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► **To cite this version:**

Séverine Blaise. On the link between Japanese ODA and FDI in China: a microeconomic evaluation using conditional logit analysis. *Applied Economics*, 2005, 37 (1), pp.51-55. 10.1080/0003684042000281534 . hal-02379966

**HAL Id: hal-02379966**

**<https://hal.science/hal-02379966>**

Submitted on 26 Nov 2019

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***On the Link between Japanese ODA and FDI in China :***  
***A Microeconomic Evaluation Using Conditional Logit Analysis***

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**Abstract**

This paper investigates the effectiveness of Japan's official development assistance in promoting foreign direct investments inflows in the case of the People's Republic of China. Conditional logit analysis using province level statistics from 1980 to 1999, shows that Japanese aid flows did have a significant positive impact on private investors location choice even though other profit-maximizing factors such as the level of economic activity had a leading spillover effect. In a context of growing scarcity of aid, we conclude by asserting the importance of a complementary process in which foreign aid is aimed at enhancing the development of infrastructures, acting as a pre-requisite for future direct investments. Finally, Japan providing an interesting case study, we stress the need for a better cooperation between public and private sectors in development assistance programs.

## **Introduction**

Even since Japan emerged as the largest donor of official development assistance (ODA) in volume, its motives and practice for giving aid got more and more attention. Heavily criticized from both inside and outside Japan, Japanese aid policy has long been depicted as ‘mercantilist’ and routinely accused of ‘unfair aid practices’. The concentration of aid flows on Asian countries, the emphasis on capital projects for economic infrastructures, the strong involvement of Japan’s private sector in development co-operation are the key features of Japanese aid program that have been under harsh scrutiny (Ensign, 1992).

The purpose of this study is to verify whether Japanese aid leans on a better economic rationalization of aid programs by evaluating its effectiveness in promoting foreign direct investments (FDI). In the case of the People’s Republic of China (China hereafter) we investigate the link between Japanese public and private sector in development cooperation. Indeed, the underlying idea is that ODA projects act as a prerequisite for future private investment, notably through the development of infrastructures in recipient countries.

China is one of the Asian countries that had the most intense relationship with Japan for cultural, historical and strategic reasons. Even though Japan has always been distrustful of China, after World War II the 1972 Sino-Japanese rapprochement and the 1978 Sino-Japanese Peace and Friendship Treaty laid foundations for the rapid development of bilateral relations. China began its economic reform and open-door policy and for the first time showed a willingness to accept foreign aid. As a consequence, Japanese aid program to China began much later than in other Asian countries. Even though, from 1979 Japanese aid grew substantially : from 1982 to 1986 China was the largest recipient of Japanese aid and ever since it has been the

second largest recipient next to Indonesia<sup>1</sup>. In the mean time, China has been economically very important to Japan : the enormous potential of its market has led many Japanese companies to invest in China, and the two countries rapidly became major trade partners.

The next section presents an econometric analysis aimed at verifying the role of ODA projects in the location decision of Japanese private investors using conditional logit analysis. The literature on the economic impact of FDI is vast and we will not discuss this issue here. However, following Ichikawa (1991), one could assert that FDI, unlike portfolio investment, promotes the dissemination of valuable knowledge and entrepreneurship in the form of research and development, production technology, marketing skills, managerial expertise, and so on. That is, direct investment is a vehicle for the dissemination of these inputs and services, not simply a provider of finance. Thus, direct investment – particularly in manufacturing – is more likely than portfolio investment to promote economic growth. Therefore, one could expect ODA to contribute substantially to the economic growth of a recipient country not only through its direct impact, but also indirectly by promoting the inflows of FDI.

## **II. Methodology**

A number of works was carried out on the relationship between ODA and FDI in the case of Japan. Nevertheless, the causal relation that has been evaluated is rather the opposite. That is, to assert the impact of FDI as a determinant of ODA flows<sup>2</sup>. As far as we know, few studies (with contrasted results) have considered the possibility that ODA act as a prerequisite for future Japanese FDI<sup>3</sup>. These studies suffer a number of shortcomings ranging from misspecification for some, to invalid

estimation methodology for others. Yet, their common limitation lies in their restriction to macroeconomic framework. As pointed out by Mosley, while at the microeconomic level evaluation of aid effectiveness brings generally satisfactory results, macroeconomic analyses remain quite ambiguous (the so-called "*Macro-Micro paradox*"). Moreover, in the case of large countries such as China, because there is a great disparities in the geographical distribution of those financial flows, it does not seem very relevant to consider the country as a whole. Consequently, we would rather perform a microeconomic evaluation of the relationship between Japanese ODA and FDI, using province level statistics of the Chinese economy as well as detailed data on Japanese affiliates activity. This evaluation is carried out on the period 1980-1999. Statistics for ODA are issued from the Japan Bank for International Cooperation (JBIC) online database for loan aid, and "*ODA Annual Report*" of the Ministry of Foreign Affairs for grant aid. We refer to ODA as the sum of loan and grant aid, setting aside technical cooperation. Those statistics have been classified by province (calculation from the author). As far as FDI are concerned, we use Toyo Keizai "*Overseas Japanese Companies Data*" from 1990 and 1999 editions which also allow us to have a classification by Chinese province of Japanese affiliates activities. Statistics for each Chinese province are compiled from "*China Statistical Yearbook*" published by China Statistical Publishing House, various volumes. This process will allow us to have a more precise perception of the 'spillover effect' of foreign aid.

### III. Model

The location decision of Japanese investor in China is analysed by means of a conditional logistic regression in which we introduce ODA along with other profit-maximizing factors.

Conditional logit model has been widely used in previous empirical studies of location choice. For example Head, Ries & Swenson (1995) examined the agglomeration benefit and location choice of Japanese manufacturing in the United States. Fukao & Yue (1997), analyzed the determinants of FDI by Japanese electronic firms. Belberdos & Carree (2002) also examined the location of Japanese Investment in China, focusing on agglomeration effects, Keiretsu and firm heterogeneity. Urata & Kawai (1999) studied the determinants of the location of FDI by Japanese small and medium-sized enterprises<sup>4</sup>. The conditional logit model was first developed in economic analysis by Mc Fadden (1973).

The purpose of this study is to verify if, in a given province, the amount of Japanese aid has an impact on the location choice of Japanese private investors, for instance through the development of infrastructure. To model the location of Japanese FDI in China, we assume that Japanese firms undertake FDI in a province where they can maximize their profit after evaluating relevant characteristics of alternative locations. By assuming that the firm has a production function of Cobb-Douglas form, let us describe the profit ( $\pi$ ) of firm  $i$  obtained from undertaking FDI in province  $j$  as Equation (1).

$$\pi_{ij} = a_0 X_{1j}^{a_1} \dots a_m X_{mj}^{a_m} \cdot e^{\mu_{ij}} \quad (1)$$

where  $a_0, \dots, a_m$  are unknown parameters,  $X_{sj}$  ( $s=1, \dots, m$ ) are variables describing the characteristics of the province  $j$  ( $j=1, \dots, n$ ), and  $\mu_{ij}$  is a random

disturbance term capturing province- and investment specific-heterogeneity in total factor productivity.

Given profit equation (1), if and only if  $\mu_{ij}$  is distributed as Type I extreme value (independent random variable) according to the Weibull distribution, then the probability that province  $j$  will yield investor  $i$  the highest profit among all the provinces is given by the logit expression (Equation 2) (McFadden, 1973).

$$P_{ij} = \frac{\exp\left(\sum_{s=1}^m a_s \ln X_{sj}\right)}{\sum_{j=1}^n \exp\left(\sum_{s=1}^m a_s \ln X_{sj}\right)} \quad (2)$$

We express the number of FDI selections made by Japanese firm  $i$  in the province  $j$  as  $W_{ij}$  ( $j=1, \dots, n$ ). This dependent variable takes the value 1 if the province is selected by the investor and 0 otherwise. Finally, we obtain the probability of observing such FDI pattern as Equation (3).

$$L = \prod_i \prod_{j=1}^n P_{ij}^{W_{ij}} \quad (3)$$

The parameter  $(a_0, \dots, a_m)$ , which indicate the characteristics of potential host provinces to Japanese FDI, are estimated by the maximum likelihood method, which maximizes the likelihood function (Equation 3).

In other respects, as pointed out in previous studies the location choice criteria may vary across different sectors. Therefore, the estimation is carried out in both *manufacturing* and *non-manufacturing* sectors. The following variables enter into consideration as independent variables:

- **Agglomeration effect:** economic activities of existing Japanese firms in one province that generate positive externalities for nearby firm engaged in similar activity. This is measured by the *number of existing Japanese affiliates before the*

*venture began operation* (JAmc and JANmc, respectively for manufacturing and non-manufacturing sector). Note that we use this number plus one in order to be able to use the log of the variable.

- **Level of economic activity:** we control for economic size of the provinces by including the *per capita GDP* (GDPc). Indeed, the larger the economic size of a region, the more likely that it will receive foreign investments.
- **Production cost:** labor cost is recognized as one of the most important factors. It is given by the *average wage level of workers* (Wage), which is expected to discourage investment especially in the case of manufacturing location.
- **Infrastructure:** a well developed transportation infrastructure reduces the costs of importing inputs and exporting or distributing output as well as a good communication infrastructure facilitates and reduces the cost of communication of affiliates. Consequently, we expect infrastructure indicator to have a positive impact on the location decision of private investors.

We introduce the *dummy Coast* (C), which takes the value 1 if the region is located on the coast side and 0 otherwise, as well as the *distance from Japan* (DIST).

We also include a measure of the quality of telecommunication infrastructure : *the number of long-distance telephone lines* (Telecom). Finally, we introduce the *cumulative amount of Japanese aid* (ODAc), which is also supposed to reinforce the development of infrastructure, especially in the transportation sector.

- **Human capital:** the level of education is expected to have a positive impact on the location decision especially in non-manufacturing sectors as it enhance the quality of human capital. The education level is measured by *the number of students enrolled in senior middle schools as a percentage of population* (EDU).



We are using the log of all variables, except for the dummy C as well as the Distance variable.

#### **IV. Results**

Results of the conditional logistic regression are given in Table 1. The agglomeration effect and the level of economic activity appear to have the largest impact on location choice by Japanese investors in manufacturing as well as non-manufacturing sectors. For both sectors the two variables are strongly significant, holding the highest positive coefficient (especially for non-manufacturing activities).

##### **Table 1 : Conditional (fixed-effects) logistic regression**

As expected, high wage level strongly discourages Japanese investors in the manufacturing sector. This shows that Japanese affiliates activities in labor intensive sector took advantage of China's cheap labor. This finding is corroborated by the significant negative impact of education level in the same sector. In non-manufacturing activities, wage level also holds a negative coefficient, but the variable is less significant. Education level is positive but not significant. It can be suggested that in the later sector, investors give more importance to qualified labor force.

The amount of Japanese ODA attributed to each province is strongly significant in the two sectors and confirms that aid has a spillover effect on the location decision of Japanese investors. This positive effect is shown to be slightly more important for non-manufacturing activities. Indeed, ODA projects have been

concentrated mainly on economic infrastructures, considered as high priority by the Chinese government itself, in order to resolve serious bottlenecks in the economy. This is also proved by the impact of infrastructure indicator such as telecommunication facilities. This had an important ‘spillover effect’ on promoting Japanese investors activities. As far as the loan component of ODA is concerned (which constitutes the bulk of Japanese aid to China), this finding confirms the idea that the incentive for future private investment and technology transfer not only allowed a high rate of reimbursement of loan aid, but that the duty to reimburse constitutes an indicator of solvability well perceived by private investors (Teboul and Bassino, 1997).

Furthermore, we find that manufacturing activities tend to locate in coastal areas, which offer considerable transport facilities for importing inputs and exporting production output. However, this factor is not significant in the location decision of non-manufacturing activities. Finally, the distance from Japan is proved to have a negative impact on FDI location in both sectors, still favoring north and coastal provinces.

## **Conclusion**

This econometric analysis allowed us to support the view that Japan’s ODA has been quite effective in promoting Japanese FDI in China. Even though other profit-maximizing factors such as the level of economic activity or the agglomeration effect of Japanese firms had a leading role in location decision of Japanese investors, the allocation of aid projects did have a significant positive impact. Japanese ODA programs in China have been mainly allocated to infrastructure projects (especially in transportations), paving the way for future private investment. In Japan, this

complementary process is generated by both institutional and informal links between the public and private sectors and appears to be substantially beneficial to the recipient country. In a context of growing scarcity of aid, a detailed analysis of this effective framework of development cooperation could be an enriching and useful exercise.

## **Acknowledgements**

I would like to express all my gratitude to professor Kyoji Fukao for his precious advices and comments regarding this study and to professor Ding Jianping for generous provision of Chinese statistics.

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## List of Tables

**Table 1 : Conditional (fixed-effects) logistic regression**

<i>Variable</i>	<i>Manufacture</i>	<i>Non-Manufacture</i>
C	0.297*** (3.245)	-0.045 (-0.275)
LJAc	0.623*** (9.552)	0.605*** (6.872)
LODAc	0.129*** (3.880)	0.189*** (2.715)
LGDPc	0.638*** (4.514)	1.220*** (4.829)
LWAGE	-0.679*** (-3.617)	-0.651** (-1.923)
LEDU	-0.635** (2.218)	0.39 (0.745)
DIST	-0.174*** (-2.599)	-0.299** (-2.160)
LTELECOM	0.285*** (3.823)	0.399*** (3.737)
Log likelihood	-4147.6929	-1290.6864

\*, \*\*, \*\*\* mark the results which are respectively 10%, 5%, 1% significant.



## Footnotes

- 1 - *ODA Annual Report*, Ministry of Foreign Affairs, various years.
- 2 - See for example Teranishi (1983).
- 3 - The International Development Center of Japan (1997), Yosioka, Moro & Sawada (1998), Inui (2000) and more recently Nakamura *et al* (2001).
- 4 - Other examples can be found in Fukao (1996), Fukao and Tei (1996).