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Do FDI Firms Employ More Workers than Domestic Firms
for Each Dollar of Assets?

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Do FDI Firms Employ More Workers than Domestic Firms for Each Dollar of Assets?

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Abstract

This paper studies whether FDI firms employ more workers than domestic firms for each dollar of assets. Using the Orbis database and its ownership structure information, we show that, in most economies, domestic firms tend to employ more workers per asset than FDI firms. The result remains robust across individual industries in the case study of the United Kingdom. The analysis of the switchers (ownership changes from domestic to foreign or vice versa) suggests that ownership changes do not have an immediate impact on the employment per asset. This result suggests that different patterns of employment per asset seem to come from technological differences rather than from different ownership structures.

Contents

I. INTRODUCTION

Foreign direct investment (FDI) brings many different benefits, but the most wanted benefit might differ depending on the recipient economies. For example, some economies might be most interested in the tax revenue generated by foreign-participated companies. The economies that aim to catch up with advanced economies may find knowledge transfer to be the main benefit. For other economies (for instance, those already at the technology frontier), employment can be the benefit of interest.

Among the various dimensions of FDI, this paper specifically focuses on the employment aspect. The employment that FDI may generate in recipient economies is usually underscored by both the firms engaged in FDI and policy makers. For example, large MNEs that are often subject to the accusation of tax avoidance use the number of employees to justify their business in the local economies.[2] Policy makers often accolade FDI by quoting the total value of the investment and the employment it creates.[3] Despite its relevance, the aspect of employment has been under-explored in the literature.

This paper is an attempt to fill the gap by studying whether, for each dollar of assets, FDI firms employ more workers than domestic firms. To answer the question, we use the firm-level data of Orbis by Bureau van Dijk to construct a unique dataset of FDI and domestic firms. Specifically, we use the ownership structure data to classify each firm into FDI or domestic and use the financial statement to construct its employment per asset ratio. To prevent "phantom FDI" from contaminating the analysis, we also remove special purpose entities (SPEs) from the main specification.

The analysis can be understood in the following way: suppose a policy maker interested in generating employment has a certain amount of funds to lend and receives two applications for a loan to invest in similar businesses (of the same size, industry, etc.), one application from a foreign direct investor and the other from a domestic investor. The analysis that compares the two distributions of employment per asset for FDI and domestic firms would tell the policy maker which project on average results in more employment by formulating the decision making as a random draw from the distribution.

As the main result, we show that, in most economies, domestic firms employ more workers than FDI firms for each dollar of assets. Specifically, in 2016, in 41 out of 51 economies in the sample, the mean of the log employment per asset for domestic firms is significantly

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[2] For example, Apple Inc. has websites to advertise the total number of jobs it creates in each economy. https://www.apple.com/uk/job-creation/

[3] U.S. president Donald Trump mentioned in his 2017 tweet "Toyota & Mazda to build a new $1.6B plant here in the U.S.A. and create 4K new American jobs. A great investment in American manufacturing!"

higher than that for FDI firms. This result is robust to alternative definitions of FDI and SPEs.

To understand the driving forces behind the aggregate result, the paper compares FDI and domestic firms not just for each economy but also for each industry. The case study of the United Kingdom shows that domestic firms employ significantly more workers per asset in 9 out of 11 industries. This result suggests that the main result is not driven by a particular industry but is a common feature across different industries.

The analysis at the industry level also explores the cross-country relationship between industry composition and the difference in employment per asset between FDI and domestic firms. It is shown that domestic firms tend to employ more workers per asset if a higher fraction of domestic firms is in construction, wholesale trade, or services. The result suggests the driving industries that help predict the difference in employment between FDI and domestic firms at the aggregate level.

Finally, to understand whether the difference between FDI and domestic firms comes from the ownership structure itself or from other firms' characteristics, we leverage the time-series dimension of the data by tracing the firms that change ownership from FDI to domestic and vice versa as well as those with stable ownership. The sample from 2011 to 2016 reveals that (1) the ownership change itself does not have an immediate impact on the behavior of employment per asset and (2) the always-domestic firms employ significantly more employees per asset than the switchers and always-FDI firms. These results suggest that the behavior of employment per asset is not so much driven by the ownership structure itself as by other characteristics such as the production technologies of the firms.

The interpretation and the resulting policy implications of the analysis need to be understood with care. For example, the analysis is about direct employment and is not informative about the overall job creation that includes trickle-down effects, etc., nor about the quality of employment. In the economies where policies to attract FDI are active, the results of this paper can move policy makers to demand additional commitment from foreign investors to generate more benefits in the recipient economy.

II. LITERATURE

There is a strand of literature focusing on the labor market effects of FDI, but the data tend to be limited to a particular industry or a specific economy. Harrison and Scorse (2005) use data on firms in Indonesia to find that the wage premium paid by foreign establishments during the 1990s were robust to the inclusion of workers' characteristics, suggesting that the higher wage premiums may be due to a foreign firm's higher spending for training, partly in order to retain workers. Harrison and McMillan (2011) use U.S. MNEs' data and study the impact of U.S. MNEs' offshore jobs on domestic employment. They show that the effect of job shifting

to offshore on the domestic labor market is limited. Lundin et al. (2007) study the impact of FDI on employment in the Chinese manufacturing industry, suggesting that the FDI entry into China has positive effects on employment growth in the manufacturing industry.

Although the employment aspect of FDI has been under-explored, other gains from FDI have been studied extensively. For example, there is a large literature on the productivity gain and technology spillover of FDI. Aitken and Harrison (1999) use panel data on Venezuelan plants and suggest that foreign equity participation is positively correlated with plant productivity, but the spillover effect is small. Javorcik (2004) uses firm-level data from Lithuania and shows that spillovers are associated with projects with shared domestic and foreign ownership but not with fully owned foreign investments. Haskel et al. (2007) use the plant-level panel data of the United Kingdom and find a significantly positive correlation between a domestic plant's TFP and the foreign-affiliate share of activity in that plant's industry. Alfaro (2003) relates inward FDI to the local financial market and finds that economies with well-developed financial markets gain significantly from FDI.

III. DATA

This section describes the Orbis database and the cleaning process. Regarding the data cleaning process, we introduce three layers of cleaning in addition to dropping missing values: (1) dropping the data related to consolidated financial statements, (2) classifying firms into FDI and domestic firms, (3) dropping Special Purpose Entities (SPEs). Section IX.A presents the table of summary statistics of the cleaning process.

The Orbis database used in this paper is a commercial database compiled by Bureau van Dijk (BvD). It reports the information of firms' financial statements collected from administrative sources and its coverage extends to more than 300 million firms across the world. Orbis is one of the most comprehensive firm-level databases that cover both listed and unlisted firms across the world, although some quality concerns have already been known in the literature as discussed by Kalemli-Ozcan, et al. (2015) and Tørsløv et al. (2018).

The main analysis of this paper uses the 2016 data of each firm's (1) number of employees, (2) total asset, (3) nationality of shareholders, and (4) direct and total percentages of shares held by the shareholders. We choose 2016 as the benchmark since 2016 data is the most complete recent data due to the reporting lags of Orbis as of 2019. The four variables are taken from the financial historical database and historical ownership database of Orbis, which are then matched using the unique BvD firm identifier.[4]

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[4] The analysis at industry level in Section V and that of the switching firms in Section VI further restrict the observations to those that have industry information and those that can match past data respectively. The number of the observations in each analysis will be reported in each section.

We implement three more steps to filter out the data suitable for the analysis, in addition to the standard data cleaning process to keep the non-missing observations. The first step is to drop the observations of the consolidated data in Orbis. Consolidated data aggregate up the information of all the subsidiaries into the group total, including those incorporated abroad. As a result, the number of employees in the consolidated data does not necessarily reflect the employment in the economy where the parent firm is incorporated.[5]

The second step is to classify firms into FDI and domestic firms. Ideally, the identification of FDI firms should follow the definition of the direct investment enterprises in the *Balance of Payments and International Investment Position Manual, sixth edition* (*BPM6*). In practice, however, the information in Orbis is not sufficient to directly apply *BPM6*. The next section explains the issue and describes the definition adopted in this paper.

A. Classifying Firms into FDI and Domestic Firms

BPM6 defines a direct investment enterprise as an entity subject to control or a significant degree of influence by a nonresident entity. The definition of control or influence is further divided into (1) the immediate direct investment relationship where a nonresident entity directly owns more than 10 percent equity with voting power and (2) the indirect direct investment relationship where a nonresident entity can exercise more than 10 percent voting power through a chain of direct investment relationships. Figure 1 describes an example of both the immediate and indirect direct investment relationships, where Firm A is a nonresident entity and Firm B, C, and D are resident entities in the economy. The percentage indicates the equity share with voting power and the vertical line represents the boundary of economic territories. In this example, Firm B and C are the direct investment enterprises of Firm A since Firm A directly owns more than 10 percent equity of Firm B and C. Firm D is also a direct investment enterprise of Firm A, even though Firm A has no equity of Firm D, because A has an influence of 10 percent voting power on Firm D through Firm B and C.

Figure 1. Firm B, C, and D are All Direct Investment Enterprises of Firm A

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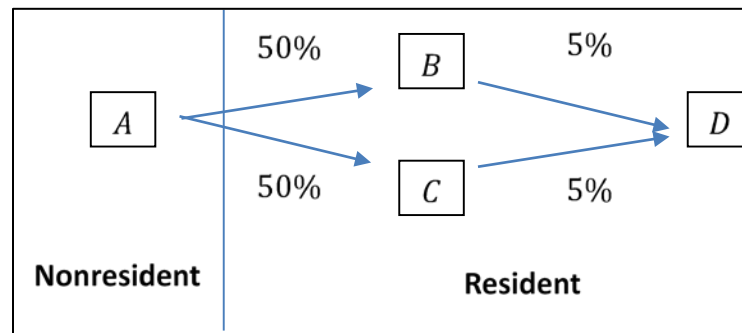
[5] The parent firm is often incorporated in a tax heaven with small population, in which case the number of employees in the consolidated data can exceed the population of the economy.

Similar to *BPM6*, the ownership structure data in Orbis are also divided into two types, direct and total percentage, although the definitions have subtle differences. Table 1 illustrates an example similar to Figure 1 that shows how Orbis records such a situation, assuming that Firm A is incorporated in the United States and Firm B, C, and D are in China. Each firm and shareholder has a 2-digit identifier of the location of the economy at the beginning of their ID. The ownership share is reported in either direct percentage or total percentage.

Table 1. Format of Shareholder Information in Orbis

Firm ID	Shareholder ID	Direct percentage	Total percentage
CN000B	US000A	50	NA
CN000C	US000A	50	NA
CN000D	US000A	NA	5
CN000D	CN000B	5	NA
CN000D	CN000C	5	NA

Note that the total percentage of A on D is $5 = (0.5 \times 0.05 + 0.5 \times 0.05) \times 100$ instead of 10. This is because the total percentage in Orbis is calculated by summing up the multiplication of the shares throughout the chains. In contrast, *BPM6* counts the voting power using only the last legs (i.e., $5 + 5 = 10$). The rest of the chains are used only to make sure that every investment relationship is chained by more than 50 percent equity share so that the parent firm has control over the voting decision of the last legs.

Using the total percentage in Orbis to estimate the direct investment enterprises in *BPM6* can end up with both under- and over-estimation. Figure 1 is an example of under-estimation. Over-estimation can also happen if the number of firms in the middle increases. Suppose that, instead of Firm B and C, Firm A has 10 percent equity shares of Firm $B_1, \ldots, B_{10}$ and each of them has 10 percent shares of Firm D as in Figure 2. The total percentage in Orbis is 10, but the voting power in *BPM6* is 0 since Firm A does not have control of Firm $B_1, \ldots, B_{10}$.

Figure 2. Total Percentage in Orbis Overestimates Direct Investment
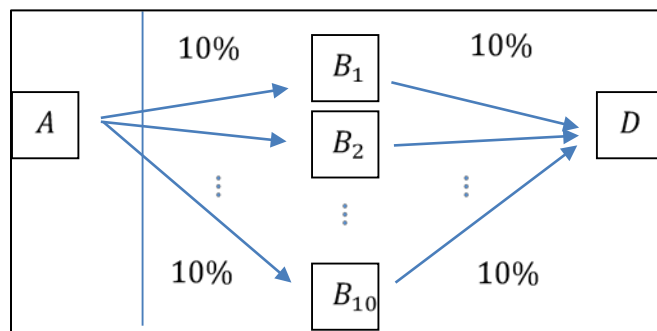
The patterns of the existing and missing data add further complications to the identification of direct investment enterprises. In some cases, the direct percentage of all the shareholders of a firm does not sum up to 100, implying the possibility of either missing shareholder information or the possibility that the direct percentage is recorded in the total percentage column. In other cases, only the names of the shareholders are reported without any information on the direct or total percentage.

Given these difficulties in identifying direct investment enterprises, this paper adopts a simpler definition than *BPM6* by restricting FDI firms to those with at least one foreign shareholder owning more than 10 percent share in either direct or total percentage. To demonstrate the robustness of the analysis based on this definition, Section IX shows that the main result in Section IV remains similar after replacing 10 by 50 so that firms are restricted to those that are under the control of foreign parent companies.

B. Treatment of Special Purpose Entities

The last step of the data cleaning is to drop the Special Purpose Entities (SPEs) from the sample. SPEs refer to the legal entities that are used to fulfill the special purpose of firms, such as isolating financial risks and tax avoidance by multinational firms. As discussed by Damgaard et. al (2019), SPEs are often considered to be pass-through entities and do not reflect the real activities that FDI statistics intend to capture. The existence of SPEs can change the FDI data significantly as discussed in IMF (2018).

To prevent SPEs from driving the result, this paper excludes SPEs from the analysis. Following the definition proposed by IMF (2018), FDI firms with less than five employees are defined as SPEs and dropped from the main analysis. To ensure that the result is not driven by domestic shell companies, the main analysis also excludes domestic firms with less than five employees.

Although the threshold of five employees is a crude definition, it turns out that the results of the main analysis are robust to alternative definitions. Section IX.D and IX.E discuss the robustness by using two alternative definitions of SPEs. The first one is to keep all the domestic firms but drop the FDI firms with less than five employees. The second one is to use the lower five percentile of the employment distribution instead of five employees.

In summary, the definition of FDI and domestic firms used in this paper is as follows.

Definition. *Fix a firm in Orbis identified by the unique BvD firm ID. The firm is an FDI firm if (1) it reports an unconsolidated financial statement, (2) it has at least one foreign shareholder owning more than 10 percent share in either direct or total percentage, and (3) it has at least five employees. The firm is a domestic firm if it satisfies (1), (3), and (4) all the foreign shareholders hold less than 10 percent share in both direct and total percentage.*

IV. MAIN ANALYSIS

This section analyzes whether FDI firms employ more workers than domestic firms for each dollar of assets. We describe our approach and show that, in many economies, domestic firms employ more workers for each dollar of assets. The main analysis at the aggregate level motivates more disaggregated analysis at the industry and individual firm level in the following sections.

The comparison of the FDI firms and domestic firms is based on the number of employees divided by the total asset. The asset serves as the normalization tool of the firm size to compare different firms. Given the fat tail distribution of the financial statement variables, we take the log as is suggested by Willett (2015). Thus, each firm is represented by

$$e = \log_{10}\left(\frac{Number\ of\ employees}{Total\ assets}\right).$$
(1)

There can be multiple legitimate interpretations for employment per asset e. One interpretation is how efficiently the firm can create jobs given the same size of the assets. Another is how efficiently the firm can operate using the employees. Since the interpretation can depend on the specific context of the readers, this paper avoids the evaluative term "efficiently" and just neutrally call e employment per asset.

Note that the measure of employment per asset e may not have a direct connection with the productivity of the firm. For example, labor productivity of a firm can be measured by value-added over employment. The total asset, however, is not necessarily a measure of the value-added and can include both the value of the capital used for production and other activities including investment in financial instruments. Therefore, the two concepts do not necessarily have a one-to-one mapping with each other, and the extensive literature on productivity may not provide an informative prior.

The comparison between FDI and domestic firms in each economy is based on hypothesis testing. Specifically, the null and alternative hypotheses are

$$H_0: \mathbb{E}[e^{Dom}] = \mathbb{E}[e^{FDI}]$$

$$H_1: \mathbb{E}[e^{Dom}] \neq \mathbb{E}[e^{FDI}]$$
(2)

where e^{Dom} and e^{FDI} are the random variables drawn from the distributions of domestic and FDI firms. The t-statistic of the test is

$$t = \frac{\bar{e}^{Dom} - \bar{e}^{FDI}}{\sqrt{\hat{V}(\bar{e}^{Dom} - \bar{e}^{FDI})}}$$
(3)

where $\bar{e}^{Dom}$ and $\bar{e}^{FDI}$ are the sample means of the employment per asset for domestic and FDI firms, and $\hat{V}$ is the estimated variance. The observations are assumed to be *i.i.d.*, so the estimated variance is the sum of the sample variances. Since the hypothesis testing is based on the large sample theory, we drop the economies with either the number of FDI or domestic firms less than 50.

The main result is plotted in Figure 3. Each dot corresponds to the t-statistic of an economy. The red dashed line is the 10 percent acceptance region of the null hypothesis. The figure is ordered by the t-statistic and a larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets.

Figure 3. Domestic Firms Employ More Workers per Asset in Most Economies
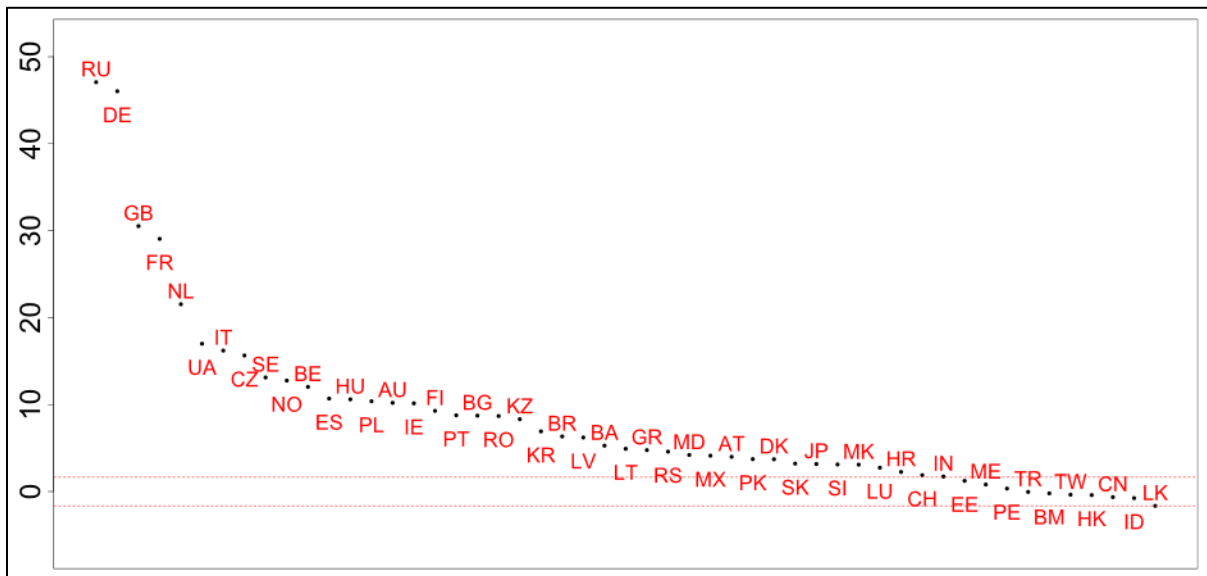
Y-axis denotes the t-statistics. A larger number suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. The number of observations can be found in Table 2.

Figure 3 suggests that, in most economies, domestic firms tend to create more jobs than FDI firms for each dollar of assets. One can see that some economies exhibit large positive t-statistics, but no economies exhibit large negative t-statistics. In this sense, there is not much qualitative heterogeneity across economies.

Figure 4 suggests that the large t-statistics for some of the economies are not driven by outliers. It shows the density of FDI firms and domestic firms for the three largest t-statistic economies. One can see that, although the fatness of the densities are different across economies, they all have larger t-statistics because the densities of FDI firms are shifted to the left side of those of domestic firms and is not because of outliers.

Figure 4. The Largest t-Statistics Economies Are Not Driven by Outliers
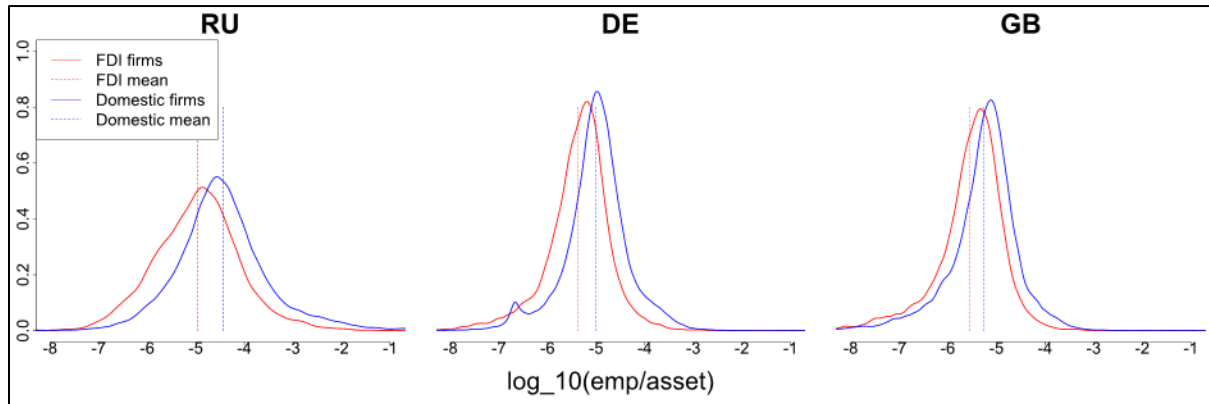
A. Discussion About the Main Result

The main result might be surprising if one considers that all economies exhibit similar patterns. For example, MNEs, which are known to be more productive than the rest as surveyed by Bernard et al. (2012), often lower costs by locating labor-intensive activities in economies with lower wages. Thus, FDI enterprises, which are affiliates of the parent company, would be expected to employ a large number of workers relative to the asset size. Although the data do not cover the universe of firms, the results suggest otherwise (i.e., that domestic firms employ more workers per dollar of assets than MNEs).

The policy implications from the main result can differ across economies. For example, policies to attract FDI may be used less frequently in some economies than others due to barriers including legal restrictions. In the economies with such restrictions, the results of this study may not lead to immediate policy implications. The analysis, however, can be informative for economies that actively attract FDI, namely can move policy makers to demand additional commitment from foreign investors to generate more benefits in the recipient economy.

The main result is also arguably based on many specific choices. One natural question is whether the result in Figure 3 is robust to alternative specifications of FDI and domestic firms. Figure 5 shows that the qualitative result survives even if all firms with less than 100 employees are dropped. Thus, dropping small- and medium-sized enterprises (SMEs) does not change the insight.

**Figure 5. The Result Survives If All Firms with Less Than 100 Employees Are Dropped**
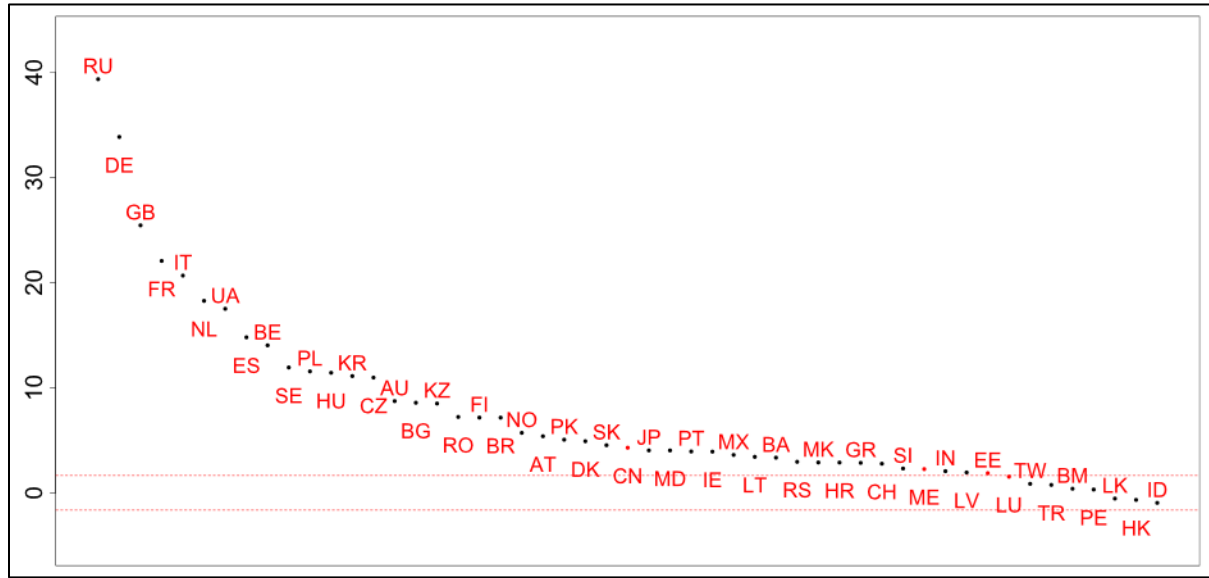
Y-axis denotes the t-statistics. A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.

In annexes, we show additional results about the robustness of Figure 3. Specifically, the qualitative result remains similar if (1) the total assets are replaced by shareholders' funds (Section IX.B), (2) the 10 percent threshold in the definition of FDI firms is replaced by 50 percent (Section IX.C), (3) the definition of SPEs is restricted to FDI firms and all domestic firms are included in the exercise (Section IX.D), and (4) the five-employee threshold in the definition of SPE is replaced by five percentile (Section IX.E). These robustness checks suggest that the main result does not so much hinge on the details of the FDI-related concepts as represents the overall pattern of the data at the aggregate level.

Another natural question is whether Figure 3 implies that domestic firms pay a larger amount of wage and other financial benefits for the employees. For this question, we can use the information about the cost of employees in Orbis and conduct the same exercise.

$$e^{cost} = \log_{10}\left(\frac{Cost\ of\ employees}{Total\ assets}\right) \tag{4}$$

Figure 6 shows that, in the majority of the economies, domestic firms spend more on the cost of employees than FDI firms for each dollar of assets, although more economies than Figure 3 exhibit the opposite pattern. Note that this does not necessarily mean that the wage for each employee is higher in domestic firms. What it means is that domestic firms not only employ more workers but also generate more total income for workers than FDI firms for each dollar of assets in many economies.

Figure 6. Heterogeneity Increases if the Number of Employees is Replaced by Their Cost

Y-axis denotes the t-statistics. A larger t-statistic suggests that it is more likely that, on average, domestic firms spend more on the cost of employees than FDI firms for each dollar of assets. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.
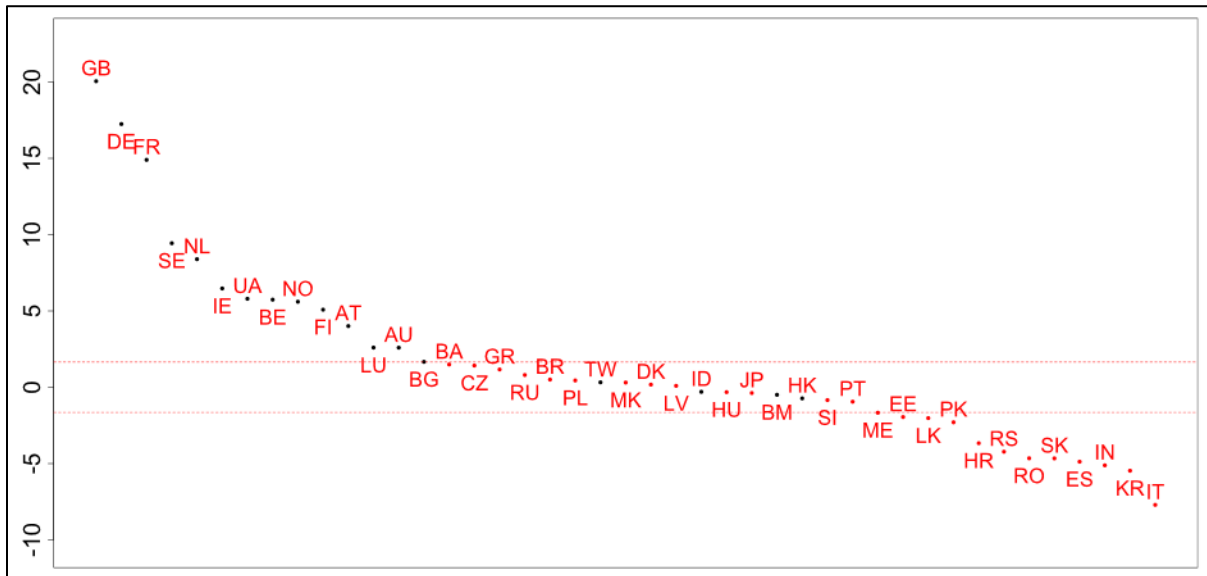
V. ANALYSIS AT THE INDUSTRY LEVEL

Section IV has studied the aggregate behavior by comparing all the FDI and domestic firms. This section explores further granularity of the data at the industry level. Specifically, we dig deeper into two aspects of the main result in Section IV.

A. Comparison of FDI and Domestic Firms at the Industry Level

The industry level comparison of this section focuses on the United Kingdom. The United Kingdom is the economy with the highest t-statistic in Figure 3 among those that have industry information for more than 90 percent of the firms. Thus, the United Kingdom is the most informative economy in the sample for the exploration of the driving industries behind the difference in employment per asset between FDI and domestic firms.

Figure 7 suggests that domestic firms employ more workers per asset than FDI firms in all industries in the United Kingdom. It shows the same exercise of t-statistics as Figure 3 except that the x-axis is the individual industry in the United Kingdom instead of the economies. One can see that all t-statistics are positive, although some of them are statistically insignificant.

Figure 7. Domestic Firms Employ More Workers per Asset in All Industries of the United Kingdom
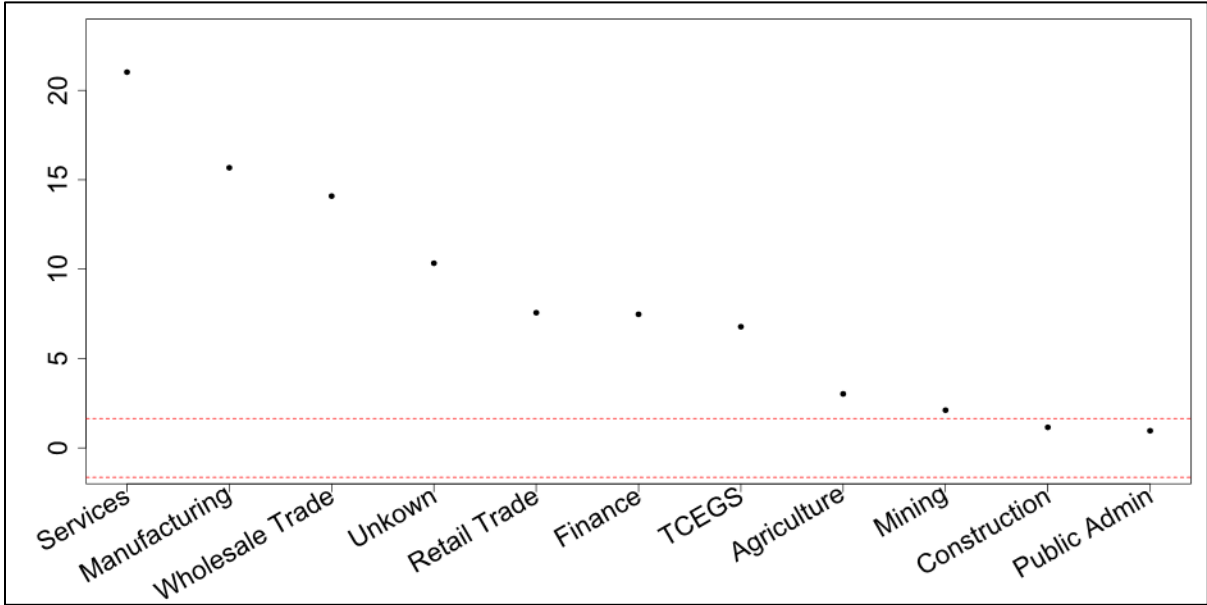
Y-axis denotes the t-statistics. A larger t-statistic in y-axis suggests that domestic firms are likely to employ more workers than FDI firms for each dollar of assets. X-axis denotes industries based on US-SIC where TCEGS represents transportation, communications, electric, gas and sanitary service and Unknown represents the firms without industry information.

Figure 8. Services and Manufacturing Are the Two Highest t-Statistics Industries
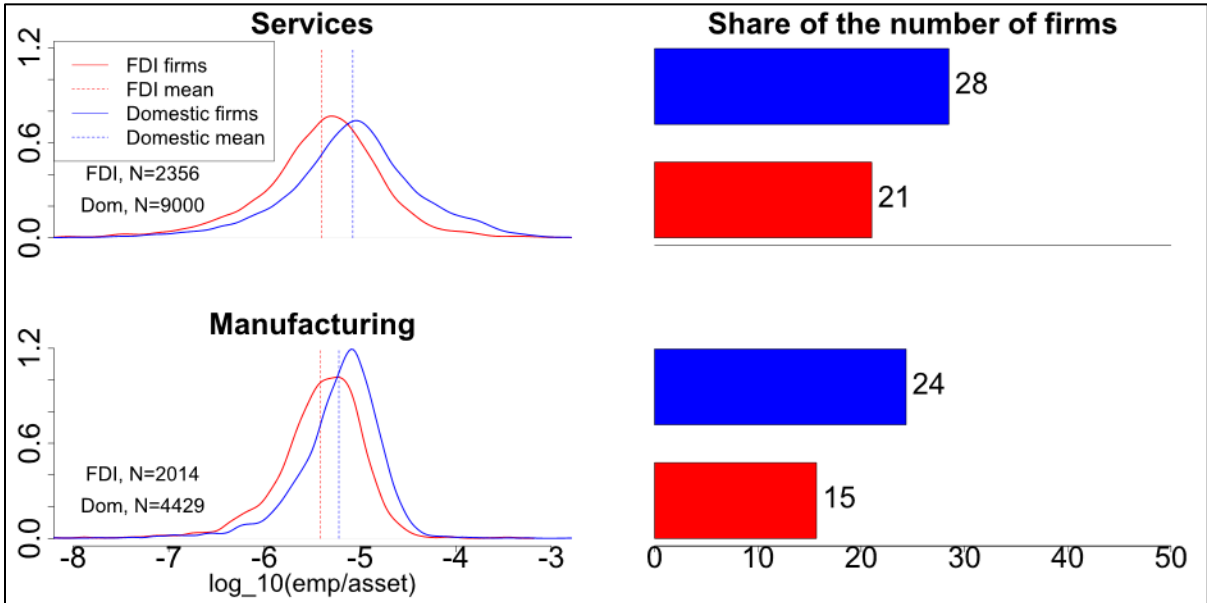
The left column shows the densities of the employment per asset for services and manufacturing industries. The first row of the right column shows the percentage of the firms in the services industry within FDI firms (blue) and domestic firms(red). The second row of the right column shows the corresponding shares for the manufacturing industry.

To see further details, Figure 8 presents the distributions of employment per asset for the two highest t-statistics industries. The left column shows the densities of the employment per asset for services and manufacturing industries. One can see that the distributions of domestic firms are more right shifted than FDI firms in both industries. The first row of the right column shows the share of the services industry within FDI firms and domestic firms, while the second row shows the shares for the manufacturing industry. One can see that, in terms of the number of firms, the two industries have large shares in both groups of FDI and domestic firms.

The high aggregate t-statistics in Figure 3 for the United Kingdom is, therefore, not a result of a few outlier industries or firms but is a general behavior of the FDI and domestic firms. Interestingly, the services sector that constitutes the largest share in both the FDI and domestic firms exhibit the sharpest contrast between the two groups of the firms. In the next subsection, we study whether there is a relationship between the structure of the industry and the difference in employment between FDI and domestic firms.

B. Industry Composition and Cross-Sectional Pattern of Employment per Asset

The analysis so far has focused on the comparison between FDI and domestic firms within the same economies. Whether the cross-sectional differences in employment per asset can be predicted by different economic structure is of natural interest.

Figure 9. Sectors That Are Positively Associated with FDI-Domestic Difference
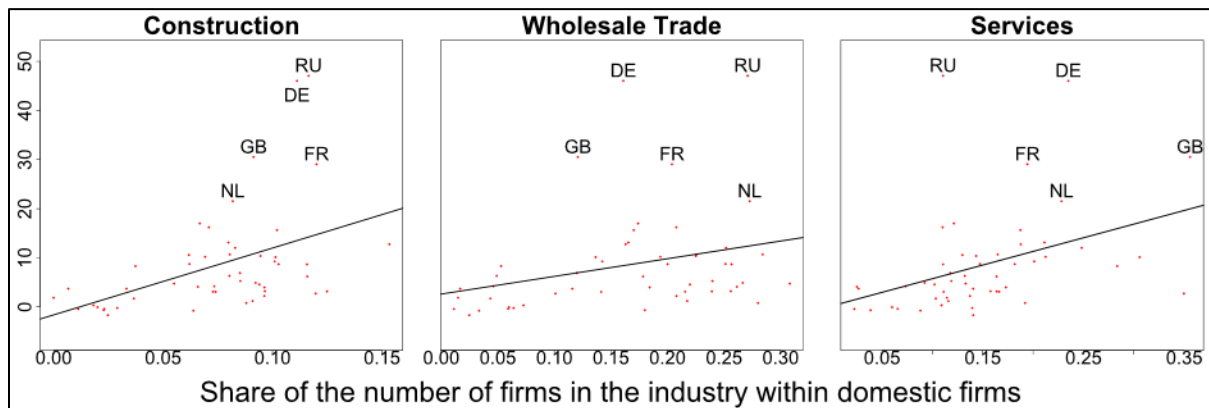
Y-axis denotes the same t-statistics as Figure 3 with ISO2 label for top five economies. A higher t-statistic suggests that it is more likely that domestic firms employ more workers than FDI firms per asset. X-axis denotes the share of the number of firms in the industry within domestic firms. A larger share in the above three industries is associated with a larger aggregate difference between domestic and FDI firms.

Figure 9 presents the cross-sectional pattern of differences in employment per asset against the industry structure measured by the share of the number of firms in the industry within

domestic firms. One can see that a larger share in construction, wholesale trade, and services predicts is associated with a higher likelihood that domestic firms employ more workers than FDI firms for each dollar of assets.[6]

The pattern does not hold as clearly as the above three industries when it comes to other industries. For example, the financial industry can exhibit low employment per asset in both FDI and domestic firms due to the nature of the business, but as in Section IX.F, it turns out that the size of the financial industry is not correlated with the difference in employment per asset between the two groups of firms.

VI. ANALYSIS OF SWITCHERS

The previous sections have studied the data of a single year. This section explores the time series dimension by analyzing the firms that switch ownerships between domestic and FDI firms. Although focusing on switchers implies that the sample is limited to a subset of brownfield FDI firms, and thus excludes greenfield FDI firms, the analysis has the advantage of controlling some of the firms' fixed effects.

The analysis focuses on the firms that have changed ownership status between FDI and domestic from 2013 to 2014. As in Section V.A., we use the United Kingdom as an example to visualize the exercise. The switchers are compared with non-switchers with 2 years lag and forward. Although the non-switchers are natural candidates for control groups, switchers may possess their own unique characteristics that drove them into the switchers in the first place, so the result needs to be interpreted with care. Specifically, we study the following four groups of firms.

1. Firms that are domestic firms from 2011 to 2016.
2. Firms that are domestic firms from 2011 to 2013 and FDI firms from 2014 to 2016.
3. Firms that are FDI firms from 2011 to 2016.
4. Firms that are FDI firms from 2011 to 2013 and domestic firms from 2014 to 2016.

Figure 10 shows the time series of employment per asset ratio in Eq. (1) for the four groups of the firms. One can see that the ownership change from 2013 to 2014 does not have an obvious impact on the employment per asset in itself. Rather, the always-domestic firms have higher employment per asset ratio uniformly over time. An interesting observation is that always-FDI firms do not necessarily exhibit the lowest employment per asset ratio, although the FDI-to-domestic group is based on a small sample size of 44. The same chart is plotted

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[6] Note that the regression cannot be interpreted as causality since both axes are endogenous variables and should be interpreted as prediction based on correlation.

for Russia, Germany, and all firms in the world in Section IX.G, exhibiting similar stable patterns as the United Kingdom.

Figure 10. The Four Groups Do Not Exhibit Obvious Patterns of Change in the United Kingdom
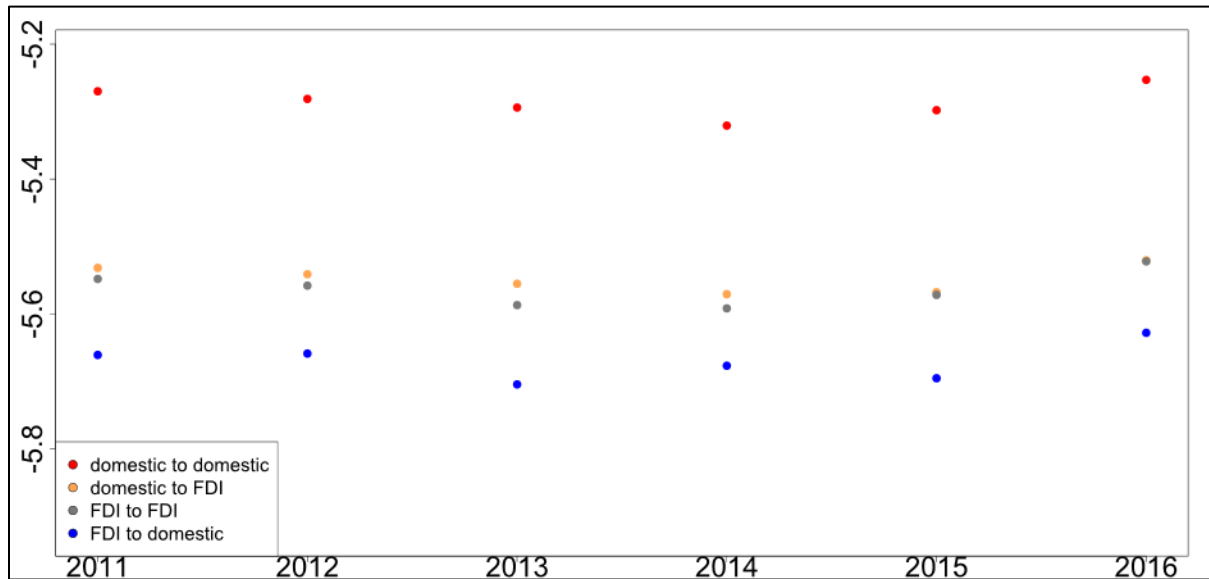
Y-axis denotes the mean of the log employment per asset ratio for the four groups of firms. There is no obvious change of pattern after the ownership change from 2013 to 2014.

The result suggests that the behavior of employment per asset is not so much driven by the ownership structure itself as by the technological characteristics of the firms that are owned or traded by foreign investors. In other words, the image of foreign vulture funds taking over firms and laying off employees for cost-cutting is not what the data show. Rather, the firms that receive cross-border investment possess certain production technologies in the first place. One policy implication is that, although domestic firms employ more workers per asset, policies to force changes of ownership from FDI to domestic firms do not necessarily lead to immediate job creation, unless the underlying production technology also changes.

A regression-based analysis can be conducted using the difference-in-difference framework. Section IX.H applies the regression with firm and time fixed effects to all the firms in all economies. Consistent with the analysis in the current section, it is shown that there is no systematic difference before and after the ownership change.

VII. CONCLUSION

This paper has shown that, in most economies, domestic firms employ more workers than FDI firms for each dollar of assets. In the industry level analysis of the United Kingdom, it is shown that the aggregate result is not driven by certain industries, and instead, domestic firms tend to employ more workers per asset than FDI firms in all industries. The switchers'

analysis suggests that the change of ownership itself does not have immediate impacts on the behavior of employment per asset, and therefore, the difference between FDI and domestic firms may rather reflect the technological difference of the firms owned by foreign investors rather than the ownership structure itself.

The policy implications can vary across economies. In the economies where policies to attract FDI are active, the results may move policy makers to demand additional commitment from foreign investors to generate more benefits in the recipient economy. The results in the switcher's analysis (meaning ownership changes from domestic to foreign or vice versa) also suggest that the intervention in the ownership is not likely to change the behavior of employment per asset since ownership is an endogenous response to other characteristics of the firms that affect employment per asset.

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IX. ANNEXES

A. Summary Statistics of Data Cleaning

Table 2. Reduction of Observations Due to Lack of Asset or Number of Employees

Economy	# of obs Before Cleaning	# of obs After Cleaning	Survival Rate	# of FDI Firms	# of Domestic Firms
AU	10873	5053	0.464729	1307	3746
AT	13428	7034	0.523831	1612	5422
BE	18526	12683	0.684605	2240	10443
BM	684	280	0.409357	96	184
BA	1552	1202	0.774485	248	954
BR	5290	1374	0.259735	253	1121
BG	5614	3979	0.708764	846	3133
CN	56589	22378	0.395448	5071	17307
HR	2456	2107	0.857899	468	1639
CZ	19719	9586	0.48613	2857	6729
DK	9046	4796	0.530179	1100	3696
EE	1593	937	0.588198	370	567
FI	7530	4774	0.633997	968	3806
FR	74164	38764	0.522679	5391	33373
DE	116706	69166	0.592652	8673	60493
GR	3769	3490	0.925975	616	2874
HK	5289	401	0.075818	302	99
HU	6756	5140	0.760805	850	4290
IN	18062	1539	0.085207	249	1290
ID	550	524	0.952727	180	344
IE	7682	2472	0.321791	903	1569
IT	70652	54412	0.770141	5163	49249
JP	45313	31328	0.691369	425	30903
KZ	845	695	0.822485	99	596
KR	28835	19751	0.684966	1253	18498
LV	1691	1303	0.77055	498	805
LT	1923	1627	0.846074	468	1159
LU	3636	772	0.212321	341	431
MK	1235	722	0.584615	122	600
MX	1938	535	0.276058	54	481
MD	614	276	0.449511	33	243
ME	267	182	0.681648	57	125
NL	31084	7492	0.241024	1984	5508
NO	20423	11503	0.563238	1592	9911
PK	567	376	0.663139	64	312

Economy	# of obs Before Cleaning	# of obs After Cleaning	Survival Rate	# of FDI Firms	# of Domestic Firms
PE	214	146	0.682243	70	76
PL	18590	5461	0.29376	1479	3982
PT	10981	8400	0.764958	1561	6839
RO	9453	7281	0.770232	2463	4818
RU	75713	66875	0.88327	7260	59615
RS	3760	2400	0.638298	523	1877
SK	4614	3574	0.774599	1349	2225
SI	2192	1599	0.729471	405	1194
ES	48148	33921	0.704515	4326	29595
LK	527	172	0.326376	44	128
SE	20405	13321	0.65283	2760	10561
CH	22143	310	0.014	87	223
TW	2169	1544	0.711849	57	1487
TR	4691	165	0.035174	46	119
UA	9242	7805	0.844514	1579	6226
GB	105246	35116	0.333656	8207	26909

## B.   An Alternative Measure Based on Shareholders' Funds

The main analysis in Section IV is based on the number of employees per asset, but there can be other ways to measure the financial resources used to operate the firm. For example, the same exercise can be conducted by replacing the total assets with shareholders' funds

$$e^{equity} = \log_{10}\left(\frac{Number\ of\ employees}{Shareholders'funds}\right) \tag{5}$$

One problem of this measure is that often the shareholders' funds are negative. This can happen for example when the firm runs a deficit, but it gets loans from banks guaranteed by its parent company. We drop the observations with negative shareholders' funds and conduct the same exercise as Figure 3.

Figure 11 shows that the qualitative feature of the main analysis remains similar if the total asset is replaced by shareholders' funds. The result can be interpreted as indicating the robustness of the main analysis, suggesting that domestic firms on average employ more workers than FDI firms for one of unit of financial resource.

Figure 11. Domestic Firms Employ More Workers in Most Economies for Each Dollar of Equity
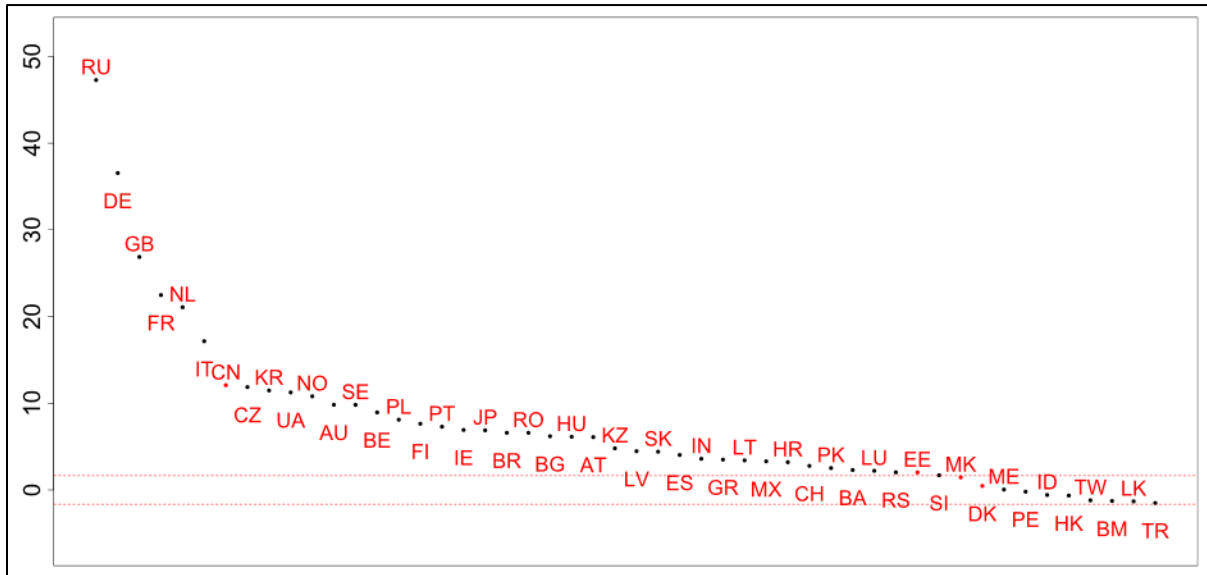
A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of equity. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.

C. Alternative Definition of FDI Firms

The definition of FDI firms in the main analysis of section IV is based on the 10 percent threshold of foreign shareholders. Although the 10 percent threshold is the internationally accepted definition of *BPM6*, one might be concerned about whether the result survives when a different threshold is chosen.

One natural candidate for the threshold is 50. In *BPM6*, the shareholders with more than 50 percent share are defined as the investors who can exercise control, while those with 10 percent share are considered to be able to exercise a significant degree of influence but not control. Thus, the alternative threshold 50 narrows down the FDI firms to those controlled by foreign shareholders and extends the set of domestic firms by including those that are not controlled but are under the influence of foreign shareholders.

Figure 12 shows that the qualitative result survives even if the definition of FDI firms adopts the 50 percent threshold instead of 10. Thus, the behavior of FDI firms is mostly driven by those that are controlled by foreign shareholders with more than 50 percent share. Table 3 shows the number of firms by the share held by foreign investors. Indeed, one can see that the majority of FDI firms are controlled by foreign investors.

Figure 12. Qualitative Result Survives if FDI Firms are Defined Using 50 Percent Threshold
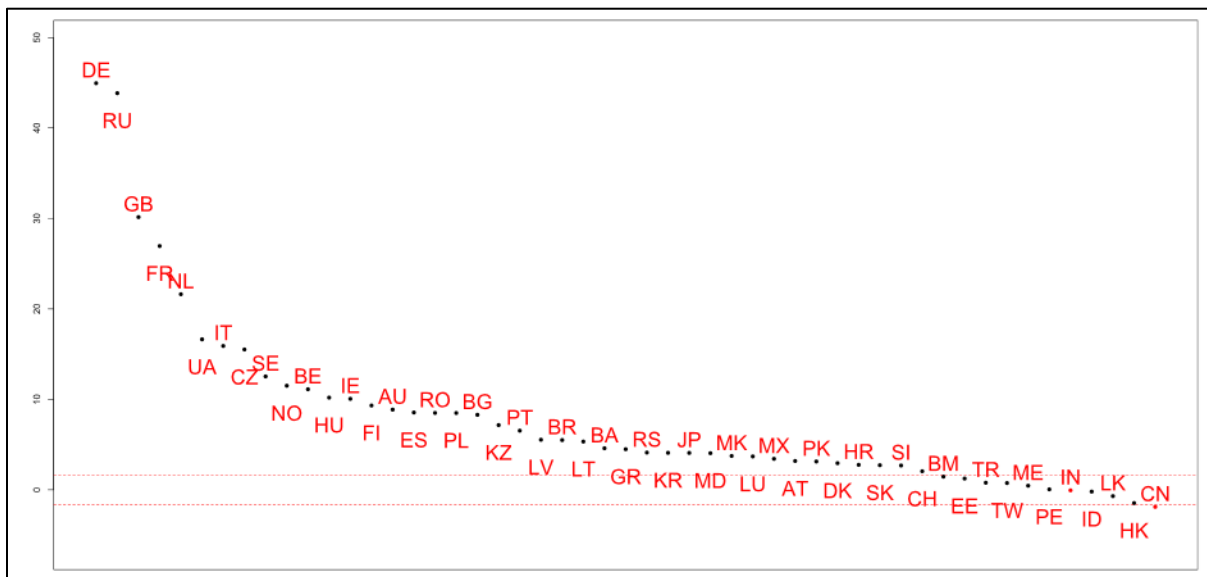
A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.

Table 3. Number of Firms by the Share Held by Nonresident

Share Held by Foreigners	[0,10)	[10,50)	[50,100]
AU	3746	137	1169
AT	5422	165	1446
BE	10443	153	2087
BM	184	69	27
BA	954	62	186
BR	1121	67	186
BG	3133	113	737
CN	17307	744	4337
HR	1639	55	413
CZ	6729	271	2579
DK	3696	56	1042
EE	567	48	322
FI	3806	64	904
FR	33373	582	4809
DE	60493	1324	7349
GR	2874	156	460
HK	99	50	252
HU	4290	48	802
IN	1290	143	106
ID	344	108	72
IE	1569	79	824
IT	49249	737	4426
JP	30903	256	169
KZ	596	32	66
KR	18498	333	920
LV	805	77	421
LT	1159	75	393
LU	431	66	275
MK	600	19	103
MX	481	10	40
MD	243	10	23
ME	125	19	38
NL	5508	53	1931
NO	9911	137	1454
PK	312	27	37
PE	76	29	41

| Share Held by Foreigners	[0,10)	[10,50)	[50,100]
PL	3982	292	1187
PT	6839	220	1341
RO	4818	426	2037
RU	59615	1022	6100
RS	1877	70	453
SK	2225	157	1192
SI	1194	53	352
ES	29595	521	3805
LK	128	26	18
SE	10561	226	2534
CH	223	10	78
TW	1487	41	16
TR	119	12	34
UA	6226	415	1164
GB	26909	468	7739

D. Alternative Definition of SPEs: Restrict SPEs to FDI Firms

In the main analysis of Section IV, we have dropped all the SPEs defined as the firms with less than five employees. Although the criteria follow the recommendation of IMF (2018) as discussed in Section III.B, the crude nature of the definition may raise concerns about the robustness of the main result.

One concern of defining all the firms with less than five employees as SPEs is that it might exclude many domestic firms that are engaged in real economic activities, such as self-employed and small and medium-sized enterprises (SMEs). Thus, this section defines SPEs to be the FDI firms with less than 5 employees and assume none of the domestic firms are SPEs.

Figure 13 presents the result. One can see that the inclusion of domestic firms with less than five employees changes results for several economies, but the majority remains the same. One caveat is that Orbis may not have better coverage for larger firms, so the analysis of self-employment and SMEs may not be representative.

Figure 13. The Result Changes for Some but Remains Similar for Most Economies if SPEs are Removed from Only FDI Firms
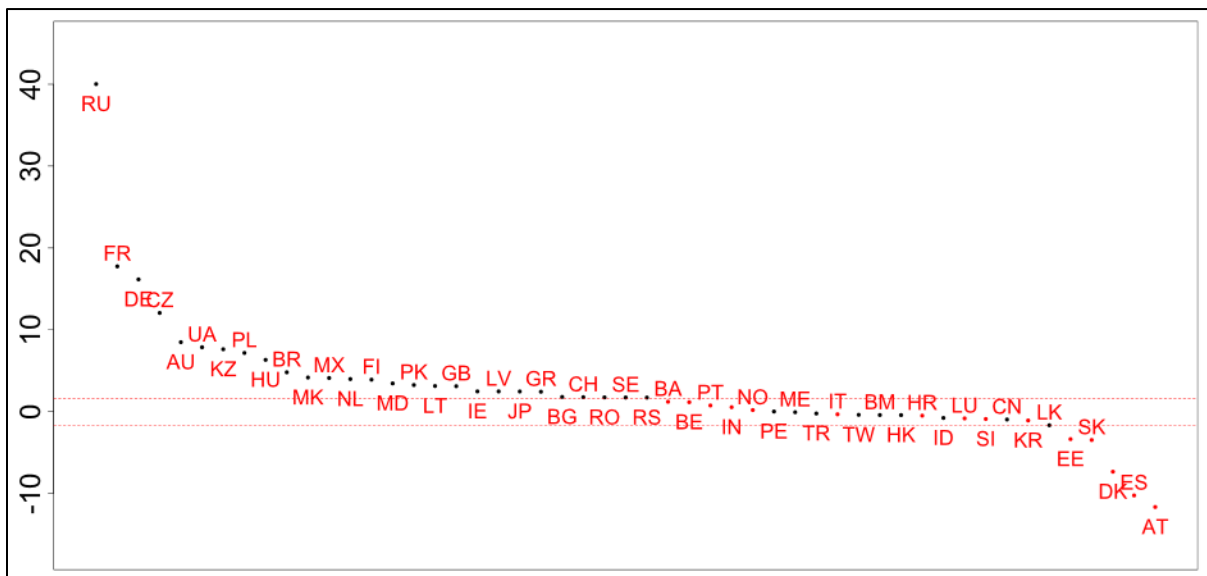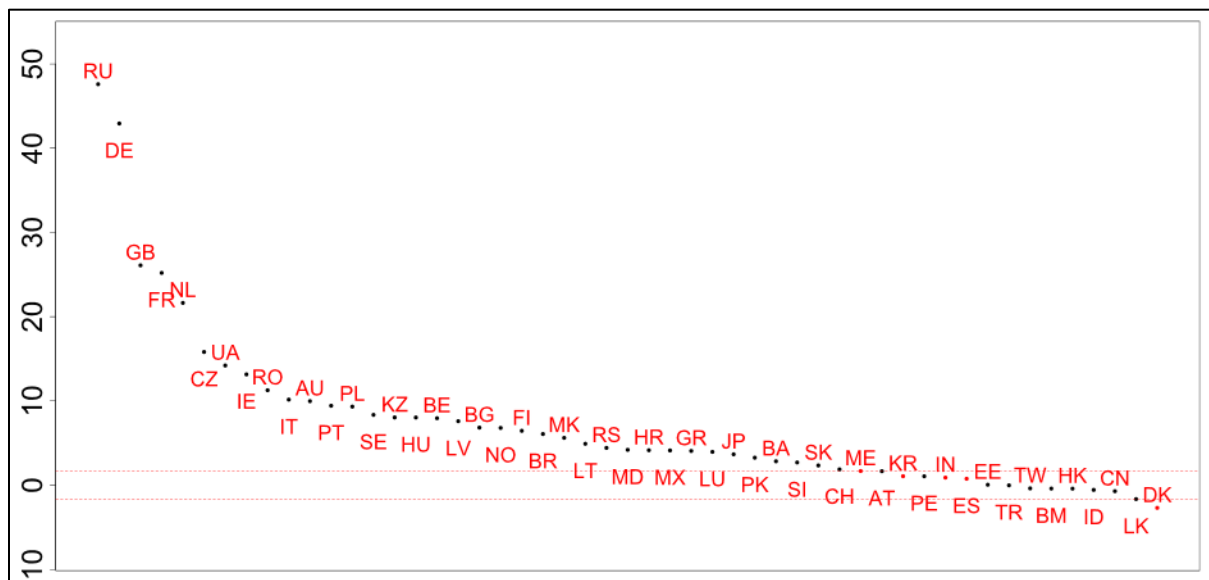

A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.

E. Alternative Definition of SPE: Lower Five Percentile of the Employee Distributions

The threshold of five employees in the main analysis of Section IV might exclude firms disproportionately from the sets of FDI and domestic firms since the employment distributions of the two groups might have different shapes. To address this concern, this section defines SPEs to be the firms in the lower five percentile of the employment distributions of the FDI and domestic firms. It turns out that, as shown in Figure 14, the result is almost the same as the main analysis in Figure 3.

Figure 14. The Result Remains Similar for Most Economies if SPEs Are Defined as Firms in Lower Five Percentile of the Number of Employees


A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. Red dots correspond to those whose result of the hypothesis test changed from Figure 3.

F. Industry Structure and Difference in Employment per Asset: Finance Industry

Figure 15. The Size of Finance Sector Does Not Tell Much About Difference in Employment per Asset
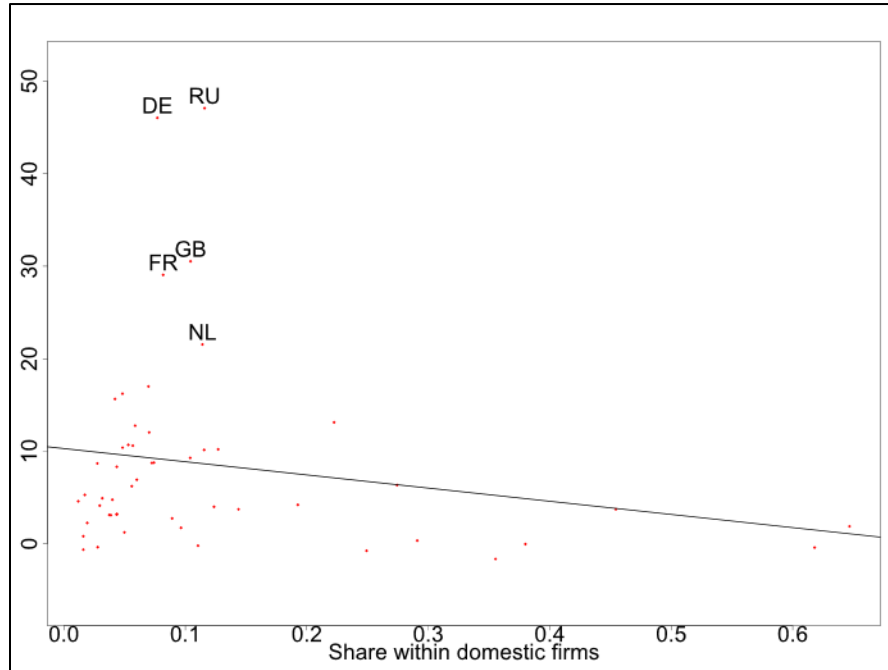
Y-axis denotes the t-statistics. A larger t-statistic suggests that it is more likely that on average domestic firms employ more workers than FDI firms for each dollar of assets. X-axis denotes the share of finance industry within domestic firms.
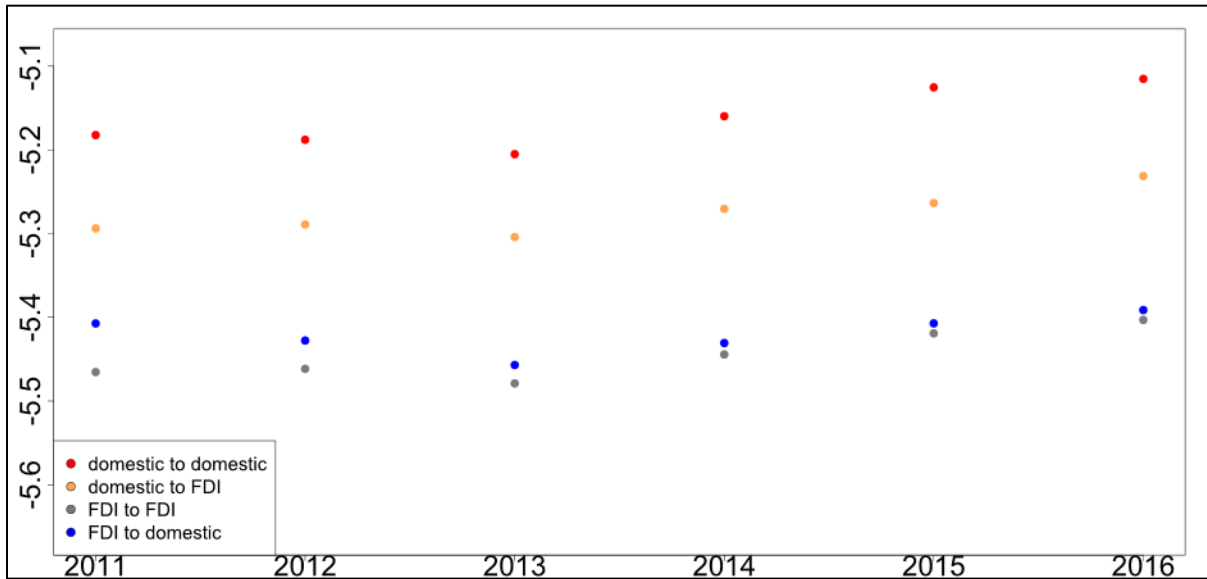
G. Switcher's Analysis: Russia, Germany, All Firms in the Sample

Figure 16. Switcher's Analysis for Russia
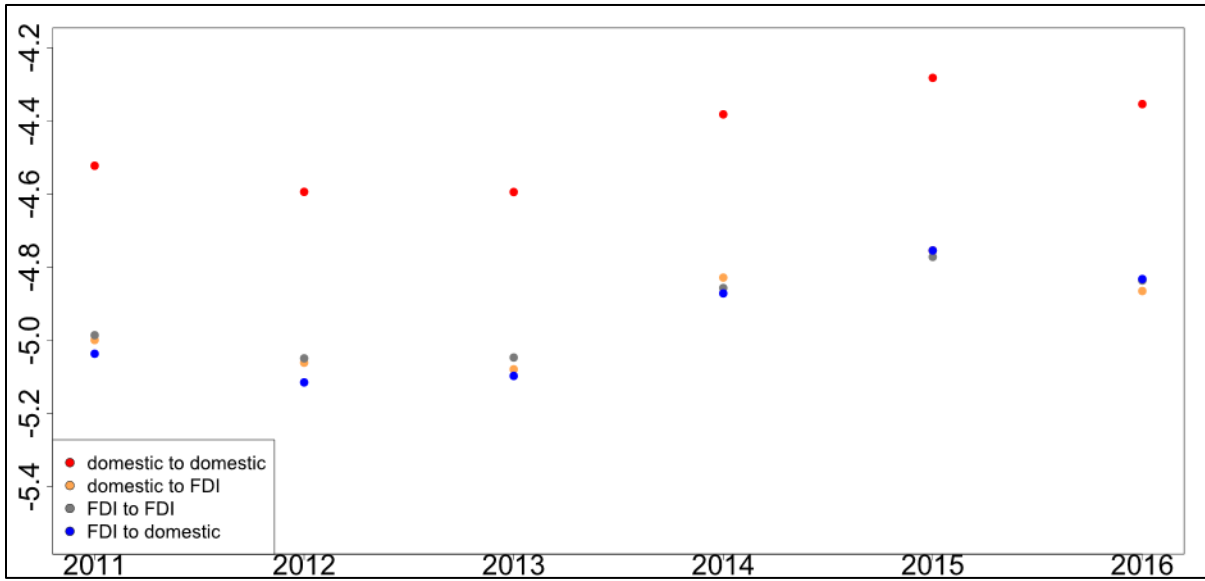
Y-axis denotes the mean of the log employment per asset ratio for the four groups of firms. There is no obvious change of pattern after the ownership change from 2013 to 2014.
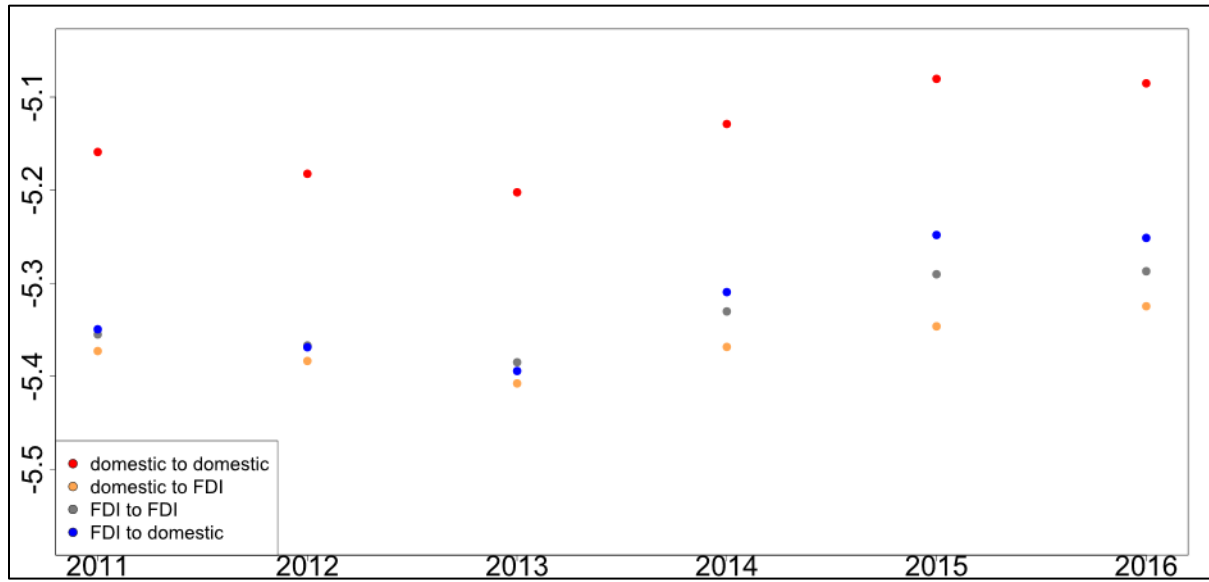
Figure 17. Switcher's Analysis for Germany

Y-axis denotes the mean of the log employment per asset ratio for the four groups of firms. There is no obvious change of pattern after the ownership change from 2013 to 2014.

Figure 18. Switcher's Analysis for All Firms in All the Countries in the Sample

Y-axis denotes the mean of the log employment per asset ratio for the four groups of firms. There is no obvious change of pattern after the ownership change from 2013 to 2014.

H. Switcher's Analysis: Difference-in-Difference

For each pair of (1) control group 1 and experimental group 2 and (2) control group 3 and experimental group 4 as defined in section VI, we run the following regression

$$e_{it} = \beta_i + \beta_t + treat_i + treat_i \left(\sum_{\tau=2011}^{2012} \beta_\tau 1_{t=\tau} + \sum_{\tau=2014}^{2016} \beta_\tau 1_{t=\tau} \right) + \epsilon_{it},$$

where e_{it} is the log employment per asset for Firm i at year t, (β_i, β_t) represents the fixed effects for the firm and year, $treat_i$ is a dummy variable with 1 if Firm i belongs to the experimental group that switches the ownership.

The interaction of year and the treatment dummy is included to test the pre-treatment parallel trend of the switcher and the non-switchers. The interaction term for 2013 is omitted so that the year 2013 serves as the baseline. The standard error is clustered at the firm level to allow correlations within-firm across observations in different years.

The switch of ownership has an effect if β_{2011} and β_{2012} are close to 0 and β_{2014} is not. In this case, the two groups have a similar trend before the treatment, but after the switch, there is a change in the employment per asset for the switchers compared to the non-switchers. β_{2015} and β_{2016} tell whether the effect of the ownership change increases or dies out.

Table 4 below shows the results of the two regressions. The first one is the comparison between group 1 and group 2 firms. The second regression is the comparison between group 3 and group 4 firms. The p-values are put in the parentheses. All the coefficients are insignificant, suggesting that the difference between the two groups is not the consequence of ownership change but rather an endogenous behavior. The result is also consistent with the aggregate results in Figure 10 and Section IX.G.

Table 4. Difference in Difference Analysis

Variable	Dependent variable: log of employment per asset	
	Group 1: dom-dom v.s.dom-fdi	*Group 2: fdi-fdi v.s. fdi-dom*
β_{2011}	-0.0052	-0.0135
	(0.8259)	(0.6750)
β_{2012}	-0.0109	-0.0070
	(0.6365)	(0.8183)
β_{2014}	-0.0087	-0.0084
	(0.7280)	(0.7870)
β_{2015}	-0.0053	-0.0093
	(0.8220)	(0.7736)
β_{2016}	-0.0137	-0.0057
	(0.5818)	(0.8549)
Firm fixed effect	Yes	Yes
Time fixed effect	Yes	Yes
Observations	Balanced Panel: n = 206252, T = 6, N = 1237512	Balanced Panel: n = 29354, T = 6, N = 176124
R^2	4.5682e-07	1.474e-06

P-values are put in the parentheses.