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Article

How outward FDIs affect income: Experiences from Chinese city-regions

ZFW - Advances in Economic Geography

Provided in Cooperation with:

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Suggested Citation: Yang, Ruilin; Bathelt, Harald (2023) : How outward FDIs affect income: Experiences from Chinese city-regions, ZFW - Advances in Economic Geography, ISSN 2748-1964, De Gruyter, Berlin, Vol. 67, Iss. 1, pp. 47-64, <https://doi.org/10.1515/zfw-2023-0001>

This Version is available at:

<https://hdl.handle.net/10419/333169>

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How outward FDIs affect income: experiences from Chinese city-regions

<https://doi.org/10.1515/zfw-2023-0001>

Received: 18. January 2023; accepted: 09. April 2023

Acknowledgements: This paper was presented at the 2022 Virtual Annual Meeting of the American Association of Geographers and the 2022 Virtual Annual Meeting of the Academy of International Business Asia Pacific. We would like to thank the participants of these meetings for constructive criticism, especially Yuk-shing Cheng, Dan Li, Christian Sellar and Godfrey Yeung. We are also grateful to two Reviewers and the Editor of *ZFW – Advances in Economic Geography*, as well as Max Buchholz, John Cantwell, Pengfei Li, Yuanyuan Li, Yutian Liang and Yuefang Si, for constructive comments and suggestions for improving our paper.

Abstract: While outward foreign direct investments (OFDIs) shift resources from a home economy to foreign destinations, increased market and resource access as well as technological and knowledge effects in return have positive impacts on the home region. Such effects may be especially important in emerging contexts, such as that of China. Analyzing data of 285 Chinese city-regions, this paper investigates the impact of OFDIs on home-region income. We show that foreign investment activity positively and significantly impacts income levels in the home region, with differentiated effects depending on the knowledge characteristics of investments and regional absorptive capacity.

Keywords: China; emerging markets; home-region investment impact; outward foreign direct investments (OFDIs); reverse investment effect

1 Introduction

From the perspective of a specific location, foreign direct investments (FDIs) are always directional: inward FDIs

(IFDIs) refer to investments of foreign firms within the local economy, while outward FDIs (OFDIs) refer to local firms' investments abroad by either establishing new or acquiring existing branches (greenfield vs. brownfield investments) (Hymer 1976; Li & Cantwell 2018). Scholars in international business studies and international economics have long proposed that OFDIs correlate positively with the development of the host economy by having a positive impact on the destination's productivity (Blalock & Gertler 2008), employment (Aitken & Harrison 1999) and innovation (Crescenzi et al. 2015). Thus far, however, there is only a limited body of research about the effects of OFDIs on the home region. And few studies have measured the impact of knowledge characteristics of investments, broken down to the regional level (Li M. et al. 2016; Cantwell & Zaman, 2018; Bathelt & Buchholz, 2019).

The investment development path (IDP) model developed by Dunning (1981) describes the relationship between OFDIs and economic development. In the conventional IDP framework, the increase in income per capita and speed of industrialization of a country are associated with improved capabilities of domestic firms, enabling these firms to become active abroad and leading to a fast growth of OFDI activity in later development stages (Dunning & Narula 1996). This is significant because empirical studies show that outward investments can positively affect the home economy (Castellani et al. 2008; Dunning & Lundan 2008; Masso et al. 2008; Criscuolo 2009; Herzer 2011; Bathelt & Buchholz 2019). These studies suggest that OFDIs may play an important role in economic development in the home region by facilitating skill upgrading and generating jobs that support foreign-based activities, creating new markets and stimulating production growth, as well as improving customer satisfaction abroad and facilitating access to both foreign business networks and new knowledge. OFDIs therefore provide opportunities for sales growth and higher income levels at home.¹

One of the intensifying phenomena of current global competition is the increasing participation of multinational enterprises (MNEs) from emerging markets (Kotabe

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¹ Findings with respect to the impact on home-region employment are less consistent and seem to depend on the country context (Gagliardi et al. 2021; Crescenzi et al. 2022).

& Kothari 2016). These MNEs are not only active in mature and traditional industries but are also catching up and succeeding in knowledge-intensive and turbulent industries (Awate et al. 2015). Whereas empirical studies are mostly focused on reverse investment effects in developed countries (Criscuolo 2009; Bathelt & Buchholz 2019), a positive development trigger may even be more important in emerging contexts as the corresponding MNEs do not possess traditional resource-based advantages for internationalization (Cuervo-Cazurra & Ramamurti 2014). In contrast to their counterparts in developed economies, MNEs from emerging countries initially lack internal capabilities and external business networks that could be exploited in accessing global markets (Mathews 2002; Deng 2009; Santangelo & Meyer 2017). Investing abroad, therefore, may act as a means for emerging-country MNEs to gain access to knowledge and resources that would otherwise not be available to them. Our paper directly addresses this context and proposes that OFDIs also positively affect home-region income in emerging contexts, related to similar multiplier effects and knowledge spillovers. It is further suggested that these effects are impacted by knowledge characteristics and moderated by absorptive capacity.

Most of the literature examining the impact of foreign investment activity has typically focused on firm- and country-level analyses (Blomström et al. 1997; Masso et al. 2008; Elia et al. 2009; Clegg et al. 2016; Tang et al. 2020) while only limited attention has been paid to region-specific effects that result from internationalization (McCann & Mudambi 2005; Li M. et al. 2016; Chen 2018; Bathelt & Buchholz 2019). A significant contribution of this paper is therefore the analysis of home-region effects of OFDIs at the level of city-regions. In studies about economic structures and processes, city-regions are a fundamental reference point. First, they are the sites of advanced forms of economic development as they host important industrial agglomerations, specialized labor pools and enable localized knowledge spillovers (e. g., Storper 1997; Maskell & Malmberg 1999; Dicken & Malmberg 2001). Second, economic development within countries occurs in an uneven fashion (Bathelt & Glückler 2018). Such unevenness, which results from disparities in the spatial distribution of resources and production factors and differential access to distribution networks, prioritizes urban cores. Therefore, it is important to employ a subnational lens in the study of outward investments as not all regions in a country are capable of making investments abroad and not all city-regions participate in internationalization processes in the same way.

China is a particularly good case to test our proposition regarding the home-region impact of OFDIs in emerging contexts. After decades of rapid economic growth since

1978, labor costs have increased significantly and a large part of the economy encounters bottlenecks related to a lack of access to leading-edge technologies (Fu 2015). In response to these challenges, the government established a “Go Global” strategy to specifically encourage OFDI activity since 1999 (Luo et al. 2010). Since then, the country has shifted from a major FDI absorber to an important FDI provider and moved very quickly from a newly developing into an emerging economy. Alongside China’s exponential growth, a rising regional divide has developed between the Eastern coastal regions and the rest of the country (Wei et al. 2009; Iammarino & McCann 2013; Liefner et al. 2021; Cao et al. 2023). While an increasing literature recognizes the country’s role as a major outward investor (e. g., Yeung & Liu 2008; Cheung & Qian 2009; Fu et al. 2020; Li 2023), research on the reverse impact of foreign investments on Chinese city-regions is still at an early stage. To test our propositions regarding the home-region effects of OFDIs, we conduct two cross-sectional analyses in this study based on 285 Chinese city-regions for the periods from 2003 to 2009 and from 2010 to 2016.

Our paper is divided into five parts. The relevance of OFDIs in regional economic development is the subject of the next section. Here, we conceptualize the argument that OFDIs can have positive impacts on home-region income in emerging economies such as China, depending on the knowledge characteristics of investments and moderated by regional absorptive capacity. Section 3 describes the data and methodology of our study. Section 4 identifies and tests the relationship between OFDIs and regional economic development through two cross-sectional analyses of Chinese city-regions. Our target variable is per-capita city-region income. To explore and test for potential endogeneity associated with the relationship between OFDI activity and regional income, we apply a two-stage least square (2SLS) estimator. Extensive robustness checks support our findings. Finally, section 5 presents some concluding remarks regarding our main contributions, limitations and directions for future research, as well as policy implications.

2 Conceptual framework and propositions

2.1 Home-region income effects of OFDIs

One of the key questions policymakers are interested in when firms make investments abroad is whether these investments have a positive or negative impact on the home

economy and, more specifically, the home region. While negative implications of OFDI activity are often related to firms' efficiency-seeking behavior, such investments are less common in emerging economies (UNCTAD 1998; Bathelt et al. 2023). In this section, we investigate the reverse impacts of OFDIs on home-region income, generated through demand triggers, multiplier effects and knowledge spillovers. While we are especially interested in the home-region impact in emerging contexts, our argument begins building on existing research that focuses on developed economies.

Positive income effects result when new and expanded economic activities abroad increase home-region demand and innovation and create opportunities for further expansion and growth of other businesses in a developed home location. In other words, MNEs' OFDI activity unfolds multiplier effects in the home region and the home economy more generally (Dunning & Lundan 2008), and improves the competitive position of firms in that region. On the one hand, demand-driven multiplier effects lead to the expansion of production activities and, on the other hand, knowledge generation and sharing stimulate innovation. Both effects operate via backward and forward linkages.

First, demand-driven multiplier effects of OFDIs are caused by the increasing demand for goods and services from foreign markets. To serve such new demand, the scale of the investing firms' activities expands, which triggers growth in the supplier sector and initiates economic development in the home region, as many firms not only have domestic but also regional ties (Domański & Gwosdz 2010; Buchholz et al. 2020). Intermediate firms also generate increasing demand for goods and services and stimulate further multiplier effects (Bathelt et al. 2023). As such, expanded production activities in the home region generate higher income levels.

Second, it has been shown that MNEs acquire foreign knowledge and technologies through OFDIs (Dunning 2000; Mudambi 2002; Gaur et al. 2019; Li & Bathelt 2020). Through extensive interactions between MNEs and their partnering firms, such knowledge spills over to other firms in the home region and beyond (Globerman et al. 2000; Beugelsdijk 2007). For instance, a firm investing abroad may transfer knowledge from foreign markets to local and domestic suppliers and help these firms produce new customized products (Dunning & Lundan 2008). Or MNEs that acquire advanced technological knowledge through OFDIs may transfer technologies to partners in the home region to develop new products and foster innovation. Such spillovers will have an expansionary effect in the home region and eventually drive-up regional incomes.

The above processes that lead to positive income effects of OFDIs in the home region have thus far been primarily

been studied in developed economies (Bathelt & Buchholz 2019; Buchholz et al. 2020). In principle, however, such processes should also operate in an emerging context and could have a critical impact as these economies initially lack traditional advantages for internationalization (Li & Phelps 2017). We therefore propose our first and main proposition regarding a positive home-region impact of OFDIs from an emerging economy:

Proposition 1: In an emerging economy such as China, OFDIs are positively associated with income levels in the home city-regions.

2.2 Knowledge components of OFDIs' reverse income effects

In the case of an emerging economy, it is possible that income increases may not happen during the initial stages of development. There may have to be some minimum level of industrial activity before the impact of OFDIs is noticeable at the regional level. We therefore expect that context conditions are important in the potential realization of income effects. Spillover and multiplier effects in the home city-region may, for instance, depend on a variety of OFDI knowledge characteristics, such as the development stage of the receiving economy, the technological sophistication of the investing sector and the motivation of investing MNEs.

According to Singh (2007), knowledge flows to a home region may be greater if investments are directed toward technologically advanced economies as opposed to less advanced economies. When a host economy is at or close to the technological frontier, it possesses valuable technological knowledge that investing firms from an emerging economy do not have (Cantwell & Janne 1999; Li et al. 2017; Piperopoulos et al. 2018). Previous studies have also shown that home-region knowledge effects through OFDIs may be greater in sectors in which the host region has a sophisticated knowledge base and cutting-edge R&D capabilities and where technological capabilities are strong (Singh 2007; Bathelt & Buchholz 2019).

It can further be expected that the impact of OFDIs on the home region depends on the investment motive. In the context of emerging-country multinationals, it has been argued that these MNEs utilize outward investments as a strategic asset and use knowledge scouting strategies to strengthen their home capabilities (Morck et al. 2008; Peng 2012). Emerging-country MNEs often lack superior technologies in the initial stage of internationalization and go abroad to learn and upgrade. For instance, Chinese MNEs such as Lenovo and Haier have acquired foreign technology and reorganized their production bases at home through

OFDIs to meet global market requirements for higher-end products (Luo & Tung 2007). From the existing literature, we can assume that OFDIs with a strong strategic-asset and knowledge-seeking motive are more likely to generate knowledge for investing firms and their regional partners at home compared to other motives (Rugman & Verbeke 2001; Cantwell & Mudambi 2005; Deng 2007; Li J. et al. 2016). Such knowledge acquisition results from interactions with foreign partner firms and organizations and takes the form of acquiring proprietary technology, cutting-edge manufacturing capabilities, management know-how, product brands and distribution networks. This knowledge is then transferred back to the headquarters in the home region and radiates to regional partner firms and other domestic actors via a variety of linkages. From the above, we postulate a set of propositions that take into consideration the knowledge characteristics of outward investments:

Proposition 2a: In an emerging economy such as China, the higher the share of OFDIs that are directed to advanced economies, the larger their impact on income levels in the home city-regions.

Proposition 2b: In an emerging economy such as China, the higher the share of OFDIs in advanced and knowledge-intensive industries, the larger their impact on income levels in the home city-regions.

Proposition 2c: In an emerging economy such as China, the higher the share of OFDIs characterized by knowledge-seeking motives, the larger the impact on income levels in the home city-regions.

2.3 Home-region absorptive capacity effects

The expected impact of OFDIs on income levels also depends on the characteristics of the home region. In an emerging economy, the technological capabilities of local firms may be low and firms investing abroad may not be able to partner with foreign firms, instead relying on domestic extra-regional linkages. In such cases, the impact in the home city-region can be expected to be relatively low. We must therefore consider that the spillover and multiplier effects of OFDIs are subject to the absorptive capacity of local partner firms. Cohen & Levinthal (1990: 128) define absorptive capacity as “... an ability to recognize the value of new information, assimilate it, and apply it to commercial ends”. In other words, to benefit from spillover effects of OFDIs, investing firms need to have the capacity to integrate the knowledge and/or technology associated with outward investments internally (Singh 2007). Low absorptive capacity prevents local firms to benefit from such knowledge spillovers because of the lack of sufficient competences to internalize foreign knowledge (Cohen & Levinthal 1990; Li & Cantwell 2018).

While the above argument views absorptive capacity at the firm level, the concept has also been applied to aggregate contexts, such as the regional level (Niosi & Bellon 2002; Cantwell & Iammarino 2003; Abreu 2011; Miguélez & Moreno 2015). The justification for this is that the absorptive capacity of a region is determined by the accumulated absorptive capacity of its firms and organizations (Miguélez & Moreno 2015). Related literature has typically used human capital stock (Crespo & Fontoura 2007) and technological advancement (Li M. et al. 2016) as proxies for regional absorptive capacity. Using panel data from 29 Chinese provinces from 2003 to 2013, Li M. et al. (2016) show that, when the technology gap between local and foreign locations is narrow enough, the productivity growth of OFDIs is positive. Low regional absorptive capacity may, in turn, not enable substantial knowledge spillovers and development triggers in the home region. This leads to our final proposition:

Proposition 3: In an emerging economy such as China, the income effects of OFDIs in the home city-regions are dependent on and moderated by the city-regions' level of absorptive capacity.

3 Data and methodology

3.1 Data

Our empirical analysis spans from 2003 to 2016, which suits the context of the Chinese economy well. After the implementation of the so-called “Go Global” strategy by the Chinese government, which actively encouraged firms to engage in investment activity abroad (Luo et al. 2010; Wang et al. 2012), the early-2000s marked the beginning of a new emphasis on OFDIs. We ended our investigation in the year 2016 when Donald Trump was elected U.S. President. This year coincides with important changes in the global political landscape characterized by increasing anti-globalization politics in many countries, particularly directed toward China (Lampton 2019). These changes affected trade, foreign investment patterns and technology transfers, and led to declines in global flows (Enderwick & Buckley 2020; UNCTAD 2020). Our data about investments of Chinese MNEs comes from the fDi Markets dataset (Financial Times 2017), while data on city-region attributes originates from the China City Statistical Yearbook (National Bureau of Statistics of China 2017).

The fDi Markets database provides information on individual investment projects at the city-region level starting in 2003 (Financial Times 2017) and includes the number of investment projects (not just their value). This enables a

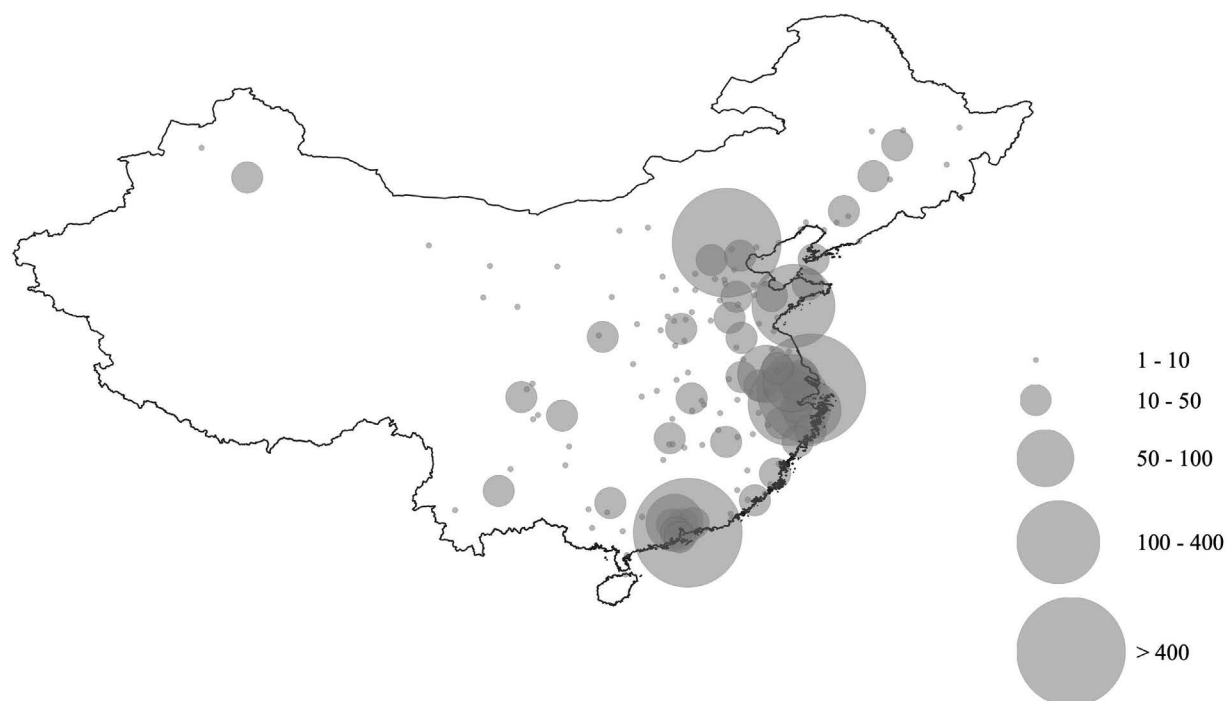


Figure 1: Number of Chinese greenfield OFDIs by city-region, 2003–2016 (Data source: Financial Times 2017)

better representation of investment dynamics (Beugelsdijk et al. 2010) without biasing findings toward sectors with high sunk costs, such as natural resource and large-scale manufacturing sectors. The data also contains information about the activity type of investment projects, which allowed us to draw careful implications regarding likely investment motives. Finally, fDi Markets records the final destinations of OFDIs, and thus overcomes limitations due to round-tripping and onward-journeying phenomena, which are inherent in most other datasets on Chinese OFDIs (Sutherland & Anderson 2015; Yang & Bathelt 2022). However, the database focuses on greenfield investments only and does not record brownfield investment activities. Still, investment data captured by this dataset are highly correlated with other macro-level data from UNCTAD and the World Bank (Crescenzi et al. 2015). The fDi Markets dataset therefore represents a consistent source of information about OFDI activities by Chinese firms from 2003 to 2016. Since the annual number of investments per Chinese city-region is relatively small and often “0”, we accumulated investments across the two time periods 2003–2009 and 2010–2016 and conducted a cross-sectional analysis for each. Our second dataset, the China City Statistical Yearbook (CCSY) contains information about education, employment, public expenditures, as well as R&D activities for Chinese city-regions from 1995 to 2020 (National Bureau of Statistics of China 2017).

The geographic unit of our analysis are city-regions. We defined these as 293 prefectural city-regions plus 4 municipality cities under the direct administration of the central government (Ma 1996). According to Xiao (2003), prefectural city-regions are critical economic units in China. It is at this spatial level that economic development is coordinated for both urban and rural areas. Since 1983, prefectural city-regions have adopted a “city manages county” institutional system. Prefectural-level cities include central cities and their surrounding rural areas and establish a territorial unit for planning purposes that includes urban economic development cores and their hinterlands. Data during our observation period was available for a total of 285 city-regions.

Figure 1 presents information about the spatial distribution of accumulated OFDI activity in these city-regions between 2003 and 2016. The most striking feature in this map is the uneven spatial distribution of city-regions that engage in OFDI activity. During our study period, OFDIs were mainly conducted in eastern and coastal area city-regions, especially in Beijing (1323 OFDI projects), Shenzhen (586) and Shanghai (434). This is not surprising given that these city-regions are crucial centers of economic activity with advantageous factor endowments including favorable geographical locations, skilled labor, extensive investment activity and strong policy support (Fan & Sun 2008; Wei et al. 2009). Many of these city-regions also received prefer-

ential trade and economic development policies as special economic zone and coastal-open cities (Yeung et al. 2009). Overall, Figure 1 confirms the importance of a city-region perspective in our analysis of Chinese OFDIs.

3.2 Variable definitions

Dependent variable. In line with the objective of this study, we used the annual per-capita income at the city-region level as our dependent variable to investigate the impact of OFDIs on regional economic development. While economic development can be measured in different ways, per-capita income is a crucial indicator that does not include government transfers (e. g., associated with industrial policies) and directly measures the prosperity level of the city-region population. It is positively correlated with per-capita gross regional product ($r = 0.64$). As is usually done, we transformed per-capita income into logarithmic form ($\ln.Income$) because it has a right-skewed distribution, and we expected non-linear relationships. Of course, our dependent variable also has limitations as it does not take into consideration intra-regional distribution and inequality levels (Hunter & Markusen 1986).

Independent variables. The independent variables in this analysis include foreign investment activity and variables related to knowledge characteristics of investments. Following our first proposition, we used *OFDIper10000* as the main independent variable, defined as the accumulated number of OFDI projects per 10,000 residents in a city-region in each of our two cross-sections. By using the number of investment projects rather than the flow or stock of investments in monetary values, we aimed to avoid bias toward investments in traditional and highly capital-intensive sectors (Bathelt & Buchholz 2019; Yang & Bathelt 2022). We considered only city-regions with at least one investment project. The reasons for this selection are two-fold: First, the distribution of *OFDIper10000* is extremely right-skewed and only considering city-regions with OFDIs strongly improves this distribution. Second, knowledge characteristics associated with OFDIs that are a crucial part of this analysis were measured as investment *shares* according to country, sector and investment motive. By excluding city-regions without OFDIs, we ensured feasible variable values between 0 and 1. Through this, the number of city-regions in our analysis dropped to 87 in 2003–2009 and 143 in 2010–2016. While this may be a relatively small number of observations, it was not of concern for the regression models we ran, as the number of observations was more than ten times the number of independent variables (Wooldridge 2016). In robustness checks, we changed the cut-off points for the inclusion and

exclusion of city-regions and also considered city-regions without OFDIs.

Our second proposition refers to the knowledge characteristics of outward investments. We used three indicators to capture these characteristics: *OFDIAdEconShare* refers to the proportion of OFDIs directed toward developed economies; *OFDIAdSectorShare* measures the share of OFDIs that take place within advanced and knowledge-intensive industries; and *OFDIKnowledgeShare* corresponds with the share of OFDIs engaged in knowledge-related activities, associated with strategic-asset- and knowledge-seeking motives abroad. The precise definition of all variables and some descriptive statistics can be found in Table 1. Based on the discussion in the previous section, all independent variables in the table were expected to be positively associated with home-region income.

Control variables. In order to consider the specific growth context of Chinese city-regions, we controlled for the growth rate of the gross regional product per city-region (*GRPGrowthRate*), measured as the growth factor over each cross-section. Controlling for regional economic growth is necessary as it takes into consideration differential economic development dynamics across all finished goods and services in a city-region. This is important as we are facing a national growth context with generally high growth in all parts of the economy and in all regions. Using the *GRPGrowthRate* controls for general growth trends and helps isolate the developmental contribution of outward investments. We assumed *GRPGrowthRate* to have a positive impact on regional income. In addition, we included *SEZCoastalCities* as another control variable that takes the value “1” when a city-region is a special economic zone or a coastal-open city-region during the corresponding time period, and “0” otherwise. Special economic zones and coastal-open city-regions have better access to resources, finance and global networks and receive more policy support than other city-regions (Yeung et al. 2009). As indicated in Figure 1, these are the locations of major OFDI activity. We therefore expected *SEZCoastalCities* to be positively associated with regional income. We also controlled for city size (*CitySize*) as an indicator of agglomeration effects that may be an important driver of regional economic growth (Frick & Rodríguez-Pose 2018). *CitySize* was expected to positively affect city-region income.

Figure 2 shows the scatterplots of all independent and control variables with our dependent variable for both cross-sections. The scatterplots provide initial support for the proposed positive association of the OFDI and control variables with $\ln.Income$. This is in line with Propositions 1 and 2. The figure also reveals a potential disadvantage of our data as many city-regions have only 1 or few invest-

Table 1: Variable definitions and descriptive statistics for the cross-sections 2003–2009 and 2010–2016

Variables	Definition	Type	Source	2003–2009				2010–2016			
				Min	Max	Mean	SD	Min	Max	Mean	SD
<i>In.Income</i>	Average annual salary of employees in 2009 and 2016, respectively	Dependent	CCSY	9.809	11.060	10.334	0.243	10.57	11.72	11.02	0.201
<i>OFDIper10000</i>	Number of outward foreign direct investments (OFDIs) per 10,000 residents	Explanatory	fDi	0.001	0.703	0.026	0.081	0.001	1.073	0.033	0.109
<i>OFDIAdEconShare</i>	Share of OFDIs in developed economies ¹	Explanatory	fDi	0	1	0.626	0.351	0	1	0.562	0.353
<i>OFDIAdSectorShare</i>	Share of OFDIs in advanced and knowledge-intensive industries ²	Explanatory	fDi	0	1	0.250	0.335	0	1	0.219	0.304
<i>OFDIKnowledgeShare</i>	Share of OFDIs in knowledge intensive activities ³	Explanatory	fDi	0	1	0.140	0.234	0	1	0.142	0.224
<i>HighTechBSLaborShare</i>	Share of labor in high-tech and business service sectors ⁴ in 2009 and 2016, respectively	Moderator	CCSY	2.314	28.779	8.615	3.480	3.476	34.079	9.218	4.291
<i>GRPGrowthRate</i>	Growth factor of the gross regional product (GRP) (factored by 100)	Control	CCSY	164.4	443.8	261.4	54.959	68.8	281.5	181.1	32.917
<i>SEZCoastalCities</i>	Dummy for special economic zones and open coastal city-regions	Control	Official designation	0	1	0.172	0.38	0	1	0.112	0.316
<i>CitySize</i>	Household registered population size (in 10,000) in 2009 and 2016, respectively	Control	CCSY	47.57	3,275.61	558.14	412.41	30.0	3,392.0	532.4	371.53
<i>FriendshipCities</i>	Total number of international friendship cities in 2009 and 2016, respectively	2SLS ⁵	BBUC	0	63	7.770	9.425	0	73	7.909	9.660

Notes: ¹ Developed economies are defined as high-income economies with annual gross national income (GNI) per capita of \$12,696 or more (World Bank 2022).

² Advanced industry and knowledge-intensive sectors refer to two kinds of industries: First, high-tech sectors with a large concentration of engineering workers (Wolf & Terrell 2016) include aerospace, biotechnology, business machines and equipment, communications, consumer electronics, electronic components, medical devices, pharmaceuticals, semiconductors, and space and defense. Second, knowledge-intensive sectors that create, accumulate and disseminate knowledge to develop customized service solutions (Bettencourt et al. 2002) include business services, financial services, and software and IT services.

³ Knowledge-intensive activities include business services; design, development and testing; headquarters; ICT and internet infrastructure; and research and development functions.

⁴ High-tech and business services sectors consist of information transmission, computer services and software; financial intermediation; leasing and business services; and scientific research, technical service, and geologic prospecting.

⁵ Variable used in the two-stage least square (2SLS) regression.

Data sources: National Bureau of Statistics of China (2017) (CCSY), Financial Times (2017) (fDi) and Chinese Academy of Social Sciences (2015) (BBUC – Blue Book of Urban Competitiveness)

ments abroad. As a consequence, the variables *OFDIAdEconShare*, *OFDIAdSectorShare* and *OFDIKnowledgeShare*, which measure the share of investments toward developed economies, in advanced and knowledge-intensive industries and with knowledge-related motives, tend to overemphasize the extreme values “0” and “1”. With few investment cases, however, this may not necessarily be an indication of weak or strong knowledge-seeking behavior in that region. We therefore need to exercise care with respect to the results for Propositions 2 and 3, where these variables play a key role. Furthermore, the scatterplots indicate that there are no heteroskedasticity problems.

Moderating variable. Often, absorptive capacity is measured by using R&D intensity or expenditures (Cohen & Levinthal 1990; Lane et al. 2001). Since such data are

difficult to obtain at the city-regional level, we used the share of workers in high-tech and business service sectors (*HighTechBSLaborShare*) as a proxy for regional absorptive capacity. Florida et al. (2008) found that occupations in knowledge-intensive sectors such as computer science, engineering, and business and financial services have a stronger association with regional economic development compared to other occupations. Our assumption was that when the home region has a larger share of highly skilled employees in such occupations, the region will be able to leverage the technology and knowledge acquired in a foreign location better and implement it more successfully into home-region production and innovation processes. Also, suppliers and service firms will be able to adjust to new technologies more easily resulting in faster economic development and

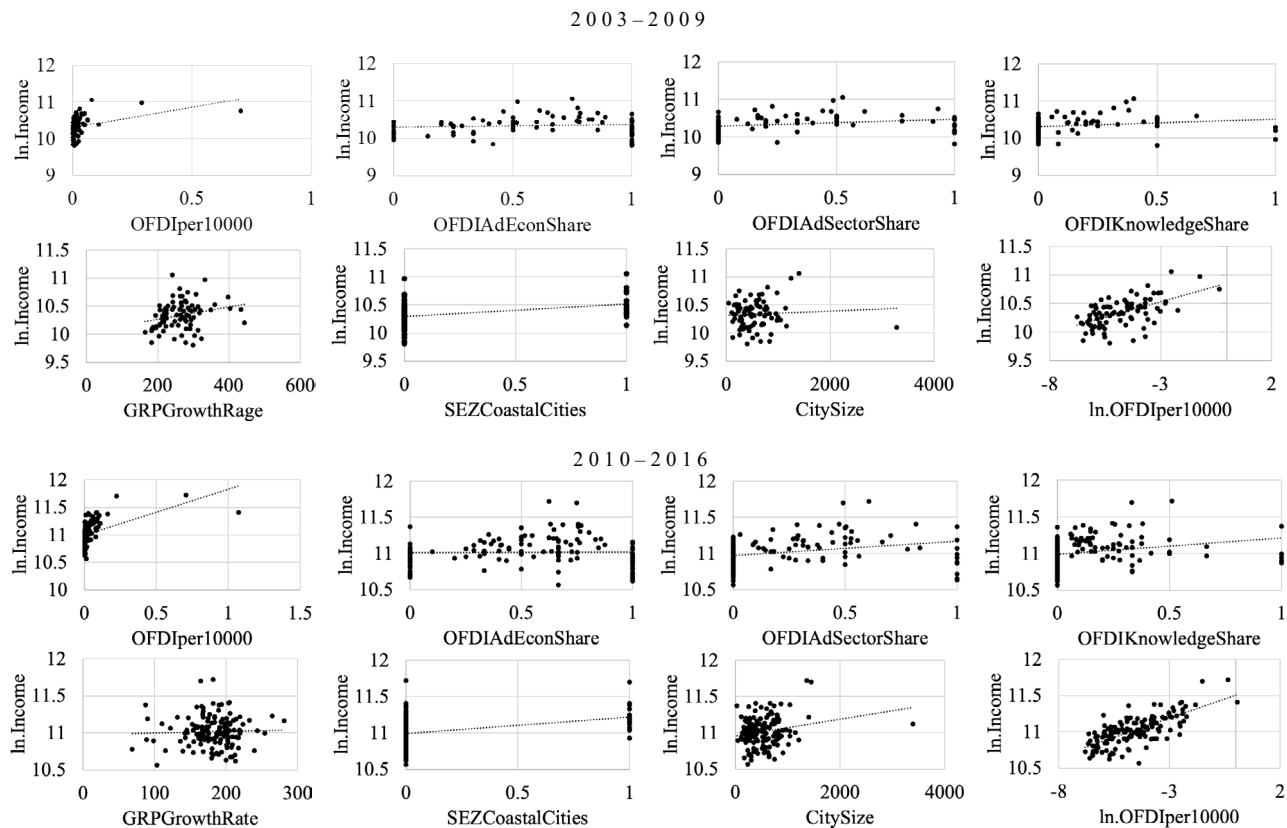


Figure 2: Scatterplots of variables in the main model (Data sources: National Bureau of Statistics of China 2017; Financial Times 2017)

higher regional income levels. Without a skilled workforce, regions may in turn not be able to achieve positive development impulses from OFDIs (Cohen & Levinthal 1990; Li M. et al. 2016). We used *HighTechBSLaborShare* as a moderating variable that interacts with *OFDIper10000*, *OFDIAdEconShare*, *OFDIAdSectorShare* and *OFDIKnowledgeShare* to measure the effects of regional absorptive capacity.

3.3 Methodology

In our empirical analysis, we employed a cross-sectional regression analysis for the time periods 2003–2009 and 2010–2016. There are two reasons for choosing these specific time periods: First, China's OFDI activity only took off in the early-2000s and investment activity increased substantially not only within but also between the two periods. The number of greenfield investments increased from 1,133 in 2003–2009 to 3,067 in 2010–2016 (Financial Times 2017). Second, the subprime financial crisis in 2008/2009 interrupted economic activities at the global scale and affected investments abroad. This crisis could have altered investment patterns regarding geographical destinations, sectors and motives of investments in the subsequent period (Yang

& Bathelt 2022), as well as their home-region impacts. While we are unable to conduct a panel analysis at this point, due to the measurement of our knowledge-related variables (*OFDIAdEconShare*, *OFDIAdSectorShare* and *OFDIKnowledgeShare*) as shares, we consider a certain level of lagged effects since we use two consecutive cross-sections, accumulating the number of OFDI projects over each period and measuring the dependent variable (*ln.Income*) at the end of these periods.

As discussed in the conceptual section, we specified our main model that formulates the relationship between OFDI activity and city-region income as follows:

$$\ln.Income_i = \alpha + \beta_1 OFDIper10000_i + \beta_2 OFDIAdEconShare_i + \beta_3 OFDIAdSectorShare_i + \beta_4 OFDIKnowledgeShare_i + \beta_5 GRPGrowthRate_i + \beta_6 SEZCoastalCities_i + \beta_7 CitySize_i + \varepsilon_i$$

where *ln.Income_i* is the dependent variable measuring the average annual salary of employees in city-region *i*. *OFDIper10000_i* corresponds with the number of OFDIs per 10,000 residents in city-region *i*. *OFDIAdEconShare_i*, *OFDIAdSectorShare_i* and *OFDIKnowledgeShare_i* are investment-related variables in city-region *i* representing the share of OFDIs toward developed economies, in advanced

Table 2: Correlation matrix with variance inflation factors (VIFs) for the cross-sections 2003–2009 and 2010–2016

2003–2009								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	VIFs
(1) <i>ln.Income</i>								
(2) <i>OFDIper10000</i>	0.369							1.574
(3) <i>OFDIAdEconShare</i>	0.100	−0.034						1.190
(4) <i>OFDIAdSectorShare</i>	0.263	0.257	0.131					1.208
(5) <i>OFDIKnowledgeShare</i>	0.193	0.153	0.271	0.325				1.487
(6) <i>HighTechBSLaborShare</i>	0.482	0.351	−0.082	0.138	0.103			1.647
(7) <i>GRPGrowthRate</i>	0.251	0.125	0.131	−0.040	0.325	0.154		1.256
(8) <i>SEZCoastalCities</i>	0.349	0.250	0.122	0.320	0.207	0.068	−0.091	1.155
(9) <i>CitySize</i>	0.066	−0.038	−0.174	−0.009	−0.013	0.254	−0.054	1.193
2010–2016								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	VIFs
(1) <i>ln.Income</i>								
(2) <i>OFDIper10000</i>	0.424							1.264
(3) <i>OFDIAdEconShare</i>	0.012	0.043						1.096
(4) <i>OFDIAdSectorShare</i>	0.292	0.268	0.211					1.212
(5) <i>OFDIKnowledgeShare</i>	0.254	0.189	0.203	0.365				1.158
(6) <i>HighTechBSLaborShare</i>	0.579	0.419	−0.080	0.142	0.111			1.130
(7) <i>GRPGrowthRate</i>	0.037	0.024	0.168	−0.032	−0.002	−0.088		1.071
(8) <i>SEZCoastalCities</i>	0.352	0.270	0.052	0.106	0.051	0.199	−0.055	1.232
(9) <i>CitySize</i>	0.178	0.128	−0.063	0.004	0.001	0.197	0.192	1.097

Data sources: National Bureau of Statistics of China (2017) and Financial Times (2017)

and knowledge-intensive sectors and with strategic-asset- and knowledge-seeking motives, respectively. *GRPGrowthRate_i*, *SEZCoastalCities_i*, and *CitySize_i* are control variables that include the growth of the gross regional product in city-region *i*, the status as a special economic zone or a coastal-open city-region, as well as the size of the city-region, respectively. ε_i is a standard disturbance term for city-region *i*.

We then ran separate ordinary least square (OLS) regressions for each cross-section. In the next step, we investigated the role of regional absorptive capacity by introducing *HighTechBSLaborShare* as a moderating variable into the model. In the final step, we conducted robustness checks to take into consideration potential endogeneity and other data issues: 1) instead of including all city-regions with at least one OFDI, we computed the same regressions with different thresholds, and also tested a model that included city-regions without OFDIs; 2) the main model was run without outlier city-regions; 3) further we checked our regression results using a different relationship between OFDIs and regional income; and 4) finally we applied a two-stage least square (2SLS) regression model to test for endogeneity.

4 Results and discussion

4.1 Main effects of OFDIs

Table 2 presents the correlation coefficients between all variables and variance inflation factors (VIFs) for each cross-section. The VIF values below 10 suggest that there is no multicollinearity problem in our data.

Models (1) to (3) in Table 3 show the main results for the first cross-section based on 87 city-regions and 1,133 investment projects. Model (1) only includes our control variables with the expected findings for the period from 2003 to 2009. *GRPGrowthRate* and *SEZCoastalCities* are highly significant and have a positive coefficient, suggesting that city-regions with high growth rates in production and economic regions with preferential government funding had a higher income level than other city-regions. The coefficient of *CitySize* is positive but insignificant. Model (2) includes our main OFDI variable. As proposed, *OFDIper10000* is positively associated with *ln.Income* at a high significance level of 1%. This provides strong initial support for Proposition 1, suggesting that city-regions with higher OFDI activity also have higher income levels. Model (3) includes additional variables that take into account the characteristics of the investments

Table 3: OLS main results – Determinants of *ln.Income* in Chinese city-regions for the cross-sections 2003–2009 and 2010–2016

Variables	Dependent Variable: <i>ln.Income</i>					
	2003 – 2009			2010 – 2016		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>GRPGrowthRate</i>	0.001*** (0.000)	0.001** (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>SEZCoastalCities</i>	0.237*** (0.063)	0.192*** (0.063)	0.169** (0.067)	0.211*** (0.050)	0.147*** (0.048)	0.146*** (0.047)
<i>CitySize</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000** (0.000)	0.000* (0.000)	0.000* (0.000)
<i>OFDIper10000</i>		0.790*** (0.295)	0.735** (0.305)		0.700*** (0.137)	0.584*** (0.139)
<i>OFDIAdEconShare</i>			0.034 (0.070)			–0.040 (0.042)
<i>OFDIAdSectorShare</i>			0.096 (0.078)			0.096* (0.052)
<i>OFDIKnowledgeShare</i>			–0.040 (0.116)			0.129* (0.069)
<i>Constant</i>	9.944*** 0.123	9.972*** 0.119	9.921*** 0.132	10.920*** 0.088	10.920*** 0.081	10.890*** 0.081
Observations	87	87	87	143	143	143
R ²	0.205	0.269	0.286	0.153	0.287	0.336
Adjusted R ²	0.176	0.234	0.223	0.135	0.266	0.301

Note: ***, ** and * indicate a significance level of 1 %, 5 % and 10 %, respectively. Standard errors are in parentheses.

Data sources: National Bureau of Statistics of China (2017) and Financial Times (2017)

made. While these variables' coefficients are insignificant, the ones for *OFDIAdEconShare* and *OFDIAdSectorShare* are positive and that for *OFDIKnowledgeShare* is negative. The reasons for the insignificance of these investment characteristic variables could be manifold: First, in the period from 2003 to 2009, even though many Chinese city-regions were caught up in rapid economic growth, most city-regions were likely not yet at a sufficient development level to capture the spillover effects from knowledge-intensive OFDIs (Li M. et al. 2016). Second, since the majority of Chinese MNEs started to go global only after 2003, these newly internationalized firms lacked the experience and ability to acquire and absorb crucial knowledge to build competitive advantages (Kotabe & Kothari 2016). They may have suffered from liabilities of foreignness and outsidership at foreign locations where partners and customers were less willing to share valuable knowledge with them (Johanson & Vahlne 2009; Cui & Xu 2019). Therefore, whether OFDIs were more or less knowledge-intensive seemed to matter less in the first cross-section.

Models (4) to (6) refer to the second cross-section, which includes 143 city-regions and represents a much higher number of 3,067 OFDIs. In a similar sequence as before, we begin with Model (4) that only includes the control variables. Compared to the first cross-section, all of the control

variables still have positive coefficients, but while *SEZCoastalCities* is highly significant, *GRPGrowthRate* becomes insignificant and *CitySize* turns significant (also in the remaining models in Table 3). This may indicate that, in the period from 2010 to 2016, the early catch-up growth of Chinese city-regions had come to an end (Hodgson & Huang 2013) and further growth was now more differential, depending on size and agglomeration effects, as well as the nature of investment activities and unique locations characteristics (such as priority policy support in coastal-open city-regions or special economic zones). Similar to Models (1) to (3), the adjusted R-squared values substantially increase throughout the sequence of Models (4) to (6). Model (5) introduces our main investment variable, which is again positive and highly significant.

Model (6) includes investment-specific variables. First, the coefficient for *OFDIAdEconShare* turns negative but remains insignificant. This could indicate that firms in newly internationalizing city-regions (for instance, those located in northern China) were less experienced, less developed and lacked the capability to benefit from investments in advanced economies compared to cities that had already earlier OFDI activity. While *OFDIAdSectorShare* remains positive, *OFDIKnowledgeShare* changes signs and turns positive, both at a moderate significance level of 10 %.

Table 4: OLS interaction results – Determinants of *ln.Income* in Chinese city-regions for the cross-sections 2003–2009 and 2010–2016

Variables	Dependent Variable: <i>ln.Income</i>							
	2003 – 2009				2010 – 2016			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>GRPGrowthRate</i>	0.001** (0.000)	0.000** (0.000)	0.001** (0.000)	0.001** (0.000)	0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>SEZCoastalCities</i>	0.172*** (0.063)	0.166*** (0.061)	0.182*** (0.062)	0.166*** (0.062)	0.115*** (0.043)	0.126*** (0.042)	0.143*** (0.042)	0.133*** (0.042)
<i>CitySize</i>	–0.000 (0.000)	–0.000 (0.000)	–0.000 (0.000)	–0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>OFDIper10000</i>	0.865 (0.878)	0.360 (0.293)	0.221 (0.323)	0.192 (0.311)	0.620** (0.297)	0.256* (0.134)	0.182 (0.146)	0.252* (0.149)
<i>OFDIAdEconShare</i>	0.052 (0.065)	–0.304 (0.207)	0.040 (0.065)	0.032 (0.065)	–0.016 (0.038)	–0.186* (0.107)	–0.022 (0.037)	–0.021 (0.038)
<i>OFDIAdSectorShare</i>	0.072 (0.072)	0.070 (0.070)	–0.111 (0.207)	0.077 (0.071)	0.081* (0.046)	0.093** (0.046)	–0.078 (0.103)	0.087* (0.046)
<i>OFDIKnowledgeShare</i>	–0.038 (0.107)	–0.041 (0.105)	–0.052 (0.106)	–0.444 (0.284)	0.117* (0.061)	0.107* (0.061)	0.103* (0.061)	0.041* (0.141)
<i>HighTechBSLaborShare</i>	0.031*** (0.009)	0.001 (0.016)	0.020* (0.011)	0.015 (0.011)	0.022*** (0.004)	0.009 (0.008)	0.014*** (0.005)	0.019*** (0.004)
<i>OFDIper10000 *</i>	–0.038 (0.060)				–0.018 (0.014)			
<i>HighTechBSLaborShare</i>								
<i>OFDIAdEconShare *</i>		0.044* (0.025)				0.020* (0.012)		
<i>HighTechBSLaborShare</i>								
<i>OFDIAdSectorShare *</i>			0.023 (0.024)				0.020* (0.011)	
<i>HighTechBSLaborShare</i>								
<i>OFDIKnowledgeShare *</i>				0.053 (0.036)				0.008 (0.015)
<i>HighTechBSLaborShare</i>								
<i>Constant</i>	9.751*** 0.136	10.001*** 0.176	9.833*** 0.136	9.877*** 0.139	10.650*** 0.082	10.760*** 0.095	10.720*** 0.083	10.690*** 0.082
Observations	87	87	87	87	143	143	143	143
R ²	0.410	0.430	0.414	0.424	0.483	0.488	0.489	0.479
Adjusted R ²	0.341	0.364	0.345	0.356	0.448	0.453	0.455	0.443

Notes: ***, ** and * indicate a significance level of 1%, 5% and 10%, respectively. Standard errors are in parentheses.

Data sources: National Bureau of Statistics of China (2017) and Financial Times (2017)

This confirms Propositions 2b and 2c, indicating that OFDIs in advanced sectors and with knowledge-seeking motives were positively associated with home-region income. After years of internationalization and a massive increase in the number and amount of outward investments, Chinese MNEs apparently gained experience in how to do business abroad, built interfirm networks in foreign locations and gained trust from foreign partners (Bathelt & Li 2020; Liu 2020). As a consequence, firms in foreign locations were seemingly willing to share more knowledge, and Chinese MNEs were able to use this acquired knowledge and market impulses successfully at home and grew further in their headquarters locations. The results suggest that as investment activity increased, knowledge characteristics of the investments became more important in terms of regional impacts. It should also be noted that China shifted during this time period from a producer of standardized mass

products toward an exporter of more innovative products (Liefner et al. 2021). The leading city-regions that drove this shift were particularly able to benefit from knowledge flows through OFDIs in advanced sectors and driven by knowledge/strategic-asset-seeking motives (Li M. et al. 2016; Li and Cantwell 2018). Overall, Table 3 displays consistent parameter estimates throughout different model formulations and provides strong support for Proposition 1, as well as partial support for Propositions 2b and 2c. It may be unrealistic to expect stronger support for the latter propositions because many city-regions in both cross-sections were characterized by small investment numbers which generated extreme values in the investment share variables (Figure 2).

4.2 Moderating role of regional absorptive capacity

Table 4 reports the results of our analysis as to how regional absorptive capacity affects a city-region's propensity to benefit from OFDI activity. We used the same set of independent and control variables as in Table 3 but added the moderating variable *HighTechBSLaborShare*. With this moderator, we computed interaction terms with all OFDI variables and entered them one at a time in our regression analyses. This procedure investigated whether city-regions with a high share of labor in high-tech and business service sectors were able to utilize OFDI activities more effectively associated with higher income levels.

Models (1) to (4), each featuring a different OFDI interaction, display the results for the first cross-section 2003–2009. In Model (1) *HighTechBSLaborShare* interacts with *OFDIper10000*. The interaction term has a negative coefficient and is insignificant. Model (2) displays the result for the interaction with *OFDIAdEconShare*. The coefficient of this term is positive and significant at the 10 % level thus providing moderate support for Proposition 3. This indicates that city-regions with higher shares of workers in high-tech and business service sectors were better able to internalize knowledge and resources acquired through OFDIs in advanced economies than city-regions with a lower share of high-tech and business services workers. The former city-regions were associated with higher income levels than the latter, suggesting that absorptive capacity may have played a role in catalyzing benefits from OFDI activity. Models (3) and (4) show the results for the interaction terms with *OFDIAdSectorShare* and *OFDIKnowledgeShare*; both have positive but insignificant coefficients.

Models (5) to (8) present the same sequence of interactions for the cross-section 2010–2016. As before, the coefficient of the interaction term with *OFDIper10000* in Model (5) is negative and insignificant. However, the coefficients of both interaction terms with *OFDIAdEconShare* and *OFDIAdSectorShare* in Models (6) and (7) turn out positive and moderately significant at the 10 % level. This may be related to a shift toward the development of digital and electronics technologies in the country (Lee et al. 2020), through which the need to access sophisticated knowledge components for production and innovation increased. Our results indicate that city-regions with high absorptive capacity (i. e., a high share of workers in high-tech and business service sectors) may have benefited most from this shift as these city-regions were associated with higher income levels than city-regions with lower absorptive capacity. Locations at the frontier of technology development and innovation were thus seemingly able to strengthen their leadership position. Regional income

effects were especially associated with OFDIs directed to advanced economies and advanced and knowledge-intensive sectors. The coefficient for the final interaction term with *OFDIKnowledgeShare* is also positive but insignificant. Given the constraints of our share variables, the results in Table 4 provide decent support for Proposition 3.

4.3 Robustness checks

To examine the robustness of our results, we conducted a series of checks in Table 5. In Models (1) and (2), we excluded two city-regions which can be considered outliers, due to their extremely high OFDI levels (Figure 2). These outliers are Beijing, with 360 and 963 investment projects in 2003–2009 and 2010–2016, respectively, and Shenzhen with 173 and 413 investments. Beijing and Shenzhen are highly developed city-regions in China with many internationally active MNEs (Liefner & Zeng 2008). The results in Models (1) and (2) strongly support our previous findings. The coefficients are similar to those in Table 3 and indicate that our findings are not biased by outliers. Particularly, urban regions with a high regional growth rate that are designated coastal-open city-regions or special economic zones and engage in high OFDI activity are associated with high levels of regional income. While the results regarding the knowledge characteristics of outward investments remain mixed, we find strong support for Proposition 1, suggesting that high OFDI activity in an emerging context is associated with high city-region income levels.

In Models (3) to (6), we removed city-regions with extremely low investment activity to see how this affects our findings. When doing this, the number of regional observations drops substantially, and we need to exercise care in terms of a sufficient sample size. Models (3) and (4) show the results for our main model across both cross-sections when including only city-regions with at least 2 OFDIs. Again, the models strongly support our prior findings. Models (5) and (6), which only include city-regions with 3 or more investments, show a similar outcome, but there are some interesting deviations. In the first cross-section, the coefficient of our main investment variable *OFDIper10000* remains positive but turns insignificant. Second, some knowledge-related investment variables become significant, even in the first cross-section. This trend continues if we increase our threshold for inclusion even further (not shown here). It may suggest that, as investment activity increases, what becomes more important is the nature of investments, not just their number. In addition, it appears that city-regions with an investment focus in advanced economies and advanced and knowledge-intensive sectors are the main

Table 5: OLS robustness checks – Determinants of *ln.Income* in Chinese city-regions for the cross-sections 2003–2009 and 2010–2016

Variables	Dependent Variable: <i>ln.Income</i>									
	Without Outliers ¹		OFDI ≥ 2		OFDI ≥ 3		With All City-Regions ²		Log-Log Model ³	
	2003–2009	2010–2016	2003–2009	2010–2016	2003–2009	2010–2016	2003–2009	2010–2016	2003–2009	2010–2016
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>GRPGrowthRate</i>	0.001* (0.000)	0.000 (0.000)	0.001 (0.001)	0.001* (0.000)	0.001* (0.001)	0.001* (0.001)	0.001** (0.000)	0.000 (0.000)		
<i>ln.GRPGrowthRate</i>									0.188 (0.113)	0.070 (0.057)
<i>SEZCoastalCities</i>	0.144** (0.065)	0.094** (0.042)	0.162** (0.072)	0.100** (0.042)	0.152** (0.071)	0.115** (0.046)	0.169** (0.067)	0.146*** (0.047)	0.115* (0.059)	0.066* (0.038)
<i>CitySize</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000 (0.000)	0.000** (0.000)	0.000 (0.000)	0.000* (0.000)		
<i>ln.CitySize</i>									0.086*** (0.032)	0.049*** (0.018)
<i>OFDIper10000</i>	4.430*** (1.240)	3.272*** (0.420)	0.626* (0.314)	0.441*** (0.125)	0.323 (0.302)	0.426*** (0.127)	0.735** (0.305)	0.584*** (0.139)		
<i>ln.OFDIper10000</i>									0.105*** (0.019)	0.098*** (0.009)
<i>OFDIAdEconShare</i>	0.064 (0.066)	−0.048 (0.036)	0.151 (0.103)	0.037 (0.063)	0.303** (0.114)	0.100 (0.079)	0.034 (0.070)	−0.040 (0.042)	0.086 (0.062)	−0.050 (0.033)
<i>OFDIAdSectorShare</i>	0.080 (0.072)	0.045 (0.045)	−0.016 (0.099)	0.238*** (0.066)	0.119 (0.113)	0.228*** (0.079)	0.096 (0.078)	0.096* (0.052)	0.029 (0.068)	0.057 (0.041)
<i>OFDIKnowledgeShare</i>	−0.033 (0.108)	0.103* (0.059)	0.217 (0.171)	−0.081 (0.086)	0.314 (0.198)	−0.347 (0.113)	−0.041 (0.116)	0.129* (0.069)	−0.006 (0.099)	0.070 (0.055)
<i>Constant</i>	9.939*** (0.123)	10.820*** (0.070)	9.996*** (0.168)	10.800*** (0.097)	9.874*** (0.166)	10.760*** (0.109)	9.921*** (0.132)	10.890*** (0.081)	9.185*** (0.688)	10.803*** (0.281)
Observations	85	141	63	96	48	82	285	285	87	143
R ²	0.320	0.463	0.316	0.421	0.491	0.475	0.286	0.336	0.460	0.588
Adjusted R ²	0.260	0.435	0.229	0.375	0.401	0.426	0.223	0.301	0.412	0.567

Notes: ***, ** and * indicate a significance level of 1%, 5% and 10%, respectively. Standard errors are in parentheses.

¹ In these models, the city-regions Beijing and Shenzhen were excluded as outliers because of very large OFDI counts.

² In these models, we also included city-regions without OFDIs and defined all knowledge variables in these cases as “0”.

³ In these models, all metric variables were used in logarithmic form.

Data sources: National Bureau of Statistics of China (2017) and Financial Times (2017)

beneficiaries of associated developmental effects. These results provide additional support for Propositions 1 and 2. In Models (7) and (8), we ran similar regressions with all 285 city-regions, including those without OFDIs. In city-regions without OFDI activity, we defined all knowledge share variables as “0”. The results are again highly consistent with our main models in Table 3 and strongly support our findings.²

To check for potential bias in the functional form of our regressions, we ran similar models where all variables are logarithmic, except for the knowledge characteristics variables and the designated city-region status (since these contain values of “0”). The results are presented in Models

(9) and (10) and strongly confirm our previous findings. In both cross-sections, the coefficient of our main investment variable *ln.OFDIper10000* is positive and highly significant, thus presenting strong support for Proposition 1.

To address potential endogeneity issues related to our main investment variable, we adopted an instrumental variable technique and conducted 2SLS regressions (Table 6). To do this, an instrument was chosen that is correlated with our OFDI variable, but not directly related to city-regional income. We believe that the number of international friendship cities (*FriendshipCities*) satisfies this criterion and represents an appropriate instrumental variable. International friendship cities (sister, partner or twin cities) are linked through formal friendship agreements between two geographically and politically distinct city-regions to promote cultural and commercial ties (Li 2020). According

² As an additional robustness check, we also tested our models with per-capita gross regional product (GRP) as dependent variable. Our main findings remained the same as with *ln.Income*.

Table 6: Two-stage least square (2SLS) results – Determinants of *ln.Income* in Chinese city-regions for the cross-sections 2003–2009 and 2010–2016

Panel A	Dependent variable: <i>ln.Income</i>			
	2003–2009		2010–2016	
	OLS	2SLS	OLS	2SLS
variables	(1)	(2)	(3)	(4)
<i>GRPGrowthRate</i>	0.001** (0.000)	0.000 (0.001)	0.000 (0.000)	–0.000 (0.000)
<i>SEZCoastalCities</i>	0.192*** (0.063)	–0.078 (0.171)	0.147*** (0.048)	–0.025 (0.085)
<i>CitySize</i>	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000 (0.000)
<i>OFDIper10000</i>	0.790*** (0.295)		0.700*** (0.137)	
<i>OFDIper10000#</i>		5.494*** (2.072)		2.571*** (0.524)
<i>Constant</i>	9.972*** (0.119)	10.140*** (0.251)	10.930*** (0.082)	10.930*** (0.125)
Observations	87	87	143	143
R ²	0.269	–2.003	0.287	–0.671
Adjusted R ²	0.234	–2.149	0.266	–0.720
Panel B	Dependent variable: <i>OFDIper10000</i>			
	2003–2009		2010–2016	
	OLS		OLS	
First-stage variable				
<i>FriendshipCities</i>	0.003*** 0.001		0.005*** 0.001	
<i>Constant</i>	–0.026 0.043		–0.019 0.046	
Observations	87		143	
First-stage F statistics	3.997***		10.08***	
R ²	0.163		0.226	
Adjusted R ²	0.122		0.204	

Note: ***, ** and * indicate a significance level of 1 %, 5 % and 10 %, respectively. Standard errors are in parentheses. The second-stage variable *OFDIper10000#* represents the fitted values from the first stage.

Data sources: National Bureau of Statistics of China (2017) and Financial Times (2017)

to Wu and Li (2018), these are formal, comprehensive and long-term institutional arrangements, which include the most basic form of contemporary urban diplomacy and an important platform for cooperation. As such, the number of international friendship cities reflects a city-region's level of openness and outreach, and it can be expected to be positively correlated with OFDI activity. Chinese city-regions with a higher number of international friendship cities are more likely to support internationalization processes of local firms. At the same time, this variable is unlikely to be directly related to regional income.

The 2SLS results in Table 6 confirm our previous findings and provide confidence that our model is not compromised by endogeneity problems. The first-stage results in Panel B for Models (2) and (4) show a highly significant

positive impact of *FriendshipCities* on our main investment variable in both cross-sections. In the second-stage Models (2) and (4) in Panel A, which now include the fitted values from the previous stage (*OFDIper10000#*), our adjusted OFDI variable is positively associated with regional income and highly significant. This again provides strong support for a positive relation between OFDI activity and home-region income levels as expressed in Proposition 1.

5 Conclusion

This paper is an attempt to formally model the reverse impact of Chinese OFDIs on income at the city-region level. Our motivation is to test the extent to which OFDIs are

associated with economic development in the home region beyond firm-level effects. Based on a conceptual framework that draws from recent work in economic geography and international business, we establish a consistent model using aggregated firm-level data on Chinese OFDIs and data on city-region attributes.

Through an analysis of two cross-sections 2003–2009 and 2010–2016, our study provides evidence that there is a positive association between OFDI activity and income development in the home region. Arguably, such a relationship is more likely to be supported by recent data than by older data because Chinese firms have gained extensive global experience in recent years and tapped into local knowledge networks at foreign locations. Using both older and more recent data, our analysis provides strong support for Proposition 1 suggesting that investments abroad can have a positive impact on economic development in the home region. The results also give some support, albeit at a moderate significance level, to the claim that the impact of OFDIs on regional incomes depends on knowledge characteristics of investments (Propositions 2b and 2c). Finally, when examining the moderating role of regional absorptive capacity, we find that the share of workers in high-tech and business service sectors as a moderator affects the home city-regions' propensity to benefit from OFDIs. This is shown at a moderate significance level for investments in advanced economies and in advanced and knowledge-intensive sectors. As such, Proposition 3 regarding the importance of regional absorptive capacity is also supported.

Although conventional views see OFDIs as shifting resources and production away and having a negative impact on the home region, our study suggests that a positive association exists between these variables – not just at the country but even at the city-region level and in an emerging context. As proposed in our conceptualization and tested through robustness checks, especially the 2SLS model, we believe that this may indeed indicate a causal relationship. While this is an important finding, we also recognize that our study has limitations that ought to be considered in future research. Clearly, more research is necessary to better understand the relationship between outward investment activity and home economic development. One important limitation of our paper is the investment dataset that only considers greenfield investments and excludes mergers, acquisitions and joint ventures. While fDi Markets data is consistent with macro-level analyses (Crescenzi et al. 2015), brownfield investments should also be included in future research. We expect this would strengthen our findings because brownfield investments generate easier access to resources and knowledge in the host location and may substantially affect home-region development (Johan-

son & Vahlne 2009; Anderson et al. 2015; Bathelt & Li 2020). Another limitation is that we cannot rule out an impact of potentially omitted variables. It is for this reason that we avoid quantifying effect sizes and instead focus on the significance and sign of regression coefficients in our interpretations. We are also careful in claiming causation and rather emphasize the associative nature of variable relations. An additional limitation of this study is its cross-sectional character. Although investigating two consecutive time periods, a panel analysis would be more appropriate to rule out the possibility of reverse causality in our dataset. We were not able to conduct such a study in this paper because of the small number of observations when including investment knowledge characteristics as share variables, which was one of our main objectives. We thus leave panel analyses and the development of models that can be analyzed in an evolutionary setting for further studies. Future research could also benefit from more qualitative investigations that identify the channels and mechanisms through which knowledge transfers from OFDIs stimulate development.

Altogether, our findings are quite stable and entail important policy implications. First, foreign investment activity provides opportunities for emerging economies to catch up and can have a positive impact on home region development. The knowledge components of OFDIs play a significant role to achieve such effects. Second, enhancement of home-region absorptive capacity may be crucial to realize upgrading and catalyze reverse income effects of OFDIs. Finally, in the face of the current global economic context with national protectionist policies, which may make it more difficult for Chinese MNEs to conduct business abroad in the future (Lampton 2019; Bathelt & Li 2022), it will be an important task in international relations to recreate trust in order to support international market access and outward investment activities that could generate positive developmental effects at home.

Funder Name: Social Sciences and Humanities Research Council of Canada

Funder Id: <http://dx.doi.org/10.13039/501100000155>

Grant Number: 752-2021-2203

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