberalization. The results of this modified version of Model (4) are reported in Columns (1)-(3). The results remain qualitatively unchanged: average output growth increases following liberalization, and so does tail risk, implying that negative skewness is a reasonable proxy for the incidence of tail events of larger magnitude.

In the next six columns of Table 8, I test the hypothesis that my results may be driven by the fact that the liberalized and non-liberalized countries in the sample contain non-overlapping sets of sectors. I have so far required that each country has at least 10 sectors with at least 20 years of data, but given that there are 21 sectors all in all, it is possible that liberalized countries are a truncated sample of high-growth high-risk industries, biasing the estimates of the baseline model. Therefore, in order to ensure that there is a sufficient overlap, I now require that all countries in the sample contain at least at least 15 (Columns (4)-(6)), and at least 18 (Columns (7)-(9)) industrial sectors. The main results of the paper are not weakened by this robustness procedure.

4.5 Capital accumulation, productivity, new business creation, and employment

I next turn to some of the channels through which financial liberalization affects the distribution of growth rates. Previous studies using disaggregated data have found that at the sector level, financial liberalization tends to promote output growth through the growth of existing establishments and through higher capital accumulation (Levchenko et al., 2009; Gupta and Yuan, 2009), and it also stimulates new business creation if adopted by countries with lower barriers to entry (Gupta and Yuan, 2009). I wish to know how these results extend into the higher moments of the distribution

of growth rate, and whether the growth effects of liberalization survive a simultaneous equation framework.

The 2010 UNIDO Industrial Statistics 2 Database contains industry data on investment, number of establishments, and employment. I need to construct the capital series from the investment data, and the productivity measure from the capital and employment series.

In order to construct the capital series from the investment data in the dataset, I apply the perpetual inventory method proposed by Hall and Jones (1999) and followed by Bonfiglioli (2008) and Levchenko et al. (2009), among others. The initial stock of capital in country c in industry s is estimated as $\frac{I_{cst_0}}{g_{cs}+\delta}$, where g_{cs} is the average geometric growth rate of total investment between t_0 and $t_0 + 10$. A depreciation rate of $\delta = 0.06$ is assumed. t_0 is the first year for which investment data is available in the dataset, for each country-sector pair. Finally, the stock of capital in country c in industry s at time t is computed as $K_{cst} = (1-\delta)K_{cst-1} + I_{cst}$. Next, the TFP data series is constructed by assuming for each industry s in country c a production function $Y_{cst} = K_{cst}^{\alpha}(A_{cst}H_{ct}L_{cst})^{1-\alpha}$, where Y_{cst} is total output in country c in industry s at time t, K_{cst} is the stock of physical capital in country c in industry s at time t, A_{cst} is labour-augmenting productivity in country c in industry s at time t, L_{cst} is total employment in country c in industry s at time t, and H_{ct} is a measure of the average human capital of workers in country c at time t. $H_{ct}L_{cst}$ is therefore the human capital-augmented labour in country c in industry s at time t. Following Psacharopulos (1994), I define labour-augmenting human capital as a function of years of schooling ($educ_{ct}$) as $H_{ct} = e^{\phi(educ_{ct})}$, where $\phi(educ_{ct})$ is a piecewise linear function with coefficients 0.134 for the first four years of education, 0.101 for the next four years, and 0.068 for all years thereafter. Finally, using data on capital constructed as above, on employment, and on output from the 2010 UNIDO Industrial Statistics 2 Database, as well as data on years of schooling from the Barro and Lee Database, TFP for each industry-country pair is calculated as $A_{cst} = \frac{Y_{cst}}{H_{ct}L_{cst}}\left(\frac{K_{cst}}{Y_{cst}}\right)^{\frac{\alpha}{1-\alpha}}$, where the factor share is assumed to be constant in each industry and across countries, and is given the value of one third, which adequately represents national account

data for developed countries.

Table 9 reports the estimates from these empirical tests of the modified Model (4). I use all non-liberalized countries as a control group in the tests (the results are robust to a propensity score matching procedure). The evidence is somewhat mixed. In Panel A, Columns (1)-(3), I find that financial openness increases the volatility and negative skewness of the process of capital accumulation. The increase in negative skewness relates to the argument in Eichengreen and Lebland (2003) about the link between financial liberalization and banking crises, if liberalizing countries tend to be dominated by industries dependent on external finance. In that sense, my finding somewhat qualifies the result in Galindo et al. (2007) who find that liberalization has a beneficial long-term effect on economic performance by increasing the efficiency with which investment funds are allocated. Alternatively, it could be driven by sudden stops, which, as Rothenberg and Warnock (2011) show, tend to lead to more pronounced slowdowns in GDP than sudden flights.

I find a somewhat similar effect of liberalization on TFP: growth rates increase following liberalization, and so does negative skewness. While the former finding goes somewhat against the results documented in Levchenko et al. (2009) and Gupta and Yuan (2009), who find no robust effect of liberalization on TFP at the sector level, it confirms the findings in Bonfiglioli (2008) and Bekaert et al. (2011) who document a significant increase in aggregate TFP associated with financial openness. My methodology qualifies somewhat this result as well. As Column (5) in Panel A indicates, financial liberalization decreases the volatility of TFP growth, and growth and volatility are positively correlated (Column (4) in Panel A). Hence, while liberalization increases TFP growth directly, it decreases it indirectly through the channel of lower volatility. The sum of the two effects may well amount to zero, reconciling our findings with the prior literature.

In Panel B, I look at the effect of liberalization on establishments and employment. In Columns (1)-(3), I find that financial openness decreases the rate of new business creation directly, but it increases it through the channel of higher volatility, to some degree reconciling my findings with the null results in Levchenko et al. (2009). Liberalization also increases the negative skewness

of the process of new business creation. This latter result informs the literature on the effect of the business cycle on business creation. For example, Barlevy (2007) finds that R&D investment is strongly pro-cyclical. If the entry of new firms follows the development of new technologies, then business cycle-exacerbating financial liberalization would also contribute to a higher negative skewness of the distribution of new business.

My final result is that financial liberalization has increased average employment growth, both directly and through the channel of higher volatility, with no significant effect on skewness (Columns (4)-(6)). One possible story, reconciling this result with the result on establishments, would be that liberalization has enabled the emergence of larger and stabler firms. It is also useful to think of this result and the result on new business creation jointly. One strand of literature has maintained the Schumpeterian notion that recessions encourage agents to shift to a more efficient mode of production. A version of this hypothesis is the idea that recessions drive out or "cleanse" the least efficient production arrangements that are no longer profitable (e.g., Caballero and Hammour, 1994; Mortensen and Pissarides, 1994). Aghion and Saint Paul (1998) argue that recessions encourage agents to engage in activities that contribute to future productivity instead of to current production given that the return to the latter declines in recessions. However, in a more recent study Barlevy (2003) presents evidence that in the presence of credit market frictions, reallocation might direct resources from more efficient to less efficient uses if more efficient production arrangements are also more vulnerable to credit constraints. My results seem to offer stronger evidence to the second theory: if financial liberalization is associated with higher risk, then agents may choose to engage in less profitable employment rather than in more profitable but riskier self-employment.

4.6 Financial openness, institutions, and economic fluctuations

There is a growing body of work arguing that various economic developments and institutions should interact with financial liberalization in affecting the distribution of growth rates. For example, democracy and institutions tend to raise economic growth by offering stronger protection

of investment, thus both increasing the return to and lowering the cost of entrepreneurship. In general, however, the direct effect on growth may differ from the indirect effect. Mobarak (2005) estimates jointly the effect of democracy on growth and volatility and finds that through the direct channel, democracy lowers the rate of economic growth, but through the channel of lowering volatility it increases it. Following Acemoglu et al. (2003), I use constraints on the executive as a proxy for the country's level of institutional development.

Domestic financial market development and trade openness have also been argued by the literature to affect output growth and variability (Acemoglu and Zilibotti, 1997; Bekaert et al., 2005; Kose et al., 2006) and so I interact my liberalization variable with empirical proxies for these. Human capital has a positive effect on growth (e.g., Barro, 1991), and so I include a proxy for years of schooling in the interactions. Finally, it is possible that for reasons of unobservable institutional quality, distance to trade centers, and social cohesion, among others, different regions will experience different responses, in terms of growth and risk, to the same event (liberalization). To that end, I include dummies for various regions of the world interacted with the dummy for financial liberalization. I also instrument private credit and institutions using data on legal origin in the spirit of La Porta et al. (1998), who argue that the predetermined component of the country's legal system is a good instrument for concurrent financial and legal development.[12]

The estimates from these empirical tests are reported in Table 10. The evidence suggests that industries experience higher average growth following liberalization in countries with strong institutions (higher constraints on the executive) and in countries with better developed domestic credit markets (Column (1)). In addition, in such countries the distribution of growth rates becomes less negatively skewed following financial liberalization, implying lower risk of abrupt contractions in output at the industry level (Column (3)). To the extent that constraints on the executive are correlated with democracy, this finding is related to the evidence in Rodrik and Wacziarg (2005)

[12] Data on settlers mortality is missing for 31 of the 53 countries in the sample, and so while in robustness exercises the main message of Table 10 is not altered by using settlers mortality to instrument for institutions, as in Acemoglu et al. (2003), I do not report these results here.

that democratization events are associated with a positive effect on economic growth, at least in the short run. The evidence also relates to the finding in Acemoglu et al. (2003) that strong institutions are associated with lower variability of output growth, although my finding is in the dimension of the skewness, not in the dimension of volatility. Finally, I also find that Latin American countries benefited relatively more from liberalization than Europe and North America (the control group) in terms of both higher growth and lower skewness. These findings are related to recent evidence pointing to the fact that after financial liberalization Latin American stock markets have become less volatile (Edwards et al., 2003). Finally, there is some evidence that financially open economies tend to have a more volatile output growth if they are also open to trade (Column (2)), relating to recent evidence on the positive effect of trade openness on aggregate volatility (e.g., Di Giovanni and Levcnehko, 2009).

4.7 Financial openness and skewness: Aggregate data evidence

The main purpose of this paper is to identify the impact of financial openness on the distribution of output growth, not to address the welfare implications of this process, and industry-level data is better suited than country-level data for this purpose. Nevertheless, the question whether the growth-skewness pattern I have uncovered holds in the aggregate data, is fully warranted. In particular, while higher industry growth implies higher aggregate growth by a simple mathematical identity, it is not immediately clear whether a more negative industry skewness should imply a more negative aggregate skewness. For example, while Ramey and Ramey (1995) show that more volatile countries tend to have lower long-term growth, Imbs (2007) argues that the opposite pattern holds in disaggregated data where high-growth industries command higher investment and tend to be more volatile. This sectoral pattern is masked by aggregation as the country specific component of aggregate variance, which tends to be detrimental to long-term growth, dominates. How industry-level output skewness aggregates into total output skewness is thus an empirical question which can reveal whether financial openness may potentially be imposing welfare costs associated with

large and rare macroeconomic contractions *a la* Barro (2006, 2009).

To formally test this, in Table 11 I use data from the Penn Tables on total output over for the same sample of countries and sample period as in the previous empirical tests. Identification is now hindered by the fact that I can no longer extract within-country cross-industry components, but I do control for the standard determinants of growth and volatility (e.g., Barro, 1991; Bekaert et al., 2006), like financial and economic development, trade openness, government spending, various aspects of human capital (education, life expectancy, population growth), and macroeconomic stability (inflation). I also control for the quality of institutions, using the measure of constraints on executives from Polity IV, but data are missing for 2 of the 53 countries and so I run a separate regression using that variable.

The estimates strongly imply that financial openness increases the negative skewness of GDP growth. Numerically, in the post-liberalization period, the skewness of the distribution of growth rates in a financially open country is lower by 0.54 of a sample standard deviation relative to a non-open country. There is (weak) evidence that larger financial markets, high population growth, and larger governments have an independent negative effect on skewness. Thus - while mindful of all caveats related to the use of cross-country data for identification purposes - the evidence tentatively suggests that when it comes to the negative effect of financial openness on output skewness, there is no averaging away of sector-specific developments, as in the case of the volatility.

Figure 1 illustrates this result by comparing the output growth pattern of Argentina and Panama. These two countries are similar in terms of per capita wealth, are a part of the same economic area, and exhibit similar trade patterns. By the definition of financial liberalization used in the paper, Argentina became fully open in 1991. According to the same criteria, Panama is not. Figure 1 indicates that Argentina grew at a rate almost four times higher after 1991 (2.6% vs. 0.7%), while annual growth rates in Panama declined somewhat after 1991, from 3.8% to 2.9%. Aggregate volatility declined in Panama while it remained steady in Argentina. Finally, while the distribution of growth rates became more positively skewed in Panama, it went from sym-

metric to negatively skewed in Argentina (-0.666 post-liberalization vs. -0.118 pre-liberalization). Thus, relative to non-liberalized Panama, liberalized Argentina experienced higher growth, and its growth distribution became more negatively skewed indicating the incidence of a large and abrupt macroeconomic contraction.[13]

5 Conclusion

In this paper, I examine the effect of financial openness on the distribution of growth rates over the business cycle. The literature has so far focused on output growth and volatility, pointing to mixed effects of financial liberalization in the dimension of volatility (see Kose et al., 2006, for a survey) and to a mostly positive effect in the dimension of growth, especially in the case of stock market liberalization (Bekaert et al., 2005; Gupta and Yuan, 2009). However, the first two moments of growth do not exhaust the welfare implications of financial openness. In particular, the same increase in volatility could be driven by one large macroeconomic contraction, or by a series of small symmetric deviations from a relatively stable growth path. In the latter case, a larger government would insure the additional output volatility away (Rodrik, 1998b), and even with no insurance the welfare cost of higher volatility would be small (Lucas, 1987). In the former case, however, the government sector could be unable to provide adequate insurance, and so a large and rare macroeconomic contraction could impose non-negligible welfare costs on economic agents as in Barro (2006, 2009).

To address this point, I use output data on 53 countries over 45 years to study the impact of financial liberalization on output growth, volatility, and *skewness*. The skewness of the distribution of output growth captures the asymmetric variability of the growth process and is thus more closely related to the concept of disaster risk than the volatility. I also estimate the effect of liberalization on the first three moments of growth jointly, which allows me to separate the direct from the indirect effect of liberalization. I rely on industry-level data in order to identify a causal link

[13] Argentina's real GDP declined by 20% between 1998 and 2002.

between openness and the pattern of output fluctuations.

The data strongly suggests that financial openness is associated with higher output growth, but also with higher variability of output growth, more so in the sense of negative skewness than in the sense of higher volatility. These results are remarkably robust to a wide variety of alternative tests, including accounting for the strategic choice associated with liberalization, controlling for the channels through which concurrent policy reforms and macroeconomic developments affect the rate and the variability of the growth process, and alternating between *de jure* and *de facto* measures of openness. Regarding the specific channels, the increase in negative skewness appears to be driven by a more left-skewed distribution of growth rates of capital, TFP, and new business creation. I also find that the direct effect of financial openness on skewness is somewhat muted by the indirect effect through the channel of higher growth. Finally, countries with deeper financial markets and with better institutions seem to benefit more from financial liberalization, both in terms of higher growth and in terms of lower probability of large and rare contractions.

While the evidence suggests that for sufficiently disaggregated data, financial openness increases the probability of large, abrupt, and rare contractions in output, this need not hold in the aggregate. Imbs (2007) shows that while high-growth activities tend to be more volatile, in the aggregate data a component of aggregate volatility dominates which correlates negatively with growth, and hence an increase in sectoral volatility is not inconsistent with a decrease in aggregate volatility. In the last part of the paper, I provide evidence that financial openness is associated with a more negatively skewed distribution not just of sectoral growth rates, but of aggregate growth rates as well. While tests using country-level data are traditionally prone to conceptual and econometric problems, the evidence tentatively suggests that there is no averaging away of sector-specific developments, as in the case of the volatility. What are the welfare consequences of this combined increase in growth and in negative skewness would, of course, require a fully specified growth model, as well as a robust empirical test of the role of the government sector in insuring away not just excess volatility, but also excess negative skewness. Such an investigation is beyond this paper's scope.

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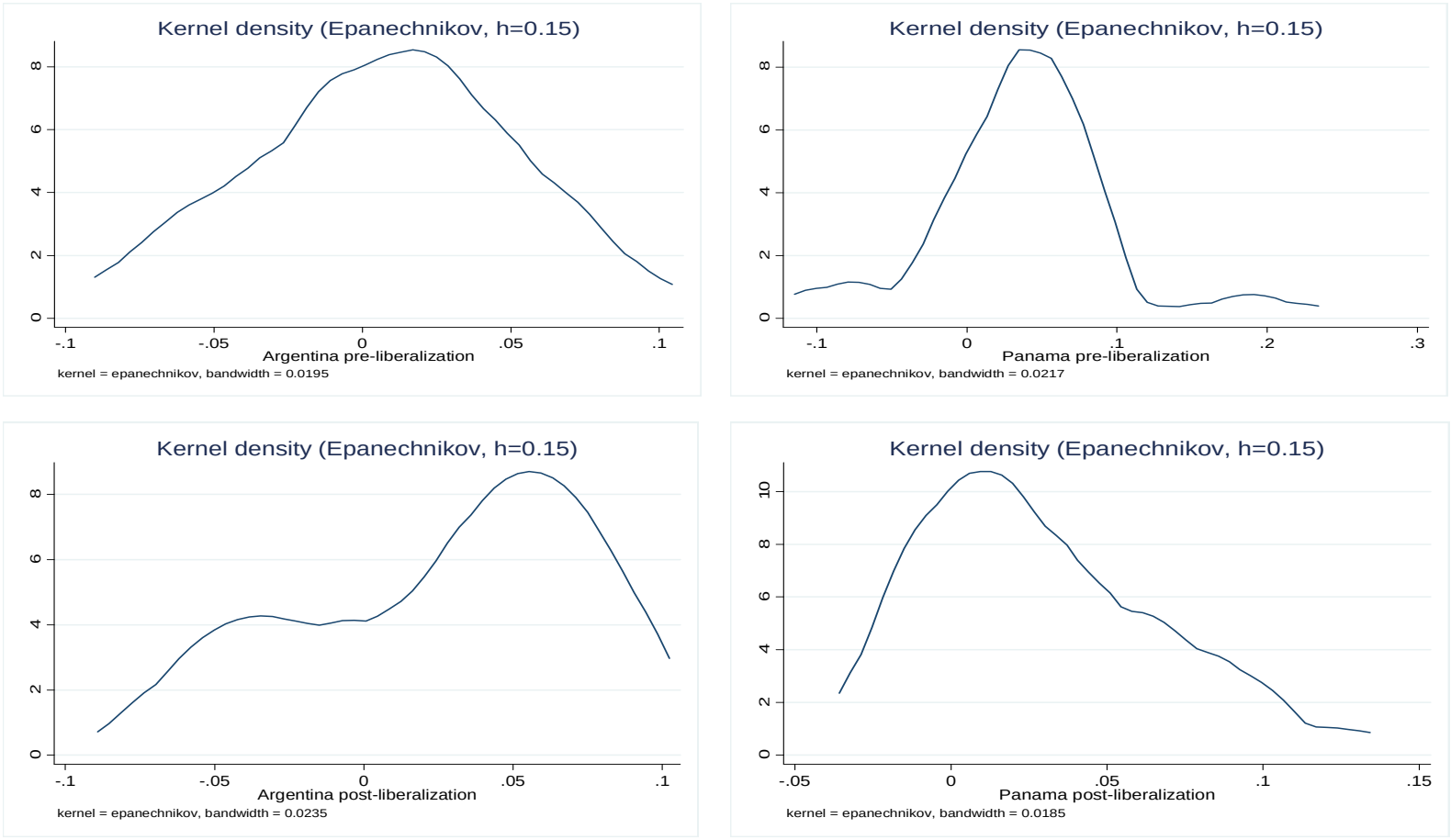
Figure 1.Kernel distribution of real GDP growth, pre- and post- liberalization: Argentina vs. Panama



Moments of real growth, pre- vs. post- liberalization event

	Argentina		Panama	
	Pre-	Post-	Pre-	Post
Mean	0.007	0.026	0.038	0.029
Standard deviation	0.042	0.043	0.059	0.034
Skewness	-0.118	-0.666	0.365	0.863

Table 1
Growth, volatility, skewness, and liberalization

Country	Average growth	Average volatility	Average skewness	Liberalization event	Country	Average growth	Average volatility	Average skewness	Liberalization event
Argentina	-0.014	0.116	0.497	1990	Kenya	0.033	0.249	0.063	
Australia	0.014	0.121	0.143		Korea	0.079	0.124	0.346	1999
Austria	0.026	0.111	0.114		Kuwait	0.042	0.401	0.043	
Belgium	0.021	0.160	0.009		Macao	0.047	0.328	0.516	
Bolivia	0.031	0.309	-0.123		Malawi	0.052	0.307	0.616	
Bulgaria	0.016	0.186	-0.429		Malaysia	0.094	0.156	-0.058	
Cameroon	0.024	0.313	0.234		Malta	0.044	0.226	0.240	
Canada	0.027	0.086	-0.620	1976	Mauritius	0.063	0.204	0.220	
Chile	0.030	0.175	-0.142	1999	Morocco	0.049	0.224	0.252	
China	0.109	0.105	0.004		Netherlands	0.004	0.085	-0.518	
Colombia	0.039	0.128	-0.070	1999	New Zealand	0.032	0.086	0.421	
Costa Rica	0.046	0.154	0.486		Norway	0.015	0.134	0.064	1989
Cyprus	0.043	0.154	-0.042		Peru	-0.016	0.175	0.114	1992
Ecuador	0.056	0.265	0.223		Philippines	0.042	0.182	-0.135	
Finland	0.026	0.110	-0.211	1990	Qatar	0.020	0.189	0.431	
France	0.018	0.088	-0.604	1990	Singapore	0.060	0.191	-0.002	
Germany	0.016	0.057	-0.095	1982	South Africa	0.043	0.123	0.528	
Greece	0.010	0.122	-0.109		Spain	0.036	0.108	0.467	1993
Hungary	0.011	0.124	0.204		Sri Lanka	0.075	0.289	0.448	
Iceland	0.028	0.128	0.132		Sweden	0.018	0.109	-0.021	1989
India	0.065	0.122	-0.174		Tonga	0.061	0.376	0.263	
Indonesia	0.128	0.264	0.336	1990	Tunisia	0.065	0.122	0.090	
Ireland	0.033	0.134	-0.474	1992	Turkey	0.079	0.177	0.232	
Israel	0.037	0.175	0.019		United Kingdom	0.001	0.099	-0.530	1981
Italy	0.037	0.142	0.608	1992	United States	0.018	0.074	-0.309	1982
Japan	0.010	0.083	-0.436	1992	Uruguay	-0.002	0.223	-0.082	
Jordan	-0.014	0.116	0.497						

Note: Data on manufacturing industry output from UNIDO (2010) and on liberalization events from Kaminsky and Schmukler (2008). All countries included have data on at least 10 sectors for at least 10 years pre- and 10 years post-liberalization. All data sources in Appendix.

Table 2
Country characteristics

Country	Log GDP per capita	Private credit / GDP	Trade openness	Human capital	Constraints on executive
Argentina	9.30	0.12	0.17	67.96	2.15
Australia	9.83	0.39	0.22	87.42	4.20
Austria	9.82	0.61	0.48	93.42	3.93
Belgium	9.78	0.24	0.97	93.02	5.50
Bolivia	8.05	0.14	0.44	67.74	2.06
Bulgaria	8.49	0.09	0.81	85.86	1.00
Cameroon	7.85	0.11	0.29	11.57	1.00
Canada	9.70	0.32	0.37	94.64	4.00
Chile	9.00	0.34	0.38	84.53	2.13
China	7.13	0.26	0.29	88.32	1.00
Colombia	8.54	0.21	0.25	57.94	2.33
Costa Rica	8.87	0.13	0.44	37.71	3.00
Cyprus	9.02	0.70	0.69	86.79	3.00
Ecuador	8.38	0.13	0.41	49.48	2.81
Finland	9.67	0.44	0.35	95.09	4.43
France	9.76	0.52	0.24	91.85	6.80
Germany	9.79	0.69	0.29	97.46	6.56
Greece	9.55	0.20	0.23	82.44	3.00
Hungary	9.21	0.19	0.32	87.21	1.00
Iceland	9.92	0.32	0.61	86.16	4.06
India	7.24	0.15	0.16	56.78	4.06
Indonesia	7.66	0.13	0.54	47.99	1.00
Ireland	9.41	0.47	0.52	84.35	5.41
Israel	9.51	0.41	0.52	88.20	3.56
Italy	9.73	0.51	0.32	91.05	4.73
Japan	9.75	0.85	0.13	99.51	3.47
Jordan	8.60	0.46	0.83	79.74	1.00
Kenya	7.54	0.18	0.53	38.13	1.00
Korea	8.92	0.74	0.26	89.50	2.96
Kuwait	10.83	0.16	0.90	78.51	1.00
Macao	9.71	0.51	1.43	67.73	---
Malawi	6.74	0.07	0.75	28.19	1.00
Malaysia	8.62	0.43	0.93	64.14	3.25
Malta	9.01	0.46	2.01	85.13	3.00
Mauritius	8.80	0.26	1.19	71.62	4.15
Morocco	8.30	0.22	0.40	32.67	1.00
Netherlands	9.86	0.69	0.60	87.14	4.06
New Zealand	9.67	0.54	0.32	90.49	3.00
Norway	9.96	0.69	0.55	94.79	3.64
Peru	8.56	0.06	0.27	67.75	2.94
Philippines	8.02	0.19	0.53	53.25	1.50
Qatar	11.09	0.26	0.93	74.45	1.00
Singapore	9.33	0.64	2.93	77.32	2.00
South Africa	8.93	0.39	0.49	66.67	1.75
Spain	9.54	0.67	0.19	87.28	3.28
Sri Lanka	7.72	0.09	0.73	56.12	3.00
Sweden	9.81	0.60	0.42	96.43	3.36

Tonga	8.37	0.19	0.90	71.78	---
Tunisia	8.18	0.52	1.08	57.21	1.00
Turkey	8.29	0.12	0.15	57.94	3.75
United Kingdom	9.62	0.24	0.28	94.98	4.50
United States	9.95	0.85	0.10	87.27	4.67
Uruguay	8.96	0.18	0.29	67.74	2.44

Note: The Table reports summary statistics from country-specific control variables. 'Log GDP per capita' is the logarithm of average GDP per capita in the period before and after a liberalization event. 'Private credit/GDP' is the ratio of credit to the private sector to GDP. 'Trade openness' is the average degree of openness to trade in the 10 years before and after a liberalization event. 'Human capital' is the ratio of secondary school enrollment to total enrollment. 'Constraints on the executive' is an index of checks and balances on the executive branch of government. All data sources in Appendix.

Table 3
Industry characteristics

Two-Digit ISIC Sector	External dependence	Growth opportunities	Liquidity needs	Exports/ Output	Imports/ Output
15. Food and beverages	-0.118	0.056	0.10	0.168	0.239
16. Tobacco manufacturing	-0.459	0.045	0.24	0.158	0.591
17. Textile mills products	-0.067	0.072	0.16	0.209	1.127
18. Wearing apparel and fur	-0.489	0.062	0.20	1.047	0.797
19. Leather and leather products	-0.996	0.027	0.245	0.654	2.057
20. Wood products	0.058	0.079	0.15	1.499	8.130
21. Paper and allied products	-0.052	0.074	0.11	0.184	0.729
22. Printing and publishing	-0.120	0.089	0.08	0.065	0.173
23. Petroleum and coal products	-0.065	0.009	0.105	0.201	1.037
24. Chemicals and allied products	0.306	0.031	0.14	0.413	1.417
25. Rubber and plastic products	-0.031	0.052	0.14	0.276	1.073
26. Stone, clay, glass and concrete	0.083	0.040	0.16	0.420	1.486
27. Primary metals	0.083	0.040	0.155	0.861	1.624
28. Fabricated metal products	-0.067	0.043	0.18	0.183	0.577
29. Industrial machinery and equipment	0.058	0.030	0.21	3.878	12.188
30. Office, accounting, and computing	0.058	0.030	0.21	0.484	2.205
31. Electrical and electronic equipment	0.441	0.044	0.21	0.484	2.205
32. Radio, television, and communications	0.244	0.044	0.21	0.484	2.205
33. Medical, precision, and optical instruments	0.473	0.026	0.21	0.484	2.205
34. Other transportation equipment	0.129	0.056	0.15	1.499	8.130
35. Furniture; miscellaneous manufacturing	0.031	0.049	0.21	1.035	4.941

Note: The Table reports summary statistics from country-specific control variables. 'External dependence' is the sector's median value of capital expenditures minus cash flows divided by capital expenditures. 'Growth opportunities' is the sector's median sales growth. 'Liquidity needs' is the sector's median value of total inventories divided by total sales. 'Exports/Output' is average exports in a particular sector divided by output in a particular sector. 'Imports/Output' is average imports in a particular sector divided by output in a particular sector. All data for mature Compustat firms (data sources in Appendix).

Table 4
De jure financial liberalization, growth, volatility, and skewness:

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			3SLS		
	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized	0.029	0.018	-0.217	0.020	0.018	-0.597
	(0.009)***	(0.011)*	(0.134)*	(0.010)**	(0.012)	(0.228)***
Post	-0.090	-0.028	-0.462	-0.075	-0.028	0.717
	(0.017)***	(0.028)	(0.200)**	(0.029)***	(0.039)	(0.721)
Growth						13.714
						(6.876)**
Volatility				0.407		
				(0.329)		
Initial share	-0.007	-0.191	-1.011	0.073	-0.190	-0.898
	(0.023)	(0.083)**	(0.559)*	(0.073)	(0.050)***	(0.532)*
Exports/Output × Trade openness	0.014	-0.005	-0.080	0.014	-0.005	-0.252
	(0.008)*	(0.013)	(0.153)	(0.010)	(0.015)	(0.181)
Imports/Output × Trade openness	-0.004	0.006	0.016	-0.006	0.006	0.073
	(0.002)*	(0.004)	(0.035)	(0.003)*	(0.004)	(0.053)
Log GDP per capita	-0.012	-0.038	-1.730	-0.003	0.027	0.301
	(0.015)	(0.057)	(0.487)***	(0.005)	(0.009)***	(0.119)**
Private credit/GDP	0.022	-0.070	0.116	0.071	-0.068	0.488
	(0.021)	(0.042)*	(0.433)	(0.037)*	(0.036)*	(0.458)
Private credit/GDP × External dependence	0.019			-0.023		
	(0.022)			(0.011)**		
Private credit/GDP × Growth opportunities	-0.480			-0.568		
	(0.198)**			(0.245)**		
Private credit/GDP × Liquidity needs		-0.073	-1.136		-0.086	-3.054
		(0.217)	(2.181)		(0.169)	(2.283)
Log population		-0.019	-0.812		0.021	-0.688
		(0.003)	(0.256)***		(0.016)	(0.211)***
Log population × Liquidity needs		-0.052	-0.184		-0.050	0.087
		(0.045)	(0.401)		(0.030)*	(0.372)
Country fixed effects				Yes		
Industry fixed effects				Yes		
Time fixed effects				Yes		
Observations	1,588	1,588	1,588	1,588	1,588	1,588
R-squared	0.37	0.46	0.14	0.30	0.46	0.18

Note: The Table reports estimates from fixed effects regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of the growth rates of output during the years immediately before or immediately after an episode of financial liberalization. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. 'Initial share' is the beginning-of-period share of output in a sector in total manufacturing output. 'Exports/Output' are exports in a particular sector divided by output in a particular sector. 'Imports/Output' are imports in a particular sector divided by output in a particular sector. 'Trade openness' is average degree of openness to trade. 'Log GDP per capita' is the logarithm of average GDP per capita in the period before and after a liberalization event. 'Private credit/GDP' is the ratio of credit to the private sector to GDP. 'External dependence' is the sector's median capital expenditures minus cash flows divided by capital expenditures. 'Growth opportunities' is the sector's median sales growth. 'Liquidity needs' is the sector's median inventories over sales. 'Log population' is the logarithm of total population. Estimates from OLS regressions (Columns labeled "OLS") and from three-stage simultaneous equations regressions (Columns labeled "3SLS"). All regressions include fixed effects as specified. Standard errors clustered at the country×time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 5
De jure financial liberalization, growth, volatility, and skewness: Propensity score matching results

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			3SLS		
	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized	0.017	0.023	-0.438	0.013	0.023	-0.618
	(0.008)**	(0.014)*	(0.134)***	(0.008)*	(0.013)*	(0.176)***
Post	-0.050	-0.064	-0.302	-0.040	-0.063	0.245
	(0.016)***	(0.033)*	(0.223)	(0.026)*	(0.039)*	(0.551)
Growth						11.764
						(7.779)
Volatility				0.137		
				(0.223)		
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Observations	1,216	1,216	1,216	1,216	1,216	1,216
R-squared	0.42	0.38	0.15	0.36	0.38	0.30

Note: The Table reports estimates from fixed effects regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of the growth rates of output during the years immediately before or immediately after an episode of financial liberalization. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). In all regressions the control group is all countries which never liberalized their financial markets and which attained a minimum propensity score from a first-stage logistic regression of the probability of liberalization on the set of country level variables summarized in Table 2. Estimates from OLS regressions (Columns labeled "OLS") and from three-stage simultaneous equations regressions (Columns labeled "3SLS"). All regressions include fixed effects as specified. Standard errors clustered at the country×time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 6
De jure financial liberalization, growth, volatility, and skewness: Industry characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Growth	Volatility	Skewness	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized × External dependence	0.027	-0.012	-0.387						
	(0.008)***	(0.011)	(0.146)***						
Liberalized × Growth opportunities				0.416	0.207	-4.123			
				(0.149)***	(0.191)	(3.267)			
Liberalized × Liquidity needs							0.040	0.191	-1.507
							(0.071)	(0.065)***	(1.209)
Post	-0.071	-0.001	0.111	-0.076	-0.019	-0.342	-0.060	-0.041	-0.126
	(0.029)***	(0.037)	(0.526)	(0.026)***	(0.038)	(0.632)	(0.030)**	(0.038)	(0.754)
Growth			9.961			2.361			5.532
			(5.350)*			(6.171)			(8.369)
Volatility	0.358			0.344			0.434		
	(0.256)			(0.306)			(0.294)		
Country × Time fixed effects					Yes				
Industry fixed effects					Yes				
Observations	1,588	1,588	1,588	1,588	1,588	1,588	1,588	1,588	1,588
R-squared	0.08	0.46	0.25	0.10	0.46	0.20	0.06	0.46	0.24

Note: The Table reports estimates from fixed effects three-stage simultaneous equations regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of the growth rates of output during the years immediately before and immediately after an episode of financial liberalization. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'External dependence' is the sector's median value of capital expenditures minus cash flows divided by capital expenditures. 'Growth opportunities' is the sector's median sales growth. 'Liquidity needs' is the sector's median value of inventories over sales. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). Estimates from three-stage simultaneous equations regressions. All regressions include fixed effects as specified. Standard errors clustered at the country × time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 7
De facto financial liberalization, growth, volatility, and skewness

	(1)	(2)	(3)	(4)	(5)	(6)
	Growth	Volatility	Skewness	Growth	Volatility	Skewness
(Foreign assets + liabilities)/GDP × External dependence	0.016	-0.010	-0.195			
	(0.010)*	(0.007)	(0.010)**			
Foreign liabilities/GDP × External dependence				0.039	-0.027	-0.463
				(0.024)*	(0.016)*	(0.216)**
Growth			22.793			22.719
			(6.757)***			(6.705)***
Volatility	1.021			1.024		
	(0.586)*			(0.585)*		
Country fixed effects			Yes			
Industry fixed effects			Yes			
Time fixed effects			Yes			
Observations	1,546	1,546	1,546	1,546	1,546	1,546
R-squared	0.21	0.44	0.10	0.23	0.44	0.10

Note: The Table reports estimates from fixed effects three-stage simultaneous equations regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of the growth rates of output during the years immediately before or immediately after an episode of financial liberalization. '(Foreign assets + liabilities)/GDP' is the sum of capital assets and capital liabilities divided by GDP. 'Foreign liabilities/GDP' is the country's capital liabilities divided by GDP. 'External dependence' is the sector's median value of capital expenditures minus cash flows divided by capital expenditures. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). All regressions include fixed effects as specified. Estimates from three-stage simultaneous equations regressions. Standard errors clustered at the country × time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 8
De jure financial liberalization, growth, volatility, and skewness: Measurement and data issues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Growth	Volatility	Minimum growth	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized	0.020	0.018	-0.117	0.017	0.019	-0.287	0.016	-0.001	-0.443
	(0.011)**	(0.012)	(0.053)**	(0.008)**	(0.011)*	(0.197)	(0.008)**	(0.016)	(0.265)*
Post	-0.075	-0.028	0.180	-0.046	-0.054	-0.280	-0.022	0.081	0.665
	(0.029)***	(0.039)	(0.168)	(0.026)*	(0.039)	(0.595)	(0.012)*	(0.029)***	(0.348)*
Growth			3.102			5.223			-0.281
			(1.352)**			(7.422)			(9.966)
Volatility	0.403			0.139			-0.036		
	(0.329)			(0.234)			(0.154)		
Country fixed effects					Yes				
Industry fixed effects					Yes				
Time fixed effects					Yes				
Observations	1,588	1,588	1,588	1,316	1,316	1,316	559	559	559
R-squared	0.01	0.46	0.26	0.39	0.42	0.25	0.55	0.38	0.20

Note: The Table reports estimates from fixed effects three-stage simultaneous equations regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), the skewness (Columns labeled 'Skewness'), or the difference between lowest realized growth and mean output growth during the years immediately before or immediately after an episode of financial liberalization (Columns labeled 'Minimum growth') during the years immediately before or immediately after an episode of financial liberalization (Columns labeled 'Skewness'). In columns (1)-(3), the full sample of countries is used. In columns (4)-(6), countries with data on at least 15 of all industries are used. In columns (7)-(9), countries with data on at least 18 of all industries are used. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). Estimates from three-stage simultaneous equations regressions. All regressions include fixed effects as specified. Standard errors clustered at the country×time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 9
De jure financial liberalization, volatility, and skewness: Empirical channels

Panel A. Capital accumulation and TFP

	(1)	(2)	(3)	(4)	(5)	(6)
	Capital			TFP		
	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized	0.002	0.041	-0.242	0.054	-0.031	-0.386
	(0.019)	(0.015)***	(0.140)*	(0.030)*	(0.014)**	(0.203)*
Post	-0.061	0.036	0.468	-0.149	0.082	-0.213
	(0.034)	(0.044)	(0.424)	(0.082)*	(0.040)**	(0.606)
Growth			-4.827			11.306
			(6.332)			(6.921)*
Volatility	0.231			1.116		
	(0.395)			(0.613)*		
Observations	1,172	1,172	1,172	1,210	1,210	1,210
R-squared	0.51	0.34	0.16	0.35	0.50	0.33

Panel B. New business creation and employment

	(1)	(2)	(3)	(4)	(5)	(6)
	Establishments			Employment		
	Growth	Volatility	Skewness	Growth	Volatility	Skewness
Liberalized	-0.055	0.037	-0.988	0.018	0.039	0.619
	(0.013)***	(0.020)*	(0.598)*	(0.019)	(0.013)***	(0.511)
Post	-0.015	0.312	4.715	-0.060	-0.018	-1.665
	(0.047)	(0.044)***	(1.754)***	(0.026)**	(0.042)	(1.136)
Growth			-12.319			-10.249
			(13.829)			(14.263)
Volatility	0.430			0.384		
	(0.144)***			(0.419)		
Observations	1,258	1,258	1,258	1,586	1,586	1,586
R-squared	0.18	0.49	0.41	0.14	0.42	0.30

Note: The Table reports estimates from fixed effects three-stage simultaneous equations regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of growth rates of capital and TFP (Panel A) and establishments and employment (Panel B). 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). Estimates from three-stage simultaneous equations regressions. All regressions include country, industry, and time fixed effects. Standard errors clustered at the country×time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All data sources in Appendix.

Table 10
Financial liberalization, growth, volatility, and skewness: Heterogeneity

	(1)	(2)	(3)
	Growth	Volatility	Skewness
Liberalized × Constraints on executive	0.029	-0.003	1.187
	(0.018)*	(0.037)	(0.413)***
Liberalized × Private credit/GDP	0.110	0.001	3.717
	(0.068)*	(0.152)	(1.681)**
Liberalized × Trade openness	-0.004	0.126	-0.181
	(0.038)	(0.075)*	(0.823)
Liberalized × Human capital	-0.001	-0.001	-0.096
	(0.001)	(0.003)	(0.032)***
Liberalized × Latin America dummy	0.086	0.049	2.301
	(0.031)***	(0.073)	(0.806)***
Liberalized × Asia dummy	-0.026	0.034	1.699
	(0.031)	(0.063)	(0.699)**
Observations	1,235	1,235	1,235
R-squared	0.33	0.41	0.10

Note: The Table reports estimates from fixed effects regressions where the dependent variable is the mean (Columns labeled 'Growth'), the standard deviation (Columns labeled 'Volatility'), or the skewness (Columns labeled 'Skewness') of the distribution of the growth rates of output during the years immediately before or immediately after an episode of financial liberalization. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. 'Constraints on executive' is an index of executive checks and balances in the country. 'Private credit/GDP' is the ratio of credit to the private sector to GDP. 'Trade openness' is the average degree of openness to trade. 'Human capital' is the ratio of secondary school enrollment to total enrollment. 'Latin America dummy' is an indicator variable equal to 1 if the country is in Latin America. 'Asia dummy' is an indicator variable equal to 1 if the country is in Asia. The regressions include all other covariates from Table 5 (coefficients not reported for brevity). Estimates from 2SLS regressions where the private credit to GDP ratio and constraints on the executive have been instrumented using dummies for legal origin, from La Porta et al. (1998). All regressions include country, industry, and time fixed effects. Standard errors clustered at the country × time level appear below each coefficient in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 11
Financial openness and skewness: Aggregate data

	(1)	(2)	(3)	(4)
	Skewness			
Liberalized	-0.601	-0.516	-0.561	-0.564
	(0.270)**	(0.259)**	(0.284)**	(0.265)**
Post	-0.189	-0.170	0.041	-0.047
	(0.198)	(0.189)	(0.217)	(0.196)
Growth		16.765	19.695	19.744
		(5.120)***	(5.456)***	(5.136)***
Private credit/GDP			-0.007	0.003
			(0.003)**	(0.061)
Log GDP per capita			0.198	0.329
			(0.157)	(0.147)**
Trade openness			-0.001	-0.001
			(0.002)	(0.001)
Government /GDP			0.001	-0.040
			(0.023)	(0.023)*
Human capital			-0.003	-0.010
			(0.006)	(0.006)*
Population growth			-0.157	-0.120
			(0.085)**	(0.079)
Log life expectancy			-1.669	-1.368
			(1.404)	(1.282)
Inflation			-0.139	-0.156
			(0.142)	(0.130)
Constraints on executive				0.003
				(0.061)
Observations	106	106	106	102
R-squared	0.09	0.17	0.28	0.32

Note: The Table reports estimates from regressions where the dependent variable is the skewness of the distribution of the growth rates of output during the years immediately before or immediately after an episode of financial liberalization. 'Liberalized' is a dummy variable equal to 1 if a country is liberalized in a given period. Liberalization periods are periods during which all three liberalization criteria in Kaminsky and Schmukler (2008) are fulfilled. 'Post' is a dummy variable equal to 1 after a liberalization event for all countries, irrespective of whether they liberalized or not. 'Growth' is average GDP growth. 'Private credit/GDP' is the ratio of credit to the private sector to GDP. 'Log GDP per capita' is the logarithm of average GDP per capita. 'Trade openness' is the average degree of openness to trade. 'Government/GDP' is the average ratio of government spending and transfers to GDP. 'Human capital' is the average ratio of secondary school enrollment to total enrollment. 'Population growth' is average growth of the population. 'Log life expectancy' is the logarithm of average (male and female) life expectancy. 'Inflation' is average inflation. 'Constraints on executive' is an index of executive checks and balances in the country. Estimates from OLS regressions where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Appendix. Variables and sources

Output	Total output in a particular industry in a particular country in a particular year, in constant US dollars. Source: INDSTAT 2010 Rev. 3.
Liberalized	Dummy variable equal to 1 following the year in which the country attains a liberalization status on all three liberalization dimensions – credit markets, stock markets, and capital controls – for countries which liberalized. Source: Kaminsky and Schmukler (2008).
Post	Dummy variable equal to 1 following the year in which the country attains a liberalization status on all three liberalization dimensions – credit markets, stock markets, and capital controls – for countries which liberalized. For countries which did not, it equals 1 after the mean liberalization year in the sample. Source: Kaminsky and Schmukler (2008).
Initial share	The industry's share of output out of total manufacturing output in this country for a particular year. Source: INDSTAT 2010 Rev. 3.
Minimum growth	Difference between minimum growth experienced during the pre- or post-liberalization period and the average growth experience during that period, for each industry. Source: INDSTAT 2010 Rev. 3.
Log population	Average logarithm of the total population in the respective country. Source: Penn Tables.
Population growth	Average growth in the total population over the previous year. Source: Penn Tables and author's calculations.
GDP per capita	Average of total GDP divided by the population. Source: Penn Tables.
GDP growth	Average growth in GDP per capita over the previous year. Source: Penn Tables.
Log GDP per capita	Logarithm of average GDP per capita for the pre- and post-liberalization period. Source: Penn Tables.
Trade openness	Average index of the country's realized openness to trade. Source: Penn Tables.
Human capital	Average ratio of secondary school enrollment to total enrollment. Source: World Bank Development Indicators.
Years of schooling	Average years of schooling per person (male and female) in the country. Source: Barro and Lee Database.
Life expectancy	Average life expectancy at birth. Source: WB Development Indicators.
Inflation	Average inflation in the respective country over the previous year. Source: WB Development Indicators.
Constraints on executive	Average index of executive checks and balances on the executive branch of government. Source: Polity IV.
Private credit/GDP	Average value of total credits by financial intermediaries to the private sector in each country, available with annual frequency. Excludes credit by central banks. Calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDP_t/P_at]

	where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI. Source: Beck et al. (2010).
Foreign assets/GDP	Average total foreign assets over GDP. Source: Lane and Milesi-Ferretti (2007).
Foreign liabilities/GDP	Average total foreign liabilities over GDP. Source: Lane and Milesi-Ferretti (2007).
Government/GDP	Average government spending as a share of total GDP. Source: Penn Tables.
Legal origin	A matrix of dummies for the origin of the country's legal system. Dummies take on the value of 1 if the respective country has English, French, German, or Nordic legal origin. Source: La Porta et al. (1998)
Exports/Output	Average exports in a particular sector divided by output in a particular sector. Adapted for ISIC Rev. 3 from Di Giovanni and Levchenko (2007).
Imports/Output	Average imports in a particular sector divided by output in a particular sector. Adapted for ISIC Rev. 3 from Di Giovanni and Levchenko (2007).
External dependence	The sector's median value of capital expenditures minus cash flows divided by capital expenditures, for mature Compustat firms. Adapted for ISIC Rev. 3 from Cetorelli and Strahan (2006).
Growth opportunities	The sector's median value of capital expenditures minus cash flows divided by capital expenditures, for mature Compustat firms. Adapted for ISIC Rev. 3 from Fisman and Love (2006).
Liquidity needs	The sector's median value of total inventories divided by total sales, for mature Compustat firms. Adapted for ISIC Rev. 3 from Raddatz (2006).