Understanding foreign currency borrowing by firms: Evidence from India

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Abstract

The Indian capital controls permit foreign currency borrowing (FCB) for firms with low credit risk, and by 2013, there was a stock of borrowing of $132 billion. Through a combination of home bias and capital controls, FCB is the preserve of large and internationally active firms with low financing constraints. We establish a quasi-experimental design through which the causal impact of FCB upon future growth in capital, labour, exports and output is assessed. The two doublings of exchange rate flexibility in India, in 2003 and 2007, appear to have avoided moral hazard: the firms which have undertaken FCB have successfully achieved modest gains in capital stock and output.

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1 Introduction

In the analysis of capital account liberalisation by emerging markets, some of the most difficult questions concern foreign currency borrowing (FCB) by firms. To the extent that FCB is unhedged, there is the risk of impaired balance sheets in the event of a large exchange rate depreciation.

Two kinds of arguments have been offered about *why* some firms may choose to hold unhedged foreign currency exposure. The first argument is grounded in moral hazard: If the government is offering to eliminate the probability of a large exchange rate depreciation, then private firms have an incentive to borrow without hedging (Kamil, 2012; Dominguez and Tesar, 2006). A second argument is grounded in a combination of financing constraints and incomplete markets, a situation termed "original sin" by Eichengreen and Hausmann (1999). Here, it is suggested that firms borrow in foreign currency as borrowing in local currency is infeasible owing to an underdeveloped credit market (Allayannis *et al.*, 2003; Demir, 2013). Even if firms *want* to hedge currency exposure, this may be hampered by underdeveloped currency derivatives markets (Eichengreen and Hausmann, 1999; Eichengreen *et al.*, 2007; Bordo *et al.*, 2010).

When a substantial set of firms possess unhedged currency exposure, this can create incentives for monetary policy to pursue exchange rate objectives (Sengupta, 2010). There can, thus, be a feedback loop where exchange rate pegging induces moral hazard and firms have unhedged FCB, and the presence of firms with unhedged FCB creates a fear of floating (Parsley and Popper, 2006).

Alongside these concerns about original sin is the possibility that borrowing in foreign currency might enable the growth of firms. Inadequate financial development may create a large set of firms who face financing constraints. If some of these firms are able to borrow abroad, and thus ease financing constraints, this can have a significant impact upon their growth.

Firms can hedge through currency derivatives markets, or firms can have natural hedges. For a firm which expects cashflows in foreign currency in the future, borrowing in foreign currency is unusually attractive as (a) It can negate the exchange rate exposure of the firm, and thus *reduce* firm exposure and (b) The cost of borrowing is low as there is no need to undertake hedging through financial markets (Mora *et al.*, 2013). In an ideal scenario, if a financially constrained exporting firm taps into FCB, this can yield a considerable impact upon the firm (Ranciere *et al.*, 2010).

In this framework, the following 3 questions are of importance:

1. What kinds of firms in EMs borrow abroad?
2. To what extent are the borrowing firms financially constrained?
3. What is the causal impact of FCB, upon the borrower firms, in the years that follow the first episode of borrowing?

In terms of firm characteristics of the firms that borrow abroad, there are four elements at work:

1. The capital controls regime that is in operation may distort firm choice.
2. The traditional themes of home bias and asymmetric information are likely to be at work. Foreign capital is often able to only engage with well known and large firms.
3. FCB is particularly attractive when there are natural hedges. Firms which are active in exports and FDI may be more connected into global financial networks, and may possess natural hedges which make FCB more inviting.
4. In an underdeveloped financial system, there is the possibility of firms with good projects seeking foreign capital as a way to avoid the difficulties of borrowing within the country.

When we turn from causes to consequences, there are two groups of hypotheses. If firms are financially constrained with an underdeveloped domestic financial system, and if the information processing of foreign investors is sound, then foreign debt capital will find its way to high quality borrowers and will yield a causal impact upon the capital and output of these firms. On the other hand, there is the possibility that foreign investors suffer from home bias, and only give foreign debt to large and internationally visible firms, which are unlikely to face financial constraints (Brown *et al.*, 2014). Alternatively, foreign investors may do poor security selection, and give foreign debt to firms which have a low marginal product of capital (Patnaik and Shah, 2013).

This paper contributes to this literature using firm data for India, which is an unusually good laboratory for understanding these phenomena, because of the availability of good-firm level data and its particular history of policy changes. The remainder of the paper is structured as follows. Section 2 describes the institutional setting of the Indian case, including the nature of capital controls pertaining to foreign currency borrowing (FCB), rules on

hedging using currency derivatives, and the exchange rate regime. These facets of Indias institutional environment are used to formulate specific hypotheses, presented at the end of this section. Section 3 describes the data used, as well as how various measures are constructed for firm performance, internationalization and financing constraints. In addition, this section provides an overview of which kinds of firms in the dataset borrow in foreign currency: in particular, FCB is concentrated in the largest firms in the dataset. These firms risk exposure as a result of borrowing is also described. Section 4 provides a causal model that predicts when a firm might resort to FCB, using Tobit estimation for different size quartiles of the distribution. Section 5 presents our main results, in the form of propensity score matching combined with an analysis of performance, comparing FCB firms with those that do not borrow abroad. This section also presents analysis of panel data as an alternative empirical strategy and robustness check, since the propensity score matching analysis excludes the largest FCB firms. Section 6 provides a summary conclusion.

2 Institutional setting

2.1 Capital controls

Capital controls were introduced in India during the Second World War. For many decades, restrictions were increased. Capital controls on foreign debt began to be liberalised in the mid-1980s, with an emphasis on foreign borrowing by public sector firms. The economic reforms after the balance of payments crisis in 1991 led to opening up to private capital flows. However, India pursued a regulatory approach of placing restrictions on debt creating flows.

The phrase 'external commercial borrowing' (ECB) is used in India to denote foreign currency borrowing. Under the present framework, RBI regulates borrowing through the ECB route. A detailed administrative system is in place where all transactions are prohibited unless explicitly permitted, and rules specify what is done in great detail.

ECBs can be accessed under an 'automatic' and an 'approval' route. In both cases, there are numerous restrictions governing who can borrow, who can lend, the terms of the borrowing (amount and tenor), the uses to which the borrowed amount can be put ('end use restrictions'), and the maximal

Table 1 The maximal interest rate that can be paid

	(Premium to LIBOR, bps)		
	Maturity (years)		
Date of change	3–5	5–7	> 7
31.01.2004	200	350	350
21.05.2007	150	250	250
29.05.2008	200	350	350
22.09.2008	200	350	450
22.10.2008	300	500	500
09.12.2009	300	500	500
23.11.2011	350	500	500

Source: RBI

interest rate that can be paid ('all-in-cost restrictions'). The maze of rules introduces many unintentional consequences (Patnaik and Shah, 2012).

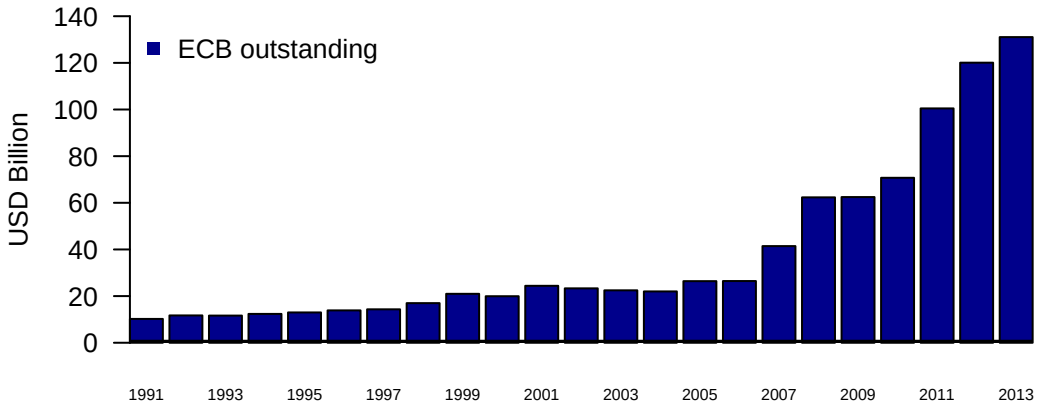
Table 1 shows the maximal interest rate that can be paid for ECB by an Indian firm. The limits are specified by maturity and modified from time to time by RBI in response to the objectives of currency policy. This capital control favours firms with low credit risk. Through this entire period, the maximal interest rate that can be paid is only slightly higher than the credit premium of the Indian government. This may explicitly induce effects similar to those documented in Chile by Forbes (2007), where capital controls favour large firms. Given the scarce access to FCB, there are related concerns that the firms which do FCB might merely engage in financial intermediation[1], where foreign borrowing is (in turn) lent out to other firms in the country who lack access to FCB and have greater financing constraints.

Figure 1 shows the time-series of the stock of borrowing through ECB[2]. This shows a surge in borrowing in recent years. In this period, there are many firms which have transitioned into foreign currency borrowing (FCB) for the first time. These events are utilised in our identification strategy.

[1]The RBI under the extant foreign borrowing framework does not allow utilisation of foreign currency debt proceeds for on-lending to other firms. However, given fungibility of funds, this control is hard to administer.

[2]The composition of India's external debt reveals that commercial borrowings constitute one of the largest components of external debt. ECB liabilities witnessed more than 12-fold increase between March 1991 to March 2013. This is also reflected in the share of commercial borrowings in total external debt. The share has increased from 12.18% in March 1991 to 31.50% at the end of December 2013

Figure 1 Stock of ECB borrowing



2.2 Hedging using currency derivatives

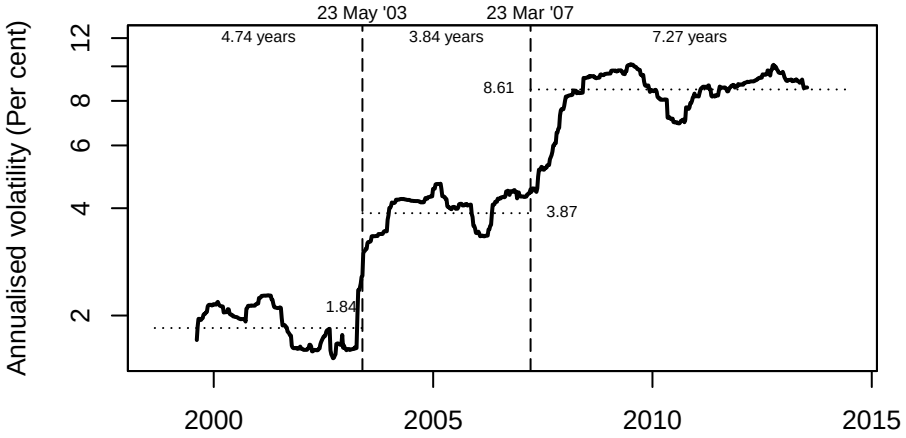
Currency derivatives on the USD/INR rate are traded in India and overseas. The onshore market suffers from two problems: low liquidity particularly for longer maturities, and capital controls that hamper hedging by firms (Shah, 2014).

Cash-settled USD/INR derivatives are traded overseas and have achieved significant liquidity. In the derivatives market, in 2013, it is estimated that turnover on the onshore market was $3.14 billion a day and on the offshore market it was $19.083 billion a day (McCauley *et al.*, 2014). Indian firms who have done outbound FDI are able to access the offshore market.

Putting these facts together, we may cautiously suggest that there is problem with incomplete markets for currency hedging, particularly for firms that have not done outbound FDI which would get around the problems of capital controls and the weak onshore market. However, given the nature of the capital controls against foreign borrowing, and the problems of home bias in international portfolio formation, it is likely that the bulk of borrowing is being done by large and well known firms, who have an FDI presence overseas. In addition, firms have a strong incentive to undertake financial engineering through which the restrictions of the capital controls are bypassed (Bruno and Shin, 2014; Shah and Patnaik, 2010). Putting these together, it is likely that incomplete markets may not hamper currency hedging.

Figure 2 Evolution of the Indian exchange rate regime

Each point in the graph is the annualised volatility of weekly returns on the USD/INR exchange rate, computed over a centred window of width two years. The horizontal lines are averages and the vertical lines are structural break dates.
The first period, of a *de facto* pegged exchange rate, ran for 4.74 years. A doubling of exchange rate volatility took place on 23 May 2003, and this lasted for 3.84 years. A doubling of exchange rate volatility took place on 23 March 2007, and this has been a durable framework for the following 7.27 years.



2.3 Exchange rate regime

The exchange rate regime classification methodology of Zeileis *et al.* (2010) identifies two structural breaks in the Indian exchange rate regime. This is depicted in Figure 2. From 1999 to 2003, there was a pegged exchange rate with INR/USD volatility of 1.84%. This is comparable to the RMB/USD volatility of 1.39% which has prevailed from 2005 to 2014.

On 23 May 2003, there was a first structural break, and exchange rate volatility doubled to 3.87%. This lasted for slightly less than four years, until 23 March 2007, when another doubling of exchange rate volatility took place, to 8.61%. For the most recent 7.27 years, this new regime has prevailed. While the INR/USD volatility of 8.61% is lower than that found with freely floating emerging market currencies, and the RBI continues to engage in exchange rate policy, it can be argued that the moral hazard motivation for firms to have unhedged foreign currency exposure has dropped substantially.

Figure 1 shows the aggregate time-series of foreign currency borrowing by Indian firms. The bulk of this action is found in the period after 2009, in

the aftermath of the three rounds of reduction in all-cost ceilings that were effected between 2008-09 (Table 1). Over this period, exchange rate flexibility was relatively high. This suggests that moral hazard is likely to be a weak motivation in encouraging firms to undertake unhedged currency exposure.

2.4 Hypotheses

Drawing on this literature, and in this setting, we may pose a few questions and establish certain hypotheses:

1. On the borrowing side, the capital controls regime emphasises borrowing by firms with low credit risk. On the lending side, home bias is likely to be at work. Hence, the firms that undertake FCB are likely to be large and internationally active firms with low credit risk.
2. These are likely to be firms which face low financing constraints in the first place.
3. The combination of capital controls and home bias hampers access to capital through FCB for firms with high credit risk, low size and lower international visibility.
4. Most of the period under examination has substantial currency volatility. This diminishes moral hazard. Firms are likely to want to hedge their foreign currency exposure. Even though onshore currency derivatives are restricted, firms are likely to be able to bypass the capital controls and protect themselves. While the USD/INR exchange rate has experienced substantial fluctuations, this is likely to not induce balance sheet effects and adversely affect the working of hedged firms.

3 Data description

3.1 Measurement

This paper draws upon the CMIE Prowess database in order to observe characteristics of firms and their foreign borrowing. We study the universe of all firms observed in the CMIE Prowess dataset where two tests are met: The firm should not be a financial firm and the revenues should be above Rs. 50 million in the year, which maps to a cutoff of roughly $1 million.

Other firm characteristics are defined as follows:

- *Measures of financing constraints*:
    1. Leverage is calculated as total borrowing divided by total assets. High values denote a firm that has been able to borrow, i.e. one that faces low credit constraints.
    2. Asset tangibility is calculated as gross fixed assets divided by total assets. High values denote a firm with low credit constraints.
    3. Liquidity is calculated as the difference between current assets and current liabilities divided by total assets. High values denote a firm with low credit constraints.
- *Measures of firm internationalisation*
    1. Exports/Sales ratio: This is the ratio of exports to sales.
    2. Foreign investment: This is the fraction of the publicly traded shares of the company owned by foreign institutional investors, that is, registered companies who are the only investors allowed to directly engage in investment in Indian shares.
    3. Foreign ownership: This is the fraction of the shares of the company owned by a foreign entity.
    4. OFDI: This is the fraction of the total assets of the firm which are invested outside India through outbound FDI (OFDI).
- *Performance measures*
    1. Return on capital is calculated as net profit divided by capital employed.
    2. Size is defined as the average of income and total assets over the last three years.

Firm data is extracted from the CMIE Prowess database from 2001 onwards. Foreign currency borrowing is defined as loans taken by the company denominated in a currency other than the Indian rupee, from any source. The full definition of FCB in Prowess database is "Any loan taken by the company in a currency other than in Indian rupees is a foreign currency loan. Examples of such loans are loans taken from foreign banks, foreign currency loans taken from foreign branches of Indian banks, foreign currency loans taken from Indian banks, loans taken from EXIM banks, loans taken from multinational lending institutions such as World Bank, IBRD, and Asian Development Bank, external commercial borrowings, suppliers/buyers credit, global depository receipts and American depositary receipts."This is a somewhat more inclusive definition than ECB, in particular including trade credit as well.

Table 2 Number of firms in various categories

We define foreign currency borrowers as those where foreign currency borrowing exceeds 1% of total borrowings. Exporting firms are defined as those where exports exceed 1% of sales. Domestic borrowers are defined as firms where domestic borrowings exceed 1% of total borrowings.

Year	Total firms	FCB firms	Exporters	Domestic borrowers
2004	5964	462	2664	5539
2005	6470	899	2778	6000
2006	6894	947	2929	6345
2007	7359	949	3118	6759
2008	8042	1032	3260	7349
2009	8793	963	3483	8010
2010	8929	987	3305	8030
2011	7444	861	2814	6669
2012	5946	818	2413	5277
2013	4975	769	2139	4338
2014	4043	626	1843	3534

Foreign currency borrowing by Indian firms began on a significant scale from 2007 onwards, in response to changes in the capital controls regime and favourable macroeconomic conditions. This gives an opportunity to observe firms make the transition from no FCB to having FCB, which is the basic identification strategy of this paper. By matching the firms which made this transition against firms which did not, we achieve a quasi-experimental design within which a difference-in-difference estimator is feasible with treated and control firms.

3.2 Describing firms and their foreign borrowing

Table 2 shows the number of firms in each year, in the dataset. It shows that most firms are domestic borrowers. Only some of these are exporters and the smallest number is found for the firms that borrow abroad.

Figure 3 compares the sum of FCB seen in the firms in our dataset against the aggregate for the full country. It shows that roughly half of the overall FCB of India is in our dataset. There are two factors at work in explaining this gap. Some of the borrowing is by financial firms, which are excluded in our dataset. In addition, some borrowing is by firms which are absent in the CMIE Prowess dataset. For the purposes of the empirical analysis of this paper, the fact that roughly half of the aggregate borrowing by Indian firms is within the firms in our dataset suggests that the results are fairly representative.

Figure 3 Coverage of the dataset

This figure shows the total outstanding long term FCB by all non-financial firms in the country, and the sum of the FCB by the firms in our dataset. The blue part of the graph is the scale of FCB by Indian firms which is not in our dataset.

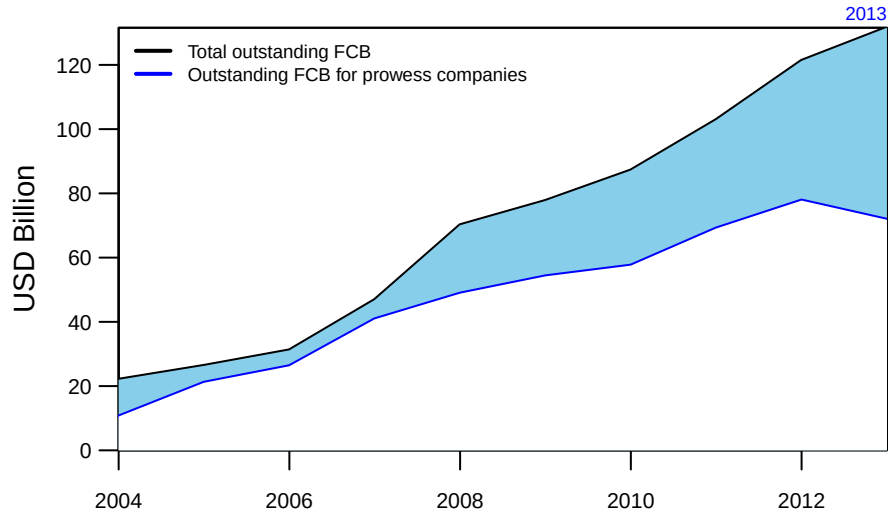


Table 3 Number of FCB firms, expressed by size quartiles

The bulk of FCB firms have a size that is above median.

Year	Q1	Q2	Q3	Q4
2004	1	29	132	300
2005	0	28	249	622
2006	0	32	247	668
2007	0	29	215	705
2008	0	33	214	785
2009	0	21	175	767
2010	0	24	187	776
2011	0	16	130	715
2012	0	19	150	649
2013	0	33	169	567
2014	0	33	136	457

Table 4 Sum of FCB within each size quartile

The sum of foreign borrowing for each year is shown by size quartiles. The bulk of the borrowing is in the firms of the top quartile.

Year	Q1	Q2	Q3	Q4
2004	0.00	0.02	0.18	10.02
2005	0.00	0.02	0.28	20.10
2006	0.00	0.02	0.29	26.16
2007	0.00	0.01	0.28	36.61
2008	0.00	0.02	0.34	52.16
2009	0.00	0.01	0.32	56.65
2010	0.00	0.02	0.31	54.05
2011	0.00	0.01	0.28	71.52
2012	0.00	0.01	0.48	85.70
2013	0.00	0.05	0.79	87.86
2014	0.00	0.05	0.76	102.52

All values are in USD Billion

Table 3 organises FCB firms by size quartiles. It shows that the bulk of FCB firms are in the 3rd and 4th quartile by size. The magnitude of the borrowing in each quartile is shown in Table 4. The bulk of the borrowing is in firms in the top quartile.

Table 5 Summary statistics

Variable	Category	Mean	SD	Min	25th	Median	75th	Max	Observed
Leverage (Ratio)	All firms	0.34	0.30	0.00	0.12	0.31	0.49	2.30	89139
	Non-FCB firms	0.37	0.30	0.00	0.16	0.33	0.51	2.30	71711
	FCB firms	0.41	0.24	0.00	0.26	0.39	0.52	2.30	9972
Asset Tangibility (Ratio)	All firms	0.54	0.36	0.00	0.26	0.50	0.76	1.91	88238
	Non-FCB firms	0.55	0.36	0.00	0.27	0.51	0.77	1.91	71268
	FCB firms	0.59	0.33	0.00	0.35	0.56	0.79	1.90	9999
Liquidity (Ratio)	All firms	0.17	0.24	-0.82	0.03	0.18	0.33	0.74	88238
	Non-FCB firms	0.17	0.24	-0.82	0.03	0.18	0.33	0.74	71096
	FCB firms	0.15	0.21	-0.81	0.02	0.14	0.28	0.74	9968
Exports/Sales (Percent)	All firms	12.53	24.24	0.00	0.00	0.00	11.33	99.85	89139
	Non-FCB firms	11.29	23.10	0.00	0.00	0.00	8.93	99.85	71937
	FCB firms	20.99	28.24	0.00	0.00	6.31	33.63	99.84	9972
Foreign investment (Percent)	All firms	2.00	8.03	0.00	0.00	0.00	0.00	92.46	90031
	Non-FCB firms	1.39	6.72	0.00	0.00	0.00	0.00	92.46	72522
	FCB firms	6.43	13.65	0.00	0.00	0.00	4.59	88.26	10053
Foreign ownership (Percent)	All firms	2.10	10.33	0.00	0.00	0.00	0.00	96.80	90040
	Non-FCB firms	1.66	9.03	0.00	0.00	0.00	0.00	96.77	72531
	FCB firms	3.45	12.82	0.00	0.00	0.00	0.00	96.80	10053
OFDI/Total assets (Percent)	All firms	0.03	0.28	0.00	0.00	0.00	0.00	5.55	89139
	Non-FCB firms	0.02	0.25	0.00	0.00	0.00	0.00	5.55	72012
	FCB firms	0.08	0.47	0.00	0.00	0.00	0.00	5.50	9778
Return on capital (Percent)	All firms	4.72	18.16	-116.20	0.40	3.90	10.41	108.88	88229
	Non-FCB firms	3.68	17.69	-116.20	0.25	3.46	9.40	108.88	71065
	FCB firms	4.05	13.92	-115.34	0.86	4.40	9.30	107.00	9950
Size (INR Million)	All firms	5796.58	51135.04	10.40	213.90	578.55	1964.50	3558444.80	90040
	Non-FCB firms	3474.35	23479.61	10.40	201.70	508.20	1578.55	1544910.70	72531
	FCB firms	24069.88	135250.50	24.40	785.70	2794.90	10463.20	3558444.80	10053

Table 5 shows summary statistics about the firms in the dataset where we observe 90040 firm-years.

The median size of FCB firms is Rs.2794.9 million while the median size of non-FCB firms is Rs.508.2 million: the firms that borrow abroad are more than five times bigger on average than the firms that do not. The home bias literature suggests that foreign investors are likely to favour large, low credit risk and internationally active firms. This is exacerbated by the Indian capital controls which limit foreign borrowing to firms with low credit risk.

When we look at measures of financing constraints, small differences between FCB and non-FCB firms are visible. Asset tangibility for FCB firms has a mean of 0.59 while it is 0.55 for non-FCB firms. On the other hand, there is no difference in the liquidity ratio. While high leverage suggests more borrowing, it can also be interpreted as a lack of equity capital. In our data, the average leverage of FCB firms is 0.41 while for non-FCB firms it is 0.37 .

We examine three internationalisation measures – exporting, foreign equity ownership and outbound FDI. The firms that borrow abroad are much more internationalised by all three measures. The exports/sales ratio has a mean of 20.99 % for FCB firms while it is 11.29 % for non-FCB firms. Half of the non-FCB firms have zero exports, while the median value of exports for FCB firms is 6.31 % of sales.

In terms of foreign investment, the mean value for FCB firms is 6.43 % while for non-FCB firms it is 1.39 %. Foreign ownership by non-financial firms is 3.45 % for FCB firms on average while it is 1.66 % for non-FCB firms. Outbound FDI by FCB firms is 0.08 % of assets on average while it is 0.02 % of assets for non-FCB firms. This is consistent with the home bias literature, which finds that foreign investors favour internationally active firms. There may also be interconnections between the various modes of firm internationalisation, where each mechanism of international engagement reinforces the others.

In terms of operating performance, the return on capital for FCB firms has a median value of 4.4 % while for non-FCB firms it is 3.46 %. This is consistent with the idea that better performing firms are likely to be larger and have lower credit risk, which enables their overcoming home bias and satisfying the Indian capital controls.

We now turn to the question of natural hedges. The fact that FCB firms export more and own more assets overseas suggests that they have greater natural hedges. The simplest case of a natural hedge is a firm which has net exports that pay for the flow of repayments associated with an FCB. We

Table 6 Percentage of firms by hedge coverage ratio

FCB firms in each year are classified into 'High', 'Low' or 'None' based on the extent to which net exports pay for the ongoing cost of repayment and interest on FCB.

	High	Low	None
2004	37.23	3.46	59.31
2005	42.27	3.00	54.73
2006	41.71	3.70	54.59
2007	41.41	3.58	55.01
2008	40.12	4.07	55.81
2009	39.15	3.63	57.22
2010	36.07	3.44	60.49
2011	37.17	4.07	58.77
2012	39.24	3.18	57.58
2013	39.53	2.73	57.74
2014	39.14	3.19	57.67

Table 7 Share of FCB borrowing by hedge coverage ratio

FCB firms in each year are classified into 'High', 'Low' or 'None' based on the extent to which net exports pay for the ongoing cost of repayment and interest on FCB.

	High	Low	None
2004	18.78	0.73	80.48
2005	24.56	3.89	71.55
2006	17.75	7.87	74.38
2007	21.25	5.05	73.70
2008	18.21	8.46	73.33
2009	19.47	4.81	75.72
2010	16.09	4.90	79.01
2011	14.95	2.85	82.20
2012	16.70	1.84	81.46
2013	14.28	6.77	78.95
2014	9.94	6.64	83.42

undertake a simple quantification of the extent to which FCB is covered by exports as follows.

The average maturity of Indian firm borrowing is 5 years. We may approximate the cost of borrowing at 350 bps above LIBOR. This permits an estimate of the annual payments that would have to be made as a consequence of a given level of FCB. This estimate, of the flow of repayments, is compared against the net exports of the firm to assess the extent to which a natural hedge is present. We classify firms into three discrete categories based on the extent of hedging: 'High' are firms where net exports are over 80% of the flow of repayments, 'None' are firms with below 20%, and 'Low' are those in between. The cutoffs are based on the observed distribution of firm hedging, as described in Table 6 and 7.

Table 6 shows a bimodal structure where, in 2013, 39.87% FCB firms have a strong natural hedge based on net exports, and 57.14% FCB firms where net exports are smaller than 20% of the required repayment in foreign currency, and 2,99% firms lie in between. For the firms who do not have natural hedges, there is the possibility of hedging using financial derivatives, or of holding unhedged exposure.

3.3 Top 30 FCB firms, 2013

Table 8 lists the 30 firms with the largest FCB in 2013. It can be seen that many of these firms are in energy and infrastructure, and are not naturally hedged. These 30 firms accounted for almost two-thirds of the measured FCB in our dataset for 2013. Overall risk exposure is indicated by leverage (debt to total assets), and this varies widely in this set of firms, ranging from slightly under 12 percent to almost 84 percent, with a median value of 35.6 percent. The ratio of FCB to total borrowing also varies widely, from less than 12 percent to over 88 percent, with a median value of almost 45 percent. Table 8 also presents calculations for the total ratio, indicating the extent to which annual profits cover estimated debt payments. There are several firms with values below one, and even the median is only 1.21, which is somewhat low by usual rules of thumb. Only three of the 30 firms have a total ratio above two. For comparison, we also calculate ratios based only on FCB - these would be relevant if domestic debt could be rolled over or rescheduled, while FCB obligations had to be met.

4 Which firms undertake FCB?

There are a large number of firms with zero foreign currency borrowing, and some firms which have undertaken it. In order to explore descriptive linear relationships in the data, we estimate a tobit model. There is strong heterogeneity in the relationships found in the data across size categories. Hence, we estimate the model separately within size quartiles. In the smallest quartile (Q1) there are too few FCB firms and hence the model cannot be estimated. The remaining three within-size-quartile estimates are shown in Table 9.

In a less developed financial system, firms are able to borrow against tangible collateral, and lenders lack the skill required for assessing their prospects. Asset tangibility powerfully influences FCB in Q2 and Q3 but has a lower

Table 8 Top 30 firms with the largest FCB in 2013

Top 30 firms which used the largest FCB in 2013

Company Name	FCB Share	Leverage	FCB/TB	FCB/TA	Total Ratio	FCB Ratio
Indian Oil Corpn. Ltd.	10.93	34.88	56.78	19.81	1.20	2.00
Hindustan Petroleum Corpn. Ltd.	6.32	43.89	78.65	34.52	1.09	1.34
Power Grid Corpn. Of India Ltd.	5.26	58.13	32.40	18.83	1.21	3.42
Bharat Petroleum Corpn. Ltd.	4.94	35.06	87.10	30.54	1.35	1.53
Reliance Communications Ltd.	4.85	41.84	63.35	26.50	1.06	1.60
N T P C Ltd.	4.15	34.04	30.00	10.21	1.74	5.30
Steel Authority Of India Ltd.	2.89	25.21	56.26	14.18	1.33	2.24
Reliance Industries Ltd.	2.71	22.73	15.72	3.57	2.01	11.45
Bhushan Steel Ltd.	2.23	65.90	32.89	21.68	1.11	3.08
Shipping Corpn. Of India Ltd.	1.71	50.42	88.05	44.39	0.96	1.07
Coastal Gujarat Power Ltd.	1.67	80.66	53.07	42.81	0.60	1.06
Nuclear Power Corpn. Of India Ltd.	1.61	34.26	40.34	13.82	1.43	3.29
J S W Steel Ltd.	1.59	32.74	37.22	12.18	1.34	3.32
Idea Cellular Ltd.	1.59	36.15	51.39	18.58	1.21	2.21
Larsen & Toubro Ltd.	1.45	11.76	68.99	8.11	2.81	3.91
Bhushan Power & Steel Ltd.	1.42	69.71	23.99	16.72	1.08	4.07
Reliance Infrastructure Ltd.	1.24	24.93	45.53	11.35	1.59	3.24
Adani Ports & Special Economic Zone Ltd.	1.18	45.66	59.40	27.12	1.69	2.70
Tata Motors Ltd.	0.87	31.65	21.40	6.77	1.06	4.47
Sistema Shyam Teleservices Ltd.	0.84	83.93	44.35	37.22	-0.22	-0.46
Jindal Stainless Ltd.	0.83	61.79	31.96	19.75	0.74	2.12
Chambal Fertilisers & Chemicals Ltd.	0.82	60.42	67.29	40.66	1.19	1.70
Alok Industries Ltd.	0.79	64.42	20.63	13.29	1.20	5.22
Ultratech Cement Ltd.	0.75	19.61	58.30	11.43	2.62	4.26
Tata Steel Ltd.	0.71	26.58	10.79	2.87	1.65	13.54
Bharat Aluminium Co. Ltd.	0.70	40.71	68.26	27.79	1.04	1.47
Mangalore Refinery & Petrochemicals Ltd.	0.67	28.23	37.37	10.55	0.66	1.63
Jaiprakash Associates Ltd.	0.67	52.80	11.56	6.10	1.07	8.24
Rashtriya Ispat Nigam Ltd.	0.60	19.82	51.45	10.20	1.24	2.26
N H P C Ltd.	0.57	34.13	12.90	4.40	1.44	9.95
Total Share/Median Value	66.55	35.61	44.94	15.45	1.21	2.89

effect in Q4. This shows that for Q2 and Q3 firms, foreign lenders are very strongly influenced by the presence of tangible collateral. While asset tangibility matters for Q4 firms also, the coefficient is halved.

Less financially constrained firms are those that are more liquid, and in some sense, these firms require debt capital the least. The coefficient of liquidity is 57.89 for the Q2 firms, 34.04 for the Q3 firms and 3.64 for the Q4 firms. This shows that FCB is going to the least constrained firms, particularly when they are relatively small. To the extent that leverage can be interpreted as *access* to debt capital, a similar relationship is found with leverage also.

Internationalisation measures are positively associated with FCB, other than the presence of outbound FDI which is not important for Q2 and Q3 firms. This is consistent with two perspectives: More international firms are likely to have natural hedges, and under conditions of home bias, foreign investors are likely to choose internationally visible firms.

The results for Q2 and Q3 are qualitatively similar to each other and so we focus on the comparison of Q3 and Q4. In order to better visualise the differences between Q4 (the largest firms) and Q3 (the next smaller quartile), Figure 4 displays the 95% confidence interval of all the estimates. This

Table 9 Tobit results

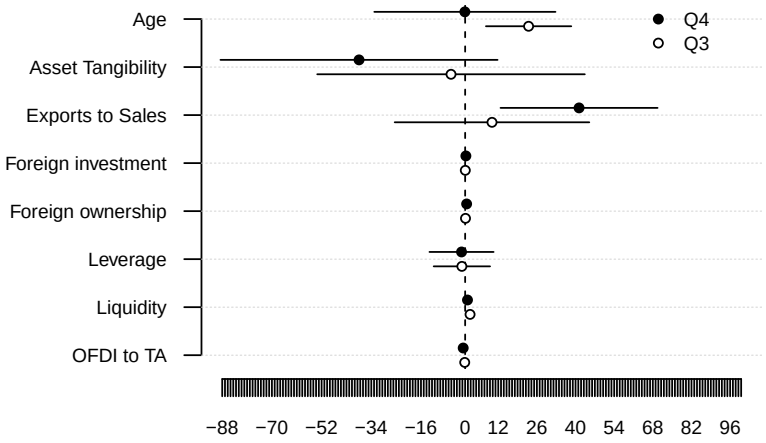
We use a tobit regression model to study the characteristics of firms which take on foreign currency debt. The dependent variable here is the ratio of FCB to total borrowing.

	Q2	Q3	Q4
Intercept	-224.18	-147.55	-66.96
	(0.00)	(0.00)	(0.00)
Asset Tangibility	56.73	61.06	34.67
	(0.00)	(0.00)	(0.00)
Liquidity	57.89	34.04	3.64
	(0.00)	(0.00)	(0.42)
Leverage	37.19	12.12	6.72
	(0.00)	(0.00)	(0.02)
Exports to Sales	0.85	0.54	0.25
	(0.00)	(0.00)	(0.00)
Foreign investment	0.48	1.03	0.93
	(0.6)	(0.00)	(0.00)
OFDI to TA	-1.71	-0.41	1.59
	(0.43)	(0.63)	(0.00)
Foreign ownership	0.98	0.88	0.02
	(0.01)	(0.00)	(0.8)
Age	-0.19	-0.18	0.06
	(0.28)	(0.03)	(0.18)

Values in parentheses are p-values

Figure 4 Visualising the tobit estimates

This figure shows the range of tobit estimates calculated as $\beta \pm 1.96 * s$; where β is the coefficient from the tobit regression and s is the standard error of the coefficients.



shows that for the Q3 firms, it is much more important to have *low* financing constraints, in order to do FCB.

5 Causal impact of FCB on firm outcomes

Our methodology for setting up a quasi-experimental design for foreign currency borrowing by firms builds on Patnaik and Shah (2013) which developed this approach for foreign versus domestic institutional investment into firms.

5.1 A quasi-experimental design

The previous analysis has shown that there is a strong selection process in operation with FCB. Large, internationalised firms with low financing constraints are likely to engage in FCB. In order to identify the causal impact of FCB upon the outcome for the firm, we require observations of some firms which used FCB, and controls which have similar characteristics which did not use FCB. This will permit a comparison of firm performance in the period after the first FCB date. These differences in performance can be causally attributed to FCB.

The two key elements of our strategy are propensity score matching (Rosenbaum and Rubin, 1983) coupled with analysis in event time. Propensity score matching helps us identify a matched control firm at time t, for each firm which first undertakes FCB at time t. This helps address selection on observables. Analysis in event time helps average out changes in laws and macroeconomic conditions which would affect both treatment and control units. This improves external validity when compared with the analysis of any one year, by averaging across a greater range of external conditions.

The key event date is the transition where a firm is observed for one year without foreign borrowing and is seen with foreign borrowing for the next two consecutive years. We identify firms which have followed the trajectory $(0, 1, 1)$. The control pool is composed of all firms which never borrowed abroad.

The first stage in propensity score matching is the estimation of a logit regression that predicts which firms did FCB. This logit is estimated using firm characteristics at time $t-1$ in order to avoid endogeneity bias. Nearest neighbour matching without replacement is done within each year. If P_{it} is the predicted probability of FCB at time t for firm i (a firm in the treatment

Table 10 Number of treated and control firms

This table shows the number of treated and control firms using our trajectory definition.

Year	Number of controls	Number of treated	Matched pairs
2002	2068	46	15
2003	2145	63	25
2004	2458	138	61
2005	2557	342	118
2006	2948	131	62
2007	3223	137	55
2008	3457	131	54
2009	3734	79	37
2010	3217	89	38
2011	2678	158	52
2012	2091	111	36

group), a firm j is chosen as its matched partner if its probability to borrow is the closest to P_{it} amongst all firms in the control group in year t. If the best available j is not sufficiently close to i then i is dropped from the analysis.

Table 10 shows the number of firms in each year which survive the matching process. As an example, in 2008, in the full data, there were 131 events of a firm which did FCB for the first time. There was a control pool of 3457 firms available which have never done FCB. Of the 131 treated firms, it was possible to find high quality matches, using propensity score matching, for 54 firms. For the remaining 77 firms, we observe firm outcomes after FCB, but we do not see a plausible control firm with similar characteristics that did *not* do FCB. Hence, these remaining 69 firms are not useful in understanding the causal impact of FCB. In this fashion, the events of each year yield some observations where a treated firm can be paired against a highly similar control. In total, this yields a design with 553 matched pairs.

5.2 Has match balance been achieved?

The essence of credible quasi-experimental econometrics is match balance: the outcomes for treatment and control can be compared as in an experiment because the control unit is much like the treatment unit.

The matching procedure is effective if it delivers balance. We use standardised differences, and Kolmogorov Smirnov tests, to verify that the treatment and control group are not significantly different based on the calculated propensity score and firm characteristics in the year prior to treatment.

Table 11 shows the standardised differences between treated and control firms

Table 11 Goodness of matched pairs: Standardised difference

This table shows the standardised difference for different variables for treatment and control group. After matching, the standardised difference drops to zero.

	Before Matching	After Matching
Propensity score	0.72	-0.00
Asset tangibility$_{i,t-1}$	0.08	-0.11
Liquidity$_{i,t-1}$	0.07	0.17
Leverage$_{i,t-1}$	-0.03	-0.24
Export to sales$_{i,t-1}$	0.35	0.12
Log(Size)$_{i,t-1}$	0.12	0.01
Log(Size)$^2_{i,t-1}$	0.66	-0.02
Age$_{i,t-1}$	0.04	-0.11
FII$_{i,t-1}$	0.30	-0.03
Foreign promoter$_{i,t-1}$	0.12	0.04
OFDI/TA$_{i,t-1}$	0.04	-0.00

before and after the matching process. As an example, the standardised difference in the exports/sales ratio is 0.35 before matching: FCB firms have a higher exports/sales ratio. After the matching process, this standardised difference drops to 0.12 , which shows that there is match balance; the treated and control firms are alike.

We go beyond the first two moments to the entire distribution in Table 12, which shows results of the Kolmogorov-Smirnov test for all variates. As an example, the p value of the test that compares the exports/sales ratio is 0 for the raw data. This shows that the exports/sales ratio is emphatically different between FCB firms and non-FCB firms. After matching, the p ratio of the KS test is 0.0368; it is not possible to reject the null hypothesis of equality of distribution.

Figure 5 shows the cumulative density of the propensity score. Before matching, the two distributions are clearly different from each other. Once the matching process has been done, the two distributions lie on top of each other. This justifies causal inference through propensity score matching, within the constraint of only matching on observables.

5.3 Analysis of the matched dataset

Table 12 Goodness of matched pairs: KS test

This table shows the Kolmogorov-Smirnov test for different variables for treatment and control group. The null of equality of distributions is always rejected in the raw data and is never rejected after matching.

	Before Matching	After Matching
Propensity score	0.4838	0.0054
	(0)	(1)
Asset tangibility$_{i,t-1}$	0.0667	0.0669
	(0)	(0.1681)
Liquidity$_{i,t-1}$	0.0555	0.0832
	(5e-04)	(0.0436)
Leverage$_{i,t-1}$	0.0852	0.1121
	(0)	(0.0019)
Export to sales$_{i,t-1}$	0.2638	0.085
	(0)	(0.0368)
Log(Size)$_{i,t-1}$	0.3282	0.0434
	(0)	(0.6749)
Log(Size)$^2_{i,t-1}$	0.3282	0.0434
	(0)	(0.6749)
Age$_{i,t-1}$	0.0452	0.0759
	(0.0077)	(0.0823)
FII$_{i,t-1}$	0.2176	0.0271
	(0)	(0.9871)
Foreign promoter$_{i,t-1}$	0.0586	0.0181
	(2e-04)	(1)
OFDI/TA$_{i,t-1}$	0.0057	0.0018
	(1)	(1)

Values in parentheses are p-values

Figure 5 Cumulative density of propensity score

This figure shows the cumulative density of the propensity score of treated and control firms, before and after matching. After matching, the distribution of the treated and control firms is similar.

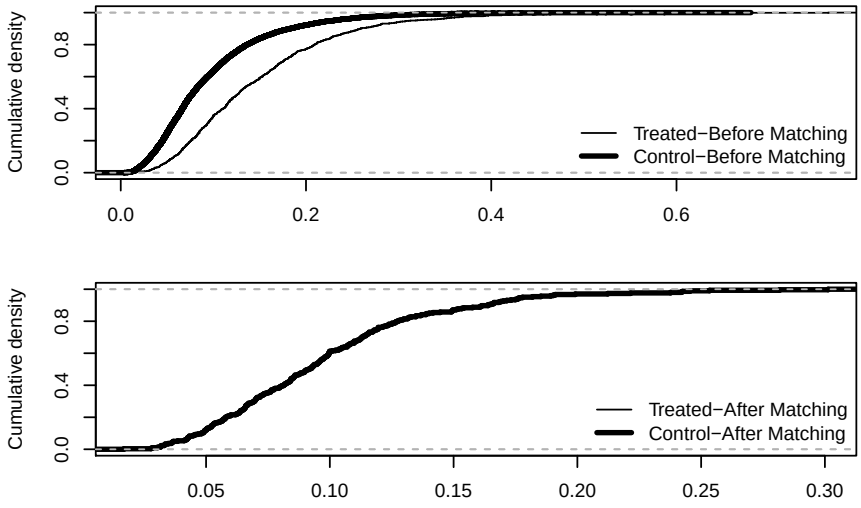


Table 13 Summary statistics after matching

Variable	Category	Mean	SD	Min	25th	Median	75th	Max	Observed
Leverage (Ratio)	Treatment	0.36	0.21	0.00	0.22	0.34	0.46	1.44	553
	Control	0.41	0.31	0.00	0.19	0.37	0.53	2.06	553
Asset Tangibility (Ratio)	Treatment	0.56	0.32	0.01	0.32	0.53	0.76	1.55	553
	Control	0.59	0.34	0.00	0.34	0.57	0.79	1.91	553
Liquidity (Ratio)	Treatment	0.23	0.20	-0.55	0.10	0.22	0.36	0.70	553
	Control	0.19	0.22	-0.65	0.06	0.21	0.33	0.74	553
Exports/Sales (Percent)	Treatment	15.82	27.37	0.00	0.00	1.43	18.05	99.67	553
	Control	12.44	23.38	0.00	0.00	0.62	12.51	99.79	553
Foreign investment (Percent)	Treatment	0.95	4.92	0.00	0.00	0.00	0.00	69.15	553
	Control	1.11	6.18	0.00	0.00	0.00	0.00	90.75	553
Foreign ownership (Percent)	Treatment	2.16	10.10	0.00	0.00	0.00	0.00	82.33	553
	Control	1.76	9.06	0.00	0.00	0.00	0.00	82.51	553
OFDI/Total assets (Percent)	Treatment	0.00	0.06	0.00	0.00	0.00	0.00	1.48	553
	Control	0.00	0.07	0.00	0.00	0.00	0.00	1.55	553
Return on capital (Percent)	Treatment	5.27	11.34	-93.02	1.63	4.80	10.92	41.68	552
	Control	3.49	17.36	-76.40	0.40	3.74	9.73	83.14	544
Size (INR Million)	Treatment	1994.08	7820.34	47.60	296.50	578.00	1428.20	151197.30	553
	Control	1886.03	4610.15	37.00	286.20	623.00	1429.30	58169.40	553

As emphasised above, our ability to make causal claims is limited to the support of the data where similar firms are observed, where some have done FCB and others have not. For many large firms that undertake FCB, it is not possible to find controls as all their peers have also done FCB. Table 13 shows summary statistics of the treatment and control firms. This shows match balance: the treated firms are much like the controls. The gross differences between FCB and non-FCB firms, which are visible in Table 5 for the full dataset, have been eliminated.

In the full dataset, summarised in Table 5, the mean size of FCB firms was Rs.24069.88 million and the mean size of non-FCB firms was Rs.3474.35 million: the FCB firms were much bigger than the non-FCB firms. In the matched dataset, the two means are Rs.1994.08 million and Rs.1886.03 million respectively. Here, the two means are alike. In addition, it was only possible to find similar control units for smaller firms, so the average size of firm in the matched dataset is smaller than that seen in the full dataset. It is important to emphasise that the summary statistics in Table 5 were across all firm-years, whereas what is shown in Table 13 only pertains to the year -1 in event time for the 553 treated firms and their 553 matched controls.

With this matched dataset is in hand, the difference in difference estimator is calculated based on the following specification:

$$\Delta y_{i,s} - \Delta y_{j,s} = a_0 + e_{ij,s}$$

where y is the firm characteristic of interest; s denotes event time, that is 0 is the time at which the firm starts borrowing, 1 is one year after firm begins to borrow and so on; i is the treated firm and j is the matched control firm. In all cases, we show results for a simple OLS estimator and also a robust MM-type estimator for linear regression.

The main result is shown in Table 14. The robust regression shows that FCB firms have substantially higher growth in fixed assets in year 1 and 2 after the FCB in year 0. There is some growth in employment in year 0 and 1. This yields improved growth of exports (in year 2) and output (in year 0 and 2).

The fact that FCB gave an increase in inputs of fixed assets, and of labour, suggests that firms use FCB for growing their operations and not for financial intermediation. If there had been large currency mismatches, and if fluctuations of the exchange rate were adversely affecting the firm, then the impact on output measures would have been hampered. This does not seem to be the case, as there is some statistically significant increase in exports and sales by year $+2$.

Table 14 Results

OLS and robust regression for $\Delta y_{i,s} - \Delta y_{j,s} = a_0 + e_{ij,s}$ are estimated for various outcomes of interest y in event time s. i is the treated firm and j is the matched control firm. Estimated a_0 is reported in each case.
As an example, consider an outcome of interest: log gross fixed assets. The robust regression estimates show that firms that take on FCB have a growth in assets over a one year horizon after treatment that is larger than that observed for controls by 0.13 with a standard error of 0.023.

	Growth of gross fixed assets	
	OLS	Robust
0	0.15 (0.022) ***	0.07 (0.014) ***
1	0.08 (0.022) ***	0.08 (0.014) ***
2	0.06 (0.018) **	0.06 (0.014) ***
Obs	324	324

	Employee growth	
	OLS	Robust
0	0.15 (0.03) ***	0.12 (0.026) ***
1	0.04 (0.034)	0.04 (0.027)
2	0.04 (0.029)	0.03 (0.024)
Obs	294	294

	Growth of exports	
	OLS	Robust
0	0.32 (0.13) *	0.13 (0.076)
1	0.03 (0.129)	0.12 (0.102)
2	0.04 (0.104)	0.02 (0.093)
Obs	110	110

	Sales growth	
	OLS	Robust
0	0.09 (0.025) ***	0.07 (0.021) ***
1	0.04 (0.026)	0.04 (0.022) .
2	0.05 (0.029) .	0.04 (0.022) .
Obs	325	325

If firms were financially constrained, and FCB eased a financing constraint, then there would be a sharp impact upon output for the FCB firm when compared with the control. This is not the case; the effects are modest. This may, in turn, reflect the fact that home bias and capital controls have limited access to FCB to relatively financially sound Indian firms, as was demonstrated in Section 4, our analysis of the characteristics of the firms that have obtained FCB.

5.4 Is FCB easing financing constraints?

The second dimension in which we explore heterogeneous treatment effects is about financing constraints. If firms were domestically financially constrained, then access to FCB could make a big difference in yielding high output growth. If, on the other hand, the combination of home bias and capital controls was limiting FCB access to firms that were relatively unconstrained, then the economic impact of FCB is relatively limited.

The dataset is split into two sub-samples: those with high (above median) financing constraints versus those with low (below median) financing constraints. For this analysis, we use the liquidity measure from among the three measures discussed in Section 3. The results are shown in Table 15.

Table 15 Results: Financing constraints

The overall dataset is broken into two groups: those with above median financing constraints, versus those with below median financing constraints.

Above median

Growth of gross fixed assets

	OLS	Robust
0	0.14 (0.051) **	0.04 (0.032)
1	0.18 (0.052) **	0.14 (0.051) **
2	0.03 (0.043)	0.03 (0.038)
Obs	113	113

Employee growth

	OLS	Robust
0	0.08 (0.039) *	0.1 (0.037) **
1	0.12 (0.052) *	0.1 (0.043) *
2	0.03 (0.038)	0.03 (0.035)
Obs	111	111

Export growth

	OLS	Robust
0	0.02 (0.139)	0.08 (0.114)
1	0.28 (0.138) *	0.12 (0.1)
2	-0.14 (0.136)	-0.1 (0.1)
Obs	36	36

Sales growth

	OLS	Robust
0	0.08 (0.04) .	0.07 (0.036) .
1	0.1 (0.039) **	0.06 (0.034) .
2	0.07 (0.043)	0.07 (0.029) *
Obs	113	113

Below median

Growth of gross fixed assets

	OLS	Robust
0	0.04 (0.039)	0.02 (0.03)
1	0.13 (0.044) **	0.08 (0.037) *
2	0.03 (0.04)	0.02 (0.032)
Obs	136	136

Employee growth

	OLS	Robust
0	0.05 (0.053)	0.01 (0.031)
1	0.06 (0.043)	0.06 (0.031) .
2	-0.03 (0.053)	0 (0.034)
Obs	133	133

Export growth

	OLS	Robust
0	-0.01 (0.139)	-0.03 (0.12)
1	-0.15 (0.142)	-0.12 (0.071) .
2	0.29 (0.127) *	0.25 (0.132) .
Obs	51	51

Sales growth

	OLS	Robust
0	0.05 (0.038)	0.03 (0.03)
1	-0.02 (0.037)	-0.01 (0.028)
2	0.02 (0.039)	-0.04 (0.027)
Obs	137	137

The results for both groups are fairly similar for growth in employees, exports and sales, and even somewhat more positive for the firms with low financing constraints in the case of employee growth. Only in the case of asset growth is there evidence that firms with relatively high financing constraints are able to use FCB to relax those constraints. As was the case for the whole sample (Table 14), higher asset growth associated with FCB does not seem to translate into growth in sales or exports. The latter is likely related to the fact that firms with access to FCB are often not exporters. However, the lack of additional sales growth is consistent with a view that FCB is not playing a significant positive role among Indian firms, under present levels of home bias and under the present system of capital controls. It is possible, however, that there may be longer-run effects, and the question bears further investigation.

5.5 Robustness Checks

The propensity score matching procedure provides a clean causal analysis of the impacts of FCB on the subsequent performance of Indian firms. The only drawback of the analysis is that it excludes the largest foreign currency borrowers, which account for by far the bulk of such borrowing. Hence, we perform a conventional regression analysis as a robustness check. Since almost all FCB is in the top size quartile of firms, we restrict the empirical analysis to this quartile. We estimate panel regressions for each of the four performance variables considered in the propensity score matching. We allow for year fixed effects, and to deal with endogeneity, we use system GMM as the estimation method. Paralleling the propensity score matching, we consider three specifications for each dependent variable, using the contemporaneous ratio of FCB to total borrowing, as well as first and second lags. Overall, the results, presented in Tables 16 through 19, are similar to the propensity score matching, in the sense that there is little evidence of significant positive effects of FCB on subsequent firm performance. However, the details of the results are somewhat different. The strongest effects in the panel GMM estimates come in the case of growth in exports and sales, each with a two-year lag. In the propensity score matching results, by contrast, the strongest effects were identified for the other two performance variables, employment growth and fixed asset growth.

Table 16 GMM for fixed assets growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

GMM for fixed assets growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

VARIABLES	(1) GFAGrowth	(2) GFAGrowth	(3) GFAGrowth
L.GFA.Growth	0.118*	0.112*	0.0852
	(0.0643)	(0.0596)	(0.0994)
FCB/TB	0.0837		
	(0.0823)		
L.FCB/TB		0.0524	
		(0.0723)	
L2.FCB/TB			-0.0249
			(0.0873)
L.Liquidity	17.50**	20.18***	21.17***
	(6.829)	(7.379)	(7.176)
L.Leverage	-5.461	-2.930	-2.389
	(6.594)	(7.198)	(6.899)
L.Age	-0.140***	-0.138***	-0.115***
	(0.0226)	(0.0224)	(0.0252)
L.Size	-17.27***	-17.76***	-9.162**
	(4.516)	(4.179)	(4.277)
L.Size^2	0.376***	0.353**	-0.0801
	(0.144)	(0.140)	(0.120)
L.Exports.Sales	-2.432*	-2.041	-1.591
	(1.335)	(1.425)	(1.435)
L.FRGNProm	-0.888	-0.659	-1.676*
	(0.888)	(0.959)	(0.903)
L.FII	2.054***	1.513*	2.236***
	(0.785)	(0.861)	(0.814)
L.Market.Share	9.172***	10.65***	10.79***
	(3.439)	(3.505)	(4.049)
Constant	201.8***	216.3***	174.0***
	(54.65)	(53.72)	(61.76)
Observations	29,061	29,183	24,098
Number of unique companies	4,922	4,934	4,205

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17 GMM for employment growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

GMM for employment growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

VARIABLES	(1) Emp.Growth	(2) Emp.Growth	(3) Emp.Growth
L.Employ.Growth	-0.0348***	-0.0356***	-0.0462
	(0.00600)	(0.00593)	(0.118)
FCB/TB	0.302		
	(0.276)		
L.FCB/TB		0.0162	
		(0.0406)	
L2.FCB/TB			0.0539
			(0.209)
L.Liquidity	3.356*	3.790**	4.169**
	(1.790)	(1.747)	(1.839)
L.Leverage	-10.22***	-10.13***	-8.052***
	(1.730)	(1.716)	(1.944)
L.Age	-0.186***	-0.197***	-0.137***
	(0.0171)	(0.0128)	(0.0323)
L.Size	2.201	2.472	6.307***
	(2.142)	(2.097)	(2.115)
L.Size^2	0.0508	0.0814	-0.303**
	(0.112)	(0.104)	(0.126)
L.Exports.Sales	-0.286	0.0729	0.215
	(0.412)	(0.206)	(0.320)
L.FRGNProm	-0.872***	-0.709***	-0.710***
	(0.256)	(0.225)	(0.234)
L.FII	-0.316	0.0836	0.372
	(0.544)	(0.279)	(0.432)
L.Market.Share	-4.834***	-4.912***	-1.429
	(0.794)	(0.804)	(1.642)
Constant	-48.65***	-45.45***	-36.06
	(15.06)	(15.18)	(22.49)
Observations	27,552	27,673	23,170
Number of unique companies	4,787	4,799	4,120

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 18 GMM for sales growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

GMM for sales growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

VARIABLES	(1) Sales.Growth	(2) Sales.Growth	(3) Sales.Growth
L.Sales.Growth	-0.211***	-0.186**	0.119
	(0.0797)	(0.0812)	(0.104)
FCB/TB	-0.189		
	(0.162)		
L.FCB/TB		0.0131	
		(0.0150)	
L2.FCB/TB			0.0834**
			(0.0374)
L.Liquidity	5.264**	5.634**	8.510***
	(2.234)	(2.248)	(2.254)
L.Leverage	-15.19***	-14.15***	-15.00***
	(2.236)	(2.271)	(2.692)
L.Age	-0.176***	-0.157***	-0.0138
	(0.0336)	(0.0312)	(0.0295)
L.Size	1.886	2.915	14.83***
	(2.848)	(2.800)	(3.547)
$L.Size^2$	0.628***	0.612***	0.335**
	(0.167)	(0.168)	(0.148)
L.Export.Sales	-0.191	-0.385	0.161
	(0.293)	(0.249)	(0.273)
L.FRGNProm	-0.360	-0.408	0.0567
	(0.312)	(0.313)	(0.306)
L.FII	0.326	0.0162	-0.0397
	(0.418)	(0.306)	(0.350)
L.Market.Share	-13.94***	-15.34***	-23.21***
	(4.110)	(4.161)	(3.850)
Constant	-125.3**	-167.2***	-309.0***
	(60.24)	(52.62)	(54.93)
Observations	29,190	29,312	24,127
Number of unique companies	4,950	4,965	4,215

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 19 GMM for export growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

GMM for export growth (contemporaneous, one-lag, and two-lag effects of FCB/TB)

VARIABLES	(1) Exp.Growth	(2) Exp.Growth	(3) Exp.Growth
L.Export.Growth	-0.0879***	-0.0913***	-0.118***
	(0.0140)	(0.0143)	(0.0193)
FCB/TB	0.228*		
	(0.138)		
L.FCB/TB		0.222	
		(0.179)	
L2.FCB/TB			0.577**
			(0.234)
L.Liquidity	66.99**	72.22**	60.77**
	(30.54)	(29.20)	(28.32)
L.Leverage	-10.37	3.871	6.768
	(29.45)	(28.69)	(29.24)
L.Age	-0.117**	-0.111**	-0.0943*
	(0.0485)	(0.0487)	(0.0520)
L.Size	-2.012	-13.95	-14.01
	(13.62)	(14.41)	(15.55)
$L.Size^2$	0.783***	0.823***	0.375
	(0.249)	(0.248)	(0.280)
L.Export.Sales	-6.952*	-6.899*	-9.569***
	(3.614)	(3.570)	(3.707)
L.FRGNProm	-0.488	1.400	0.117
	(3.209)	(3.162)	(3.136)
L.FII	-0.667	-1.077	-1.692
	(2.459)	(2.511)	(2.696)
L.Market.Share	-12.13	-0.141	7.843
	(12.72)	(13.60)	(13.68)
Constant	-92.01	73.65	176.1
	(193.6)	(207.3)	(214.0)
Observations	16,819	16,891	15,196
Number of unique companies	2,860	2,865	2,615

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion

The results of this paper may be summarised as follows. There is a strong selection process which determines which Indian firms engage in foreign currency borrowing (FCB). The traditional problems of home bias have limited access to international capital markets to large and internationally active firms. These have been exacerbated by the Indian capital controls which favour firms with low credit risk. Put together, FCB has been the preserve of large and internationally active firms, with relatively low financing constraints.

There is a strong bimodal pattern where roughly half the firms have good natural hedges through exporting, while the other half do not. Access to currency hedging is limited by weak domestic financial markets development coupled with problems in capital controls. However, our results are consistent with the moral hazard hypothesis. The fact that the USD/INR exchange rate has substantial flexibility has given incentives to firms to be careful about exchange rate exposure. As a consequence, the outcomes for firms with low natural hedges do not betray difficulties with impaired balance sheets for firms with low natural hedging through exports.

Foreign currency borrowing could have been a mechanism for overcoming financing constraints. However, the firms which obtain access to international capital markets tend to be less constrained, and the Indian capital controls restrict access to firms with low credit risk. There is mild evidence that fixed asset growth of borrowing firms is higher than for the firms that borrow abroad. But this does not kick off a sharp spurt of sales growth or exports growth, which is what would have obtained under financing constraints.

There is also no evidence that firms which have access to FCB are engaged in financial intermediation, lending out their borrowed resources to other, more constrained, firms. Fixed asset growth is found within the FCB firms.

The contribution of this paper lies in a thorough analysis of foreign currency borrowing at the firm level using a quasi-experimental design. The results suggest a relatively benign and modest set of phenomena. The Indian arrangements for foreign borrowing are not fraught with risk owing to original sin. At the same time, foreign borrowing is not going to financially constrained firms, and it is not filling the gaps in access to capital in the domestic financial system.

Forbes (2007) has emphasised that capital controls can favour large firms against small firms. Such phenomena may well be present in India, where

the capital controls explicitly require low credit risk. The analysis of these questions is left to future research.

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