Credit constraints, equity market liberalizations and international trade ☆

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A B S T R A C T

This paper provides evidence that credit constraints are an important determinant of international trade flows. I exploit shocks to the availability of external finance and examine the impact of equity market liberalizations on the export behavior of 91 countries in the 1980–1997 period. I show that liberalizations increase exports disproportionately more in financially vulnerable sectors that require more outside finance or employ fewer collateralizable assets. This result is not driven by cross-country differences in factor endowments and is independent of simultaneous trade policy reforms. Moreover, it obtains with equal strength in the full panel of countries as well as in both panel and event-study analyses of countries which removed capital controls during the sample period. Finally, the effects of liberalizations are more pronounced in economies with initially less active stock markets, indicating that foreign equity flows may substitute for an underdeveloped domestic financial system. Similarly, opening equity markets has a greater impact in the presence of higher trade costs caused by restrictive trade policies.

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1. Introduction

The standard Heckscher–Ohlin model predicts that a country rich in labor, natural resources, or physical or human capital has a comparative advantage in goods intensive in the abundant input factors. This view abstracts from market frictions that may arise from agency problems, and presumes that entrepreneurs can enter any industry regardless of its need for outside finance or endowment of collateralizable assets. In the presence of financial frictions, however, borrowing constraints will vary across industries and affect the sectoral composition of a country's exports by limiting the investment opportunities open to producers with insufficient private capital.

This paper provides evidence that credit constraints are an important determinant of international trade flows. I exploit shocks to the availability of external finance and examine the impact of equity market liberalizations on the export behavior of 91 countries in the 1980–1997 period. I show that liberalizations increase exports disproportionately more in sectors intensive in external finance and softer assets, suggesting that pre-liberalization trade was restricted by financial constraints. This result is not driven by cross-country differences in factor endowments and is independent of simultaneous trade policy reforms. Moreover, it obtains with equal strength in the full panel of countries as well as in both panel and event-study analyses of countries which removed capital controls during the sample period. Finally, the effects of liberalizations are more pronounced in economies with initially less active stock markets, indicating that foreign equity flows may substitute for an underdeveloped domestic financial system. Similarly, opening equity markets has a greater impact in the presence of higher trade costs due to restrictive trade policies.

These findings add to a small but growing literature on the role of domestic financial institutions in determining trade flows. Financially developed countries have been shown to export relatively more in sectors that require more outside finance or are

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intensive in fixed upfront costs (Beck, 2003; Becker and Greenberg, 2005; Svaleryd and Vlachos, 2005; Hur et al., 2006). The cross-sectional approach in these studies,[1] however, has made it difficult to establish a causal link from finance to trade. The problem arises because in the absence of credit constraints, higher foreign demand for sectors intensive in external funds would lead to both higher exports from these industries and to more borrowing in the economy. With credit extended to the private sector the most common measure of financial development, this mechanism could generate the result that financially developed countries export relatively more in external capital dependent sectors even under perfect credit markets. More broadly, the concern is that countries specialized in industries intensive in external finance are more likely to develop stronger financial institutions. Recent evidence also suggests that trade openness may stimulate domestic financial development (Braun and Raddatz, 2004; Huang and Temple, 2005; Do and Levchenko, 2007).[2]

I exploit shocks to the availability of outside finance and study equity market liberalizations to circumvent these concerns. In principle, allowing foreign portfolio investments should result in resources flowing from capital-abundant developed countries, where expected returns are low, to capital-scarce emerging countries, where expected returns are high. This should reduce the cost of capital in liberalizing economies, increase investment, and raise output and exports. Moreover, the exact timing of a liberalization event is the product of complex political processes and thus arguably exogenous from the perspective of individual producers and exporters.

Equity market liberalizations have indeed been shown to reduce the cost of capital (Bekaert and Harvey, 2000; Henry, 2000a; Martell and Stulz, 2003), trigger aggregate investment booms (Henry, 2000b), improve firm-level investment and performance, and promote an efficient resource allocation (Chari and Henry, in press; Mitton, 2006).[3] While there has been some controversy about the consequences of liberalizing capital flows for aggregate growth (Prasad et al., 2006), the latest reading of the literature finds strong support for liberalizations' predicted temporary growth-enhancing and permanent output level effects (Bekaert et al., 2005; Gupta and Yuan, 2004; Henry, 2007). These findings suggest that, if credit constraints restrict firms' ability to produce and grow, equity market liberalizations should also stimulate aggregate exports by allowing more firms to become exporters and/or by increasing firm-level exports.

I follow the literature and exploit the variation in the impact of increased availability of external finance across sectors. In industries in which all necessary investments can be funded with internal cash flows, access to external funds matters little since firms do not need to borrow. As a sector's dependence on external finance increases, however, the availability of outside capital becomes more important (Rajan and Zingales, 1998). In addition, entrepreneurs find it easier to raise outside capital in industries which, for technological reasons, employ more tangible assets that can serve as collateral, such as real estate, plants and machinery (Claessens and Laeven, 2003; Braun, 2003).[4] Equity market liberalizations should therefore increase exports disproportionately more in financially vulnerable sectors that require more outside finance or use fewer collateralizable assets.[5] Moreover, exploiting the cross-sector variation in asset tangibility further helps establish the causal effect of credit constraints on trade (see Section 7).

I find strong support for these predictions in a panel of 91 countries and 27 industries over the 1980–1997 period. I use an indicator variable that equals 1 after an equity market liberalization and interact it with industry-level measures of asset tangibility and external finance dependence. As in Rajan and Zingales (1998), external finance dependence is calculated as the share of capital expenditures not funded by cash flow from operations for the median U.S. firm in each industry. Asset tangibility is similarly defined as the share of net plant, property, and equipment in total assets for the median U.S. firm in a sector, as in Braun (2003). I obtain data on liberalization events from Bekaert et al. (2005) and present robust results with measures of the comprehensiveness of each reform.

I first establish the impact of liberalizations on worldwide exports by sector for all countries in the sample. I find that open equity markets are associated with greater exports, especially in sectors intensive in external capital or soft assets. These results obtain with country, year and industry fixed effects, which account for systematic differences across countries and sectors and capture general time trends. These effects are also independent of comparative advantage arising from cross-country differences in factor endowments. I then show consistent evidence for the sample of 39 economies which liberalized foreign portfolio flows during the sample period. This further suggests that the results are not driven by cross-sectional differences between countries with open and closed stock markets, but can be attributed to the financial reform. Finally, I perform an event study and examine the change in exports around liberalization events. First-differencing trade flows allows me to remove the variation arising from factors specific to a country–industry pair and exploit purely the time-series variation. I continue to observe that exports grow disproportionately faster in financially vulnerable sectors in the immediate aftermath of an equity market reform.

My results are highly statistically and economically significant. Within three years after an equity market liberalization, a country's textile exports (highly dependent on external finance, 75th percentile) increase by 13 percentage points more than its

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[1] A notable exception is Becker and Greenberg (2005), who examine a panel of bilateral exports and document that financially developed countries respond more to real exchange rate fluctuations.

[2] Legal origin has been proposed as an instrument for private credit. However, legal origin has been shown to impact institution formation and the economy more broadly (La Porta et al., 1997, 1998), which in turn are likely to affect sectors differentially. It is thus not obvious that this instrument meets the exclusion restriction.

[3] There is also evidence that equity market liberalizations are associated with increased entrepreneurial activity (Alfaro and Charleton, 2006) and a greater share of capital goods in imports (Alfaro and Hammel, 2007).

[4] In contrast, it is more difficult to transfer control over a firm's human and organizational capital, research and development, and even accounts receivable, cash and inventories. Grossman and Hart (1986), Hart and Moore (1988, 1990, 1994), Hart (1995), and Shleifer and Vishny (1992) model these effects theoretically.

[5] A number of theoretical models have formalized the intuition that financially developed countries will specialize in sectors that require more outside funds (Kletzer and Bardhan, 1987; Beck, 2002; Matsuyama, 2005; Chaney, 2005; Manova, 2006) or have fewer collateralizable assets (Manova, 2006).

mineral products exports (intensive in internal funding, 25th percentile). Similarly, exports of low tangibility sectors (other chemicals, 25th percentile) grow by 17 percentage points more than exports of high tangibility sectors (wood products, 75th percentile). These results are comparable to a 20%–40% increase in commonly used measures of domestic financial development, such as private credit or equity market capitalization. In addition, I find stronger effects of liberalization in countries with less active stock markets prior to reform, as measured by initial market turnover or value traded as a share of GDP. This suggests that foreign portfolio flows may compensate for an underdeveloped domestic financial system.

Since capital account liberalizations are sometimes part of a broader reform program, I confirm that my findings are not driven by simultaneous changes in trade policy. My panel results remain unchanged when I control for initial trade openness (at the time of equity market reform) and allow it to affect sectors differentially. The effects of stock market liberalizations are of similar magnitude but less precisely estimated when I explicitly account for trade liberalizations. The strongest evidence of an independent effect of removing capital controls comes from event-study results: exports rise after equity market reforms even in the sample of countries that liberalized only their stock markets but not trade flows. I also show that equity market liberalizations have more powerful effects in countries with more restrictive trade policies. This suggests that the impact of increased access to external finance is greatest when trade costs are high and hence credit constraints are most acute.

The remainder of the paper is organized as follows. The next section describes the data and presents some motivating descriptive statistics. Sections 3 and 4 study the impact of equity market liberalizations on trade using the panel analysis and event-study approach, respectively. Sections 5 and 6 explore how this effect varies with initial stock market activity and trade openness. Endogeneity considerations are discussed in Section 7. The last section concludes.

2. Data and descriptive statistics

To examine the effect of financial liberalizations on trade I combine data on equity market reforms, countries' exports by industry, and financial vulnerability by sector. This section describes the data I use and provides a first glance at trade patterns around liberalization events.

2.1. Data on trade flows and equity market liberalizations

I obtain data on all positive export flows at the 4-digit SITC Rev.2 industry level from Feenstra's World Trade Database for 1980–1997. I use Haveman's concordance tables to aggregate the data to 3-digit ISIC industries, for which sector-level data on financial vulnerability exist.

Data on equity market liberalizations are available for 91 countries between 1980 and 1997 from Bekaert et al. (2005) (BHL). In this period, 39 countries opened to foreign equity flows, while 16 liberalized prior to 1980 and 36 never removed stock market restrictions.[6] BHL date both the official year of equity market reform and the "first sign" of liberalization. This first-sign year is the earliest of three dates: official liberalization, first American Depository Receipt (ADR) announcement or first country fund launch.[7] BHL also construct a measure of the comprehensiveness of the reform, which reflects what fraction of the equity market foreigners are allowed to invest in.[8] The intensity of liberalization is a purely cross-sectional variable, which varies between 0 and 1, where a ratio of 1 implies no foreign ownership restrictions. Its average across the 55 countries with open equity markets is 46%, with a standard deviation of 41%.

I use four alternative proxies for the effect of liberalization on the availability of external finance in an economy. I construct post-liberalization dummies that equal 1 in the year of and all years after an official or first-sign liberalization. I also generate official and first-sign liberalization intensities, which I set at the intensity level in the year of the liberalization and later, and at 0 prior to the reform.

2.2. Measures of external capital dependence and asset tangibility

Industry-level measures of external capital dependence and asset tangibility for 27 3-digit ISIC sectors come from Braun (2003), and are based on data for all publicly traded U.S.-based companies from Compustat's annual industrial files. The indicator of a sector's reliance on outside finance is the ratio of capital expenditures minus cash flow from operations to capital expenditures for the median firm in each industry. Asset tangibility is similarly defined as the share of net property, plant and equipment in total book-value assets for the median firm in a sector. Both measures are constructed as averages for the 1986–1995 period, and appear very stable over time.

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[6] The 39 countries which liberalized equity markets between 1980 and 1997 are: Argentina, Bangladesh, Brazil, Chile, Colombia, Cote d'Ivoire, Ecuador, Egypt, Ghana, Greece, Iceland, India, Indonesia, Israel, Jamaica, Japan, Jordan, Kenya, Malaysia, Malta, Mauritius, Mexico, Morocco, New Zealand, Nigeria, Pakistan, Peru, Philippines, Portugal, South Africa, South Korea, Spain, Sri Lanka, Thailand, Trinidad and Tobago, Tunisia, Turkey, Venezuela, and Zimbabwe. The 16 countries which liberalized before 1980 are: Australia, Austria, Barbados, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Singapore, Sweden, Switzerland, United Kingdom, and United States. The 36 countries that remained closed to foreign equity flows are: Algeria, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Costa Rica, Dominican Republic, El Salvador, Fiji, Gabon, Gambia, Guatemala, Guyana, Haiti, Honduras, Iran, Kuwait, Madagascar, Malawi, Mali, Nepal, Nicaragua, Niger, Norway, Oman, Paraguay, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Syria, Togo, Uruguay, and Zambia.

[7] Country funds traded on stock exchanges abroad allow foreigners to access the market even though they cannot directly transact in the local equity market.

[8] The intensity measure is based on the ratio of the capitalization of the IFC Investable Index to that of the IFC Global Index. The latter encompasses the overall market portfolio in a country, while the former represents the portfolio of domestic equities that are available to foreign investors.

Table 1
Equity market liberalizations and total exports

A. Cross-section, by external finance dependence	Liberalized equity markets	Closed equity market	Difference
High FinDep	15.24 (377)	11.73 (806)	3.51
Low FinDep	14.35 (406)	11.79 (868)	2.56
Difference	0.89	−0.06	0.95
B. Cross-section, by asset tangibility	Liberalized equity markets	Closed equity markets	Difference
High Tang	14.47 (377)	11.95 (806)	2.53
Low Tang	15.14 (406)	11.55 (868)	3.59
Difference	−0.67	0.40	−1.07
C. Liberalization episodes, by external finance dependence	After liberalization	Before liberalization	Difference
High FinDep	13.38 (507)	13.09 (507)	0.29
Low FinDep	12.77 (546)	12.59 (546)	0.18
Difference	0.61	0.50	0.11
D. Liberalization episodes, by asset tangibility	After liberalization	Before liberalization	Difference
High Tang	12.97 (507)	12.79 (507)	0.19
Low Tang	13.22 (546)	12.92 (546)	0.30
Difference	−0.25	−0.14	−0.12

This table examines worldwide exports (in logs) by 3-digit ISIC sector in different subsamples. Panels A and B study 29 countries with liberalized equity markets and 62 closed economies in a cross-section for 1990. Panels C and D compare average exports over the 3 years before and the 3 years after liberalization for 39 episodes in 1980–1997. Sectors are split into high (13) and low (14) according to their external finance dependence (Panels A and C) and asset tangibility (Panels B and D) relative to the median. Each cell reports the log of the average value of exports in the relevant subsample and the number of observations in the cell (in parentheses).

The mean and standard deviation of external finance dependence (asset tangibility) across all 27 sectors is 25% and 33% (30% and 14%) respectively. The sectors with the greatest need for outside capital tend to be intensive in large upfront investments, such as professional and scientific equipment and electric machinery. On the other hand, non-ferrous metals, apparel, and beverages are among the least external finance dependent industries. The sectors with the lowest levels of tangibility are pottery, china, and earthenware; leather products; and apparel. Assets are hardest in petroleum refineries; paper and products; iron and steel; and industrial chemicals.

Constructing the industry measures from U.S. data is motivated by a number of considerations. The United States are characterized by one of the most advanced and sophisticated financial systems, which makes it reasonable to believe that the measures reflect firms' true demand for external capital and tangible assets. Using the U.S. as the reference country is convenient because of limited data for many other economies, but it also eliminates the potential for the measures to endogenously respond to a country's availability of external finance. In fact, if companies compensate with more internal financing or tangible assets in countries with stricter stock market restrictions, my estimates of the effect of liberalizations would be biased downwards.

All other variables I use in robustness check are described in the Appendix section.

2.3. A first glance at the data

As a first pass at gauging the effects of equity market liberalizations on trade, I perform a simple split-sample analysis. I compare the export behavior of 29 countries with open and 62 economies with closed stock markets in a cross-section for 1990. In particular, I examine whether countries with free international equity flows export relatively more in industries with external capital dependence above the median. As the results in Table 1 Panel A show, (log) exports are generally greater for financially liberalized countries, and even more so in sectors that rely more on outside funds (diffs-in-diffs estimate of 0.95 in log changes). In Panel B, I repeat this difference-in-difference exercise for industries with asset tangibility above and below the median sector. Once again, open equity markets are associated with higher (log) exports in all sectors, but this advantage is smaller in industries with harder assets (diffs-in-diffs estimate of −1.07 in log terms).

A similar pattern emerges when I exploit the time dimension in the data and focus on the 39 countries that removed capital flow restrictions during the sample period. In Panels C and D of Table 1, I compare the log of average exports over the three years before and the three years after a liberalization event. I split sectors into more and less financially vulnerable as before. While countries export more in all industries after liberalizing their equity flows, this effect is most pronounced for sectors intensive in external finance or softer assets (diffs-in-diffs estimates of 0.11 and −0.12 in log changes, respectively). Together, these cross-sectional and time-series findings support the hypothesis that financial liberalization influences export composition and anticipate the results from the more rigorous panel and event-study regression analyses.

An alternative way of visualizing the change in export patterns around liberalization events is to graph the average financial vulnerability of exports over time.[9] For each country c and year t, I calculate the average external finance dependence and asset tangibility of exports as Σ_i (Fin Dep$_i \times T_{cit}/T_{ct}$) and Σ_i (Tang$_i \times T_{cit}/T_{ct}$) respectively, where T_{cit}/T_{ct} is the share of sector i in total exports in year t. I plot both measures for 12 representative countries which pursued equity market reforms during the sample period in Fig. 1. Vertical lines indicate the years of official and first-sign liberalization episodes.

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[9] I thank an anonymous referee for suggesting this approach.
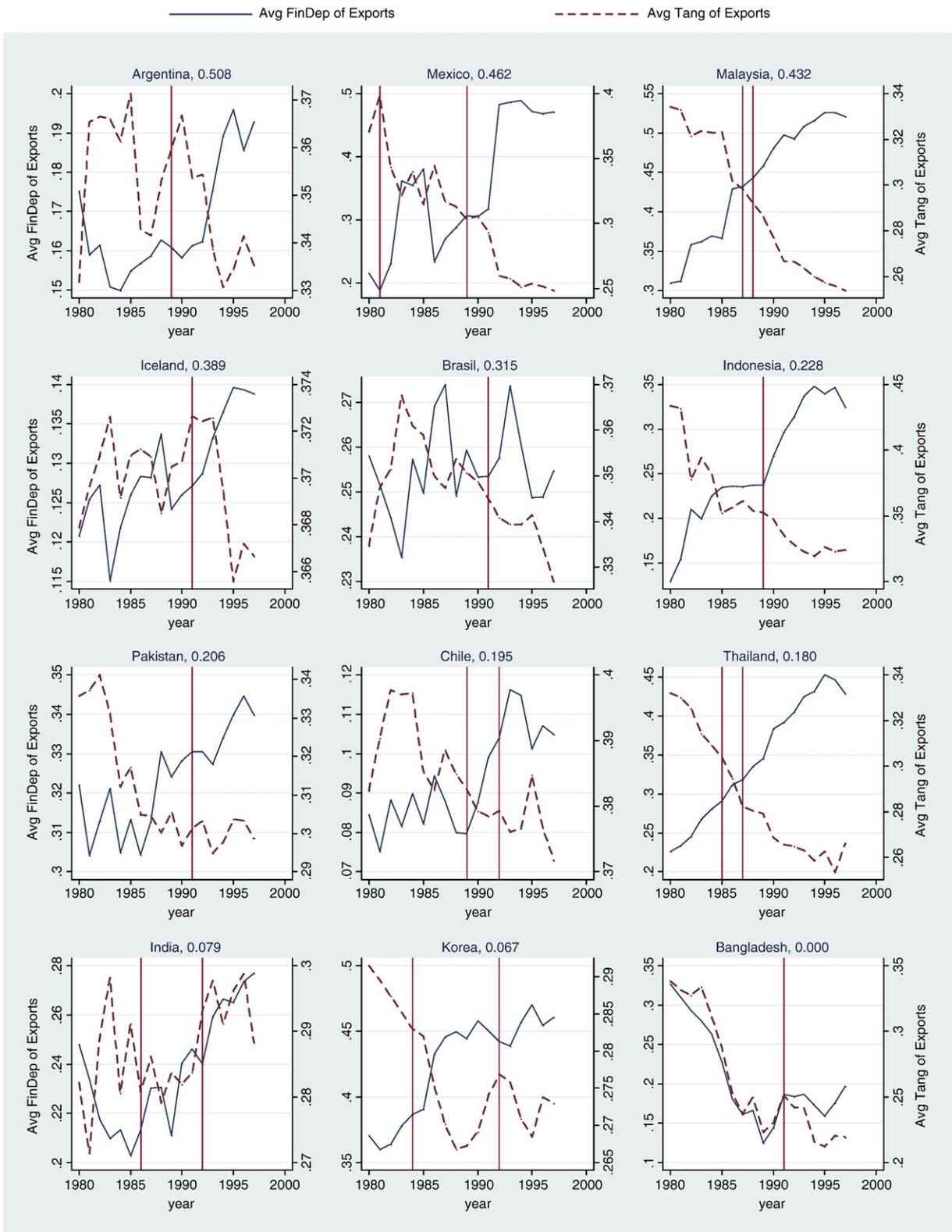
Fig. 1. Average financial vulnerability of exports. This figure shows the average financial vulnerability of exports over time for 12 countries that underwent equity market liberalization. For each year the average intensity of exports with respect to external finance dependence (Avg FinDep of Exports) is calculated as Σ_i (Fin $Dep_i \times T_{cit}/T_{ct}$), where T_{cit}/T_{ct} is the share of sector i in total exports in year t. The average intensity of exports with respect to asset tangibility (Avg Tang of Exports) is similarly constructed. Each country graph plots Avg FinDep of Exports (Avg Tang of Exports) on the left (right) vertical axis. Each graph's title indicates the intensity with which equity markets were liberalized. The years of first-sign and official liberalizations are indicated with vertical lines.

As the graphs illustrate, the average external finance dependence of exports tends to increase soon after capital controls are lifted, whereas average asset tangibility tends to fall. Some countries exhibit trends prior to a liberalization event (e.g. Malaysia, Thailand, and Indonesia), but even in those cases there are pronounced jumps in the immediate aftermath of reform. This pattern suggests that liberalizations may partly respond to the sector composition of countries' exports. However, it may also signal that exports adjust in anticipation of a reform, which would bias the estimated effects of liberalization downwards. In either case, the abrupt changes in trade composition around financial reforms indicate that equity market liberalizations constitute a shock to the availability of external finance. Finally, the patterns in Fig. 1 are consistent with a greater export response in countries that pursued more comprehensive reforms: the 12 graphs are ordered by the intensity of liberalization as indicated in the graph headings.

3. The effect of equity market liberalizations on trade: panel analysis

I take two estimation approaches to establish the impact of equity market liberalizations on trade: panel analysis and event study. Below I describe the first empirical strategy and present results from the panel regressions.

3.1. Empirical specification

I use a generalized difference-in-difference approach to test for the differential effect of equity market liberalizations on export volumes across sectors. I interact a country-level measure of equity market openness (Liberal$_{ct}$) with industry-level measures of asset tangibility and external finance dependence, and estimate the following specification:

$$T_{cit} = \alpha_0 + \alpha_1 \, GDP_{ct} + \beta_0 \, Liberal_{ct} + \beta_1 \, Liberal_{ct} \times Fin \, Dep_i + \beta_2 \, Liberal_{ct} \times Tang_i + \eta_c + \eta_i + \eta_t + \varepsilon_{cit}, \tag{1}$$

where T_{cit} is the log value of country c's exports in industry i in year t and GDP$_{ct}$ is the log of c's real gross domestic product in that year. Liberal$_{ct}$ is a binary variable equal to 1 in the year of and all years after an equity market liberalization event and 0 otherwise. In robustness tests I also use the continuous liberalization intensity measure which reflects the fraction of the stock market by value that foreigners were permitted to invest in. Fin Dep$_i$ and Tang$_i$ correspond to the level of external capital dependence and asset tangibility in sector i. The coefficients of interest are β_1 and β_2, and we expect $\beta_1 > 0$ and $\beta_2 < 0$, that is, equity market liberalizations increase exports relatively more in sectors intensive in external financing or soft assets.

I allow for exporter, sector, and year fixed effects, and cluster errors by exporter.[10] I do not estimate the main effects of Fin Dep$_i$ and Tang$_i$ because they are subsumed by the industry fixed effects, which also capture other sector-specific omitted characteristics. The time fixed effects account for changes in the trading environment that affect all countries and industries equally, such as technological improvements or price shifts. Finally, the country fixed effects control for intransient country-specific characteristics that might affect exports in all industries, such as remoteness or institutions that do not change during the sample period. The main effect of an equity market reform β_0 is thus identified purely from the within-country variation over time.

In this panel analysis, the identification of β_1 and β_2 comes from the combination of cross-sectional and time-series variation in equity market openness across countries, and cross-industry variation in external capital dependence and asset tangibility. These coefficients thus estimate the comparative advantage that a country with open equity markets has in financially vulnerable sectors relative to a financially closed economy.

Recall that the industry characteristics Fin Dep$_i$ and Tang$_i$ are calculated from U.S. data. While identification does not require that industries have exactly the same tangibility and external capital dependence levels in every country, it does rely on the ranking of sectors remaining relatively stable across countries. Rajan and Zingales (1998) and Braun (2003) argue that the measures they construct capture a large technological component that is innate to a sector and thus a good proxy for ranking industries in all countries. They point out that the measures vary significantly more across sectors than across companies within an industry.

Interpreting the results from Eq. (1) as causal rests in part on the assumption that financial liberalizations provide an exogenous shock to the availability of external finance. Imagine, instead, that a stock market reform is anticipated. In the absence of credit constraints, trade flows should not respond either ahead of or after liberalization. With financial frictions, however, trade may increase prior to the observed reform date in expectation of easier external financing in the future. This suggests that Eq. (1) may underestimate the actual impact of credit constraints and equity market liberalization. I defer other issues of endogeneity and interpretation to Section 7 below.

3.2. Evidence from the panel regressions

The basic regression results on the trade consequences of equity market liberalizations are presented in Table 2. I estimate specification Eq. (1) in the full panel of log exports for 91 countries and 27 sectors in the 1980–1997 period. Of the 44,226 potential data points, 39,568 (roughly 90%) feature positive export flows and enter the regression.

In the first two columns of Table 2, I focus on the total impact of equity market reform on exports and ignore the interaction terms with sector financial vulnerability. I find a significant positive effect of liberalizations, which suggests that removing capital flow restrictions increases exports in an average sector. This effect obtains using either an indicator variable for before and after a liberalization episode or a continuous measure of the intensity of the reform.

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[10] My results are unchanged or stronger when I cluster errors by exporter–industry pair.

Table 2
The effects of equity market liberalization: basic results

Liberalization measure	Official liberalization dummy	Official liberalization intensity	Official liberalization dummy	Official liberalization dummy	Official liberalization dummy	First sign liberalization dummy	Official liberalization intensity	First sign liberalization intensity
Liberalization	0.335	0.744	0.093	0.714	0.444	0.458	0.691	0.799
	(3.79)***	(3.61)***	(0.98)	(4.50)***	(2.79)***	(2.88)***	(2.63)***	(2.93)***
Liberalization × external finance dependence			0.946		0.924	0.996	1.177	1.213
			(7.18)***		(7.08)***	(7.19)***	(7.10)***	(6.87)***
Liberalization × asset tangibility				−1.241	−1.133	−1.282	−0.808	−0.854
				(−2.88)***	(−2.65)***	(−3.01)***	(−1.40)	(−1.46)
GDP	0.871	1.008	0.872	0.870	0.872	0.893	1.009	1.004
	(3.25)***	(3.83)***	(3.26)***	(3.25)***	(3.25)***	(3.31)***	(3.83)***	(3.82)***
Controls				Exporter, year and sector F. E.				
R-squared	0.793	0.793	0.794	0.793	0.795	0.795	0.795	0.795
(R^2_{min}, R^2_{max})	(0.001,0.34)	(0.0004, 0.36)	(0.002, 0.34)	(0.001, 0.34)	(0.003, 0.35)	(0.003, 0.38)	(0.003, 0.37)	(0.003, 0.39)
# Observations	39,568	39,568	39,568	39,568	39,568	39,568	39,568	39,568
# Exporters	91	91	91	91	91	91	91	91

The dependent variable is the log of exports to the world by 3-digit ISIC sector, 1980–1997. The official and first sign liberalization dummies and intensities, external finance dependence, and asset tangibility are defined in the text. GDP is the log of the exporter's GDP. All regressions include a constant term, exporter, year and sector fixed effects, and cluster errors at the exporter level. R^2_{min} and R^2_{max} give bounds for the minimum and the maximum contribution of the liberalization and financial vulnerability variables to R^2 as described in the text. T-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level. Dependent variable: industry-level exports to the world.

The rest of Table 2 exploits the variation in financial vulnerability across sectors. I find strong evidence that countries with open equity markets export disproportionately more in industries intensive in external finance and soft assets. This result holds after controlling for GDP, country, industry and year fixed effects, and is robust to the choice of official or first-sign liberalization date. It also persists whether I use a post-liberalization dummy or account for the intensity of reform, although the asset tangibility term is less precisely estimated in the latter case. Note that both interactions can be identified because the two sector measures of financial vulnerability are only weakly correlated at −0.04. In fact, as Columns 3 and 4 demonstrate, similar coefficient point estimates obtain when the interactions enter the regression one at a time. These findings are consistent with the idea that credit constraints restrict exports and that opening stock markets to foreign capital can alleviate such financial frictions.

I find very stable, highly statistically and economically significant coefficients across alternative specifications. The point estimates in Column 5, for example, imply that liberalizing equity markets increases exports in the 75th-percentile industry by external capital dependence by 43 percentage points more than in the 25th-percentile industry. Similarly, post-liberalization exports in the 25th-percentile sector by asset tangibility rise by 29 percentage points more than exports in the 75th-percentile sector. These reallocations are substantial relative to estimates of the effect of domestic financial development. A comparable shift in the distribution of exports would require a rise in domestic private credit of 80% or a doubling of stock market capitalization.[11]

An alternative way to gauge the contribution of credit constraints to the variation in trade flows across countries and sectors is to compare the R-squared of regressions with and without the financial variables.[12] I first re-estimate each specification in Table 2 with only the liberalization and industry financial vulnerability measures but no other controls. The R-squared from this regression provides an upper bound for the contribution of financial frictions, R^2_{max}.[13] As a lower bound, R^2_{min}, I use the difference between the R-squared from each specification in the table and a regression of exports on controls alone. This likely substantially underestimates the role of financial frictions since the sector fixed effects in the latter regression capture the main effects of Fin Dep$_i$ and Tang$_i$. My results suggest that the financial variables alone can account for up to 39% of the variation in trade patterns in the data, but their contribution may be as small as 0.3% once GDP, country, year and industry fixed effects are taken into account. For comparison, the corresponding bounds on the contribution of cross-country differences in factor endowments and cross-sector differences in factor intensities are (0.3%, 66%) (results not tabulated).

Table 3 confirms that the effects of equity market liberalization are independent of traditional sources of comparative advantage. In particular, I control for a country's per capita natural resources, physical and human capital endowments, and their interactions with the factor intensities of each industry.[14] The point estimates of β_0, β_1 and β_2 are larger but qualitatively unchanged from the basic specifications in Table 2. Now the interactions of equity market openness with both industry measures of financial vulnerability are always significant at the 1% level, regardless of the choice of official vs. first-sign reform date and liberalization dummy vs. intensity. The other variables enter as predicted by trade theory. Countries endowed with human (physical) capital tend to export relatively more human (physical) capital intensive goods. Similarly, countries rich in natural resources export more in industries dependent on such inputs.

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[11] Author's calculations available upon request. Credit to the private sector and stock market capitalization as a share of GDP are commonly used measures of domestic financial development in the growth, trade and finance literatures.

[12] I thank the editor for suggesting this approach.

[13] Since this regression excludes sector fixed effects, I include the main effect of an industry financial vulnerability measure whenever it is interacted with equity market liberalization.

[14] Data availability restricts the sample in these regressions to 70 countries. The main effects of sector factor intensities are subsumed by the industry fixed effects.

Table 3
Robustness: comparative advantage

Liberalization measure	Official liberalization dummy	First sign liberalization dummy	Official liberalization intensity	First sign liberalization intensity
Liberalization	0.725 (3.70)***	0.764 (3.85)***	0.989 (2.97)***	1.128 (3.14)***
Liberalization × external finance dependence	0.880 (5.67)***	0.909 (5.47)***	1.210 (6.71)***	1.251 (6.52)***
Liberalization × asset tangibility	−2.094 (−4.28)***	−2.245 (−4.63)***	−2.467 (−3.07)***	−2.612 (−3.15)***
K/L	0.389 (1.27)	0.414 (1.37)	0.366 (1.15)	0.372 (1.19)
H/L	−0.398 (−0.75)	−0.454 (−0.84)	−0.375 (−0.68)	−0.422 (−0.75)
N/L	0.237 (0.46)	0.250 (0.49)	0.085 (0.16)	0.103 (0.20)
K/L × K intensity	1.906 (2.02)**	2.026 (2.15)**	2.023 (1.89)*	2.135 (1.96)*
H/L × H intensity	0.923 (2.93)***	0.937 (3.01)***	0.953 (2.97)***	0.959 (3.00)***
N/L × N intensity	0.113 (1.85)*	0.101 (1.67)*	0.135 (2.15)**	0.132 (2.10)**
Controls		GDP, exporter, year and sector F. E.		
R-squared (R^2_{min}, R^2_{max})	0.806 (0.003, 0.37)	0.807 (0.004, 0.40)	0.806 (0.004, 0.40)	0.807 (0.004, 0.42)
# Observations	31,971	31,971	31,971	31,971
# Exporters	70	70	70	70

The dependent variable is the log of exports to the world by 3-digit ISIC sector, 1980–1997. The official and first sign liberalization dummies and intensities, external finance dependence, and asset tangibility are defined in the text. All regressions include a constant term, exporter, year and sector fixed effects, and cluster errors at the exporter level. R^2_{min} and R^2_{max} give bounds for the minimum and the maximum contribution of the liberalization and financial vulnerability variables to R^2 as described in the text. T-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level.
Dependent variable: industry-level exports to the world.

The effects of financial liberalization in these pooled panel regressions are identified from both cross-country and time-series variation in equity market openness. In particular, the specifications in Tables 2 and 3 exploit the differences in trade patterns among 16 countries that liberalized equity flows before 1980, 39 countries that underwent reforms during the sample period, and 36 countries that remained financially closed through 1997. I next focus on the 39 switchers that lifted capital flow restrictions between 1981 and 1997, so that I observe their export behavior at least once before and after the reform. Since the estimation includes country and year fixed effects, this approach exploits mostly the within-country variation over time. It ensures that the results are not driven by purely cross-sectional differences between financially always-open and always-closed economies that may correlate with other unobserved systematic differences. At the same time, the cross-sectional dimension is not entirely removed because countries liberalize at different times. Restricting the panel to switchers only thus constitutes an intermediate step between the full panel analysis and the event-study approach in the next section.

The evidence from the switchers panel regressions is presented in Table 4. Panel A contains the baseline specification results, while Panel B accounts for comparative advantage arising from cross-country factor endowment differences.[15] I continue to observe highly statistically and economically significant effects of equity market reforms. Financial liberalizations provide a large direct boost to trade and result in a substantial reallocation of exports towards sectors with greater reliance on external finance and intangible assets. As before, these results are robust to alternative measures of stock market deregulation.

4. The effect of equity market liberalizations on trade: event study

4.1. Empirical specification

An advantage of the panel approach is that it allows me to pool data on countries with closed and open equity markets without taking a stance on the time it takes for the removal of capital controls to affect trade. However, there may be unobserved systematic differences across countries in the economic environment at the time of an equity market intervention. These may operate at the country level or may be specific to country-sector pairs.

Pursuing an event-study approach in the spirit of Trefler (2004) allows me to account for this variation and isolate an independent effect of equity market liberalizations purely from the within-country changes in trade over time. I rewrite the expression for exports (Eq. (1)) as:

$$T_{cit} = \alpha_0 + \beta_0 \, \text{Liberal}_{ct} + \beta_1 \, \text{Liberal}_{ct} \times \text{Fin Dep}_i + \beta_2 \, \text{Liberal}_{ct} \times \text{Tang}_i + \eta_{ci} + \varepsilon_{cit}. \tag{2}$$

This specification is more flexible than Eq. (1) in that it accommodates country-sector fixed effects η_{ci}, which also capture any variation in initial conditions at the country-sector level at the time of liberalization. If $t=1$ ($t=0$) after (before) a liberalization event, then β_0, β_1 and β_2 can be recovered by first-differencing Eq. (2) and estimating the following specification:

$$\Delta T_{cit} = T_{ci1} - T_{ci0} = \beta_0 \, \Delta \text{Liberal}_{ct} + \beta_1 \, \Delta \text{Liberal}_{ct} \times \text{Fin Dep}_i + \beta_2 \, \Delta \text{Liberal}_{ct} \times \text{Tang}_i + \Delta \varepsilon_{cit}. \tag{3}$$

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[15] The number of observations and countries differs across specifications because of the availability of data on factor endowments and differences between the official and first-sign liberalization dates.

Table 4
The effects of equity market liberalization: switchers only

Liberalization measure	Official liberalization dummy	First sign liberalization dummy	Official liberalization intensity	First sign liberalization intensity
A. Basic specification				
Liberalization	0.447 (3.05)***	0.464 (2.81)***	0.699 (1.88)*	0.788 (1.77)*
Liberalization×external finance dependence	0.490 (3.39)***	0.561 (4.06)***	1.152 (2.09)**	0.633 (1.30)
Liberalization×asset tangibility	−1.554 (−3.47)***	−1.765 (−4.05)***	−2.048 (−1.99)*	−1.757 (−1.46)
Controls		GDP, exporter, year and sector F. E.		
R-squared (R_{min}^2, R_{max}^2)	0.687 (0.002,0.12)	0.673 (0.003,0.15)	0.687 (0.002,0.19)	0.671 (0.001,0.17)
# Observations	18,224	17,765	18,224	17,765
# Exporters	39	39	39	39
B. Controlling for factor endowments				
Liberalization	0.521 (3.33)***	0.541 (3.12)***	0.973 (2.78)***	1.055 (2.37)**
Liberalization×external finance dependence	0.461 (2.91)***	0.429 (2.85)***	1.241 (2.43)**	0.787 (1.76)*
Liberalization×asset tangibility	−1.955 (−4.19)***	−2.093 (−4.50)***	−3.657 (−3.00)***	−3.589 (−2.43)**
Controls		GDP, K, H, N and interactions, exporter, year and sector F. E.		
R-squared (R_{min}^2, R_{max}^2)	0.699 (0.003,0.13)	0.685 (0.003,0.16)	0.699 (0.003,0.22)	0.683 (0.002,0.19)
# Observations	15,800	15,314	15,800	15,314
# Exporters	33	32	33	32

The dependent variable is the log of exports to the world by 3-digit ISIC sector, 1980–1997. The sample is restricted to 39 countries that liberalized their equity markets in the 1981–1997 period so that they appear at least once before and after liberalization. The sample size in Columns 1 and 3 differs from that in Columns 2 and 4 because of countries with different official and first sign liberalization dates. The official and first sign liberalization dummies and intensities, external finance dependence, and asset tangibility are defined in the text. All regressions include a constant term, exporter, year and sector fixed effects, and cluster errors at the exporter level. Panel B also controls for factor endowments (physical and human capital and natural resources) and their interactions with the relevant sector factor intensity. R_{min}^2 and R_{max}^2 give bounds for the minimum and the maximum contribution of the liberalization and financial vulnerability variables to R^2 as described in the text. *T*-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level.
Dependent variable: industry-level exports to the world.

Note that the constant term α_0 has dropped out of the regression equation. First-differencing also removes all country-sector fixed effects η_{ci} and thus provides cleaner estimates of a causal impact of financial liberalization on trade. These may still be downward biased as in the panel since T_{ci0} incorporates any response of exports to an anticipated reform. Since countries liberalize their equity markets in different years, in robustness checks I also include liberalization-year fixed effects.

I estimate specification (3) with both the post-liberalization dummy and the continuous measure of liberalization intensity. In the former case, $\Delta Liberal_{ct} = Liberal_{c1} - Liberal_{c0} = 1 - 0 = 1$ for all countries, and (3) reduces to $\Delta T_{cit} = \beta_0 + \beta_1 \, Fin \, Dep_i + \beta_2 \, Tang_i + \Delta \varepsilon_{cit}$. Hence, the liberalization dummy does not enter the regression directly. Instead, the main effect of opening stock markets on trade flows is captured by the coefficient on the constant term in this regression, β_0. Correspondingly, the differential impact of financial reform across sectors is estimated by the coefficients on external finance dependence and asset tangibility, β_1 and β_2. In contrast, when I use the intensity of reform variable, $\Delta Liberal_{ct} = Liberal_{c1} - Liberal_{c0} = Lib \, Intens_c - 0 = Lib \, Intens_c$, which is a continuous measure that varies in the cross-section of countries and takes on values in the [0,1] range. In this case, I estimate Eq. (3) without a constant term, and the main effect of financial reform is given by the coefficient on liberalization intensity. The differential response of trade across sectors is now estimated by the coefficients on the interactions of liberalization intensity with the industry measures of financial vulnerability.

4.2. Event-study results

Unlike the panel analysis, the event-study approach uses only one observation per country-sector: the change in exports around a liberalization event. It thus requires taking a stance on the horizon over which the effects of equity market reform are expected to materialize. I first measure ΔT_{cit} as the difference in (the log of) average exports between $(t+1, t+3)$ and $(t-1, t-3)$ around a liberalization event in year t.[16] Averaging ensures that the results are not influenced by transient movements in trade. I focus on the sample of countries that opened their stock markets over the 1983–1994 period so that these averages are well defined.

As Table 5 illustrates, the effects of equity market liberalization on trade obtain even in this econometrically demanding set-up. In Panel A, I estimate specification (3) with the post-liberalization dummy. I find that countries start exporting more within three years of removing capital flow restrictions, especially in sectors that require more outside finance or are endowed with fewer collateralizable assets. This effect is robust to the choice of official vs. first-sign liberalization date, and obtains even after controlling for the year in which countries pursue reform.[17] The results are also unchanged when I consider a different time

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[16] Others have also used this horizon to study the effects of financial reforms (Chari and Henry, in press; Alfaro and Hammel, 2007). Trefler (2004) and Sawchuk and Trefler (2002) explore the impacts of trade liberalization over a range of time periods.

[17] The number of observations and countries differs across specifications because of differences between the official and first-sign liberalization dates.

Table 5
Equity market liberalization event study

Dependent variable	$\ln(\text{Trade}_{t+1,t+2,t+3}) - \ln(\text{Trade}_{t-1,t-2,t-3})$				$\ln(\text{Trade}_{t+4}) - \ln(\text{Trade}_{t-1})$	
Liberalization date	Official	First sign	Official	First sign	Official	First sign
A. Liberalization measure: liberalization dummy						
Constant	0.636 (5.65)***	0.698 (6.87)***	0.319 (3.16)***	0.884 (9.23)***	0.798 (6.34)***	0.858 (6.77)***
External finance dependence	0.235 (2.76)***	0.195 (2.33)**	0.237 (2.76)***	0.198 (2.36)**	0.242 (2.19)**	0.208 (1.87)*
Asset tangibility	−0.553 (−1.72)*	−0.680 (−2.23)**	−0.552 (−1.70)*	−0.678 (−2.20)**	−0.705 (−2.01)*	−0.756 (−2.24)**
Liberalization year F.E.	No	No	Yes	Yes	No	No
R-squared	0.016	0.017	0.055	0.064	0.017	0.016
# Observations	860	833	860	833	795	768
# Exporters	32	31	32	31	30	29
B. Liberalization measure: liberalization intensity						
Lib intensity	1.157 (3.66)***	1.454 (4.46)***	0.109 (0.32)	0.029 (0.07)	1.615 (4.54)***	1.820 (4.80)***
Lib intensity × external finance dependence	0.205 (1.06)	0.188 (1.08)	0.204 (1.03)	0.193 (1.10)	0.370 (1.42)	0.407 (1.60)
Lib intensity × asset tangibility	−0.523 (−0.76)	−0.964 (−1.27)	−0.523 (−0.76)	−0.960 (−1.25)	−1.189 (−1.92)*	−1.166 (−1.71)*
Liberalization year F.E.	No	No	Yes	Yes	No	No
R-squared	0.149	0.157	0.298	0.317	0.205	0.212
# Observations	860	833	860	833	795	768
# Exporters	32	31	32	31	30	29

This table examines how exports change around a liberalization event. In the first 4 columns the dependent variable is the difference between log average exports in the 3 years following and preceding a liberalization event. The sample is limited to liberalizations in the 1983–1994 period so that all averages are well defined. The last two columns examine the five-year change in log exports around a liberalization event in t (from $t-1$ to $t+4$) for liberalizations in the 1981–1993 period. The dependent variable is always based on exports to the world by 3-digit ISIC sector. The sample size varies across specifications because of countries with different official and first sign liberalization dates. All regressions cluster errors at the exporter level. The constant term is excluded from the regressions in Panel B. *T*-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level.

horizon: coefficients of the same magnitude and significance obtain when I examine the five-year change in exports from $t-1$ to $t+4$ in the last two columns.

In Panel B, I estimate Eq. (3) using the continuous measure of liberalization intensity. While the main effect of financial liberalization remains strong, the interaction terms with sectors' financial vulnerability are of the same magnitude as before but imprecisely estimated. They are significant at the 10% level when I use the five-year change in exports in the last two columns only. The intensity variable may be too noisy an indicator of the change in the availability of external finance, especially in the immediate aftermath of reform. In particular, even if only a small share of domestic companies receives portfolio investments from abroad, they may serve as a conduit of financing for other constrained firms in the economy. It is also possible that initially partial liberalizations are later followed by full liberalizations. Since the intensity measure varies only in the cross-section, it does not reflect this process. This may explain why it is unable to capture the change in export patterns within the first few years of a financial reform.

The point estimates from the event-study specifications stand at a third to a half of the magnitudes from the earlier panel results. The evidence in Column 1 of Panel A implies that, within three years after a stock market reform, exports in the 75th-percentile industry by external capital dependence increase by 13 percentage points more than in the 25th-percentile industry. Similarly, post-liberalization exports in the 25th-percentile sector by asset tangibility rise by 17 percentage points more than exports in the 75th-percentile sector. This indicates that equity market liberalizations can lead to major shifts in export patterns over a fairly short period of time.

To summarize, I obtain consistent evidence of a first-order effect of stock market liberalizations on trade using two different empirical strategies. The panel analysis pools all country-year-sector observations in the 1980–1997 period and identifies the effects of financial reform from the cross-sectional and time-series variation without taking a stance on the time it takes for the removal of capital controls to affect trade flows. In contrast, the event-study approach relies purely on within-country changes in trade over time, and exploits the differential growth of exports across sectors in the immediate aftermath of an equity market reform. These two approaches thus provide complementary evidence on the impact of liberalizing stock markets on trade.

5. Domestic stock market activity and equity market liberalization

The evidence on the trade consequences of stock market liberalization raises an important policy question: If removing restrictions on foreign equity flows can alleviate credit constraints in an economy, is capital account liberalization an alternative to developing local financial markets?

Conceptually, countries with a well developed stock market may benefit more from allowing foreign flows since they already have the financial infrastructure in place to allocate new resources. The impact of equity market liberalizations on growth has in fact been shown to be more pronounced in countries with stronger domestic institutions (Bekaert et al., 2005). At the same time, countries with underdeveloped stock markets stand to gain the most on the margin from liberalizing. In this section, I explore how the effects of equity market reform vary with the size and activity of the domestic stock market prior to liberalization. This allows me to test whether domestic stock markets and foreign equity flows act as substitutes or complements.

Table 6
The interaction of domestic stock market activity and equity market liberalization

A. Panel analysis

Dep variable: industry-level exports to the world

Mkt activity measure	Stock market value traded	Stock market turnover	
Lib	0.273 (1.40)	0.393 (1.66)	0.414 (1.81)*
Lib×Fin Dep	0.988 (6.86)***	0.975 (4.97)***	1.039 (4.64)***
Lib×Tang	−1.002 (−1.96)*	−1.275 (−2.07)**	−1.364 (−2.24)**
Mkt Activ×Fin Dep	18.000 (13.99)***	2.612 (2.11)**	2.610 (2.29)**
Mkt Activ×Tang	−23.108 (−3.85)***	−5.837 (−3.43)***	−5.836 (−3.43)***
Mkt Activ×Lib	−3.817 (−1.39)	−1.233 (−1.88)*	−1.196 (−1.80)*
Mkt Activ×Lib×Fin Dep	−16.586 (−12.72)***	−2.004 (−1.67)	−2.049 (−1.86)*
Mkt Activ×Lib×Tang	19.742 (3.37)***	4.223 (2.60)**	4.170 (2.56)**
Mkt Size×Fin Dep			1.161 (1.41)
Mkt Size×Tang			0.057 (0.03)
Mkt size×Lib			−0.084 (−0.09)
Mkt size×Lib×Fin Dep			−0.696 (−0.91)
Mkt size×Lib×Tang			0.465 (0.24)
Controls	GDP, exporter, year and sector F. E.		
R-squared	0.776	0.774	0.775
# Obs	22,206	22,206	22,206
# Exporters	46	46	46

B. Event study

Dep variable: $\ln(\text{Trade}_{t+1,t+2,t+3}) - \ln(\text{Trade}_{t-1,t-2,t-3})$

Mkt activity measure	Stock market value traded	Stock market turnover	
Constant	0.738 (7.59)***	0.872 (7.46)***	0.826 (6.80)***
Fin Dep	0.248 (2.48)**	0.167 (1.30)	0.211 (1.56)
Tang	−0.816 (−3.14)***	−1.171 (−3.61)***	−1.115 (−3.18)***
Mkt Activ	−1.880 (−1.16)	−0.926 (−2.58)**	−1.100 (−2.82)***
Mkt Activ×Fin Dep	−1.448 (−1.31)	0.218 (0.57)	0.381 (1.06)
Mkt Activ×Tang	5.991 (1.40)	2.592 (2.59)**	2.802 (2.88)***
Mkt Size			0.909 (1.35)
Mkt Size×Fin Dep			−0.852 (−2.10)**
Mkt Size×Tang			−1.100 (−1.04)
R-squared	0.028	0.033	0.039
# Obs	674	674	674
# Exporters	25	25	25

Stock market size is measured by the average stock market capitalization in 1980–1984. Stock market activity is measured by the 1980–1984 average of either value traded or turnover as indicated in the column heading. Panel A: The dependent variable is the log of exports to the world by 3-digit ISIC sector, 1980–1997. All regressions include a constant term, exporter, year and sector fixed effects, and cluster errors at the exporter level. Panel B: The dependent variable is the difference between log average exports by sector in the 3 years following and preceding a liberalization event. The sample is limited to liberalizations in the 1983–1994 period so that all averages are well defined, and errors are clustered at the exporter level. T-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level.

I examine this question using both panel and event-study techniques. I begin by extending specification (1) from the panel analysis to include interactions of financial liberalization with a measure of domestic stock market activity, Mkt Act$_{ct}$:

$$T_{cit} = \beta_0\, \text{Liberal}_{ct} + \beta_1\, \text{Liberal}_{ct} \times \text{Fin Dep}_i + \beta_2\, \text{Liberal}_{ct} \times \text{Tang}_i + \delta_0\, \text{Mkt Act}_{ct} + \delta_1\, \text{Mkt Act}_{ct} \times \text{Fin Dep}_i + \delta_2\, \text{Mkt Act}_{ct} \times \text{Tang}_i$$
$$+ \gamma_0 \text{Liberal}_{ct} \times \text{Mkt Act}_{ct} + \gamma_1 \text{Liberal}_{ct} \times \text{Mkt Act}_{ct} \times \text{Fin Dep}_i + \gamma_2 \text{Liberal}_{ct} \times \text{Mkt Act}_{ct} \times \text{Tang}_i + \alpha_0 + \alpha_1 \text{GDP}_{ct} + \eta_c + \eta_i + \eta_t + \varepsilon_{cit}.$$
(4)

If liberalizations benefit disproportionately more sectors with high external capital dependence and sectors with low asset tangibility, we expect $\beta_1 > 0$ and $\beta_2 < 0$, as before. Similarly, if access to active stock markets stimulates trade relatively more in financially vulnerable sectors, $\delta_1 > 0$ and $\delta_2 < 0$. Finally, if foreign capital compensates for a poorly developed domestic financial system, the effects of liberalization will diminish as market activity increases, and we should observe $\gamma_0 < 0$, $\gamma_1 < 0$ and $\gamma_2 > 0$. Since equity markets may endogenously respond to financial reforms, I use the initial, pre-liberalization level of stock market activity in each country, which I measure with its average over the 1980–1984 period. The main effect of stock market activity is thus subsumed by the country fixed effects.

Panel A of Table 6 estimates specification (4) in the full panel of countries. I focus on the post-official-liberalization dummy, but my findings are robust to using the first-sign date or liberalization intensity instead. In the first column, I allow the effects of liberalization to vary with initial stock market value traded, defined as the volume of equity market transactions as a share of GDP. In line with my earlier findings and results in the prior literature, both financial openness and stock market activity have a differential impact across sectors: Countries with open stock markets and higher value traded have a comparative advantage in financially vulnerable industries. At the same time, the triple interaction terms suggest that the effects of equity market liberalization are greater in countries with less active stock markets.[18] This is evidence of a substitution effect between domestic and foreign equity flows, and indicates that liberalizing the stock market may compensate for a low level of domestic financial activity.

My measure of stock market value traded can be decomposed into the size of the stock market (the value of all publicly listed companies) relative to GDP and stock market turnover, i.e. the ratio of value traded to stock market capitalization. This distinction between market size and market activity has potentially important policy implications. In Column 2, I abstract from market size and analyze the interaction of financial openness with stock market turnover prior to liberalization. All coefficients are of the same sign and significance as in Column 1. In the last column, I include interactions with both turnover and market capitalization. The coefficient estimates on the turnover interactions remain unchanged, while market capitalization has an insignificant contribution. These findings support the idea that active stock markets redistribute resources across sectors, and suggest that market activity may be a better indicator of an economy's potential to provide external financing than market size.

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[18] Local stock market activity does not overturn the effects of equity market liberalization. The coefficient on the interaction of financial openness with external finance dependence (asset tangibility) is positive (negative) at the median of market activity and remains so up to the 80th percentile.

Qualitatively similar results obtain when I use the event-study approach in Panel B, although the coefficients on external finance dependence are often imprecisely estimated and not significant. I expand the first-differences specification (3) to include interactions of financial openness with stock market activity prior to reform: $\Delta Liberal_{ct} \times Mkt\ Act_{c0}$, $\Delta Liberal_{ct} \times Mkt\ Act_{c0} \times Fin\ Dep_i$, and $\Delta Liberal_{ct} \times Mkt\ Act_{c0} \times Tang_i$. Since I use a post-liberalization dummy, $\Delta Liberal_{ct} = 1$ for all countries, and these terms reduce to $Mkt\ Act_{c0}$, $Mkt\ Act_{c0} \times Fin\ Dep_i$, and $Mkt\ Act_{c0} \times Tang_i$. As Panel B indicates, I continue to observe that equity market reforms increase exports, especially in financially vulnerable sectors. In addition, these effects are more pronounced in countries with initially less active stock markets. In contrast to the panel analysis, however, the event-study approach suggests that larger stock markets may also mitigate the impact of financial liberalizations: the interaction of market size with external finance dependence enters negatively in the last column.

6. Trade openness and equity market liberalization

Capital account liberalizations are sometimes part of a broader program of deregulations that may include trade reforms. In this section, I confirm that my findings are not driven by simultaneous changes in trade policy.

I obtain commonly used data on trade openness from Wacziarg and Welch (2003), who review and update the binary indicator originally developed by Sachs and Warner (1995).[19] A country is labeled effectively closed to trade if at least one of the following criteria is met: average tariff rates are at least 40%; non-tariff barriers cover at least 40% of trade; a black market exchange rate exists and is on average depreciated at least 20% relative to the official exchange rate; the state holds a monopoly on major exports; or there is a socialist economic system.[20] These data are available for 70 of the 91 countries in my sample. Note that in this classification a country that is "closed" to trade features high trade costs but may still participate in international trade.

I begin by documenting that the effects of equity market liberalization in the panel are independent of trade openness at the time of financial reform. I focus on the countries that remove capital flow restrictions during the 1980–1997 period, and measure trade openness in the year preceding financial liberalization. I allow it to affect sectors differentially by interacting it with the industry measures of financial vulnerability and including these interactions in specification (1). This leaves the estimated effects of stock market reform on exports unchanged, as Column 1 of Panel A in Table 7 shows.

In the rest of Panel A, I explicitly account for trade liberalizations by controlling for the concurrent level of trade openness in the full panel of countries.[21] As the results indicate, trade policy is not responsible for the reaction of exports to equity market reforms. I obtain coefficients of comparable magnitude and significance when controlling for trade openness alone in Column 2. When I allow trade openness to impact sectors differentially in Column 3, the interaction of equity market liberalization with external finance dependence remains significant, but the interaction with asset tangibility is imprecisely estimated. While these results are based on a post-official-liberalization dummy, qualitatively similar results obtain with other measures of financial reform.

The strongest evidence for an independent effect of removing capital controls comes from event-study results. I repeat the event-study analysis (specification (3)) for the sample of countries that liberalized their stock markets but not trade flows. In particular, when I examine the change in average exports between the three years preceding and following a reform, I focus on the 15 countries that did not reduce trade barriers during the same (t-3, t+3) period. Similarly, when I study the five-year change in exports around an equity market liberalization (from t-1 to t+4), I restrict the sample to the 17 countries that did not change their trade policy during that time. As the results in Panel B demonstrate, exports rise after equity market liberalization even in the absence of concurrent trade reforms. This effect is again more pronounced in financially vulnerable sectors. Together, these results suggest that removing capital controls relaxes credit constraints and stimulates exports independently of trade policy changes.

Like financial liberalization, lowering trade barriers may also have a differential impact across sectors. The results in Panel A suggest that when trade costs fall, exports rise relatively more in financially vulnerable sectors. This highlights a parallel between trade and financial liberalization: while trade reforms reduce trade costs for a given level of financial frictions, equity market reforms relax credit constraints for a given level of trade costs. In either case, the sectors that benefit most are those intensive in external finance or intangible assets.

Does the effect of financial liberalization on exports then vary with the level of trade costs? In the last column of Panel A, I interact the financial liberalization dummy with the trade openness dummy. I also include triple interactions of the two dummies with sectors' financial vulnerability in the spirit of specification (4), with trade openness taking the role of market activity. My findings indicate that equity market reforms have more powerful effects in countries with higher trade costs (caused by more restrictive trade policies). This suggests that the impact of increased access to external finance is greatest when financing needs are most acute.

7. Endogeneity

Endogeneity has been a serious concern in the growth/trade and finance literatures. Although equity market liberaliza-tions provide a shock to the availability of capital, countries may pursue reforms in expectation of better growth and export

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[19] For example, Henry (2000a, 2007) and Alfaro and Hammel (2007) use this measure of trade openness to control for concurrent policy reforms when studying the impact of equity market liberalization on growth and capital imports.

[20] Rodriguez and Rodrik (2000) have argued that the Sachs and Warner (1995) indicator gives too much weight to the black market premium and export restrictions. However, as Wacziarg and Welch (2003) note, reductions in these two trade barriers are often accompanied by other trade enhancing policy changes. They argue that the trade liberalization dates thus capture broad trade liberalization episodes, which they also cross-check with case study evidence.

[21] The correlation between the binary variables for trade openness and financial liberalization in the panel is 0.56.

Table 7
Equity market liberalizations and trade openness

A. Panel analysis					B. Event study			
Dependent variable: industry-level exports to the world					Liberalization date: official liberalization			
Liberalization measure: official liberalization dummy								
Trade openness measure	Initial trade openness	Concurrent trade openness			Dep variable	$\ln(\text{Trade}_{t+1,t+2,t+3}) - \ln(\text{Trade}_{t-1,t-2,t-3})$		$\ln(\text{Trade}_{t+4}) - \ln(\text{Trade}_{t-1})$
Liberalization	0.458	0.283	0.252	1.187	Constant	0.836	0.525	0.885
	(2.99)***	(1.60)	(1.19)	(3.98)***		(5.78)***	(3.89)***	(4.71)***
Liberalization × external finance dependence	0.436	0.893	0.568	0.453	External finance dependence	0.229	0.228	0.325
	(3.01)***	(6.38)***	(3.44)***	(0.78)		(1.62)	(1.59)	(1.76)*
Liberalization × asset tangibility	−1.594	−0.856	−0.473	−4.069	Asset tangibility	−1.221	−1.221	−1.120
	(−3.42)***	(−1.89)*	(−0.76)	(−2.06)**		(−2.75)**	(−2.71)**	(−2.02)*
Trade openness		−0.007	0.054	0.164				
		(−0.10)	(0.24)	(0.79)				
Trade openness × external finance dependence	0.712		0.618	0.604				
	(2.12)**		(3.31)***	(3.43)***				
Trade openness × asset tangibility	1.927		−0.734	−1.140				
	(1.44)		(−1.01)	(−1.94)*				
Liberalization × trade openness				−1.023				
				(−3.04)***				
Liberalization × trade openness × external finance dependence				0.127				
				(0.22)				
Liberalization × trade openness × asset tangibility				3.948				
				(1.97)*				
Controls	GDP, exporter, year and sector F. E.				Lib year F.E.:	No	Yes	No
R-squared	0.693	0.804	0.805	0.805	R-squared	0.037	0.122	0.030
# Observations	16,286	32,418	32,418	32,418	# Observations	404	404	450
# Exporters	34	70	70	70	# Exporters	15	15	17

Panel A: The dependent variable is the log of exports to the world by 3-digit ISIC sector, 1980–1997. Trade openness is a binary variable as described in the text. It is measured concurrently (columns 2–4) or in the year preceding an equity market liberalization (column 1). All regressions include a constant term, exporter, year and sector fixed effects, and cluster errors at the exporter level. Column 1 restricts the sample to countries which liberalized equity markets in the 1981–1997 period. Panel B: The dependent variable is the difference between log average exports by sector in the 3 years following and preceding an equity market liberalization at time t (columns 1–2) or the five-year change in log exports around the event (from $t-1$ to $t+4$) (column 3). The sample in columns 1–2 (column 3) is limited to equity market liberalizations in the 1983–1994 (1981–1993) period so that all averages are well defined. Columns 1–2 (column 3) limit the sample to countries that did not liberalize trade in the $(t-3,t+3)$ period $((t-1, t+4)$ period). Errors are clustered at the exporter level. *T*-statistics reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% level.

opportunities. Since I exploit the cross-sector variation, however, growth shocks would have to vary systematically across sectors to account for my results. They would also need to follow a very particular pattern across countries and over time, since countries liberalize at different times and the estimation captures global trends with sector and year fixed effects. A few other pieces of evidence suggest that, while endogeneity cannot be definitively ruled out, it does not appear problematic for my results.

First, the exact timing of an equity market liberalization is the product of complex political processes and thus plausibly exogenous from the perspective of individual producers and exporters. One of the advantages of studying stock market reforms is that they are easier to date as discrete changes in governmental policy compared to the removal of other, more subtle capital flow restrictions. Some countries, nevertheless, effectively allow foreigners to invest in the economy by launching a country fund or issuing American Depository Receipts prior to an official equity market reform. The consistent results I establish using the first-sign liberalization date, however, suggest that this is not a major concern in my analysis. In addition, to the extent that exports may respond in expectation of future financial reforms, the estimated impact of liberalization would be biased downwards.

Second, prior evidence suggests that equity market liberalizations do not follow surges in investment (Henry, 2000b) and that controlling for growth opportunities or world business cycle effects does not eliminate the impact of liberalizations on growth (Bekaert et al., 2005; Gupta and Yuan, 2004). However, the sectoral composition of exports indicates that countries may time liberalizations partly in response to higher demand for external finance. In Fig. 1, I constructed measures of a country's average external finance dependence and asset tangibility of exports over time. As the graphs show, these measures trend prior to liberalization in some countries, but in all cases change quickly and in predicted ways after a reform. This suggests that there may be some degree of endogeneity or that exports may respond in anticipation of a reform. In either case, equity market liberalizations appear associated with discrete jumps in export patterns.

Finally, the variation in financial vulnerability across sectors allows me to establish more firmly that the direction of causality runs from credit constraints to firms' export decisions. Note that the variation in external finance dependence is not sufficient in this respect. If domestic credit markets were frictionless and a country expected higher export demand for sectors intensive in external finance, it could liberalize equity markets to increase the availability of funding. Capital would then flow freely and allow firms to meet demand. We could thus observe that liberalizations are followed by higher exports in the financially dependent sectors even in the absence of credit constraints. The same reasoning, however, could not explain the results with asset tangibility. If domestic credit markets were frictionless, the availability of collateralizable assets would not matter for a sector's ability to raise

outside capital. Hence the incentives for liberalizing stock markets would not change if relative export demand increased for sectors with softer assets.[22] Instead, I find that liberalizations raise exports relatively more in industries with less tangible assets. This suggests that the lack of collateral makes it costly for exporters to obtain funding and is strong evidence of a credit constraints channel. This is further borne out by the results on the interaction of trade costs and financial openness in Section 6.

To summarize, while I cannot rule out the possibility that the timing of equity market liberalizations may be endogenous, there is strong evidence that credit constraints result in lower exports, and especially so in financially vulnerable sectors. I am also able to conclude that if the world cost of capital is lower than the domestic cost of capital and countries face export opportunities, equity market liberalizations allow countries to respond to such opportunities.

8. Conclusions

This paper presents new evidence that credit constraints are an important determinant of international trade flows. I exploit shocks to the availability of external finance and examine the impact of equity market liberalizations on countries' exports. I use the variation in financial vulnerability across industries, and show that liberalizations increase trade disproportionately more in sectors intensive in external finance and softer assets. My findings thus both attest to the role of financial frictions in determining countries' export patterns and demonstrate how capital account reform can alleviate local credit market imperfections.

My results contribute to the literature on finance and trade in three important ways. First, I make a strong case for a causal link from credit constraints to export composition by exploiting financial liberalization events, using the sectoral variation in asset tangibility, and accounting for simultaneous trade policy reforms. Second, I offer evidence that equity market liberalizations have a stronger effect in the presence of higher trade costs due to restrictive trade policies. This suggests that the impact of increased access to external finance is greatest when funding needs are most acute — further evidence consistent with financial frictions. Finally, I find larger effects of liberalizations in economies with initially less active stock markets. This has important policy implications for financially underdeveloped countries, and suggests that removing foreign capital flow restrictions may compensate for a weak domestic financial system.

Appendix A

I obtain annual GDP from the Penn World Tables 6.1 and domestic stock market data from Beck et al. (2000). The stock of physical capital per capita is constructed according to the perpetual inventory method. Human capital per worker is calculated from the average years of schooling in a country with Mincerian non-linear returns to education. Both measures are from Caselli (2005). The World Bank appraises countries' endowments of minerals and fossil fuels, timber, non-timber forests, cropland and pastureland. I use the log of the aggregate natural resource endowment per capita. The sector factor intensities with respect to natural resources, human and physical capital come from Braun (2003).[23,24]

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[22] This holds because of the weak correlation between external finance dependence and asset tangibility (-0.04).

[23] The correlation between external finance dependence (asset tangibility) and capital intensity is 0.10 (0.83).

[24] Braun's measure of natural resource intensity is a binary indicator. My results are unchanged when I use a continuous measure from Romalis (2004) instead, which is available in the 4-digit US SIC classification. Because of differences in industry classification, I am able to match this measure to 17 of my 27 3-digit ISIC sectors.

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