The Dragon Is Flying West: Micro-level Evidence of Chinese Outward Direct Investment

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Outward direct investment (ODI) from the People's Republic of China (PRC) is surging. A common perception is that it was driven by the country's resource-seeking and technology-seeking motives. Using a new, unique, and comprehensive dataset that covers close to 10,000 Chinese ODI deals from 1998 to 2009, we find that in contrast to the common perception, over half of the ODI deals are in service sectors, with many of them appearing to be export-related. In addition to documenting the pattern and trend of the PRC's ODI, we empirically examine both the determinants and effects of ODI at the firm level. We find that ex ante larger, more productive, and more export-intensive firms are more likely to start investing abroad. Using matching estimation techniques, we find that ODI is associated with better firm performance, including higher total factor productivity, employment, and export intensity, and greater product innovation. To assess the relative contributions of technology transfer, export promotion, and resource seeking to the positive effects of ODI, we use ODI data merged with customs transaction-level trade data. We find that firms' ODI participation is associated with significantly better trade performance, measured by export and import volumes, export and import unit values, and number of export destinations. Contrary to perceived technology-seeking and resource-seeking motives, we find no evidence that ODI firms import more capital or intermediate inputs compared to non-ODI firms.

Keywords: foreign direct investment, trade facilitation, resource seeking, People's Republic of China
JEL codes: F1, F2

I. Introduction

The People's Republic of China (PRC) is the world's fifth largest source of foreign direct investment in 2010 (in terms of flow), after the US, France, Germany,

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and Japan.[1] He et al. (2012) predict that the PRC's cumulative outward direct investment (ODI) would probably exceed $5 trillion in 2020, increasing from a mere $3 billion in 2010. Given the PRC's sheer size, the volume of its ODI may be expected; but considering its relatively early stage of economic development, its recent surge in ODI is surprising to many. While it is still a fairly new phenomenon, reports about Chinese ODI often hit news headlines, such as Lenovo's acquisition of IBM PC units, CNOOC's rejected acquisition of Unocal, Huawei's investment in 3Leaf System, and Dalian Wanda Group's acquisition of AMC Theaters. The target sectors are widespread, and even as mundane a product as pork has attracted tremendous media attention recently due to Shuanghui's acquisition of Smithfield. Tensions in developed countries towards Chinese ODI are rising, similar to the 1980s when Japanese firms were making high-profile acquisitions.

Despite the rising concerns, existing studies about Chinese ODI are either descriptive in nature or based on aggregate data. Among the recent studies that use micro data, the focus has been on understanding the motives of ODI, with the primary goal to verify the media hype about the PRC's attempt to control natural resources and technology around the world.[2] Little research has been done about which firms are engaged in ODI and how ODI may enhance their performance.

This paper has two goals. It first documents several stylized facts about Chinese ODI. A point of departure from all existing studies is that we document our facts based on the most comprehensive micro-level data on Chinese ODI. The dataset, which was made available by the PRC's Ministry of Commerce, covers close to 10,000 ODI deals of over 7,000 firms in all sectors over the period of 1998–2009. Consistent with the existing literature, we find that the motives of Chinese ODI can be broadly categorized into three types—resource seeking, technology seeking, and market seeking (export promotion). In contrast with the common perception, both the aggregate statistics and our micro data lend no support for the popular speculation that the recent rise of Chinese ODI is driven by resource seeking. Instead, we find that business services and wholesale/retail trade have accounted for a large and increasing share of Chinese ODI in terms of the number of deals as well as the volume of flows. The presence of private firms in Chinese ODI is also increasing. Half of the top 20 destinations of its ODI are in Asia.

The second goal of the paper is to analyze the firm-level determinants and effects of ODI, which have implications for other emerging countries. To obtain a long list of firm performance measures, we rely on manufacturing firms' survey data from the PRC's National Bureau of Statistics, which we merge with the ODI firm list.[3]

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[1] UNCTAD (http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx). The PRC's ODI flow rank is 17th in 2006, 12th in 2008, 5th in 2009, and 11th in 2011.

[2] See, for example, Cheng and Ma (2007) and Huang and Wang (2013).

[3] Given that a large fraction of the ODI firms in the PRC are non-manufacturing, the drawback of using manufacturing survey is that all ODI firms in the service sectors are dropped in our analysis. Notice that a firm can be

By estimating a probit model of ODI participation, we find that more productive (measured by total factor productivity), larger (measured by employment), and more export-intensive firms are more likely to invest abroad. These findings lend support to the studies that typically assume higher fixed costs of horizontal foreign direct investment (FDI) compared to that of exporting. We also find that relative to domestic private firms, state-owned enterprises (SOEs) are more likely to invest abroad, consistent with the conventional view that the PRC's government is behind a lot of the country's ODI flows. In contrast, foreign firms are less likely to undertake ODI.

We then apply the propensity-score matching techniques commonly used in the program evaluation literature to assess the average treatment effects of ODI on the treated firms' performance. We find that ODI has a positive effect on a wide range of firms' performance measures including value added, employment, productivity, export intensity, R&D intensity, and the propensity to innovate new products.

Since the positive effects of ODI on firm performance can be due to technology transfer, resource seeking, or export promotion, we use customs transaction-level trade data merged with our ODI list to shed light on the relative contributions of the three channels. By employing propensity-score matching techniques again to establish causality, we find that firms' ODI participation is associated with a significant improvement in their trade performance, measured by export and import volumes, export and import unit values, and number of export destinations. To the extent that unit value proxies for the quality of goods, these results imply that ODI induces quality upgrading of both imports and exports. In other words, these results show that horizontal FDI from the PRC complements rather than substitutes firms' trade. These findings are consistent with the idea that exporting entails high fixed costs, such as marketing and information signaling, which can be reduced by ODI. Finally, we find no evidence based on the composition of firms' imports and exports that ODI is associated with technology or resource seeking.

In summary, our paper shows that export-promoting ODI from emerging countries can potentially raise and sustain the benefits of exporting, which in turn contribute to the countries' structural transformation from low-skill manufacturing to high-skill manufacturing, and eventually from manufacturing to high-skill services. Our findings have important policy implications for countries beyond the PRC, which have been experiencing rising labor costs after years of FDI and export-promotion policies.

The paper proceeds as follows. Section II reviews the related literature. Section III describes our three data sources. Section IV uses the new ODI data

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classified as a service firm in the ODI list but can still be merged with the NBS data, as long as it has some businesses in manufacturing.

to describe overall patterns of ODI firms. Section V presents the characteristics of ODI from the PRC. Section VI examines the determinants and the effects of ODI at the firm level. Section VII focuses on the export-facilitation motive and examines how ODI is related to firms' trade patterns and performance. The final section concludes with some policy discussions.

II. Literature Review

Our paper is related to various strands of literature. First, it relates to the classical theory of multinational enterprises (MNEs) about how firms use their capabilities and resources to generate competitive advantage over indigenous firms in host countries (Caves 1971, Hymer 1976, Kindleberger 1969 and 1970). More recent studies show that in addition to facilitating foreign sales, firms undertake ODI to acquire resources, assets and technology to develop their competitive advantage (Child and Rodrigues 2005, Makino et al. 2002, Mathews 2006).[4]

Second, our paper contributes to the growing literature on Chinese ODI. Most of the earlier studies were descriptive in nature, sometimes relying on case studies (e.g., Deng 2003 and 2004, Wu and Chen 2001). Cai (1999) proposes that Chinese firms invest overseas mainly to seek markets, natural resources, technology, managerial skills, and financial capital.[5] More recent studies focus on the empirical examination of the determinants of Chinese ODI (e.g., Buckley et al. 2007), but most of these studies rely on aggregate data for analysis. There are a few notable exceptions that use micro-level data. For instance, Luo et al. (2011) show empirically that ODI by private Chinese firms had been prompted to exploit firm-specific advantages as well as to tackle market imperfections due to the underdevelopment of the PRC's domestic institution. Other studies on Chinese overseas mergers and acquisitions (M&As) support the resource-seeking and technology-seeking motives (Antkiewicz and Whalley 2007, Rui and Yip 2008). Using aggregate data, Cheng and Ma (2007) and Cheung and Qian (2009) show that the PRC's investment was motivated by both market seeking and resource seeking. However, they find no evidence that its investment in Africa and other oil-producing countries account for the rise. In addition, they find that the PRC's international reserves and exports to developing countries tended to complement ODI. Our findings based on firm-level data are largely consistent with the macro patterns they document.

Based on detailed firm-level data from Zhejiang province, Huang and Wang (2013) empirically identify export facilitation as the third motive, which is as important as the other two emphasized by earlier studies. Our paper finds supporting

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[4]Here, technology is broadly defined to include production technology, management skills, and brand names.

[5]Deng (2004) identified two additional motives: strategic assets (e.g., brands, marketing networks) and diversification. The focus of our paper focuses on the nonfinancial type of ODI. Clearly, because the PRC was itself a low-cost production base, cost minimization was not a major motivation of Chinese ODI.

evidence but is unique in two respects. We use a much more comprehensive micro dataset from the PRC, which covers all industries and provinces. We merge our ODI data with customs transaction-level data and manufacturing survey data so that we can assess the effects of ODI on firm performance. In particular, we examine how exporters and importers benefit from ODI.

Third, our paper contributes to the large literature on the relation between FDI and trade. Besides the early theoretical literature (Krugman 1980, Helpman 1984), there is an extensive empirical literature on the relation between FDI and trade. On the one hand, there are studies showing substitution between FDI and exports (Brainard 1997; Markusen and Venables 2000; and Helpman, Melitz, and Yeaple 2004). The key idea is the proximity concentration trade-off (i.e., a trade-off between transportation costs and firm level returns to scale). These models are explicitly designed for horizontal FDI. On the other hand, some studies show that FDI and exports can be complements (Lipsey and Weiss 1981 and 1984; Yamawaki 1991, Clausing 2000). By using Japanese product-level data on foreign production in the US and exports to the US, Blonigen (2001) finds both substitution and complementarity effects of FDI on exports. Substitution is likely to be found for final goods exports, while complementarity is likely to be found for intermediate inputs and finished products. A more recent strand of literature studies the complex interactions between ODI and exports by highlighting the export-platform type of exports by multinational firms (Antràs 2003; Grossman, Helpman, and Szeidl 2006; Ekholm, Forslid, and Markusen 2007; Yeaple 2003; Conconi et al. 2013).[6] Our paper finds that FDI and trade are complements in the PRC.

III. Data

We use data on ODI's by Chinese companies provided by the Chinese Ministry of Commerce (MOFCOM). The dataset covers all ODI transactions that were approved by the MOFCOM between January 1, 1998 and December 31, 2009. For each ODI deal, the dataset reports the name of the investing firm, the firm's sector of business, the province of origin, and the recipient country of the ODI flow. There is, however, no information on the amount of the deal or the name of the target for M&As. There are altogether 9,744 deals from 7,202 unique firms for the 12-year period (1998–2009) included in the dataset. Since all Chinese firms need to be approved by MOFCOM for each cross-border deal, this data source is the most official and comprehensive among all other firm-level sources that have been used. To verify the representativeness of our data, we compare the number of deals in our

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[6]By considering a dynamic model with uncertainty and learning, Conconi et al. (2013) show that ODI and export are substitutes in the short run but can be complements in the long run.

data with those studied by Huang and Wang (2013). Our dataset covers 90% of the deals from Zhejiang, the province they focus on over the same sample period.[7]

The second data source is the Annual Survey of Industrial Enterprises, conducted by the PRC's National Bureau of Statistics (NBS) over the period of 1998–2009. The survey includes all industrial firms that are either state owned or non-state owned with sales above CNY5 million (around $600,000 during the sample period). The survey covers all manufacturing, mining, and utilities sectors. The number of firms covered in this data set ranges from around 150,000 in 1998 to 431,000 in 2007. The dataset contains information on ownership structure, tangible assets, number of employees, research and development (R&D), advertising, value added, sales, new product sales, and exports. Readers are referred to Ma et al. (2014) for a more detailed description.

The third data source is the transaction-level trade data from the PRC's customs over the period of 2000–2006. This dataset contains information on values (in US dollars), quantities, and prices of all import and export transactions between the PRC and over 200 destination countries at the HS 6-digit level (over 5,000 products).[8] This level of disaggregation is the finest for empirical studies in international trade—i.e., transactions at the firm-product-country-month level. For each trading firm, the dataset also provides information on ownership type (state, private, foreign) and customs regime (processing and non-processing).[9] Mainly based on firm names, we merge the ODI data with the firm-level manufacturing data and the transaction-level trade data, respectively. More details will be described below.

IV. Overall Patterns of ODI Firms

Before analyzing the three micro-level datasets, let us highlight an overlooked pattern simply based on aggregate data. Using sector-level data on Chinese ODI reported by MOFCOM for the period of 2006–2010, Figure 1 reveals that the "mining" sector used to account for about 40% of total Chinese ODI flows in 2006, followed by "leasing and business services" which contributed about 21% of the total. Since then, the share of "mining" in ODI flows declined gradually, while that of "leasing and business services" increased continuously until it became the most

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[7]Liao and Tsui (2012) compare the aggregate ODI data from the PRC's Ministry of Commerce (MOFCOM) and the transaction-level data put together by the Heritage Foundation and show that the former dataset systematically underreports the PRC's ODI in mining. Their main explanation for the discrepancy is that MOFCOM did not track the final destination of ODI that went through tax havens (e.g., Hong Kong, China; Virgin Islands, etc.). While we verify that the overall patterns and the regression results remain robust to the exclusion of tax havens—in particular Hong Kong, China—two more remarks are in order. First, their datasets begin in 2005, which make the comparison between ours and theirs difficult. Second, it is not clear why the Heritage Foundation dataset provides a more comprehensive coverage of the PRC's ODI transactions compared to MOFCOM data. Selection could be an issue in the Heritage Foundation data as well.

[8]Example of a product: 611241 – Women's or girls' swimwear of synthetic fiber, knitted, or crocheted.

[9]Readers are referred to Fernandes and Tang (2013) for details of this dataset.

Figure 1. **Share of ODI Flows (2006–2010)**
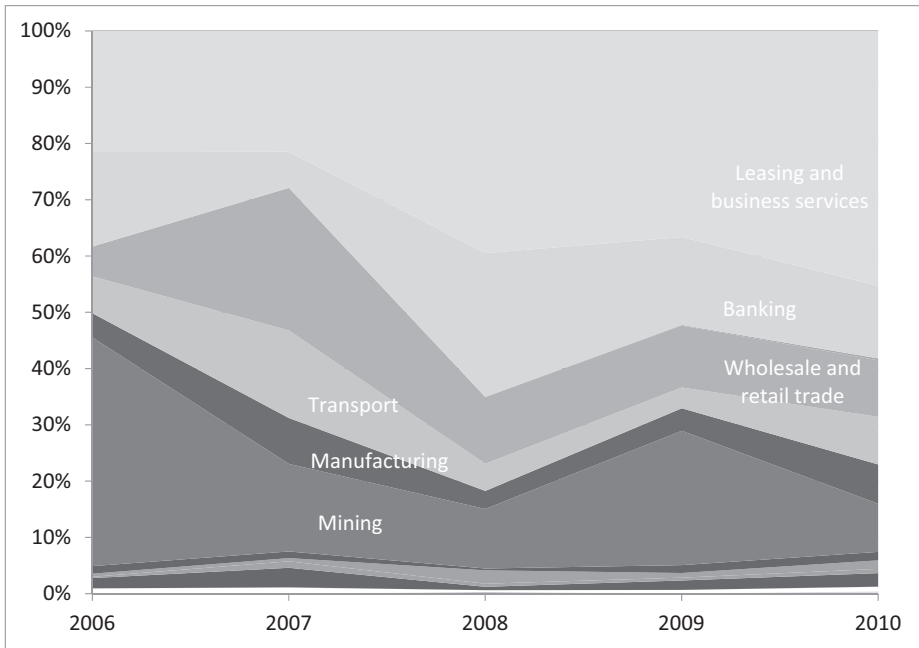
Source: The PRC's Ministry of Commerce.

prevalent sector in terms of Chinese ODI flows (44% of the total). Together with "wholesale and retail trade," these two broad sectors accounted for over half of the aggregate volume of the PRC's ODI in 2010, compared to 27% in 2006. Mining and banking, on the other hand, accounted for only 8% and 13% of the PRC's total ODI flows in 2010, respectively. These findings, based on official statistics, do not support the common perception that the rising ODI from the PRC is due to rising financial outflows or resource seeking.[10] Instead, these aggregate patterns and trends suggest that the recent rise in Chinese ODI could be related to its continuous growth in exports. Motivated by these aggregate patterns, we will verify how firms' ODI are related to their overall and export performance.

The aggregate patterns outlined above say nothing about which firms are engaged in ODI, where they invest, and how ODI may enhance their performance. In the rest of the paper, we will use our firm-level ODI data along with official micro-level balance sheet and trade data to analyze the determinants and effects of ODI. Our dataset contains 9,744 deals conducted by 7,202 unique companies that were approved by the PRC's MOFCOM between 1998 and 2009. Table 1 reports

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[10]There are concerns that the MOFCOM dataset is not representative. We will discuss the quality of the data and other related research in Section 3.

Table 1. **ODI Deals Breakdown, by Year**

Year	Frequency	Percent
1998	19	0.19
1999	9	0.09
2000	20	0.21
2001	21	0.22
2002	66	0.68
2003	79	0.81
2004	244	2.50
2005	1,091	11.20
2006	1,412	14.49
2007	1,632	16.75
2008	2,091	21.46
2009	3,060	31.40
Total	**9,744**	**100.00**

ODI = outward direct investment.
Source: The PRC's Ministry of Commerce.

the distribution of the deals per year during our sample period of 1998–2009.[11] As expected, the number of ODI deals increased significantly from 19 deals in 1998 to 3,060 deals in 2009. The increase is particularly sharp in 2005, when the number of deals increased from 244 to 1,091 (over a 300% increase). Table A2 in the appendix shows that most of the increase is due to the massive liberalization of ODI by domestic private firms.[12]

Table 2 tabulates the distribution of Chinese ODI deals by host country in our data. Between 1998 and 2009, Hong Kong, China appears as the major recipient of ODI from the PRC, accounting for close to 20% of total deals. One may argue that it may not be the final destination of Chinese ODI, as there can be a lot of transit or round-trip FDI. First, firms in the PRC may take advantage of the low tax regime and more developed legal and financial institutions in Hong Kong, China to raise funds. Second, many firms in the PRC may choose to set up subsidiaries and even headquarters to channel capital to a third country or even back to the PRC. Both transit and round-trip FDI through Hong Kong, China are well-known. A drawback of our dataset is that we have no information to separate both types of ODI from genuine ODI to Hong Kong, China. We will check the robustness of our main results by excluding Hong Kong, China as the host country of ODI.

After Hong Kong, China, the US comes as the second most important recipient of ODI, accounting for 9.4% of the total number of deals. Following the US are

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[11]Cheng and Ma (2007) pointed out that the gap between official statistics and figures found in news reports appears to be big. We therefore focus mostly on the distribution of ODI across sectors and countries, and their associated impact, rather than the actual amount of ODI when reporting our summary statistics.

[12]According to Cheng and Ma (2007), the Ministry of Commerce along with the All-China Federation of Industry and Commerce started a discussion on policy reforms that encourage private firms to go overseas. A draft document surfaced in 2006, which called for stronger support for domestic private and foreign firms in the areas of taxation, finance, insurance, and foreign exchange.

Table 2. **Top 20 Destinations of the PRC's ODI**

Country	Frequency	Percent
Hong Kong, China	1,946	19.97
United States	918	9.42
Russian Federation	551	5.65
Viet Nam	464	4.76
United Arab Emirates	370	3.80
Japan	360	3.69
Korea, Rep.	299	3.07
Germany	270	2.77
Lao PDR	267	2.74
Australia	236	2.42
Indonesia	180	1.85
Canada	167	1.71
Singapore	167	1.71
Thailand	143	1.47
Nigeria	137	1.41
United Kingdom	134	1.38
India	128	1.31
Mongolia	102	1.05
Kazakhstan	101	1.04
Malaysia	95	0.97

ODI = outward direct investment.
Source: The PRC's Ministry of Commerce.

the Russian Federation and Viet Nam, respectively. Interestingly, the United Arab Emirates (UAE) is the fifth important recipient country. To the extent that UAE is a major oil exporter, the high ranking of UAE as a major recipient of the PRC's ODI provides some support for the resource-seeking hypothesis (Antkiewicz and Whalley 2007, Rui and Yip 2008). It is worth noting that out of the top 20 Chinese ODI destinations (in terms of the number of deals), 12 are in Asia. The prevalence of Asian countries among the top hosts is consistent with the sectoral pattern that horizontal ODI (leasing and business services, along with wholesale and retail trade) accounts for the majority of ODI flows in recent years, rather than technology-seeking or resource-seeking ODI as commonly speculated.

Table 3 shows the numbers of deals by regions (e.g, Asian versus non-Asian, OECD versus non-OECD, and so on) in our sample. The average fraction of Chinese firms investing in OECD countries across all years (1998–2009) is only 30% (last row). Among the non-OECD countries, Asian countries accounted for about 80% (55.75/69.83). After 2004, Asian countries consistently accounted for over 60% of Chinese ODI deals, while OECD countries never accounted for more than 40% again. Sub-Saharan Africa rarely accounted for more than 10% of the total Chinese ODI deals over the sample period. Just by considering the number of deals across host countries, the relatively small fractions of ODI to OECD countries and the concentration of ODI in Asia lend little support to the hypothesis that technology seeking or resource seeking are the main drivers of the recent rise of ODI from the

Table 3. **Fraction of ODI Deals, by Region and Year**

Year	Non-OECD	OECD	Non-Asia	Asia	Non-SSA	SSA	Total (No.)
1998	95	5	21	79	95	5	19
1999	56	44	89	11	78	22	9
2000	75	25	45	55	85	15	20
2001	71	29	29	71	100	0	21
2002	70	30	58	42	88	12	66
2003	58	42	61	39	91	9	79
2004	69	31	41	59	90	10	244
2005	69	31	38	62	93	7	1,091
2006	64	36	37	63	94	6	1,411
2007	69	31	38	62	91	9	1,632
2008	72	28	35	65	92	8	2,091
2009	70	30	39	61	91	9	3,058
Average	**69.83**	**30.17**	**44.25**	**55.75**	**90.69**	**9.31**	**9,741**

ODI = outward direct investment, OECD = Organisation for Economic Co-operation and Development, SSA = Sub-Saharan Africa.
Note: Numbers are in % in the first eight columns, while they are in whole numbers in the last column.
Source: The PRC's Ministry of Commerce ODI data (1998–2009).

PRC. We are aware of the fact that some of the resource-seeking deals, for example those in Sub-Saharan Africa, are much larger in monetary value than the export-related deals in Asia. However, the trends in shares shown in Figure 1 imply that the relatively large resource-seeking deals are unlikely to overturn the conclusion based on the number of deals.

Next, we turn to analyzing the distribution of ODI deals across industries. Consistent with Figure 1 that shows shares in total flows, Table 4 shows that a majority of the PRC's ODI deals belong to the service sectors. In particular, based on a sample pool of observations from all years, "business services" and "wholesale trade" stand out as the top two sectors in which most ODI deals are found. Together, they account for 5,235 deals and thus, over half of the country's total. The third largest ODI sector in terms of the number of deals is "building and civil engineering," but it accounts for only 3% of the total. The sectors that are often suspected as the main drivers of the rise in the PRC's ODI—"nonferrous metals mining and dressing," "nonmetal mineral products," and "geologic prospecting"—together account for less than 6% of the total, consistent with the continuous decline in the share of mining in the country's aggregate ODI flow depicted in Figure 1. One can argue that some of the firms in the mining sector can invest in other industries abroad. Moreover, mining-related ODI could induce other types of ODI, such as "waterway transport." However, given that the "business services" and "wholesale trade" account for the bulk of ODI deals, the required complementary effects of ODI from mining to other sectors will need to be very large to support the hypothesis that the PRC's ODI is ultimately driven by resource seeking but not export promotion. In sum, over half of the PRC's ODI deals are in the service sectors. ODI in manufacturing, mining, and high-tech sectors have not been rising as has been postulated by many.

Table 4.   **Industry Breakdown of ODI (Top 20 Only)**

Industry	Frequency	Percent
Business services	2,816	28.94
Wholesale trade	2,419	24.86
Building and civil engineering	285	2.93
Nonferrous metals mining and dressing	212	2.18
Nonmetal mineral products	202	2.08
Garments, shoes, and caps manufacturing	189	1.94
Forestry	181	1.86
Real estate	169	1.74
Electric equipment and machinery	162	1.66
R&D	159	1.63
Geologic prospecting	157	1.61
Other financial activities	143	1.47
Metal products	135	1.39
Retail trade	122	1.25
Transport equipment	118	1.21
Food production	106	1.09
Water way transport	101	1.04
Agriculture	86	0.88
Ordinary machinery	86	0.88
Software	84	0.86

ODI = outward direct investment.
Note: Industry classification is based on ODI firms' description of the main business scope.
Source: The PRC's Ministry of Commerce OFDI data (1998–2009).

In Table A2 in the appendix, we also show the distribution of the origin of ODI across provinces in the PRC. The origins tend to be concentrated in coastal provinces (e.g., Zhejiang, Jiangsu, Shandong, Guangdong, and Shanghai). These findings are consistent with the common perception that the PRC's engagement in globalization started in coastal provinces and is still largely concentrated there.

V. Characteristics of ODI Firms

The ODI dataset does not contain balance sheet information. To study the relationship between the causes and effects of ODI at the firm level, we merge the ODI data with the PRC's NBS manufacturing firm survey data. Since there is no common firm identifier in the two datasets, the merging is done based on firm names. The statistics of the merging is reported in Table A5 in the appendix. The NBS data are available for the period of 1998–2009. On average, about 35% of the ODI deals can be merged to a firm in the NBS data, with the success rate ranging from 11% (in 1999) to 55% (in 2002).[13] We present the list of challenges we face when merging the two datasets in online appendixes.[14] Besides the imperfect match,

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[13]These success rates are in the same order of magnitude of merging the PRC's customs data with NBS data done by other scholars (e.g., Ma, Tang, and Zhang 2014; Manova and Yu 2013).
[14]Appendixes A and B, available at http://www.hwtang.com/adb_appendix.html.

Table 5. **The t-test of Key Characteristics between ODI and non-ODI**

	ODI	non-ODI	Diff
Size			
ln(Sales)	12.32	10.006	2.314***
No. or s.e.	7464	2,345,223	(0.017)
ln(Value Added)	11.081	8.587	2.494***
No. or s.e.	3,323	1,705,234	(0.026)
ln(Employment)	6.339	4.726	1.613***
No. or s.e.	7,561	2,711,011	(0.014)
Ownership Type			
Foreign	0.119	0.034	0.085***
No. or s.e.	10,418	7,696,402	(0.002)
HKG; TAP; and Macau, China invested firms	0.112	0.099	0.013***
No. or s.e.	7,566	2,744,253	(0.003)
SOE	0.04	0.12	−0.08***
No. or s.e.	7,566	2,744,253	(0.004)
General Performance Measures			
ln(Labor Productivity)	5.425	4.39	1.035***
No. or s.e.	7,539	2,524,320	(0.017)
Export/Sales	0.393	0.144	0.249***
No. or s.e.	7,464	2,345,223	(0.004)
Value Added/Sales	0.286	0.295	−0.009***
No. or s.e.	3,299	1,548,148	(0.002)
R&D/Sales (multiplied by 1,000)	0.0211	0.00501	0.000***
No. or s.e.	3,241	899,075	(0.00)
Raw materials/Sales	0.618	0.616	0.002
No. or s.e.	3,384	1,171,453	(0.003)

*** $= p < 0.001$, HKG = Hong Kong, China, ODI = outward direct investment, TAP = Taipei,China.
Note: Data on value added are only available from 1998–2007. Data on R&D are only available from 2002–2007.
Standard errors in parentheses.
Source: Authors' computations using manufacturing survey data (1998–2009).

another drawback of using the merged dataset is that all "services" firms will be excluded from our sample.

Before dealing with selection and endogeneity issues, let us simply compare the means of several key variables between firms that conduct ODI (after they got at least one deal approved) and those that do not. Table 5 reports the results. Compared to non-ODI firms, ODI firms are significantly larger (in terms of sales, value added, or employment). Specifically, the log difference in sales, value added, and employment between ODI and non-ODI firms are 2.3, 2.5, and 1.6, respectively.

Interestingly, proportionately more ODI firms are foreign firms, including those that have investors from Hong Kong, China; Macau, China; and Taipei,China. Against the common perception that a lot of the ODI deals are initiated by the state, we find proportionately fewer ODI firms that are SOEs. It is possible that the government does not need to invest in the ODI firms directly in order to influence it. What they need to do is provide capital and other types of support to firms that invest abroad.

ODI firms are also on average more productive (in terms of labor productivity) and more export-intensive. Specifically, the average export-to-sales ratio of ODI firms is 0.25 higher than that of non-ODI firms. These findings are consistent with the export-promotion motive of ODI firms, which we will further confirm using transaction-level trade data below. ODI firms are also on average more R&D-intensive (measured by the ratio of R&D expenses to total sales) and have a slightly lower value-added/sales ratio. This finding is consistent with the theory of horizontal FDI that firms may offshore the most downstream part of global supply chains (e.g., marketing) to foreign affiliates.

As Table 4 already showed, ODI deals are unevenly distributed across sectors. Other unobserved factors may shape the revealed differences in observables between ODI and non-ODI firms. Besides the simultaneity bias, there could be selection bias behind the observed differences in the means reported in Table 5. Suppose more productive firms choose to undertake ODI overseas, which would be the case based on Helpman, Melitz, and Yeaple (2004) who emphasize higher fixed cost for horizontal FDI than that for exporting, the observed superior performance among ODI firms could be driven by selection. Without a feasible instrument in the dataset, we will rely on matching techniques (i.e., Heckman et al. 1997 and subsequent studies) to identify the effects of ODI on firm performance, relative to the control group that shares similar ex ante characteristics.

Before introducing the matching estimation results, we estimate the following linear specification, which fully controls for firm-specific, time-invariant determinants of post-ODI performance:

$$Y_{it} = [f_i + f_t] + \beta ODI_{it} + \varepsilon_{it}, \tag{1}$$

where f_i and f_t stand for firm and year fixed effects, and ε_{it} is the regression residual. Y_{it} is the measure of firm performance, including (log) sales, (log) value added, (log) employment, (log) total factor productivity (TFP), export to sales ratio, value added to sales ratio, R&D to sales ratio, new output sales to total sales ratio, and new product dummy, and material to sales ratio. Notice that any sector-level and province-level effects are already absorbed by firm fixed effects.[15] The ODI dummy equals 1 *in and after* the year the firm reported positive ODI, 0 otherwise. By including firm fixed effects, we are identifying the within-firm relationship between ODI and firm performance. In addition to all non-ODI firms, in the control group, we also include observations of ODI firms before their engagement in ODI. Thus, the coefficients on the ODI dummy should be interpreted as the difference-in-difference in the average outcomes between ODI and non-ODI firms.[16]

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[15] In unreported results, we verify that a majority of firms in the sample are single-plant firms.
[16] The first difference is the difference from firms' means (across the sample periods). The second difference is the difference from the non-ODI firms' demeaned average within each year.

Table 6. **ODI Effects on Firm Performance (FE Regressions)**

Dependent Variable:	ln(Sales)	ln(Value Added)	ln(Emp)	ln(TFP)	Exp/Sales
ODI	0.047*	0.071	0.118***	−0.001	0.019
	(0.022)	(0.037)	(0.016)	(0.033)	(0.012)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.883	0.851	0.904	0.787	0.8639
No. of obs.	2,419,825	1,719,528	2,400,966	1,713,660	2,445,197
Dependent Variable:	VA/Sales	R&D/Sales	New Product Sales Share	New Product Dummy	Materials/Sales
ODI	−0.005	0.001	0.013*	0.034***	0.003
	(0.005)	(0.001)	(0.006)	(0.007)	(0.005)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.628	0.702	0.598	0.484	0.609
No. of obs.	1,706,349	857,519	1,845,020	2,445,197	1,640,541

* $= p < 0.05$, ** $= p < 0.01$, *** $= p < 0.001$, ODI = outward direct investment, FE = fixed effects.
Note: ODI $= 1$ for all firm-years when and after a firm reported overseas investment, 0 otherwise. The number of observations fluctuates because data for some variables are not available in all years (e.g., R&D only for 2003–2005). Standard errors, clustered at the industry level (2-digit), are in brackets.
Source: Authors' computations.

Table 6 reports the results. Standard errors are clustered at the 2-digit industry level. Controlling for firm and year fixed effects, we find that engaging in ODI increases firms' employment and propensity to innovate new products. The effects on sales and exports are also positive, but only marginally significant. We cannot find supporting evidence for a positive effect on R&D activities or productivity. This is inconsistent with the idea that ODI from emerging markets transfers technology from their affiliates in advanced economies. Although we are still far from establishing any causal relationship or tackling the selection bias, the regression results provide some preliminary evidence that whenever a significant effect of ODI on firm performance is identified, it is positive.

The next step is to implement the propensity-score matching methods to deal with the selection bias, which potentially drives the results reported so far. To this end, we will need to estimate propensity scores for each firm so that we can match ODI with similar non-ODI firms. We estimate a probit model, using a dummy for the firm's first year of ODI as the dependent variable. Specifically, we estimate the following specification:

$$Pr(ODI_{it}) = [f_s + f_p] + \mathbf{X_{it-1}}\boldsymbol{\alpha} + \varepsilon_{it}, \tag{2}$$

where i, s, p, and t stand for the firm, industry (2-digit, 29 categories), province (30), and year (12), respectively. Sector fixed effects (29 categories), f_s, and province fixed effects (30 categories), f_p, are always included to capture all regional (e.g.,

ODI promotion policies) and sectoral unobserved determinants (e.g., comparative advantage) of ODI participation.

ODI_{it} equals 1 if a firm starts engaging in ODI in year t, 0 otherwise. Notice that an ODI firm will only appear once in the sample, and firms that never report any ODI can appear multiple times in the sample. $\mathbf{X_{it-1}}$ is a vector of (lagged) firm characteristics that are suspected to affect a firm's participation in ODI. Based on previous models on FDI and exports (e.g., Helpman, Melitz, and Yeaple 2004), we include firm TFP and employment as regressors.[17] To capture the idea that exporters may have stronger incentive to invest overseas to facilitate trade, we include the ratio of exports to total sales. Specific to the institutional background of the PRC, where foreign firms and SOEs have better financial access (e.g., Zhu 2012) and even preferential policy treatments (Huang and Tang 2012), we include three firm ownership type dummies to indicate SOEs, foreign-owned (both wholly-owned and joint ventures) firms, and firms owned by investors from Hong Kong, China; Macau, China; and Taipei,China (i.e., domestic private firms are the excluded firm group). Moreover, to account for ODI that is driven by resource or technology seeking, we include firm-level measures of material and capital intensities, respectively.

Table 7 reports the probit estimation results. Similar to our explanations for the t-test and the regression results, we find that ex ante (lagged by one year) more productive (measured by TFP) and larger (measured by employment) firms are more likely to start investing in foreign markets. More export-intensive firms are also more likely to undertake ODI.

We also find that compared to domestic private firms, SOEs are more likely to undertake ODI, consistent with the conventional view that the PRC's ODI has a strong government backing. The first finding implies that the t-test results reported in Table 5 are pure correlation and cannot be inferred as a rejection that SOEs are less likely to invest abroad.[18] Foreign firms and firms with major investors from Hong Kong, China; Macau, China; and Taipei,China are less likely to invest in a third market. These findings are consistent with the idea that foreign firms (e.g., Foxconn which assembles all products for Apple) tend to outsource assembly and processing tasks to the PRC and import the finished products back to the headquarters or export them directly to a third market. If these are their incentives to conduct ODI, they tend to initiate the investment directly from the headquarters, rather than doing it through their processing plants in the PRC. Column 2 shows that the results remain robust to using the same set of regressors lagged by two years instead of one year.

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[17]Since data on firms' value added and thus TFP are only available for 1998–2007, the last two years of the sample 2008–2009 are automatically dropped.

[18]During the sample period, the PRC's central government embarked on an active privatization program (Zhu 2012). The fraction of SOEs in the total number of enterprises dropped significantly, which may explain the seemingly contrasting results about SOEs' likelihood to invest abroad between Tables 5 and 7.

Table 7. **Participation in ODI Based on Manufacturing Firm Characteristics (Probit)**

Dependent Variable	ODI Dummy	
Sample	1 year before ODI	2 years before ODI
ln(TFP)	0.270***	0.255***
	(0.014)	(0.014)
ln(Employment)	0.114***	0.106***
	(0.011)	(0.011)
Export intensity	0.424***	0.368***
	(0.028)	(0.027)
Capital intensity	0.409***	0.354***
	(0.052)	(0.050)
Material intensity	0.691***	0.616***
	(0.093)	(0.088)
SOE	0.0744**	0.0837**
	(0.027)	(0.026)
HKG; TAP; and Macau, China invested firms	−0.0868**	−0.0385
	(0.033)	(0.032)
Foreign	−0.105***	−0.0513
	(0.031)	(0.030)
Industry FE	Yes	Yes
Province FE	Yes	Yes
No. of obs.	1,075,673	877,378

$* = p < 0.05$, $** = p < 0.01$, $*** = p < 0.001$, FE = fixed effects, HKG = Hong Kong, China, ODI = outward direct investment, TAP = Taipei,China, TFP = total factor productivity, SOE = state-owned enterprises.
Note: The ODI dummy is equal to 1 for a firm in the year when it reports positive ODI, 0 for the same firm otherwise. ODI is equal to 0 for all observations of firms that never conducted any ODI during the sample period. All independent variables are lagged by one year in column 1, and by two years in column 2. Standard errors in parentheses.
Source: Authors' computations, based on Manufacturing Firm Survey from the PRC's National Bureau of Statistics (NBS).

Before moving to the next section about the effects of ODI on firm and export performance, a final remark is in order. All results from Tables 5 to 7 are robust to the exclusion of firms that had ODI in Hong Kong, China. This eliminates the concern that some of the documented patterns are an artifact of investment intermediation in Hong Kong, China. In other words, our claim that a majority of ODI projects belong to the service sectors is robust to excluding the main tax haven for the PRC's ODI.

VI. The Effects of ODI on Firm Performance

We use the concept of the average treatment effect on the treated (ATET) to gauge the effects of ODI on firm performance. To this end, we use the propensity-score matching methods, proposed by Rosenbaum and Rubin (1983) and applied by Heckman, Ichimura, and Todd (1997) in the program evaluation literature, to

compare the post-ODI average outcomes of ODI firms with ex ante similar non-ODI firms.[19]

We first obtain the propensity score from each firm by estimating the probit model as specified in eq. (2). We then compute the average effect of ODI based on Rosenbaum and Rubin (1983), in which the authors propose reweighting estimators using propensity scores. Specifically, the estimator for the ATET is

$$\hat{\Delta}^{ATET} = \frac{1}{n} \sum_{i=1}^{n} \left[y_i F_i - \frac{\frac{\hat{P}(X_i)}{1-\hat{P}(X_i)}}{\sum_{j=1}^{n} \frac{\hat{P}(X_j)}{1-\hat{P}(j)}} y_i (1 - F_i) \right]. \tag{3}$$

The first term is just the mean of the outcomes for the ODI firms (i.e., when $F = 1$). The second term is the weighted average of the outcomes of the control units, i.e., firms that do not conduct ODI, where the weights have been normalized by dividing each of them by the sum of all individual weights, so that they add up to one. A firm that is more likely to conduct ODI receives a larger weight by virtue of reweighting the propensity score with the probability of being a control unit. For instance, for a firm with zero probability of treatment, the control unit gets a weight of 0 (before normalization) because it is always observed as a control unit. In contrast, a control unit with a probability of treatment of 0.9, for instance, gets its outcome divided by 0.1 (before normalization) to reflect the fact that we observe only 1 in 10 of such units as control units. Thus, control units with higher probabilities of treatment receive more weight since they resemble the treated units more. Propensity score reweighting has the advantage of avoiding the bandwidth selection problem, as well as the need to decide what type of kernel to use or how many neighbors to select.

As with many two-step estimation procedures, using the simple formula for the variance of the estimator is incorrect. We adjust the standard errors in the second step by bootstrapping to account for measurement errors from the first stage estimation.[20] Table A7 in the appendix shows the balancing test results for the matching. It clearly shows significant reductions in the differences in the average ex ante characteristics between ODI and non-ODI firms after matching.

Table 8 reports the ATET estimation results, using the same set of dependent variables from Table 6. In general, we find statistically more significant effects of ODI on firm performance. For a firm that invests abroad (including the year of investment), we find positive ATET of ODI on the firm's value added (0.29 log points), employment (0.42 log points), and TFP (0.16 log points). All these results are statistically significant at the 0.1% level. Compared to the matched non-ODI

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[19] Previous studies that have used the matching approach to search for causal effects of exporting on productivity include Girma, Greenaway, and Kneller (2003), Konings and Vandenbussche (2005), and De Loeker (2007), among others.

[20] The implementation of the propensity score reweighting is closely based on the inverse probability regression as proposed in Brunell and DiNardo (2004). We use the Stata routine *treatrew* following Cerulli (2012).

Table 8. **ODI Effects on Firm Performance (Based on Propensity-score Matching 1 Year before ODI)**

Dependent Variable:	ln(Sales)	ln(Value Added)	ln(Emp)	ln(TFP)	Export/Sales
ATET	0.288***	0.257***	0.067***	0.163***	0.021***
	(0.026)	(0.036)	(0.016)	(0.027)	(0.005)
No. of obs.	1,145,251	934,158	1,140,946	934,689	1,148,377
Dependent Variable:	**VA/Sales**	**R&D/Sales**	**New Output Share**	**New Output Dummy**	**Materials/Sales**
ATET	−0.008*	0.002*	0.018**	0.028**	0.005
	(0.004)	(0.001)	(0.007)	(0.009)	(0.004)
No. of obs.	929,661	553,322	864,991	1,148,377	899,973

$* = p < 0.05$, $** = p < 0.01$, $*** = p < 0.001$, ODI = outward direct investment, TFP = total factor productivity, VA = value added, ATET = average treatment effect on the treated.
Note: ODI = 1 for all firm-years when and after a firm reported overseas investment. The number of observations fluctuates because data for some variables are not available in all years (e.g., R&D only for 2003–2005). Bootstrapped standard errors are in brackets.
Source: Authors' computations.

firms, ODI firms derive on average a slightly larger share of their sales from exports (a 0.02 log-point increase; significant at the 1% level). They also spend slightly more on R&D (a 0.2% higher share in total sales; significant at the 5% level), create new products, and derive a larger portion of sales from new products (significant at the 1% level). All results remain robust to the exclusion of Hong Kong, China as the host economy of ODI. These results are consistent with the hypotheses that ODI transfers technology or complements sales abroad by decreasing fixed cost of exporting. We will provide more evidence to disentangle these two channels in the following section.

VII. The Effects of ODI on Firms' Trade Performance

The positive effects of ODI on firm performance documented in the previous section can be due to technology transfer or market expansion. For instance, the finding that a firm tends to create more products after ODI can be induced by new ideas or market expansion, which makes innovative activities profitable. In this section, we focus on the market-seeking (export-promotion) motive of ODI and examine how ODI affects a firm's export performance, and through the export channel enhances firm performance as documented above. Since the ODI dataset has no information on exports and imports, we merge the ODI data with the customs transaction-level trade data by firm names. Table A5 in the appendix shows the fractions of firms in the ODI data that can be merged to the customs data. Notice that the customs transaction-level data are only available for the year 2000–2006 (7 years).

The match success rate is fairly high for the last two years of the customs sample (2005–2006). Around 40% of the deals in our ODI dataset can be matched with an observation in the customs trade dataset. Table A4.2 in the appendix shows the distribution of the successfully matched observations across industries. The industrial distribution of deals in the matched sample is very close to the ones in the original ODI sample, providing some support that the matched observations are systematically unbiased across sectors. The challenges that arise for this merging are very similar to those encountered when we merge the ODI data with the customs data.[21]

Similar to the analysis of the ODI effects on firms' overall performance, we apply the matching techniques outlined in Section 5 again to assess the ATET of ODI on firms' export performance. To implement the matching estimation exercise, we need to first obtain the propensity score for each exporter (or importer), which requires an estimation of the ODI participation equation using probit again. While we try to include regressors as close as possible to those from manufacturing survey data, customs trade data only include information related to firms' trade and we are restricted to use proxies. To proxy for TFP and firm size, we use the exporter's total export value (to the rest of the world). To proxy for material intensity (or reliance on imported inputs), we include the exporter's ratio of imports to exports. Similar to Table 7, we include a set of ownership type dummies, with private firms being the excluded group with no dummy included.

Consistent with Table 7, we find that larger (or more productive) exporting firms are more likely to start investing abroad. Similarly, compared to domestic private exporters, foreign exporters are less likely to undertake ODI. SOEs are also less likely to conduct ODI, compared to domestic private exporters. This result should not be taken as a rejection of the earlier finding that SOEs are more likely to invest abroad, as here we focus on a subset of firms—only those that export. Finally, in column 2, we show that the results remain robust to using the same set of regressors lagged by two years instead of one year.

Next we use the propensity scores estimated from Table 9 to assess the ATET of ODI on firms export performance. The dependent variables include ODI firm's export volume, export unit value, number of products (HS6) exported, and number of foreign countries served. All these variables are in log. We also conduct the same regression analysis by using the same four measures but for imports. By matching ODI exporters with non-ODI exporters based on ex ante characteristics, we aim to tackle the bias due to firms' selection into ODI.

Table 10 reports the matching estimation results. We find evidence that after investing overseas, existing exporters' total export volume (in US dollars), export unit value, and number of destinations all increase. In particular, ODI exporters on average export about 0.6 log points more than non-ODI. Their unit value of the

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[21] See (online) Appendix A (http://www.hwtang.com/adb_appendix.html).

Table 9. **Participation in ODI for Customs (Probit)**

Dependent Variable	ODI Dummy	
Sample	1 year before ODI	2 years before ODI
Export	0.114***	0.121***
	(0.007)	(0.007)
SOE	−0.0801**	−0.090**
	(0.036)	(0.040)
Foreign	−0.565***	−0.574***
	(0.035)	(0.039)
Collective	0.085*	0.123**
	(0.047)	(0.050)
Import/Export	−0.075	−0.0764058
	(0.052)	(0.057)
Industry FE	Yes	Yes
Province FE	Yes	Yes
No. of obs.	366,566	289,344

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, ODI = outward direct investment, SOE = state-owned enterprises, FE = fixed effects.
Note: The ODI dummy is equal to 1 for a firm in the year when it reports positive ODI, 0 for the same firm otherwise. ODI is equal to 0 for all observations of firms that never conducted any ODI during the sample period. Industry is an HS2 category. Domestic private firms are the excluded ownership type. Standard errors in parentheses.
Source: Authors' computations, based on the PRC's customs transaction-level trade data.

Table 10. **Export Performance (Based on Propensity-score Matching 1 Year before ODI)**

Sample	All firms (ODI = 0 for non-ODI firms and observations before ODI)			
Dependent Variable:	Exp Value	Exp Unit Val	No. of HS6 Exp	No. of Exp Countries
ATET	0.586***	0.396***	0.031	0.239***
	(0.058)	(0.075)	(0.051)	(0.047)
No. of obs.	314,240	314,240	316,011	316,011
Dependent Variable:	Imp Value	Imp Unit Val	No. of HS6 Imp	No. of Exp Countries
ATET	0.363***	0.286***	−0.070	0.057
	(0.084)	(0.010)	(0.052)	(0.040)
No. of obs.	307,119	307,119	307,119	310,766

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, ODI = outward direct investment, ATET = average treatment effect on the treated.
Note: The ODI dummy is equal to 1 for a firm in the year when it reports positive ODI, 0 for the same firm otherwise. ODI is equal to 0 for all observations of firms that never conducted any ODI during the sample period. Bootstrapped standard errors reported in brackets.
Source: Authors' computations, based on the PRC's customs transaction-level trade data.

same product (a HS6 category) is 0.4 log points higher, while the number of export destinations increases by 0.2 log points. To the extent that unit value proxies for quality, we postulate that ODI can lead to quality upgrading, but higher unit values can also arise from more effective marketing. In the presence of fixed exporting costs, the increase in the number of export destinations after ODI suggests that

ODI may be associated with an across-the-board reduction in those fixed costs. Collectively, these results confirm our conjecture that ODI from the PRC has been mostly related to export promotion. We find no effect in terms of the number of exported products after ODI.

In the lower panel of Table 10, we repeat the same exercises but for importers. We find that importers that invest abroad have higher import volumes and unit values for a given product. These results show that ODI serves not only as a platform for exports, but also for imports, an aspect of ODI that has not received its deserved attention in the literature. However, there is no effect on import variety or the number of source countries for imports.

While Table 10 shows very strong export promotion effects of ODI, we still cannot rule out technology transfer or resource seeking as the source of the positive effects. To this end, we rely on firms' imports to provide indirect evidence. If technology and resource seeking are important, we should expect ODI firms to import more capital goods and intermediate inputs, compared to non-ODI firms. To verify these speculations, we repeat the same estimation as in Table 10 but with dependent variables replaced by the shares of capital goods and intermediate inputs (materials) in firms' exports and imports, respectively.

To classify a product (HS6) as capital good, raw material, and others, we use the list from the United Nations Broad Economic Categories (UN BEC) classification.[22] If the increase in import volume documented in Table 10 is really associated with technology transfer, we should observe an increase in the share of capital goods in imports. The findings about the share of raw materials will then inform us about whether the PRC's ODI could be associated with resource seeking.

Table 11 reports the results. The first four columns report the results regarding the share of capital and materials in firms' imports, in terms of total value or the total number of imported varieties. The last four columns report the results regarding those shares in exports. We find no evidence for a higher import share or fraction of capital goods in total imports by ODI firms. There is also no significant effect of ODI on imports of material. Based on trade of tangible goods, we find no evidence that Chinese ODI is technology seeking. However, it is worth noting that there can still be transfer of intangible asset from foreign affiliates to the headquarters in the PRC that are not observed in trade data, as pointed out by Atalay et al. (2014).

For completeness, we also examine the ODI effects on firms' composition of exports. Interestingly, as reported in the last four columns, we find a significantly positive effect on firms' capital export share, consistent with the export promotion or quality upgrading effects reported in Table 10. However, there is no effect when it is measured as a fraction of total export varieties. There is no evidence of an effect on exports of materials.

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[22] Available at http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=10. See also (online) Appendix B for details (http://www.hwtang.com/adb_appendix.html).

Table 11. **Capital Goods and Raw Materials in Exports and Imports and ODI**

Sample	**All Firms** (ODI = 0 for non-ODI firms and observations before ODI)				**All Firms** (ODI = 0 for non-ODI firms and observations before ODI)			
Dep. Variable	**Share of Capital Goods**		**Share of Materials**		**Share of Capital Goods**		**Share of Materials**	
	Firm Import Volume	No. of Imported Goods	Firm Import Volume	No. of Imported Goods	Firm Export Volume	No. of Exported Goods	Firm Export Volume	No. of Exported Goods
ATET	0.027	−0.004	0.014	−0.003	0.042***	−0.003	−0.009	0.001
	(0.015)	(0.005)	(0.012)	(0.005)	(0.013)	(0.005)	(0.006)	(0.003)
No. of obs.	301,043	301,043	301,043	301,043	309,817	309,817	309,817	309,817

$* = p < 0.05$, $** = p < 0.01$, $*** = p < 0.001$, ODI = outward direct investment, ATET = average treatment effect on the treated.

Note: The ODI dummy is equal to 1 for a firm in the year when it reports positive ODI, 0 for the same firm otherwise. ODI is equal to 0 for all observations of firms that never conducted any ODI during the sample period. Bootstrapped standard errors reported in brackets.

Source: Authors' computations, based on the PRC's customs transaction-level trade data.

VIII. Conclusion

Using a new panel dataset of Chinese multinational firms that covers close to 10,000 deals from all provinces and industries from 1998 to 2009, we find that over half of the ODI deals are in service sectors, with many of them appearing to be related to export promotion. In addition to documenting the pattern and trend of the PRC's ODI firms, this paper empirically examines both the determinants and effects of the PRC's ODI at the firm level.

We find that ex ante larger, more productive, and more export-intensive firms are more likely to start engaging in ODI. Using matching estimation techniques, we find that ODI enhances firm performance in terms of TFP, export intensity, product creation, and employment. To shed light on the relevant importance of technology transfer and export promotion of ODI, we use customs transaction-level trade data merged with the ODI firm list for analysis. We find that firms' ODI participation is associated with better performance in both exports (in terms of volume, unit value, and number of destination countries) and imports (in terms of volume and unit value). We find no evidence of technology upgrading and resource seeking based on the pattern of imported products.

What lessons do we learn from the PRC about development strategies that are applicable for other developing nations and emerging markets? One of the intriguing findings in the literature about the PRC is its fast transition from processing exports, which mostly originate from foreign-invested exporting firms, to non-processing exports by indigenous Chinese firms. Our findings on the export promotion effects of ODI in the PRC imply that ODI may have played an important role in driving this transition.

It has been shown that inward FDI into the PRC has transferred know-how, technology, and management skills to the country. However, the benefits of promoting exports and inward FDI are diminishing for the PRC, about 20 years after the country's economic integration with the rest of the world, initiated by Deng's famous southern trip in 1992. This phenomenon is not specific to the PRC and has been or will be faced by many developing countries that lose comparative advantage in labor-intensive sectors due to increasing labor costs. When the average wage level of low-skilled workers continues to increase, a country will have to transition to more skill-intensive and capital-intensive sectors. While this transition can happen naturally (with some adjustment cost), there could be room for policies to make the transition smoother. In Chen and Tang (2013), we find evidence of skills upgrading and capital deepening through ODI, as revealed in the pattern of exported products from the PRC's exporters that engage in ODI. In summary, our paper shows that export-promoting ODI can potentially raise and sustain the benefits of exporting, which may in turn contribute to a country's structural transformation from low-skill manufacturing to high-skill manufacturing, and eventually from manufacturing to high-skill services.

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Appendix

Table A1. **Industry Breakdown**

Industry	Freq.	Percent
Business services	2,816	0.289
Wholesale trade	2,419	0.248
Building and civil engineering	285	0.029
Nonferrous metals mining and dressing	212	0.022
Nonmetal mineral products	202	0.021
Garments, shoes, and caps manufacturing	189	0.019
Forestry	181	0.019
Real estate	169	0.017
Electric equipment and machinery	162	0.017
R&D	159	0.016
Geologic prospecting	157	0.016
Other financial activities	143	0.015
Metal products	135	0.014
Retail trade	122	0.013
Transport equipment	118	0.012
Food production	106	0.011
Waterway transport	101	0.010
Agriculture	86	0.009
Ordinary machinery	86	0.009
Software	84	0.009
Plastic products	82	0.008
Professional and technical services	82	0.008
Timber processing, bamboo, cane, palm fiber, and straw products	82	0.008
Food processing	77	0.008
Textile industry	75	0.008
Telecom and other information transmission	67	0.007
Securities	61	0.006
Leather, furs, down, and related products	58	0.006
Medical and pharmaceutical products	57	0.006
Raw chemical materials and chemical products	57	0.006
Telecom, computer, and other electronic equipment	57	0.006
Ferrous metals mining and dressing	55	0.006
Cultural, educational, and sports goods	53	0.005
Instruments, meters, cultural, and clerical machinery	48	0.005
Waste materials recycling and reprocessing	48	0.005
Catering	47	0.005
Smelting and pressing of ferrous metals	44	0.005
Computer services	42	0.004
Special purposes equipment	42	0.004
Smelting and pressing of nonferrous metals	41	0.004
Art and craft, and other manufacturing	34	0.003
Other services	34	0.003
Building installation	33	0.003
Science and technology exchange, and promotion services	33	0.003
Petroleum and natural gas extraction	32	0.003
Nonmetal minerals mining and dressing	29	0.003
Fishing	28	0.003
Furniture manufacturing	26	0.003

Continued.

Table A1.   *Continued.*

Industry	Freq.	Percent
Rubber products	25	0.003
Air transport	22	0.002
Papermaking and paper products	22	0.002
Leasing	20	0.002
Railway transport	18	0.002
Chemical fiber	17	0.002
Building decoration	15	0.002
Loading and unloading, and carrying, and other transport	15	0.002
Animal husbandry	14	0.001
Beverage production	13	0.001
Hotels	13	0.001
Services to households	13	0.001
Storage	13	0.001
Culture and art	12	0.001
Highway transport	12	0.001
Production and supply of power, steam, and electricity	11	0.001
Services for agriculture, forestry, animal husbandry, and fishing	10	0.001
Urban public transport	10	0.001
Education	9	0.001
Other construction	9	0.001
Banking	7	0.001
Broadcasting, television, film, and audio	7	0.001
Health	7	0.001
News and publishing industry	7	0.001
Petroleum refining, coking, and nuclear energy	7	0.001
Printing and record medium reproduction	7	0.001
Tobacco processing and production	7	0.001
Post	6	0.001
Entertainment industry	5	0.001
Production and supply of water	5	0.001
Production and supply of gas	4	0.000
Coal mining and processing	3	0.000
Pipeline transport	3	0.000
Sports	3	0.000
Management of public facilities	2	0.000
Management of environment	2	0.000
Other	13	0.001
Total	**9,744**	**1.000**

Note: Industry classification is based on NBS 4-digit code.
Sources: PRC's Ministry of Commerce, PRC National Bureau of Statistics, and authors' own calculation.

Table A2. **Distribution across Provinces**

Province	Freq.	Percent	Cum.
Zhejiang	1,993	20.45	20.45
Shandong	996	10.22	30.68
Jiangsu	938	9.63	40.30
Guangdong	920	9.44	49.74
Central Enterprises	568	5.83	55.57
Shanghai	508	5.21	60.79
Beijing	489	5.02	65.80
Fujian	410	4.21	70.01
Liaoning	341	3.50	73.51
Heilongjiang	302	3.10	76.61
Hunan	295	3.03	79.64
Tianjin	253	2.60	82.24
Yunnan	201	2.06	84.30
Henan	171	1.75	86.05
Hebei	170	1.74	87.80
Jilin	164	1.68	89.48
Sichuan	159	1.63	91.11
Guangxi	139	1.43	92.54
Xinjiang	123	1.26	93.80
Anhui	103	1.06	94.86
Chongqing	95	0.97	95.83
Jiangxi	89	0.91	96.75
Hubei	73	0.75	97.50
Shaanxi	73	0.75	98.25
Shanxi	72	0.74	98.98
Gansu	35	0.36	99.34
Hainan	28	0.29	99.63
Ningxia	13	0.13	99.76
Guizhou	12	0.12	99.89
Qinghai	9	0.09	99.98
Xizang	2	0.02	100.00
Total	**9,744**	**100.00**	

Sources: PRC's Ministry of Commerce and authors' own calculations.

Table A3. **Number of ODI Firms by Ownership Type**

Year	State-owned	Domestic Private	Foreign
1998	0	0	0
1999	0	0	0
2000	0	3	2
2001	2	2	1
2002	0	28	1
2003	4	22	3
2004	2	39	13
2005	20	273	82
2006	21	366	79
2007	23	366	93
2008	12	335	79
2009	26	336	110

ODI = outward direct investment.
Source: PRC's Ministry of Commerce.

Table A4.1. **Breakdown of Industries by NBS Classifications of NBS ODI Dataset**

Sector	Freq.	Percent
Manufacturing	2,544	98.76
Mining	19	0.74
Power, gas, and water	13	0.50

NBS = National Bureau of Statistics, ODI = outward direct investment.
Sources: PRC's Ministry of Commerce, PRC National Bureau of Statistics, and authors' own calculation.

Table A4.2. **Breakdown of Industries by ODI Assigned Classifications of Customs ODI Dataset**

Industry		Freq.	Percent	Cum.
74	Business services	718	39.56	39.56
63	Wholesale trade	421	23.20	62.75
18	Garments, shoes, and caps manufacturing	46	2.53	65.29
47	Building and civil engineering	45	2.48	67.77
31	Nonmetal mineral products	32	1.76	69.53
39	R&D	31	1.71	71.24
75	Electric equipment and machinery	31	1.71	72.95
65	Retail trade	28	1.54	74.49
14	Food production	25	1.38	75.87
34	Metal products	23	1.27	77.13
19	Transport equipment	22	1.21	78.35
37	Leather, furs, down, and related products	22	1.21	79.56
30	Plastic products	20	1.10	80.66
60	Telecom and other information transmission	19	1.05	81.71
24	Cultural, educational, and sports goods	18	0.99	82.70
2	Forestry	17	0.94	83.64
20	Timber processing, bamboo, cane, palm fiber, and straw products	17	0.94	84.57
35	Ordinary machinery	17	0.94	85.51
9	Nonferrous metals mining and dressing	16	0.88	86.39
17	Textile industry	15	0.83	87.22
40	Telecom, computer, and other electronic equipment	14	0.77	87.99
78	Geologic prospecting	14	0.77	88.76
41	Instruments, meters, cultural, and clerical machinery	13	0.72	89.48
13	Food processing	12	0.66	90.14
71	Other financial activities	11	0.61	90.74
1	Agriculture	10	0.55	91.29
36	Special purposes equipment	10	0.55	91.85
26	Raw chemical materials and chemical products	9	0.50	92.34
27	Medical and pharmaceutical products	9	0.50	92.84
72	Real estate	8	0.44	93.28
76	Professional and technical services	8	0.44	93.72
8	Software	7	0.39	94.10
29	Waterway transport	7	0.39	94.49
32	Rubber products	7	0.39	94.88
54	Smelting and pressing of ferrous metals	7	0.39	95.26
62	Ferrous metals mining and dressing	7	0.39	95.65
22	Papermaking and paper products	6	0.33	95.98

Continued.

Table A4.2. *Continued.*

Industry		Freq.	Percent	Cum.
33	Waste materials recycling and reprocessing	6	0.33	96.31
43	Smelting and pressing of nonferrous metals	6	0.33	96.64
69	Securities	6	0.33	96.97
83	Other services	5	0.28	97.25
4	Services to households	4	0.22	97.47
42	Fishing	4	0.22	97.69
61	Computer services	4	0.22	97.91
82	Art and craft, and other manufacturing	4	0.22	98.13
7	Building installation	3	0.17	98.29
21	Science and technology exchange, and promotion services	3	0.17	98.46
28	Furniture manufacturing	3	0.17	98.62
48	Catering	3	0.17	98.79
58	Chemical fiber	3	0.17	98.95
67	Storage	3	0.17	99.12
77	Petroleum and natural gas extraction	3	0.17	99.28
10	Highway transport	2	0.11	99.39
16	Nonmetal minerals mining and dressing	2	0.11	99.50
52	Tobacco processing and production	2	0.11	99.61
5	Loading and unloading, and carrying, and other transport	1	0.06	99.67
15	Air transport	1	0.06	99.72
55	Post	1	0.06	99.78
57	Leasing	1	0.06	99.83
59	Beverage production	1	0.06	99.89
73	Culture and art	1	0.06	99.94
90	Services for agriculture, forestry, animal husbandry, and fishing	1	0.06	100.00
Total		**1,815**	**100**	

ODI = outward direct investment.
Sources: PRC's Ministry of Commerce, PRC National Bureau of Statistics, and authors' own calculation.

Table A5. **Success Rates of Matching between ODI and Customs Data, and ODI and Manufacturing Survey Data**

Year	NBS Matches	Customs Matches Export	Customs Matches Import
1998	0.16		
1999	0.11		
2000	0.35	0.01	0.01
2001	0.29	0.01	0.01
2002	0.55	0.06	0.06
2003	0.47	0.05	0.05
2004	0.32	0.09	0.08
2005	0.47	0.39	0.37
2006	0.44	0.41	0.42
2007	0.39		
2008	0.34		
2009	0.27		
Average	**0.35**	**0.15**	**0.14**

NBS = National Bureau of Statistics, ODI = outward direct investment.
Sources: PRC's Ministry of Commerce, PRC National Bureau of Statistics, PRC Customs, and authors' own calculation.

Table A6.   **ODI Effects on Export Performance (FE Regressions)**

Sample	**All Firms** (ODI = 0 for non-ODI firms and observations before ODI)			
Dependent Var:	**Export Total Value**	**Exp Unit Value**	**# of Exp HS6**	**Exp # of Country**
ODI	0.017	0.103	0.079**	0.067**
	(0.069)	(0.057)	(0.027)	(0.023)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.727	0.806	0.839	0.838
No. of obs.	717,355	717,355	751,589	751,588
Dependent Var:	**Imp Total Value**	**Imp Unit Value**	**Imp # of HS6 Value**	**Imp # of Country**
ODI	0.630***	0.047	0.301***	0.064*
	(0.074)	(0.083)	(0.034)	(0.030)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.826	0.795	0.835	0.716
No. of obs.	659,392	659,392	659,392	677,740

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, FE = fixed effects, NBS = National Bureau of Statistics, ODI = outward direct investment.

Note: ODI = 1 for all firm–years when and after a firm reported overseas investment. All dependent variables are in log form. All custom firms and treated firms prior to ODI are included in the control group. Robust standard errors reported in brackets.

Source: Authors' computations.

Table A7.   **Balancing Test of Matching ODI and non-ODI (NBS Sample)**

		Mean		**%Reduction**			
Variable	**Sample**	**Treated**	**Control**	**%Bias**	**Bias**	**t**	**p>t**
Export Intensity	Unmatched	0.441	0.202	62.1		21.89	0.000
	Matched	0.441	0.443	−0.6	99.1	−0.05	0.962
Ln Employment	Unmatched	5.722	4.703	85.8		32.65	0.000
	Matched	5.716	5.736	−1.7	98.1	−0.01	0.989
Capital Intensity	Unmatched	0.217	0.204	8.5		2.78	0.000
	Matched	0.217	0.213	2.9	65.4	0.34	0.735
Material Intensity	Unmatched	−0.248	−0.279	11.4		3.20	0.001
	Matched	−0.248	−0.262	5.1	55.0	0.21	0.834
TFP	Unmatched	6.258	5.477	72.3		26.02	0.000
	Matched	6.254	6.298	−4.1	94.4	0.03	0.976
SOE	Unmatched	0.252	0.176	18.5		6.64	0.000
	Matched	0.251	0.244	1.8	90.0	0.13	0.893
HKG; TAP; and Macau,	Unmatched	0.133	0.128	1.3		0.45	0.653
China invested firms	Matched	0.133	0.134	−0.3	74.3	−0.01	0.990
Foreign	Unmatched	0.169	0.119	14.4		5.23	0.000
	Matched	0.169	0.176	−2.0	86.1	−0.46	0.643

HKG = Hong Kong, China, NBS = National Bureau of Statistics, ODI = outward direct investment, TAP = Taipei,China, TFP = total factor productivity, SOE = state-owned enterprises.

Source: Authors' computations.

Table A8. **Balancing Test of Matching ODI and non-ODI (Customs Sample)**

| Variable | Sample | Mean | | %Reduction | | | |
		Treated	Control	%Bias	Bias	t	p>t
Import Share	Unmatched	0.280	0.404	−41.6		−10.36	0.000
	Matched	0.280	0.283	−1.1	97.4	−0.19	0.850
Export	Unmatched	15.324	13.467	76.9		18.63	0.000
	Matched	15.324	15.261	2.6	96.6	0.48	0.629
SOE	Unmatched	0.329	0.136	46.9		13.58	0.000
	Matched	0.329	0.331	−0.5	99.0	−0.07	0.946
POE	Unmatched	0.445	0.166	63.6		18.13	0.000
	Matched	0.445	0.427	4.2	93.5	0.63	0.532
Foreign	Unmatched	0.226	0.687	−104.5		−24.04	0.000
	Matched	0.226	0.241	−3.5	96.7	−0.61	0.541

ODI = outward direct investment, SOE = state-owned enterprises, POE = privately-owned enterprises.
Source: Authors' computations.