

### Do spillover benefits grow with rising foreign direct investment? An empirical examination of the case of China

Wang, Chengqi; Yu, Li

Postprint / Postprint

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

[www.peerproject.eu](http://www.peerproject.eu)

#### Empfohlene Zitierung / Suggested Citation:

Wang, C., & Yu, L. (2008). Do spillover benefits grow with rising foreign direct investment? An empirical examination of the case of China. *Applied Economics*, 39(3), 397-405. <https://doi.org/10.1080/00036840500428096>

#### Nutzungsbedingungen:

Dieser Text wird unter dem "PEER Licence Agreement zur Verfügung" gestellt. Nähere Auskünfte zum PEER-Projekt finden Sie hier: <http://www.peerproject.eu> Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

#### Terms of use:

This document is made available under the "PEER Licence Agreement". For more information regarding the PEER-project see: <http://www.peerproject.eu> This document is solely intended for your personal, non-commercial use. All of the copies of this documents must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.



**DO SPILLOVER BENEFITS GROW WITH RISING FOREIGN DIRECT INVESTMENT? AN EMPIRICAL EXAMINATION OF THE CASE OF CHINA**

Journal:	<i>Applied Economics</i>
Manuscript ID:	APE-05-0310.R1
Journal Selection:	Applied Economics
Date Submitted by the Author:	21-Jul-2005
JEL Code:	F23 - Multinational Firms International Business < F2 - International Factor Movements and International Business < F - International Economics
Keywords:	Foreign direct investment , Spillover effects, LOEs, Performance, China

powered by ScholarOne  
Manuscript Central™

DO SPILLOVER BENEFITS GROW WITH RISING FOREIGN DIRECT INVESTMENT?

DO SPILLOVER BENEFITS GROW WITH RISING FOREIGN DIRECT INVESTMENT? AN EMPIRICAL EXAMINATION OF THE CASE OF CHINA

Using data for Chinese manufacturing industry for 2001, this paper examines the impacts of foreign presence on the performance of locally-owned Chinese firms. Our key result supports a curvilinear functional form. Foreign penetration rates in excess of just about two third of industrial capital are associated with declining spillover benefits, indicating the dominance of negative spillovers. The curvilinear relationship is found to be particularly strong in labour-intensive industries, contrasting a standard linear relationship in technology-intensive sectors. The finding of the complexity of spillover effects challenges the laissez-faire view that ‘the more inward FDI, the better’ and that inward FDI into all types of domestic industry is equally valuable, in terms of performance benefits. Our findings argue for policy measures to strengthen domestically-owned Chinese industry, to provide effective competition to foreign firms and to absorb the benefits from spillovers more effectively.

## I. INTRODUCTION

The relationship between inward foreign direct investment (FDI) and the performance of host country locally-owned enterprises (LOEs) has been studied both intensively and extensively. Although the arguments for a positive relationship seem compelling, the results of empirical research are decidedly mixed. Prior studies reported either a positive, indeterminate, or negative relationship (Buckley *et al.* 2002, 2004; Liu *et al.* 2000). Görg and Strobl (2001) sought an explanation for the lack of congruent findings, believing that inconsistent results might be associated with underlying differences between the data sets employed. We argue in this paper that the disarray may be easily attributed to a misspecification of the nature of the relationship. Theoretical shortcomings have been a severe handicap to investigating the subject. As a result, methodological approaches employed to date have been flawed.

A drawback of the existing literature, with a few notable exceptions, is that it has largely been confined to examining linear forms of relationship. What the inconsistent results suggest, however, is that the relationship is far from a simple linear one. There is considerable evidence to suggest that the form of the relationship might be curvilinear (Aitken and Harrison, 1999). Thus, further evidence on the impact, and the form that this takes, of inward FDI on LOE's performance is still needed to advance theories and to promote the research stream's capability to effectively inform government policy formation.

1  
2  
3 The paper presents results from a study that attempts to remedy previous  
4 deficiencies in theory and methodology. We present an approach that addresses  
5 explicitly the possibility of both positive and negative spillovers associated with the  
6 operations of multinational enterprises (MNEs), which leads to a non-monotonic  
7 relationship between the level of foreign presence and LOEs' performance. The  
8 resulting empirical model is tested using the latest data for Chinese industry.  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19

20 The paper finds a considerable support for a curvilinear and inverted U-shaped  
21 relationship between foreign presence and spillover benefits. This finding indicates  
22 that the currently prevailing euphoria about FDI rests on weak empirical foundations.  
23 It challenges the laissez-faire view that advocates the unfettered inflow of FDI as an  
24 optimal policy prescription for the development of Chinese industry. It suggests that  
25 in certain circumstances inward FDI can entail winners and losers, corresponding with  
26 foreign and indigenous firms, respectively. The presence of foreign firms beyond  
27 some level impedes the performance of LOEs in the same industry. The challenge for  
28 governments is to use their policy making powers to maximize the economic and  
29 social gains from foreign capital and to mitigate the losses for indigenous industry.  
30 Our analysis yields a hitherto unseen pattern of spillover effects.  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

In section 2, we present a theoretical framework by reviewing the literature. Then a description of the model and data follows. The penultimate section discusses the econometric results. The last section concludes.

## II. THEORETICAL FRAMEWORK

Spillovers arise from non-market transactions when resources, notably knowledge, are spread without a contractual relationship, so-called externalities (Meyer, 2004). In the empirical literature on FDI, intra-industry spillovers have been defined as the performance-related benefits accruing to domestic firms from foreign firms operating within the same sector. Görg and Greenaway (2004) mention imitation, the acquisition of skills, competition and exports as channels through which developing host countries may achieve productivity gains via intra-industry spillovers.

A limited number of studies have considered how the relationship between foreign presence and spillover benefits might change as inward FDI rises. Some argue that a moderate foreign presence is all that is required to generate positive spillovers, even when there is a relatively wide technological gap (Perez, 1997). Evidence that the mere presence of only a few competitors is sufficient to sharpen incentives for allocative efficiency gains is provided in an empirical study of entry thresholds. Bresnahan and Reiss (1991) find that most of the competitive impact from entry comes from the first two entrants to challenge a monopolist, with the effect levelling out once market participants number around five. Likewise, demonstration effects that benefit local technical efficiency are available even when foreign presence is moderate (Haddad and Harrison, 1991). The employment of advanced foreign technology in just a few foreign affiliates is all that is needed to prove to local firms the benefits of acquiring this technology. According to this argument, small foreign capital shares are sufficient to generate spillovers, since foreign skills and managerial

1  
2  
3 practices may be then transferred via original equipment manufacturing and other  
4 mechanisms to local firms (Hsu and Chen, 2000).  
5  
6  
7  
8  
9

10 More recently a number of theoretical reasons for negative spillover effects have  
11 been put forward. The key argument is that at greater levels of foreign presence,  
12 negative effects start to become apparent, and may begin to counteract positive  
13 effects. First, the productivity of LOEs might fall owing to a ‘market stealing’ effect.  
14 This is based on the argument that foreign affiliates (FAs) are able to compete at low  
15 marginal cost through access to the parent’s ownership advantages (Aitken and  
16 Harrison, 1999). In final and intermediate markets, incoming FAs are able to draw  
17 demand away from LOEs or confine competing LOEs to less profitable segments of  
18 industry through the introduction of new differentiated products and of process  
19 innovation with improved quality control. Thus, domestic firms that compete directly  
20 with the foreign investor may lose market share and, left strand with excess capacity,  
21 experience a decline in the productive use of their resources (Mody, 2004). There is  
22 evidence that the FDI reduces productivity of local firms through market-stealing in  
23 the UK manufacturing sectors (McVicar, 2002). Negative externalities may also arise  
24 in factor market where foreign investors increase demand for scarce resources such as  
25 skilled labour and domestic credit, and hence raise production costs. Feestra and  
26 Hanson (1997) argue that foreign investors will use a more skill-intensive technology  
27 than the typical domestic investors and hence raise the wages of skilled workers, a  
28 proposition for which they find support in Mexican data (Mody, 2004)<sup>1</sup>. The labour-  
29 stealing by foreign firms would deprive local firms of their most productive labour  
30 and make the process of assimilating foreign technology harder.  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45

Second, senior management in FAs often uses aggressive strategies to secure market share (Zhou *et al.* 2002). This leads to fierce competition, which may drive the LOEs to reduce production and therefore to incur higher average costs (Konings, 2000). This effect will be most pronounced in instances where local firms are subject to large fixed costs, which cannot be easily shed. Inflexible organizational structures in established domestic firms, especially state-owned enterprises (SOEs), will exacerbate this impact and the process of adjustment will be slow and inefficient.

22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The above reasoning suggests that at higher levels of foreign presence the market share of local firms will be cannibalized, so raising their costs of production and resulting in a ‘crowding out’ effect. In this situation negative spillover effects can even come to dominate positive effects. This clearly points to the possibility of curvilinearities in the effect of foreign presence on spillovers to locally owned industry. The above discussion implies that spillover benefits will increase with foreign presence up to a point. Beyond this cross-over point increased foreign presence will act — at least in part — as an impediment to the rate of growth of LOEs’ performance, and spillover benefits may start to decline.

46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The form and the strength of the relationship between foreign presence and spillover benefits, however, may be associated with the characteristics of the industries under consideration (Kathuria, 2001). Conventional theory on MNEs and FDI suggests that knowledge-based assets are the key firm-specific advantages held by MNEs, which motivate them to invest across borders. Thus, mainstream theoretical perspectives such as the OLI paradigm (Dunning, 1993) suggest that MNEs operate in technology-intensive industries.



1  
2  
3  
4  
5  
6 It follows that in technology-intensive sectors to which the ownership advantages of  
7  
8 foreign firms are more relevant, we expect dominant positive spillover effects that  
9  
10 enhance LOEs' performance, according to the theoretically positive arguments first  
11  
12 put forward by Caves (1974) and reiterated by Feinberg and Majumdar (2001). These  
13  
14 positive effects arise from technology transfer on the basis of demonstration effects  
15  
16 and the movement of labour from foreign to locally-owned firms. In addition, foreign  
17  
18 firms which produce differentiated products are more likely to compete with LOEs in  
19  
20 different market segments of the technology-intensive sectors. This would mean that  
21  
22 the scope for negative spillovers is limited since the two types of firms are less likely  
23  
24 to be involved in head-to-head competition. It is thus expected that in technology-  
25  
26 intensive industries the more FDI there is, the more technologies LOEs can acquire  
27  
28 from FAs, and the higher of the performance of LOEs. Indeed, the expectation that  
29  
30 inward FDI brings more technology spillovers has motivated many governments to  
31  
32 offer attractive incentive packages to entice investors to technology-intensive  
33  
34 industries.  
35  
36  
37  
38  
39  
40  
41  
42

43  
44 In labour-intensive industries, however, more inward FDI may not lead to  
45  
46 proportionately more spillover benefits to LOEs. First, the scope for technological  
47  
48 spillovers in labour-intensive sectors is limited. This is because MNEs in these  
49  
50 industries are not very technologically advanced. Foreign MNEs operating in labour-  
51  
52 intensive industries may base their competitiveness more on organizational skills and  
53  
54 marketing skills, such as experiences in organizing labour-intensive production and  
55  
56 the ability to specialize across international borders (Shi, 1998). It follows that LOEs  
57  
58 in labour-intensive industries would not reap much technology spillovers from FAs.  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Second, developing host country local firms typically have a larger presence in labour-intensive industries, such as ‘textile’ and ‘food’, than in technology-intensive industries. These light industries are often characterized by mature saturated markets, in which circumstances the growth of FAs is likely to lead to more fierce head-to-head competition and results in the rapid cannibalization of markets serviced by traditional Chinese domestic firms. The negative effects may arise because of the price competitive nature of these markets. This would mean that local firms are unprotected by brand loyalty and, as a result negative primary and secondary effects interact in a reinforcing manner.

The above discussion leads to the following hypotheses:

Hypothesis 1: The relationship between foreign presence and spillover benefits is curvilinear, i.e., past some level of foreign presence, spillover benefits begin to fall.

Hypothesis 2: The relationship between foreign presence and spillover benefits is curvilinear in labour-intensive industries.

Hypothesis 3: The relationship between foreign presence and spillover benefits is linear in technology-intensive industries.

### III. METHODOLOGY

In common with standard approach prevailing in the study of FDI spillovers (e.g., Aitken and Harrison, 1999), an augmented Cobb-Douglas production function is implemented in this study. It is assumed that the output in LOEs is a function of inputs, measures of foreign presence in these firms' industry and other control regressors. We interpret coefficient estimates on foreign presence regressor as evidence consistent with spillovers from inward FDI to domestic firms' output.

$$Y_i = C + \beta_1 K_i + \beta_2 L_i + \beta_3 MGT_i + \beta_4 SIZE_i + \beta_5 FP_{(i,-1)} + \beta_6 FP_{(i,-1)}^2 + \varepsilon_i \quad (1)$$

Where  $Y$  is sales by LOEs and  $FP$  represents the level of presence of FAs, and it is measured in two dimensions in this study: the capital share accounted for by all FAs in each industry ( $FP_k$ ) and the employment share accounted by all FAs in each industry ( $FP_l$ ). By using two measures of foreign presence, we can get a sense of the robustness of our results. For all  $FP$  variables, one-year lag is adopted to allow time for spillovers to grow to be observable. The adoption of a lag structure for the FDI variable ( $FP_{(i,-1)}$ ) also helps to address the question of causality with respect to spillovers<sup>2</sup> (Haskel, Pereira and Slaughter, 2002). We expect that  $FP$  exerts a positive and significant impact on  $Y$ .

$K$  and  $L$  are routine capital and labour, proxied by total received capital and total number of employees in each industry;  $MGT$  and  $SIZE$  are management input and scale of economy proxied by, respectively, management cost per employee<sup>3</sup> and net fixed assets per firm in an industry. Along with  $Y$ , all these control variables are defined for LOEs only. The employment of these control variables increases our

1  
2  
3 confidence in the robustness of the findings through controlling for influences other  
4 than foreign presence.  
5  
6  
7  
8  
9

10 Nonlinearity can be captured by a variety of functional forms. The quadratic form  
11 of nonlinearity is selected for Equation (1) because it is a general form capable of  
12 identifying both accelerating and decelerating relationships. We are in particular  
13 investigating the co-existence of negative and positive spillovers from foreign  
14 presence. The quadratic form is appropriate to capture this nonlinear decline. In  
15 Equation (1) the data are transformed into natural logarithms (except for *FP* variables  
16 whose values are less than one). The equation is estimated using OLS cross-section  
17 regression analysis with White (1980) heteroscedasticity-consistent covariance matrix  
18 correction for unknown form of heteroscedasticity.  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33

34 The examination of related issues is mainly based on the Industrial Annual Report  
35 of China for 2001, compiled by the State Statistical Bureau (SSB) of the People's  
36 Republic of China. The SSB kindly provided the author with the data on input and  
37 output of Chinese industries at different levels of aggregation<sup>4</sup>. Industry data is  
38 preferred because spillovers are commonly hypothesized to fall along industry or  
39 regional lines (Haskel, Pereira and Slaughter, 2002). In addition, there is more  
40 variation in the foreign presence variable in industry level data.  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52

53 There are 196 sectors (at three-digit level) all together which, according to Chinese  
54 convention, range from mining and manufacturing to public utilities. Our sample is  
55 reduced to 166 industries for two reasons. First, on theoretical grounds we include  
56 only those industries which have been largely liberalised, with prices determined in  
57  
58  
59  
60

1  
2  
3 near to fully competitive markets and which enjoy largely free entry and exit<sup>5</sup>. FDI in  
4 these industries has been encouraged, with almost no restriction at all. This decision  
5 allows us to avoid biased results arising from industry selection. Second, industries  
6 for which data are imperfect are also excluded<sup>6</sup>. Since many of the excluded industries  
7 are mining and utilities, most industries left in our sample are pure manufacturing.  
8 Nevertheless, the data that remain provide a reliable and very rich source of  
9 information for the investigation of the relationship between foreign presence and  
10 spillover benefits.  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

#### 24 IV. EMPIRICAL RESULTS

25  
26  
27  
28  
29 Table 1 provides descriptive statistics and correlation matrix for independent variables  
30 to facilitate the interpretation of regression results. As can be seen, most of the  
31 correlations are small, accounting for little common variance, and therefore are not of  
32 present concern. The high correlation between  $K$  and  $L$  demonstrates the high  
33 capital-labour substitution effect within Chinese industry. The  $FP$  variables show  
34 high correlations in the expected direction.  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45

46 (Insert Table 1 here)

47  
48  
49  
50  
51 Tables 2 and 3 report the estimated results. Suffice to say here that in terms of  
52 diagnostics, all the models estimated were satisfactory<sup>7</sup>. The first set of results  
53 estimated from model (1) of both linear and curvilinear specifications is reported in  
54 Table 2. The linear specifications of the model (column (1)) show that the effect of  
55 foreign presence ( $FP_k$ ) on the sales of local Chinese firms ( $Y$ ) is positive and  
56  
57  
58  
59  
60

1  
2  
3 statistically significant, so reproducing the standard result. What merits our attention,  
4  
5 however, is the results in the curvilinear specification (column (2)). We note that the  
6  
7 explanatory power of the models increases when the nonlinear foreign presence term  
8  
9 ( $FP_k^2$ ) is entered. More importantly, the squared term is statistically significant. We  
10  
11 can conclude that the curvilinear specification fits the data better than the linear  
12  
13 specification. Columns (3) and (4) show the estimates using the measurement of  
14  
15 foreign employment share ( $FP_l$ ). We find that it makes no material difference to the  
16  
17 results. Therefore, we focus only on the estimates using the capital share measure in  
18  
19 this study.  
20  
21  
22  
23  
24  
25  
26  
27

28 (Insert Table 2 here)

29  
30 The results show that there is a statistically significant, positive relationship  
31  
32 between foreign presence and LOEs' performance. Furthermore, there is a negative  
33  
34 relationship between foreign presence squared and LOEs' sales. The latter  
35  
36 relationship suggests a curvilinear relationship and combined, these two relationships  
37  
38 denote a potential inverted-U shaped relationship between foreign presence and  
39  
40 LOEs' performance, thereby supporting Hypothesis 1. Thus, in our sample, low and  
41  
42 moderate levels of foreign presence are positively related to LOEs' performance, but  
43  
44 further rising level of foreign presence is likely to lead to declining spillover benefits  
45  
46 to LOEs. The relationships depicted provide some support for the theoretical  
47  
48 arguments presented earlier. This finding is also consistent with that of Buckley *et al.*  
49  
50 (2002), which find some evidence that inward FDI negatively impacts on the  
51  
52 performance of Chinese domestic industry. Our review has suggested that the  
53  
54 literature offers some reasons for negative competitive impacts in the form of market  
55  
56 stealing effects (Aitken and Harrison, 1999).  
57  
58  
59  
60

1  
2  
3  
4  
5  
6 The point of inflection, where spillovers begin to decline, can be computed by  
7  
8 taking the partial derivative of regression equation (1) with respect to foreign presence  
9  
10 variable (  $FP_k$  ) as follows:  $\delta Y / \delta FP_k = \beta_5 + 2(\beta_6 FP_k)$  . This partial derivative  
11  
12 represents the slope of the spillover benefit curve with respect to  $FP_k$  . It implies that  
13  
14 positive spillover effects reach a maximum at the cross-over point, and subsequently  
15  
16 decline as negative effects come to dominate with rising levels of foreign presence.  
17  
18 Hence, by substituting the  $\beta$  coefficients, the point of inflection can be obtained.  
19  
20 Based on this procedure, the turning point was in our case 0.619 (61.9 percent). In our  
21  
22 sample we identify twenty-three industries as beyond the turning point in the FDI-  
23  
24 spillover relationship, and find that the majority of industries (143 or 86.2%) lie to the  
25  
26 left of this maximum. According to our results, for the most part, domestic Chinese  
27  
28 industry is not colonized to an extent that should cause concern.  
29  
30  
31  
32  
33  
34  
35  
36

37 The discussion in the literature review suggested that technology intensity is a  
38  
39 potentially important means of discriminating between those host industries likely to  
40  
41 experience differential level of spillover benefits. Accordingly, we test for structural  
42  
43 difference in the relationship between foreign capital share and LOEs' performance,  
44  
45 on the basis of those industries with high and low capital-labour ratio share. This is  
46  
47 done by breaking the sample into two equal groups of 83 industries according to the  
48  
49 level of capital-labour ratio. We label the low capital-labour ratio group as 'labour-  
50  
51 intensive industries' and the high capital-labour group as 'technology-intensive  
52  
53 industries'. The designation of capital-intensive industries as technology-intensive is  
54  
55 justified by the embodiment of technology in physical capital<sup>8</sup>. We carried out a  
56  
57 Chow Test and the result confirms that there is indeed a structural difference (  $F$   
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

statistic 4.222, which exceeds the critical value of  $F_{0.01} = 2.96$ ). Through this method of classification, in addition to alleviating the problem of heterogeneity, the difference in foreign presence effect on LOEs' performance between the labour- and technology-intensive sectors can be explored.

We now re-estimate equation (1) for these two groups of Chinese industries separately. The results are presented in Table 3. The variable *MGT* is dropped since it is insignificant in all regressions throughout in the full sample. In the labour-intensive group,  $FP_k^2$  is significant in the curvilinear regression (column (2)) and this regression again has higher explanatory power than the linear specification (column (1)). Therefore, the curvilinear specification is still preferable to the linear specification in this group.

(Insert Table 3 here)

Both  $FP_k$  and  $FP_k^2$  in column (2) are correctly signed and are statistically significant. In particular, we notice that  $FP_k^2$  records larger magnitude in both coefficient and significance in the labour-intensive group than in the full sample. These results suggest that the proposed curvilinear relationship between foreign presence and the performance of LOEs is most prominent among labour-intensive sectors. This finding corroborates Hypothesis 2. The finding illustrates that it is the labour-intensive industries that dominate the relationship between foreign presence and spillover benefits in the full sample. It also suggests that market stealing effects are even stronger in labour-intensive sectors, in which competition is most intense.



1  
2  
3 These negative impacts are amplified by barriers to exit by Chinese SOEs or by  
4  
5  
6 impediments to LOEs' exploitation of scale economies arising from foreign presence.  
7  
8  
9

10 We again calculate the point of inflection with respect to the foreign presence  
11 variable in column (2). In this case it is 0.542 (54.2%). In the labour-intensive group  
12  
13 we find twenty-three sectors as beyond the turning point (quite a coincidence with the  
14  
15 case of full sample). Though this result means that the majority of the labour-  
16  
17 industries (60 or 72.3%) still lie to the left of this maximum, the lower level of the  
18  
19 threshold implies that spillover benefits reach the maximum earlier in labour-intensive  
20  
21 industries than in the whole manufacturing. Furthermore, we note that the percentage  
22  
23 of sectors which are beyond the cross-over point in the labour-intensive group (27.7%)  
24  
25 is twice that in the full-sample (13.8%). This result reinforces our above conclusion  
26  
27 with respect to the particularly strong market-stealing effect in the labour-intensive  
28  
29 industries.  
30  
31  
32  
33  
34  
35  
36  
37  
38

39 In technology-intensive group, however, the linear regression (column (3)) is found  
40  
41 to be superior to the curvilinear one (column 4)) with the explanatory power being  
42  
43 higher in the former. More importantly, the coefficient on  $FP_k^2$  is not statistically  
44  
45 significant in the curvilinear model, indicating that a curvilinear relationship can not  
46  
47 be established in the technology-intensive group.  
48  
49  
50  
51  
52

53 The positive and significant  $FP_k$  in column (3) suggests that the performance of  
54  
55 LOEs is linearly correlated with rising foreign presence in technology-intensive  
56  
57 sectors and in stark contrast to the case of labour-intensive sectors. This result is  
58  
59 consistent with previous studies such as Kathuria (2001) who find greater spillover  
60

1  
2  
3 effects to domestic firms belonging to the ‘scientific’ sectors. Our finding of linear  
4 profile might be generated by a situation in technology-intensive industries in which  
5 negative spillovers are either absent or are more or less invariant with the level of  
6 technology while positive spillovers are rising. One interpretation is that in  
7 technology-intensive sectors foreign firms tend not to compete head-to-head with  
8 LOEs, therefore dramatically reducing the scope for market stealing effects. This  
9 finding is also consistent with the view that LOEs in technology-intensive industries  
10 are more prone to benefit from FDI technological spillovers than their counterparts in  
11 labour-intensive industries.  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26

27 The credibility of our findings is enhanced through the use of other theoretically  
28 relevant variables as controls. Labour variable ( $L$ ) is positive and statistically  
29 significant at the 1 per cent level in all the regressions throughout, while capital  
30 variable ( $K$ ), though significant in the Table 2, records smaller magnitude in both  
31 coefficient and significance, and even becomes marginally significant and  
32 insignificant in the Table 3. This finding confirms the generally labour intensive  
33 nature of the Chinese industry. The management variable ( $MGT$ ) is positive but  
34 insignificant, highlighting the weak role of management in the Chinese industry  
35 though China has for many years been in its transition to a market-oriented  
36 economy.  $SIZE$  reaches significance in all instances with an exception of technology-  
37 intensive group. This indicates that size of firm (in terms of net fixed assets) is an  
38 important strategic variable for business performance in Chinese domestic industry,  
39 and suggests the importance of exploiting scale economies. We interpret the lack of  
40 significance of  $SIZE$  variable in the technology-intensive sectors as an indication that  
41 these industries are dominated by small- and medium-sized high technology  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 enterprises to which size of operation is not crucial for business success, compared  
4  
5 with firms operating in traditional sectors.  
6  
7  
8  
9

## 10 **V. CONCLUSIONS**

11  
12  
13  
14  
15 The results provide support for all three hypotheses. The paper finds clear evidence of  
16  
17 a curvilinear relationship between foreign presence and spillover benefits to  
18  
19 domestically owned industry in China. This curvilinear relationship, compared with  
20  
21 linear relationship found in previous studies, defines better the nature of the FDI-  
22  
23 induced spillover benefits. The finding suggests that ‘the more FDI, the better’ thesis  
24  
25 in the sense of spillover benefits is only verified in the range defined by the threshold  
26  
27 of just about two-third of foreign capital share in the Chinese industries concerned.  
28  
29 Indeed, along with our finding of declining spillovers, another key conclusion of this  
30  
31 paper is that moderate levels of foreign presence are beneficial to the performance of  
32  
33 Chinese locally owned firms.  
34  
35  
36  
37  
38  
39  
40

41  
42 Furthermore, we find that the form and the strength of the relationship between  
43  
44 foreign presence and LOEs’ performance depend on the characteristics of the industry  
45  
46 involved. The curvilinear relationship is particularly stronger in labour-intensive  
47  
48 industries, where foreign and locally-owned firms compete head-to-head in the  
49  
50 saturated market for standardized goods, leading to ‘crowding out’ effect on domestic  
51  
52 firms. This finding is in marked contrast with that for technology-intensive sectors  
53  
54 where spillover benefits grow linearly with rising foreign presence.  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The finding of a curvilinear effect that begins positive and eventually turns negative fits the theoretical arguments presented. At this point, the complexity of spillovers overwhelms the positive benefits of foreign presence, and LOEs' performance begins to suffer. The results of the study clear up of the mixed findings from previous empirical studies and add insights to otherwise unexpected questions. More empirical validation is necessary for the construction of a more complete theory of the relationship between inward FDI and spillover benefits.

The approach that this study employs is a methodological improvement on existing studies, and our finding of a curvilinear relationship has implications for research on spillovers. We conclude that the mixed, contradictory and weak results found in many studies have been caused, at least in part, by a failure to accurately capture the non-linear nature of the relationship between foreign presence and spillover benefits.

Methodological improvement along the lines that we advocate is perhaps most critical where the host is a developing rather than a developed country. In developed countries competitive locally-owned firms are present. But in developing countries we should expect the productivity gap between foreign and domestically-owned firms to be large. In these conditions many local firms may be unable to improve their performance quickly. Fast growing and high foreign penetration rates are more likely the less competitive is domestic industry, providing a source of negative productivity spillovers, and an early diminution of spillover benefits.

Policy implications arise from our findings. The limiting of further growth in foreign presence in liberalized industries is circumscribed by China's accession to the

1  
2  
3 WTO. However, it is quite permissible for policy to encourage the upgrading of  
4 Chinese domestic industry to keep pace with the growth of foreign presence. The  
5 strengthening of local competitiveness might involve the stimulation of new privately  
6 owned Chinese firms that are best able to benefit from the presence of FAs. To date  
7 the main instrument for building up Chinese firms has been inward FDI itself, and our  
8 research suggests that this has been successful. But as foreign penetration shares rise,  
9 it becomes imperative to ensure that domestically-owned firms are capable of  
10 appropriating the beneficial aspect of spillovers. This study also suggests that China  
11 should accelerate the removal of remaining foreign ownership restrictions in Chinese  
12 industry. Our results demonstrate that foreign presence is of general benefit across  
13 industrial sectors. Above all our findings suggest that a policy mix to promote a  
14 moderate rather than a dominant foreign presence is best.  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33

34 This study indicates some avenues for future research. First, further investigation at  
35 the industrial level will be beneficial. This will help to more accurately determine not  
36 simply the point at which the presence of foreign firms ceases to add to spillover  
37 benefits, but also what industrial characteristics are involved and what precise policy  
38 measures may be used to extend the growth of positive spillovers. Second, if future  
39 research can investigate the apparent co-existence in the data of negative and positive  
40 spillovers from foreign presence, it may be of considerable value for the fine tuning of  
41 policy to limit the negative and encourage the positive effects.  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51

---

#### 52 53 54 ENDNOTES

55  
56  
57 <sup>1</sup> Chakraborty and Basu (2002) however found that inward FDI in the host country produces a labour-  
58 displacing effect. This arises because the technology transfer brought in by FDI causes an excess  
59 supply of labour creating downward pressure on unit labour costs. It seems that further evidence on the  
60 impact of FDI on labour costs is still needed.

<sup>2</sup> The association between FDI and LOEs' performance may be a result of MNEs entering industries with higher performance, rather than of performance being raised by FDI (Meyer, 2004). While we make optimal use of the data that are available by adopting a lag structure, panel data would be better able to address the issue of causality.

<sup>3</sup> This measure of managerial input is recorded in the Chinese statistical source, and refers to the salaries of managers plus other fees that facilitate transactions.

<sup>4</sup> The Report is not publicly published and is produced primarily for internal use within the SSB. It bears similarities with the widely-cited Third Industrial Census of China published by the SSB (1997) in contents, and indeed it is produced especially for the years for which the industrial census is not conducted.

<sup>5</sup> According to this principle, we excluded industries in which the government prohibits the operation of non state-owned enterprises, and this naturally includes foreign firms. These state monopoly industries include 'Oil extraction', 'Gas extraction', 'Petroleum-shale mining', 'Other black metal ore mining', 'Precious metal ore mining', 'Salt production', 'Tobacco production', 'Other Tobacco processing', and other industries relating to the production and supply of electricity, gas and water. Also excluded are industries where the government is the monopoly or major purchaser of products, and where non-state firms are largely denied from entering. These industries include 'Locomotive manufacturing', 'Far ocean ships', 'Aerospace crafts', 'Telecommunication transmission equipment', 'TV and broadcasting equipment', 'Radar'.

<sup>6</sup> These include 'Other non-metal ore mining', 'Other ore mining', 'Logging of timber', 'Logging of bamboo', 'Salt processing', 'Tramcar manufacturing', 'Instrument repairing', 'Arts and crafts', 'Daily groceries', 'Other groceries'.

<sup>7</sup> The results of the normality test are not highly satisfactory for some models and caution needs to be exerted when interpreting results. It is generally accepted that this test has no properly defined alternatives and so has limited power.

<sup>8</sup> The literature often links the magnitude of FDI spillovers with technology intensity of the industries involved (e.g., Liu *et al.* 2000)

## REFERENCES

- 1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12 Aitken, B. and Harrison, A. E. (1999) Does domestic firms benefit from direct foreign  
13 investment? evidence from Venezuela, *The American Economic Review*, **89(3)**,  
14 605-618.  
15  
16  
17  
18  
19  
20  
21  
22 Bresnahan T. and Reiss, P. (1991) Entry and competition in concentrated markets,  
23 *Journal of Political Economy*, **99 (5)**, 977-1009.  
24  
25  
26  
27  
28  
29  
30 Buckley, J. P., Clegg, J. and Wang, C. (2002) The impact of inward FDI on the  
31 performance of Chinese manufacturing firms, *Journal of International*  
32 *Business Studies*, **33(4)**, 637-655.  
33  
34  
35  
36  
37  
38  
39  
40 Buckley, J. P., Clegg, J. and Wang, C. (2005) The relationship between inward  
41 foreign direct investment and the performance of domestically-owned Chinese  
42 manufacturing industry, *Multinational Business Review*, Special Edition,  
43 **12(3)**, 23-40.  
44  
45  
46  
47  
48  
49  
50  
51  
52 Caves, R. E. (1974) Multinational firms, competition and productivity in host country  
53 markets, *Economica*, **41**: 176-93.  
54  
55  
56  
57  
58  
59 Chakraborty, C. and Basu, P. (2002) Foreign direct investment and growth in India,  
60 *Applied Economics*, **34(9)**: 1061-1073.

1  
2  
3  
4  
5  
6 Dunning, J. H. (1993) *Globalization of Business*. London and New York: Routledge.  
7  
8  
9

10  
11 Feestra, R. and Hanson.G. (1997) Foreign direct investment and relative wages:  
12 evidence from Mexico's Maquiladoras, *Journal of International Economics*,  
13 **42 (3-4)**, 371-394.  
14  
15  
16  
17

18  
19  
20  
21 Feinberg, S. E. and Majumdar, K. S. (2001) Technology spillovers and foreign direct  
22 investment in the Indian pharmaceutical industry, *Journal of International  
23 Business Studies*, **32(3)**, 421-437.  
24  
25  
26  
27

28  
29  
30  
31 Görg, H. and Greenaway, D. (2004) Much ado about nothing? do domestic firms  
32 really benefit from foreign direct investment?, *World Bank Research  
33 Observer*, **19(2)**, 171-197.  
34  
35  
36  
37

38  
39  
40  
41 Görg, H. & Strobl, E. (2001) Multinational companies and productivity spillovers: a  
42 Meta-Analysis, *The Economic Journal*, **111 (November)**, 723-739.  
43  
44  
45  
46

47  
48 Haddad, M. and Harrison, A.E. (1991) Are there dynamic externalities from direct  
49 foreign investment? evidence for Morocco', Industry and Energy Department  
50 Working Paper No. **48**, Washington, D.C., The World Bank, pp. 1-28.  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 Haskel, E. J., Pereira, C. S., & Slaughter, J. M. (2002) Does foreign direct investment  
4 boost the productivity of domestic firms?, Working Paper No. **452**, ISSN  
5 1473-0278, Department of Economics, Queen Mary, University of London.  
6  
7  
8  
9

10  
11  
12  
13 Hsu, M and Chen, B. (2000) Labor productivity of small and large manufacturing  
14 firms: the case of Taiwan, *Contemporary Economic Policy*, **18(3)**, 270-283.  
15  
16  
17

18  
19  
20  
21 Kathuria, V. (2001) Foreign firms, technology transfer and knowledge spillovers to  
22 Indian manufacturing firms: a stochastic frontier analysis, *Applied Economics*,  
23 **33(5)**, 625-642.  
24  
25  
26

27  
28  
29  
30 Kennedy, P. (2003) *A Guide to Econometrics*. Fifth Edition, Blackwell Publishing.  
31  
32

33  
34  
35  
36 Konings, J. (2000) The effects of foreign direct investment on domestic firms:  
37 evidence from firm level panel data in emerging economies, Discussion Paper  
38 No. **2586**, ISSN 0265-8003, Centre for Economic Policy Research, London.  
39  
40  
41

42  
43  
44  
45 Liu, X., Siler, P., Wang, C and Wei, Y. (2000) Productivity spillovers from foreign  
46 direct investment: evidence from UK industry level panel data, *Journal of*  
47 *International Business Studies*, **31(3)**, 407-425.  
48  
49  
50

51  
52  
53  
54  
55 McVicar, D. (2002) Spillovers and foreign direct investment in UK manufacturing,  
56 *Applied Economics Letters*, **9(5)**, 297-300.  
57  
58  
59  
60

1  
2  
3 Meyer, E. K. (2004) Perspectives on multinational enterprises in emerging economies,  
4  
5 *Journal of International Business Studies*, **35(4)**, 259-276.  
6  
7

8  
9  
10  
11 Mody, A. (2004) Is FDI integrating the world economy, *The World Economy*, **27(8)**,  
12  
13 1195-1222.  
14  
15

16  
17  
18  
19 Perez, T. (1997) Multinational enterprises and technological spillovers: an  
20  
21 evolutionary model, *Evolutionary Economics*, **7**, 169-192.  
22  
23

24  
25  
26 Shi, Y. (1998) Technological assets and the strategy of foreign firms to enter the  
27  
28 China market, *Journal of International Marketing and Marketing Research*,  
29  
30 **23(3)**, 129-138.  
31  
32

33  
34  
35  
36 White, H. (1980) A Heteroscedasticity consistent covariance matrix estimator and a  
37  
38 direct test for Heteroscedasticity, *Econometrica*, **48**, 817-38.  
39  
40

41  
42  
43 Zhou, D, Li, S and Tse, D. (2002) The impact of FDI on the productivity of domestic  
44  
45 firms: the case of China, *International Business Review*, **11(4)**, 465-484.  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Table 1. *Descriptive Statistics and Correlation Matrix (N=166)*

Variables	Mean	S.D.	2	3	4	5	6	7	8
1. $K$	3.67	1.61	0.94	0.24	0.57	-0.17	-0.20	-0.25	-0.24
2. $L$	2.32	1.48		-0.04	0.38	-0.19	-0.22	-0.30	-0.28
3. $MGT$	8.99	0.51			0.55	-0.13	-0.11	-0.04	-0.01
4. $SIZE$	8.01	0.81				-0.26	-0.21	-0.16	-0.08
5. $FP_k$	0.37	0.21					0.96	0.85	0.73
6. $FP_k^2$	0.18	0.17						0.86	0.79
7. $FP_l$	0.22	0.18							0.95
8. $FP_l^2$	0.08	0.11							

Table 2. *Regression Results (Full sample, N=166)*

Dep. Var.: $Y$	Foreign Capital Share		Foreign Employment Share	
	Linear	Curvilinear	Linear	Curvilinear
	(1)	(2)	(3)	(4)
$K$	0.343 (3.12)***	0.324 (2.97)***	0.275 (2.37)**	0.261 (2.29)**
$L$	0.577 (5.01)***	0.585 (5.13)***	0.650 (5.42)***	0.659 (5.57)***
$MGT$	0.072 (0.82)	0.069 (0.81)	0.118 (1.30)	0.121 (1.35)
$SIZE$	0.312 (5.09)***	0.339 (5.58)***	0.296 (4.71)***	0.328 (5.10)***
$FP_k$	0.625 (4.43)***	1.639 (3.03)***		
$FP_k^2$		-1.327 (-2.15)**		
$FP_l$			0.471 (2.85)***	1.930 (3.86)***
$FP_l^2$				-2.409 (-3.25)***
$\bar{R}^2$	0.960	0.962	0.956	0.959
F-statistics	798.07***	689.07***	727.50***	649.70***
Functional Form (Ramsey's RESET, one term)	0.07	0.06	0.38	0.00
Normality of Distributed Errors (Jarque-Bera)	3.85	1.59	5.21*	2.20

Notes:

- Figures in parentheses are t statistics (two-tailed tests); \*, \*\*, and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.

2. For ease of expression, the estimates for the Constant term are suppressed.
3. The approach for 'normality of distributed errors' also serves to test for outliers and, is sometimes used as a general test for misspecification (Kennedy, 2003).

Table 3. *Regression Results (sub-samples)*

Dep. Var.: $Y$	Labour-intensive sectors (N=83)		Technology-intensive sectors (N=83)	
	Linear	Curvilinear	Linear	Curvilinear
	(1)	(2)	(3)	(4)
$K$	0.250 (1.83)*	0.233 (1.64)*	0.246 (1.35)	0.236 (1.29)
$L$	0.684 (5.34)***	0.696 (5.21)***	0.714 (3.74)***	0.723 (3.79)***
$SIZE$	0.390 (4.35)***	0.420 (4.90)**	0.153 (1.10)	0.154 (1.09)
$FP_k$	0.729 (3.48)***	2.634 (4.21)***	0.556 (2.67)***	0.767 (0.99)
$FP_k^2$		-2.432 (-3.17)***		-0.279 (-0.33)
$\bar{R}^2$	0.942	0.948	0.972	0.971
F-statistics	317.01***	288.34***	673.54***	532.75***
Functional Form (Ramsey's RESET, one term)	0.01	0.03	0.51	0.38
Normality of Distributed Errors (Jarque-Bera)	3.63	0.89	5.42*	6.18**

Notes:

See Table 2.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For Peer Review