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Benefits of foreign ownership: Evidence from foreign direct investment in China☆

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ABSTRACT

To examine the effect of foreign direct investment, this paper compares the post-acquisition performance changes of foreign- and domestic-acquired firms in China. Unlike previous studies, we investigate the purified effect of foreign ownership by using domestic-acquired firms as the control group. After controlling for the acquisition effect that exists in domestic acquisitions, we find no evidence that foreign ownership can bring additional productivity gains to target firms, though both foreign and domestic acquisitions bring productivity improvements to target firms. In contrast, a strong and robust finding is that foreign ownership significantly improves target firms' financial conditions and exports relative to domestic-acquired firms. Foreign acquisition is also found to improve output, employment and wages for target firms. These findings conflict with the conventional view of productivity-driven FDI and highlight the financial channel through which FDI benefits the host countries.

1. Introduction

Conventional wisdom follows that FDI can increase host countries' productivity and such wisdom is supported by numerous empirical studies documenting the superior performance of FDI-involved firms in the host countries and the technology spillovers from these firms to their local counterparts.[2] FDI is also considered safer than other types of capital inflows and became the favorite form of foreign investment for emerging markets following the financial crises in the 1980s and 1990s.[3] As a result, many emerging markets provide tax and other incentives to attract FDI, and the past three decades have observed dramatic FDI inflows to these countries.

However, policies designed to promote FDI can be counterproductive if policymakers do not understand the mechanisms through which FDI benefits host countries. The positive correlation between firm productivity and FDI may simply reflect endogenous FDI decisions: foreign investors choose to acquire or start business with more productive domestic firms. For instance, Fons-Rosen et al. (2013) find that FDI has a very small effect on target firms' productivity in their sample of advanced European economies after controlling for unobservable factors that influence ex-ante acquisition decisions.

To control for the endogeneity issue, we employ the difference-in-differences method combined with propensity score matching (e.g., Arnold and Javorcik, 2009). However, we depart from the literature by examining purified performance gains from foreign ownership after controlling for gains existing in domestic mergers and acquisitions.

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1 Tel.: +1 701 777 3351.
2 For instance, see Javorcik (2004) for Lithuania, Yasar et al. (2007) for Turkey and Keller and Yeaple (2009) for the US, among others. However, Aitken and Harrison (1999) and Haddad and Harrison (1993) find no or even negative evidence for such technology spillovers in Morocco and Venezuela.

3 For instance, Krugman (2001) and Aguiar and Gopinath (2005) document that FDI is counter-cyclical and also less volatile than portfolio investment.

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0022-1996/

Some previous studies find that foreign acquisitions can improve the performance of target firms even after taking into account selection bias.[4] However, numerous empirical studies document that domestic mergers and acquisitions are also followed by substantial changes in the performance of target firms (e.g., Maksimovic and Phillips, 2001). In particular, Fons-Rosen et al. (2014) find that even negative changes in foreign ownership are associated with firm productivity improvements, consistent with productivity improvements coming from a general change in ownership rather than an increase in foreign ownership. Therefore, even though previous studies evidently documented performance gains following foreign acquisitions, it remains unclear whether foreign ownership is crucial for the detected gains.

Our main dataset is obtained from the firm-level data collected through China's Annual Surveys of Industrial Production from 2000 to 2007. Every firm in China has a registration type that indicates its main ownership and we use such information to identify domestic and foreign mergers and acquisitions. Each foreign-acquired firm is first paired with a domestic-acquired firm with similar pre-acquisition characteristics by propensity-score matching. Then the post-acquisition performance changes of these two groups of firms are compared using the difference-in-differences method.

We find no evidence that foreign acquisitions can improve target firms' productivity relative to domestic acquisitions, which conflicts with the conventional view of productivity driven FDI.[5] Foreign acquisitions in our data do not perform differently from domestic acquisitions in improving target firms' productivity, and the result is robust under different measures of productivity. Although both foreign and domestic acquisitions can improve target firms' productivity relative to domestic firms that experienced no change in their ownership, the productivity improvement for the two types of acquisitions is comparable, leaving no additional gains from foreign ownership relative to domestic acquisitions.

Next, we document robustly that foreign ownership significantly improved the financial conditions (as measured by the leverage and liquidity ratios) of target firms relative to domestic acquisitions, highlighting the financial benefits of FDI. Most previous studies mainly focus on the productivity benefits of FDI to host countries. FDI firms' advantages of easy credit access have been largely neglected in empirical studies until recently. FDI firms are less financially constrained than domestic firms due to their access to international financial markets and foreign parent companies for credit, which is particularly true in emerging countries. For instance, Song et al. (2011) and Dollar and Wei (2007) show that private firms in China are subject to strong discrimination in obtaining credit from state-owned banks. Desai et al. (2008) document that US multinational affiliates in emerging markets are financially less constrained during currency crises than local firms. These studies inspire us to examine whether foreign acquisitions can improve financial conditions of target firms.

We find that following acquisitions, foreign-acquired firms rely less on external short-term debt and more on internal capital than domestic-acquired firms, highlighting the advantages of foreign ownership in relaxing credit constraints faced by target firms. The improvement of financial conditions is both statistically significant and quantitatively meaningful. For instance, the liquidity ratio of foreign-acquired firms increased over 4 percentage points two years following the acquisition relative to domestic-acquired firms, which is a substantial increase relative to its pre-acquisition mean of 11%. We also find that FDI from Hong Kong, Macau and Taiwan improves target firms' financial conditions more strongly than FDI from other sources, indicating that the effect of FDI varies with its sources of origin.

In addition, we evaluate firms' other performance, which includes exports, capital per worker, real wages, output, employment and real profits. Combined with our careful distinction between gains from foreign ownership and domestic acquisition, our study offers a comprehensive, balanced and accurate description of the advantages of FDI acquisitions relative to domestic acquisitions.

FDI is found to improve target firms' exports, supporting the financial channel of FDI in promoting international trade as documented in Manova et al. (2015). Our results show that such a channel remains at work even after we exclude the effect of domestic acquisition. In addition, we check the robustness of these findings across different sources of origin for FDI and the pre-acquisition export status of target firms, taking advantage of our panel data. Manova and Zhang (2009) document that relative to domestic firms, FDI firms in China trade more and import more products from more source countries but export fewer products to fewer destinations. While their study documents the difference in exporting behaviors between domestic and FDI firms, we identify the causal effect of FDI on target firms' exports following the acquisition.[6]

Foreign ownership is also found to increase output, employment and wages of target firms relative to domestic-acquired firms. This may be because that the improvements of financial conditions can help firms increase sales and market shares relative to their rivals, as suggested in previous empirical studies. All in all, our empirical results suggest the following channels through which foreign ownership benefits the host countries: foreign ownership can strongly ease target firms' financial constraints and promote their participation in export activities, resulting in increases in output, employment and labor incomes. However, we do not find strong evidence that foreign ownership increases firm productivity relative to domestic acquisitions.

Although we use Chinese data, our findings are likely to hold in other emerging markets too. Abundant empirical evidence shows that local firms in emerging markets are more financially constrained than FDI firms (e.g., Harrison and McMillan, 2003). Financial markets in developing countries usually have many frictions due to the status of development and/or market distortions imposed by the government. Therefore, FDI's financial benefits documented in our Chinese data are very likely to exist in other emerging markets. Recently, Alquist et al. (2014) document evidence of liquidity-driven FDI in the manufacturing sector of fifteen emerging economies.

Our paper contributes to the literature that explores other motivations for FDI and their effects on host countries. Nocke and Yeaple (2007) show that cross-border mergers and acquisitions can be driven by the complementarities between internationally mobile and non-mobile capacities rather than productivity differentials. Blonigen et al. (2014) argue that FDI can be driven by the existing export networks of local firms and they find empirical evidence in French manufacturing firms. This paper emphasizes the role of financial factors in foreign acquisitions. Our empirical findings conflict with the conventional view of productivity-driven FDI and highlight the financial channel through which FDI benefits the host countries.

Although some previous empirical studies question the productivity benefits of FDI to advanced economies, it may remain reasonable to believe the productivity gains for FDI to emerging markets because these countries lag far behind advanced economies in technology. However, we document that even foreign acquisitions in China, an emerging market, do not improve target firms' productivity relative to domestic acquisitions. Our results question the policies that intend to catch up to the technological frontier by providing tax and financial benefits to FDI.

Our paper also contributes to the recent literature that examines the effect of firms' financial constraints on trade and FDI. Manova et al.

[4] For instance, see Arnold and Javorcik (2009) for plant-level evidence for Indonesia and Guadalupe et al. (2012) for a study on manufacturing firms in Spain.

[5] Chen (2011) also compares foreign- and domestic-acquired US firms, but her study focuses on the effect of FDI's source of origin on the performance of target firms.

[6] Besides FDI, monetary policy may also influence international trade through financial channels. For instance, Ju et al. (2014) recently document that changes in monetary policy can affect exports through their effect on financial constraints of trade sectors, on top of the effect through the real exchange rate and aggregate demand.

(2015) document that FDI can promote exports and economic growth by mitigating firms' financial constraints. They find that FDI firms in China have better export performance than domestic firms, and this finding is more pronounced in more financially vulnerable sectors. In a related study, Huang et al. (2008) show, using firm-level data in the garment industry of China, that firms with greater financial constraints are more likely to be acquired by foreigners. Our paper complements these studies by identifying causal effects of FDI on target firms' performance through ownership changes. While Manova et al. (2015) rely on cross-sectional variations for their identification, we employ panel data to study changes in firms' performance following acquisitions. In particular, our panel data allow us to control for the effect of domestic ownership changes by using domestic-acquired firms as our control group. Due to data restrictions, Manova et al. (2015) study focuses on trade and does not examine the effect of FDI on firm productivity either. While Huang et al.'s (2008) results support that target firms' financial constraints are an important pre-acquisition factor for endogenous FDI decision, our findings focus on the causal effect of FDI on target firms' post-acquisition financial conditions and other performances. Our study also covers broader industries than Huang et al. (2008).

We conclude this section by discussing some limits of our empirical findings and directions for future studies. First, our paper focuses on the direct effects of foreign acquisitions and does not consider several other channels for FDI to increase host countries' productivity. We exclude greenfield FDI in the study due to our econometric method. Greenfield FDI may be more likely than foreign mergers and acquisitions to improve host countries' productivity. One important reason for greenfield FDI is that local firms are not suitable for acquisitions due to their obsolete technology and/or management styles. In this case, greenfield FDI firms are very likely to boost the host country's productivity by introducing new technology and management skills (e.g., Nocke and Yeaple, 2008). Brandt et al. (2012) document a significant increase in firm-level TFP in China during the period of 1998–2007 and new entries account for over two-thirds of the increase in TFP. Due to data limitations, our paper is also silent about technology spillovers from FDI to domestic firms. In particular, several recent studies (e.g, Goldberg et al., 2009, 2010 and de Loecker et al., 2012) document important effects of access to foreign inputs on local firms' product innovation. It is likely that FDI can benefit the target firms and their downstream firms through this channel.

Second, our results might also depend on the technology gap between the host and source countries of FDI.[7] The technology gap between Chinese firms and their foreign counterparts has shrank dramatically since China adopted radical economic reforms in the early 1980s. The productivity gains from foreign ownership might have become insignificant in our sample period that starts in 2000. However, this does not exclude the possibility that foreign ownership improved China's productivity in the 1990s when Chinese firms lagged further behind their peers in advanced economies.[8]

The remainder of the paper is arranged as follows. Section 2 describes our econometric strategy. Section 3 introduces the data, the way we identify acquisitions from firms' registration information and the matching of foreign and domestic acquisitions. Section 4 presents and discusses our empirical results, and section 5 concludes.

2. Econometric strategy

Our primary goal is to study whether FDI can improve acquired firms' performance. A simple least-squares estimation in this case is inadequate due to the endogeneity of acquisition decisions. The endogeneity issue can be mitigated by employing the difference-in-differences method, which compares the firms acquired by foreigners (treatment group) to the firms that are not acquired by foreigners (control group). If the average performance improvement of the treatment group differs systematically from that of the control group following the acquisition, it provides evidence that the foreign acquisition may have caused such performance improvement.

However, there are two potential pitfalls for this method. First, the choice of control group is a crucial issue. One may want to use all firms that are not acquired by foreigners as the control group. In this case, the underlying question is whether a firm performs better after being acquired by foreign firms relative to a firm that is not acquired by foreigners. However, there are two types of domestic firms in the control group. Some domestic firms experienced no change in their ownership and others were acquired by their domestic peers. In the case of no change in ownership, even if foreign-acquired firms on average outperform the firms in the control group, it is still not clear whether the performance improvement is caused by the foreign ownership or due to an acquisition in general. The target firms would probably have experienced similar performance improvement had they been acquired by domestic firms. Indeed, there is a large literature documenting the productivity and other gains of target firms from acquisitions. Therefore, we argue that an appropriate control group should only include the firms that are acquired by domestic firms.[9]

Second, the difference-in-differences method is still vulnerable to any time-varying bias induced by the foreign firms' non-random selection of target firms. This issue is addressed in the literature by combining the difference-in-differences method with some matching technique that creates a comparison group with similar pre-acquisition characteristics as the treatment group. In this way, the comparison is restricted to the differences within carefully selected pairs of firms/plants that have similar observable pre-acquisition characteristics. For instance, Arnold and Javorcik (2009) and Chen (2011) estimated the probability of firms/plants being acquired by foreigners using a probit model, and the predicted probability (propensity score) forms the basis of matching the treatment and control firms/plants. In this paper, we combine the difference-in-differences method with the propensity score matching method in Abadie and Imbens (2009). Compared to previous studies, Abadie and Imbens (2009) take into account the fact that the propensity scores are random variables and are estimated from the data (instead of being constants), and they derive the adjustment to the large sample variance of the estimated treatment effects. Our propensity score matching includes similar control variables as in Arnold and Javorcik (2009). Details on the propensity score matching are reported in Section 3.2.

3. Data

Our main dataset contains firm-level data collected by the National Bureau of Statistics of China through the Annual Surveys of Industrial Production. The raw dataset covers all state-owned manufacturing firms and private manufacturing firms with sales greater than 5 million RMB (approximately 600,000 US dollars at the exchange rate of 2000) from 2000 to 2007 after cleaning. We cleaned the data following standard procedures in the literature and the details of our data cleaning procedure are included in the appendix. On average, there are over 125,000 firm-level observations each year from 2000 to 2007. In the final dataset, we lose the observations of year 2000 because the information of changes in registration type is required to identify acquisitions. In addition, we have to end our sample in 2005 because we want to study the firms' performance in the following two years after the acquisition.

[7] For instance, Chen (2011) and Kamal (2014) document that the source of origin of FDI influences the performance of target firms.

[8] Productivity improvements could also be limited if the technology gap is too big because firms may have to be at a similar level to benefit from technology transfers. See Cohen and Levinthal (1989) for discussions on absorptive capacity.

[9] Arnold and Javorcik (2009) examine, as a robustness check, the effects of foreign acquisitions versus domestic acquisitions using privatization cases in their data. However, they only have 80 or less observations in their data and could not control for factors such as the industrial and acquisition year effects due to data limitations. Our data contain information that allows us to investigate this issue more thoroughly.

Therefore, our consolidated dataset for empirical exercises covers the period between 2001 and 2005.

The firm-level data include some basic firm information such as firm identification number, registration type, start year, operating status and total employment. We use the changes in registration type to identify firm acquisitions, which we will describe shortly. Our dataset also contains detailed information about each firm's balance sheet and income statement. The balance sheet data report detailed information about assets and liabilities such as total assets, fixed assets, current assets, long-run investment, total liabilities, total equities and capital. Capital information includes disaggregate-level information about the ownership of capital (e.g., state, collective, corporate, special districts and foreign). So we can use such information as a cross-check on firms' ownership. The data on income statement include each firm's total sales, total industry production, value added, export volume, income from main product, cost from main product, financing cost, interest cost, tax, wages, employee benefits, total intermediate inputs, total profits, etc. The above data are used to calculate TFP of each firm following Ackerberg et al. (2006) method. Firm TFP is re-scaled around the industry TFP mean and divided by the industry TFP standard deviation.[10]

Other variables used in our paper include the real wage, real capital per worker, export share, leverage ratio and liquidity ratio. The real wage is calculated by deflating the nominal wage (total nominal wage divided by the total number of employees) by the CPI, and this variable reflects the real labor incomes. Real capital per worker is obtained by dividing nominal capital per worker by industry-level PPI, which captures the capital intensity of firms. The export share is measured by the ratio of exports to total sales.

Following the literature, the leverage ratio is defined as the ratio of total liabilities to total assets, though our results are qualitatively robust to using other leverage ratio measures such as short-term debt divided by current assets.[11] A higher leverage ratio indicates that the firms depend more on external financing to cover operational costs. These firms usually have more difficulties raising funds in the future and therefore are more financially constrained. Following Greenaway et al. (2007), the liquidity ratio is measured by:

$$\text{Liquidity ratio} = \frac{\text{Current assets - Current liabilities}}{\text{Total assets}}.$$

Current assets and liabilities are firms' short-term assets and liabilities. A higher liquidity ratio indicates that firms have more liquid assets to cope with potential external financial disruptions, and therefore are less vulnerable to financial shocks and less financially constrained. The summary statistics of the variables used in our paper are reported in the appendix (Table A.1).

3.1. Mapping registration changes to acquisitions

Every firm in China has a registration type that indicates its main ownership. We classify these registration types into four categories: state or collectively owned domestic firms (SCOEs), privately owned domestic firms, mixed domestic firms and FDI firms. State-owned and collectively owned firms are classified into one category because they usually contain government or semi-government ownership. The first three categories include all domestic firms, while the last one contains foreign-owned firms and joint ventures. The detailed mappings of individual firms' registration codes into these four categories are described in the appendix. If a firm's registration type changed from one category to another, its main ownership must have changed due to mergers and acquisitions. Firms are classified as domestic acquired if their registration types changed within the first three categories, while firms are classified as foreign acquired if their registration types changed from one of the three domestic categories into the category of FDI firms. Then foreign-acquired domestic firms are matched with their domestic-acquired counterparts and the performance of these two groups of acquisitions is compared.[12] We also employ several other classifications of domestic and foreign acquisitions as robustness checks and will report their results later.

Table 1 shows the total number of firms in our cleaned dataset and the number of different types of acquisitions from 2001 to 2007. In each year, around 500 domestic firms are acquired by foreigners (Panel A). Among these foreign-acquired firms, about 20% were SCOEs before the acquisition. In particular, state- or collectively-owned enterprises account for about half of foreign acquisitions between 2001 and 2003, but the share fell sharply in 2004 and the following years to only 10%. Note that most of these firms were collectively-owned rather than truly state-owned. Column five reports the foreign acquisitions that involved state-owned enterprises (SOEs), accounting for less than 10% of all foreign acquisitions in most years.

Panel B shows that about 4000 domestic firms were acquired by their domestic counterparts in each year during our sample period. Among these domestic acquisitions, about 20% are initially associated with SCOEs, but the share declined to around 10% after 2004. Like in foreign acquisitions, most of these acquisitions are associated with collectively-owned enterprises rather than SOEs. This pattern is consistent with China's privatization reform of collectively-owned enterprise in the late 1990s and early 2000s. The privatization process is completed in 2003 and the share of state- and collectively-owned enterprises declined sharply in both foreign and domestic mergers and acquisitions. We will give more discussion on the privatization issue later. In particular, we show in a robustness check that our main findings hold up well when we only include ex ante private firms.

Here we need to acknowledge a potential issue for our identification of domestic and foreign acquisitions. In our benchmark case, we group several registration types into one category. For instance, the category of privately owned domestic firms includes the following four registration types: sole proprietorship, partnership, private limited liability corporations and private companies limited by shares. The changes of registration types within a category may also be due to mergers and acquisitions, but they will not be captured in our benchmark results. In other words, we only consider a subset of all mergers and acquisitions in our data.

To address this issue, we consider several alternative cases to identify domestic and foreign acquisitions. In one case, all registration type changes are considered as acquisitions. Note that using all registration type changes overestimates the number of acquisitions in our data because registration type changes may simply reflect changes in a firm's legal status or business expansion, instead of changes in ownership. For instance, many registration type changes within a category are not accompanied by significant changes in the firms' capital, indicating no major change in their ownerships. In contrast, the identified acquisitions in our benchmark case are all associated with major changes in firms' capital structure, indicating changes in ownership. Additionally, we believe that acquisitions of domestic firms by foreigners are substantial changes in the firms' ownership and such changes are more comparable to acquisitions across different categories rather than within each category.

In the second case, all registration changes in the category of mixed domestic firms are considered as acquisitions. This is because firms in this category are more heterogeneous than those in other categories. Therefore, registration type changes in this category are likely due to

[10] An appendix of describing the method of calculating firm TFP can be found on the authors' websites. See De Loecker and Warzynski (2012) for a recent example of using this method.

[11] Our benchmark measure of the leverage ratio is employed in studies such as Ahn et al. (2006). Our results are robust to using other leverage ratio measures such as short-term debt divided by current assets used in Greenaway et al. (2007) and following studies.

[12] Our results do not change qualitatively if we exclude the firms that change their registration types multiple times during our sample period. Results are available upon request.

Table 1
Number of firms in different types of acquisitions.

	Total number of all firms	Panel A: domestic to foreign				
		Total	SCOE to FDI	SOE to FDI	Mixed to FDI	Private to FDI
2001	104,438	537	269	44	161	107
2002	103,398	253	95	31	86	72
2003	106,152	357	139	41	121	97
2004	139,112	835	149	31	259	427
2005	130,956	258	34	14	134	90
2006	138,792	580	52	32	252	276
2007	153,861	711	71	43	335	305
Average	125,244	504	116	34	193	196

	Panel B: domestic to domestic					
	Total	SCOE to private	SCOE to mixed	Mixed to SCOE	Private to mixed	Mixed to private
2001	4,300	760	2,137	639	271	493
2002	2,788	533	1,164	439	249	403
2003	4,095	848	1,452	595	445	755
2004	6,349	744	1,905	885	1,429	1,386
2005	3,391	405	785	467	756	978
2006	3,578	395	720	437	809	1,217
2007	2,334	229	375	333	649	748
Average	3,834	559	1,220	542	658	854

Panel A shows the number of firms whose registration types changed from one of the domestic categories to the foreign category. SCOE stands for state- or collectively-owned enterprises; SOE stands for state-owned enterprises; "Mixed" stands for mixed domestic firms and "Private" is for privately-owned firms. These acquisitions are considered as foreign acquisitions.
Panel B shows the number of firms whose registration type changed from one of the domestic categories to another type of domestic categories. These acquisitions are considered as domestic acquisitions.
See Section 3 for the definitions of domestic and foreign categories of firm registrations.

mergers and acquisitions. Our results are also robust when we use changes in the foreign capital share to identify foreign acquisitions and when we only include firms that are fully owned by foreigners after the acquisitions. We will give more information about these exercises when reporting their results.

3.2. Matching domestic and foreign acquisitions

To match domestic- and foreign-acquired firms, the following variables in the pre-acquisition year are used as regressors in the logit model: firm TFP, employment, the real wage, firm age, the real capital per worker, exporting status, a dummy for state-owned or collectively owned enterprises, the leverage ratio and the liquidity ratio. Blonigen et al. (2014) find that foreign firms are attracted to acquire domestic firms that had high productivity level but were hit by a negative productivity shock. To address this issue, we also include the growth rate of productivity in the pre-acquisition year as an independent variable in a robustness check.[13] Among these variables, productivity, employment, real wages and real capital per worker are in logs. Dummy variables for the acquisition year and industry (2-digit level) are also added to control for their fixed effects.[14] The exporting status is measured by a dummy variable indicating whether the firm is an exporter in the year before acquisition. Most variables are employed by following Arnold and Javorcik (2009). A dummy is added in our model for state or collectively owned firms because these firms are usually subject to more restrictions on foreign acquisitions. We also include financial condition variables (the leverage ratio and the liquidity ratio) in the estimation to control for the pre-acquisition differences in financial conditions among the treatment and control groups. Since one of our major findings is on the effects of foreign acquisitions on target firms' financial conditions, it is crucial to take into account the differences in financial conditions prior to acquisitions.

Table 2 reports the estimation results of the logit model. The coefficient estimates suggest that a high level of productivity, employment, real wages and real capital per worker can significantly increase a firm's probability of being acquired by foreigners. However, the coefficient estimate of productivity is only marginally significant at the 10% level, while the estimates of most other coefficients are statistically different from zero at the 1% level. It suggests that target firms' productivity may be a less important factor than other characteristics in foreign acquisitions.

Fig. 1 shows the average TFP relative to the industrial mean for the foreign and domestic-acquired firms, respectively, from two years prior to the acquisition through two years after the acquisition. Since firm TFP is normalized around the industrial mean (at the 2-digit level), positive TFP values in Fig. 1 indicate that both domestic- and foreign-acquired firms are more productive than the average firm in the same industry before acquisitions. In addition, both types of firms exhibit similar TFP decreases relative to the industrial average level prior to the acquisition, which is consistent with the "cherry-picking" story in Blonigen et al. (2014): investors are more attracted to firms that had above-average productivity but were hit by negative productivity shocks. Blonigen et al. (2014) document a similar pattern in French manufacturing firms. Since our treatment and control groups display similar decline in TFP prior to the acquisition, our results of FDI's effect on firm productivity are unlikely to be driven by the difference in the "cherry-picking" behaviors of home and foreign investors.

Being an exporter before the acquisition also significantly increases a firm's chance of being acquired by foreigners. This might be due to two reasons. First, exporters are usually more productive. Second, FDI may be attracted to firms with existing export networks as in Blonigen et al. (2014).

Firm age and government ownership are found to decrease the probability of being acquired by foreigners. Foreign firms seem to also prefer domestic firms with less constrained financial conditions: the

Table 2
Estimation results of the logit model.

	Coefficient	Std. err	z	$P > \|z\|$	95% conf. interval	
TFP	0.056*	0.031	1.800	0.072	−0.005	0.118
Employment	0.111***	0.022	4.960	0.000	0.067	0.155
Real wage	0.286***	0.039	7.320	0.000	0.209	0.363
Age	−0.045***	0.003	−14.510	0.000	−0.051	−0.039
Real capital per worker	0.123***	0.023	5.330	0.000	0.078	0.168
Export status	1.118***	0.056	20.140	0.000	1.009	1.227
Leverage ratio	−0.332**	0.137	−2.420	0.016	−0.601	−0.063
Liquidity ratio	0.503***	0.129	3.900	0.000	0.250	0.757
Dummy of state/collectively owned	−0.821***	0.055	−14.920	0.000	−0.929	−0.714

All variables are measured in their pre-acquisition year except for age.
Employment, real wage and real capital/worker are in logarithms.
Export status is a dummy variable that equals one if the firm is an exporter and zero otherwise.
Dummy of state/collectively owned equals one if the firm is a state or collectively owned enterprise and zero otherwise.
Results for the acquisition year dummy and the industry dummy (2-digit level industrial code) are not reported in the table to save space.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

[13] Our results are also robust when we include pre-acquisition changes in the leverage and liquidity ratios or replace the export status dummy with the size of exports relative to domestic sales in the logit model.

[14] An alternative method used in the literature for controlling for the acquisition year and industry fixed effects is to first match the treatment and control groups in the same acquisition year and industry and then average the treatment effects across acquisition years/industries. We do not follow this practice because Abadie and Imbens (2008) prove that the bootstrapped standard errors in this method are inconsistent. We check the robustness of our results to the exact match for acquisition year and industry by employing the nonparametric nearest neighbor matching method in Abadie and Imbens (2008) and the results are reported in the appendix (Table A.19).

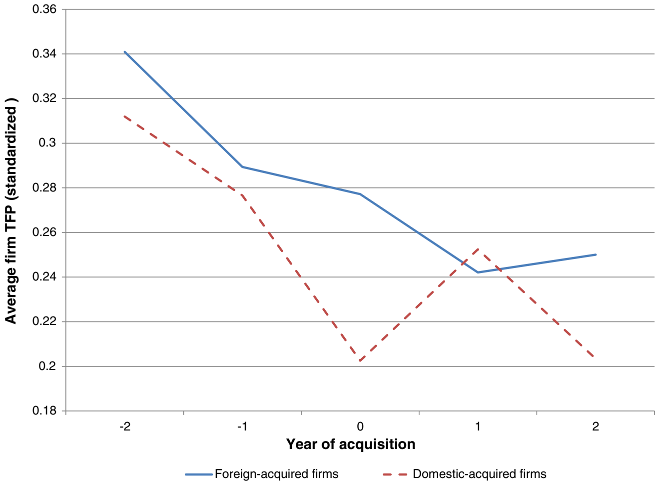

Fig. 1. TFP of foreign- and domestic-acquired firms across time. Note: TFP is measured by firm TFP minus the industrial average and divided by the industrial standard deviation. See Section 5 for details. The domestic-acquired firms are matched with the foreign-acquired firms based on their characteristics in the pre-acquisition year.

Table 3
Balance test of matching covariates in propensity score matching.

	Mean			t-test	
	Treatment	Control	Bias (%)	*t*	P > |*t*|
TFP	0.29*	0.28**	1.50***	0.48	0.63
Employment	5.19	5.22	−2.30	−0.75	0.45
Real wage	2.28	2.24	4.20	1.35	0.18
Age	7.99	8.05	−0.70	−0.23	0.82
Real capital per worker	3.67	3.69	−1.30	−0.43	0.67
Export status	0.48	0.47	2.50	0.81	0.42
Leverage ratio	0.54	0.54	−0.10	−0.05	0.96
Liquidity ratio	0.11	0.12	−2.90	−0.92	0.36
Dummy of state/collective owned	0.30	0.28	3.20	1.03	0.30

See footnotes in Table 2 for details about the variables in this table.
Columns two and three report the means of the treatment and control groups, respectively.
Column "Bias (%)" displays the percentage deviations of the mean of the treatment group from that of the control group ($\frac{\text{treatment group mean} - \text{control group mean}}{\text{treatment group mean}} \times 100$).
The null hypothesis of the t-test is that the treatment and control groups have the same sample means.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

leverage ratio decreases a firm's probability of being acquired by foreigners, while the liquidity ratio increases the probability. In a related study, Huang et al. (2008) seem to document an opposite pattern: foreign investors are more likely to buy financially constrained local firms. This discrepancy is mainly due to an important difference between our paper and theirs. Our logit model only considers firms with ownership changes, while Huang et al.'s (2008) sample contains all firms regardless of their ownership status. They find that among all firms, foreign-acquired firms are more financially constrained, while we document that among firms for sale, foreigners choose those with better financial conditions.[15]

For each foreign-acquired firm, we choose one domestic-acquired firm whose fitted value in the logit model is the most similar to that of the foreign-acquired firm. We would like the matched foreign-acquired firms and domestic-acquired firms to have pre-acquisition conditions that are as similar as possible. Table 3 presents the results for the balance tests of matching covariates. The second and third columns report, respectively, the means of covariates for foreign-acquired firms and the means for the corresponding domestic-acquired firms that are matched to foreign-acquired firms based on the estimated logit model. Column four displays the difference (in percentage) between two group means (treatment group minus control group). The means of all covariates are very similar between the treatment group and the control group: the differences are less than 3% in most cases.[16] The t-tests indicate that the differences in the means of the treatment group and the control group are not statistically different from zero at the conventional significant levels. These results suggest that the foreign-acquired firms and the matched domestic-acquired firms have very similar pre-acquisition characteristics. Therefore, the post-acquisition performance differences are more likely due to foreign ownership rather than endogenous selection biases.

Our annual data may suffer from the partial year effects discussed in Bernard et al. (2014). As a robust check for the partial year effects, we repeat our logit model of the propensity score matching by using firms' pre-acquisition characteristics two years before the acquisition. Our empirical findings hold up well in this case too.[17] We will also show later that our empirical findings not only hold in the acquisition year, but also in the two years following the acquisition. These results suggest that the partial year effects may not significantly affect our main findings.

Our results are also robust under alternative matching methods. Results for the non-parametric nearest neighbor matching and the nearest neighbor, propensity-score re-weighting matching are reported in the appendix.

4. Empirical results

As a first pass, we run simple OLS regressions with the data. Our benchmark difference-in-differences model only includes the domestic-acquired firms that are paired with foreign-acquired firms, giving zero weight to unpaired domestic-acquired firms. In the simple OLS regressions, all domestic-acquired firms are used and help us check the robustness of our benchmark results.

The dependent variable in the simple OLS regressions is the accumulative change in firm performance following the acquisition. Independent variables include a dummy variable indicating foreign acquisitions and a location dummy (provinces of target firms). We also include the independent variables of the logit model to control for pre-acquisition differences across firms. We run six sets of regressions in total and the dependent variables in these regressions are post-acquisition changes in three measures of productivity (TFP, gross output per employee and value-added output per employee), the leverage ratio, the liquidity ratio and the export share, respectively.

Table 4 summarizes these regressions.[18] The first column shows the name of the dependent variable in each regression, and each row presents the estimation results for the foreign acquisition dummy. Besides coefficient estimates, robust standard errors clustered by province, year and industry and the corresponding p-values are also displayed in the table. In the first row, the change in productivity as measured by TFP is used as the dependent variable. The coefficient estimate of the foreign acquisition dummy is statistically significant in only one out of three cases (two years after) at the 10% level, indicating no strong evidence that foreign acquisitions can improve target firms' productivity. Evidence based on other measures of productivity (gross output per employee and value-added output per employee) is even weaker. For

[15] In addition, Huang et al. (2008) employ different variables to measure financial constraints and our samples also cover different industries.
[16] Two exceptions are the real wage (4.2%) and the dummy variable for state/collectively owned (3.2%).
[17] The results are reported in the web appendix and we thank an anonymous referee for recommending this exercise to us.
[18] The details of these regressions can be found in an appendix on the authors' websites.

Table 4
Results for OLS regressions.

Dependent variable	Acquisition year			One year after			Two years after		
	Coeff.	Std. err	P > |z|	Coeff.	Std. err	P > |z|	Coeff.	Std. err	P > |z|
Productivity 1	0.021	0.017	0.231	−0.009	0.021	0.673	0.043*	0.026	0.098
Productivity 2	−0.028*	0.014	0.051	−0.035*	0.018	0.049	−0.022	0.024	0.345
Productivity 3	−0.001	0.021	0.963	−0.036	0.025	0.150	0.003	0.030	0.930
Leverage ratio	−0.019***	0.003	0.000	−0.021***	0.005	0.000	−0.015**	0.006	0.019
Liquidity ratio	0.029***	0.005	0.000	0.036***	0.007	0.000	0.036***	0.009	0.000
Export share	0.027***	0.005	0.000	0.032***	0.005	0.000	0.028***	0.008	0.000

This table reports the estimation results of the simple OLS regressions discussed in Section 4. Only the results for the foreign acquisition dummy are reported in the table and complete estimation results are displayed in the appendix (Tables A.3–A.6).
The first column shows the dependent variable of each regression and each row presents the estimation results for the foreign acquisition dummy.
We consider three measures of firm productivity: Productivity 1 is measured by firm TFP, Productivity 2 is measured by gross output per employee and Productivity 3 is measured by value-added output per employee. In all cases, the dependent variable is the change in log productivity following acquisitions.
In rows "Leverage ratio", "Liquidity ratio" and "Export share", the dependent variable is, respectively, the change in the leverage ratio, the change in the liquidity ratio and the change in the export share.
The independent variables in all regressions include industry, year and location dummies, a dummy for foreign acquisitions and pre-acquisition characteristics (a dummy for exporter, a dummy for state-owned enterprises, log employment, log real wage, log real capital per worker, log age, the leverage ratio and liquidity ratio, log productivity).
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

instance, when productivity is measured by value-added output per employee, the coefficient estimates are statistically insignificant in all three years we consider.

In contrast, we find strong evidence that foreign acquisitions can significantly improve target firms' financial conditions (decreases in the leverage ratio and increases in the liquidity ratio). The coefficient estimates of the foreign acquisition dummy are significantly different from zero at the 1% or 5% level in all 9 cases. Similar results are also found for the regression using export shares as the dependent variable. In these preliminary results, all observations are treated equally and did not fully take into account the pre-acquisition differences between foreign-acquired firms and their domestic counterparts. We will show next that our results hold up well after we take such differences more seriously.

In our benchmark difference-in-differences results, we first focus on the effect of foreign acquisitions on target firms' productivity and highlight the importance of using domestic-acquired firms as the control group. Then we extend our study to broader indicators of firm performance.

4.1. Firm productivity

Table 5 presents our benchmark results for firm productivity. In Panel A, firm TFP is employed as a measure of productivity, and two control groups are considered here. The first control group is picked from Chinese firms acquired by other domestic firms. In the second case, the control group is chosen from the domestic firms that experienced no change in their ownership.[19]

We first focus on the case in which the control group is chosen from domestic-acquired firms. In this case, TFP of foreign-acquired firms on average increased 6.2% relative to domestic-acquired firms in the year of acquisition and the increase is statistically significant at the 5% level. However, the productivity difference becomes insignificant in the following two years, though the coefficient estimates remain positive. This is in sharp contrast to previous empirical findings that productivity gains of foreign-acquired firms are statistically significant in the acquisition year and continue to be significant in subsequent years. For instance, Arnold and Javorcik (2009) find that the productivity advantage of acquired plants in Indonesia continued to increase and reached almost 13.5% by the third year following the acquisition. Similar results are also documented by Yasar et al. (2007) for Turkish manufacturing plants.

An important difference between our paper and previous studies is that we use the domestic-acquired firms as our control group to identify the purified effect of foreign ownership, while previous studies choose the control group from all domestic firms. To make the point more

Table 5
Benchmark results for productivity.

	Coefficient	Std. err	z	P > |z|	95% conf. interval	
Panel A: TFP as a measure of productivity						
Control group: domestic-acquired firms						
Acquisition year	0.062**	0.025*	2.480***	0.013	0.013	0.111
One year after	0.003	0.032	0.090	0.930	−0.060	0.066
Two years after	0.031	0.035	0.900	0.369	−0.037	0.099
Control group: domestic firms with no acquisition						
Acquisition year	0.081**	0.036	2.240	0.025	0.010	0.152
One year after	0.080**	0.039	2.070	0.039	0.004	0.157
Two years after	0.096**	0.046	2.060	0.040	0.005	0.187
Panel B: Gross output per employee as a measure of productivity						
Control group: domestic-acquired firms						
Acquisition year	0.011	0.023	0.480	0.633	−0.034	0.056
One year after	0.016	0.029	0.550	0.581	−0.041	0.073
Two years after	−0.045	0.034	−1.320	0.186	−0.112	0.022
Panel C: Value-added output per employee as a measure of productivity						
Control: domestic-acquired firms						
Acquisition year	0.023	0.028	0.850	0.398	−0.031	0.078
One year after	0.034	0.038	0.880	0.377	−0.041	0.109
Two years after	−0.012	0.044	−0.280	0.782	−0.098	0.074

This table reports the benchmark results for the effect of foreign ownership on target firms' productivity.
Panels A, B and C use TFP, gross output per employee and value-added output per employee as the measure of firm productivity, respectively.
Panel A considers two cases for the control group: firms that are acquired by domestic firms in the first case (the benchmark model) and firms that experienced no acquisition in the second case.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

[19] Alternatively we can employ the multi-value treatment effect model similar to Lechner (2002) to include foreign-acquired firms, domestic-acquired firms and non-acquisition domestic firms in one model. However, it is not clear how to apply the propensity score estimation method used in our paper (following Abadie and Imbens, 2009) to the multi-value treatment effect model. Fukao et al. (2008) employ standard propensity score matching and difference-in-differences techniques in a multinomial logit model and find that foreign acquisitions improve target firms' productivity and profits relative to acquisitions by domestic firms in Japan. However, under their nearest neighbor matching method, different non-acquisition firms are used as the control group for domestic- and foreign-acquired firms. Therefore, the differences between foreign-acquired and domestic-acquired firms are partly due to the fact that the matching control sets are different for the two categories.

salient, we re-estimate our model using a control group chosen from domestic firms that experienced no ownership change. In this case, we find larger productivity improvements for foreign-acquired firms relative to the control group: in Table 5, the coefficient estimate is 8.1% in the acquisition year and increased to 9.6% two years after the acquisition. Note that the coefficient estimate is only 3.1% two years after the acquisition when domestic-acquired firms are used as the control group. In addition, the coefficient estimates now become statistically significant for all three years, echoing previous findings in the literature. These findings suggest that both foreign- and domestic-acquired firms have experienced significant productivity gains due to acquisitions and such gains would be inappropriately attributed to foreign ownership if they are not carefully controlled in estimation.

As robustness checks, we consider two alternative measures of productivity in Table 5: gross output per employee and value-added output per employee. The evidence of productivity improvement is even weaker: none of the coefficient estimates is significantly different from zero in the acquisition year and in the subsequent two years after the acquisition. Some point estimates for the coefficient of productivity even turn negative.

4.2. Financial conditions, exports and other performance

Recent literature emphasizes the financial channels through which FDI affects host countries' economies. For instance, Alfaro et al. (2004) document that economies with better-developed financial markets are able to benefit more from FDI to promote their economic growth. Their conjecture is that well-functioning local financial markets provide financing for technology spillovers from FDI firms to local firms. Manova et al. (2015) provide firm-level empirical evidence that FDI to China can ease credit constraints for exporters and therefore promote international trade.

We provide direct evidence for the causal effect of foreign ownership on firms' financial conditions and export performance. We show that this mechanism exists in the data even after controlling for the effect in domestic acquisitions. Firm productivity in the above exercises is replaced with two measures of financial conditions: the leverage and liquidity ratios. A robust finding is that the financial conditions of foreign-acquired firms improve significantly relative to domestic-acquired firms. In Table 6, the average leverage ratio of foreign-acquired firms declined relative to domestic-acquired firms in the acquisition year and the following two years. In the acquisition year, the leverage ratio of foreign-acquired firms declined 2.1 percentage points relative to domestic-acquired firms. The difference remains at around 2 percentage points in the next two years. The coefficient estimates in all three years are significantly different from zero at the 5% level.

In contrast, the liquidity ratio of foreign-acquired firms increased relative to domestic-acquired firms in the acquisition year and the subsequent two years. The coefficient estimates are significantly different from zero at the 1% level for all three years. The liquidity ratio of foreign-acquired firms increased 2.7 percentage points relative to domestic-acquired firms in the acquisition year. The difference continued to increase in the following two years and reached 4.1 percentage points in the second year following the acquisition. These findings suggest that foreign ownership significantly reduces target firms' reliance on external financing and increases the share of internal capital. The robust findings on the leverage and liquidity ratios are in sharp contrast to the evidence that foreign ownership does not significantly increase target firms' TFP after controlling for the effect in domestic acquisitions.

Manova et al. (2015) argue that improved financial conditions help FDI firms participate in international trade. We also document that foreign acquisition can significantly improve target firms' export performance. We compare the post-acquisition changes in export shares (exports divided by total sales) of foreign-acquired and domestic-acquired firms and report our results in the last panel of Table 6. In the year of acquisition, the export share of foreign-acquired firms on average increased 3.2 percentage points relative to domestic-acquired firms. It is 2.9 percentage points and 2.7 percentage points in the first and second years, respectively, following the acquisition. All coefficient estimates in these three years are significantly different from zero at the 5% level. Note that the average pre-acquisition export share of foreign-acquired firms is 28%. Our results indicate a 10% increase in the export share for foreign-acquired firms relative domestic-acquired firms following the acquisition.

Our sample covers the period of China's accession to the WTO, which may have changed the ability of Chinese firms to exporting and receive FDI. Rumbaugh and Blancher (2004) document that WTO accession substantially contributed to China's sustained growth in international trade. Branstetter and Feenstra (2002) model the tradeoff of increased trade and FDI against the losses of SOEs due to such liberation. The WTO membership may have promoted FDI activities in China by removing export barriers, which is consistent with our findings.

Table 7 displays the results based on additional measures of firm performance: gross output, value-added output, employment, the real wage, the real profit and the real capital per worker. We find some evidence that foreign ownership can improve output, employment and income even after controlling for the effect in domestic acquisitions. Foreign ownership significantly increases total output in the acquisition year and the following two years at the 5% level. The value-added output of foreign-acquired firms increases about 10 percentage points relative to domestic-acquired firms following the acquisition. Employment of foreign-acquired firms also increases by a similar amount as output, indicating no significant improvement in productivity measured by output per worker as we have shown.

The real wage in the foreign-acquired firms also increased significantly relative to that in the domestic-acquired firms following the acquisition, while the real capital per worker of foreign-acquired firms declined.[20] These findings indicate a higher share of labor income in value-added output per worker if the capital return remains constant. Recall that post-acquisition changes in the productivity measured by value-added output per employee are about the same for domestic and foreign acquisitions. In this case, the real wage of foreign-acquired firms can still increase, relative to domestic-acquired firms, with a larger share of increases in value-added output going to labor.

Table 6
Benchmark results for financial conditions and exports.

	Coefficient	Std. err	z	$P > \lvert z \rvert$	95% conf. interval	
Leverage ratio						
Acquisition year	−0.021***	0.006	−3.500	0.000	−0.034	−0.009
One year after	−0.021***	0.007	−2.810	0.005	−0.035	−0.006
Two years after	−0.020**	0.009	−2.210	0.027	−0.038	−0.002
Liquidity ratio						
Acquisition year	0.027***	0.008	3.420	0.001	0.012	0.042
One year after	0.041***	0.009	4.480	0.000	0.023	0.059
Two years after	0.041***	0.011	3.570	0.000	0.018	0.063
Export share						
Acquisition year	0.032***	0.009	3.590	0.000	0.014	0.049
One year after	0.029***	0.010	2.980	0.003	0.010	0.048
Two years after	0.027**	0.012	2.300	0.022	0.004	0.050

This table reports the benchmark results for the effect of foreign ownership on target firms' financial conditions and exports.
The treatment group includes foreign-acquired firms and the control group includes domestic-acquired firms that are paired with foreign-acquired firms using the propensity score matching method.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

[20] Using establishment-level data for the UK, Girma and Görg (2007) find sizable positive post-acquisition wage effects following acquisitions by US firms, though no such effect is detected for firms acquired by EU firms.

Table 7
Benchmark results for other performance.

	Coefficient	Std. err	z	$P > \|z\|$	95% conf. interval	
Gross output						
Acquisition year	0.051**	0.021*	2.510	0.012	0.011	0.092
One year after	0.088***	0.026	3.440	0.001	0.038	0.138
Two years after	0.106***	0.036	2.950	0.003	0.036	0.177
Value-added output						
Acquisition year	0.119***	0.029	4.110	0.000	0.062	0.176
One year after	0.083**	0.036	2.290	0.022	0.012	0.155
Two years after	0.101**	0.043	2.370	0.018	0.017	0.184
Employment						
Acquisition year	0.070***	0.019	3.640	0.000	0.032	0.108
One year after	0.091***	0.025	3.690	0.000	0.043	0.140
Two years after	0.118***	0.032	3.760	0.000	0.057	0.180
Real wage						
Acquisition year	0.051**	0.021	2.490	0.013	0.011	0.092
One year after	0.059**	0.026	2.300	0.021	0.009	0.109
Two years after	0.075***	0.025	3.000	0.003	0.026	0.124
Real profit						
Acquisition year	0.125**	0.051	2.480	0.013	0.026	0.224
One year after	0.047	0.065	0.730	0.466	−0.080	0.174
Two years after	−0.069	0.081	−0.850	0.395	−0.229	0.090
Real capital per worker						
Acquisition year	−0.080***	0.026	−3.010	0.003	−0.132	−0.028
One year after	−0.050	0.034	−1.490	0.138	−0.117	0.016
Two years after	−0.029	0.045	−0.640	0.520	−0.118	0.060

This table reports the benchmark results for the effect of foreign ownership on target firms' other performance. All measures of firm performance are in logarithms.
The treatment group includes foreign-acquired firms and the control group includes domestic-acquired firms that are paired with foreign-acquired firms using the propensity score matching method.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

The decrease in capital per worker is consistent with the fact that FDI improves exports and that China exports labor-intensive products. Aitken and Harrison (1999, 2014) document that Chinese firms become more labor intensive after exporting. They argue that labor-abundant countries, such as China, allocate more resources to labor-intensive sectors to explore their comparative advantages in international trade.

We barely find any evidence that foreign ownership can increase the real profit relative to domestic-acquired firms. Although the real profit of foreign-acquired firms increased significantly relative to domestic-acquired firms in the acquisition year, the increase becomes insignificant in the following years. The results are robust when we use other measures of profitability such as the profit ratio (total profits divided by total sales). This may be due to the fact that many FDI firms in China are in highly competitive industries.

4.3. Discussions

In this section, we highlight and discuss some of the above results that may help to understand our findings in a coherent framework.

First, we want to emphasize that both domestic and foreign acquisitions bring productivity improvement relative to non-acquisition domestic firms.[21] Like FDI, domestic acquisitions significantly improved target firms' productivity relative to non-acquisition domestic firms. TFP of domestic-acquired firms increased about 10 percentage points relative to that of non-acquisition firms in the acquisition year and the following two years. The coefficient estimates are statistically significant at the 1% level in all three years. These results are consistent with previous findings of post-acquisition productivity gains in the literature. For instance, Maksimovic and Phillips (2001) show that most M&A transactions result in productivity gains using US plant-level data. Guadalupe et al. (2012) document technology upgrading upon foreign acquisitions for Spanish manufacturing firms. Intuitively, mergers and acquisitions facilitate the reallocation of resources from less productive firms to more productive ones. Our results suggest that the amount of productivity improvement is comparable for domestic and foreign acquisitions, leaving no additional productivity gains from foreign ownership in our data.

Second, we confirm that the improvement of financial conditions in foreign acquisitions, relative to domestic acquisitions, is mainly from a financial improvement of foreign-acquired firms rather than a financial deterioration of domestic-acquired firms. We compare the performance of domestic-acquired firms relative to that of no-acquisition domestic firms and find no evidence that the financial conditions of domestic-acquired firms improved or deteriorated after the acquisition relative to non-acquisition firms. The results are presented in the appendix (Table A.7).[22]

Given the above clarifications, we next discuss potential factors that drive our results and relate our findings to other studies in the literature. Our findings raise several interesting questions for further studies. First, the finding of no additional productivity gain from foreign ownership may seem puzzling, given that FDI improved target firms' financial conditions. One would expect an improvement in the acquired firms' productivity if they invest in new technology after their financial constraints are relaxed following the acquisition. As we just mentioned, foreign acquisitions do increase target firms' productivity but to a comparable extent as domestic acquisitions. Capital input increased for both domestic- and foreign-acquired firms following acquisitions. Meanwhile, labor input also increased in foreign acquisitions relative to domestic acquisitions. As a result, the capital per employee of foreign-acquired firms even decreased slightly relative to that of domestic-acquired firms (the last panel of Table 7), though the difference is statistically insignificant. This explains why labor productivity (measured by output per employee) of foreign-acquired firms does not increase relative to that of domestic-acquired firms.

Several factors may contribute to the absence of additional productivity gains for foreign-acquired firms even if they became less financially constrained than before. As emphasized in Manova et al. (2015), international trade involves large fixed costs and the capital inflows from FDI can help financially-constrained local firms pay for the fixed costs and promote exports. In this case, we may not observe an increase in productivity though exports and total output increased after the acquisition.

In addition, improved financial conditions of foreign-acquired firms may give competition advantages that are not related to productivity. For instance, Fresard (2010) finds that high liquidity helps firms to cope with unexpected market shocks and therefore leads to an increase in the market share. Gamba and Triantis (2008) show that firms prefer to maintain financial flexibility when facing financial frictions and such flexibility increases firms' overall market value. Therefore, the lower leverage ratio and higher liquidity ratio of foreign-acquired firms as we documented may strengthen the performance (e.g., output) of foreign-acquired firms even though they do not improve the relative productivity.

The difference in the balance sheets of multinational affiliates and domestic firms may also reflect the capital structure choices by multinational affiliates. Desai et al. (2004) document that U.S. multinational affiliates utilize more internal borrowing and rely less on external finance in countries with underdeveloped local capital markets. In addition, multinational affiliates may use balance sheets to circumvent capital controls as shown in Desai et al. (2006). The financial decisions based on these considerations are not directly related to firm productivity.

[21] We have discussed this result for foreign-acquired firms in Panel A of Table 5. The comparison between domestic-acquired firms and non-acquisition domestic firms is presented in Table A.7 of the appendix.

[22] In the appendix, we also confirm that the other documented performance improvements of foreign-acquired firms are not driven by a performance deteriorations of the control group.

Another interesting issue is on how FDI promotes target firms' exports. As in Manova et al. (2015), FDI may relax firms' financial constraints on fixed export costs, resulting in more firms participating in international trade. In this case, the extensive margin is expected to account for a larger share of the increase in exports for foreign-acquired firms than for domestic-acquired firms as foreign acquisitions relax target firms' financial constraints. We decompose the changes in exports into extensive and intensive margins for foreign- and domestic-acquired firms in our treatment and control groups. The extensive margin includes firms that did not export in the pre-acquisition year but exported in the acquisition year or the two years following the acquisition. The intensive margin includes firms that were exporters in the pre-acquisition year and continued to export in the acquisition year or the following two years.[23] In our data, the extensive margin contributes to 38% of post-acquisition increases in exports for the foreign-acquired firms, while it only accounts for 11% of export increases for domestic-acquired firms. These findings are consistent with Manova et al. (2015) prediction.

The role of foreign ownership in promoting trade could also go through the information channel as emphasized in Fernandes and Tang (2014): FDI may have promoted trade by increasing target firms' knowledge about foreign markets.[24] Table 8 compares the performance of FDI from Hong Kong, Macau and Taiwan (HMT) and that from other countries.[25] We find that the relative strength of these two channels may depend on FDI's sources of origin.

A large fraction of foreign acquisitions in China is from HMT. In our data, HMT acquisitions account for 55% of the total assets of all acquisitions in 2001. The share declined during our sample period, but remains at about 30% in more recent years.[26] No significant difference is detected between HMT FDI and FDI from other countries based on their effects on firm productivity. To save space, we do not report this result in the table.

Table 8 shows strong evidence that FDI from HMT can improve target firms' financial conditions. The leverage ratio of HMT-acquired firms declined relative to domestic-acquired firms following the acquisition, and the decrease is statistically significant at the 1% level in all three years. The evidence for the liquidity ratio is similar. We also find evidence that HMT-acquired firms perform better than domestic-acquired firms in exports: the performance difference is statistically significant in two out of three years at the 1% level. These findings are consistent with the financial constraint channel of FDI in promoting exports in Manova et al. (2015).

For the firms acquired by FDI from other countries, the evidence for financial condition improvement is weak: the coefficient estimate is statistically significant in two out of three years at the 10% level. However, we still find strong evidence that FDI from other countries can significantly improve target firms' exports: the export shares of foreign-acquired firms increased significantly relative to domestic-acquired firms following the acquisition at the 1% level in all three years we consider. The increase in the export share is also greater than that for HMT firms, suggesting other channels (e.g., information) may also be at work.

It is of interest in the future to investigate the post-acquisition changes in export activities of foreign-acquired firms using micro-level trade data to shed light on different channels through which FDI promotes target firms' exports.

Table 8
Effects of FDI from different sources.

	Coefficient	Std. err	z	$P > \|z\|$	95% conf. interval	
Panel A: Firms from Hong Kong, Macau and Taiwan						
Leverage ratio						
Acquisition Year	−0.019***	0.006	−3.317	0.001	−0.030	−0.008
One year after	−0.038***	0.007	−5.387	0.000	−0.051	−0.024
Two years after	−0.018***	0.007	−2.621	0.009	−0.032	−0.005
Liquidity ratio						
Acquisition Year	0.023**	0.011	2.122	0.034	0.002	0.044
One year after	0.062***	0.011	5.790	0.000	0.041	0.083
Two years after	0.056***	0.012	4.681	0.000	0.033	0.079
Export share						
Acquisition Year	0.027***	0.008	3.326	0.001	0.011	0.044
One year after	0.029***	0.007	3.865	0.000	0.014	0.043
Two years after	0.029***	0.008	3.739	0.000	0.014	0.044
Panel B: Firms from other countries						
Leverage ratio						
Acquisition Year	−0.025***	0.006	−4.178	0.000	−0.036	−0.013
One year after	−0.002	0.006	−0.277	0.782	−0.013	0.010
Two years after	−0.023***	0.007	−3.055	0.002	−0.037	−0.008
Liquidity ratio						
Acquisition Year	0.032***	0.010	3.287	0.001	0.013	0.051
One year after	0.017	0.011	1.645	0.100	−0.003	0.038
Two years after	0.023*	0.013	1.756	0.079	−0.003	0.049
Export share						
Acquisition Year	0.031***	0.007	4.328	0.000	0.017	0.045
One year after	0.053***	0.007	7.454	0.000	0.039	0.067
Two years after	0.045***	0.008	5.315	0.000	0.028	0.061

This table reports the results for the effect of foreign ownership on target firms' financial conditions and exports for FDI with different sources of origin.
The treatment group in panels A and B includes foreign-acquired firms from different sources and the control group includes domestic-acquired firms that are paired with these foreign-acquired firms using the propensity score matching method.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

4.4. Private and state owned firms

Due to issues related to state-owned enterprises (SOEs), mergers and acquisitions in China could be very politicized, especially when they involve foreign ownerships. State and collectively owned firms may be subject to implicit restrictions on foreign acquisitions and hence behave differently relative to private firms. For instance, the government may prefer domestic private firms rather than foreign firms to acquire state-owned enterprises to avoid the critiques from nationalists. These implicit policies and rules on foreign investment may also vary across regions. In this case, the conditional independence assumption may not hold: after controlling for observable characteristics in propensity score estimation, unobserved heterogeneity may still affect firms' chance of being acquired by foreigners. In the benchmark result, we add a dummy of state/collective ownership before acquisitions to alleviate this concern. In this section, we consider another two exercises to address these issues. First, we restrict our sample to the firms that are privately owned prior to acquisition. The above issue is less of a concern when we exclude state and collectively owned firms from our sample.

Table 9 reports the results when we only include private firms in our estimation. As in the benchmark model, there is no strong evidence that foreign acquisitions can significantly improve firm TFP relative to domestic acquisitions. We find similar results when using other measures of firm productivity such as output per employee. The results for the leverage and liquidity ratios are statistically significant at the 1% level in five out of six cases and at the 5% level in the remaining case. As in our benchmark model, foreign acquisitions are found to significantly promote exports in all three years at the 1% level. Indeed, our results

[23] More precise extensive margin measures should also include existing exporters that export to more markets and/or more varieties of products.
[24] The increase in exports could also be a result of improved technology: Girma et al. (2012) apply a propensity score reweighting estimator to Chinese manufacturing firms and find that foreign acquisitions have a strong effect on R&D activities and exports. However, we do not find productivity improvement for foreign-acquired firms relative to domestic-acquired firms in this paper.
[25] In this exercise, we first match foreign-acquired firms with domestic-acquired firms. Next we separate foreign-acquired firms and their corresponding matched domestic-acquired firms into two sub-samples: HMT firms and FDI firms from all other countries. Then the difference-in-differences estimation is applied to each of these two sub-samples. Other studies on FDI from HMT include Huang et al. (2013) and Kamal (2014), among others.
[26] Kamal (2014) documents that the share of HMT FDI in total FDI declines from 60.8% in 2001 to 45.0% in 2006.

Table 9
Results for private firms only.

	Coefficient	Std. err	z	P > |z|	95% conf. interval	
Productivity (as measured by TFP)						
Acquisition Year	0.080**	0.034*	2.401	0.016	0.015	0.146
One year after	−0.015	0.037	−0.405	0.686	−0.087	0.057
Two years after	−0.024	0.037	−0.647	0.518	−0.098	0.049
Leverage ratio						
Acquisition Year	−0.031***	0.008	−4.136	0.000	−0.046	−0.016
One year after	−0.036***	0.009	−4.064	0.000	−0.053	−0.019
Two years after	−0.022**	0.010	−2.278	0.023	−0.041	−0.003
Liquidity ratio						
Acquisition Year	0.043***	0.011	3.992	0.000	0.022	0.064
One year after	0.059***	0.012	4.741	0.000	0.035	0.083
Two years after	0.045***	0.013	3.377	0.000	0.019	0.071
Export share						
Acquisition Year	0.037***	0.010	3.544	0.000	0.016	0.057
One year after	0.039***	0.012	3.353	0.000	0.016	0.062
Two years after	0.042***	0.012	3.531	0.000	0.018	0.065

This table reports the results for the firms that were privately owned before the acquisition.
The treatment group includes foreign-acquired firms and the control group includes domestic-acquired firms that are paired with foreign-acquired firms using the propensity score matching method.
* Denotes significance at the 10% levels.
** Denotes significance at the 5% levels.
*** Denotes significance at the 1% level.

indicate a stronger effect of FDI on exports for private firms: the coefficient estimates for private firms are more than 50% higher than those in our benchmark model. This finding is consistent with the fact that private firms contribute more than state-owned enterprises to China's export increases after 2000.

In the second exercise, we include location as a key variable to match domestic- and foreign-acquired firms.[27] Matching on location allows us to control for the variation of FDI policy across regions. In addition, it provides an additional control (besides a dummy of export status) on firms' export potential as firms in certain regions of China are more likely to export. In a robustness check, we add a province dummy to the logit model of the propensity-score matching of our benchmark model. In an alternative exercise, we employ the nonparametric nearest neighbor matching method in Abadie and Imbens (2006, 2008) and require an exact match on location, state ownership and acquisition year.[28] The results for these two exercises of matching on location are reported in the appendix (Tables A.10 and A.11) and our main findings hold up well.

China undertook dramatic privatization in the late 1990s and the newly privatized domestic firms are likely to become more financially constrained due to the loss of access to state capital. In this case, it may bias our findings that foreign acquisitions improve target firms' financial conditions relative to domestic acquisitions. To check if privatization worsened target firms' financial condition, we compare the performance of privatized SOEs to that of surviving SOEs. In this exercise, the treatment group includes domestic-acquired firms that were state-owned enterprises before the acquisition. The control group contains SOEs that experienced no change in registration and are paired with the firms in the control group by propensity score matching. We do not find evidence that the target firms' financial conditions deteriorated following the privatization and the results are reported in the appendix (Table A.9). This may be due to the fact that China only privatized SOEs that were losing money. As mentioned in Hsieh and Song (2015), the main purpose of China's privatization in the late 1990s was to solve the non-performing loans of state-owned firms. It is likely that the privatized SOEs were already financially constrained before the acquisitions.[29]

4.5. Robustness checks

4.5.1. Different definitions for domestic and foreign acquisitions

As we previously mentioned, our benchmark method of identifying acquisitions may not include all acquisitions in our sample. We consider several robustness checks to address this concern. First, we use all registration type changes as an indicator of acquisitions. Note that this method overestimates the number of acquisitions because registration changes may also be due to changes in other aspects such as legal status, instead of ownership.

Second, we consider a different definition of domestic acquisitions. In this case, the domestic acquisitions include firms that changed registration types across different domestic groups as defined in the benchmark model plus two additional cases. In the first case, we consider all registration type changes in the group of mixed domestic firms as domestic acquisitions. The group of mixed domestic firms contains firms with heterogeneous backgrounds and registration type changes within this group are also likely to be mergers and acquisitions. There are about 200 observations annually for these registration type changes. In the second case, we consider as domestic acquisitions the registration type changes in which state- or collectively-owned enterprises changed to state-owned LLC. There are about 30 observations in each year for this case. Then we repeat our benchmark difference-in-differences exercise and find that our benchmark results hold up qualitatively well.

In another robustness check, we employ changes in the foreign capital share to identify foreign acquisitions. Following the literature, we use 10% as the cutoff for FDI firms: foreign acquisitions include all firms whose foreign capital share increased from below 10% before the acquisition to above 10% after. Our results are also robust when 25% is used as the cutoff, which is usually the minimum requirement in China for a firm to register and FDI firm.

Javorcik and Spatareanu (2008) document that the ownership structure affects the extent of technology spillovers of FDI firms. In particular, they find that multinationals are less likely to transfer sophisticated technologies to their partially owned subsidies than to wholly owned ones. In a robustness check, we only include FDI firms that are wholly owned by foreigners before the acquisitions.

The results of these robustness checks are qualitatively similar to our benchmark results and are reported in the appendix (Tables A.12–A.15).

4.5.2. Industries with different labor intensities

Our results are also robust across industries with different labor intensities. Huang et al. (2008) argue that finance is an important factor explaining FDI inflows in China's labor-intensive industries such as garments. Labor-intensive industries are usually characterized by low technology and high competition. Therefore, the advantages of FDI firms are likely to come from easy access to credit rather than advanced technology for these industries. We divide 30 industries (at 2-digit industry code level) in our sample into three groups with 10 industries in each group: high, medium and low labor-intensive industries.

Table A.16 in the appendix presents the results for these three industrial groups. For all industrial groups, there is no significant evidence that foreign-acquired firms became more productive relative to domestic-acquired ones following the acquisition. Instead, for low labor-intensive industries, we find some evidence that foreign-acquired firms became even less productive relative to domestic-acquired firms. However, such results disappear when we use other measures of firm productivity

[27] We thank an anonymous referee for suggesting we explore this issue.

[28] In the nonparametric matching method, the location dummy is an indicator showing if a province is among coastal provinces (Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, Hainan). We did not use location dummies for individual provinces as in the propensity score matching method because the choice for the control group will be extremely limited in this case.

[29] The finding here should be interpreted with caution since the financial conditions of privatized and surviving SOEs were different before the acquisitions.

such as output per employee. As for financial constraints, the results for the liquidity ratio are quite robust across all industrial groups, though the results are less robust for the leverage ratio. The liquidity ratio significantly improved in 7 out of 9 cases at the 10% level.

The results for exports also hold well across industries with different labor intensities: in 7 out of 9 cases, we find foreign-acquired firms outperform their domestic-acquired counterparts in export shares following the acquisition at the 10% level. It may sound puzzling that China's export shares in capital-intensive sectors also increased after foreign acquisitions since the country's comparative advantage is on labor-intensive products. However, this finding is consistent with the cross-sectional results in Manova et al. (2015). They find that financial constraints limit trade similarly after controlling for capital intensity. However, FDI can relax greater financial constraints in more capital-intensive industries because capital-intensive industries are usually more financially constrained. In this case, the increases in exports due to removing financial constraints may more than offset the decreases induced by shifting to exporting labor-intensive products.

4.5.3. Exporters vs. non-exporters

Our results are also robust when we separately estimate production functions for exporters and non-exporters. We separate exporters and non-exporters for two reasons. First, capital intensity may be different for exporters and non-exporters and it is problematic to estimate their productivity using the same production function.[30] Ma et al. (2014) document that Chinese firms become less capital intensive after exporting and we find in this paper that FDI promotes the exports of target firms. Therefore, it could be problematic to use the same production function to estimate firm TFP prior to and after acquisition. For instance, if a firm becomes an exporter following the acquisition, the capital share in the production function will decrease. If we do not take this change into account, the estimated TFP could be seriously biased. Following Ma et al. (2014), we separate our observations according to firms' exporting status and estimate productivity separately for exporters and non-exporters.

Second, we separate exporters and non-exporters to check whether exports increased for both groups following the acquisition. FDI can improve exports through two different channels. First, it could relax the financial constraints of non-exporters and enable them to participate in the international trade following the acquisition (extensive margin) as argued in Manova et al. (2015). Alternatively, it could improve existing exporters' performance (intensive margin), for example, by better utilizing their export networks as discussed in Blonigen et al. (2014). Separating exporters and non-exporters allows us to examine these two different channels.

Observations in each year are divided into two groups: one is for firms with positive exports and the other for firms with no exports. Then we estimate TFP for each group separately. Next, we divide firms into exporters and non-exporters based on their pre-acquisition status. Following Ma et al. (2014), if a firm exported in one or more years before acquisition, it is classified as an exporter. Otherwise, the firm is classified as a non-exporter. The difference-in-differences method is applied to exporters and non-exporters respectively to check if foreign acquisition has different impacts on firms with different pre-acquisition export statuses.

Table A.17 in the appendix reports results for exporters and non-exporters. For both types of firms, there is no significant evidence that foreign acquisitions can improve target firms' TFP relative to domestic acquisitions. Financial conditions for both exporters and non-exporters improve following the acquisition and the improvement is statistically significant in most cases. For export shares, we find a significant increase for non-exporters: the export share of firms that did not export before the acquisition increased between 4 and 6 percentage points following the acquisition. The increase in export share is statistically significant in all three years at the 1% level. This result is consistent with previous studies that the surviving firms that switched from non-exporters to exporters contribute significantly to China's export growth. Manova and Zhang (2009) document that surviving firms that start to export account for 70% of China's export growth between 2003 and 2005, while new firms explain the remaining 30%.

The coefficient estimates of the export share are statistically insignificant for exporters in all three years considered in our exercise. However, this finding does not conclude that foreign acquisitions do not improve target firms' export performance relative to domestic acquisitions. We have shown earlier that foreign acquisitions improve target firms' output. As a result, there may be no significant difference in the changes of the export share between foreign- and domestic-acquired firms, even though the exports of foreign-acquired firms increased relative to domestic-acquired firms following the acquisition. In the last panel of Table A.17, we report the results for exports and find that for both exporters and non-exporters, the exports of foreign acquired firms significantly increased relative to domestic acquired firms. The difference is statistically significant for all 6 cases at the 10% level.[31] This finding suggests that FDI also contributes to the increase in China's exports through the intensive margin.

4.5.4. Processing-trade foreign acquisitions

Our main results are not driven by the processing trade in China. Processing trade is an important type of international trade in developing countries such as China, Indonesia and Mexico. In processing trade, domestic firms import all or part of their raw materials and intermediate inputs to process or assemble their final goods, which are re-exported to foreign countries. Firms with low-productivity and unskilled labor are usually involved in processing trade (e.g., Yu, 2015 and Manova and Yu, 2011), which may bias our finding that foreign acquisitions do not improve target firms' productivity relative to domestic acquisitions.

The Chinese transaction-level customs data indicate whether exported products are for processing trade or not, and we use such information to identify processing-trade firms.[32] In each year, firms are designated as processing-trade firms if they claim any of their exports as processing trade. Among 2,240 foreign acquisitions between 2001 and 2005 in our dataset, 332 target firms participated in processing trade in the pre-acquisition year. To control for firms' pre-acquisition processing-trade status, a dummy variable is added to the logit model in the propensity-score matching. Then we divide foreign-acquired firms (and their matched domestic-acquired firms) into two groups according to their post-acquisition processing-trade status. The group of processing-trade foreign acquisitions includes all foreign-acquired firms that are involved in processing trade after the acquisition. The remaining foreign-acquired firms, referred to as other foreign acquisitions, either conduct ordinary international trade or do not export at all after the acquisition. Then we perform the same difference-in-differences estimation for these two groups of firms.

As in the benchmark model, we do not find evidence of productivity improvement for either processing-trade foreign acquisitions or other foreign acquisitions. There exists strong evidence that foreign acquisitions improved target firms' financial conditions based on the liquidity ratio. The liquidity ratio increased significantly at the 1% level for the foreign-acquired firms regardless of their processing-trade status. The results for the leverage ratio remain strong for the group of other foreign acquisitions, while they are weak for foreign acquisitions involving processing trade. For both groups of foreign-acquired firms, the export

[30] More generally, the production structure may have changed following an acquisition. The robustness check here may at least partially address this concern.

[31] Exports are measured by $\log(1 + \text{real exports})$, where real exports equal nominal exports divided by industrial-level PPI (2-digit level). We add one to real exports before taking logs because many firms have zero exports in one or more years. Due to this reason, the coefficient estimates cannot be interpreted as percentage increases in exports.

[32] We thank Zhi Yu for providing identifications of processing-trade firms, which are obtained by combining trade data from the Chinese Customs Office and our firm-level data from the Annual Surveys of Industrial Production.

share significantly increased relative to domestic acquired firms following the acquisition.

5. Conclusion

It is well believed, especially among policymakers in developing countries, that FDI can improve the host country's productivity by the direct introduction of new technology/management and the spillover from FDI firms to local firms. Part of the belief is from the empirical findings of post-acquisition performance improvement for foreign-acquired firms. However, such empirical evidence may have disguised the true channel through which FDI promotes the host country's economic growth and labor income if we do not carefully take into account the general acquisition effect that also exists in domestic acquisitions.

Using firm-level data for China during the period of 2000–2007, our study identifies the purified effect of foreign ownership by employing domestic-acquired firms as the control group. We find that, relative to domestic-acquired firms, foreign acquisitions did not significantly increase Chinese firms' productivity. However, we do find that foreign ownership can significantly improve target firms' financial conditions as measured by the leverage and liquidity ratios even after controlling for the effect in domestic acquisitions. Foreign ownership is also found to promote target firms' exports, output, employment and the real wage. These findings provide support for the recent emphasis on the financial channel through which FDI promotes international trade, labor income and economic growth of host countries.

Many developing countries provide tax and other incentives to attract FDI inflows. Such financial and policy incentives may not be as effective as providing a macroeconomic environment that can help the FDI firms best utilize their comparative advantages. Our results show that an important advantage of FDI acquisitions, relative to domestic acquisitions, is to promote the international trade of the host country through improving target firms' financial conditions (and maybe through other channels too). In this case, a more effective way to attract FDI inflows is to remove trade barriers through free trade agreements and WTO membership. Our results also suggest that FDI inflows to emerging markets, such as China, may reflect the inefficiency of their financial markets. To some extent, FDI inflow is an indicator of the extent of such financial market inefficiency. Therefore, the increase in the volume of FDI inflows should not always be the top priority of government officials. The long-run goal for these emerging markets is to improve their financial markets' efficiency through reforms, rather than provide tax or policy incentives to maintain the level of FDI inflows.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jinteco.2015.07.006.

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