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The Economic Impact of Chinese FDI on Sub-Saharan Africa

~Human Capital, Financial Market and Mobile Phone as Catalysts~

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Abstract

The purpose of this paper is to examine whether Chinese FDI has an economic impact on Sub-Saharan Africa and what factors drive FDI's impact better. The empirical analysis suggests that FDI (world's nor Chinese) has no significant impact on economic growth of host countries in Sub-Saharan Africa. The results also show that no factors promote FDI's economic impact.

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1 Introduction

1.1 Purpose of this study

The purpose of this study is to clarify whether or not Chinese FDI is effective for the economic growth of Sub-Saharan Africa and what makes Chinese FDI's impact greater.

Economic growth in Sub-Saharan Africa is one of the most important goals in the world in order to achieve poverty reduction as said in MDGs. As described in the following sections, Chinese FDI toward Sub-Saharan Africa has been increasing so dramatically in recent years. It has become important to consider the relation between Chinese FDI and the development of Sub-Saharan Africa because it is said that FDI might bring about economic growth in host countries.

In this paper, we take a close look at Chinese FDI toward Sub-Saharan Africa and describe its characteristics which are different from other countries' FDI, the process how Chinese FDI might influence host countries' economy and examine empirical analysis on its real effect. Furthermore, we focus on what makes its effect greater so that we could make constructive political suggestion.

1.2 Definition of FDI

Before analyzing the Chinese FDI's impact on the economic growth in Sub-Saharan Africa, we should clarify the definition of FDI that will be discussed in this paper.

According to IMF's definition, "*Direct investment is the category of international investment that reflects the objective of a resident entity in one economy obtaining a lasting interest in an enterprise resident in another economy. (The resident entity is the direct investor and the enterprise is the direct investment enterprise.) The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence by the investor on the management of the enterprise. Direct investment comprises not only the initial transaction establishing the relationship between the investor and the enterprise but also all subsequent transactions between them and among affiliated enterprises, both*

incorporated and unincorporated.[1]"

Simply speaking, FDI implies the international investment whose objective is to directly gain interests by managing firms in host countries. It includes M&A and green-field investment and so on. FDI does not include speculative investment. In this paper, we also use FDI data according to the IMF definition.

1.3 FDI impact on host countries

FDI is thought of to have a positive impact on host countries' economic growth because it is said that FDI can provide host countries with various benefits. Generally speaking, FDI is considered to be able to bring into host countries abundant direct financing, technology transfer, employee training, international production networks, access to market and so on.

In particular, technology transfer is considered to play an important role in the process of economic growth. *Growth rates in developing countries are, in part, explained by a 'catch-up' process in the level of technology.*[2] Technology diffusion could occur through various transmission channels of new idea and technology. *Foreign direct investment by multinational corporations (MNCs) is considered to be a major channel for the access to advanced technologies by developing countries. MNCs are among the most technologically advanced firms, accounting for a substantial part of the world's research and development (R and D) investment. Some recent work on economic growth has highlighted the role of foreign direct investment in the technological progress of developing countries.*[3]

1.4 FDI trends

1.4.1 World trend of FDI

FDI has been increasing all over the world in its value. Of course, financial crisis influenced its spread, but it has started increasing again after crisis. UNCTAD says, "*Global FDI inflows in 2011 surpassed their pre-crisis average despite turmoil in the global economy, but remained 23 % short of the 2007 peak.*[4]*"* We could expect FDI to keep increasing, rapidly or slowly, in the future.

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1 IMF P.86
2 Alfaro et al (2000) P.116
3 Alfaro et al (2000) P.116
4 UNCTAD (2012) P.2

FDI inflows have increased both in developed countries and in developing countries. *FDI inflow toward developed countries increased by 21 %, and by 11 % toward developing countries in 2011.*[5]

Geographically seen, *the rise of FDI flows in 2011 was widespread in all three major groups – developed, developing and transition economies. Developing economies continued to absorb nearly half of global FDI and transition economies another 6 per cent.*[6] As seen in Figure 1, FDI toward developing countries has been increasing gradually but stably. It could be said that FDI toward developing countries will keep increasing also in the future. At the same time, for developing countries, as FDI host countries, it will be inevitably important issue how they could effectively connect FDI to the economic growth of their own countries.

1.4.2 Sub-Saharan Africa and FDI

The economy in Sub-Saharan Africa is the least developed in the world. Sub-Saharan Africa lies in the south of the Sahara. Its economic environment was not favorable because of its bad infrastructure, unstable governance, unfavorable weather and so on. 27 of 48 countries in Sub-Saharan Africa are low income countries. 47.5% of Sub-Saharan African people live with less than 1.25 $ a day.[7] The economic growth and poverty reduction in Sub-Saharan Africa is one of the most important challenges to be solved.

As its economy is less developed and unstable, Sub-Saharan Africa countries are receiving lots of ODA from relatively developed countries and UN. ODA can be said to have a big impact to SSA countries' economy because it is one of the main income of SSA. Actually, net ODA received from other countries or UN accounts for 4.1% of GNI in SSA.[8] As seen in figure 2, the net ODA received (% of GNI) of SSA is much higher than other parts of the world. Although the ratio is declining in recent years, yet ODA still can be said to take an important role in SSA's economy. In this paper, we assume in the model that the amount of ODA inflow may also influence SSA's economic growth.

Sub-Saharan Africa is one of the least developed provinces. However, it has become a new target as a potential market for business. More and more FDI tends to flow into Sub-Saharan Africa in these days. Developed countries all over the world have started investing in Sub-Saharan Africa.

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[5] Data from UNCTAD (2012) P.1
[6] UNCTAD (2012) P.3
[7] Data in 2008 from World Development Indicators
[8] Data in 2010 from World Development Indicators

UNCTAD also says, "*Africa and the least developed countries (LDCs) saw a third year of declining FDI inflows. But prospects in Africa are brightening. The 2011 decline in flows to the continent was due to largely to divestments from North Africa. In contrast, inflows to Sub-Saharan Africa recovered to $37 billion, close to their historic peak.*"[9]

In figure 3, we can see net FDI inflow in SSA increase in the long run. We can also expect that FDI toward SSA will be increasing in the future for its potential to economic growth and abundant natural resources.

In the aspect of FDI sectors, oil and other natural resources attract more and more FDI in SSA. UNCTAD says, "*New oil- and gas-producing countries are emerging as major recipients of FDI. Oil production in subSaharan Africa has been dominated by the two principal producer countries, Angola and Nigeria. Nigeria was Africa's largest recipient of FDI flows ($8.92 billion) in 2011, accounting for over one fifth of all flows to the continent. In gross terms, Angola attracted FDI inflows worth $10.5 billion, although in net terms, divestments and repatriated income left its inflows at -$5.59 billion.*"[10]

In addition to those natural resources, services sectors are newly emerging, attracting lots of FDI. Figure 4 shows that the main FDI sector is shifting to services sector while primary sector is getting relatively less important. Many kinds of services sector attract more FDI toward SSA. For example, according to UNCTAD, *aside from the construction industry, projects are drawn into industries such as electric, gas and water distribution, and transport, storage and communications in the services sector and industries such as coke, petroleum products and nuclear fuel in the manufacturing sector.*[11] Actually, we can see lots of Chinese mobile phones around SSA.

1.4.3 Chinese FDI

China, in recent years, is the most noticeable nation in the world in that it has kept very high economic growth rate for a long time. Actually, China surpassed Japan as the second largest economy in 2010. Some say that *the country of 1.3 billion people will overtake the U.S., where annual GDP is about $14 trillion, as the world's largest economy by 2027.*[12]

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[9] UNCTAD (2012) P.xi
[10] UNCTAD (2012) P.40
[11] UNCTAD (2012) P.41
[12] Bloomberg Website
http://www.bloomberg.com/news/2010-08-16/china-economy-passes-japan-s-in-second-q

China has acquired great economic growth by receiving inward FDI from all over the world and exploiting its fund and new technology. However, in recent years, more and more Chinese companies with developed technology have started investing in foreign countries (outward FDI). China is no longer FDI-receiving country but FDI-providing country. Although China's GDP has already become the second largest in the world, yet its FDI can still be said to increase both in inflow and outflow in the future.

In fact, *Chinese outward FDI has been increasing dramatically in 2000s.*[13] *Outward FDI in 2010 marked 68,811 million USD which was more than 70 times of that (916 million USD) in 2000.*[14] *Comparing FDI sectors, service and mining, rather than manufacturing, are the main sectors of Chinese outward FDI. In addition to green field investment, more and more M&A investments have been established, particularly for acquiring natural resources.*[15]

One of the main reasons why Chinese outward FDI has been increasing so much is Chinese government's policy providing Chinese outward investors with favorable incentives. Chinese government started a new outward FDI policy after its WTO entry in 2001. This new policy is called 'go global' policy which promotes Chinese enterprises to invest more in foreign countries. To stimulate more outward FDI flow, this policy benefits Chinese enterprises which are going to invest in foreign countries, with tax cut, information providing service, simpler procedure, financing support and diplomatic support.

As one of the characteristics of Chinese outward FDI, we can easily see it focus on natural resources. Although China has acquired more than 8% of GDP growth per year since 1980s, yet its growth rate of the demand for petroleum has already exceeded 13% since 2001, surpassing its GDP growth rate.[16] It can be said that China's petroleum demand will keep increasing also in the future.[17] That's why Chinese government is promoting so much outward FDI which can gain foreign natural resources. In fact, in SSA, China has invested in the nations which have abundant natural resources.

Related to the above, Chinese outward FDI is clearly different from that of other developed countries in its business goals. Chinese outward FDI does not always focus on making the best profit from its projects while enterprises from other developed

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uarter-capping-three-decade-rise.html
(accessed 2012-12-30)

[13] See Figure 5.
[14] Data from UNCTAD STAT
[15] Gwan (2009) P.65 (translated by the author)
[16] Data from アジア経済研究所（2009）P.6
[17] See Figure 6.

countries usually set the goal on making the best profit. Chinese outward FDI often ignores political and financial risk in the host countries and actively invest in relatively risky countries while enterprises of other developed countries hesitate. This is because Chinese outward FDI flow is based on Chinese government's political goals. The government's goals through outward FDI are, for example, to secure enough energy and natural resources for rapidly increasing demand in China, and to have an access to the new consumer markets for Chinese products and so on. It is also said that one of the reasons why Chinese government promotes so much FDI (particularly into Africa) is that it aims to get African countries' votes at the conference in the UN.

1.4.4 Chinese FDI toward Sub-Saharan Africa

The economic relation between China and Sub-Saharan Africa has got stronger than before in recent years. According to National Bureau of Statistics of China, in 2010, China invested in 52 African countries and provinces, and the amount of FDI in value was 36,249 million US$ (including contracted projects, labor cooperation and design consultation) which was about one third of the total outward FDI in the year.[18]

One of the reasons why Chinese FDI has been increasing so much is Chinese government's policy. As described in the former sections, Chinese government provides Chinese enterprises that are willing to invest in foreign countries with very favorable benefits. In order to secure energy and natural resources, gain new business markets and get African votes in the UN, Chinese government focuses so much particularly on SSA.

1.5 Interactive factors

1.5.1 Human capital

In many previous literatures on development economy, human capital has been considered as a very important key for economic growth. Furthermore, as FDI became public attention for its possibility to promote economic growth of the host countries, human capital was taken notice of as a catalyst to strengthen FDI's impact.

As described in the former sections, one of the FDI's main effects is technology transfer. *Technological progress takes place through a process of 'capital deepening' in the form of the introduction of new varieties of capital goods. MNCs possess more*

[18] See Figure 7.

advanced 'knowledge', which allows them to introduce new capital goods at lower cost. However, the application of this more advanced technologies also requires the presence of a sufficient level of human capital in the host economy. The stock of human capital in the host country, therefore, limits the absorptive capability of a developing country.[19]

Borensztein et al (1998) showed that FDI contributed to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy by empirical analysis.

1.5.2 Financial market

Some researchers showed that financial market condition could limit the FDI impact on host countries' economic growth. Bad financial market conditions may have undesirable influence on FDI's spillover effect while better financial markets allow agents in the economy to take advantage of knowledge spillovers from FDI. In short, in order to maximize the FDI impact on economic growth, host countries need good financial market conditions.

Alfaro et al (2000) empirically analyzed the importance of financial markets and concluded that it was essential for FDI to achieve spillover effects and bring economic growth into the host countries.[20]

1.5.3 Mobile phone

As the technology made more and more progress, mobile phones have taken an inevitably important role of our life. The situation is the same in Sub-Saharan Africa, or we can say that the role of mobile phones is much more important in Sub-Saharan Africa. Figure 7 shows that more and more people have started using mobile phones also in Sub-Saharan Africa as its using rate in the whole world got higher. Figure 7 also shows that more than 50 % people in Sub-Saharan Africa have their own mobile phone and use it in their daily life.

Mobile phones in Sub-Saharan Africa are a little different from other countries in its use. A lot of people in Sub-Saharan Africa use their mobile phones for mobile banking. Mobile banking is one of the financial services using telecommunication technology. People can send and receive money or pay their bills on their mobile phones. This service is very important in Sub-Saharan Africa because most of them rely on

[19] Borensztein et al (1998) P.116-117
[20] See Alfaro et al (2000) for more details.

remittance for their life. The Economist says, "*Three-quarters of the countries that use mobile money most frequently are in Africa, and mobile banking in some of them has reached extraordinary levels.*[21]"

Mobile phones can be considered to promote FDI's impact on economic growth because technology transfer is easier if people can get more information with their mobile phones. Furthermore, we could expect that the more people use mobile phones, the more impact FDI has on host countries' economy because, with mobile banking service, it is easier for people to consume more if their (or their husbands') income increases benefitted by FDI. Mobile banking will stimulate people's consumption and thus will promote economic growth.

1.6 Previous literatures

1.6.1 Borensztein et al (1998)

Borensztein et al (1998) is one of the most important literatures on FDI's impact on host countries' economy because it describes the necessity of human capital stock for FDI's impact. It tests the effect of foreign direct investment (FDI) on economic growth in a cross-country regression framework, utilizing data on FDI flows from industrial countries to 69 developing countries over the last two decades. Its results suggest that FDI is an important vehicle for the transfer of technology, contributing relatively more to growth than domestic investment. However, the higher productivity of FDI holds only when the host country has a minimum threshold stock of human capital. Thus, FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy.

1.6.2 Alfaro et al (2000)

Alfaro et al (2000) shows that good financial market is essential for FDI's impact on growth. The purpose of Alfaro et al (2000) is to examine the various links among foreign direct investment, financial markets and growth. It models an economy with a continuum of agents indexed by their level of ability. Agents have two choices: they can work for the foreign company in the FDI sector and use their wealth to earn a return or

[21] The Economist Website
http://www.economist.com/node/21553510
(Accessed 2013-02-06)

they can choose to undertake entrepreneurial activities, which are subject to a fixed cost. Better financial markets allow agents in the economy to take advantage of knowledge spillovers from FDI. The empirical evidence suggests that FDI plays an important role in contributing to economic growth. However, the level development of local financial markets is crucial for these positive effects to be realized.

1.6.3 Naemura (2009)

Naemura (2009) shows that Chinese FDI into Sub-Saharan Africa drives host countries' economic growth. The objective of Naemura (2009) is to examine whether China's FDI has a positive effect on economic growth in Sub-Saharan Africa. Using the panel data consisting of 39 countries and 10 years (1997-2006), the results suggest the existence of a positive relationship. It separates the data into two 5-year-groups and uses the average data of 5 year for each variable.

1.7 Value added

As the value of this paper added to previous literatures, we use the newest data for each variable. We use the data in 1992-1996 and 2007-2011 in addition to the data in 1997-2006 used in Naemura (2009). In addition to the new data, we add a new independent variable, MOBILE, to the model (precisely described in the latter section). We also examine the interactive effect of CONTROLS on CHINA's impact on growth while Naemura (2009) examines the interactive effect of CONTROLS only on general FDI's impact.

2 Model & Method

2.1 Model

2.1.1 Model

In order to empirically analyze the Chinese FDI's impact on SSA's economy, we have to build a proper model for multiple regression analysis. In this paper, we arrange the previous Naemura (2009) model into more favorable form. Naemura (2009) built the model below to examine empirical analysis on Chinese FDI's impact and the effect of human capital.

【Naemura (2009) model】

$$GROWTH_{it} = \alpha_i + \beta_1 \ln(IGDP)_{it} + \beta_2 FDI_{it} + \beta_3 CHINA_{it} + \beta_4 TRADE_{it} + \beta_5 ODA_{it} + \beta_6 SCHOOL_{it} + \beta_7 SCHOOL*FDI_{it} + \varepsilon_{it}$$

【Variables】

GROWTH: GDP growth rate per capita (%)
IDGP: Initial GDP in the 1st year during the samples (US$)
FDI: the ratio of FDI inflow (except Chinese FDI) to GDP (%)
CHINA: the ratio of Chinese FDI inflow to GDP (%)
TRADE: the ratio of total trade value to GDP (%)
ODA: the ratio of ODA received to GDP (%)
SCHOOL: Net enrollment for secondary school (%)
SCHOOL*FDI: Interaction term of SCHOOL and FDI
i: Country
t: Year

Naemura (2009) used the regression model above for empirical analysis. In this paper, we use a new regression model based on the Naemura (2009) model to precisely

analyze the FDI impact and other factors' effects on host countries' economy. The new regression model has changed some variables and those proxies from the Naemura (2009) model. We use the new regression model below.

【The new regression model】

$$GROWTH_{it} = \alpha_i + \beta_1 \ln(INITIAL\ GDP)_{it} + \beta_2 FDI_{it} + \beta_3 CHINA_{it} + \beta_4 TRADE_{it} + \beta_5 ODA_{it} + \beta_6 CONTROLS_{it} + \beta_7 CONTROLS*FDI_{it} + \beta_8 CONTROLS*CHINA_{it} + \varepsilon_{it}$$

【Variables】[22]

GROWTH: GDP per capita growth (annual %)
ln(INITIAL GDP): GDP per capita, PPP (current international $, log)
FDI: Foreign direct investment, net inflows (% of GDP)
CHINA: Turnover of economic cooperation with foreign countries or territories (% of GDP)
TRADE: Trade (% of GDP)
ODA: Net ODA received (% of GNI)
i: Country
t: Year
CONTROLS: consist of HUMAN CAPITAL, FINANCE and MOBILE
CONTROLS*FDI: Interaction term of CONTROLS and FDI
CONTROLS*CHINA: Interaction term of CONTROLS and CHINA
HUMAN CAPITAL:
[1] School enrollment, secondary (% net)
[2] Literacy rate, adult total (% of people ages 15 and above)
[3] School enrollment, primary (% net)
FINANCE:
[1] Money and quasi money (M2) as % of GDP
[2] Domestic credit to private sector (% of GDP)
MOBILE: Mobile cellular subscriptions (per 100 people)

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[22] Precise data will be described in the Data section.

The new model has a new variable CONTROLS which consist of 3 concrete variables, HUMAN CAPITAL, FINANCE and MOBILE. To the best knowledge of the author, these 3 variables have not been analyzed at the same time for Sub-Saharan Africa as interaction terms in the previous literatures although each of 3 was used individually.

The variable SCHOOL, which the Naemura (2009) model used in order to analyze the effect of human capital, is included in CONTROLS as one proxy for HUMAN CAPITAL. In addition to HUMAN CAPITAL, the new regression model has 2 new variables, FINANCE and MOBILE. The variable FINANCE is necessary for this analysis because local financial market condition in host countries has been shown to have an influence on FDI's impact in the previous literatures. The variable MOBILE also should be included in this model because mobile phone service is one of the Chinese enterprises' main businesses and because mobile banking is the main stream for financing which is essential for economic growth.

2.1.2 Variables

It is said that INITIAL GDP is one of the negative factor for economic growth because of 'catch-up effect'. The low initial GDP means that the country has a lot of room to achieve for its economic growth. Actually, almost all of the previous literatures show that initial GDP has negative impact on economic growth.

FDI is a main positive factor which has positive impact on growth. FDI brings technology transfer, abundant money, incentive for business competition and so on, which lead to host countries' economic growth.

CHINA is considered to have a positive effect on growth because it should have the same effect as FDI. Naemura (2009) shows that CHINA has a positive impact on host countries' economic growth.

TRADE is also considered to have a positive impact on growth because trade promotes optimal allocations of resources. Lots of countries such as Japan also succeeded in economic development thorough trade. It is said that trade has a big influence in some Sub-Saharan African countries.

ODA is considered to have positive impact on growth because it is one of the main national incomes for Sub-Saharan Africa. Actually, as described in Section 1.4.2, ODA accounts for more than 4% of GNI in Sub-Saharan Africa. More ODA is expected to promote more economic growth.

CONTROLS are described precisely in Section 1.5.

Interaction terms are the variables to examine whether CONTROLS promote FDI's (or CHINA's) impact on growth.

2.2 Method

The empirical analysis is based on cross-country regression analysis using ordinary least square method. We examine the regression analysis on the new model with Microsoft's 'Excel'. Analysis knowledge used in this paper is all based on Shirasago (2007)[23].

[23] See 白砂堤津耶（2007） for more details about analysis knowledge.

3 Data

3.1 Sample countries

We choose 45 Sub-Saharan countries[24] as the sample for this regression analysis. Sample selection is limited by data availability.

3.2 Data used

See Data Appendix for precise data actually used in regression analysis.

3.3 Data source

Data for CHINA comes from National Bureau of Statistics of China. All data except CHINA comes from World Development Indicators Online.

[24] 45 countries include Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Democratic Republic, Congo Republic, Cote d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

4 Analysis

The purpose of this empirical investigation is to estimate the effects of FDI, particularly, Chinese FDI on economic growth and to find what the catalyst factors are through which FDI and Chinese FDI can benefit better for growth. In particular, we examine whether FDI and Chinese FDI interact with the stock of human capital, the liquidity of financial market and use of mobile phone.

We opt for cross-section regression with 45 SSA countries for the time period 1992 – 2011.[25] We use the average data of 20 years for each variable. All regression is performed based on OLS with the software 'EXCEL 2011' of Microsoft.

Table 1 shows the regression results of the correlation between growth and various independent variables. Table 2 shows the regression results of various patters of data selection.

4.1 INITIAL GDP

All regression results in Table 1 show that INITIAL GDP has significantly positive effect on growth and has strong robustness. It means that the more initial GDP the more growth. However, this result is quite different from previous literatures, which state that initial GDP should have negative effect on growth. In previous literatures, researches state that the less initial GDP the more growth in the future because the less initial GDP the more room to develop (catch-up effect). The author has no idea to explain this result, or this result may be wrong with some data collection problem.

4.2 FDI and CHINA

As you can see in Table 1, FDI has significantly positive effect on growth and has strong robustness. Regression 1 shows that FDI has significantly positive effect on growth and is robust with high t-values after controlling for initial GDP, Chinese FDI, trade and ODA. Regression 2 shows that FDI's significantly positive impact on growth is robust to the inclusion of other controlling variables (such as human capital, financial market and mobile phone). In Table 2, which performs the regressions with various

[25] Borensztein et al (1998), who performed similar regressions, states that panel regressions and cross-section regressions yield similar qualitative results.

patterns of data selection, we can also see the robustness of FDI's positive impact with high t-values. We can be sure that FDI can benefit for host countries' economic growth also in SSA.

Table 1 shows us that CHINA has no significant effect on growth. We can see its negative effect on growth (not significant with low t-values), which means that Chinese FDI may have a bad influence on host countries' economic growth. However, we can state that Chinese FDI has no positive or negative effects on growth because all the regression results in table 1 and 2 show that CHINA has no significant effect with very low t-values.

This result is not so surprising because we can see some problems in Chinese FDI. For example, first, many Chinese investors are focusing only on natural resources (ex. natural gas and petroleum) and are exploiting it. This type of FDI can be considered not so effective for economic growth because it does not bring new technology or knowledge into host countries although it can create some employment. Second, take a look at infrastructure sector. It is often said that the infrastructure provided by Chinese FDI is so fragile that it needs repaired too many times. It causes so much loss of capital in the host countries and limit its potential growth power.

4.3 TRADE and ODA

All the regression results in Table 1 and Table 2 show that TRADE's impact on growth is significantly negative. It indicates that the more trade the less growth. This negative correlation seems paradoxical because it is often said that the increase of trade promotes the economic growth.

One probable reason for this negative correlation is the substitutive relation between trade and FDI. The relation between them has two types, substitution and subsidiarity. Many previous literatures describe that the relation between trade and FDI is subsidiary. In short, trade increases FDI and vice versa. However, in the author's opinion, it can be possible that they have substitutive relation in Sub-Saharan Africa and that the increase in FDI and growth causes the negative correlation between trade and growth.

Table 1 and 2 indicate that ODA has no significant impact on growth. All the regression results in tables show low t-values for ODA variable, meaning there is no significant correlation between ODA and growth.

4.4 CONTROLS

HUMAN CAPITAL, as seen in Table 1, can be said to have no significantly positive impact on economic growth in Sub-Saharan Africa while previous literatures (ex. Borensztein et al [1998]) describe that human capital stock is essential for economic growth, in particular, increasing FDI's impact on growth. Table 2 shows that HUMAN CAPITAL has no significantly positive effect with the various pattern of data selection. It is sure that human capital stock has no significant correlation with economic growth in Sub-Saharan Africa. However, as we take a close look at the results, we can see some negative effects of human capital stock on growth. Regression number 3 indicates that human capital stock's positive impact on growth is significant at 10 % level. The cause of this result is not clear.

Table 1 also shows that FINANCE does not have significant impact on growth. Although regression number 4 in Table 1 shows that financial market has positive impact on growth (significant at 10 % level), we can see no robustness it has. In short, it is very likely that financial market has no impact on host countries' economic growth in Sub-Saharan Africa.

MOBILE, as seen in Table 1 and 2, has significantly negative impact on growth while other controlling variables have no impact as described above. We can see it also has strong robustness for its impact because almost all of the regression results show that FINANCE's negative impact on growth is significant at 5 %. In short, surprisingly, host countries' economic growth increase easier if its financial market is in bad condition in Sub-Saharan Africa.

4.5 Interaction

We did not find any interactive impact between FDI or CHINA and CONTROLS. This indicates that no one factor strengthens FDI's positive impact on growth in Sub-Saharan Afria. According to previous literatures, FDI and human capital stock or financial market have interaction effect, meaning the better human capital stock or the better financial market the greater impact of FDI on growth. We can see the difference of the results between Sub-Saharan Africa and other countries.

5 Concluding Remarks

The purpose of this paper is to examine whether or not Chinese FDI has an economic impact on Sub-Saharan Africa and what factors drive its impact better. This issue is very important for Sub-Saharan African countries because they must decide whether or not they should make some policy to attract Chinese FDI, which is increasing dramatically in these years. We describe the characteristics of Chinese FDI and examine regression analysis with the new model which includes new controls.

As seen in Analysis Section, we can see no positive impact of Chinese FDI on Sub-Saharan Africa's economy. We also see that FDI from the world has significant impact as described in previous literatures. We conclude that the reason why Chinese FDI has no significant impact is its focus on natural resources, which probably does not bring technology transfer and its poor technology of infrastructure construction.

We suggest to Sub-Saharan African countries that they actively attract more FDI in order to accomplish economic development but do not have to too actively attract Chinese FDI with much budget and labor.

For more precise analysis, we need FDI data of Chinese small firms managing in Sub-Saharan Africa. One of the characteristics of Chinese FDI is its small firms. Compared to other countries, China has much more small firms in Sub-Saharan Africa whose FDI data is not included in Chinese government's statistics. In this paper, we do not include those precise FDI data of small firms because of the lack of data source.

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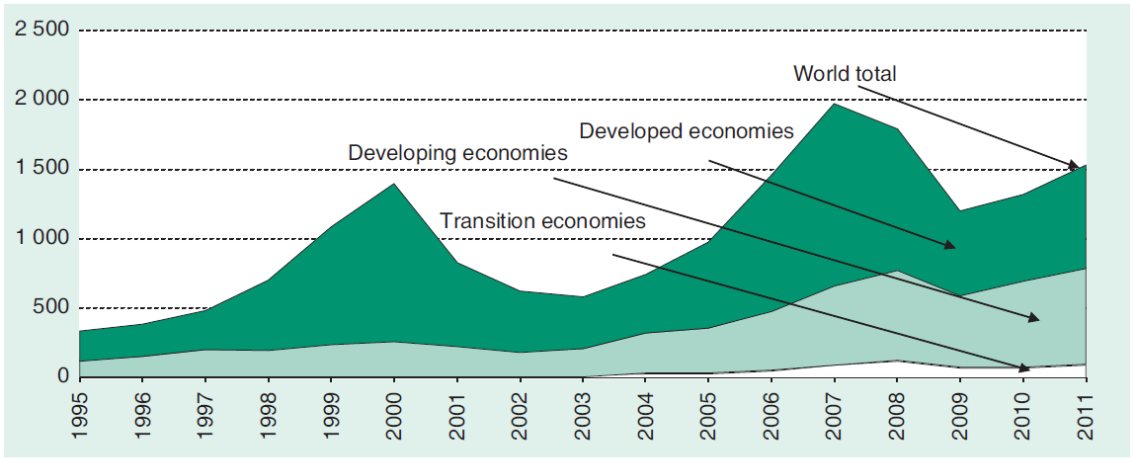
7 Appendix

7.1 Figures

Figure 1

Figure I.2. FDI inflows, global and by group of economies, 1995–2011
(Billions of dollars)

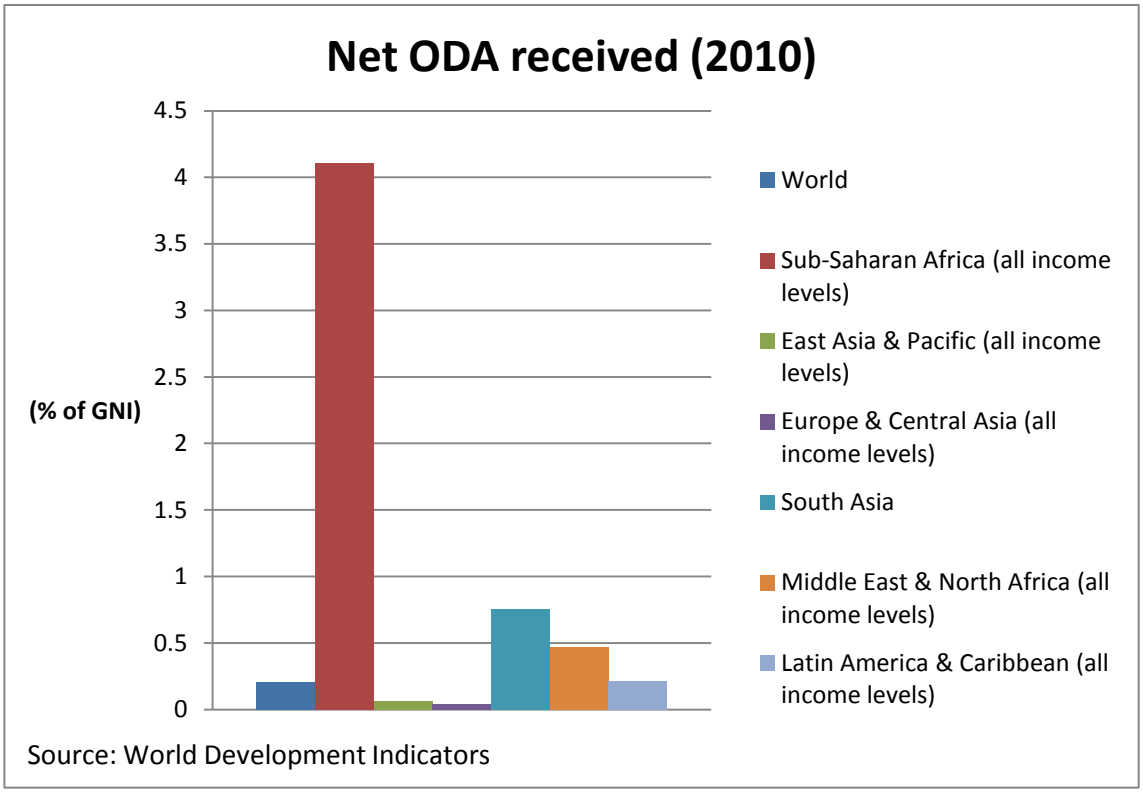


Source: UNCTAD, based on annex table I.1 and the FDI/TNC database (www.unctad.org/fdistatistics).

[26]

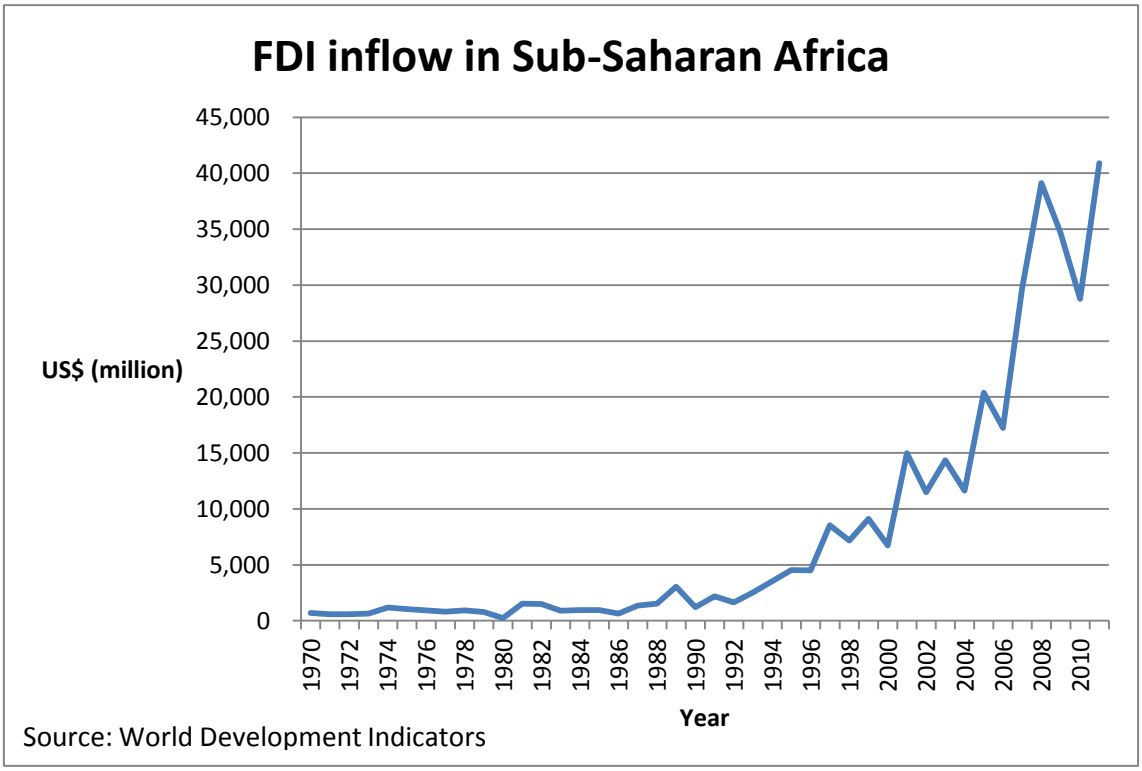
[26] UNCTAD (2012) P.3

Figure 2



Source: World Development Indicators

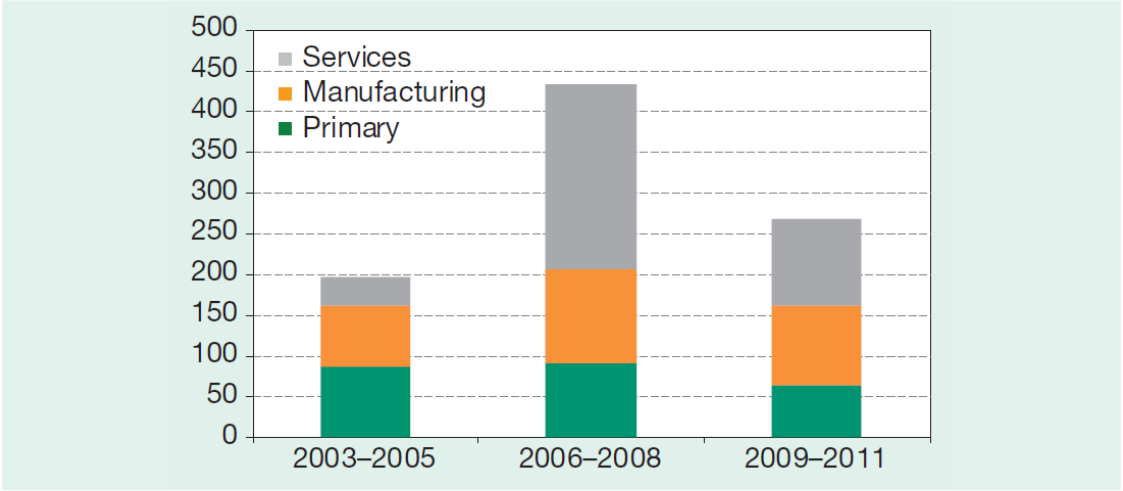
Figure 3



Source: World Development Indicators

Figure 4

Figure II.1. Value of greenfield investments in Africa, by sector, 2003–2011
(Billions of dollars)

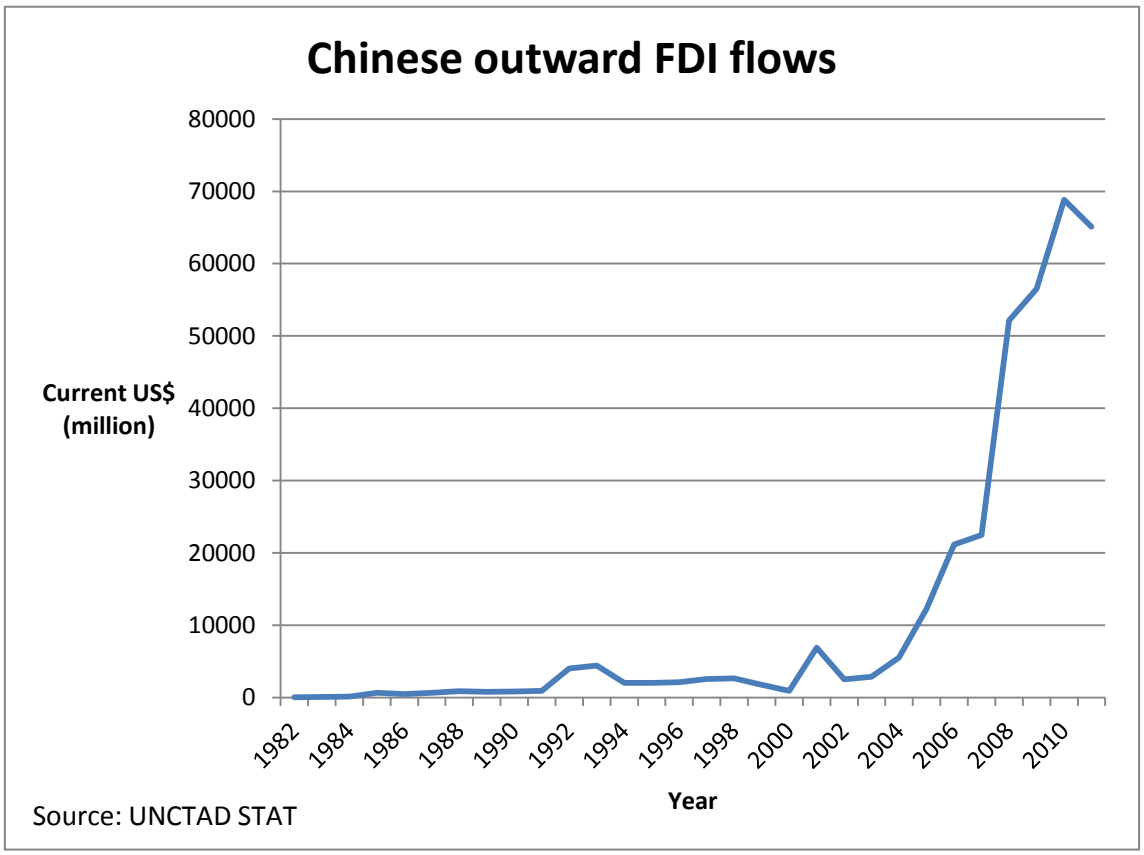


Source: UNCTAD, based on data from Financial Times Ltd, fDi Markets (www.fDimarkets.com).

[27]

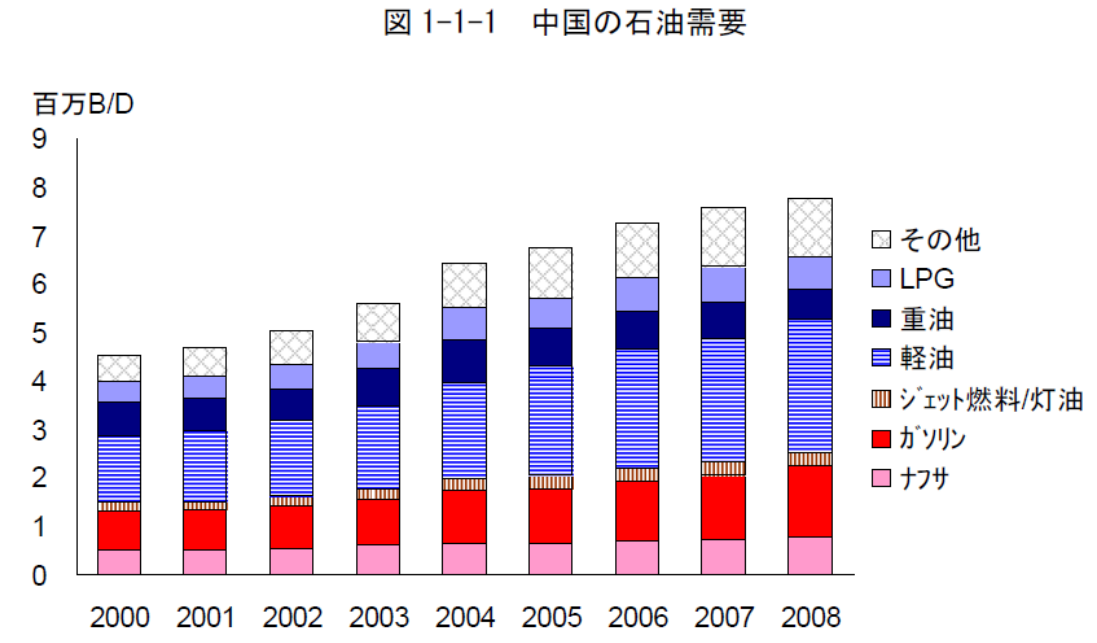
[27] UNCTAD (2012) P.41

Figure 5



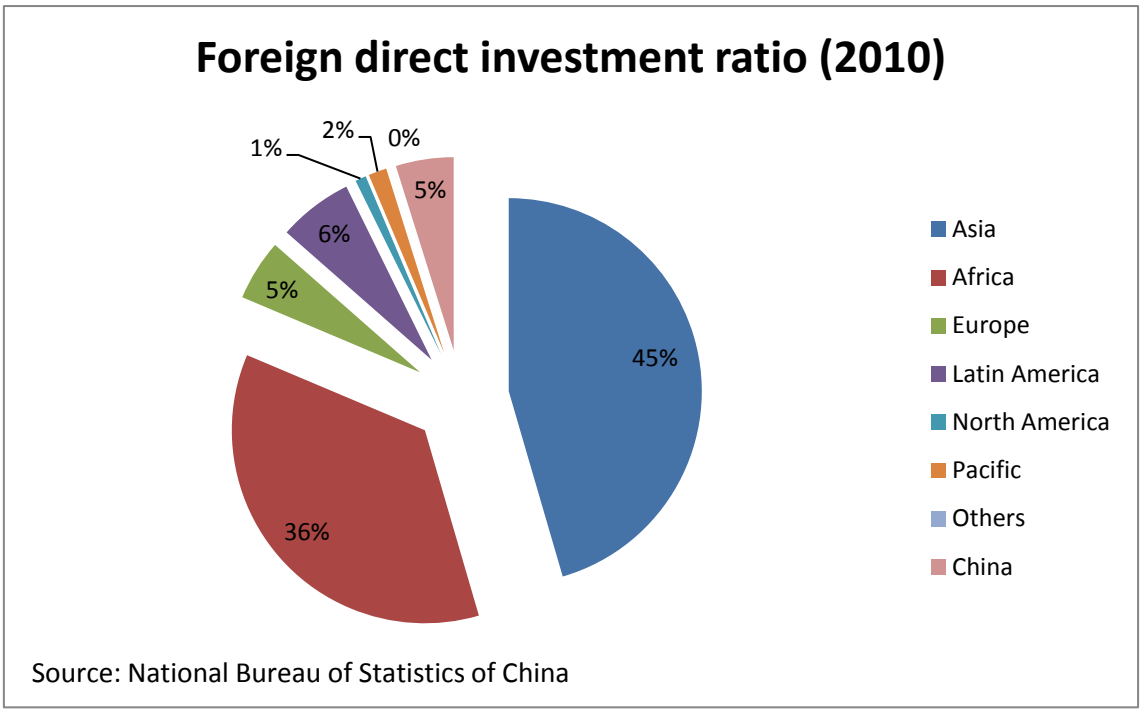
Source: UNCTAD STAT

Figure 6



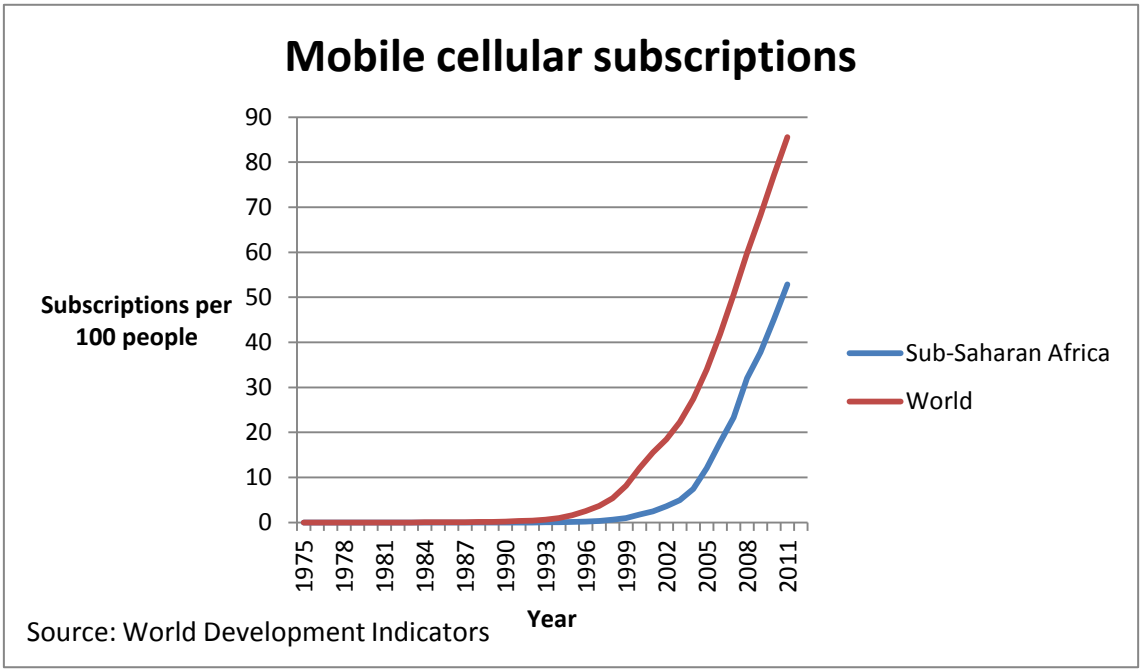
出所：IEA(2010). Annual Statistical Supplement with 2009 Data (2010 Edition). [28]

Figure 7



[28] 日本エネルギー経済研究所（2010）P.3

Figure 8



Source: World Development Indicators

7.2 Tables

Table 1

Regression Number	1	2	3	4	5	6	7	8
Independent Variable	Coefficient (t-value)							
ln(INITIAL GDP)	2.395** (2.256)	5.798*** (3.654)	5.206*** (3.270)	4.528** (2.547)	5.889*** (3.584)	5.813*** (3.612)	5.763*** (3.512)	5.987*** (3.647)
FDI	0.545*** (6.632)	0.519*** (6.361)	0.104 (0.387)	0.608*** (6.079)	0.496*** (4.220)	0.503*** (5.383)	0.517*** (6.062)	0.516*** (6.238)
CHINA	-1.156 (-0.494)	-0.330 (-1.023)	-0.432 (-1.346)	-0.274 (-.0.857)	-0.353 (-1.046)	-0.687 (-0.675)	-0.256 (-0.356)	-0.495 (-1.112)
TRADE	-0.031** (-2.528)	-0.025* (-1.954)	-0.021 (-1.629)	-0.015 (-1.056)	-0.026* (-1.941)	-0.025* (-1.888)	-0.025* (-1.781)	-0.027* (-1.997)
ODA	0.002 (0.061)	0.031 (0.796)	0.054 (1.347)	0.031 (0.817)	0.323 (0.823)	0.032 (0.822)	0.030 (0.783)	0.033 (0.838)
HUMAN CAPITAL		-0.018 (-1.072)	-0.036* (-1.816)	-0.018 (-1.095)	-0.018 (-1.065)	-0.024 (-1.020)	-0.018 (-1.059)	-0.018 (-1.075)
FINANCE		0.014 (1.096)	0.013 (1.050)	0.036* (1.853)	0.014 (1.055)	0.013 (0.996)	0.017 (0.601)	0.014 (1.057)
MOBILE		-0.126** (-2.691)	-0.100** (-2.052)	-0.089 (-1.667)	-0.135** (-2.374)	-0.129** (-2.680)	-0.125** (-2.574)	-0.146** (-2.432)
FDI*HUMAN CAPITAL			0.005 (1.611)					
FDI*FINANCE				-0.007 (-1.484)				
FDI*MOBILE					0.002 (0.279)			
CHINA*HUMAN CAPITAL						0.007 (0.370)		
CHINA*FINANCE							-0.003 (-0.117)	
CHINA*MOBILE								0.014 (0.544)
R^2 adjusted	0.596	0.692	0.706	0.703	0.682	0.683	0.682	0.685

Observations	43	41	41	41	41	41	41	41

[Notes for Table 1]

All regressions have a constant term. T-values are in parentheses. All the regressions numbered 1 to 8 used the literacy rate proxying for HUMAN CAPITAL and M2 proxying for FINANCE.

*: significant at 10% level

**: significant at 5% level

***: significant at 10% level

Table 2

Regression Number	9	10	11	12	13
Independent Variable	Coefficient (t-value)				
ln(INITIAL GDP)	6.046*** (3.372)	6.172*** (3.366)	5.575*** (3.514)	4.752*** (2.848)	4.634** (2.707)
FDI	0.510*** (5.062)	0.504*** (5.091)	0.499*** (6.241)	0.552*** (6.094)	0.514*** (5.854)
CHINA	-0.343 (-1.000)	-0.368 (-1.047)	-0.274 (-0.839)	-0.117 (-0.361)	-0.085 (-0.249)
TRADE	-0.031** (-2.235)	-0.031** (-2.279)	-0.020 (-1.566)	-0.036*** (-2.822)	-0.029** (-2.316)
ODA	0.058 (1.033)	0.060 (1.084)	0.030 (0.786)	0.011 (0.267)	0.015 (0.369)
HUMAN CAPITAL (Secondary school enrolment)	0.028 (0.752)	0.031 (0.918)			
HUMAN CAPITAL (Literacy rate)			-0.018 (-1.059)		
HUMAN CAPITAL (Primary school enrolment)				0.025 (1.071)	0.018 (0.776)
FINANCE (M2)	0.002 (0.097)			0.021 (1.479)	
FINANCE (Private credit)		-0.006 (-0.315)	0.012 (0.758)		0.013 (0.795)
MOBILE	-0.153** (-2.100)	-0.151** (-2.079)	-0.127** (-2.587)	-0.129** (-2.623)	-0.127** (-2.432)
R^2 adjusted	0.683	0.684	0.686	0.644	0.628
Observations	34	34	41	42	42

[Notes for Table 2]

All the regressions have a constant term. T-values are in parentheses. Each regression is different from each other in that they use various patterns of data selection for controlling variables (described in parentheses).

*: significant at 10% level

**: significant at 5% level

***: significant at 10% level

8 Data Appendix

GDP per capita growth (annual %) as **GROWTH** is annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. (Source: World Development Indicators)

GDP per capita, PPP (current international $, log) as **ln(INITIAL GDP)** is the log of GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current international dollars. (Source: World Development Indicators)

Foreign direct investment, net inflows (% of GDP) as **FDI** is the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. In this paper, Chinese FDI is excluded. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP. (Source: World Development Indicators)

Turnover of economic cooperation with foreign countries or territories (% of GDP) as **CHINA** consists of *Contracted Projects with Foreign Countries*, *Service Cooperation with Foreign Countries* and *Overseas Design and Consultation Service*. (Source: National Bureau of Statistics of China)

Contracted Projects with Foreign Countries refer to projects undertaken by Chinese contractors (project contracting companies) through bidding process. They include: (1)overseas civil engineering construction projects financed by foreign investors; (2)overseas projects financed by the Chinese government through its foreign aid programs; (3)construction projects of Chinese diplomatic missions, trade offices and other institutions stationed abroad; (4)construction projects in China financed by foreign investment; (5)sub-contracted projects to be taken by Chinese contractors through a joint umbrella project with foreign contractor(s); (6)housing development projects. The business income from international contracted projects is the work volume of contracted projects completed during the reference period, expressed in monetary terms, including completed work on projects signed in previous years. (Source: National Bureau of Statistics of China)

Service Cooperation with Foreign Countries refers to the activities of providing technology and labour services to employers or contractors in the forms of receiving salaries and wages. Labour services providing by contractual joint ventures of Chinese statistics of service co operation with foreign countries. The business income of labour service co operation is the income in the form of wages and salaries, overtime pay, bonuses and other remuneration received from the employers during the reference period. (Source: National Bureau of Statistics of China)

Overseas Design and Consultation Service refers to projects with charges for technical services from overseas operators. It includes geographic and topographic mapping, geological resource prospecting and survey, planning of construction areas, provision of design documents, blueprints, materials on production process and techniques, as well as engineering, technical and economic consultation, and feasibility study, research and evaluation of projects. Also included under this category are the above-mentioned services of foreign-financed projects in China that are paid in foreign currencies. (Source: National Bureau of Statistics of China)

Trade (% of GDP) as **TRADE** is the sum of exports and imports of goods and services measured as a share of gross domestic product. (Source: World Development Indicators)

Net ODA received (% of GNI) as **ODA** consists of disbursements of loans made on

concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent). It is divided by GNI. (Source: World Development Indicators)

School enrollment, secondary (% net) as **HUMAN CAPITAL** is the net enrolment rate in all programmes of secondary schools. Total is the ratio of children of the official secondary school age who are enrolled in secondary school to the population of the official secondary school age. (Source: World Development Indicators)

Literacy rate, adult total (% of people ages 15 and above) as **HUMAN CAPITAL** is adult (15+) literacy rate (%). Total is the percentage of the population age 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations. This indicator is calculated by dividing the number of literates aged 15 years and over by the corresponding age group population and multiplying the result by 100. (Source: World Development Indicators)

School enrollment, primary (% net) as **HUMAN CAPITAL** is the net enrolment rate in all programmes of primary schools. Calculating method is the same as secondary one above. (Source: World Development Indicators)

Money and quasi money (M2) as % of GDP as **FINANCE** comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of money supply is frequently called M2; it corresponds to lines 34 and 35 in the International Monetary Fund's (IMF) International Financial Statistics (IFS). (Source: World Development Indicators)

Domestic credit to private sector (% of GDP) as **FINANCE** refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. (Source: World Development Indicators)

Mobile cellular subscriptions (per 100 people) as **MOBILE** are subscriptions to a public mobile telephone service using cellular technology, which provide access to the public switched telephone network. Post-paid and prepaid subscriptions are included. (Source: World Development Indicators)