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Provincial interdependence and China's "irrational" outward foreign direct investment

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Abstract: China's outward foreign direct investment (OFDI) has increased by more than 70-fold since early 2000. A sudden plummet of 30% OFDI in 2017 particularly merits explanation. We suggest that the interdependent behavior of Chinese provincial OFDI plays a key role in the astonishing increase and sudden decease in China's OFDI. Using OFDI data from 31 Chinese provinces, we find that OFDI from one province positively depends on neighboring provinces' OFDI. While the spillover from neighbors' behavior increases provincial OFDI, it tends to lead to more OFDI than warranted by economic fundamentals, resulting in an irrational OFDI bubble. Further, we argue that the "follow the leader" firm behavior and the OFDI promotional policies under China's political tournament environment give rise to the neighboring interdependence. Finally, based on our results, we make a plausible estimation of the amount of irrational OFDI in China in 2016.

Keywords: China's outward FDI; provincial interdependence; spillover effect; government promotion policy

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1. Introduction

China became an important capital provider for the global economy after three decades of fast economic growth. A salient example is that China finances United States (US) treasury securities with more than one trillion of USD. Another main channel that China exports capital is via its burgeoning OFDI. China's OFDI has been taking off since the "going global" policy began in the early 2000's. The recent launch of the "Belt and Road Initiative" (BRI) accelerated the speed of Chinese firms' overseas investments. As a result, China's OFDI reached $183 billion USD in 2016 (Figure 1), when the OFDI out-numbered foreign direct investment (FDI) inflow to China. China became a net FDI capital provider for the first time in Chinese history. However, a sudden plummet of OFDI in 2017 caught the attention of many observers. According to the Ministry of Commerce (MOFCOM) data, Chinese OFDI decreased by about 30% in 2017 compared to 2016 (the solid line in Figure 1). What caused such a substantial decrease in Chinese OFDI in less than one year? The headline news has suggested that the decrease is due to the Chinese government imposed restrictions on the OFDI invested in certain industries, including entertainment, sports clubs, movie theaters, theme parks, and hotels, etc., which the Chinese government considers to be "speculative and irrational investments"[1]. But, what is the fundamental rationale for those irrational investments in the first place? How much irrational OFDI is the result of that reason? What could be the appropriate government policy to reduce or control irrational OFDI, hence rein in the consequence to Chinese economy?

We attempt to provide a plausible reason for China's irrational OFDI in this paper; further we assess possible consequences and make some policy suggestions. We suggest that there is interdependence between China's provincial OFDI. More specifically, a province tends to increase the level of OFDI when it observes that the neighboring provinces have engaged in more OFDI. This interdependence creates the spillover effect of OFDI from the neighboring provinces. Thus, in addition to canonical "pull" and "push" economic factors that determine Chinese OFDI (Buckley et al, 2007; Cheung and Qian, 2009), there is the spillover effect from OFDI in neighboring provinces. This spillover effect might distort the decision-making process of OFDI, thereby leading to more OFDI than that is warranted by economic fundamentals,

[1] The Ministry of Commerce of China branded OFDI toward business in entertainment industries, real estate, sports clubs, and movie theaters etc. as irrational OFDI.

resulting in irrational OFDI[2]. It is a dynamic process in which one province raises OFDI based on its observation of more OFDI in neighboring provinces, which, in turn, do the same next period when they observe more OFDI in the first province. Over time, this dynamic accumulates irrational provincial OFDI, aggregately, and substantially more irrational OFDI for China as a country.

It is important to understand what motivates provincial OFDI to imitate the behavior of OFDI in neighboring provinces. We provide two plausible reasons, both of which are Chinese specific. The first one stems from firms' competitive behavior in OFDI. As Knickerbocker (1973) suggested, there is a tendency towards oligopolistic investment behavior among multinational companies (MNCs). MNCs therefore are inclined to match each other's investment moves to maintain their market positions in foreign markets. In China, locals protect their domestic markets. Due to "local market protectionism"[3] among provinces, firms from one province frequently do not have the chance to penetrate the markets in other provinces (Child and Rodrigues, 2005). Seeking foreign markets, as opposed to domestic markets, appears to be a more cost-efficient option for many provincial firms to expand their business, which results in firms from different provinces competing for foreign markets. A firm from one province tends to follow the OFDI of firms in other provinces in order to maintain its competitiveness in foreign markets.

The second reason concerns the process by which the Chinese central government promotes officials. Their performance in the local economic front and how well the local government executes central government policies are key conditions for a provincial governor's promotion to high rank in the central government (Blanchard and Shleifer, 2001). Thus, provincial governors compete rigorously to accomplish better local economic growth and to

[2] Different from the definition of irrational OFDI from Chinese government, we consider irrational OFDI as the deviation from the level of OFDI that is determined by economic fundamentals. Although two definitions describing irrational OFDI from different angles, they share the same root that both irrational OFDI depart from economic foundation consideration and are speculative.

[3] The arise of local market protectionism is due to the incentive of personnel control (e.g. government official promotion) in China's political tournament environment (Zhou, 2004; 2007). Li and Zhou (2005) found that the likelihood of promotion of provincial leaders increases with their economic performance and concluded that political incentive of government officials induces local economic growth. To perform better in economic growth, one strategy is making better policies and subsidies to promote local economy directly; the other is protecting local market from being penetrated by businesses form other provinces.

execute central policies, which include promoting more OFDI as part of the central government's "going global" and BRI policies. As a consequence, provincial government races to promote local firms to invest in OFDI by providing incentives (e.g., an easy approval process, preferential taxes, cheap loans, and even direct subsidies), which could distort firms' decision-making regarding OFDI and resulting in more OFDI than that is warranted by economic fundamentals. Thus, provincial government rivalry usually causes over-heated promotion and a lack of careful scrutiny, and firms think less about the economic reasons for their OFDI, thus resulting in irrational OFDI. In fact, according to China Social Science Research, many incapable firms managed to initiate OFDI projects perhaps because of the over-promotion from local government, but later incurred operation problems and business failure.

To gather empirical evidence for our theoretical hypotheses we utilize China's annual provincial OFDI data published in *Statistical Bulletins of China's Outward Foreign Direct Investment*. We first discuss who the neighbors that a provincial OFDI depends on are and how to measure the neighbors' spillover effect. Given a lack of available information about who the neighboring provinces are to follow, we experiment with different definitions for the plausible neighboring provinces. Further, we attempt to determine whether the spillover effect originated from the average of neighboring provinces or from the largest OFDI neighbor (a conjecture of "race to the top"). We then provide econometric estimations of the spillover effect using various regression methods, including spatial regressions, and different OFDI datasets.

To preview the results, we find that there exists positive spillover effect from the neighboring provinces that causes a province to invest more OFDI. According to our estimate, the OFDI from a province increases 0.26% more if the neighboring provinces raise the average level of OFDI by one percent, *ceteris paribus*. This spillover effect from the neighboring provinces' OFDI significantly contributes to the stunning taking-off of China's OFDI since 2000. But at the same time, it may create irrational OFDI because the neighboring spillover effect stemmed from firm-competition and government promotion could cause OFDI activities to over-heat and to be irrational.

Further, to verify that this spillover effect is not because of some common shocks that cause higher OFDI across provinces, we augment our models with common factors that affect GDP or FDI inflows of all Chinese provinces - the policy shock from the BRI and a global shock

– 2008 global financial crisis. The found spillover effect from neighboring OFDI sustains at the presence of those shocks. These results are robust to different OFDI data, e.g. OFDI stock data and the number of OFDI projects data, and various regression approaches, such as the fixed effect panel data regression, spatial regression, and dynamic panel data system GMM regression.

This paper contributes to the vast literature concerning what determines China's OFDI, where the typical empirical strategy is to analyze the push and pull factors within a canonical gravity model framework (Buckley et al, 2007; Chen and Ma, 2010; Cheung and Qian, 2009). While the commonly identified pull factors from host countries include market size, natural resources availability, and political risk, etc., the prominent push factor is the Chinese government's promotion of OFDI, which not only influences the volume and the locational choice of China's OFDI (Cheung and Qian, 2009; Lu, Liu, and Wang, 2010; Luo, Xue, and Han, 2010; Voss, Buckley, and Cross, 2009), but also decides the type of OFDI, for instance, joint venture versus green field FDI (Child and Rodrigues, 2005; Cui and Jiang, 2012; Voss, Buckley, and Cross, 2009). A majority of these papers focuses on the "bright" side of government involvement in OFDI, but neglect the downside of government policy that potentially causes OFDI over-heated and generates irrational OFDI. We raise this issue by arguing that, due to the spillover effect from the OFDI behavior in neighboring provinces, government promotion may lead to more OFDI than that which is aligned with economic fundamentals.

The argument of interdependence in OFDI among China's provinces is also relevant to a strand of management literature that studies "following the leader" behavior in MNC investment in foreign markets (Knickerbocker, 1973). An OFDI move may "trigger a chain reaction of countermoves at both domestic and international levels by rivals anxious to protect their positions" (Schenk, 1996), thus amplifying the scale of overall OFDI activities (Lieberman and Asaba, 2006). This rivalry affects firms' locational selection and timing choice of investments in foreign markets (Alcácer, Dezső, and Zhao, 2013; Delios, Gaur, and Makino, 2008; Rose and Ito, 2008). However, these papers assume homogeneous MNCs completion for foreign market without explicitly considering the home country characteristics and investing firms' heterogeneity. We consider Chinese provincial OFDI to be heterogeneous due to "local protectionism" and study the rivalry behavior among provincial OFDI from the perspective of home country as opposed to competing for the same foreign host county.

The main contribution of our paper is that we uncover a plausible mechanism through which China invests more OFDI than that which is aligned with economic fundamentals and thereby creates irrational OFDI. We propose that OFDI from a Chinese province depends on the level of OFDI observed in its neighboring provinces – the more its neighbors have, the greater the amount of OFDI a province tends to invest. Such a spillover effect perhaps results from government promotion of OFDI, which may be associated with the government official rank promotion process. The rivalry for rank promotion in China's political tournament not only causes over-promoted OFDI in one province but also spillover to neighboring provinces, eventually resulting in irrational OFDI in the whole of China. In order to curb irrational OFDI, the government needs to address the fundamental reasons leading to irrational OFDI. Our findings suggest that the government might cool down its promotion of OFDI to rein in the OFDI rivalry between provinces when the overall Chinese OFDI surges and provincial OFDI appears to increase in tandem. At the same time, it is necessary to tighten the OFDI approval process and scrutinize OFDI projects more carefully.

The remainder of the paper is organized as follows: in Section 2 we describe our OFDI data and discuss some stylized facts about China's provincial data. We lay out our baseline empiric model to test our hypothesis and interpret regression results in Section 3. In Section 4 we perform additional analyses for robustness purposes. In Section 5 we conclude and suggest some policy implications.

2. Some stylized facts about China's OFDI

China's OFDI has gone through three stages, all of which were defined by government policies. China started OFDI activities in the early 1980's, but those OFDI remained rather minor and negligible until the early 2000's when the Chinese government initiated its "going global" policy to promote Chinese firms to invest oversea. Between then and 2016, the OFDI flows increased more than 70-fold. The launch of the BRI in 2013 designed to create economic ties with Europe, Asia, and Africa via trade and international investment accelerated the rate of increase of OFDI. As a result, OFDI increased 70% in year 2016 alone. However, as shown in Figure 1, there was a substantial correction of this astonishing trend, due to the fact that

government imposed controls on the OFDI going towards the entertainment industries, real estate, sports clubs, and movie theaters, etc. that government considered to be irrational OFDI.

In the early stage of Chinese OFDI, only state owned enterprises (SOE) had the privilege to engage in OFDI. The government gradually allowed qualified private firms to invest overseas, but they need to go through a lengthy approval process managed by multiple government agencies, including the National Development and Reform Commission (NDRC) and MOFCOM. In 2006 after the government substantially eased the OFDI approval process for private enterprises, the OFDI originating from private firms has greatly increased. The BRI further promotes private OFDI.

Figure 2 shows a comparison of the different development paths taken by SOE OFDI and provincial OFDI[4]. Clearly, both SOE and provincial OFDI have been increasing since 2003. The provincial OFDI grew faster than SOE OFDI - although SOE OFDI had a larger scale. Provincial OFD were catching up quickly until the launch of the BRI policy in 2013; after that point, their paths diverged – as Figure 2 shows, the BRI promotes provincial OFDI substantially and it seems to crowd out SOE OFDI.

Although provincial OFDI grew significantly, the level of development is uneven across different provinces. Figure 3 displays an image of China's provincial OFDI distribution. Shifting from the east-coastal region to more western provinces, the level of OFDI gradually decreases. Provinces seem to cluster in different regions; for example, the provinces with the most OFDI are concentrated in the east-coastal region, which provides 74% of China's total provincial OFDI. The region with the least OFDI (the north-eastern region) only accounts for about 6.6% of China's provincial OFDI.

In addition to the uneven regional distribution of OFDI, China's provincial OFDI seems to form a pattern of provinces following each other's lead in making investment, which we demonstrate (Figure 4) by plotting the logarithm of a province's current OFDI against the logarithm of its neighbors' average OFDI in the previous year. Each dot represents paired logarithms for 31 provinces between 2003 and 2015. Figure 4 clearly shows a positive

[4] Specific information on OFDI ownership is not publicly available. Shen (2013) identifies firms' ownership structure for 1586 Chinese investment projects by following firms' names and websites and occasionally by making phone calls. According to Shen (2013), the majority of provincial OFDI is private OFDI.

correlation (the slope of the fitted line is as high as 0.8) between a given provincial OFDI and the OFDI observed from other provinces.

China's OFDI plummeted almost 30% in 2017 mainly because Chinese government stopped approving any OFDI going towards what the government (and other observers) considered to be irrational investments (e.g., the entertainment industries, real estate, sports clubs, and movie theaters) due to the fact that many of such OFDIs appeared to be losing substantial money. For example, Suning Commerce Group, an electric products retailor company, bought 68% of Inter Milan football club for $307 million USD and Sino-Euro Sports used about $800 million USD to acquire the AC Milan football club, neither of which has been profitable for multiple years. The other reason was that China lose about one trillion USD of foreign exchange reserves between July 2014 and December 2016; OFDI is one of the major drains on foreign reserves, as entities may disguise large amounts of capital flight as OFDI to circumvent China's capital controls and move capital overseas illegally.

Due to a lack of data, we were not able to produce some statistics for irrational OFDI. However, we show in Figure 5 the number of OFDI that were approved by MOFCOM. The share of the number of "irrational" OFDI of the total number of China's OFDI began as a relatively small amount (1%), but quickly increased to 7% in 10 years, almost paralleling the increasing trend of the overall number of OFDI. We would have expected this trend to continue had the Chinese government not intervened on a policy level in 2017.

3. Empirical model and results

In this section, we discuss some regression model specifications to test our hypothesis of provincial interdependence in China's OFDI, interpret estimation results accordingly, and offer some policy implications based on our findings.

We first use fixed effect panel data regression to estimate the impact of the spillover effect from neighboring provinces' OFDI, then provide a rough estimation of the overall amount of irrational OFDI based on our results. As we lack information concerning individual provinces' competitors, we used two different definitions for "neighbors": all other provinces in the same region and the province with the greatest OFDI located in the same region as "the neighbor", respectively.

3.1. All other provinces in the region as "the neighbors"

In this subsection, we assumed that all other provinces in the same "region" as the original province are "the neighbors". We follow Chinese government protocol to define "the region". The Chinese government separates the entire country into four regions according to both the geographic location and the level of economic development, namely, east-coastal, central, north-east, and western region[5]. This categorization appears to reflect the geographic distance; but it essentially captures the closeness of the level of economic development and the similarity of industrial structure. Let us take Zhejiang, a top economic growth province, as an example. It is located in the 10-province east-coastal region which is the highest economic growth regime that concentrates manufacturing and exporting industries. Under the current definition of the neighbors, Zhejiang considers the other 9 provinces in the east-coastal region as its neighbors.

This definition for "neighbors" is in accordance with our argument concerning the reasons for the spillover effect from neighboring provinces' OFDI. First, we argue that the OFDI from one province follows the OFDI from its neighboring provinces in competition for foreign markets. "Local business protectionism" among Chinese provinces limits firms to explore markets in neighboring provinces and intensifies their competition on foreign markets. Provinces in a similar level of economic development (e.g., within the same region) especially protect their local market from being penetrated by firms from provinces in the same group (Bai et al, 2004; Poncet, 2005; Zhou, 2004). Thus, it is conceivable that a province considers the economic rivalry of provinces that are similar in economic development as the neighbors for purposes of competition over OFDI.

Second, the competition in government official promotion in the same "region" is another plausible reason for the spillover effect that causes a province to invest more in OFDI than other provinces in the region. The Chinese central government routinely promotes provincial governors to the rank of national government based on their performance in terms of local economic growth and on how well they execute central government policies. It is a tournament in which, to succeed, the local government must achieve better economic performance (Zhou, 2004) and better execution of central government policies, that include the "going global" OFDI

[5] http://www.stats.gov.cn/ztjc/zthd/sjtjr/dejtjkfr/tjkp/201106/t20110613_71947.htm

promotional policy (Luo et al, 2010) and the BRI (Yu et al, 2019). A direct measurement of a province's promotion of OFDI is the amount of OFDI from that province. Promoting more OFDI than other provinces in the region increases provincial officials' chances to win the political tournament.

For these reasons, we argue that a province constantly studies the level of OFDI from its neighbors in the same "region". It catches up with the neighbors in order either to maintain its economic position in foreign markets or to raise its rank in the political tournament. Thus, we consider the following approach to numerically measure the spillover effect from the neighbors:

$$NeiborOFDI_i = \frac{1}{n_k - 1}\sum_{j=1}^{n_k} OFDI_{j\neq i} \qquad (1)$$

where $NeiborOFDI_i$ proxies the spillover effect, measured as the average OFDI level in the neighbors in region k. k is the index for the four regions (east-coastal, central, north-east, and western). $OFDI_{j\neq i}$ is the annual OFDI volume in each neighbor. n is the number of provinces in a region.

Against this backdrop, we specify a panel data regression as follows:

$$OFDI_{it} = \alpha + \beta * X_{i,t-1} + \gamma * NeiborOFDI_{i,t-1} + \varepsilon_{it} \qquad (2)$$

where $OFDI_{it}$is the logarithm value of the OFDI volume (in US dollars) from each Chinese province. We obtained OFDI annual flow data for the period 2003 to 2015 from the *Statistical Bulletins of China's Outward Foreign Direct Investment*. All 31 provinces are included in the data sample. Subscripts *i* and *t*, are the province index and the year index.

$X_{i,t-1}$ is a vector that contains some relevant push and pull factors of Chinese provincial OFDI. We include "energy" as one push factor. As identified in Cheung and Qian (2009), China's OFDI seeks natural resources to meet the demand from the fast-growing Chinese economy. High energy consumption may indicate that a province needs to find more energy for

economic development. We expect greater energy consumption to push more provincial OFDI to grab more natural resources overseas.

FDI and trade are two economic activities that usually interact, both directly and indirectly, with each other[6]. China's OFDI has also been found to facilitate Chinese exports (Cheung and Qian, 2009; Buckley et al, 2007; Aizenman et al, 2018). We include *exports*, measured as the total exports from a province, as another push factor, and expect that greater exports motivate a Chinese province to invest more in OFDI. In addition, we included the FDI inflows to a province, marked as *FDIinflow*. FDI inflows not only bring in capital investment but also technological and management knowledge, which create a positive spillover effect to domestic firms that learn from inward FDI and later raise the productivity level high enough to be capable of engaging in OFDI (Chen, 2011; Helpman et al, 2004; Wang and Wang, 2015).

We also include two variables that measure the size of economy and technology endowment in each province, proxied by *population* and *education*, respectively. A larger economy size and a more technologically advanced workforce, hence greater productivity, motivate firms to invest overseas to explore foreign markets (Liu, 2008; Kee, 2015). *Population* is measured as the number of people in each province and *education* is defined as follows:

$Y = 6 * y_1 + 9 * y_2 + 12 * y_3 + 16 * y_4$, where $y_1,\ y_2,\ y_3$ and y_4 represent the share of population with an elementary, junior high, senior high, and college degree, respectively (Bai, 2004).

In addition to domestic factors that push China's provincial OFDI, foreign market characteristics may pull Chinese OFDI. Market factors (e.g., market size, trade intensity, and natural resource endowment) and institutional factors (e.g., political risk and cultural approximation) are key determinants for Chinese OFDI (Cheung and Qian, 2009; Buckley et al, 2007). As we used aggregate provincial OFDI data and did not specify individual host countries, we are not able to include host country specific variables as pull factors. Rather, we created two world factors, "world's total imports excluding China" (*WDimports*) and "world total FDI excluding China" (*WDFDI*), to represent world market characteristics that attract Chinese OFDI.

[6] For instance, Aizenman and Noy (2006) and Camarero et al. (2018) found FDI and trade positively reinforce (complimentary) each other; Collie and Vandenbussche (2005) discuss trade policy affect OFDI conditional on labor market unionization; and Dées and Zorell (2012) found FDI synchronize business cycle indirectly by raising the similarity in sectoral specialization.

All other things being equal, we expect that China would invest more OFDI if the world market demands more imports (*WDimports*) and engages in more FDI (*WDFDI*).

The definition and data source of all these variable described above are summarized in Appendix I. We use the log value of all of our independent variables and lagged them by one time period (except for the two world variables) to address the potential endogeneity issue before running regressions.

The results of fixed effect panel data regression[7] are reported in Table 1. Column (1) includes all economic factors, column (2) regresses only the neighboring spillover effect variable, and column (3) combines both economic factors and the neighbor effect. The estimates for economic factors are in accordance with findings from other researchers: A large energy demand pushes a province to invest more OFDI; provincial exports are positively associated with provincial OFDI, similar to the findings of Aizenman and Noy (2006); and provinces with greater economic size have invested more OFDI. The world's demand for FDI pulls more OFDI from China. FDI inflows that proxy for productivity and education (a proxy for technologic endowment) are not significantly associated with OFDI, indicating productivity and technology have no significant impact on Chinese provincial OFDI. The estimate for the effect of the world's total import is negative and insignificant.

Regarding our postulated neighboring effect, column (2) reports the fixed effect regression results with the neighbors' OFDI as the only independent variable. Although the estimation here might be biased due to the omitted variables issue, column (2) suggests a strong spillover effect from the neighbors' OFDI behavior. This positive spillover effect remains significant when we combine both economic fundamentals and the neighboring spillover effect in column (3).

The estimated result in column (3) suggests that a one percent increase of average OFDI in the neighboring provinces is associated with 0.26 percent increase of OFDI in a province. Based on this result, we use Zhejiang province in 2015 as an example to demonstrate the strength of the spillover effect. According to column (3) result, a one percent increase in the average OFDI of east coastal region in 2014 results in 1.85 billion USD more OFDI from Zhejiang

[7] Hausman test rejects random effect panel data regression.

province in 2015. If we apply the same calculation to the aggregate OFDI for China and given that there was a 71% increase in to China's provincial OFDI from 2014 to 2015, there would be 36 billion USD of total OFDI in China in 2016 due to the spillover effect for neighbors alone [8]. This number is comparable to the decrease in OFDI of 50 billion USD observed in 2017 when Chinese government halted any OFDI investment in "irrational" industry sectors, (e.g., entertainment, real estate, sports clubs, and movie theaters). Had no spillover effect occurred we estimate that the irrational OFDI in 2016 would have been about 14 billion USD.

The estimation in column (3) explains 77% percent of the variation in China's provincial OFDI overall. The estimates for economic factors are intuitive and similar to column (1) except that the world's demand for imports becomes significantly negative. A plausible explanation for this is that many provincial OFDIs are horizontal OFDI that bypass trade cost barriers (i.e., directly "produce and serve" for foreign local markets), which may reduce the demand for imports from those foreign markets.

In addition to the estimation in column (3), for robustness purpose, we run three more regressions in which we control for a time trend[9], all other provinces as the neighbors, and geographically bordered provinces as the neighbors, respectively. The results are shown in columns (4), (5), and (6). Overall, adding a time trend and using different sample selections for neighboring effect yield consistent results for the neighboring spillover effect with that in column (3).

Next, we run the same regression models using only the samples in each of four regions individually and treat all provinces in the same region as the neighbors. The results for each of the four regions (east-coastal, central, western, and north-eastern region) appear in column (1) to (4) of Table 2. The spillover effect is only significant for the east-coastal and western region provincial OFDI, while the estimates for the central region and the north-eastern region are not significant.

[8] Note that we estimate the spillover effect elasticity based on provincial OFDI data which exclude the OFDI made by China's central government owned enterprises (SOE). In estimating 36 billion OFDI, we used total Chinese OFDI, which include both provincial and SOE OFDI.

[9] It would be more appropriate to control year effect in fixed panel data regression. However, due to multicollinearity with two world factors (*WDFDI and WDimports)*, we use a time trend to capture possible time effect.

Comparing the Table 2 estimates to the results in Table 1, the spillover effect appears to be much stronger in east-coastal and western region. While it is within expectation that competition exists in the east-coastal region where the richest provinces are located, it is interesting that the spillover effect from neighbors is fairly strong among western provinces. This is perhaps due to that the Chinese government designated many economic policies supporting economic growth in the western region in order to balance the economic inequality between east and west China. The western region provincial government competes with each other to support central government policy in the political tournament, particularly with respect to the promotion of the BRI that was especially given preference to promoting economic cooperation (trade and OFDI) and growth in the western region.

3.2. Race to the top

The IO based FDI theory suggests that FDI essentially is the result of defensive moves in oligopolistic industries (Knickerbocker, 1973; Yu and Ito, 1988). An FDI move made by the first firm may trigger a chain reaction of follow-up FDI moves by other firms to protect their positions (Schenk, 1996), which could be described as "following the leader" behavior facilitating collusive behavior to maintain the profitability of the entire industry (Leahy and Pavelin, 2003). In this scenario, it is the leader, not the average neighbors, who really imposes spillover effect to other FDI. In China, this effect might better be described as "racing to the top". As Zhou (2007) suggests, in the political tournament, the usual result of the game is that one official is promotion, leaving nothing for other officials. In this win-or-lose situation, officials race to the top in many aspects including promoting provincial OFDI. We therefore consider this "race to the top" mechanism via which each province competes to be the top OFDI investor in their region. To test this hypothesis, we replace the average OFDI from the neighbors with the highest OFDI neighbor variable, which is measured as follows:

$$TopNeiborOFDI_i = Max\left(OFDI_1, OFDI_2, .. OFDI_{j\neq i} \ldots OFDI_n\right) \qquad (3)$$

where $TopNeiborOFDI_i$ is the investor with the most OFDI of n provinces in a region. A positive estimate for $NeiborOFDI_i$ indicates a positive spillover effect from the neighboring OFDI leader. Table 3 shows that the coefficient for $NeiborOFDI_i$ is 0.21 and significant, suggesting that individual provinces closely watch the OFDI-related behavior of the regional

leader province and place more OFDI when they observed more OFDI actions taken by the leading province.

The estimated spillover effect from the leading OFDI province is similar to that seen in Table 1 (0.26 vs. 0.21), as are the estimated effects of economic factors in significantly determining China's provincial OFDI. This suggests that the spillover effect from neighbors tends to increase provincial OFDI, regardless of the exact source (leader province or the regional group). This is a dynamic spillover process – a province increases OFDI due to a higher level in its neighbor provinces this year; next year, other provinces, in turn, do the same to follow up with the first province. This dynamic continues to push the level of OFDI further from the equilibrium level that is determined by economic factors, resulting in irrational OFDI.

3.3. Common latent economic factors

The estimates of spillover effect are robust, as we used different measurements of the neighbors (average and leading OFDI neighbor) and different province samples (4 different regions). However, one concern is that increases in provincial OFDI might be due to latent dynamics that affect economic activities across all provinces. If this is the case, the spillover effect from neighbors might be spurious since it could be the common latent economic factors that drive OFDI from all provinces to greater levels. To address this concern, we first assumed that common factors that drive provincial GDP growth also drive the provincial OFDI. This assumption is made based on the findings of Helpman et al. (2004) that the most productive firms choose to serve the oversea market via FDI. Common factors that drive more productive firms in provinces also drive up their GDP and OFDI to serve oversea markets.

To implement, we use Principal Component Analysis (PCA) to extract the first principal component of GDP data from all provinces to proxy the common latent economic factor. In addition, for purposes of robustness, we repeat the same approach to generate a common factor from FDI inflows data in all provinces in that provinces with more productive firms and higher GDP attract more FDI inflows.

Two common factors, notated as Common_GDP and Common_FDI, are lagged one year and added to the baseline regression (2). As shown in the reported results in Table 4, both

common factors are estimated to be negative, but statistically insignificant[10]. Interestingly, common factors that drive either GDP or FDI inflows to all provinces appears to negatively associated with China's provincial OFDI according to our estimation. They are statistically insignificant though.

Adding these common factors does not alter other results, particularly, the neighboring effect variable is still positive and significant as in Table 1, as are the economic factors. It appears that the identified spillover effect from the neighbors' OFDI is robust to common latent economic factors.

3.4. The common shocks from BRI and 2008 financial crisis

In addition to common economic factors, national policy shocks or global economic and financial shocks might result in common movements of provincial OFDI that appears to be the "following the neighbors" behavior we observed. To address this concern, we investigated the effect of two shocks, namely, China's BRI policy shock and the 2008 financial crisis shock, on China's provincial OFDI to determine whether and how they influenced the interdependent nature of provincial OFDI.

Following the approach of Yu et al. (2019), who found that BRI promoted more OFDI and altered some Chinese firms' OFDI behavior, we created a time dummy (*BRI* = 1 if year >2013, 0 otherwise) to measure the BRI policy effect. To assess the possibility that spillover effect from the neighbors might change before and after the launch of BRI, we tested the effect of the interaction of *BRI* with *NeiborOFDI*. We first ran a panel data regression, including *BRI*, *NeiborOFDI*, and the interaction term; column (1) of Table 5 shows the results. Although *NeiborOFDI(-1)*BRI* is positive, we do not find significant impact of BRI on the spillover effect from the neighbors in the absence of economic factors. However, the regression with BRI variable explains 1% better than the corresponding one in Table 1, suggesting that BRI policy is perhaps relevant to provincial OFDI. We then add other economic factors to the regression, both the value and the significance of the BRI interaction term are turned up substantially - the coefficient becomes 0.36 (significant at 1% level). This result suggests that the spillover effect

[10] In the pass, we also check the potential common factors that drive provincial industrial production and the number of labors employed. They yield the same results as in Table 4. These results are not reported, but are available from the authors.

from the neighboring provinces is stronger with the influence of the BRI policy. In fact, the marginal spillover effect after the launch of BRI is 0.6, more than two-fold higher than its value in Table 1. Controlling for BRI impact does not change the spillover effect before BRI launch– the elasticity of 0.23 is similar to the value of 0.26 seen in Table 1.

In addition to domestic policy shocks such as the BRI, global shock potentially impacts provinces across China. The 2008 financial crisis slowed down virtually all types of global capital flow, including the world's FDI flow. China is not an exception. As seen in Figure 1, the upward trend of China's OFDI flattens out around the time of the 2008 financial crisis. Thus the 2008 financial crisis perhaps is a good proxy to assess the effects of a global shock on China's provincial OFDI and the interaction among neighboring provinces. We created a pulse time dummy (Crisis = 1 if year =2007, 2008, and 2009; 0 otherwise) to evaluate the effect of the 2008 financial crisis and generated an interaction term with *NeiborOFDI*. Table 6 shows the results. As expected, the 2008 financial crisis significantly reduce the neighbor spillover effect. This is in line with the findings of other researchers that a financial crisis increases the risk level of investments; thus, risk averse firms would rather resolve risk concerns by reducing OFDI activities instead of competing with each other. Regardless, the coefficient for the spillover effect at non-crisis time remains very similar to that seen in Table 1.

In sum, the neighbor spillover effect is robust even in the presence of factors such as common latent factors, domestic policy shock, and global financial shock.

4. Further Analyses and robustness

4.1. The spatial regressions

In our previous analyses we treated each neighbor as equally important by using the average OFDI to measure the spillover effect. Conceivably, however, neighboring provinces are heterogeneous and a province would treat one particular neighbor more important than others. With no concrete information about the criteria by which a province differentiates its neighbors, we assume that a province considers a neighboring province that has a higher GDP or level of FDI inflows as an important neighbor. The level of importance can be measured by the spatial weight matrix in the context of spatial regression as follows:

$$W\_gdp_{s,m} = diag\left(\frac{gdp_1}{\overline{gdp}}, \frac{gdp_2}{\overline{gdp}}, \ldots, \frac{gdp_n}{\overline{gdp}}\right)/d_{s,m}^2, s \neq m \qquad (4)$$

$$W\_fdi_{s,m} = diag\left(\frac{fdi_1}{\overline{fdi}}, \frac{fdi_2}{\overline{fdi}}, \ldots, \frac{fdi_n}{\overline{fdi}}\right)/d_{s,m}^2, s \neq m \qquad (5)$$

$$W\_gdp_{s,m} = 0 \; and \; W\_fdi_{s,m}, = 0, \qquad if \; s = m$$

where gdp_i and fdi_i are GDP and FDI inflows of province i; $\overline{gdp}$ and $\overline{fdi}$ are average GDP and FDI inflows of all provinces; $d_{s,m}$ measures the geographic distance between province s and m ($s \neq m$). Compared to typical spatial weight matrix that uses geographic distance as weight, our matrix captures not only geographic closeness but also relative economic development level, which is evaluated by the ratio of GDP or FDI inflows of a province to average provincial GDP or FDI inflows. Moreover, using ratios of GDP and FDI inflows to their average level enables our spatial weight matrix to capture asymmetric spatial effect. For example, one would expect province s to consider province m as an important neighbor if $gdp_s < gdp_m$. On the other hand, province m would consider province s as a less important neighbor, because it has larger GDP than province s.

We first use Moran's Index to test the spatial interdependence among provincial OFDI for each year in our data sample. The spatial weight matrix is based on the relative level of FDI inflows in each province for each year, $W\_fdi_{s,m}$. Thus, the higher the level of FDI inflows, the greater the weight assigned to a neighboring province, indicating a closer special (spillover) effect. Table 7 shows the Moran Index test results in which only 2 out of 13 years are estimated negative but not significant. Most of Monran's I indices are positive and significant, suggesting that there is a positive spatial effect in China's provincial OFDI in most of the sample years.

Next, we turn to estimate the spatial interdependence of China's provincial OFDI by using the spatial lag regression (SAR). The SAR, which posits that the dependent variable depends on the dependent variable observed in neighboring units and on a set of other variables, is an ideal alternative approach to test the spillover effect from neighbors' OFDI. The SAR model is specified as follows:

$$OFDI_{it} = \alpha + \rho * W * OFDI_{i,t-1} + \beta * X_{i,t-1} + \varepsilon_{it} \qquad (6)$$

where *W* is the spatial weight matrix defined in (4) and (5). OFDI from one province is spatially correlated with last period OFDI from its neighboring provinces. $X_{i,t-1}$ includes the same control variables as in regression (2). A positive estimation of ρ may indicate that the provincial OFDI spillover effect that comes from competition based on the observation on neighbor's OFDI behavior.

Column (1) and (4) of Table 8 report results of SAR model (6) and show significant and positive ρ *(Rho)*, the coefficient of the observed neighboring effect evaluated by GDP and FDI inflows weighted spatial matrix, respectively[11]. These results suggest a positive spatial spillover effect from the OFDI behavior in neighboring provinces[12].

In addition to analyzing spatial effect associated with provincial OFDI, we examine the direct and indirect effect of independent variables (e.g. energy and exports, etc.) on $OFDI_{it}$. The direct and indirect effect arise due to that the spatial matrix alters the data generating process when estimating the spatial coefficient ρ (LeSage and Pace, 2014). More specifically, in SAR specification, OFDI from province *i* is affected, for example, not by its own exports level alone; it is also affected by its neighbors' exports, the degree to which is regulated by the spatial weight matrix. Following the approach of LeSage and Pace (2014), we estimate the average direct and indirect effect of all independent variables in equation (6) and the results are reported in columns (2), (3), (5), and (6) of Table 8. Results are varying depending on which spatial weight matrix is used. When we use provincial GDP spatial matrix [equation (4)], there is neither significantly direct, nor indirect effect. However, when using FDI spatial matrix [equation (5)], while no

[11] In addition to using relative level on GDP and FDI inflows to create spatial weight matrix, we tried using the closeness of economic tie between provinces to weight spatial matrix. The bilateral freight exchange via national railway data are used to generate spatial matrix. We did not estimate a significant spatial effect, suggesting that it is perhaps the relative level of economic development as opposed to the closeness of economic tie that promotes the neighboring spillover effect on provincial OFDI. These results are not reported but they are available upon request.

[12] Note that, although ρ reflects the strength of spatial dependence, ρ is not a conventional correlation coefficient between $OFDI_{it}$ and the spatial lag vector $W*OFDI_{i,t-1}$ (Lesage and Pace, 2004). We reserve to further elaborate the interpretation on these results other than the exist of spatial interdependence of provincial OFDI in China.

indirect effect is identified, we find that the overall effect of provincial exports, FDI inflows, education level, and population on OFDI are mainly resulted from the direct effect.

The SAR model that we discussed above considers provincial OFDI spillover effect coming from competitions based on the observation on neighbors' OFDI behavior. It is plausible that the neighboring spillover effect stems from some undisclosed (latent) objectives. A spatial error model (SEM), which handles such situation where unobserved shocks follow a spatial pattern, can help us test the possibility of latent spatial force that drives the spillover effect on provincial OFDI. A positive estimation of SEM may indicate that the provincial OFDI spillover effect come from competition for some undisclosed objectives. To explore this possibility, we run SEM regressions using spatial weight matrix (4) and (5). The estimated results, which are reported in columns (7) and (8) of Table 8, suggest a latent neighboring spillover effect as *Lambda* (from unobserved spatial factors weighted by GDP and FDI inflows) is estimated significantly positive. In sum, we able to obtain some evidences suggesting that Chinese provincial OFDIs compete with each other not only based on what they observed from their neighbors' behavior, but also some unobserved objectives that all provincial OFDI were chasing, both of which lead to more OFDIs. These results from spatial regression models lend support to the results obtained from our panel data regression models in Section 3.

4.2. Stock data of OFDI and GMM approach

To further test the robustness of our findings, we use different OFDI datasets that might have different data generation processes thus possessing different information and dynamics.

First, we utilize the stock data of China's provincial OFDI that were published in *Statistical Bulletins of China's Outward Foreign Direct Investment.* Due to that OFDI stock data are subject to a time serial data persistency issue in which current OFDI depends on the previous years' OFDI (Cheng and Kwan, 2000), a lagged dependent variable is required to control for this issue. However, a panel data regression with lagged dependent variable usually yields biased estimates (Anderson and Hsiao, 1982). We therefore follow the approach of Cheng and Kwan (2000) and use dynamic panel system GMM (Generalized Method of Moments) instead.

The results shown in Table 9 suggest a positive spillover effect of OFDI stock from the neighboring provinces, although the column (1) estimate of the degree of spillover effect (about

0.09) is smaller than that seen in Table 1. Moreover, by using the OFDI stock data and controlling for the effects of BRI [column (2)] and the 2008 financial crisis shock [column (3)] to run regressions, we estimate similar neighboring spillover effect as those in Tables 5 and 6.

4.3. Alternative data – the number of approved OFDI in each province

Next, we use the number of OFDI deals approved by (and registered at) the Ministry of Commerce (MOFCOM) from January 1, 2000 to the end of 2015. For every OFDI deal, the dataset records the name of the investing firm, its industrial sector, the province of origin, the deal's approval date, the recipient country of the OFDI, and a short description of the investment transaction. However, MOFCOM did not release information on the investment value of OFDI deals[13]. For this reason, we count the number of OFDI deals originating from a province each year in a variable labeled as *OFDInumber*.

We repeat the same regressions as in Table 1 except that here the dependent variable is the log-transformed value of *OFDInumber*[14]. Table 10 shows the results; we find that these results are similar to those of Table 1, except that here the effect of *Education* is significant. The elasticity of the spillover from the neighbors is 0.2, indicating that one percent more approved OFDI deals from the neighbors is associated with 0.2 percent increase in the number of approved OFDI deals in a province. This model explains more variance (as indicated by an R^2 of 0.83) than the model which used the OFDI flow data.

To sum up, our findings are robust to the use of different regression approaches, different measurements of the spillover effect from the neighbors, and three types of OFDI data.

5. Concluding remarks and policy suggestions

We studied the interdependent behavior of Chinese provincial OFDI and suggest a plausible consequence of such interdependency. Using China's provincial OFDI data, we found

[13] Admittedly, only the number of OFDI, without the investment value of each OFDI project, entails risk of misinformation, because one large scale project might be more important than several small projects in economic sense. However, it is reasonable to assume that a province that registers higher number of OFDI projects is likely to have more large scale OFDI and higher overall OFDI as well.

[14] To be specific, the dependent variable is formulated as log(1+ *OFDInumber*) to copy with the case where there is no OFDI from a province in some years.

that the OFDI from one province positively depends on the OFDI of neighboring provinces. Such spillover effect tends to induce more OFDI than warranted by economic fundamentals, resulting in irrational OFDI.

We argue that the interdependent relationship we observed in China's provincial OFDI is due to the "follow the leader" behavior of the provinces and is an unexpected consequence of OFDI promotional policies under China's political tournament environment. Provincial governors compete to achieve better local economic development and execute expeditiously and effectively the policies of the central government, including those which promote OFDI, in order to have better chance to win the political tournament. Both channels leads to more OFDI; however, competition on promoting provincial OFDI can quickly turn to be over-heated and distort firms' decision in making OFDI thereby creating more OFDI than justified by the economic fundamentals (irrational OFDI).

Based on our model results, we roughly estimate that China has about 36 billion USD of irrational OFDI that is deviated from the equilibrium level determined by economic fundamentals. Irrational OFDIs that are built on factors other than economic fundamentals tend to fail. Since many of OFDI projects are financed by Chinese SOE banks, a failure of irrational OFDIs (thus defaults on loans) add risk to China's banking system. In addition, many irrational OFDI may in fact be capital flight disguised as legal OFDI to circumvent Chinese capital controls and move money out of the country illegally; the loss of about 1 trillion USD of China's foreign exchange reserves, which threatened China's financial stability in 2015 and 2016, might have resulted from a combination of normal OFDI and irrational OFDI.

To avoid the negative consequences of irrational OFDI, the Chinese government might examine the fundamental reasons for irrational OFDI and adopt some prudent policies to control it. Our findings suggest that the government might restrain its promotion of OFDI to quell the OFDI rivalry among provinces when the overall Chinese OFDI surges and provincial OFDI appears to increase in tandem (a similar fashion of counter cyclical monetary policies). It will also be necessary to tighten the central government's OFDI approval process and to scrutinize OFDI projects more carefully. More importantly, China needs to monitor the provincial OFDI approval process that might become too permissive when provinces are competing to promote OFDI.

Similar to competition among provinces, a firm might follow neighboring firm's OFDI to compete for foreign markets to maintain its market share and competitiveness; this may result in positive outcomes for both firms, but may also create a loss for at least one of the two firms as intense competitions in a foreign market may bring destructive impact to their business. Strategic planning for both OFDI firms and government is needed to avoid the destructive consequences of "following the neighbors" in OFDI.

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Appendix I: variable definition and data sources

Variable	Definition	Data source
OFDI	Aggregate data for outward FDI from firms registered in each Chinese province, in US Dollar	*Statistical Bulletins of China's Outward Foreign Direct Investment*, various years
NeiborOFDI	The level of OFDI flow from the neighboring provinces, in logarithm value	*Statistical Bulletins of China's Outward Foreign Direct Investment*, various years and authors' calculation
Energy	Annual consumption of coal in each province in Million Tons	National Bureau of Statistics of China
Exports	Annual exports from each Chinese province in US Dollar	National Bureau of Statistics of China
FDIinflow	Annual FDI inflows to each province in US Dollar	National Bureau of Statistics of China
Education	Weighted average of Chinese population with elementary, junior high, senior high, and college degree	Survey in China's Labor Market and authors' calculation
Population	Number of residents in each province, year-end number	National Bureau of Statistics of China
Freight	Number of tons of bilateral freight exchange between provinces via national railway.	National Bureau of Statistics of China
WDimports	World's total imports of goods and service to GDP ratio, excluding China	World Development Index, World Bank
WDFDI	World's net FDI inflow, excluding China, in US Dollar	World Development Index, World Bank
BRI	A time dummy for the launch of China's "Belt and Road Initiative", =1 if year > 2013; otherwise, = 0.	
Crisis08	A time dummy for 2008 Global financial crisis, =1 if year = 2007, 2008, and 2009; otherwise, = 0.	

Figure 1: China's FDI inflows and outward FDI

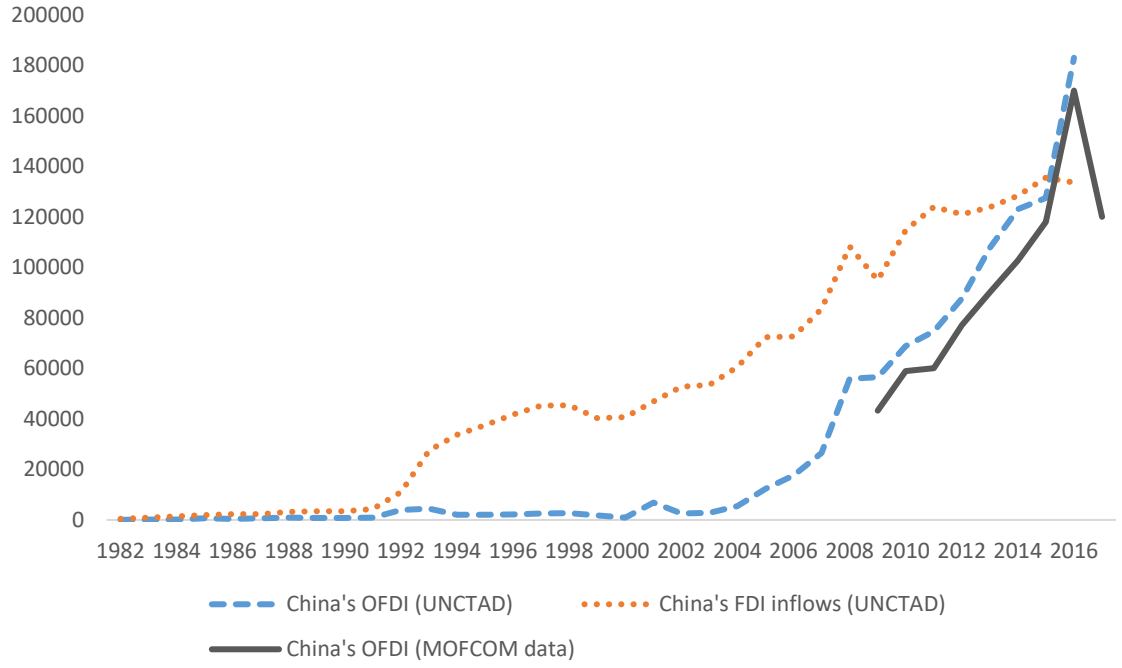

Figure 2: China's OFDI from state owned enterprises (SOE) and provincial OFDI

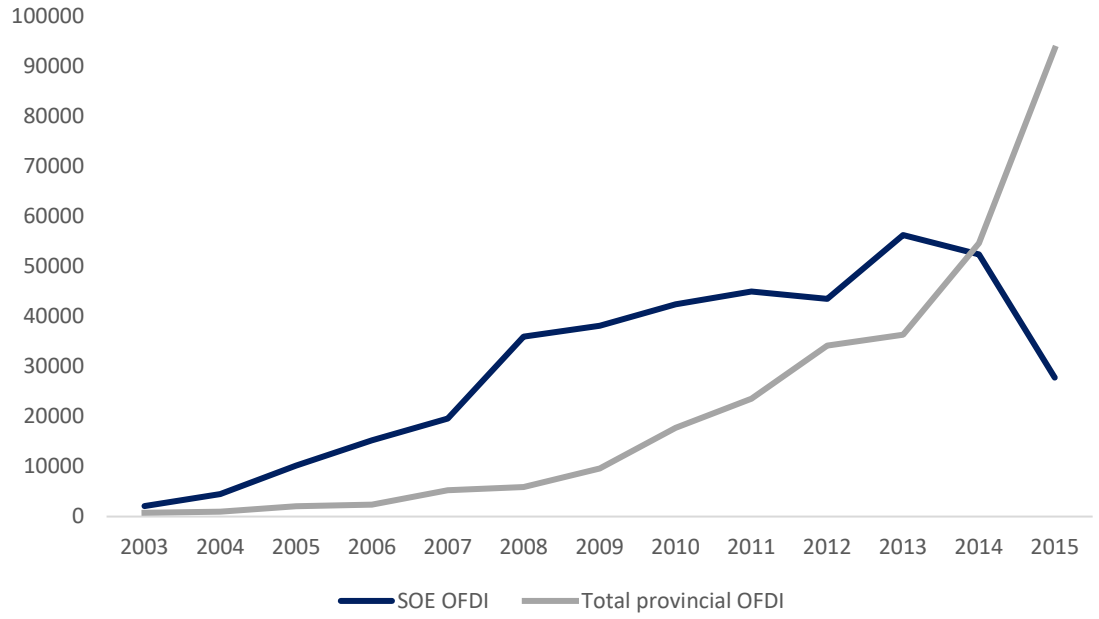

Figure 3: Geographical distribution of Chinese OFDI (2003-2015)

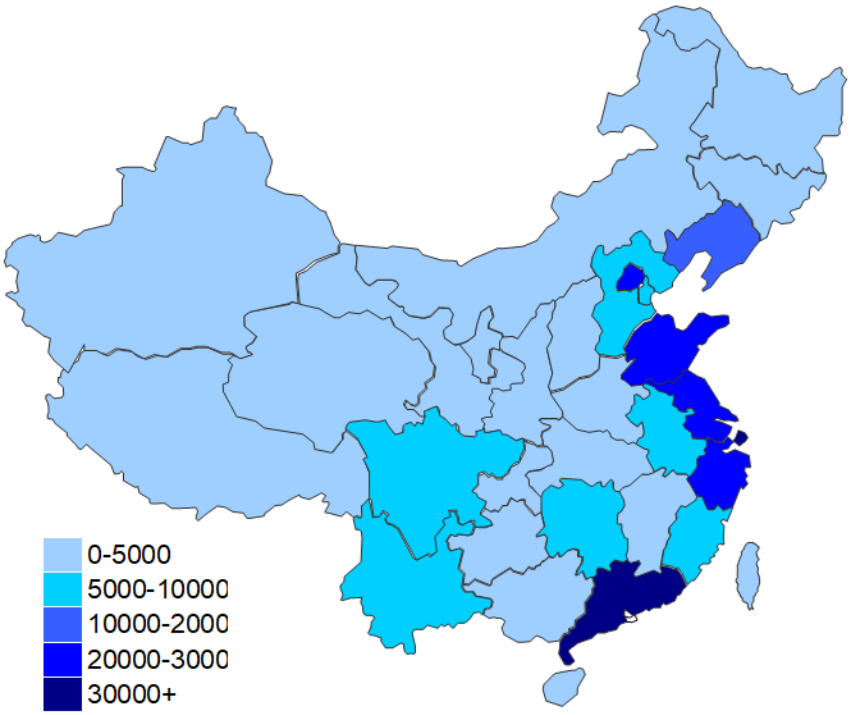

Figure 4: the linear relation between OFDI of neighbor's and the current province's

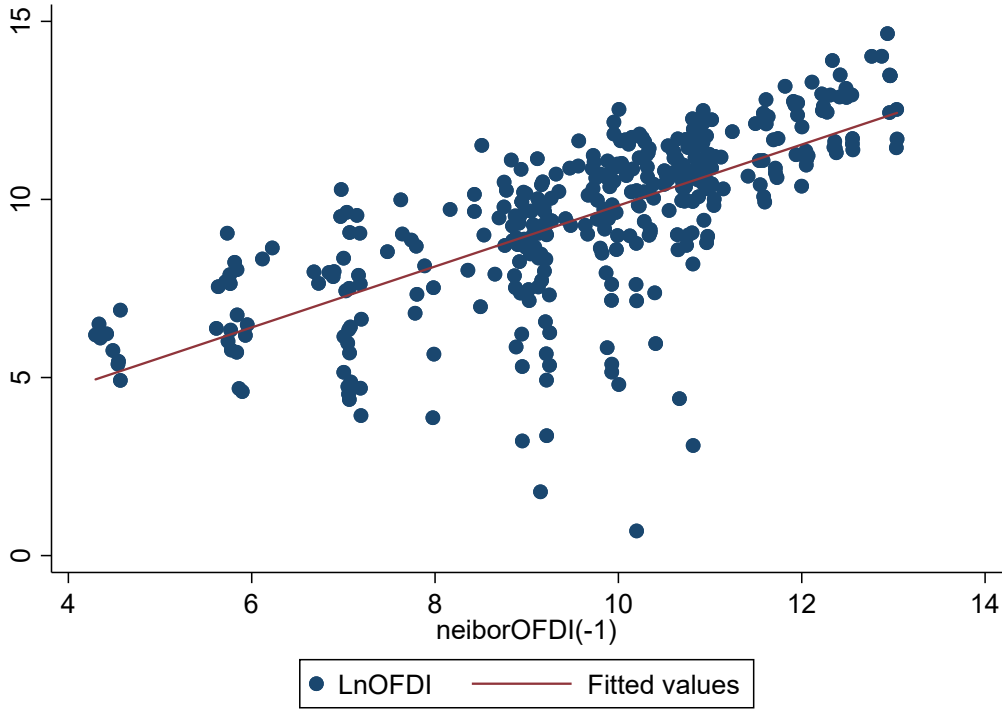

Figure 5: the number of OFDI invested in "irrational" industrial sectors

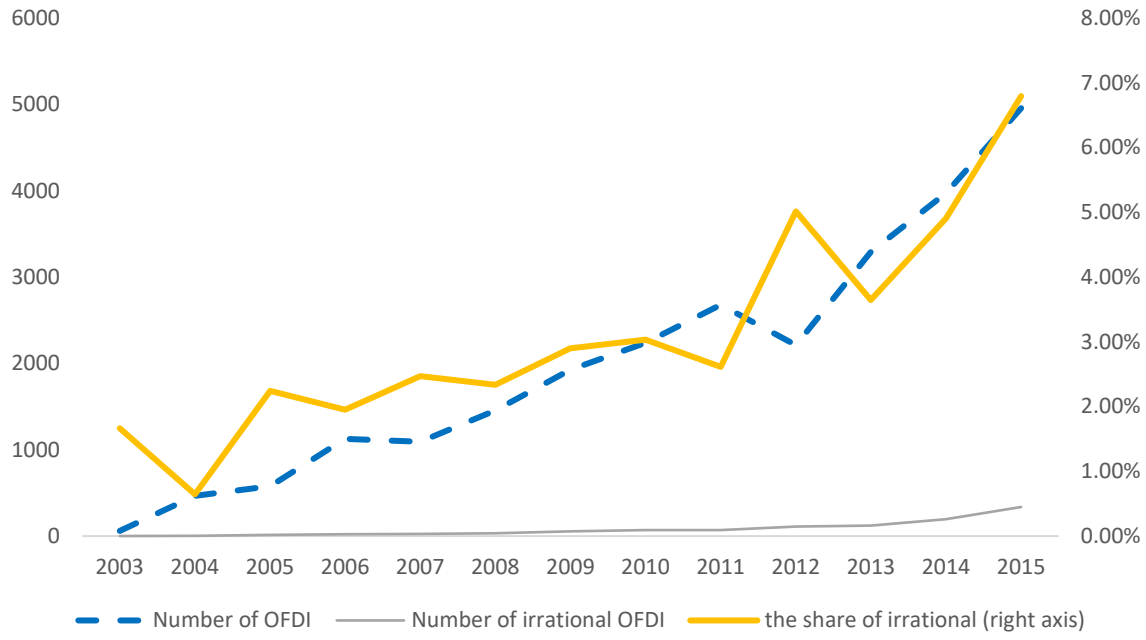

Table 1: Results for spillover effect from the neighbors' average OFDI

	(1)	(2)	(3)	(4)	(5)	(6)
Energy(-1)	1.7887***		1.3866**	1.4281**	1.2615**	0.9961***
	(0.5507)		(0.5281)	(2.7462)	(2.5747)	(0.3527)
Exports(-1)	0.9712***		0.7772***	0.7562***	0.5501**	0.7803***
	(0.2188)		(0.2431)	(3.0781)	(2.3973)	(0.2276)
FDIinflow(-1)	0.3211		0.0261	0.0100	-0.0431	0.1467
	(0.2005)		(0.2336)	(0.0423)	(-0.2045)	(0.2060)
Education(-1)	2.4017		1.8428	1.7582	0.7877	2.1897
	(1.7289)		(1.6510)	(1.0640)	(0.5134)	(1.5145)
Population(-1)	6.0954***		5.1103***	5.1523***	2.8665*	3.7728**
	(1.6515)		(1.5641)	(3.3879)	(1.8274)	(1.4663)
WDFDI	0.4655**		0.3504	0.3312	0.3859*	0.4170**
	(0.2159)		(0.2172)	(1.5278)	(1.7738)	(0.2033)
Wdimports	-2.6571		-3.3984**	-3.3580**	-3.8726**	-2.7329*
	(1.6083)		(1.4977)	(-2.2499)	(-2.3494)	(1.4467)
NeiborOFDI(-1)		0.9136***	0.2609**	0.2527**	0.5367***	0.2827***
		(0.0511)	(0.1054)	(2.4495)	(3.6565)	(0.0792)
Cons	-31.1717***	0.7131	-18.1926***	-20.8582***	-9.0198	-18.3747***
	(5.5569)	(0.4939)	(6.2661)	(-3.5389)	(-1.2416)	(6.1960)
N	355	361	355	355	350	343
Adj. R^2	0.767	0.684	0.773	0.773	0.794	0.805

Note: this table reports the results of fixed effect panel data regression (2). Column (4) controls a time trend. Columns (5) and (6) considers all other provinces and bordered provinces as neighbors, respectively. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Results for spillover effect from the neighbors' average OFDI in different region

	(1)	(2)	(3)	(4)
NeiborOFDI(-1)	0.6474*	0.1313	0.4048***	0.2385
	(0.2943)	(0.3408)	(0.0992)	(0.2489)
Energy(-1)	1.3985*	3.0126*	1.8260**	3.7804**
	(0.7587)	(1.1992)	(0.5776)	(0.7199)
Exports(-1)	0.5931	0.9863**	0.8172***	-0.4447
	(0.4331)	(0.3030)	(0.2083)	(0.6244)
FDIinflow(-1)	0.1937	0.3405	-0.1618	-0.5373
	(0.2606)	(0.8107)	(0.2970)	(0.7733)
Education(-1)	-1.2907	1.5493	-0.5441	-6.3403
	(4.9796)	(4.1778)	(1.9535)	(11.0423)
Population(-1)	4.8865***	4.8323	-8.3777	68.7750**
	(1.4610)	(6.5097)	(7.1684)	(13.8180)
WDFDI	-0.8348	-0.0828	0.3463	-0.8394
	(0.4629)	(0.8800)	(0.6479)	(0.7505)
Wdimports	-0.3150	-2.6099	-3.6548	5.7754
	(1.5171)	(6.2972)	(4.2075)	(4.2115)
Cons	-17.0350**	-40.1373	-1.5733	-104.9252**
	(5.9801)	(22.8792)	(13.0732)	(15.0741)
N	119	72	128	36
Adj. R^2	0.798	0.844	0.774	0.840

Note: this table reports the results of fixed effect panel data regression (2) using different samples. Four columns report result of sample for east-coastal, central, western, and north-eastern region. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Results for spillover effect from the neighbors with the highest OFDI

	(1)	(2)	(3)
Energy(-1)	1.7887***		1.4204**
	(0.5507)		(0.5393)
Exports(-1)	0.9712***		0.8292***
	(0.2188)		(0.2340)
FDIinflow(-1)	0.3211		0.0837
	(0.2005)		(0.2151)
Education(-1)	2.4017		2.2685
	(1.7289)		(1.6458)
Population(-1)	6.0954***		5.4575***
	(1.6515)		(1.5664)
WDFDI	0.4655**		0.3870*
	(0.2159)		(0.2189)
Wdimports	-2.6571		-3.3310**
	(1.6083)		(1.5095)
TopNeiborOFDI(-1)		0.9086***	0.2077**
		(0.0510)	(0.0822)
Cons	-31.1717***	-0.1499	-21.4336***
	(5.5569)	(0.5440)	(5.9626)
N	355	361	355
Adj. R^2	0.767	0.9190	0.772

Note: this table reports the results of fixed effect panel data regression (2). Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Results for spillover effect from the neighbors' average OFDI with common factors that drive provincial GDP and FDI inflows

	(1)	(2)
NeiborOFDI(-1)	0.2329*	0.2316**
	(0.1140)	(0.1034)
Energy(-1)	1.3854**	1.3061**
	(0.5250)	(0.5224)
Exports(-1)	0.8045***	0.8434***
	(0.2551)	(0.2388)
FDIinflow(-1)	0.0572	0.0926
	(0.2403)	(0.2272)
Education(-1)	2.0286	1.7055
	(1.6434)	(1.6583)
Population(-1)	5.2962***	6.1822***
	(1.6218)	(1.6210)
WDFDI	0.3823*	0.3401
	(0.2126)	(0.2151)
WDimports	-3.3415**	-2.5868*
	(1.4965)	(1.3212)
Common_GDP(-1)	-0.0857	
	(0.0870)	
Common_FDI(-1)		-0.1567
		(0.1314)
Cons	-19.7134***	-23.0350***
	(6.7066)	(5.1475)
N	355	343
Adj. R^2	0.773	0.774

Note: this table reports the results of fixed effect panel data regression. Column (1) reports results of regression with the common factor in GDP; Column (2) shows the results from the common factor in FDI inflows. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Results for spillover effect from the neighbors' average OFDI by adding the "Belt and Road Initiative" policy effect

	(1)	(2)
NeiborOFDI(-1)	0.8329***	0.2321**
	(0.0545)	(0.1038)
*NeiborOFDI(-1)*BRI*	0.1526	0.3585***
	(0.1511)	(0.1262)
BRI	-1.2539	-4.2437***
	(1.7940)	(1.4926)
Energy(-1)		1.4495***
		(0.4656)
Exports(-1)		0.9152***
		(0.2334)
FDIinflow(-1)		0.0417
		(0.2549)
Education(-1)		2.2778
		(1.5879)
Population(-1)		4.1446**
		(1.5278)
WDFDI		0.2453
		(0.2286)
WDimports		-2.8914*
		(1.4320)
Cons	1.3674**	-21.7608***
	(0.5071)	(6.0635)
N	361	355
Adj. R^2	0.692	0.777

Note: this table reports the results of fixed effect panel data regression. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Results for spillover effect from the neighbors' average OFDI by adding the 2008 global financial crisis effect

	(1)	(2)
NeiborOFDI(-1)	0.9195***	0.2576**
	(0.0493)	(0.1015)
*NeiborOFDI(-1)*Crisis*	-0.3422***	-0.3653***
	(0.0954)	(0.0961)
Crisis	3.0008***	3.2806***
	(0.8768)	(0.9356)
Energy(-1)		1.3687***
		(0.4910)
Exports(-1)		0.8575***
		(0.2651)
FDIinflow(-1)		0.1653
		(0.2260)
Education(-1)		1.5229
		(1.9178)
Population(-1)		4.5342***
		(1.5827)
WDFDI		0.0636
		(0.2535)
WDimports		-2.1535
		(1.5646)
Cons	0.6882	-21.7730***
	(0.4756)	(6.0722)
N	361	355
Adj. R^2	0.692	0.781

Note: this table reports the results of fixed effect panel data regression. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: results for Moran's I Index value for China's provincial OFDI, various years

Year	I	SD(I)	z	p-value
2003	-0.189	0.152	-1.028	0.304
2004	0.308	0.200	1.709	0.087
2005	0.465	0.154	3.236	0.001
2006	0.307	0.185	1.842	0.066
2007	0.258	0.183	1.594	0.111
2008	-0.092	0.183	-0.321	0.748
2009	0.555	0.213	2.763	0.006
2010	0.877	0.209	4.361	0.000
2011	0.363	0.204	1.936	0.053
2012	0.318	0.205	1.710	0.087
2013	0.218	0.203	1.239	0.215
2014	0.369	0.196	2.057	0.040
2015	0.595	0.188	3.348	0.001

Table 8: Results for interdependence among China's provincial OFDI using spatial lag regressions (SAR) and spatial error model (SEM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SAR_gdp			SAR_fdi			SEM_gdp	SEM_fdi
	Overall	Direct	Indirect	Overall	Direct	Indirect		
Rho	0.2510***			0.3000***				
	(0.0133)			(0.0438)				
Lambda							0.0850***	0.0892***
							(0.0028)	(0.0009)
Energy(-1)	0.3733	0.1782	-0.0317	0.0521	0.0601	0.0212	0.2133	0.2710*
	(0.6128)	(0.2594)	(0.0557)	(0.1854)	(0.1802)	(0.0414)	(0.1417)	(0.1552)
Exports(-1)	0.2764	0.0834	-0.0139	0.4153**	0.3796**	0.0394	-0.0276	-0.1669
	(0.7182)	(0.2579)	(0.0716)	(0.1887)	(0.1749)	(0.0676)	(0.1441)	(0.1105)
FDIinflow(-1)	-2.1094**	-0.7051	0.1282	-0.8426***	-0.7495***	-0.0577	-0.5238***	-0.1917
	(0.9592)	(0.4384)	(0.1778)	(0.2548)	(0.2197)	(0.1066)	(0.1599)	(0.1242)
Education(-1)	-8.3426*	-2.9280	0.5046	-7.8154***	-7.2428***	-0.6522	-6.1809***	-1.3383*
	(4.5912)	(2.1087)	(0.8371)	(1.1891)	(1.2329)	(1.0863)	(0.9915)	(0.7585)
Population(-1)	-1.3057	-0.9061	0.1517	-0.8512	-0.7853***	-0.0684	-2.5067***	-1.9345***
	(6.3690)	(2.3675)	(0.6574)	(0.000)	(0.0509)	(0.1101)	(0.9425)	(0.6912)
Sigma2_e	14.4526***			0.9851***			2.5894***	5.1880***
	(1.3097)			(0.0640)			(0.2119)	(0.3749)
N	403			403			403	403
R^2	0.044			0.057			0.374	0.295

Note: this table reports the results of spatial regression. Columns (1) and (4) reports spatial lag model results where the spatial weight matrix is constructed based on the distance in GDP and FDI inflows. Columns (2) and (5) report the direct and (3) and (6) show indirect effects. Column (7) and (8) report spatial error model results where the spatial weight matrix is constructed based on the distance in GDP and FDI inflow, respectively. *WDFDI* and *WDimports* are dropped by STATA due to multicollinearity with year effect. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Results from system GMM method using OFDI stock data

	(1)	(2)	(3)
OFDI(-1)	0.8771***	0.8767***	0.8635***
	(0.0433)	(0.0431)	(0.0428)
OFDI(-2)	-0.0494	-0.0526*	-0.0537*
	(0.0309)	(0.0308)	(0.0306)
Energy(-1)	-0.0125	-0.0292	-0.0178
	(0.0667)	(0.0716)	(0.0709)
Exports(-1)	-0.0044	0.0340	0.0171
	(0.0452)	(0.0468)	(0.0549)
FDIinflow(-1)	0.0283	-0.0843	-0.0594
	(0.0435)	(0.0613)	(0.0619)
Education(-1)	0.7255*	0.9704**	1.1915**
	(0.3854)	(0.4124)	(0.4932)
Population(-1)	0.1702**	0.2499**	0.2411**
	(0.0863)	(0.0989)	(0.1025)
WDFDI	0.1865**	0.1747*	0.1277
	(0.0949)	(0.0957)	(0.0986)
WDimports	-1.0543*	-1.4581**	-1.4255**
	(0.5670)	(0.6170)	(0.6138)
NeiborOFDI(-1)	0.0887**	0.1258***	0.1363***
	(0.0419)	(0.0444)	(0.0438)
*NeiborOFDI(-1)*BRI*		0.0781*	0.0593
		(0.0404)	(0.0411)
BRI		-1.1384**	-0.8948*
		(0.5138)	(0.5232)
NeiborOFDI(-			-0.0604*
			(0.0313)
Crisis			0.6684**
			(0.3321)
Cons	2.1199	3.2794	3.0105
	(1.8843)	(2.0182)	(1.9983)
N	330	330	330
Sargan Test	16.99	17.90	14.55

Note: this table reports the dynamic panel data system GMM regression. Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Results from panel data regression by using the number of approved OFDI projects

	(1)	(2)	(3)
Energy(-1)	0.4800*		0.2103
	(0.2505)		(0.2534)
Exports(-1)	0.4595***		0.3013**
	(0.1325)		(0.1366)
FDIinflow(-1)	0.2759***		0.0314
	(0.0935)		(0.1189)
Education(-1)	2.6422***		2.1863**
	(0.8685)		(0.8155)
Population(-1)	3.0736***		2.4042***
	(0.7655)		(0.7867)
WDFDI	1.2700***		1.2035***
	(0.1623)		(0.1397)
WDimports	-6.4249***		-7.0949***
	(1.0532)		(1.0879)
NeiborOFDI(-1)		0.5322***	0.2020***
		(0.0285)	(0.0612)
Cons	-4.8602	-1.6736***	5.2390
	(3.9237)	(0.2759)	(5.6049)
N	351	359	351
Adj. R^2	0.818	0.721	0.830

Note: this table reports the results of fixed effect panel data regression (2). Robust errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$