



Developing inland China: Do heterogeneous coastal foreign direct investments and exports help?



Puman Ouyang  
Shunli Yao

ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

# Working Paper

NO. 138 | DECEMBER 2013

The Asia-Pacific Research and Training Network on Trade (ARTNeT) is an open regional network of research and academic institutions specializing in international trade policy and facilitation issues. IDRC, UNCTAD, UNDP, ESCAP and WTO, as core network partners, provide substantive and/or financial support to the network. The Trade and Investment Division of ESCAP, the regional branch of the United Nations for Asia and the Pacific, provides the Secretariat of the network and a direct regional link to trade policymakers and other international organizations.

The ARTNeT Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about trade issues. An objective of the series is to publish the findings quickly, even if the presentations are less than fully polished. ARTNeT Working Papers are available online at [www.artnetontrade.org](http://www.artnetontrade.org). All material in the Working Papers may be freely quoted or reprinted, but acknowledgment is requested, together with a copy of the publication containing the quotation or reprint. The use of the working papers for any commercial purpose, including resale, is prohibited.

**Disclaimer:**

The designations employed and the presentation of the material in this Working Paper do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where the designation “country or area” appears, it covers countries, territories, cities or areas. Bibliographical and other references have, wherever possible, been verified. The United Nations bears no responsibility for the availability or functioning of URLs. The views expressed in this publication are those of the author(s) and do not necessarily reflect the views of the United Nations. The opinions, figures and estimates set forth in this publication are the responsibility of the author(s), and should not necessarily be considered as reflecting the views or carrying the endorsement of the United Nations. Any errors are the responsibility of the author(s). Mention of firm names and commercial products does not imply the endorsement of the United Nations.



## Developing inland China: Do heterogeneous coastal foreign direct investments and exports help?

Puman Ouyang and Shunli Yao\*

**Please cite this paper as:** Puman Ouyang and Shunli Yao (2013). Developing inland China: Do heterogeneous coastal foreign direct investments and exports help?

ARTNeT Working Paper Series No. 138, September, 2013, Bangkok, ESCAP.

**Available at [www.artnetontrade.org](http://www.artnetontrade.org).**

---

\* Puman Ouyang is a researcher at the Research Institute of Economics and Management, Southwestern University of Finance and Economics, Chengdu. Shunli Yao is a researcher at the Institute for Applied International Trade, University of International Business and Economics, Beijing. This work was carried out with the aid of a grant from the International Development Research Centre (IDRC), Canada, and is part of an ARTNeT Phase III Research Programme initiative. The technical support of the United Nations Economic and Social Commission for Asia and the Pacific and ARTNeT Secretariat is gratefully acknowledged. Any remaining errors are the responsibility of the authors who can be contacted at [ouyangpm@swufe.edu.cn](mailto:ouyangpm@swufe.edu.cn) or [shunliyao@yahoo.com](mailto:shunliyao@yahoo.com).

**Abstract:** By applying panel estimation models to Chinese provincial level data for 1993-2008, this paper examine the impacts of China's coastal foreign direct investment (FDI) and exports on its inland regions. The results show that coastal FDI has overall positive interregional impacts, while coastal exports do not. Cooperative joint ventures generate positive impacts, but little impact is produced by wholly foreign-funded enterprises. In the case of equity joint ventures, there may even be negative impacts. The interregional impacts do not exhibit any differences across FDI origins or exporters' ownership status. The authors attribute these findings to the protectionist behaviour of state-owned enterprises participating in equity joint ventures as well as to the prevalence of processing exports.

**JEL classification:** F23, O33, R11, R12.

**Keywords:** Foreign direct investment, exports, interregional spillovers, China.

## Contents

<b>1. Introduction</b> .....	3
<b>2. Background: FDI, exports and interregional interactions</b> .....	5
2.1. <i>Mechanisms of coastal-inland interactions</i> .....	5
2.2. <i>Key reform initiatives during 1993-2008</i> .....	8
2.3. <i>Specific FDI and exports: Implications for interregional spillovers</i> .....	9
2.4. <i>Interregional impact estimation</i> .....	12
<b>3. Econometric model specification</b> .....	13
<b>4. Data and measurement</b> .....	16
4.1. <i>Data</i> .....	16
4.2. <i>Effective coastal FDI and exports</i> .....	16
4.3. <i>Other independent variables</i> .....	17
4.4. <i>Summary statistics</i> .....	18
<b>5. Interregional impacts: Overall FDI and exports, 1993-2008</b> .....	19
<b>6. Interregional impacts: Heterogeneous FDI and exports, 2002-2007</b> .....	23
6.1. <i>Do the organizational forms of coastal FDI matter?</i> .....	23
6.2. <i>Do the origins of coastal FDI matter?</i> .....	25
6.3. <i>Does ownership of exporting companies matter?</i> .....	26
<b>7. Conclusion</b> .....	27
<b>References</b> .....	29

## List of tables

Table 1. GDP, FDI and exports: coastal vs. inland provinces.....	15
Table 2. Summary statistics of key variables.....	18
Table 3. Fixed-effect estimation of interregional impacts from overall coastal FDI and exports .....	20
Table 4. Random effect estimation of interregional impacts from overall coastal FDI and exports .....	21
Table 5. Robustness checks .....	22
Table 6. Interregional impacts by various modes of FDI.....	24
Table 7. Interregional impacts by FDI origin .....	25
Table 8. Interregional impacts by exporter ownership.....	26

## 1. Introduction

China's coastal regions have formed the country's front line in implementing its open-door policy during the country's reform era. Comprising 40% of the total population and 30% of the total land area, the coastal regions attract 90% of the country's foreign direct investment (FDI) inflows and export trade. Support for this uneven development strategy in favour of the coastal regions has been justified by, among other reasons, the belief that the coastal economic boom would subsequently spread back into the inland regions.

It is well understood that FDI and exports benefit Chinese local area economies. However, there is no consensus that they will necessarily benefit other regions, as their positive spatial spillovers may be offset by the negative impact of their competition with inland regions for talent and resources. On the one hand, China's coastal FDI inflow and exports have sustained very strong performance for almost 20 years. On the other hand, the widening income disparity between the coastal and inland regions has long been of concern among Chinese policymakers who are trying to steer the country towards a harmonious society. In the wake of the recent global financial crisis, rebalancing the economy by reducing its heavy reliance on foreign demand as well as by improving efficiency and upgrading the quality of FDI and exports has become a policy priority. The new Government of China, under Xi Jinping and Li Keqiang, is working on a blueprint for a new round of comprehensive reform. Against this backdrop, this paper attempts to answer the question of whether or not China's coastal FDI inflow and export trade really contribute to inland development through positive spatial spillovers that are large enough to offset the competition effects.

Studies carried out on China's coastal and inland development have mainly focused on relative regional disparity. For example, Zhang and Zhang (2003) found that the role of FDI and export trade play an important role in contributing to the widening regional inequality in China while Su and Chang (2013) explored the issue of convergence in per capita income between the eastern and western provinces. This paper, however, studies how the level of inland economic development has been affected by coastal FDI and exports. The spatial impacts of coastal FDI and exports on inland economies are estimated by focusing on the impacts generated by different modes of FDI and exports, i.e., FDI by type of local partnership and by origin, and exports by ownership of trading companies. This approach is used in this study because different types of FDI and exports interact with the inland

economy through different mechanisms, and could generate very different spatial impacts.

Given the co-existence of a positive spillover effect and a negative competition effect on the inland generated by coastal FDI and exports, it is difficult to predict in theory the net impacts. Nevertheless, the stylized features of the Chinese foreign trade and investment regimes can help in speculating on possible outcomes of this empirical investigation of the issue. First, the bulk of Chinese exports constitute processing goods with low domestic value-added. This implies that true Chinese export activities are not as intensive as the export volume suggests, and that domestic spillover of production technology and management know-how could be limited.

Second, China's technology-for-market policy requires high-tech foreign investors who are seeking access to the Chinese market to form equity joint ventures (EJVs) with domestic firms, mostly state-owned enterprises (SOEs). As far as intellectual property rights protection is concerned, wholly foreign-funded enterprises (WFFEs) are the best form of overseas investment. EJVs make possible the maximum transfer of production technology and management know-how from foreign investors to local partners. In-between are the cooperative joint ventures (CJVs). China's high-tech sectors are dominated by monopolistic SOEs. So the Chinese partners in high-tech EJVs are mostly SOEs. They benefit from foreign partners' transfers of technology and know-how, but also have an interest and the ability to protect themselves from leaks to other firms, including firms in other regions, and from competition. Therefore, EJVs may not do better than other forms of foreign investment.

Third, FDI with advanced technology normally comes from advanced countries. For the same reason, FDI originating from advanced countries may not necessarily do better than lower-tier countries in interregional technology spillovers.<sup>2</sup>

In this paper, a theory-based econometric model has been developed in order to estimate the spatial impacts of both overall and specific coastal FDI and exports. Panel estimation models are applied to Chinese provincial-level data for 1993-2008, a period that begins one year after Deng Xiaoping's southern tour and ends with the outbreak of the global financial crisis. This period also covers the whole process of China's WTO accession and witnesses the fast growth of Chinese inward FDI and exports.

The authors found that coastal FDI has overall positive interregional impacts while coastal

---

<sup>2</sup> Section 2(c) presents a more detailed discussion of specific forms of FDI and exports.

exports do not. Among the different modes of FDI and exports, CJVs generate positive impacts, while WFFE effects are small and even negative in the case of EJVs. In addition, the interregional impacts do not exhibit any differences across FDI origin or across exporters' ownership status.

Section 2 provides a background to the research questions and explains (a) the potential mechanisms through which coastal FDI and exports interact with inland economies, and (b) the characteristics of specific forms of FDI and exports as well as the potential magnitude of their interregional spillovers. Section 3 specifies a theory-based empirical model based on section 2 and incorporating both FDI and exports. The econometric model is subsequently used to analyse the research questions. Section 4 discusses the data and the construction of key variables with distance adjustment. Section 5 reports the estimation results for the interregional impacts of overall coastal FDI and exports. The impacts of specific forms of coastal FDI and exports are presented in section 6. The results from sections 5 and 6 confirm the speculations in section 2. Section 7 summarizes the paper and the implications for the forthcoming new round of economic reform in China.

## **2. Background: FDI, exports and interregional interactions**

The effects of coastal FDI and exports on inland regions of China are twofold: (a) positive spillover effects and (b) negative competition effects. The net impacts depend on the relative magnitudes of the two opposing effects and thus are the subject of empirical investigations. To lay out the theoretical basis for the econometric models, this section introduces the mechanisms of coastal and inland interactions, the key events in China's foreign trade and investment development during the period covered by this paper, and the characteristics of specific modes of FDI and exports that may generate different productivity gains for inland economies.

### *2.1. Mechanisms of coastal-inland interactions*

Coastal FDI and inland economies interacts in several ways. China is a capital scarce country, and more so for its labour intensive sectors as resources are allocated heavily in favor of state-owned enterprises in capital intensive sectors. In seeking higher returns in China, foreign investment also provides Chinese workers opportunities of higher-paying

jobs, as marginal labour productivity tends to be higher with higher ratio between capital (tangible and intangible) and labour in production. This is true not only for investment from the United States of America, the European Union members and other advanced nations that require skilled college graduates, but also for investment from Hong Kong, China and Taiwan Province of China that hire mostly unskilled workers for their assembly lines. As a result, foreign funded enterprises (FFE) normally have workforces more talented than their local Chinese counterparts. When local labour cannot meet the demand of coastal FDI, college graduates and migrant workers from other provinces move in. The majority of migrant workers in coastal regions come from the inland provinces, as opposed to migrating from one coastal region to another (Cai and Wang, 2003).

While inland economies suffer from the loss of their young and talented workforce, they also benefit from the remittances sent back home by such migrant workers and from the expertise developed at coastal FFEs that is brought home when they eventually return. For example, during the 1990s, for every percentage point increase in real coastal FDI, there was a more than a 1.25% increase in internal migration. This massive internal migration raised the inland regions' productivity and incomes because migrant workers remitted between 20% and 50% of their income back home in the inland regions (Bao and others, 2007). In addition, the returning workers from the coastal foreign firms accelerated the inland region's imitation process of advanced technology brought by coastal foreign firms (Du and others, 2005; Rozelle and others, 1999).

When FFEs buy local inputs, some may come from inland provinces, creating production linkages between coastal FDI and inland firms. These vertical inter-industrial linkages not only help with sales of intermediate inputs made in inland provinces, but also help expose inland firms to production technology, product design, marketing strategy and management know-how adopted by FFEs in coastal regions. At the same time, at the horizontal level, coastal FDI may also affect the inland economies adversely, because they may compete for the same market, and foreign firms may adopt predatory market penetration tactics and take existing or potential markets away from the competing inland firms.

China's growing exports and FDI inflows are closely intertwined, but the two cannot be regarded as the same thing. Literature points to the fact that only productive firms tend to export (Bernard and Jensen, 1999; Delgado and others, 2002). While nearly half of the FDI in China is export-oriented, not all exports are conducted by FFEs. According to Chinese customs statistics, even though the share of exports by domestic firms declined from about

66% in 1995 to around 40% in 2004, it is still significant. In particular, the share of exports handled by the non-state domestic trading companies has been increasing steadily, especially since China joined the WTO in 2001 with a commitment to trading rights liberalization, to reach 17% in 2004.

Export activities embody a firm's expertise in global marketing, but which are not necessarily captured by FDI. With more productive technology and well-established overseas distribution networks, coastal exporting firms possess a unique asset that enables them to interact with the inland economies in the same manner as coastal FDI, i.e., attract productive migrant workers from inland areas, form vertical production and supply linkages with inland producers, yet at the same time, compete with inland exporting firms. Again, positive spillovers and negative competition effects are generated for the inland regional economies.

Unlike coastal FDI and exports, coastal markets generate only positive effects, i.e., demand for goods and services from inland regions. As economies boom and consumer bases expand in coastal cities, job opportunities for migrant workers are found in construction sites, hotels, restaurants and even urban households. Inland products, although not up to the quality necessary for international markets, are well-received by coastal consumers and producers.

For FDI, exports and local markets, the exact mechanisms through which they interact with inland economies may differ; however, they have one thing in common – all involve movements of labour and goods across China. In this regard, distance matters. While the coastal regions lie in a narrow north-south strip, the inland regions stretch across a vast area of Chinese territory, ranging from the north-east (e.g., Heilongjiang) to the south-west (Yunnan), and from eastern China (e.g., Anhui) to the north-west (e.g., Qinghai and Xinjiang). Needless to say, distant provinces are less effective in interacting with the coastal regions than are the provinces neighbouring Guangdong and the Yangtze delta, which are China's FDI and export hubs and boast the highest per capita income in the country.

Development of inland economies depends on their own factor endowments, among others, as does their capacity to absorb coastal spillovers. Inland regions with a well-developed industrial infrastructure and experienced labour force are in a better position to assimilate the coastal spillovers and translate them into local productivity gains. In the early years of China's industrialization, strategic industries were moved to inland provinces to escape possible attacks by foreign enemies. Inland provinces, although generally backward, do

have quite a few industrial agglomerations with modern technology, well-developed infrastructure and better-trained technicians, such as the military enterprises in Sichuan and the air and space facilities in Shaanxi. At the receiving end, variations cross inland provinces in capital stock (domestic or foreign) and the labour force can make a difference in assimilating the spillover effects generated from their interactions with coastal regions.

## *2.2. Key reform initiatives during 1993-2008*

During 1993-2008, China embarked upon major programmes of economic and legal reform that profoundly changed the country's economic landscape. Deng Xiaoping's tour of the south in early 1992 gave Chinese reform a much needed, strong political impetus. Subsequently, a series of bold reform initiatives were introduced, including extending preferential policies and regulations, enjoyed by the Special Economic Zones established during the 1980s, to a wider area along the coast and the Yangtze River.

At the core of all those preferential policies and regulations governing various development zones is the autonomy given to local governments to approve FFEs in a simplified and expeditious manner as well as tax concessions given to those FFEs. Those preferential policies, together with the fine infrastructure for light industry, a pool of skilled labour force and a favourable geographical location, have helped to attract a large amount of FDI into China, particularly in the Yangtze Delta region, since the early 1990s.

The inflow of FDI into China during that period was also a result of external shocks. The Asian financial crisis in the late 1990s left the ASEAN economies in a shambles. In comparison, China was a much better alternative for FDI that would otherwise have gone to South-East Asia. IMF data show that during the late 1990s and early 2000s, FDI inflow into China steadily increased, while FDI inflows to key ASEAN countries (Indonesia, Malaysia, the Philippines, and Thailand) were fluctuating and declining. Traditionally, South-East Asia has had a strong trade relationship with the United States, exporting mainly labour-intensive manufactured goods. FDI movement from ASEAN to China due to the Asian financial crisis also boosted its exporting capacity.

While China formally acceded to WTO in 2001, it had started to reduce tariffs long before in its bid for membership and continued to do so afterwards as part of its accession commitments. Other reform initiatives associated with WTO accession include liberalization of trading rights that previously had been largely reserved for state trading companies and FFEs. In addition to measures that were aimed at improving the environment for FDI, the

permanent normal trade relationship with the United States that led to the termination of the annual review of China's MFN trading status, helped China to secure access to the United States market and encouraged export-oriented FDI to move to China.

Reform of the SOEs during this period followed the strategy of "keeping the big ones and letting the small ones go," i.e., privatize the small and money-losing SOEs, and convert the large SOEs into modern corporate enterprises. The SOE reform came with a set of industry and competition policies that helped consolidate SOEs' monopolies in key sectors, such as automotive, telecommunications, banking and oil, among others. High demand for capital and technology in the SOE-dominated sectors created room for capital- and technology-intensive FDI to enter in the Chinese market.

FDI in China is a key determinant of that country's trade expansion for two reasons. First, the majority of FDI is in processing and assembly trade operations – importing parts and components from abroad and exporting the finished goods. These operations are generally supported by China's processing trade regime, under which imports are free of duty and value-added taxes, while products using imported inputs are required to be exported. This processing trade regime itself only facilitates but does not encourage the processing trade. Second, the additional tax concessions given to export-oriented FFEs encourage more exports.

Competition among local governments to attract FDI as well as create jobs and growth also plays a role. Economic growth, FDI inflow and export promotion are not only on the platform of all China's Five-Year Plans in the reform era, but are also key criteria for the promotion of local officials (Li and Zhou, 2005). Huang (2003) explained the inflow of FDI into China from a different perspective, arguing that the failure of state-owned enterprises, institutional discrimination against private firms and the fragmentation of domestic markets constrained the growth and investment options of domestic firms, and created high demand for FDI. As such, local governments have been giving additional concessions or preferential policies to FDI, particularly the exporting FFEs, through cheap loans, free land use (often at the expense of farmers), subsidized energy supply and lax enforcement of environmental laws etc., thus serving as additional incentives for export-oriented FDI to go to China.

### 2.3. *Specific FDI and exports: Implications for interregional spillovers*

FDI in China takes three formats: WFFE, EJV and CJV. While China's EJV law emphasizes advanced technology transfer, its CJV law has an explicit export requirement.<sup>3</sup> As a result, FDI in labour-intensive joint ventures is mostly in low-tech production for exports in the format of CJV with Hong Kong, China and Taiwan Province of China origins, and operates in a competitive market. FDI in capital and technology-intensive joint ventures comes mainly from the United States, the European Union, Japan and the Republic of Korea, which seek access to the Chinese market in the format of EJVs that operate in a market protected by local governments and dominated by a few large SOEs. In fact, most FDI in technology-intensive industries is in EJVs formed with local SOEs for two reasons: (a) it is a more efficient format for transferring complicated production technology and management know-how to local partners, compared to CJVs; and (b) it is the format required by the Government of China in order to extract maximum technology transfer from foreign investors in exchange for their access to local markets. The following figure summarizes such market structure and FDI distribution patterns.

### Market structure, players and FDI distribution

Market structure and players			
		K-int, import competing monopolistic SOEs	L-int, export-oriented competitive SMEs
FDI origin	United States. High-tech	EJVs, market-access driven Employ political elite	
	Hong Kong, China; Macau, China; and Taiwan Province of China Low-tech		CJVs, cheap labour- Employ migrant workers

WFFEs have limited interactions with local firms and they therefore generate limited spillovers. EJVs with SOEs appear poised to generate local spillovers, which may spread to other inland regions if no inter-provincial barriers exist. Unfortunately, local protectionism has led to market fragmentation that not only shelters those local EJVs with SOEs from competition, and hence reduces their incentives to adopt new technology, but also blocks them from establishing production linkage with firms in other provinces. In the cases where

<sup>3</sup> See Article 3 of the Implementation Regulations of China's EJVs Law (2001) and Article 4 of China CJVs Law (2000).

EJVs in China were created by foreign firms merging with, and acquiring, domestic SOEs when the latter faced reforms and privatization in the late 1990s, they replaced SOEs in the industrial chains and purchased intermediate goods directly from their overseas parent companies. As a result, their original domestic industrial linkages were broken. All these make EJVs with SOEs less effective in generating cross-region spillovers, even though FDI may come from advanced countries with high levels of production technology and organizational skills.

In contrast, FDI in labour-intensive and low-tech industries have the options of both EJVs and CJVs, but there is no obvious reason in theory that EJVs are necessarily better than CJVs as far as technology transfer is concerned. In fact, this type of technology and know-how can be quite easily transferred to local partners through a contractual mechanism under CJVs rather than under the more complicated arrangement of EJVs. In forming CJVs, foreign investors command an edge in efficiency in negotiating deals with local partners because they operate in an extremely competitive environment. To minimize the risk of breaches of contract and to prepare for sudden market changes, foreign investors normally engage with multiple local partners under a CJV. Unlike EJVs, most CJVs are not established by mergers and acquisition, and the Chinese partners do not change their original industrial chains that enable them to create enough domestic industrial linkages. In this sense, and compared to EJVs, CJVs expose more domestic firms, coastal and inland, to foreign technology and know-how than do EJVs, and tend to generate more spillovers.<sup>4</sup>

The different employment patterns between EJVs and CJVs may also potentially be a source of different interregional impacts by different modes of coastal FDI. Coastal CJVs employ mostly migrant workers who are more mobile than employees in EJVs. Therefore, technology and know-how spillovers from CJVs are more likely to spread to inland regions with the mass movement of migrant workers across the country.

Turning to exports, about half of China's exports are under the processing trade regime, i.e., importing inputs for use together with domestic components in producing final goods that are exported. According to Chinese customs data, during 2001-2008 processing imports accounted for between 56% and 68% of total processed exports, implying that domestic value-added in such exports is no more than between 32% and 44%. Calculations based on China's input-output table put the share of domestic value-added in overall exports at 59%

---

<sup>4</sup> For an in-depth discussion on FDI in China and its modes, see Huang, 2003.

for 2007 (Chen and others, 2012). This implies that the real value-added intensity of Chinese exports is much smaller than the customs export data suggest; therefore, industrial linkages with the inland economies must be weaker. Based on this observation, limited cross-region spillovers by coastal exports can be expected. Specifically, participation by foreign trading companies in the Chinese export trade may not generate more spillovers than exports by domestic firms, as the former are more engaged in the processing trade and their knowledge of the global production chain is jealously guarded as a trade secret from Chinese firms.<sup>5</sup>

#### 2.4. *Interregional impact estimation*

So far, only a few studies have been carried out to estimate the magnitude of interregional impacts of FDI or exports in China, but none have included careful treatment of coastal-inland distances, potential interaction between FDI and exports and their heterogeneous modes by inclusion into one single econometric model.

For the FDI effects, Madariaga and Poncet (2007) used geographic proximity as a weight to discount the impact on a city of the FDI in surrounding areas, but they only assigned a zero weight for long distances. By so doing, they effectively excluded the vast inland regions from their estimation and only produced estimates of interregional impacts over a relatively small geographic area, mainly FDI-abundant coastal cities. Overcoming this drawback, Ouyang and Fu (2012) assigned non-zero weights to long distances when constructing the distance discounting matrix in their estimation of the overall impacts of coastal FDI on inland economies. They found that coastal FDI has a positive impact on inland growth.

For export effects, related research is scarce. Using the provincial-level panel data from 1990 to 1999, Fu (2004) adopted geographic proximity as a weight to discount coastal export volumes and related it to inland growth rates. She found no evidence of positive interregional impacts from coastal export.

It is worth noting that the studies mentioned above only considered one factor, either coastal FDI or coastal export, and ignored the other. Therefore, these studies suffer from potential estimation bias due to omitted variables, since FDI and exports is not the same thing. In addition, they only estimated the impacts of overall FDI or exports, without differentiating their specific modes. In fact, in estimating local spillovers, Abraham and others (2010) found

---

<sup>5</sup> In the case of the CJV arrangement, there is a clear division of labour in that foreign firms are normally responsible for intermediate imports and overseas marketing, while the Chinese partners are responsible for production and assembly operations.

that ownership, origin of foreign firms and export status etc. did matter. This suggests that the heterogeneity issue should be given due consideration when estimating the interregional impacts of coastal FDI and exports.

As a methodological improvement, this paper incorporates distances, both for coastal FDI and for exports, and their heterogeneous modes into one single econometric model to estimate possible coastal impacts on inland regions. There are many other specific characteristics of a region that may affect its absorptive capacity for FDI or export spillovers (local or spatial), such as human capital (Borensztein and others, 1998), R&D (Kinoshita, 2000; Kuo and Yang, 2008), technological level (Durham, 2004; Girma, 2005) and industrial development (Ouyang and Fu, 2012). To make the analysis tractable, this paper only looks into the heterogeneity of the sources of the spillovers, i.e., the different modes of coastal FDI and exports.

### 3. Econometric model specification

The model starts with an augmented Cobb-Douglas production function defined as:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} F_{it}^{\gamma} \quad (1)$$

where  $Y_{it}$ ,  $K_{it}$ ,  $L_{it}$  and  $F_{it}$  represent output or GDP,<sup>6</sup> domestic capital stock, labour input and foreign capital stock, respectively.<sup>7</sup> Subscripts  $i$  and  $t$  refer to inland province  $i$  and current year  $t$ . As in Solow (1957), term  $A_{it}$  denotes the technology parameter, which includes “any kind of shift in the production function,” such as macroeconomic situations and “improvements in the education of the labour force.” The coastal FDI and exports do not directly produce outputs, but they may affect an inland province’s technology level and economic environment through spillovers of technology and management know-how.

---

<sup>6</sup> This paper estimates how the level of GDP, rather than the growth rate of GDP per capita, of an inland province is related to coastal FDI and exports. Hall and Jones (1999) explicitly pointed out that the study of levels was particularly interesting because levels reflect the steady state of an economy while differences in growth rates are more likely to be transitory.

<sup>7</sup> Ideally,  $K$  or  $F$  should be the volume of domestic or foreign capital service, assumed to be a proportion of the productive domestic or foreign capital stock (Organisation for Economic Co-operation and Development, 2001). However, calculating the volume of capital service requires data on asset combination and user cost price per unit of capital service, which is not available in most regional level statistics. Therefore, in practice, capital stock is usually employed in estimating a production function.

Therefore,  $A$  is posited to be a function of regional spillovers from the coastal FDI and exports such that:

$$A_{it} = f(CFDI_{it}, CEXP_{it}, other\ factors) \quad (2)$$

where  $CFDI_{it}$  and  $CEXP_{it}$  denote the effective coastal FDI and exports to which the inland province may be exposed, respectively. Other factors include access to coastal markets, among others. A growing market in the coastal regions provides increasing demand for inland products and thus may prompt the economic growth of the inland regions.

With standard fixed effects added to the model (across time and provinces), equation (2) is incorporated into equation (1) and natural logs are taken, resulting in the log-linear form of the augmented Cobb-Douglas production being specified as:

$$\begin{aligned} \ln GDP_{it} = & \alpha + \beta_1 \ln CFDI_{it} + \beta_2 \ln CEXP_{it} + \beta_3 \ln Domestic\ Capital_{it} \\ & + \beta_4 \ln Employment_{it} + \beta_5 \ln Foreign\ Capital_{it} + \beta_6 \ln Market\ Access_{it} \\ & + Year\ Dummies + \mu_i + v_{it} \end{aligned} \quad (3)$$

The dependent variable is real GDP of inland province  $i$  at year  $t$ . As mentioned above,  $CFDI_{it}$  and  $CEXP_{it}$  denote the effective coastal FDI and exports by which province  $i$  may be influenced.  $Domestic\ Capital_{it}$  refers to  $K_{it}$  in equation (1), domestic capital stock in an inland province, while  $Foreign\ Capital_{it}$  refers to  $F_{it}$  in equation (1), an inland province's own foreign capital stock.  $Employment_{it}$  is the total employment in province  $i$  at year  $t$ , a proxy for labour input  $L_{it}$  in equation (1).

The term  $\ln Market\ Access_{it}$  refers to an inland province's accessibility to the coastal markets for its output. Since a bigger coastal market usually attracts more FDI and generates more exports, spillovers arising from the coastal FDI or export are similar to those stemming from growing coastal markets. Therefore, coastal market access must be controlled for, in order to distinguish the effect of coastal FDI and exports from the effect of coastal market access.  $Year\ Dummies$  provide control for macro shocks that affect an inland province's GDP and the independent variables simultaneously. The term  $\mu_i$  is introduced because, to a great extent, the Chinese provinces enjoy autonomy to make and implement policies of their own, which therefore has to be controlled to avoid biased estimation. Since it is difficult to parameterize cross-provincial policy variation, province-specific unobservable

factors are controlled by  $\mu_i$ .

Because the economies of all the provinces are interrelated, the inland economies may affect coastal FDI and exports. This raises the issue of reverse causality. Table 1 compares the means of per capita GDP, FDI and exports in the coastal and inland provinces during 1993-2008. The average per capita GDP in the coastal provinces is twice that of the inland provinces. The average per capita FDI in the coastal provinces is more than 10 times that of the inland provinces. The average per capita exports in the coastal provinces is about 200 times that of the inland provinces. Apparently, the economies of the inland provinces are, on average, much smaller than those of the coastal provinces. An individual inland province can hardly influence the total FDI and export in the coastal regions. Therefore, reverse causality is not an issue here.

**Table 1. GDP, FDI and exports: coastal vs. inland provinces**

Year	Unit: Yuan renminbi					
	GDP per capita		FDI per capita		Export per capita	
	Coastal	Inland	Coastal	Inland	Coastal	Inland
1993	4 895		2 010		107 979	640
1994	6 425	2 577	743	44	269 714	1 393
1995	7 838	3 185	774	48	317 851	1 714
1996	9 085	3 949	887	55	445 034	1 782
1997	10 140	4 438	900	63	503 043	2 301
1998	10 949	4 695	880	59	496 387	2 008
1999	11 722	4 916	739	50	456 495	1 389
2000	12 320	5 352	647	55	464 802	1 751
2001	14 627	5 913	822	55	752 155	1 869
2002	16 250	6 497	840	65	853 466	2 402
2003	18 553	7 430	862	67	1 229 519	3 117
2004	21 895	8 883	1 183	140	3 530 299	9 737
2005	24 961	10 556	1 213	174	2 959 741	14 514
2006	28 460	12 236	1 392	206	3 977 503	22 631
2007	33 155	14 700	1 589	261	5 267 507	37 968
2008	33 013	15 768	1 029	175	2 362 451	37 262

*Data source: China Provincial Yearbook (various issues).*

Equation (3) is the basic estimation model used to estimate the interregional impacts of overall FDI and exports. It can easily be modified to estimate the impact of heterogeneous FDI and exports, as described in section 6.

## 4. Data and measurement

### 4.1. Data

The primary source of the data used in this paper was the *Statistical Yearbooks* published by the Chinese provinces, and made available by the China Data Centre at the University of Michigan with the authorization of China's National Bureau of Statistics.<sup>8</sup> Based on the available data, two datasets were constructed for this paper. The first dataset, which covers China's 31 provinces, (12 coastal and 19 inland) for 1993-2008,<sup>9</sup> contains data for GDP, population, employment, domestic investment, total FDI and total exports, with total 491 observations – 191 for coastal provinces and 300 for inland provinces.<sup>10</sup> Because of missing values for some key variables, six observations of the inland provinces have been deleted, reducing the inland sample size to 294.

The dataset has been used to estimate the average spillover levels from the coastal FDI and exports to the inland economies. Its advantage lies in the long period it covers, making it feasible to study a steady state of an economy. However, this dataset cannot offer variables on characteristics of FDI and export activity to further estimate the heterogeneity of spillovers. In fact, the *Statistical Yearbooks* for many provinces contain information on characteristics of FDI and export activity over a shorter period. Therefore, the second dataset was formulated with information on different types of FDI and exports for 2002-2007, with a total of 114 observations for inland provinces after dropping observations with missing values for key variables.

To convert nominal variables in the above two datasets into real ones, data were also used from the provincial Consumer Price Index (CPI) in the *Statistical Yearbooks*. Data on distances are from the Geographic Information System.

### 4.2. Effective coastal FDI and exports

---

<sup>8</sup> For details, see [www.chinadataonline.com](http://www.chinadataonline.com). For simplicity, the term "province" that is used throughout this paper refers to all provincial-level administrative regions, including provinces, autonomous regions and municipalities.

<sup>9</sup> The coastal provinces are Beijing, Fujian, Guangdong, Guangxi, Hainan, Hebei, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin and Zhejiang. The inland provinces are Anhui, Chongqing, Gansu, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jiangxi, Jilin, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Tibet, Xinjiang and Yunan. Although Guangxi has a lower level of development than other coastal regions, this paper follows the existing studies' traditional division of the coastal and inland regions, and views this province as the part of the coastal region.

<sup>10</sup> Tianjin, Chongqing, Jiangxi, Ningxia, Shanxi and Yunan do not have observations for 2008.

Although inland provinces receive similar levels of coastal FDI and exports, they may receive different interregional spillovers, in part because of their geographic locations. An essential part of the empirical analysis is to incorporate cross-section and cross-time variations into the measurement of coastal FDI and exports. Based on geographic proximity, this paper constructs the distance-adjusted effective coastal FDI and exports to which an inland province is exposed:

$$CFDI_{it} = \sum FDI_{jt}^c \times e^{-\delta D_{ij}} \quad (4)$$

$$CEXP_{it} = \sum_{j \in c} EXP_{jt}^c \times e^{-\delta D_{ij}} \quad (5)$$

$CFDI_{it}$  is the effective coastal FDI for inland province  $i$ .  $FDI_{jt}^c$  is FDI flow in coastal province  $j$ .<sup>11</sup>  $D_{ij}$  is the distance between capital cities of provinces  $i$  and  $j$  in units of 1,000 kilometres.<sup>12</sup>

$\delta$  is a positive parameter as a distance discount factor.  $e^{-\delta D_{ij}}$  implies that coastal FDI becomes less influential in an inland province as  $D_{ij}$  increases.  $FDI_{jt}^c \times e^{-\delta D_{ij}}$  is the effective FDI in coastal province  $j$  for city  $i$ , and  $\sum_{j \in c} FDI_{jt}^c \times e^{-\delta D_{ij}}$  stands for the total effective FDI in all coastal provinces for inland province  $i$  at year  $t$ . Since there are 19 inland provinces and 12 coastal provinces, the 19×12 distance combinations during the sample years ensure that effective coastal FDI and exports vary by province and time. Regarding the distance discounting factor  $\delta$ , no studies on FDI regional spillovers have estimated its value. However, for R&D regional spillovers, estimates by Keller (2002) put its values at around 1. Following Ouyang and Fu (2012), this paper has adopted the value of  $\delta = 1$ .<sup>13</sup>

Similarly, effective coastal exports  $CEXP_{it}$  are created as the distance-adjusted sum of the coastal exports for an inland province.

#### 4.3. Other independent variables

It is important to distinguish the coastal FDI and exports spillovers from the effects of coastal

---

<sup>11</sup> The FDI data include the value of foreign investors' asset acquisitions in China that do not establish new equipment. However, this should not be a problem in the study of regional spillovers from FDI because asset acquisition is highly concentrated in capital-intensive industries in China; however, China's FDI inflow is distributed across industries (Dean and others, 2009; Huang, 2003). In addition, if the spillovers are from foreign technology or management practices, the broader measure of foreign involvement may be preferred.

<sup>12</sup> Units of 1,000 kilometres were selected instead of 1 kilometre because the latter makes  $FDI_{jt}^c \times e^{-\delta D_{ij}}$  close to zero.

<sup>13</sup> Different values in the neighbourhood of 1 for  $\delta$  were tried, but the estimation results do not change substantially.

market access. Therefore, similar to effective coastal FDI and exports, coastal market access is constructed as a distance-weighted sum of GDP in the coastal provinces as:

$$Market\ Access_{it} = \sum_{j \in c} GDP_{jt}^c \times e^{-\delta D_{ij}} \quad (6)$$

To measure the domestic and foreign capital stock of an inland province, this paper has adopted the perpetual inventory method proposed by Kuo and Yang (2008).<sup>14</sup>

#### 4.4. Summary statistics

Table 2 presents the summary statistics of the key variables for the inland province group. Both samples show considerable variation across the inland provinces. In dataset 1 of table 2, during 1993-2008, real GDP has a mean of Yuan (Y) 119.17 billion, ranging from Y 2.65 billion to Y 785.57 billion. The effective coastal FDI varies from Y 0.21 billion to Y 136 billion, with a mean of Y 48.46 billion. The effective coastal exports variable is, on average, Y 373 billion, ranging from Y 0.48 billion to Y 1,760 billion. Coastal market access has a mean of Y 987.12 billion, with a standard deviation of Y 773.24 billion. Domestic capital stock is, on average, Y 234.58 billion, ranging from Y 6.01 billion to Y 1,722.37 billion. Foreign capital stock is, on average, Y 10.67 billion, ranging from Y 0.20 billion to Y 53.25 billion.

**Table 2. Summary statistics of key variables**

Dataset	Mean	Std. dev.	Min.	Max.
<b>Dataset 1 – 1993-2008</b>				
Real GDP ( billion yuan)	119.17	107.62	2.65	785.57
Effective coastal FDI ( billion yuan)	48.46	30.24	0.21	136.00
Effective coastal exports ( billion yuan)	373.00	386.00	0.48	1 760.00
Coastal market access ( billion yuan)	987.12	773.24	1.83	3 439.80
Employment (10,000 persons)	1 961.82	1 397.69	112.35	5 829.27
Domestic capital stock ( billion yuan)	234.58	227.15	6.01	1 722.37
Foreign capital stock ( billion yuan)	10.67	10.77	0.20	53.25
<b>Dataset 2 – 2002-2007</b>				
Real GDP ( billion yuan)	168.08	121.19	7.05	685.52
Effective coastal FDI ( billion yuan)	63.76	35.42	0.21	136.00
Effective coastal exports ( billion yuan)	636.00	433.00	1.51	1 760.00

<sup>14</sup> This paper first regresses on  $t$  to estimate the investment growth rate ( $\gamma_1 = 17\%$ ). The initial capital stock  $K_{i0} = \frac{I_{i0}}{\delta_K}$ , where  $\delta_K$  is the capital depreciation rate, was assumed to be 7.5% in China. With  $K_{i0}$ ,  $K_{it}$  is calculated by the formula  $K_{it} = (1 - \delta_K)K_{i,t-1} + I_{it}$ . For foreign capital stock and investment,  $\gamma_1$  is replaced by the growth rate of  $FDI_{it}$  and  $I_{i0}$  is replaced by  $FDI_{i0}$ .

Coastal market access ( billion yuan)	1 474.38	859.61	4.70	3 439.80
Employment (10,000 persons)	2 029.18	1 446.74	128.80	5 772.72
Domestic capital stock ( billion yuan)	359.08	240.65	19.74	1 378.99
Foreign capital stock ( billion yuan)	14.28	13.10	0.23	53.25

*Data source: China Provincial Yearbook (various issues).*

In dataset 2 of table 2, as the economies grow, the 2002-2007 dataset shows larger means of all variables, also with widespread distribution.

## 5. Interregional impacts: Overall FDI and exports, 1993-2008

This section discusses the results of estimating equation (3) with the 1993-2008 samples. Since many foreign firms are export-oriented, it is hard to distinguish between the effect of coastal FDI and the highly-correlated effect of coastal exports. To see if the sign and magnitude of the estimates vary across specifications, regressions were run that exclude either the coastal FDI or the coastal exports and regressions including both of them.

Equation (3) is estimated by the fixed effect and the random effect models. Table 3 reports the results for the fixed-effect estimation. Columns (1) and (2) include effective coastal FDI and other independent variables but exclude effective coastal exports. Columns (3) and (4) include effective coastal exports and other independent variables but exclude effective coastal FDI. Columns (5) and (6) show the results for a set of control variables that include both coastal FDI and export variables. The estimated elasticities of an inland GDP with regard to effective coastal FDI are positive, ranging from 0.076 to 0.22, and are significant at the 10% level in column (1), 5% level in columns (2) and (5), and 1% level in column (6). In column (6), the estimates show that when effective coastal FDI increases by 10%, the GDP of an inland province increases, on average, by 2.2%. By contrast, the coefficients of coastal exports have mixed signs, and are negative in most columns and only significant at the 1% level in column (6).

**Table 3. Fixed-effect estimation of interregional impacts from overall coastal FDI and exports**

Dependent variable: Log of real GDP of an inland province						
	(1)	(2)	(3)	(4)	(5)	(6)
Coastal FDI	0.076* (1.78)	0.099** (2.57)	-	-	0.11** (1.97)	0.22*** (4.24)
Coastal exports	-	-	0.059 (0.43)	-0.091 (-0.75)	-0.17 (-0.95)	-0.55*** (-3.42)
Coastal market access	-0.064 (-0.38)	-0.26* (-1.69)	0.033 (0.19)	-0.044 (-0.28)	-0.022 (-0.12)	-0.13 (-0.88)
Employment	-	0.15* (1.70)	-	0.15* (1.69)	-	0.21** (2.40)
Domestic capital stock	-	0.47*** (8.83)	-	0.46*** (8.54)	-	0.52*** (9.55)
Foreign capital stock	-	0.00056 (0.035)	-	0.011 (0.72)	-	-0.0041 (-0.26)
Constant	5.44*** (4.46)	2.53** (2.01)	4.82** (2.45)	3.64** (-2.02)	7.34*** (3.14)	8.03*** (3.96)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test (Chi-square statistics)	1.44	67.73	1.15	49.30	3.94	52.46
Observations	294	294	294	294	294	294
R-squared	0.97	0.98	0.97	0.98	0.97	0.98

Notes: 1. Independent variables are logged. 2. T-statistics are in parentheses. \* at 10% significance, \*\* at 5% significance and \*\*\* at 1% significance.

The Hausman test was employed to choose between the fixed effect and the random effect model. As table 3 shows, the random effect models are not rejected in all models. Therefore, a random effect estimation was also made, and the results are shown in table 4. The results are similar to those obtained from the fixed effect model. The estimates of coastal FDI are positive, ranging from 0.048 to 0.17 and significant at the 10% level in columns (1) and (5), and at the 1% level in column (6). Once again, the coefficients of the coastal exports have mixed signs, negative in most columns and only significant at the 1% level in columns (4) and (6).

Therefore, both the fixed effect and the random effect estimates show positive coefficients for coastal FDI, while the coefficients of coastal exports have mixed signs and are negative in most columns. The results confirm the findings of Ouyang and Fu (2012) on coastal FDI and are consistent with the findings by Fu (2004) on coastal exports.

**Table 4. Random effect estimation of interregional impacts from overall coastal FDI and exports**

Dependent variable: Log of real GDP of an inland province						
	(1)	(2)	(3)	(4)	(5)	(6)
Coastal FDI	0.071* (1.68)	0.048 (1.16)	-	-	0.089* (1.70)	0.17*** (3.62)
Coastal exports	-	-	0.067 (0.51)	-0.34*** (-3.42)	-0.097 (-0.59)	-0.55*** (-4.73)
Coastal market access	0.027 (0.21)	-0.042 (-1.03)	0.073 (0.47)	0.33*** (3.39)	0.082 (0.53)	0.39*** (3.89)
Employment	-	0.36*** (8.98)	-	0.40*** (9.85)	-	0.42*** (10.30)
Domestic capital stock	-	0.72*** (15.80)	-	0.67*** (14.80)	-	0.67*** (15.00)
Foreign capital stock	-	0.031* (1.89)	-	0.035** (2.29)	-	0.016 (1.04)
Constant	4.80*** (5.05)	-1.83*** (-5.49)	4.37*** (2.72)	1.28 (1.53)	5.67*** (3.20)	1.92** (2.25)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	294	294	294	294	294	294
R-squared	0.97	0.98	0.97	0.97	0.97	0.98

Notes: 1. Independent variables are logged. 2. T-statistics are in parentheses. \* at 10% significance, \*\* at 5% significance and \*\*\* at 1% significance.

Estimates for other independent variables are also reported in tables 3 and 4. Labour input and domestic capital were found to be significant and positive. It is interesting to note that the coefficients of domestic capital stock are about 0.50 in table 3 and about 0.70 in table 4, making them larger than any other coefficient and illustrating the fact that domestic capital accumulation is the biggest driving force for an inland province's GDP. In contrast, an inland province's own foreign capital stock has mixed signs and is not significant in most columns. This is because the average share of FDI in GDP in an inland province is small (about 1%), so that no critical mass is formed to affect the local absorptive capacity.

To test the robustness of the above results, the authors first tried alternative definitions for effective coastal FDI and exports, and then deleted some extreme observations. For

alternative definitions,  $\sum_{j \in c} \frac{FDI_{jt}^c}{D_{ij}}$  and  $\sum_{j \in c} \frac{EXP_{jt}^c}{D_{ij}}$  is used as well as  $\sum_{j \in c} FK_{jt}^c \times e^{-\delta D_{ij}}$ , where  $FK_{jt}$

is the foreign capital stock in coastal province  $j$  at year  $t$ , calculated by the perpetual inventory method. Using the effective coastal FDI stock can help to answer how the coastal

FDI in earlier years affects the current inland GDP. All other control variables are included and defined as above. Only the fixed effect estimation results are reported here, as the random effect estimation yields similar results.

The fixed effect estimation results are presented in columns (1) and (2) of table 5. They show that coastal FDI has a positive impact on inland GDPs. The estimated elasticity with regard to coastal FDI is 0.43 and significant at the 1% level in column (1). In column (2), the coefficient rises to 0.72 and is still significant at the 1% level, larger than the coefficients in column (6) of table 3. The coastal FDI stock has a larger coefficient than the contemporary coastal FDI. This is intuitively plausible. If a foreign firm makes an investment in the coastal regions in a particular year, the investment may carry over and affect the inland regions in the years following the original.

**Table 5. Robustness checks**

<b>Dependent variable: Log of real GDP of an inland province</b>				
	<b>Alternative variable definitions</b>		<b>Exclude extreme observations</b>	
	Another distance discounted effective coastal FDI flow	Coastal foreign capital stock	Without the first and ninety-ninth percentiles of real GDP	Without the first and ninety-ninth percentiles of real GDP per capita
	(1)	(2)	(3)	(4)
	0.43***	0.72***	0.21***	0.21***
	(4.66)	(5.99)	(4.14)	(4.17)
Coastal exports	-0.39***	-0.93***	-0.59***	-0.51***
	(-2.93)	(-6.69)	(-3.75)	(-2.92)
Observations	294	294	288	272

*Notes:* 1. This table reports the results for the fixed effect estimation. 2. Independent variables are logged. 3. Unreported independent variables include employment, domestic capital stock, foreign domestic capital stock, coastal market access and year dummies. 4. T-statistics are in parentheses. \* at 10% significance, \*\* at 5% significance and \*\*\* at 1% significance.

Coastal exports have negative and significant coefficients in columns (1) and (2) of table 5. The estimated elasticities with regard to coastal exports are -0.39 in column (1) and -0.93 in column (2), and significant at the 1% level in both columns. The results show that coastal exports generate negative spillovers in inland economies.

The second robustness check was done by estimating equation (3) with extreme observations deleted for the inland provinces. The fixed effect results are reported in columns (3) and (4) of table 5. Column (3) excludes the observations with real GDP below the first percentile or above the ninety-ninth percentile. Column (4) excludes the observations with real GDP per capita below the first percentile or above the ninety-ninth percentile. The signs and significance do not change much. The magnitudes of the coefficients for coastal FDI are smaller than those in columns (1) and (2). The coefficients for coastal exports are about 0.50, between those in columns (1) and (2).

To summarize, the main results and robustness checks show that coastal FDI, on average, generates positive spillovers in the inland economies. The coastal export activity, on the contrary, is found to have no overall positive impact and may even have negative impacts on the economies of the inland regions.

## **6. Interregional impacts: Heterogeneous FDI and exports, 2002-2007**

The previous section uses a single econometric model to estimate the impacts of overall coastal FDI and exports on the inland economies. Following this methodology, and using the 2002-2007 dataset, this section looks further into the heterogeneous aspects of coastal FDI and exports. This second dataset includes various forms of FDI (WFFEs, EJVs and CJVs), their origins and exports handled by trading companies of different types of ownerships, which makes it possible to identify the spillovers from different firms, from FDI with different origins and from export activities by trading companies under different ownerships.

### *6.1. Do the organizational forms of coastal FDI matter?*

To answer this question, three effective coastal FDI variables were created – the distance-weighted sum of FDI in WFFEs, EJVs and CJVs. Equation (3) is estimated with the total effective coastal FDI being replaced by these three effective coastal FDI variables. The results are presented in table 6.

**Table 6. Interregional impacts by various modes of FDI**

Dependent variable: log of real GDP of an inland province				
	Fixed effects		Random effects	
	(1)	(2)	(3)	(4)
EJVs	-0.081** (-2.28)	-0.045 (-1.60)	-0.088** (-2.37)	-0.087*** (-2.66)
CJVs	0.072*** (2.89)	0.042** (2.14)	0.072*** (2.68)	0.068*** (2.91)
WFFEs	0.13 (1.47)	0.074 (1.08)	0.14 (1.48)	0.14* (1.67)
Coastal exports	-0.53** (-2.16)	-0.27 (-1.40)	-0.52** (-2.07)	-0.75*** (-4.49)
Coastal market access	0.76 (1.62)	0.27 (0.71)	0.59** (2.09)	0.60*** (3.64)
Employment	-	-0.024 (-0.24)	-	0.46*** (9.58)
Domestic capital stock	-	0.29*** (5.33)	-	0.53*** (9.22)
Foreign capital stock	-	0.053** (2.42)	-	0.051** (2.12)
Constant	8.55*** (2.67)	5.86** (2.25)	9.75*** (3.70)	5.92*** (3.52)
Year dummies	Yes	Yes	Yes	Yes
Hausman test (Chi-square statistics)	0.14	77.45		
Observations	114	114	114	114
R-squared	0.98	0.99	0.98	0.98

Notes: 1. Independent variables are logged. 2. T-statistics are in parentheses.\* at 10% significance; \*\*at 5% significance; \*\*\* at 1% significance.

Table 6 shows that EJVs generate negative impacts on inland regions, as EJV coefficients are negative, ranging from -0.088 to -0.045. They are significant at the 5% level in columns (1) and (3) and significant at the 1% level in column (4). Compared with the findings by Abraham and others (2010) that EJVs generate positive horizontal spillovers to local firms due to technology leakages, table 6 shows that when it comes to FDI externalities across regions, EJVs' positive technology spillovers are weak and offset by their negative competition effects. In contrast, CJVs coefficients are positive, ranging from 0.042 to 0.072, and very significant. The results indicate that CJVs generate positive spillovers to the inland regions. Meanwhile, WFFEs are not found to have a significant impact on the inland economies.

## 6.2. Do the origins of coastal FDI matter?

To answer this question, four variables for effective coastal FDI with different origins are created: (a) one for Hong Kong, China as well as Macau, China and Taiwan Province of China origins (HMT); (b) one for Japan, the Republic of Korea and Singapore origins (JKS); (c) one for the United States and Europe origins (UE); and (d) one for all other origins. The total effective coastal FDI variable in equation (3) is replaced by the four variables to generate the revised econometric model. Due to missing information on FDI origin, the sample size is reduced to 105. The estimation results are shown in table 7.

**Table 7. Interregional impacts by FDI origin**

<b>Dependent variable: log of real GDP of an inland province</b>				
	<b>Fixed effects</b>		<b>Random effects</b>	
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
FDI from HMT	-0.29*	-0.081	-0.21	0.038
	(-1.82)	(-0.60)	(-1.45)	(0.28)
FDI from JKS	0.14	0.028	0.11	-0.073
	(0.98)	(0.24)	(0.70)	(-0.53)
FDI from UE	0.0035	-0.0011	-0.0068	0.065*
	(0.096)	(-0.035)	(-0.18)	(1.83)
FDI from other origins	0.014	0.0049	0.011	-0.0023
	(1.55)	(0.63)	(1.08)	(-0.25)
Coastal exports	-0.063	0.014	-0.17	-0.62***
	(-0.26)	(0.070)	(-0.70)	(-3.55)
Coastal market access	-0.067	-0.12	0.60*	0.64***
	(-0.15)	(-0.33)	(1.89)	(3.66)
Employment		-0.041		0.44***
		(-0.37)		(8.10)
Domestic capital stock		0.27***		0.53***
		(4.41)		(8.22)
Foreign capital stock		0.057**		0.063**
		(2.32)		(2.39)
Constant	10.3***	5.68*	6.24**	4.76***
	(2.76)	(1.80)	(2.29)	(2.64)
Year dummies	Yes	Yes	Yes	Yes
Hausman test (Chi-square statistics)	8.7	77.31		
Observations	105	105	105	105
R-squared	0.978	0.986	0.978	0.978

Notes: 1. Independent variables are logged. 2. T-statistics are in parentheses. \* at 10% significance, \*\* at 5% significance and \*\*\* at 1% significance.

The coefficients for coastal FDI from HMT are negative but almost insignificant except in column (1). The coefficients for coastal FDI from JKS have mixed signs and are not significant. The coefficients for coastal FDI with European and United States origins have mixed signs and are only positively significant at the 10% level in column (4). Although Abraham and others (2010) found that the origin of the coastal foreign firms mattered for local spillovers, this study's estimations suggest that its interregional impacts are very dubious.

### 6.3. Does ownership of exporting companies matter?

To answer this question, two variables for effective exports by coastal trading companies are created: (a) one for domestic traders; and (b) the other for foreign traders. The variable for total effective coastal exports in equation (3) is replaced by these two variables in order to generate the revised econometric model. The estimation results are reported in table 8.

It can be seen that exports by foreign firms have non-significant negative signs in most columns. Although exports by domestic firms have significant positive coefficients in columns (1) and (3), they have non-significant mixed signs based on the fully-specified estimation model in columns (2) and (4), implying that exports neither by foreign nor by domestic traders have significant and robust positive impacts on the inland economies. Therefore, it is uncertain whether ownership status of coastal traders really matters as far as interregional impacts are concerned.

**Table 8. Interregional impacts by exporter ownership**

<b>Dependent variable: Log of real GDP of an inland province</b>				
	<b>Fixed effects</b>		<b>Random effects</b>	
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
Exports from foreign firms	-0.16 (-0.83)	-0.19 (-1.26)	-0.17 (-0.89)	-0.60*** (-5.79)
Exports from domestic firms	0.29*** (2.77)	0.13 (1.44)	0.22** (2.25)	-0.081 (-1.25)
Coastal FDI	-0.11 (-1.32)	-0.049 (-0.72)	-0.017 (-0.26)	0.088* (1.70)
Coastal market access	0.87* (1.74)	0.53 (1.33)	0.22 (0.83)	0.57*** (5.17)
Employment	-	0.019 (0.19)	-	0.48*** (10.40)
Domestic capital stock	-	0.29***	-	0.52***

		(5.48)		(9.58)
Foreign capital stock	-	0.045**	-	0.052**
		(2.04)		(2.26)
Constant	-1.15	0.99	4.30**	3.45***
	(-0.30)	(0.30)	(2.08)	(3.89)
Year dummies	Yes	Yes	Yes	Yes
Hausman test (Chi-square statistics)	10.42	53.48		
Observations	114	114	114	114
R-squared	0.98	0.99	0.98	0.98

*Notes:* 1. Independent variables are logged. 2. T-statistics are in parentheses. \*10% significance, \*\*5% significance and \*\*\*1% significance.

What can be learnt from the above three sets of estimations? The results from the first two sets contradict the belief that FDI from advanced economies will generate maximum technology transfers to Chinese firms under EJV, so that positive interregional impacts will be observed. In fact, the positive impacts by overall FDI are due to export-oriented CJVs with FDI from countries or regions with a lower tier of technology. The third set of estimations suggests that foreign exporters, who are often also producers, are not necessarily doing better than domestic traders in disseminating overseas marketing expertise to inland regions. The findings justify the hypotheses detailed in section 2(c) about the possible mechanisms for generating these results. The dominance of SOEs in import-competing, capital- and technology-intensive sectors and their protectionist behaviour, plus the heavy presence of processing trade and prevalence of CJVs in labour-intensive export sectors, help to explain the results.

## 7. Conclusion

This paper makes two contributions to the literature on interregional spillovers of Chinese coastal FDI and exports. First, it develops a single econometric model to incorporate both distance-adjusted FDI and exports to estimate their interregional impacts. Second, using this econometric model and provincial-level panel data, the paper estimates the interregional impacts of both overall and heterogeneous coastal FDI and exports on inland economies.

At the overall level, the empirical results show that coastal FDI creates positive spillovers into the inland regions. However, no interregional impacts are generated by coastal exports.

For specific modes of FDI and exports, however, EJVs have negative interregional impacts, while CJVs generate positive impacts on the inland regions. The origin of FDI and the ownership of export firms do not matter very much.

The findings do not fully justify China's coastal development strategy that is aimed at helping to move the inland economies forward. In particular, EJVs with SOEs in import-competing sectors do not live up to the high hopes that they will digest the advanced foreign technologies transferred from developed countries, and help to disseminate them into inland provinces. On the other hand, because of the processing trade regime, Chinese exports carry less than 60% of domestic value-added. Therefore, interregional spillovers of exports are small. Meanwhile, limited interactions between foreign trading companies and domestic firms, because of either WFFE or CJV arrangement, hamper the spillovers of overseas procurement and marketing expertise to inland provinces.

How can China's foreign trade and investment policies be reformed so that FDI and export spillovers go beyond local areas and into inland regions? Further liberalization of China's strategic sectors dominated by SOEs, dismantling local protectionism, and improving the access to credits and loans by the small and medium-sized non-state enterprises in the export sector would be sensible options. These reforms would change the behaviour of SOEs, facilitate the flow of goods, funds and people between regions, and better prepare domestic firms in the export sector to engage in production, procurement and marketing activities with higher value-added. These elements should be made part of the overall programme to rebalance the Chinese economy.

## References

- Abraham, F., J. Konings and V. Sloomakers (2010). "FDI spillovers in the Chinese manufacturing sector: Evidence of firm heterogeneity," *Economics of Transition*, vol.18, No. 1; pp. 143-182.
- Bao, S., O. B. Bodvarsson, J. Hou and Y. Zhao (2007). "Interprovincial migration in China: The effects of investment and migrant networks," Discussion Paper No. 2924, Institute for the Study of Labour (IZA), Bonn, Germany.
- Bernard, A. and B. Jensen (1999). "Exceptional exporter performance: Cause, effect or both?" *Journal of International Economics*, vol. 47, No. 1; pp. 1-25.
- Borensztein, E., J. De Gregorio and J-W. Lee (1998). "How does foreign direct investment affect economic growth?" *Journal of International Economics*, vol. 45, No. 1; pp. 115-135.
- Cai, F. and D. Wang (2003). "Migration as marketization: What can we learn from China's 2000 census data?" *China Review*, vol. 3, No. 2; pp. 73-93.
- Chen, X., L. K. Cheng, K. C. Fung, L. J. Lau, Yun-Wing Sung, K. Zhu, C. Yang, J. Pei and Y. Duan (2012). "Domestic value added and employment generated by Chinese exports: A quantitative estimation," *China Economic Review*, vol. 23; pp. 850-864.
- Dean, J. M., M. E. Lovely and H. Wang (2009). "Are foreign investors attracted to weak environmental regulations? Evaluating the evidence from China," *Journal of Development Economics*, vol. 90, No. 1; pp. 1-13.
- Delgado, M. A., J. C. Farinas and S. Ruano (2002). "Firm productivity and export markets: A non-parametric approach," *Journal of International Economics*, vol. 57, No. 2; pp. 397-422.
- Du, Y., A. Park and S. Wang (2005). "Migration and rural poverty in China," *Journal of Comparative Economics*, vol. 33, No. 4; pp. 688-709.
- Durham, J. B. (2004). "Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment on economic growth," *European Economic Review*, vol. 48, No. 2; pp. 285-306.
- Fu, X. (2004). "Limited linkages from growth engines and regional disparities in China," *Journal of Comparative Economics*, vol. 32, No. 1; pp. 148-164.
- Girma, S. (2005). "Absorptive capacity and productivity spillovers from FDI: A threshold regression analysis," *Oxford Bulletin of Economics and Statistics*, vol. 67, No. 3; pp. 281-306.
- Hall, R. E. and C. W. Jones (1999). "Why do some countries produce so much more output per worker than others?" *Quarterly Journal of Economics*, vol. 114, No. 1; pp. 83-116.
- Huang, Y. (2003). *Selling China: Foreign Direct Investment during the Reform Era*, Cambridge University Press, United Kingdom.
- Keller, W. (2002). "Geographic localization of international technology diffusion," *American Economic Review*, vol. 92, No. 1; pp. 120-142.

- Kinoshita, Y. (2000). "R&D and technology spillovers through FDI: Innovation and absorptive capacity," Discussion Paper No. 2775, Centre for Economic Policy Research, London.
- Kuo, C. and C. Yang (2008). "Knowledge capital and spillover on regional economic growth: Evidence from China," *China Economic Review*, vol. 19, No. 4; pp. 594-604.
- Li, H. and L. Zhou (2005). "Political turnover and economic performance: The incentive role of personnel control in China," *Journal of Public Economics*, vol. 89, Nos. 9/10; pp. 1743-1762.
- Madariaga, N. and S. Poncet (2007). "FDI in Chinese Cities: Spillovers and impact on growth," *World Economy*, vol.30, No.5, pp.837–862.
- Organisation for Economic Co-operation and Development (2001). *Measuring productivity: Measurement of aggregate and industry-level productivity growth*. Paris.
- Ouyang, P. and S. Fu (2012). "Economic growth, industrial development and the inter-regional spillovers from foreign direct investment: Evidence of China," *China Economic Review*, vol. 23, No. 2;pp. 445-460.
- Rozelle, S. J., E. Taylor and A. de Brauw (1999). "Migration, remittances, and agricultural productivity in China," *American Economic Review*, vol. 89, No. 2; pp. 287-291.
- Solow, R. M. (1957). "Technical change and the aggregate production function," *Review of Economics and Statistics*, vol. 39, No. 3; pp. 312-320.
- Su, C-W. and H-L. Chang (2013). "Is income converging in China?" *Economics of Transition*, vol. 21; pp. 341-356.
- Zhang, X. and K. H. Zhang (2003). "How does globalisation affect regional inequality within a developing country? Evidence from China," *The Journal of Development Studies*, vol. 39, No. 4; pp. 47-67.

## ARTNeT Working Paper Series

is available at [www.artnetontrade.org](http://www.artnetontrade.org)



### ARTNeT Secretariat

United Nations  
Economic and Social Commission  
for Asia and the Pacific  
Trade and Investment Division  
United Nations Building  
Rajadamnern Nok Avenue  
Bangkok 10200, Thailand  
Tel: +66 (0)2-288-2251  
Fax: +66(0)2-288-1027  
Email: [artnetontrade@un.org](mailto:artnetontrade@un.org)