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Moderating Role of FDI Spillovers: Evidence from China

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ABSTRACT

Basing on the mediated moderation model, this study assesses how the interaction of FDI spillovers and domestic knowledge base has affected China's competitiveness. The study findings reveal that the initial knowledge base of China has exerted significant influence on its economic complexity through absorptive capacity and under the moderating effect of FDI spillovers. In addition, the findings indicated that FDI spillovers have played a significant role in the development of the country's absorptive capacity. However, according to the test results, the contribution of trade openness in this process was found insignificant. The study concludes that FDI spillovers have played a significant contribution to recent Chinese economic performance by exerting enhancing and accelerating effect on its endogenous factors.

Keywords: *Absorptive Capacity, FDI Spillovers, Moderation, Mediation, Economic Complexity*

INTRODUCTION

Since the economic reform which was kicked off in 1979 leading to open door policy, China emerged as one of the favored destinations of FDI; in addition, there was a significant increase in trade openness. Subsequently, China's economy has been registering splendid overall performance. According to UNCTAD statistics, between 1980 and 2016, Chinese GDP growth performance has averaged around 9.6 percent annually. Studies have consistently linked this performance to opening up policies (Xiaming Liu, Song, & Romilly, 1997; Wei, 1995). In fact, since then China emerged as one of the major global FDI recipients, increasing from 0.1 in 1980 to 7.6 in 2016 of FDI inflows as a percentage of total worlds, and ranking third behind USA, and UK with 22.3 and 14.5 as a percentage of total worlds respectively. FDI have greatly contributed to this economic performance due to their advanced technology and management expertise as well as capital (X. Li & Liu, 2005; Xiangbo Liu, Luo, Qiu, & Zhang, 2014). In fact, as a developing country, the technology of China still falls behind that of advanced nations; for that matter, consistent with catch up growth theory, China was able to source technological knowledge and management expertise from advanced economies, thus skipping the risky, lengthy and costly intermediary stages of trial and error and jumping straight to the upgraded stage (Cheung & Ping, 2004; Yang, 2006). In other words, this reform sparked a leapfrog effect with swift upgrading of economic infrastructures and technology. In this process, FDI played a major role in conveying knowledge and technology to the domestic economy through spillovers. The role external knowledge from foreign investors consists of enhancing and upgrading indigenous knowledge and technology with magnified effect on domestic competitiveness and economic growth.

The literature shows that to this point, the debate on the real effect of FDI in the domestic economy still remains inconclusive with mixed results; however, the mainstream literature tilts to positive spillovers (Iamsiraroj & Ulubaşoğlu, 2015). In this paper, we base on previous studies

to develop a new framework which will shed light on the mechanism of the interaction of FDI with domestic pre-existing conditions to generate growth. Using a mediated moderation model, this study will assess how the interaction of FDI and domestic knowledge base affects the host country competitiveness.

The rest of this paper is organized as follows: Section two provides the literature review and lays the theoretical framework, section three consists of Model specification, section four consists of the empirical test, and the last section consists of discussion and conclusion.

Literature Review and Analytical Framework

In line with the endogenous growth theory, sustainable growth stems from within, investments made in human capital, innovation and knowledge coupled with policies conducive to entrepreneurship lead to a sustainable economic performance. This endogenous growth ultimately gives rise to conditions attractive to FDI inflows which are considered as external factors in framework. Once present in the economy, FDI exert enhancing and accelerating effect on endogenous factors given their attribute as delivery vehicle for transferring advanced technology along with knowledge, know-how and capital (Borensztein, De Gregorio, & Lee, 1998). Benefits of the presence of FDI to the host economy and the foreign investor will largely depend on conditions existing in the host economy which have been generated by endogenous factors. Studies have indicated that the transfer of technology and know-how can only take place if there is a certain level of technological gap between the two countries (Lorentzen, 2005). In fact, that level should be neither too low nor too high, beyond or below a certain threshold, spillovers fail to take place. This was reiterated by Romer (1993) who pointed out that thanks to FDI attribute as a conveyor of technology and know-how, they can make a significant contribution to diminish or remove gaps in technology and know-how existing between rich and poor countries. The positive effect of FDI on long-term economic growth is largely contingent on the fact that their presence in the domestic economy brings about improvement in technology and human capital through spillovers (Aghion, Howitt, Brant-Collett, & García-Peñalosa, 1998). It is also argued that this enhancing effect is conditioned by the level of absorptive capacity in the domestic economy (Borensztein et al., 1998; Cohen & Levinthal, 1990; Giuliani & Bell, 2005). Using panel data for 84 countries, X. Li and Liu (2005) study results indicated direct effect of FDI on economic growth as well as indirect effect via interaction terms in developing countries; a strong positive effect on economic growth occurred when interaction is between FDI and human capital whereas the interaction between FDI and technology gap exerts a significant and negative impact on economic growth. The other studies such as Borensztein et al. (1998) confirmed the vital role played by absorptive capacity for FDI spillovers to exert positive effect in the domestic economy. The study conducted by Iamsiraroj and Ulubaşoğlu (2015) also confirmed the effect of FDI on economic growth but found interaction terms to be trade openness and financial development rather than schooling. Using a two stage growth accounting decomposition approach, the study results by Whalley and Xian (2010) suggested that the contribution of FDI to growth may have been large and that without inward FDI China's growth rate may have been lower. Furthermore, this study suggested that a decline in inwards FDI in China would have adverse effects on its economic performance and growth prospects. The study conducted by Du, Harrison, and Jefferson (2012) indicated that FDI from OECD countries (outside of Hong Kong, Macau, and Taiwan) have positive effects on individual firm-level productivity. These findings were also confirmed by another different study conducted by Lin, Liu, and Zhang (2009). The study conducted by Xiangbo Liu et al. (2014)

indicated that FDI facilitate growth by exerting an enhancing effect of FDI on physical and human capital accumulation. However, the findings of this study further showed a negative effect on output growth due to a crowd-out effect on domestic investment, decreasing local government revenue, and increasing the opportunity cost of technology innovations.

Host Economic Capability

The literatures explored in the previous section show the crucial role played by domestic conditions in the development process of an economy. In this section, we explore how a nation develops its initial knowledge base and how connectivity to external environment comes into play to influence this process. In our framework, consistent with Cartwright (1993); O'Malley and Van Egeraat (2000); Rugman and Verbeke (1993), we posit that the knowledge base of a country is influenced by both internal factors as well as external factors from other countries with which it has a certain amount of dealings due to their geographic proximity, regional integration or any other form of cross-border or trade agreements. The indigenous knowledge base existing in a country gets accumulated and developed over time as improvement takes place in knowledge accumulation and education system and as people work out solutions to respond to existing problems and needs.

However, due to its dealings with other economies for one reason or the other, the process of knowledge accumulation is not insulated from external factors' influence. Human capital from other countries, trade as well as foreign companies all are embedded with knowledge from their countries of origin and serve as vehicle of that knowledge to the domestic economy. As a result, external knowledge brings about an enhancing effect on the indigenous knowledge (Ali, Cantner, & Roy, 2016; Bloom, Draca, & Van Reenen, 2016) which in turn boosts its capability to identify and exploit further external knowledge to boost their competitiveness. Using human capital as a measure of knowledge base or absorptive capacity of an economy, the study conducted by Miller and Upadhyay (2000) suggested that the impact of human capital in an economy is contingent on its level of international trade openness; with data from both developed and developing nations, the study results indicated that low level of trade openness leads to negative impact of human capital on total factor productivity while high level of trade openness leads to significantly positive impact. According to the study by (Blomström, Kokko, & Mucchielli, 2003), FDI contribute to the improvement and upgrading of the host country's human capital which in turn will influence the type of FDI flowing into that domestic economy.

An economy with a developed human capital will attract knowledge-intensive FDI which are more likely to have positive spillovers in the domestic economy with subsequent effect on prospective economic performance of a country. In this regard, we can posit our hypothesis as follows:

H.1: initial knowledge base of an economy influences the absorptive capacity of the domestic economy under the accelerating effect of external knowledge.

In this study, Gross Capital formation will be used as a proxy of endogenous factors which drive development of initial knowledge base within an economy. According to the World Bank, Gross Capital Formation (formerly known as gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.

Economic Performance and FDI

For an economy to grow in a sustainable manner, knowledge plays a key role. Knowledge can be categorized as explicit and tacit knowledge. Explicit knowledge is relatively easy to acquire whereas tacit knowledge requires more efforts and time. In most cases, tacit knowledge is what is needed for an economy to develop. The amount and different types of tacit knowledge a country possess as well as their complementarity can determine its ability to grow. When there is a limited amount of knowledge in an economy, it is reflected in its production output which becomes narrow as well. Similarly, incoherence in existing knowledge in an economy can hamper its performance. In contrast, when there is a multitude and coherent types of knowledge, it sparks economic success which is reflected in production output. Different types of knowledge held by different individuals in an economy reflect the capabilities within that economy. Through webs of interaction facilitated by organizations or markets, these different capabilities can collectively be put into productive use. The production output embeds the knowledge put together for that purpose. The complexity of an economy is determined by the quantity of knowledge knitted together and the size of the network of people involved in order to produce a diverse mix of knowledge-intensive output (Hausmann et al., 2014), and it is reflected in the ubiquity and diversity of the mix of a nation's production output. Economic Complexity index (ECI) developed by Hidalgo and Hausmann (2009) is used to measure the complexity of an economy. As pointed out by Hausmann et al. (2014), not only is the economic complexity a symptom and an expression of prosperity, but also it is a driver of prosperity in that countries with high level of economic complexity tend to grow faster than those with low level. This makes it a good predictor of a country's economic performance (Hidalgo & Hausmann, 2009), it affects a country's level of income per capita and drives its future growth; if there is a gap between economic complexity and economic growth of a country, that is when one does not reflect the other, correcting adjustment will eventually take place to reflect the true performance of the economy (Hausmann et al., 2014). ECI is then considered as a better predictor of GDP per capita growth then traditional measures of governance, competitiveness and human capital (Hausmann et al., 2014). In this whole process, FDI from countries with a relatively high level of economic complexity can serve as a vehicle to transfer advanced knowledge to a country with a relatively low level of economic complexity. However, for that knowledge to have an effect on the production structure of the domestic economy, it is important that the transferred knowledge be relevant and complementary to the already available and standardized technological knowledge in such a way that it comes to solve the already existing and identified problem in that domestic country, not only would this stimulate the motivation of domestic economic operators to adjust their operations accordingly but also it would be much more practical and feasible given that some of the requisite infrastructure and knowledge are already available in the domestic economy. This is in line with studies such as Cohen and Levinthal (2000), Sawada (2010) and Y. Li, HAN, and ZHANG (2011) which highlighted the crucial role of technological gap between FDI home and host country or foreign and local firm. In the domestic economy, technological knowledge brought about by foreign investors have an accelerating effect on overall host country economic performance due to its enhancing and upgrading effect on the host country technological knowledge and facilitating role in their application for productive use. In this regard, we can posit our hypothesis as follows:

H.2: The absorptive capacity of the domestic economy influences its economic complexity under the accelerating effect of external knowledge.

H.1 and *H.2* lead us to the following third hypothesis:

H.3: There is a conditional indirect effect of initial knowledge base of an economy on its economic complexity through the absorptive capacity under the moderation effect of external knowledge.

In this study, economic complexity will be proxied by Economic Complexity Index (ECI) while absorptive capacity will be proxied by Human Development Index. In addition, we allow trade openness to have influence on both the mediator and the output variable.

MODEL SPECIFICATION

Conceptual Diagram

Our conceptual diagram consists of a simple conditional process model with one mediator and a common moderator on 3 paths.

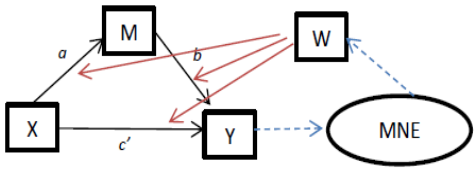

Fig1. *Conceptual diagram*

In Fig. 1, path *c'* represents the direct effect of knowledge base to competitiveness (effect on *X* on *Y*) while Path *ab* represents its indirect effect through ACAP denoted by *M*. All paths are moderated by the presence of spillovers in the economy denoted by *W* brought about by the presence of FDI.

The Model

This study uses the conditional process modeling which combines both mediation and moderation analysis to investigate the causal mechanism in the model. In conditional process model, the independent variable *X* influences the outcome variable *Y* through one or more mediators *M* and the process is conditioned by the values of one or more moderators *W* (Bachl, 2017; Preacher, Rucker, & Hayes, 2007). To test our hypothesis, we will use a mediated moderation model allowing all 3 paths to be moderated by a common moderator (Hayes, 2013). Our model can be estimated by the following two regressions:

$$M = i_1 + a_1X + a_2W + a_3XW + e_M \quad (1)$$

$$Y = i_2 + c_1'X + c_2'W + c_3'XW + b_1M + b_2MW + e_Y \quad (2)$$

Where i_1 and i_2 are intercepts, e_M and e_Y are residual error terms.

The effect of *X* on *M* is derived from equation (1) by grouping terms involving *X* and then factoring out *X*, resulting in:

$$\theta_{X\to M} = a_1 + a_3W \quad (3)$$

Which is a function of W.

The effect of M on Y comes from equation (2) and is constructed by grouping terms involving M and factoring out M:

$$\theta_{M\to Y} = b_1 + b_2W \quad (4)$$

Which is also a function of W.

The indirect effect of *X* on *Y* through *M* (path *ab*) is given by the product of the $X \to M$ and $M \to Y$ effects, each of which is moderated by *W* (the product of Equation (3) and (4)):

$$\theta_{X\to M}\theta_{M\to Y} = (a_1 + a_3W)(b_1 + b_2W) \quad (5)$$

Which is a conditional indirect effect and a function of W.

Lastly, the effect of *X* on *Y* is derived from equation (2) by grouping terms involving *X* and then factoring out X, resulting in:

$$\theta_{X\to Y} = c_1' + c_3'W \quad (6)$$

Which is a function of W, thus conditional?

Empirical Test

To test conditional process models, this study uses the Process tool developed by hay (Hayes,

2013). The Process tool has a number of benefits over normal regression tool such as mean centering, addresses heteroscedasticity problems, automatic computation of interaction and simple slopes analysis (Field, 2013).

Test Results

Conditional direct effect(s) of GCF on ECI at values of the moderator (FDI):

- When the amount of FDI spillovers are low, there is a non-significant positive effect of GCF on ECI, *c'* = 0.010, 95% CI [-0.005, 0.026], t=1.415, p=0.173
- When the amount of FDI spillovers are medium, there is a non-significant negative effect of GCF on ECI, *c'* = 0.006, 95% CI [-0.018, 0.006], t=-1.088, p=0.29
- When the amount of FDI spillovers are low, there is a non-significant negative effect of GCF on ECI, *c'* = 0.023, 95% CI [-0.047, 0.001], t=-2.006, p=0.059

Conditional indirect effect(s) of X on Y at values of the moderator(s):

- When spillovers are low, there is a non-significant positive effect of GCF on ECI through HDI, ab = 0.009, 95% CI [-0.005, 0.041].
- When spillovers are medium, there is a non-significant positive effect of GCF on ECI through HDI, ab = 0.002, 95% CI [-0.008, 0.010].
- When spillovers are high, there is a significant positive effect of GCF on ECI through HDI, ab = 0.046, 95% CI [0.025, 0.077].

Table1. *Test Output*

Run MATRIX Procedure:

********** PROCESS Procedure for SPSS Release 2.16.3 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com

****

Model = 59

Y = ECI

X = GCF_perc

M = HDI

W = log_FDI

Statistical Controls:

CONTROL= log_trad

Sample size 26

****

Outcome: HDI

Model Summary

R	R-sq	MSE	F	df1	df2	p
.9693	.9395	.0004	88.8278	4.0000	21.0000	.0000

Model	coeff	se	t	p	LCI
ULCI constant.0217	.1154	.1883	.8524	-.2182	.2617
GCF_perc .0046	.0007	.0019	.3758	.7108	-.0032
log_FDI.2383	.1890	.0237	7.9679	.0000	.1397
int_1 .0245	.0170	.0036	4.7457	.0001	.0096
log_trad.0383	-.0083	.0224	-.3704	.7148	-.0549

Product terms key:

int_1 GCF_perc X log_FDI

****

Outcome: ECI

Model Summary

R	R-sq	MSE	F	df1	df2	p
.9916	.9832	.0023	136.8220	6.0000	19.0000	.0000

Model	coeff	se	t	p	LCI
ULCI constant -.2752	.2682	-1.0262	.3177	-.8365	.2861
HDI3.8206	2.3039	.7246	3.1796	.0049	.7872
GCF_perc -.0063	.0057	-1.0883	.2901	-.0183	.0058
int_2 12.1842	8.8163	1.6090	5.4793	.0000	5.4484
log_FDI 1.0233	.6120	.1965	3.1145	.0057	.2007
int_3 -.0012	-.0405	.0188	-2.1568	.0440	-.0799
log_trad .2295	.1202	.0522	2.3005	.0329	.0108

Product terms key:

int_2 HDI X log_FDI

int_3 GCF_perc X log_FDI

********** DIRECT AND INDIRECT EFFECTS **********

Conditional direct effect(s) of X on Y at values of the moderator(s)

log_FDI	Effect	SE	t	p	LLCI	ULCI
-.4135	.0105	.0074	1.4151	.1732	-.0050	.0260
.0000	-.0063	.0057	-1.0883	.2901	-.0183	.0058
.4135	-.0230	.0115	-2.0057	.0593	-.0470	.0010

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator	log_FDI	Effect	Boot SE	BootLLCI	BootULCI
HDI	-.4135	.0085	.0098	-.0048	.0404
HDI	.0000	.0016	.0048	-.0080	.0102
HDI	.4135	.0461	.0150	.0251	.0772

Values for quantitative moderators are the mean and plus/minus one SD from mean.

Values for dichotomous moderators are the two values of the moderator.

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

Note: The following variables were mean centered prior to analysis: GCF_perc HDI log_FDI

NOTE: Some cases were deleted due to missing data. The number of such cases was: 32

Note: All standard errors for continuous outcome models are based on the HC3 estimator

------ END MATRIX -----

DISCUSSION AND CONCLUSION

The above findings reveal the following in regard to the formulated hypothesis:

Regarding *H.1* ($\theta_{X\to M}$), the findings show that indeed the initial knowledge base of China has an effect on its absorptive capacity under the enhancing effect of FDI spillovers, however, the presence of trade openness was found insignificant.

Regarding H.2 ($\theta_{M\to X}$), the findings show that the absorptive capacity of China has exerted an effect on an it's economic complexity under the enhancing effect of external FDI spillovers. The above findings coupled with the outcome of

simple slope analysis lead us to confirm *H.3* that through the absorptive capacity, China's initial knowledge base has played a significant contribution to its economic complexity under the moderation effect of external knowledge.

To conclude, it is important to highlight the crucial contribution of endogenous factors in the process of creating competitiveness of an economy; however, the pace at which an economy develops its competitiveness as well as its significance will largely depend on external knowledge, especially knowledge from FDI spillovers.

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