

## Empirical Analysis: Business Cycles and Inward FDI in China

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**Abstract:** It is well-known that the current speeding-up of globalization has been, on one hand, spreading macro economic effects around the world, while, on the other, fueling firms' activities of crossing national borders. Then, are there any links between these two influences? In this paper, we chose China as our subject, to try to clarify it. A set of models for Granger Causality test and VAR Impulse Responses were constructed and some econometric estimations and empirical analysis were made by employing the latest 20-year authorized annual statistic data. And the findings clearly indicated that firms' (foreign) activities (inward FDI) do respond pro-cyclically to business cycle developments in a long term.

**Key Words:** Business cycles; Inward FDI; Granger Causality test.

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### INTRODUCTION

During the process of globalization, the transmission of macro-economic developments across countries has been largely increased. But how does such transmission happen? Activities of multinational firms are believed to be one possible answer. Although pointing out that the inter-nationalization of production and the international business cycle developments might be linked, Hanson and Slaughter (2003) also note that studying business cycles and multinational activity simultaneously is a fairly less-developed area in International Economics.

Today, there are mainly two separate lines of related research, but with its own disadvantages. The first branch of the literature studies the determinants and effects of the activities of multinational firms, by stressing long-term fundamentals such as the absolute and relative factor endowments of countries, the distance between markets and trade and investment costs, etc., which typically ignores the impact of short-term business cycle fluctuations<sup>[1]</sup> that is unlikely to change their basic answers and might serve as trigger of entry into new markets. The second branch of the literature focuses on the importance of firm heterogeneity in its response to macroeconomic shocks, by employing, especially recently, the open macro-economic models which have paid too much attention to the impact of firm heterogeneity. In those models, fixed costs and firm heterogeneity with regard to

productivity could be reasons to explain why foreign activities of firms react to the cycle.

The purpose of this paper is to combine these two strands of research, by focusing on the impact of business cycle developments on inward FDI activities in China. As a firm-level data set on foreign activities is hard to acquire in China, we will use a relatively more macro-level annual data set covering several business cycle episodes (1983-2004) to do this research. Our research will proceed in two steps. Firstly, by visually investigating the pictorial relationship between multinational activities and macroeconomic developments, we will initially derive a testable hypothesis on links between real GDP and inward FDI. Then during the second step, we will turn to econometric estimations to empirically prove this hypothesis.

**Data and Statistics Description:** The data and statistics to be used in the paper are mainly from two sources: the National Bureau of Statistica of China, available at [www.stats.gov.cn](http://www.stats.gov.cn), and China Compendium of statistics 1949-2004 compiled by the National Bureau of Statistica of China.

**Measuring Business Cycle Developments:** This paper focuses on aggregated business cycle developments by employing country-level data on real GDP, which have already extracted the price factors from the nominal one. Although there tends to be a significant degree of

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co-movement among economic activities at sector level (For instance, Christiano and Fitzgerald (1998) showed that the business cycle properties of different sectors exhibit a high degree of co-movement with the overall cycle), it would be, by construction, difficult to isolate sectoral from aggregated business cycle developments. Moreover, consistent and complete time series for all sectoral output are hardly available in China. As our paper is aimed at showing only a general relation trend between GDP and FDI, country-level GDP could be enough and work well.

**Selecting FDI statistics:** To completely research the links between FDI and GDP, it is better to study both outward and inward FDI. But since FDI is still playing a relatively new role in China and there exist little related record of outward FDI, we, in order to continue our research, turn to inward FDI. And amongst several types of inward FDI such as contract inward FDI, borrowed inward FDI, etc., only the really employed inward FDI is included in this paper, which is supposed to respond more practically and effectively to the changes of national GDP. In addition, as Chinese statistics was not scientifically internationalized at the very beginning, the time period under study is restricted around the latest 2 decades, from 1983 to 2004, which would be long enough to cover Business Cycle Developments.

**Exchange Rate Issues:** According to global convention, FDI is usually calculated by USD. But GDP in China is computed by RMB. Thus, in order to avoid the statistical gap, we prefer to use a relative variable of inward FDI which could improve our analysis to be more precise and effective.

**Hypothesis:** In this section, we propose a testable hypothesis by providing evidences both from realistic phenomenon and theoretical background, and then based on this, establish our own empirical model in the following parts.

**Evidence from realistic phenomenon :** Claudia M. Buch and Alexander Lipponer ( 2005 ) have, after empirically analyzing Business Cycles and FDI through Evidence from German Sectoral Data, pointed out that business cycles have a strong impact on FDI projects. But how about China? Does China also have such kind of link?

As a starting point of our analysis, Fig.1 provides a visual impression of the evolutions of real inward FDI and real GDP during the last two decades. From Fig.1, the real inward FDI and real GDP curves show relatively clearer and similar trends in different stages. Before 1992, real GDP grew slowly with a low total amount while inward FDI also stayed almost still in a very low level. After 1992 until 1993, real GDP speeded up and inward FDI soared, because during this period the Chinese Central Government deepened their degree of reforming. From 1998 to 2000, real GDP growth slowed down while real inward FDI rushed to the trough which was much related to the outbreak of the southeast Asian financial storm. Then after 2000, the growth of both real GDP and real inward FDI recovered and increased rapidly again. In 2003, the real inward FDI almost stayed still as SARS blocked at the opening gate of China.

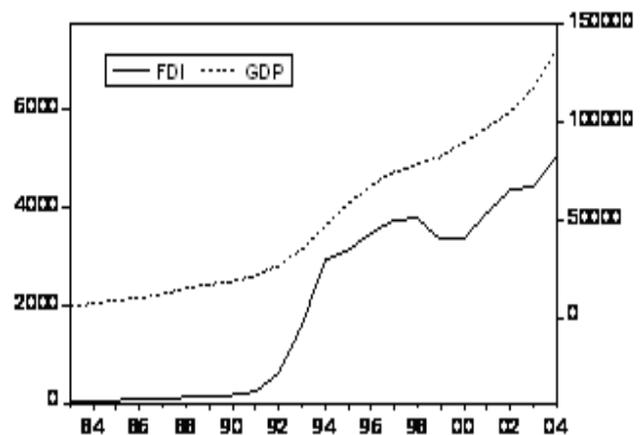


Fig.1: Comparison of absolute figures of real Inward FDI and real GDP (1983-2004)

As the absolute figures of real GDP and real inward FDI exist potential collinear trend while comparable figures could properly solve this problem, we will compare the growth rates between real inward FDI and real GDP in Fig.2. Fig.2 clearly shows that the two still moved at a similar pace. For example, in 1989 and 1990, they both reached the lowest. Then under the encouragement of policies, they both rebounded to the peak.

Thus, after the visual investigation from both the absolute and comparable angles, it is probably to assume that Chinese inward FDI and business cycle developments could have some relatively strong positive relation in a long term.

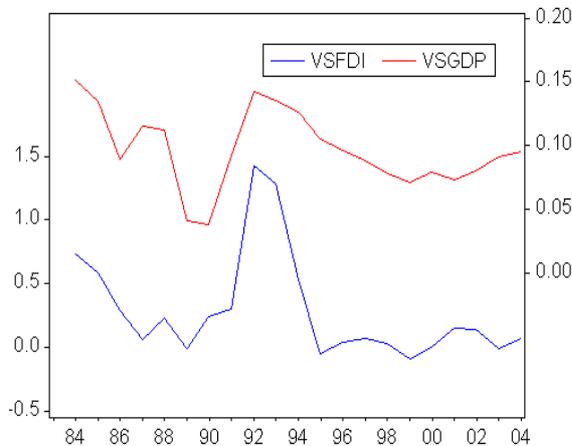


Fig.2: Comparison of growth rates between real Inward FDI and real GDP (1983-2004)

**Evidence from theoretical background:** If FDI does have positive relationship with GDP, how does the investment of firms react to business cycle developments? Theoretical literature has identified two main reasons. An initial one consists in financial market frictions, while a second is that entry into foreign markets involves some fixed costs. To identify the reasons is beyond our topic, but it, in an opposite way, granted us a theoretical foundation to reasonably take the testable hypotheses “firms’ (foreign) activities could be pro-cyclically related to business cycle developments in a long term”, which is going to be tested in the following analysis.

**RESULTS AND DISCUSSION**

Our aim in this section is to disclose the way of the influences between macroeconomic developments and inward FDI activities of micro firms, that is, who impacts who more. As time series of absolute economic data normally contains high-level of instability which could seriously distort the empirical results, we, following the normal way of stabilizing treatment, first loginize then differentiate the real GDP and real inward FDI, noted as  $\Delta \ln Y_t$  (DLNGDP) and  $\Delta \ln F_t$  (DLNFDI) respectively.

**Granger Causality test:** As the time series are stable now, we construct the models needed to further our research as follows:

$$\text{Model I : } \Delta \ln Y_t = a_0 + a_{11} \Delta \ln Y_{t-1} + a_{20} \Delta \ln F_t + a_{21} \Delta \ln F_{t-1} + \mu_{1t}$$

$$\text{Model II : } \Delta \ln F_t = b_0 + b_{11} \Delta \ln F_{t-1} + b_{20} \Delta \ln Y_t + b_{21} \Delta \ln Y_{t-1} + \mu_{2t}$$

The NULL hypothesis of Model I is  $H_0 : a_{11} = a_{20} = a_{21} = 0$ , that is, the growth of inward FDI doesn't contribute to the increase of GDP; meanwhile, the

NULL hypothesis of Model II is  $H_0 : b_{11} = b_{20} = b_{21} = 0$ , which means the growth of GDP is not the reason of the increase of Inward FDI.

By operating the acquired data and statistics in EViews3.0, the OLS estimation results of the above models are as seen in Table 1.

According to the results, F-value of Model I comes to 6.855166. Given  $\alpha = 0.05$ , as  $F_{0.05}(4,15) = 8.78$ , we can say under the significant level of 0.05, the testing result of Model I is robust, that is, the hypothesis  $H_0$  should be rejected with the significance of 95%. Thus, inward FDI could be regarded as the Granger Causality towards GDP. Meanwhile, as F-value of Model II also exceeds  $F_{0.05}(4,15)$ , GDP in turn contributes to be the Granger Causality towards FDI. Therefore, it could be initially concluded that the growth of real GDP and the growth of real inward FDI have some Granger Causality relation between each other.

To further study the results from the T-values of each coefficient, the current-period real inward FDI, compared with the former-period real GDP and real inward FDI, creates stronger influence on the current-period of real GDP. For Model II, the former-period real GDP, compared with the current real GDP and the former-period real inward FDI, has softer impact on the current-period real inward FDI.

**VAR Impulse Responses:** After researching “who impacts who more” in the section above, the test of VAR Impulse Responses will be applied in the next step to study their responding sensitivities towards changes in a relatively longer term.

Since the time series of DLNSGDP and DLNSFDI has already been supposed to be stable, we, following the theoretical principle of VAR Impulse Responses, construct a corresponding VAR model, with the maximum lagged period is 2(AIC and SC ) and the operating results from Eviews 3.0 are as shown in Fig.3, which shows that: 1) the growth rate of Chinese GDP responds significantly and rapidly to its own variance, for it starts responding from the first period until the fourth one and after the fourth period its response comes to be stable. But when the growth rate of Chinese GDP responds to the variance of real inward FDI, it comes to be lagged as starting response after the second period. Then, two points could be picked out: a) the fluctuation of Chinese GDP is mainly effected firstly by the movements of Chinese economy, i.e. the current-period GDP fluctuation would effect the following-two-year economic movement; b) the real inward FDI creates relatively slower effects on economy, which meets the reality according to the own characteristics of FDI. 2) the real inward FDI in China responds more significantly and continuously to the variance of GDP than to its own variance, which means inward FDI is more sensitive towards GDP and in lack of sustainability of its own movements

Table 1: Granger Causality test of Inward FDI and real GDP

Model I			Model II		
Variables	coefficient	T-value	Variables	coefficient	T-value
$a_0$	0.048051	2.741670	$b_0$	-0.096948	-0.446806
$\Delta \ln Y_{t-1}$	0.341104	1.597861	$\Delta \ln F_{t-1}$	0.539215	2.285024
$\Delta \ln F_t$	0.049676	2.374318	$\Delta \ln Y_t$	5.244789	2.374318
$\Delta \ln F_{t-1}$	0.002341	0.088538	$\Delta \ln Y_{t-1}$	-3.217890	-1.448959
$R^2$	0.562429		$R^2$	0.570923	
ADR <sup>2</sup>	0.480384		ADR <sup>2</sup>	0.490472	
DW-value	1.826658		DW-value	1.824232	
F-value	6.855166		F-value	7.096460	
Sample range	1985-2004		Sample range	1985-2004	

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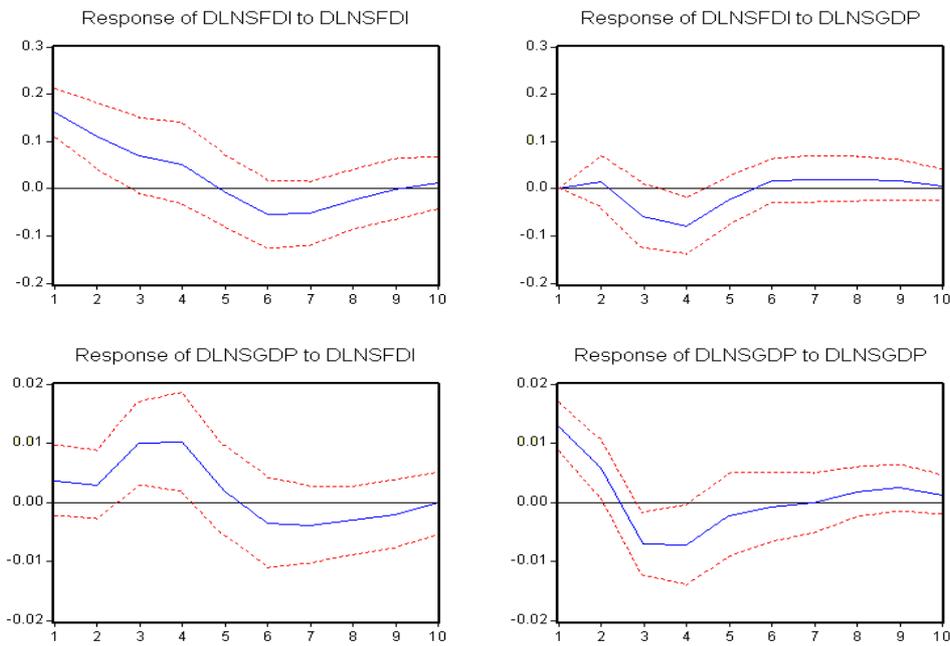


Fig.3 VAR Impulse Responses Results from Eviews 3.0

**CONCLUSIONS**

So far, theoretical and empirical literature on multinational firms has focused on the reasons why they become multinational or why they extend their business into a particular country, and focused the effects of multinational activities towards the host and home countries Claudia M. Buch and Alexander Lipponer 2005. In this paper, we have added another dimension to the discussion through analyzing the influences between business cycle movements and multinational activities, especially inward FDI by using

Chinese data and statistics, which are annual and cover a time period of 22 years (1983–2004). And the findings have clearly proved our testable hypothesis that firms’ (foreign) activities could be pro-cyclically related to business cycle developments in a long term. However, there do exist some disadvantages of this research:

1. Although the data and statistics used in this paper are from Chinese government or authorities, the degree of its trustworthiness and effectiveness is still doubtful.
2. The model in Section 4. is too simple, and almost

established from pure empirical angle, and thus it is lacking in sufficient economical theoretical support.

3. As FDI is in premature stage in China and it is more likely to be instructed by Chinese Government, to objectively follow or reflect economic connections or rules seems relatively weak.

Furthermore, this paper has taken only an initial look at the links between business cycles and inward FDI. In future work, it would be interesting to extend this analysis in a number of different directions. Finally, another interpretation of our findings that the business cycle matters for multinational activities could be that cyclical developments, to some extent, act as triggers for companies' entry into foreign markets. In this sense, research on multinationals and business cycles would help to answer the question "When do firms become multinationals?"

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