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The Impact of Financial Crises on Foreign Direct Investment: Evidence from Developed Countries.

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by

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Abstract

The purpose of this paper is to analyze the impact of financial crises on foreign direct investment (FDI) activity. The paper will examine whether or not there is fire sale FDI in host countries during a financial crisis. Also, it explores the extent to which FDI inflows is affected by the occurrence of a financial crisis. The paper adds a detail about the types of financial crises. It is expected that different types of financial crises have varying effects on FDI inflows. Hence, financial crises are categorized into banking crisis, inflation crisis, and currency crisis. It is also expected that differing types of FDI have different reaction to financial crises, hence FDI inflows are distinguished between two groups including cross-border merger and acquisitions (M&A) and greenfield investment. The sample used in this paper is based on 23 developed countries across four economic regions for the period 1990-2010. The paper uses a panel data analysis to check the appropriateness and effectiveness of financial crises in the FDI regression model. The empirical results indicate that financial crises have strong negative effects on FDI activity in my sample. In particular, banking crisis and currency crisis are shown to reduce the value of FDI inflows, FDI stocks and greenfield FDI activities significantly, while inflation crisis has little impact FDI activity. I do not find evidence in supporting the fire sale FDI hypothesis in my sample. On the other hand, financial crises lead to large decline in the value of cross-border M&A.

Keywords: Foreign direct investment (FDI), Fire sale FDI, Financial crises, cross-border Merger and acquisitions (M&A)

Contents

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1. Introduction

The role of foreign direct investment (FDI) in the world market has been increasingly important. As can be seen from Figure 1 which presents the trends of FDI inflows in the world as well as in the developed and developing nations, the world FDI inflows have been increasing at a rapid rate since the early 1980s. Table A provides the actual data for FDI inflows from 1970 to 2010. During the period of 1980-2000, the world FDI inflows increased from 54.08 billion US dollars to 1,400.54 billion US dollars. The average growth rate is about 17% a year, compared with the average rate of 7% for world exports of goods and nonfactor services during the same time period (UNCTAD, 2000). Owing to the slowing of economic activity in major industrial economies and a sharp decrease in their stock market activities, global FDI inflows declined sharply since 2001, especially in the developed economies. Global FDI flows began to bottom out in 2003, and peaked at 2007 with FDI inflows of 1,975.536 billion US dollars. The global financial crisis occurred in 2008 driven down global FDI inflows again; however, it has been in the way of recovery since 2010 and rose by 17% to 1,524.422 billion US dollars in 2011. Furthermore, as indicated in Figure 1, developing countries are becoming increasingly attractive investment destinations and have attracted more than half of global FDI flow in 2010 for the first time (UNCTAD, 2010). Countries in developing regions are taking steps to improve the principal determinants influencing the locational choice of FDI. Compared with developed countries, developing countries have superior competitive advantages in both socio-economic

and business level. As a result, developing countries are now become the main

capital recipients, while developed countries are more likely to seek investment

opportunities in developing economies.

Figure 1: Trends of FDI inflows, annual, 1970-2010 (current US dollars in billions)
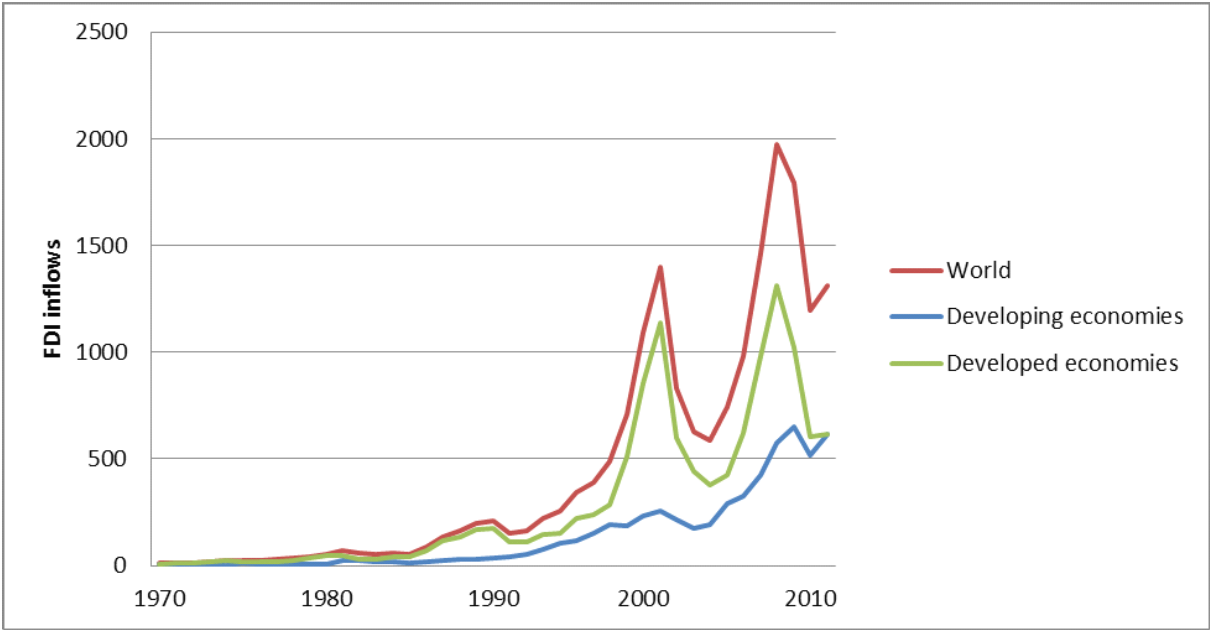
Source: United Nations Conference on Trade and Development.

Table A: Value of FDI inflows, annual, 1970-2010 (current US dollars in billions)

Year	World	Developing economies	Developed economies
1970	13.35	3.85	9.49
1971	14.28	3.63	10.65
1972	14.93	3.42	11.51
1973	20.65	5.18	15.47
1974	24.13	2.47	21.66
1975	26.57	9.71	16.86
1976	22.00	6.47	15.54
1977	27.14	6.99	20.15
1978	34.36	8.99	25.37
1979	42.29	8.51	33.79
1980	54.08	7.48	46.58
1981	69.57	24.05	45.51
1982	58.06	26.38	31.68
1983	50.27	17.57	32.68
1984	56.84	17.61	39.24
1985	55.87	14.19	41.66
1986	86.38	15.78	70.63
1987	136.64	21.79	114.84
1988	164.02	30.42	133.58
1989	197.28	30.73	166.53
1990	207.46	34.85	172.53
1991	154.07	39.83	114.04
1992	165.88	53.08	111.14
1993	223.32	76.74	143.43
1994	256.00	103.38	150.58
1995	342.80	116.21	222.48
1996	390.90	148.99	236.03
1997	487.85	192.11	285.39
1998	706.27	189.40	508.74
1999	1,091.44	230.71	852.12
2000	1,400.54	255.51	1,138.00
2001	827.62	216.87	601.24
2002	627.97	173.28	443.43
2003	586.96	190.12	376.81
2004	744.33	291.87	422.18
2005	980.73	327.25	622.63
2006	1,463.35	427.16	981.87
2007	1,975.54	574.31	1,310.43
2008	1,790.71	650.02	1019.65

2009	1,197.82	519.23	606.21
2010	1,309.00	616.66	618.59

The advantages of FDI have been identified by a large number of theoretical literatures in economics. Many of them reveal that FDI has a beneficial influence on economic development in the host countries. Urata (1999) indicated that FDI had led to the rapid economic development in East Asia since the mid-1980s. Also, Fan and Dickie (2000) claimed that FDI contributed significantly to the economic growth of the ASEAN-5 (Indonesia, Malaysia, Philippines, Singapore and Thailand) economies. Borensztein et al. (1998) stated that FDI activity can contribute more economic growth than domestic investments by transferring technology. However, Borensztein et al. (1998) provided further evidence that the increasing productivity resulted from FDI holds only when a minimum threshold stock of human capital is available in the host country. Alfaro et al. (2004) also claimed that FDI can only be beneficial to host countries with well-developed financial market. Besides the economic growth, other beneficial effects that have been cited mostly by economists are employment creation, transferring production technology and skill, increasing innovative capacity, improving productivity and competition, and enhancing access to foreign markets (Herman et al, 2004). To developing countries with low savings and investment rate, and therefore, low GDP per capita growth rate, one effective way to escape from the low level equilibrium trap is to attract more foreign financial capital by means of FDI (Hayami, 2001).

Moreover, as an important source of private external finance, FDI is perceived more

stable than other types of capital flows like portfolio investment or foreign bank lending (Osei et al., 2002). The reason is that FDI is motivated largely by the investors' long-term prospects for making profits in production activities that they directly control. Foreign bank lending and portfolio investment, on the other hand, are motivated by short-term considerations on immediate financial gains and investment decisions that can be affected by a number of factors like interest rate (UNCTAD, 2000). Thus, foreign bank lending and portfolio investment are more volatile than FDI. This difference has been highlighted by the phenomenon where some financial crises are marked by the simultaneous outflow of foreign portfolio investment and an inflow of FDI. The best studied instance of such an episode may be the Asian financial crisis of 1997-1999. In 1997, FDI inflows to some of the affected countries, including Indonesia, South Korea and Thailand, remained positive and declined only slightly for the group, whereas bank lending and portfolio investment flows declined sharply and even turned negative (Athukorala, 2003). Achayra et al. (2011) studied the behavior of FDI and foreign portfolio investments and found that in countries influenced by the Asian financial crisis, there is a strong correlation between the two types of capital flows. Achayra et al. (2011) showed that the correlation was positive during non-crisis periods and negative during the crisis, which explains the Asian financial crisis had been represented by a modest decline in FDI. Moreover, by using a panel dataset of 66 countries during the period of 1970-2003, Levchenko and Mauro (2007) found that FDI flows are less volatile than portfolio debt flows and bank lending. This has led to the fire-sale FDI

hypothesis where FDI inflows tend to increase during a financial crisis (Acharya et al., 2011). However, Urata (1999) argued that financial crises can adversely affect FDI because of the increasing deteriorated and uncertain domestic social-economic environment resulted from the crisis. Actually, the surge of FDI flows during previous financial crises, the Asian crisis for example, has been associated with an increase in merger and acquisition (M&A) activities. In contrast, the significant decline in M&A activity during 2008-2009 has resulted in a large decrease in global FDI inflows during the current financial crisis (UNCTAD, 2010). Different behavior of M&A activity during the two distinct financial crises may to some extent illustrate that financial crises with differing natures have potentially differential effects on FDI, and different types of FDI may react differently to financial crises.

This paper is an attempt to shed light on the fire-sale FDI hypothesis and the relationship between financial crises and FDI activity. Typically, I focus on the developed economies since most empirical literatures concerning the relationship between FDI inflows and financial crisis have laid attention on developing and emerging economies. The main objective of this paper is to analyze the impact of financial crises on FDI activity within the sample of developed countries. Typically, I examine whether or not there is a fire sale FDI in the developed countries during a financial crisis, and answer the question of to what extent the FDI inflows are influenced by the occurrence of a financial crisis. The paper adds a detail about the types of financial crises. Particularly, it is expected that different types of financial crisis have varying effects on FDI inflows. Hence, financial crises are categorized

into banking crisis, inflation crisis, and currency crisis. I also expect that differing types of FDI have different reaction to financial crises, and I divided FDI inflows into two groups including M&A and Greenfield investment. This paper is expected to contribute to the literature by investigating the fire sale FDI hypothesis and the relationship between FDI and financial crises under the consideration that different type of FDI response differently to differing types of financial crises. Apart from Bogach and Noy (2012) who have included the similar typologies of financial crises and FDI in their empirical research in the developing countries, this paper may be the pioneer for such a study in developed economies. The results of my empirical analysis indicate that financial crises have strong negative effects on FDI activity in my sample. In particular, banking crisis and currency crisis are shown to reduce the value of FDI inflows, FDI stocks and greenfield FDI activities significantly, while inflation crisis has little impact FDI activity. I do not find evidence in supporting the fire sale FDI hypothesis in my sample. On the other hand, financial crises lead to a large decline in the value of cross-border M&A.

The rest of this paper is structured as follows. In section 2, the terms of the key words in this paper will be clearly defined and discussed. Also, hypotheses towards the central issue are given. Section 3 provides a brief overview of previous studies on the impact of financial crises on FDI. Section 4 presents data as well as data sources. Section 5 outlines the specification of empirical methodology. Section 6 provides the empirical results and suggests the relationship between financial crises and FDI. Section 7 concludes the paper.

2. Concepts, trends and hypotheses

The term financial crises can be defined as a disturbance to the financial markets in which situation financial institutions and assets lose their value rapidly (Charles, Kindleberger and Aliber, 2005). The history of financial crises can be traced back to sovereign defaults, also known as external debt crisis, and private bank failures, which were the main forms of the crisis prior to the 18th century (Reinhart and Rogoff, 2010). Then financial crises were featured with both domestic and external debt default after the 18th century. Since the 20th century, financial crises have been a regular phenomenon. Many economists have come up with attention on the impact of financial crises on the economic environment. Economic literatures on this topic, mainly from the theoretical perspective, began to develop rapidly during the last decades. The literatures initially investigated the currency crisis in the 1970s, then banking crisis, inflation crisis, debt crisis of 1980s, and finally the sudden stops in capital flows in the 1990s (Bogach and Noy, 2012). Krugman (1979) suggested that it is necessary to understand the causes and effects of financial crises when formulating a clear hypothesis on the impact of financial crises on FDI, in which case, I investigate the theoretical mechanisms modeling crises firstly.

2.1 Fire sale FDI

Financial crises occurred in recent decades have been characterized by a resilient FDI in a number of host countries. Acharya and Shin (2011) defined such a resilience of FDI flows during financial crises as fire sale FDI. More specifically, fire sale FDI occurs when a sudden decline in the domestic price, combined with greater

access to finance by foreign investors, leads to bargain sales of domestic assets to foreign buyers, typically by means of cross-border M&A (Poulsen and Hufbauer, 2011). Among the empirical studies that examine fire sale FDI, Calderon and Didier (2009) had given rise to a specific perspective. The authors argued that when financial crises circumscribed mainly to the emerging market, foreign investors in developed market were not affected by liquidity constraints during these episodes and still have access to financial resources. Hence, they can take advantage of cheaper investment opportunities in financially-constrained domestic markets. Consequently, there is an increase in foreign acquisitions in crisis-affected countries. Indeed, the phenomenon has been observed in a number of emerging markets. For instance, affected by the Asian financial crisis of 1997-1999, the average number of M&A deals per quarter had increased by around 50% to 60 in Latin America countries (LAC) during the second half of 1998 (Calderon and Didier, 2009). A similar pattern was observed in Eastern Europe after the Russian crisis in the third quarter of 1998, where the average number of M&A deals had been increased by 100% in six months after the break out of the crisis (Calderon and Didier, 2009). Evidence can also be found in the Association of Southeast Asian Nations (ASEAN) region during the current global financial crises of 2008-2012 where FDI inflows remained positive although portfolio flows turned significantly negative during the period (UNCTAD, 2012).

Even though the fire sale FDI is evidenced in some countries during financial crises, it may not share the similar pattern when other nations or financial episodes are

concerned. During the 2008-09 global financial crises, for instance, the number of M&A deals in LAC has fallen by nearly 60%, from around 105 deals per quarter in 2007 to only 44 in 2008 (UNCTAD, 2010). The value in cross-border M&A also decreased from about 11.6 billion US dollars in the second quarter of 2007 to only 4.6 billion US dollars in the last quarter of 2008 (Ibid). Besides the Latin American countries, similar pattern was observed in other regions. For example, the number of cross-border M&A deals declined by 25% in East Asia and nearly 70% in Eastern Europe between the second quarter of 2007 and the fourth quarter of 2008 (Ibid). In contrast with the Asian financial crisis, the 2008-09 financial crisis, which is originated in the United States, was a worldwide financial meltdown. Calderon and Didier (2009) claimed that when the financial crisis spread to the rest of the world, both the owners of firms in developing countries and the potential foreign buyers in developed countries have been affected by the severe liquidity constraints. Consequently, FDI inflows in some emerging economies decreased significantly during the crisis. A similar pattern should be observed in the United States since the main inward FDI flows to the United States comes from developed countries. It has been confirmed by the decreased number in cross-border M&A deals which declined by nearly 70% in the quarter of 2008 compared with the second quarter of 2007 (Contessi and Pace, 2011).

The opposite patterns of FDI inflows during the two different financial crises periods illustrate that whether or not fire sale FDI occurs during a financial crisis should have relation with the nature of this particular financial turmoil. Hence, it is

expected that fire sale FDI may not be observed if the mainly source countries have been involved in the financial crisis.

2.2 Types of financial crises and their impacts on FDI

As acknowledged by Krugman (2002, pp.1), "there is no generally accepted formal definition of a currency crisis, but I know them when I see them". Generally, definitions of currency crisis can be categorized into three classes. The first class which is specified in a narrow way defines a currency crisis in terms of nominal currency depreciation. One example of such a definition appears in the work of Frankel and Rose (1996) who defined a currency crisis as a nominal depreciation of a currency of at least 25 percent and at least 10 percent increases in the rate of depreciation. The second class defines a currency crisis in terms of changes in real exchange rates and foreign reserves. For instance, Glick and Hutchison (2011) defined a currency crisis as a speculative attack on the foreign exchange value of a currency. Hence, currency crisis defined in this way includes both the large depreciation and speculative attacks that are eventually warded off by the authorities (Soliman, 2005). The third class, used in the work of Kaminsky and Reinhart (1996), confirms the occurrence of a currency crisis when the affected country itself or an international financial institution and reputable financial agencies report the crisis. Compared with the other two classes of definitions, the third class avoids the setting of arbitrary limit of devaluation. As a reason that the data concerning currency crisis is collected from the database provided by Reinhart and Rogoff (2010), in the following part of empirical research I employ the

definition introduced by Reinhart and Rogoff (2010) who define a currency crisis as the situation in which the annual depreciation versus the US dollar is 15% or more.

The consequences of a currency crisis are usually a sharp depreciation and can affect foreign firms in different ways (Soliman, 2005). Athukorala (2003) identified three ways in which the collapse of a currency can exert positive effects on FDI. Firstly, massive depreciation reduces domestic production costs since input prices have been lower if measured in foreign currency, in which case countries become more attractive for export-oriented foreign investments as the relative cheaper production factors. The second effect may be declined investment costs due to the reduced costs of the assets, as the demand decreases. Thirdly, the anti-crisis packages and new legislations in relation to foreign investment control are expected to create new opportunities for M&A activity. However, Soliman (2005) putted forward two ways in which a currency crisis can exert negative influences on foreign investments. Soliman (2005) argued that depreciation implies smaller revenue earned in the host country for foreign investors if measured in foreign currency, which has a negative effect on inward FDI. Moreover, the changes in one currency increase the volatility of foreign exchange markets and therefore the uncertainty of future foreign investment activities.

Besides the theoretical assertions on the impact of financial crises discussed above, some other researchers tend to study the link between financial crises and FDI by modeling the crises. Literatures regarding theoretical models of financial crises

come into three generations. The first generation model, best represented by Krugman (1979), emphasizes the inconsistency between the exchange rate commitment and the fiscal policy choice. When an economy with a fixed exchange rate regime runs government budget deficit continuously, the only way to finance the imbalance is to create money since the infeasibility of other measures including depleting reserves or borrowing indefinitely. Excess money creation results in a high inflation rate which is inconsistent with the fixed exchange rate peg. Therefore, the first generation model emphasizes the inevitability of crisis in a fixed rate regime. However, currency depreciation triggered by excess money creation is reflected in terms of nominal devaluation, the real exchange rate remains unchanged during this process. In this case, the incentives for inward FDI projects should not be affected by the currency crisis.

On the other hand, the second generation model of crisis, pioneered by Obstfeld (1994), stresses the multiple equilibria existed in fiscal policies and other macroeconomic objectives in the private sector. Under a currency crisis, authorities are forced to take steps to defend the currency devaluation (Glick and Hutchison, 2011). When policies implemented to defend an exchange rate target, such as raising the domestic interest rate, have negative effects on activities in the private sector, a speculative attack is likely to take place. Obstfeld (1994) argued that a currency crisis may occur even though the crucial fiscal disequilibria, stressed by Krugman (1979) in the first generation view, were absent, which has been evidenced in the early 1990s in Europe. Within the second generation view, the real

exchange rate has dropped, however, is expected to shifts in the future. This implies that a currency crisis may offer more incentives to FDI activities.

In the 1990s, a new round of financial crises, which had featured troubled local financial institutions and sudden reversals of short-term international capital flows, occurred in some emerging markets like Mexico, Asia and Russia (Chang and Velasco, 2001). Following the occurrence of these financial crises, the third generation model of crises was put forward to assign the trigger of financial crises, usually the banking crisis, on the distortions in financial structure and banking system, since previous models had failed to be consistent with the new features of the crises (Glick and Hutchison, 2011). Generally, a banking crisis is referred as the event in which a significant fraction of the banking sector is insolvent but remains open (Caprio and Klingebiel, 1996). Moreover, sever situation can lead to bank closure, merging or takeover (Laeven and Valencia, 2008). There are various versions of the third generation model. One crop of the theory, advocated by Chang and Velasco (2001), puts the role of international illiquidity at the center of the issue. Chang and Velasco (2011) defined illiquidity as a situation in which the liquidation value of the financial system's assets is insufficient to cover its short-term obligations. This model suggests the possibility of a banking crisis in an open economy within a Diamond and Dybvig (1983) type banking model, in which situation bank transfers part of liquid deposits in domestic and foreign assets into illiquid assets which cannot be readily converted into cash in the event of a bank run. The fear of insufficient collateral may lead to large capital outflow, which will

eventually trigger the real devaluation (Chang and Velasco, 2001). In this case, similar as the second generation model of crisis, the bank runs and the breakdown in the financial institution may entail new opportunities for FDI, and this has been witnessed in the Asian crisis of 1997-9.

Other third generation models highlight the effect of moral hazard-overborrowing generated by financial liberalization and government guarantees (Dooley, 2000; Burnside, Eichenbaum and Rebelo, 2004; Krugman, 2000). Dooley (2000) pointed out that implicit or explicit government guarantees induce banks to take excess foreign debt, resulting large private capital inflows into the country which always precedes the crisis. Krugman (2000) also argued that moral hazard can create overpricing of assets, and an endogenous policy regime in which implicit guarantees are maintained only if they are proved not to be too expensive can lead to self-fulling crisis. In these cases, plunging asset prices undermine banks. At the same time, the collapse of banks in turn ratifies the drop in the asset prices (Krugman, 2000). Krugman (2000) had cited this model as a justification to make sense of fire sale FDI. This implies that devaluated assets resulted from over-investment are also expected to attract more FDI.

Definition concerning inflation crises also varies across different empirical papers. For instance, Bruno and Easterly (1995) proposed a nonparametric definition in their work which defines a country as in an inflation crisis when the inflation rate is above 40 percent. In this paper, I follow Reinhart and Rogoff (2010) in defining an

annual inflation rate of 20% or higher with an economy as inflation crisis, also known as exchange rate crisis. Theoretical models with respect to inflation crisis emphasize a rapid increase in the money supply and velocity of money as the root causes of crisis (Bruno and Easterly, 1995). In an inflation crisis, the nominal price level within a specific economy increases rapidly if it is measured in domestic currency, whereas the real price level remains unchanged if it is measured in foreign currency (Ibid). Therefore, similar as the first generation model of crisis, it is expected that inflation crisis has little incentives for foreign investors to enter into domestic market.

On the other hand, previous studies examining the influence of inflation rate volatility on FDI inflows argue that inflation rate can be an indicator of economic and political condition in the host country and should discourage FDI inflow. Particularly, low inflation is regarded as a sign of internal economic stability, whereas high inflation means the failure of the government to balance its budget and the lack of effective monetary policy conducted by the central bank (Akinboade, Siebrits and Roussot, 2006). In this case, currency crisis is expected to have a discouraging effect on attracting foreign investments.

Similar to other financial crises, the definition of debt crisis varies over time and different institutions. One common view on the definition says that a debt crisis refers to the failure of government to meet a principal or interest rate payment on the due date (Reinhart and Rogoff, 2010). Unfortunately, theoretical literatures on

the effects of debt crisis have not been well established (Rose, 2005; Bogach and Noy, 2012). As a result, it is hard to characterize the influences of the debt crisis on the international level.

In fact, the occurrences of various types of financial crises are not independent with each other; on the other hand, they interact with each other generally. For instance, in some circumstance, a currency crisis can lead to a banking crisis, and vice versa (Glick and Huthison, 2011). It seems that it is impossible to qualify the impact of financial crises separately. However, I follow Bogach and Noy (2012) to control for the type of crisis when doing empirical research.

2.3 Types of FDI and their vulnerability to financial crises

Referred again to Figure 1 where trends of FDI inflows in developed and developing countries are presented, FDI inflows to developed countries have accounted for majority share in total FDI inflows. Moreover, there is an one-to-one relationship between the trends of FDI inflows in the world and the developed countries since the two series indicators seem to behave in a similar pattern. As can be seen from the figure, both FDI inflow in the world and in developed countries have been witnessed peaks in 2000 and 2007. When FDI inflows in the world decreased, an immediate and significant decline in the developed countries can be observed. On the other hand, Figure 1 indicates that the trend of FDI inflow in the developing countries is relatively constant and has little correlation with the world FDI inflow during the entire period under consideration. However, with the increasing

importance of FDI inflows to developing countries, the relationship between the total FDI inflows and FDI inflows in developing countries is expected to be closer. Also, the competition between developed and developing countries is expected to be increasingly intense in attracting FDI.

As have been observed in the last section, financial crisis caused by different factors may lead to different consequences in the domestic market, therefore, different incentives for international investors. Additionally, I expect that the responses of FDI to financial crises vary across different forms of foreign investment. I characterize FDI into two types, which are cross-border M&A activities and greenfield FDI, according to the differing time horizons. Cross-border M&A and greenfield FDI are two different entry modes for FDI. Generally, cross-border M&A refers to a market access mode through acquiring an existing firm in the host country, whereas greenfield FDI involves a new subsidiary establish (Calderon, Loayza and Serven, 2004). Compared with greenfield FDI, M&A should be less time consuming since it just a transfer of existing assets from local firms to foreign ones. Different time horizons are expected to explain the differing attractiveness of the two FDI entry modes during a financial crisis. Typically, when a crisis involved a real depreciation is predicted to be short-lived, it is more likely to observe a M&A boom. On the other hand, the incentives for greenfield FDI are expected to be less since it entails a longer-term prospects in the future.

3. Literature review

3.1 Literatures relating to the evolution of FDI in recent financial crises

Even though a large number of empirical literatures have been developed to study the relationship between financial crises and FDI, most of them tend to examine the pattern of FDI activity during one particular financial crisis such as the Asian financial crisis of 1997-1999 and the current global financial crisis of 2008-2012. The findings concluded from these financial crises contribute significantly to the understanding of the relationship between financial crises and FDI activity. However, it is hard to classify some of the financial crises into any particular type of crisis. For instance, some researchers regard the Asian financial crisis as an example of a currency crisis, while others regard it as the banking crises. As a result, I suppose these empirical findings have multiple implications on the issue of interest. For example, the results regarding the Asian financial crisis reflect the correlation between FDI and the currency crisis as well as the banking crisis.

Among empirical studies on the relationship between financial crises and FDI, most of them are related to the Asian financial crisis. The Asian financial crisis, which broke out in Thailand in March 1997, leads to great damage to Asian economies. Nevertheless, the Asian financial crisis impacted the economies of Asian countries differently. For example, Thu (1998) investigated the impact of the Asian financial crisis on FDI inflows in Vietnam and concluded that foreign investments in Vietnam had been negatively affected during the crisis. In his paper, the author revealed that Vietnam could not escape from the influences of the Asian financial crisis since

the main FDI source countries for Vietnam were in the region of Asia-Pacific. Thu (1998) presented related evidence on the empirical statistics which indicated that the amount of licenses granted was declined compared with the amount in 1996 and the realization of existing licensed projects was also delayed. However, Thu (1998) pointed out that the Asian financial crisis had helped to improve the investment environment by forcing the government to make structural reforms which are regarded as a key factor in attracting foreign investors to invest abroad. Empirical results achieved by Wie (2006) also indicated that financial crises have a negative effect on FDI activity. Through the examination on the value of FDI and investment climate surrounding the Asian financial crisis in Indonesia, Wie (2006) found that both domestic investment and FDI dropped dramatically after the crisis which was largely because of the deteriorating investment climate.

On the other hand, some economists have got opposite results concerning the behavior of FDI activity around financial crises in the developing countries. For instance, Athukorala (2003) investigated FDI during the Asian financial crisis in East Asia. After the examination on FDI policy and overall investment climate during the crisis in the five influenced countries (Thailand, Malaysia, Indonesia, Korea, and the Philippines), the author found that FDI was relatively stable during the crisis compared to other forms of capital inflows like portfolio investment and foreign debt, even though a modest decline in the immediate aftermath of the crisis. A similar investigation has been conducted by Cheong (2006) in the same five countries and observed that exporters performed better than local non-exporting

firms during the crisis in terms of sales, profits and operating capacity. The author also found that firms with increased FDI were companied by an increase in the assets. The stable character of FDI flows was also confirmed by the works of Loungani and Razin (2001), as well as Kim and Hwang (2000).

Following the phenomena of increasing FDI activity during the Asian financial crisis, that is the fire sale FDI, some empirical researches tend to investigate the reasons behind it. For example, Acharya, Shin and Yorulmazer (2011) employed an agency-theoretic framework for the fire sale FDI phenomenon and found that transfers of ownerships to foreign firms, including inefficient ones, at fire sale prices were possible during financial crises. The authors further observed that these stakes were subsequently re-sold, or 'flipped' back to local investors once the crisis abated. Aguiar and Gopinath (2005) also tried to find evidence to support the hypothesis that liquidity constrain was equally consistent with an inflow of foreign capital in the form of M&A. Their empirical results showed that the effect of liquidity (represented by cash flow, cash stock and sales) on the probability of being acquired changed significantly during the crisis year; while high cash flow and sales in the non-crisis year implied a lower probability of acquisition. In particular, the authors found that the decline in firm liquidity between 1996 to 1998 can account for 25 percent of the observed increase in the M&A activity in the tradable sectors.

Literatures with respect to financial crises and FDI in developed countries are limited. Some of them had focused on outward FDI in Japan during the Asian

financial crisis and are consistent with the view that the crisis had a discouraging effect on Japanese FDI activity. Particularly, Urata (1999) found that the volume of Japanese FDI to a number of Asian markets declined in the latter half of 1997. By using panel data of Japanese FDI flows to nine dynamic Asian economies during 1987-2008, Takagi and Shi (2011) also found that Japanese FDI was affected by the Asian financial crisis. Moreover, Edgington and Hayter (2001) focused on the behaviour of Japanese FDI in the manufacturing sector and observed a decline in the flows of Japanese FDI into Asia. Nevertheless, Edgington and Hayter (2001) argued that a decline was just observed in the short run, in the long run the volume of the overall Japanese FDI held steady during the Asian financial crisis.

Besides the Asian financial crisis, other financial crises happened in recent decades have been studied. Lipsey (2001) investigated the evolution of FDI in Mexico before and after the 1994 Mexican crisis. Lipsey (2001) highlighted that the volume of FDI in Mexico had doubled between the period of 1992-1993, but they decreased by 15 percent during the crisis year of 1994. The author also pointed out that the portfolio investments fell by 75 percent in the same time which indicated that FDI was less volatile than portfolio investments. On the other hand, Graham and Wada (2000) got opposite conclusion on the behavior of outward FDI during the Mexican crisis in the region of the United States. The author claimed that FDI inflows from the United States remained stable during the crisis, even though the whole volume of FDI inflows in Mexico declined modestly. Besides the Mexican crisis, Lipsey (2001) also analyzed the behavior of FDI during the Latin American currency crisis of 1982 and

found that FDI inflows to Latin America declined during the crisis time but remained positive.

Unlike the Asian financial crisis, the ongoing financial crisis is characterized by rapid contagion to all world countries, the high occurrence speed, different intensities over time and different components or regions (Milesi-Ferretti and Tille, 2010). The current crisis was originated from the sub-prime crisis in the United States which has damaged the entire financial system of America and then expanded to non-financial sectors worldwide. Qualitative, as well as quantitative empirical researches have been conducted to examine the impact of the global financial crisis on FDI activity. One example of qualitative literatures is the survey conducted by the United Nations Conference on Trade and Development (UNCTAD) (2008) regarding global investment prospects in the current global financial crisis. The survey indicated that multinational corporations are becoming more cautious about future FDI because of the crises. The results also showed that only 21 percent of corporations in 2008 expect an increase in the expenditure for foreign investments over the next three years, compared with 32 percent in 2007.

Another report made by UNCTAD (2010) revealed differential patterns of FDI inflows in developed and developing countries at the beginning of the crisis. In 2008, the FDI inflows in developed countries declined by 30 percent. In contrast, developing countries attracted more FDI inflows which were 17 percent higher respecting to 2007. Nevertheless, both developed and developing countries

experienced a decline in FDI in 2009 and thereafter. The report further investigated the reasons for the deteriorated foreign investment environment and concluded that factors, including the global financial crisis, the decline of corporate profitability, reduction of the stock market, reducing global demand and funding capabilities due to increasing cost of credit, had led to the decrease in global FDI.

Some literatures emphasized on the dynamic of FDI during a crisis in some developing economies. For example, Mamata (2011) tried to analyze the impact of the global financial crisis on FDI flows in the Indian real estate sector. By using the secondary data from 2002-2010, the author observed that the crisis had an adverse effect on the development of the housing sector in India.

Other literatures tend to examine the reaction of FDI activity to global financial crisis by focusing on a group of economies. For instance, Ucal et al. (2010) had employed a sample of developing countries in their empirical research. By using panel data of 148 developing countries during the period of 1995-2007, Ucal et al. (2010) analyzed the influence of financial crisis on FDI inflows and concluded that the current financial crisis exerted a downturn impact on FDI inflows.

Some other literatures examined the role of FDI in affecting micro-economic responses to any particular financial turmoil. For instance, Alfaro and Chen (2010) studied how multinational companies around the world response to the current global financial crisis relative to their local competitors by emphasizing on the role of FDI in determining micro-economic performance. Particularly, the authors

explored three distinct channels through which FDI can affect companies' performance including production linkages, financial linkages and multinational networks. By using a worldwide database that keeps recordings for more than 12 million companies before and after 2008, the authors' analysis showed that because of the considerable heterogeneity in the role of FDI, multinational companies performed better than the local ones during the recent financial crisis, even if during normal periods, no major differences were found.

3.2 Literatures relating any particular type of financial crisis

As have been discussed in previous part of this paper, theoretical assertions on currency crisis give rise to a bidirectional effects on FDI activity. Indeed, empirical literatures on currency crisis and FDI activity yield mixed results. The most and best studied example should be the Asian financial crisis. Moreover, some researchers have conducted an investigation on the basis of a bigger historical dataset. For example, Soliman (2005) examined the effect of the currency crisis on FDI activity in emerging market. By using an unbalanced panel of 48 developing countries from 1966-2000, the author analyzed the sensitivity of three measures of the United States outward non-bank FDI (FDI stock, affiliate sales, and the number of affiliates) to the currency crisis in 21 emerging markets. Soliman (2005) suggested that the currency crisis did not seem o have a negative effect on FDI during crisis periods. The author had found some evidence that a currency crisis may boost FDI activity in the crisis economy and stressed the stability of FDI activity relative to other types of foreign capital flows. On the other hand, some researchers found mixed results.

For instance, Rydqvist (2005) analyzed the issue that to what extent FDI inflows were affected before, during and after when a currency crisis hits the country. Typically, the author employed a sample of countries with mixed wealthy status, including both the developed and developing countries. Through the examination on the data collected from 1980 to 2000, the theoretical hypothesis which stated that a currency crisis influences FDI inflows was rejected by Rydqvist's (2005) empirical results. Rydqvist (2005) found that a currency crisis can have both positive and negative effects on FDI inflows for the sample of countries. Furthermore, the results indicated that there was no similarity in regions or year of occurrence of the currency crisis.

Some other researchers study the impact of economic crises on FDI inflows from which I can have an insight into the association between FDI inflows and any particular type of financial crises. For example, Ezirim and Muoghalu (2006) attempted to explain how and to what extent investment burden is influenced by exchange rate conditions and external debt crisis in Nigeria. In the light of international oil prices movements, the authors used four foreign investment models to investigate the relationship between foreign investment income remittances and predictors such as exchange rates and external debt burden in the international markets. The authors found that foreign investment burden was significantly and positively affected by the external debt crisis, while significantly and negatively influenced by the currency crisis and international oil prices. Blonigen (1997) provided further evidence for the association between the

currency crisis and the exchange rate. Blonigen (1997) predicted his study on the argument that exchange rate movements may affect acquisition FDI because acquisition activities involve firm-specific assets such as technology and managerial skills transferring across many markets, which can rise or decline in value and generate returns in currencies other than that used to purchase them. By using the data on Japanese mergers and acquisition FDI into the United States over three digit SIC industries during the period of 1975-1992, Blonigen's (1997) estimation results strongly supported the proposition that real dollar depreciations had made Japanese acquisitions more likely in American industries, particularly those that have firm-specific assets. In other words, currency crisis in the host countries resulted from a real depreciation in domestic currency tends to attract more foreign acquisitions and allow a fire sale of such transferable assets to foreign firms. Other researchers including Froot and Stein (1991), as well as Klein and Rosengren (1994) have found that devaluation in local currency leads to a positive 'wealth effect' that generates more attractiveness for foreign investors to take over domestic assets at lower foreign currency level.

However, the impact of currency crisis may largely differ from that of regular exchange rate movements. As identified by Soliman (2005) that the currency crisis may result in large damage to the overall performance of the economy, domestic asset prices, banking and financial sectors and may lead to regulatory changes, which do not necessarily follow currency devaluation.

Compared to currency crisis, empirical literatures regarding the impacts of inflation and banking crises on FDI are quite limited. Moreover, most of the papers investigate the relationship between inflation rates movements and foreign investment activity. For example, Kiat (2008) tried to analyze the effect of inflation on FDI and its relationship with economic growth. By using a sample of 29 countries including both developed and developing countries from 1981 to 2007, the empirical results of Kiat (2008) proved a negative relationship between inflation rate and FDI inflows in both developed and developing economies. The finding was further evidenced from the work of Udoh and Egwaikhide (2008). The authors examined the effect of exchange rate volatility and inflation uncertainty in FDI in Nigeria and found that both the two factors exerted significant negative effect on FDI during the period of 1970-2005 within Nigeria market. Moreover, Tapsoba (2012) investigated the issue about whether inflation targeting matters for attracting FDI into developing countries. Through the examination on panel data of 53 developing countries over the period 1980-2007, the author found that the treatment effect of inflation targeting on FDI was significantly positive. On the other hand, some researchers get opposite results. For instance, Omankhanlen (2011) argued that the inflation rate did not have a major impact on FDI inflows in the Nigerian economy.

Earlier studies of the relationship between financial crisis and FDI activity have been limited to either certain regions or type of financial environments. Quite a few of studies have been conducted in a thorough way. One example of the literatures

that have discriminated the differing reaction made by FDI to different type of financial crises is the work of Bogach and Noy (2012). In their paper, the authors distinguished the financial crises into eight types including inflation crisis, hyperinflation crisis, currency crash, banking crisis, systemic banking crisis, external debt crisis, domestic debt crisis, and stock market crash. Moreover, they divided FDI inflows into M&A and greenfield FDI, as well as vertical and horizontal FDI. Through the examination on a sample of 44 developing countries from 1987 to 2009, the authors found that financial crises have a strong negative effect on inward FDI. In particular, banking crisis, inflation crisis, hyperinflation crisis, and external debt crisis are shown to reduce the value of FDI inflows, as well as in horizontal, vertical FDI, and M&A. The effects of other types of crises including stock market crash, currency crisis, and domestic debt crisis on FDI inflows are insignificant. Another researchers that have considered the potential links between different types of crisis and FDI activity are Janus and Riera-Crichton (2012) who studied the interdependencies between domestic banking crisis and external financial crises, including currency and sudden stop crisis, by using a sample panel data including both developed and developing countries from 1980 to the last quarter of 2009. The authors further investigated the relationship between different crises and foreign investment in the home economy and found a negative effect of financial crises on FDI inflows in the home economy.

4. Data

As proposed by Blonigen and Wang (2005) and Noy and Vu (2008) that dataset including countries with varying wealth status is inappropriate in FDI studies since the contributional factors of FDI inflows vary across different income groups. Furthermore, few studies have been conducted to investigate FDI inflows to developed countries. The paper therefore will focus on developed countries.

To investigate the impact of financial crises on FDI activity, I use the panel data of the developed countries' inward FDI since panel datasets for economic research possess several major advantages over conventional cross-sectional or time series datasets (Hsiao, 2003). Firstly, panel data is said to give the researcher a large number of data points, increasing the degree of freedom and reducing the collinearity among explanatory variables, hence improving the efficiency of econometric estimates. Secondly, the use of panel data can model temporal effects without aggregation bias. In contrast, time series studies aggregate potentially heterogeneous individuals in each time series observation which may introduce the problem of aggregation bias, whereby behavior in the aggregate does not accurately represent the behavior at the micro level. Finally, compared with the cross-sectional data set, panel data can control for individual fixed effects. Within a cross section, the individual fixed effects are absorbed into the unobservable component of the model, which can cause statistical difficulties in estimation, particularly if these individual specific effects are correlated with observed characteristics.

The sample used in this paper is dictated by the availability of data on the value of cross-border M&A sales, which are quite limited prior to 1990. Hence, the paper focuses on the period of 1990-2010. Because that some records for the value of cross-border M&A are missing, the panel data used in this paper is unbalanced. The use of unbalanced panel data, however, has no influence in the estimation results (Balestra and Nerlove, 1966). The sample countries used in this paper are selected according to the developed countries list provided by UNCTAD (2012) and countries covered in the paper of Reinhart and Rogoff (2010) with regard to historical financial crises. Therefore, the paper focus on 23 developed countries which have experienced several significant financial crises in recent decades that have been well documented. The 23 developed countries are distributed across four different regions and are summarized in Appendix Table A.

4.1 Independent variables (FDI)

In view of the possibility, as discussed in the previous section, that different types of FDI may response differently to financial crises, it would be ideal to use FDI data disaggregated by time horizon, which are cross-border M&A and greenfield FDI. In particular, data on FDI inflows and stock, as well as the value of cross-border sales are collected through UNCTAD's online database. Following the practice of Caldderon et al. (2004), the value of greenfield FDI is constructed by subtracting cross-border M&A from FDI inflows. In the case where the value of cross-border M&A is missing, the value of greenfield FDI is recorded as none value. The definitions and data sources on FDI are provided in the Appendix Table B. Table 1

provides FDI statistics for the sample of 23 developed countries by type of FDI, decade and region. The value for the whole sample during the sample period is 9773.176692 billion of US dollars. The value for cross-border M&A is 5961.364 billion of US dollars and greenfield FDI is 3806.984648 billion of US dollars. It can be seen from the table that both the value of cross-border M&A and greenfield FDI experience a dramatic increase over the last 20 years. In particular, the value of cross-border M&A has increased from 1496.923 billion of US dollars in the 1990s to 4464.441 billion of US dollars in the 2000s. I also notice that the value of cross-border M&A is more than that of greenfield FDI which can be observed in all decades and regions.

Table 1: FDI statistics (in billions of US dollars at current prices and current exchange rates), 1990-2010

FDI inflows	Total	Cross-border M&A	Greenfield FDI
Totals	9773.176692	5961.364	3806.984648
By decade			
1990-1999	2674.202467	1496.923	1177.279467
2000-2010	7098.974226	4464.441	2634.533226
By region			
America (2)	3316.057587	2147.42	1168.637587
Asia (1)	86.249929	91.635	-5.385071
Europe (18)	6064.311597	3491.708	2572.603597

4.2 Dependent variables (Financial crises)

The data on financial crises was motivated by the work of Reinhart and Rogoff (2010) who have provided a comprehensive historical record on financial crises for 70 countries from 1800 to 2010. Following Reinhart and Rogoff (2010), financial crises are classified into five varieties including banking, currency, domestic and external debt, and inflation crises. As a reason that there is no debt crisis has been recorded by Reinhart and Rogoff (2010) during 1990-2010 in the sample countries, I only focus on banking, inflation and currency crises. Definitions and data sources on financial crises are provided in the Appendix Table B. Table 2 shows the financial crises statistics for the sample by type of financial crises and decade. It provides the number of distinct crisis episodes as well as the total number of years for each specific category. From the table, it can be noticed that banking and currency crises are more prevalent in developed countries than inflation crisis during the last 20 years. Particularly, developed countries experienced 29 distinct banking with an average of 3.7 years per crisis. Currency crisis also occurred 29 times in total but with an average of 1.2 years for each crisis. There is no inflation crisis occurred in the 2000s. In the period of 1990-1999, the number of distinct inflation crisis was 3 times in total with an average of 2.3 years in each crisis. Throughout the sample period, there is no apparent increasing or decreasing trend in the total financial crises frequencies in the developed economy even though the recent global financial crises.

Table 2: Financial crises statistics, 1990-2010

Financial crises	Total	Banking crisis	Inflation crisis	Currency crisis
Total number of distinct crisis episodes (total years in crisis)	61 (148)	29 (106)	3 (7)	29 (35)
By decade				
1990-1999	31 (75)	13 (51)	3 (7)	15 (17)
2000-2010	30 (73)	16 (55)	-	14 (18)

4.3 Control variables

In order to prevent any omitted variables from affecting the empirical results of the estimations, 13 control variables are introduced to control for broad socio-economic conditions in the host countries. Empirical researches towards the determinants of FDI are lack of general consensus. However, I cover six types of indicators, including market size and potentials, labor availability and cost, openness to international market, political environment, infrastructure, and geography, in this paper which have been discussed mostly in previous studies.

UNCTAD (2008) suggests that the aim of some foreign investors to invest abroad is mainly to seize the potential markets in developing countries and serve the host countries' consumers. Hence, it can infer that market size and market potentials in

host countries might be the major factors in attracting such type of foreign investors. Empirically, majority of relevant literatures have proved that FDI inflows are positively related to host countries' market size and potential (Nunnenkamp and Spatz, 2002; Wheeler and Mody, 1992; Jun and Sing, 1996). In this paper, market size and market potentials are measured by the host countries' nominal GDP per capita, taken from UNCTAD, and real GDP growth rate, taken from the World Bank's World Development Indicators (WDI).

Empirical research explaining the determinants of FDI points out that countries with large supply of skilled human capital attract more FDI, particularly in sectors that are relatively intensive in use of skilled labor (Scheider and Frey, 1985). Studies by Wheeler and Mody (1992) also showed a positive impact of labor cost on FDI inflow. I measure Labor availability as the total labor force which is taken from WDI. Because of data limitations, I follow Kiyota and Urata (2004) in using real GDP per capita as a proxy for the labor cost. The data set on real GDP per capita is taken from the online database of UNCTAD.

Trade policy reform in the host country is also said to be an important factor in attracting FDI (Lucas, 1993). Empirical research reveals that trade openness generally positively influences FDI inflows (Lucas, 1993; Root and Ahmed, 1979). In this paper, the degree of openness to the international market is measured by trade openness index which is taken from Penn World Tables (PWT), and export of goods and services which is taken from WDI.

The impacts of political risk and investment environment in the host country were found to be insignificant on FDI inflows by Wheeler and Mody (1992) and Singh and Jun (1995). On the other hand, Root and Ahmed (1979) and Schneider and Frey (1985) found that FDI inflow is significantly affected by the political strikes and regular constitutional changes in government. Korbin (1981) and Lim (2001) pointed out that the mixed results may result from the lack of reliable proxies for the qualitative phenomena like political stability. Nevertheless, it is expected that countries with instable political environment may increase the costs and risks to foreign investors and thus should negatively affect FDI inflow. In this paper, political environment is measured by political rights index and civil liberties index, both of which are taken from Freedom House.

The availability of infrastructure quality, especially electricity, water, transportation and telecommunication, is also an important determinant of FDI. Countries with better infrastructure tend to receive more FDI. Previous study by Wheeler and Mody (1992) shows a positive relationship between infrastructure facilities and FDI inflows. In this study, I follow Mottaleb (2007) using the number of telephone and internet users per 100 people as the measure of infrastructure. The data for the two variables are taken from WDI.

Geography is measured by total population and land area, which are taken from WDI. Theoretically, the role of population in FDI inflows is debatable among economists. One sort of thinking, proposed by Malthus (1992), argues that

countries with a large population are not expected to promote economic development and hence attract more FDI. On the other hand, Nagarajan (2007) believed that population growth was neutral or even positively affect economic growth since previous thinking did not consider the potential benefits of large labor force, vast skill base, technology, land, quality and productivity of production brought by large size of population. Aziz and Makkawi (2012) also pointed out that a large population may provide a large market for products and services. Empirically, Aziz and Makkawi (2012) had found a positive relationship between the population and FDI with a sample of developing countries. In this paper, I also expect that FDI is positively related to the size of population and land area in host countries.

Other economic indicator has been considered is the corporate tax, taken from the Organization for Economic Co-operation and Development (OECD). Theoretically, corporate tax is considered to be a factor influencing investors' decisions about the locations of their investments. However, empirical studies on tax effects present mixed results (Agostini, 2007). Some empirical literatures reveal that corporate tax has no impact on the investment location selection at all, whereas others have found a positive relationship between them (Carlton 1983; Luger and Shetty 1985; Hines 1996; Papke 1991). The list of control variables and the corresponding definitions and data sources is presented in the Appendix Table B.

5. Methodology

I suspect that there are unobservable time-invariant factors making a country attractive to foreign investment that are not included in the control variables, such as education, climate, culture, language, legal restrictions on FDI inflows. As a result, I use the panel data to capture the unobserved effect. A general specification for the panel data is:

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \sum_{p=1}^{s} \gamma_p Z_{pi} + \varepsilon_{it} \tag{1}$$

Where Y is the dependent variable, X_j are observed independent variables, Z_p are unobserved independent variables. The index i is represented as the unit of observation, t is the time period, and j and p are used to differentiate between the observed and unobserved independent variables. ε_{it} is a disturbance term assumed to follow an independent and identical distribution. The X_j variables are the variables of interest. Z_p variables refer to the unobserved heterogeneity which are specific to the individual. In particular, these variables are assumed to be constant over time. Because the Z_p variables are unobserved, Eq. (1) can be rewrite as

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \alpha_i + \varepsilon_{it} \tag{2}$$

Where

$$\alpha_i = \sum_{p=1}^{s} \gamma_p Z_{pi} \tag{3}$$

α_i, known as the individual-specific unobserved effect, refers to the joint impact of the Z_{pi} on Y_i. The individual here may be a household or an enterprise, and in this paper, it should be the individual country covered in the sample. In the case that α_i is correlated with X_j variables, the regression estimates will be subject to unobserved heterogeneity bias. If the unobserved effect is not correlated with the explanatory variables, the presence of it still results in inefficient estimations and invalid standard errors after applying the simple pooled ordinary least square (OLS) since OLS fails to capture the unobservable heterogeneity among the individuals. In this case, either fixed effects regressions or random effects regressions can be employed to fit panel data. The use of any of the two regressions, however, is depended on the characteristics of the individual effect α_i.

5.1 Fixed effects regressions

If α_i is correlated with regressors X_j, the use of fixed effects regressions is more appropriate. Generally, there are three versions of fixed effects approach. The aim of the first two models is to remove the unobserved effects from the model.

5.1.1 Within-groups fixed effects

In the first version, the means values of both the dependent and independent variables for a given individual are calculated and deducted from the data for that individual. The individual-specific mean of a variable is denoted as

$$\overline{X}_i = 1/T\sum_{t=1}^{T}X_{it}$$

(4)

Apply Eq. (4) to Eq. (2), I get

$$\overline{Y}_i = \beta_1 + \sum_{j=2}^{k} \beta_j \overline{X}_{ji} + \alpha_i + \overline{\varepsilon}_i$$

(5)

Subtracting Eq. (5) from Eq. (2), I obtain

$$Y_{it} - \overline{Y}_i = \sum_{j=2}^{k} \beta_j (X_{ijt} - \overline{X}_{ji}) + \varepsilon_{it} - \overline{\varepsilon}_i$$

(6)

In Eq. (6), the unobserved effect disappears. Component $\varepsilon_{it} - \overline{\varepsilon}_i$ satisfies all conditions for OLS estimation. As a result, I can apply OLS to Eq. (6). The within-groups regression model can explain the variations in the means of the explanatory variables for the group of observation relating to a given individual instead of variations in the mean of the dependent variable. However, this version is not free of limitations. Firstly, the intercept β_1 and any X variable that invariant over time for each individual may be omitted. As a result, the model can not be used to estimate any explanatory variables that remain constant. Secondly, there is problem in relation to the disturbance term. The precision of one multiple regression model is measured by the value of the mean square deviations of the independent variables being large in comparison with the variance of the error term. In Eq. (6), the variation in ($X_j - \overline{X}_j$) may be much smaller than the variation in X_j. In this case, the influence of the error term may be relatively large, resulting in imprecise estimates. Thirdly, when the model is manipulated to eliminate the unobserved effect, the model loses a large number of degrees of freedom. Particularly, one degree of freedom is reduced for every individual in the sample.

Hence, n degrees of freedom are consumed in the process of manipulating the model and are reduced to $nT - k - n$. In the situation where T is small compared with the number of individuals, the impact will be large.

5.1.2 First differences fixed effects

In this version of the fixed effects estimation, the unobserved effect is removed by subtracting the observation for the previous time period from the observation for the current time period, for all time periods. For individual i in time period t, the model is specified as Eq. (2). For individual i in previous time period, the model is written as

$$Y_{it-1} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit-1} + \alpha_i + \varepsilon_{it-1}$$
(7)

Subtracting Eq. (7) from (2), I get

$$\Delta Y_{it} = \sum_{j=2}^{k} \beta_j \Delta X_{jit} + \varepsilon_{it} - \varepsilon_{it-1}$$
(8)

In Eq. (8), the unobserved heterogeneity has been eliminated from the model. By applying OLS to Eq. (8), I will get the first difference estimator. Similar as the within-groups fixed effects, the intercept β_1 and any X variable that remains constant for each individual will fail to be estimated and the degrees of freedom reduce because the first observation for each individual fails to be defined. Additionally, this type of differencing leads to the problem of autocorrelation if ε_{it} satisfies the regression model conditions. On the other hand, if ε_{it} is subject to autocorrelation, the first differences estimator could be more favorable to the

within-groups estimator.

5.1.3 Least squares dummy variable fixed effects

In contrary with the first two fixed effects model, the third version of the fixed effects approach keeps the unobserved effect in the model. The Least squares dummy variable fixed effects (LSDV) assumes that shifts in the intercept term of a standard OLS regression are adequate to capture any differences across individuals. Here I define a set of dummy variables A_i, where A_i is equal to 1 in the case of an observation relating to individual i and 0 otherwise. Hence, Eq. (2) can be rewritten as

$$Y_{it} = \sum_{j=2}^{k} \beta_j X_{jit} + \sum_{i=1}^{n} \alpha_i A_i + \varepsilon_{it}$$

(9)

In Eq. (9), the unobserved effect is modeled as the coefficient of the individual-specific dummy variable. The $\alpha_i A_i$ term refers to a fixed effect on the dependent variable Y_i for individual i. After fitting the model by OLS, I can get unbiased and consistent estimates. However, the use of LSDV method should be not practical when the sample size is relatively large, because that a large number of dummy variables will be used. Mathematically, LSDV method should be the same as the within-groups method. As a consequence, if there are large number of individuals, the within-groups method should be more appropriate compared to the LSDV method. The LSDV method also suffers from the some limitations. In particular, coefficients for the X variables that are fixed across individuals fail to be estimated within this method.

5.2 Random effects regressions

As have been described in last section, a fixed effects regression has failed to be an effective tool when the variables of interest are constant for each individual. The use of random effects regressions can solve the problem, however, subject to two conditions. Firstly, each of the unobserved variables Z_p is drawn randomly from a given distribution. In this case, α_i is treated as random variables drawn from a given distribution and Eq. (2) can be rewritten as

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \mu_{it} \tag{10}$$

Where

$$\mu_{it} = \alpha_i + \varepsilon_{it} \tag{11}$$

In Eq. (10), the disturbance term contains the unobserved effect. The second condition is that the Z_p variables are distributed independently of all the X_j variables. If this condition fail to be satisfied, the unobserved effect, and hence the error term, will be correlated with the X_j variables and the random effects estimation will be biased and inconsistent. When the two conditions are met, Eq. (10) can be used as the regression specification. Before applying OLS, there are other assumptions should be made on the new disturbance term. Firstly, the expectation of error term μ_{it} should be zero, thus

$$E(\mu_{it}) = E(\alpha_i + \varepsilon_{it}) = E(\alpha_i) + E(\varepsilon_{it}) = 0 \text{ for all } i \text{ and } t \tag{12}$$

Here I am assuming that $E(\alpha_i) = 0$. Any nonzero component is absorbed by the

intercept, β_1. Secondly, the variance of the error term μ_{it} should be constant, thus

$$\sigma^2_{\mu_{it}} = \sigma^2_{\alpha_i + \varepsilon_{it}} = \sigma^2_\alpha + \sigma^2_\varepsilon + 2\sigma_{\alpha\varepsilon} = \sigma^2_\alpha + \sigma^2_\varepsilon \text{ for all } i \text{ and } t. \quad (13)$$

The term of $\sigma_{\alpha\varepsilon}$ is zero means that α_i is assumed to distribute independently of ε_{it}. By applying the OLS on Eq. (10), I can get consistent coefficient estimates. However, OLS estimation is not efficient since the disturbance term is subject to autocorrelation if all the observations relating to a given individual. For individual i in period t, the disturbance term is ($\alpha_i + \varepsilon_{it}$). For the same individual in any other period t', the disturbance term becomes ($\alpha_i + \varepsilon_{it'}$). The population covariance between them is σ^2_α since α_i remains unchanged, reflecting the unchanging unobserved characteristics of the individual. If observations relate to different individuals, there is no autocorrelation since the α components are different and generated independently. Under autocorrelation, OLS estimators remain unbiased and consistent, but are inefficient and the OLS standard errors are computed wrongly. One solution is to apply generalized least squares (GLS) to the transformed model, and then consistent and efficient GLS estimators can be obtained.

Compared with fixed effects regressions, random effects model has some advantages. Firstly, observed characteristics that remain constant for each individual are retained in the random effects model; however, they are dropped in the fixed effects estimation. Secondly, n degrees of freedom are not lost in

random effects estimation. Even though these advantages, the random effects can be used only if the preconditions are met, otherwise, the fixed effects should be used instead. There are formal tests can be used to choose from OLS, fixed effects and random effects estimation. Firstly, the Breusch-Pagan Lagrange Multiplier is used to compare the pooled OLS model to the random effects. The null hypothesis under investigation is that the disturbance term follows as an independent and identical distribution ($\sigma_\alpha^2 = 0$). If the null hypothesis is rejected, the random effect model should be more appropriate than OLS. Then, the Hausman test is used to choose between fixed effects and random effects models. The null hypothesis under this test is that the unobserved individual-specific effect is uncorrelated with the explanatory variables. If this is correct, both fixed effects and random effects are consistent, but fixed effects will be inefficient because it involves estimating an unnecessary set of dummy variable coefficients in its LSDV form. If the null hypothesis is false, the fixed effects estimator is consistent. In contrast, the random effects estimates will be subject to unobserved heterogeneity bias and will therefore differ systematically from the fixed effects estimates.

5.3 Model specification

The general model for the following empirical estimation is specified as:

$$FDI_{it}^J = \beta_1 + \beta_2 CRIS_{it}^K + \beta_3 X_{it} + \varepsilon_{it}$$
(14)

Here, subscript i represents to a host country ($i = 1,...,23$) out of the 23 developed countries; t is a time subscript; J and K refers to types of FDI and financial

crises respectively; $\beta'_j s$ ($j = 1,2,3$) are coefficients to be estimated; $\varepsilon_{it} \sim IID(0, \sigma_\varepsilon)$ is white noise which follows an independent and identical distribution. Variable X_{it} in Eq. (14) is standard. Variables FDI_{it}^J and $CRIS_{it}^K$ are chosen differently to form different versions of Eq. (14). For each measure of FDI variable, there are four different specifications: three regressions include each crisis separately and one regression includes crises jointly. Hence I have got 16 sets of specifications in estimating Eq. (14).

The descriptive statistics for the data are given in the Appendix Table 3. The dependent and independent variables in Eq. (14) are explained as follows:

FDI_{it}^J is the annual FDI inflow of type J (FDI inflows, FDI stocks, cross-border M&A, greenfield) for country i in year t measured in billions of US dollars at current prices and current exchange rates.

$CRIS_{it}^K$ is an intercept dummy variable for financial crisis of type K (banking, inflation, currency, total), that takes value of 1 in the year when the particular crisis occurs, and take value of zero otherwise.

X_{it} is a vector of control variables including GDP per capita in millions of US dollars (NCGDP), annual GDP growth rate in percentage (RGGDP), exports on goods and services in millions of US dollars (EXPORT), corporate tax in percentage (TAX), telephone lines per 100 people in numbers (TEL), internet users per 100 people in numbers (INT), trade openness index (OPENNESS), labor force in millions (TLABOR), real GDP per capita in millions of US dollars (CLABOR), land area in

square of kilometers (LAND), populations in millions (POP), political rights index (POLITICAL), and civil liberties index (CIVIL).

6. Empirical results

6.1 preliminary results

Before the formal estimation, a series tests have been performed to select the most suitable estimator for each model. Firstly, the Breusch-Pagan LM test is used to compare the pooled OLS regression model to the random effects model. The null hypothesis of the independent and identical distributed error term against the alternative hypothesis of the presence of the individual effects uncorrelated with the regressors is rejected at the 1 percent significance level for all the 16 regression models, which supports my initial expectation of the unobserved effects.

Then, I use the Hausman test to compare the random effects model to the fixed effects model. The null hypothesis of individual effects uncorrelated with the regressors versus individual effects correlated with the regressors is rejected at the 1 percent significance level for all the 16 regression models, which suggests the choice of the fixed effects estimator for the following estimation.

Finally, I implement a unit root test on the panel data in level by using the Harris-Tzavalis test with the null hypothesis of a unit root in the series and the alternative of that the series is stationary. The testing results on the empirical variables indicate that most of the macroeconomic variables are presented with a unit root including nominal GDP per capita, exports on goods and services, corporate tax and real GDP per capita. The results on FDI variable are mixed. The null hypothesis of a unit root fails to be rejected at 5 percent significance level for

FDI stock, whereas FDI inflow, cross-border M&A and greenfield FDI are proved to be stationary at 1 percent significance level. In this case, I use level data for stationary variables and first-difference data for variables with unit root.

6.2 Estimation results

The estimation results for the empirical analysis are exhibited in Table 4-7. For each type of FDI activity, I report the parameter estimates for the four different models concerning banking, inflation, currency and total crises respectively. The first column of each table presents the list of independent variables, and the last four columns provide parameter estimates for each model. Also, I report p-value for each estimated coefficient.

6.2.1 Results for the link between financial crises and FDI inflows

Table 4 presents the parameter estimates of the determinants of FDI inflows in terms of the first four models. Coefficients for control variables including the first-differenced nominal GDP per capita, total labor force, first-differenced exports on goods and services are significant with expected signs for all the four models. In other words, FDI inflows in developed countries are positively affected by the host countries' market size and potential, availability of labor force and exports on goods and services. Coefficients for variables including population and land area are also significant, however, inconsistent with my original expectation. Surprisingly, the results indicate that countries with larger size of population and more land attract less foreign investments. Also, factors including labor cost, trade openness,

political environment, number of internet users, and corporate tax are found to have no effect on FDI inflows as their coefficients are statistically insignificant. The results for remaining variables are differing over different regression models. I found that real GDP growth rate is positively related with FDI inflows with statistically significant coefficient for models (1), (2) and (4). Coefficient for number of telephone lines is significant with the expected sign for only models (2) and (3).

Table 4: Panel regression by fixed effect estimation for FDI inflows
Dependent variable: FDI inflows (in billions of US dollars)

Independent variable	Model			
	(1)	(2)	(3)	(4)
CRIS_banking	-7.725*			
	(-2.22)			
CRIS_inflation		-5.358		
		(0.29)		
CRIS_currency			-17.67***	
			(-3.76)	
CRIS_total				-5.571*
				(-2.89)
dNCGDP	0.000576*	0.000475*	0.000717*	0.000515*
	(2.30)	(2.07)	(2.63)	(2.17)
RGGDP	0.379*	0.993*	0.871	0.782*
	(2.30)	(2.79)	(2.72)	(2.64)
TLABOR	14.57***	12.97***	13.09***	12.82***
	(4.86)	(4.42)	(4.54)	(4.39)
dCLABOR	0.00101	0.000528	0.00112	0.000511
	(0.30)	(0.15)	(0.34)	(0.15)
OPENNESS	0.168	0.117	0.0541	0.114
	(1.24)	(0.84)	(0.41)	(0.86)

dEXPORT	0.0000732*	0.0000714*	0.0000748*	0.0000712*
	(2.46)	(2.38)	(2.54)	(2.39)
POLITICAL	3.172	1.326	1.615	1.215
	(0.22)	(0.09)	(0.11)	(0.08)
CIVIL	7.037	7.193	7.926	7.378
	(1.58)	(1.61)	(1.80)	(1.66)
TEL	0.461	0.525*	0.565*	0.453
	(1.88)	(2.15)	(2.35)	(1.84)
INT	0.0787	0.102	0.136	0.111
	(1.09)	(1.39)	(1.92)	(1.56)
POP	-5.071**	-4.246*	-4.255*	-4.162*
	(-2.97)	(-2.53)	(-2.58)	(-2.49)
LAND	-0.00307*	-0.00257*	-0.00227*	-0.00268*
	(-2.37)	(-2.00)	(-1.79)	(-2.09)
dTAX	0.453	0.497	0.379	0.521
	(0.90)	(0.99)	(0.76)	(1.04)
Constant	3914.3*	3255.7	2861.1	3409.4*
	(2.29)	(1.92)	(1.71)	(2.02)
Number of observations	460	460	460	460

t statistics in parentheses $^{*} p < 0.05, ^{**} p < 0.01, ^{***} p < 0.001$

For model (1) in which the banking crisis is isolated to examine its impact on FDI inflows, coefficient for banking crisis is negative and statistically significant at 5 percent significance level. Quantitatively, the occurrence of a banking crisis is predicted to reduce FDI inflows by 7.725 billion US dollars when other control variables are kept to be constant. Theoretically, this finding may to some extent reflect the statement that the large capital outflow resulted from international

illiquidity in financial systems will eventually trigger the real depreciation both real and financial assets. Empirically, my finding is consistent with the results of Bogach and Noy (2012). In Model (2), the inflation crisis is isolated from other types of financial crises to examine its impact on FDI inflows. Coefficient for inflation crisis is negative indicating a negative link between inflation crisis and FDI inflows in the sample of countries. Nevertheless, the result fails to be statistically significant. This finding has in line with the previous expectation in which I argue that inflation crisis should have few incentives for foreign investors to enter into the domestic market since the nominal depreciation in one currency may not be a motivation for foreign investments. The finding is contrasted with the predictions of Bogach and Noy (2012) who argued that inflation crisis exerted significant negative effect on FDI inflows.

The fourth column of Table 4 provides the estimation results for model (3) in which the relationship between currency crisis and FDI inflows is studied. Coefficient for the currency crisis is negative and highly significant at 0.1 percent significance level. Particularly, I find that a currency crisis in a given year reduces the value of FDI inflows by 17.67 billion US dollars. The negative relationship between the currency crisis and FDI inflows observed in the sample of developed countries refuses the hypothesis concluded from the first generation of crisis model which states that a currency crisis is predicted to have no effect on FDI activity. The finding is also in contrary with the expectation of the second generation of crisis model which predicts a positive relationship between the currency crisis and FDI inflows.

Nevertheless, the result may be explained by Soliman's (2005) argument that depreciation resulted from currency crisis implies smaller revenue earned in host country for foreign investors if measured in foreign currency, in which case currency crisis have negative effect on inward FDI; or I can predict that the currency crisis in the developed countries leads to greater volatility in the foreign exchange market and therefore uncertainty of future foreign investment activities. Empirically, the finding has been in contrary with most researchers' results, however, in consistent with the prediction of Rydqvist (2005). The final column in Table 4 presents the estimation results of model (4) in which the three types of financial crises are pooled together to examine their joint effect on the value of FDI inflows. Coefficient for the total crises is negative and significant at 5 percent significance level, implying that FDI inflows are negatively affected by the occurrence of financial crises. In particular, I observe that financial crises in a given year are shown to reduce the value of FDI inflows by 5.571 billion US dollars. The empirical finding has been in consistent with most of the previous findings reported in the literature.

6.2.2 Results for the link between financial crises and FDI stocks

Tale 5 presents fixed-effects estimation results for the determinants of FDI stocks. The results for the control variables are mixed across the four models. Coefficients for variables including first-differenced nominal GDP per capita, real GDP growth rate, total labor force, number of internet users, and land area are significant and

positive for all the four models, implying that FDI is attracted to larger market size and potential, more labor force, internet users and land area. Additionally, I find that the effects of variables, including labor cost, exports on goods and services, political index, number of telephone lines, total population, and corporate tax, appear to be zero since their coefficients   are insignificant. The result in relation to the effect of trade openness is mixed. Trade openness has fairly significant and positive effect on FDI when inflation, currency or total crises are considered, while has no impact on FDI when banking crisis is concerned with.

Table 5: Panel regression by fixed effect estimation for FDI stocks
Dependent variable: FDI stocks (in billions of US dollars)

Independent variable	Model			
	(5)	(6)	(7)	(8)
CRIS_banking	-55.03***			
	(-3.39)			
CRIS_inflation		-40.06		
		(-0.46)		
CRIS_currency			-34.21*	
			(-2.53)	
CRIS_total				-5.930*
				(-2.43)
dNCGDP	0.0000885**	0.000718**	0.00122**	0.000801**
	(3.04)	(3.35)	(3.58)	(3.38)
RGGDP	7.536*	4.398*	3.692*	3.630*
	(2.30)	(1.74)	(1.64)	(1.63)
TLABOR	68.50***	79.15***	79.65***	79.30***
	(4.90)	(5.74)	(5.80)	(5.75)
dCLABOR	-0.00578	-0.00619	-0.00358	-0.00453
	(-0.37)	(-0.37)	(-0.22)	(-0.28)

OPENNESS	0.940	1.471*	1.284*	1.393*
	(1.49)	(2.25)	(2.04)	(2.22)
dEXPORT	0.0000389	0.0000533	0.0000593	0.0000524
	(0.28)	(0.38)	(0.42)	(0.37)
POLITICAL	32.97	32.47	38.21	38.35
	(0.49)	(0.47)	(0.57)	(0.57)
CIVIL	-95.53***	-97.61***	-95.82***	-96.99***
	(-4.61)	(-4.64)	(-4.57)	(-4.62)
TEL	-1.620	-2.063	-1.989	-2.145
	(-1.42)	(-1.80)	(-1.74)	(-1.85)
INT	1.764***	1.530***	1.623***	1.571***
	(5.24)	(4.43)	(4.81)	(4.67)
POP	15.42	9.994	9.808	9.888
	(1.94)	(1.27)	(1.25)	(1.25)
LAND	0.0398***	0.0365***	0.0370***	0.0362***
	(6.59)	(6.04)	(6.13)	(6.00)
dTAX	1.036	0.838	0.566	0.813
	(0.44)	(0.35)	(0.24)	(0.34)
Constant	-53881.1***	-49486.5***	-50137.9***	-49192.5***
	(-6.76)	(-6.21)	(-6.30)	(-6.18)
Number of observations	460	460	460	460

t statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

From Table 5, it can be seen that the estimation results for the links between various types of financial crises and FDI stocks are similar with that for FDI inflows. In particular, the coefficient for banking crisis shown in model (5) is found to be negative and statistically significant at 0.1 percent significance level, implying a strong negative relationship between banking crisis and FDI inflow. Inflation crisis

that is examined in model (6) is also shown to have a negative impact on FDI stocks; nevertheless, the result is not statistically significant. Coefficient for currency crisis showed in model (7) is negative and statistically significant at 5 percent significance level, indicating a negative impact exerted on FDI stocks. Finally, total financial crises are shown to exert negative and significant effect on FDI stocks.

6.2.3 Results for the link between financial crises and cross-border M&A

I then distinguish between the different time horizons for FDI activity and examine the effects of crises on cross-border M&A and greenfield FDI separately. The fixed effect estimation results for cross-border M&A are provided in Table 6. Coefficients for variables including first-differenced nominal GDP per capita, real GDP growth rate, exports on goods and services and number of telephone lines are positive and significant for all the four models. Empirically, the result indicates that host countries with larger market size and potential, more exports, telephone lines are likely to attract more foreign investments. The size of population is shown to be strong significant and negatively affect the value of cross-border M&A. The remaining factors, including labor availability and cost, trade openness, political environment, number of internet users, land area and corporate tax, are found to have no impact on the value of cross-border M&A.

Table 6: Panel regression by fixed effect estimation for cross-border M&A
Dependent variable: cross-border M&A (in billions of US dollars)

Independent variable	Model			
	(9)	(10)	(11)	(12)
CRIS_banking	-4.250*			
	(-2.35)			
CRIS_inflation		1.127		
		(0.07)		
CRIS_currency			-2.835*	
			(-2.66)	
CRIS_total				-0.361*
				(-2.14)
dNCGDP	0.000600**	0.000546**	0.000585**	0.000550**
	(3.50)	(3.37)	(3.45)	(3.38)
RGGDP	0.145*	0.164*	0.140*	0.138*
	(2.13)	(2.14)	(2.13)	(2.12)
TLABOR	7.46	6.60	6.63	6.60
	(0.44)	(0.27)	(0.29)	(0.28)
dCLABOR	0.00219	0.00201	0.00212	0.00205
	(0.71)	(0.63)	(0.69)	(0.67)
OPENNESS	-0.000525	-0.0324	-0.0432	-0.0343
	(-0.00)	(-0.26)	(-0.36)	(-0.29)
dEXPORT	0.0000806**	0.0000796**	0.0000801**	0.0000796**
	(2.99)	(2.95)	(2.97)	(2.95)
POLITICAL	-1.681	-2.379	-2.286	-2.251
	(-0.13)	(-0.18)	(-0.18)	(-0.17)
CIVIL	7.106	7.214	7.335	7.236
	(1.77)	(1.79)	(1.82)	(1.80)
TEL	0.324*	0.359*	0.365*	0.354*
	(1.46)	(1.63)	(1.66)	(1.59)

INT	0.0733	0.0876	0.0934	0.0889
	(1.12)	(1.32)	(1.44)	(1.38)
POP	-7.877***	-7.434***	-7.437***	-7.433***
	(-5.11)	(-4.91)	(-4.92)	(-4.92)
LAND	-0.00125	-0.000983	-0.000935	-0.000992
	(-1.07)	(-0.85)	(-0.81)	(-0.86)
dTAX	-0.114	-0.0927	-0.112	-0.0922
	(-0.25)	(-0.20)	(-0.25)	(-0.20)
Constant	1600.7	1245.3	1183.0	1258.2
	(1.04)	(0.82)	(0.77)	(0.82)
Number of observations	460	460	460	460

t statistics in parentheses $^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

The link between banking crisis and cross-border M&A is examined in model (9). From the empirical results, I observe that a banking crisis has a significantly negative effect on cross-border M&A. A banking crisis in a given year is shown to decrease the value of cross-border M&A by 4.250 billion US dollars. The negative relationship between banking crisis and cross-border M&A refuses the fire sale FDI hypothesis in my sample of countries. The finding is also in contrary with the theoretical assertion which argues little impact of banking crisis on FDI that generated from the third generation of crisis model.

Empirical results concerning the impact of inflation crisis on cross-border M&A are presented in model (10), from which, I find that the coefficient for inflation crisis is positive but fail to be statistically significant. The result implies that inflation crisis

has little influence on the M&A activity and refuses the fire sale FDI hypothesis in the sample of developed countries. The finding has supported the previous thinking that nominal depreciation in one currency has little effect in attracting more assets acquisitions during a crisis. On the other hand, real depreciation in on currency is expected to entail opportunities for more foreign acquisitions and allow a fire sale of such transferable assets to foreign firms. However, I fail to observe fire sale FDI from the empirical results for the link between currency crisis and cross-border M&A (model (11)) in the sample of developed countries. The coefficient for currency crisis is negative and significant at 5 percent significance level. Quantitatively, a currency crisis in a given year is predicted to reduce the value of cross-border M&A by 2.835 billion US dollars. Finally, the joint effect of financial crises on cross-border M&A analyzed in model (12) is proved to be negative and significant at 5 percent significance level. In particular, financial crisis occurred in a given year is shown to reduce the value of cross-border M&A by 0.361 billion US dollars. The negative relationship between financial crises and cross-border M&A indicates that the fire sale FDI is not observed in my sample.

6.2.4 Results for the link between financial crises and greenfield FDI

Table 7 shows the fixed effect estimation results for the greenfield FDI. Particularly, variables including nominal GDP per capita, real GDP growth rate, number of telephone lines and size of population are shown to have a significantly positive influence on the value of greenfield FDI. In contrast with the result for cross-border

M&A, total labor force in the host countries has some positive effect on greenfield FDI. The difference may be explained by the factor that greenfield FDI involves a new subsidiary establish which may entail a large number of labor force in the host countries. Control variables including labor cost, exports on goods and services, political environment, number of internet users and inflation rate are observed to have no impact greenfield FDI. Other control variables including trade openness, land area and corporate tax have differing effect on greenfield FDI when different type of financial crises is considered.

Table 7: Panel regression by fixed effect estimation for greenfield FDI Dependent variable: greenfield FDI (in billions of US dollars)

Independent variable	Model			
	(13)	(14)	(15)	(16)
CRIS_banking	-3.470 (-1.72)			
CRIS_inflation		4.448 (0.41)		
CRIS_currency			-14.84*** (-5.55)	
CRIS_total				-5.201** (-3.06)
dNCGDP	0.0000271* (0.11)	0.0000750* (0.29)	-0.000129* (-0.51)	0.0000383* (0.15)
RGGDP	0.508* (0.70)	0.816* (1.11)	0.714* (1.04)	0.628* (0.89)
TLABOR	2.894 (1.66)	3.628* (2.13)	3.529* (2.15)	3.775* (2.24)
dCLABOR	0.00116	0.00148	0.000978	0.00152

	(1)	(2)	(3)	(4)
	(0.59)	(0.72)	(0.51)	(0.78)
OPENNESS	0.168*	0.149	0.0963*	0.147
	(2.13)	(1.85)	(2.28)	(1.92)
dEXPORT	0.00000723	-0.00000799	-0.00000511	-0.00000816
	(-0.42)	(-0.46)	(-0.30)	(-0.47)
POLITICAL	4.871	3.685	3.918	3.485
	(0.58)	(0.43)	(0.49)	(0.42)
CIVIL	-0.0435	0.00161	0.616	0.167
	(-0.02)	(0.00)	(0.25)	(0.07)
TEL	0.139*	0.168*	0.202*	0.101*
	(1.97)	(1.18)	(1.47)	(0.71)
INT	0.00539	0.0139	0.0429	0.0222
	(0.13)	(0.33)	(1.06)	(0.54)
POP	2.804**	3.187**	3.180***	3.268***
	(2.83)	(3.27)	(3.38)	(3.39)
LAND	-0.00181*	-0.00158*	-0.00133	-0.00169*
	(-2.41)	(-2.12)	(-1.85)	(-2.29)
dTAX	0.566	0.589*	0.490	0.613*
	(1.94)	(2.01)	(1.73)	(2.12)
Constant	2313.3*	2009.7*	1678.0	2151.1*
	(2.33)	(2.04)	(1.76)	(2.21)
Number of observations	460	460	460	460

t statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The relationship between banking crisis and greenfield FDI is reported in model (13) in Table 7. From the table, I observe that banking crisis has a negative but insignificant effect on greenfield FDI. The impact of inflation crisis on greenfield is examined in model (14). The regression results show that inflation crisis has

insignificantly positive effect on the value of greenfield FDI. The insignificant effects exerted by banking and inflation crises in the sample may be explained by the thinking that greenfield FDI that involves longer term prospects in the future may not be influenced by short term uncertainty imposed by financial crises. However, analysis on the impact of currency crisis results in opposite results. Coefficient for currency crisis that provided in model (15) is negative and statistically significant at 0.1 percent significance level, shown to reduce the value of greenfield FDI by 14.84 billion US dollars. Moreover, the joint effect of the total financial crises is also shown to be negative and statistically significant at 1 percent level. In particular, a financial crisis reduces the value of greenfield FDI by 5.201 billion US dollars in a given year. The significant negative link has rejected previous assertion with reference to financial crises and greenfield FDI.

7. Conclusion

In this paper I empirically examine the impact of financial crises on FDI activity. Since different FDI activities are expected to react differently to differing types of financial crises, I category financial crises into three types including banking crisis, inflation crisis and currency crisis. Also, FDI activity is distinguished between cross-border M&A and greenfield FDI. By applying a fixed effects regressions model on a panel data of 23 developed countries for the period 1990-2010, the empirical results show that financial crises had strong negative effects on FDI activity in the sample. In particular, banking crisis and currency crisis are shown to reduce the value of FDI inflows, FDI stocks and greenfield FDI activities significantly, while inflation crisis has little impact FDI activity. I do not find evidence supporting the fire sale FDI hypothesis in the sample of developed countries. On the other hand, financial crises lead to a large decline in the value of cross-border M&A. This finding is in consistent with the situation observed in the current global financial crisis during which period the foreign investors have trapped into financial illiquidity. In my own thinking, the availability of access to funds should be a critical factor in affecting FDI activities, especially during a financial crisis.

The results have been in contrary with the view of fire sale FDI. Three possible explanations are provided below. Firstly, the fire sale FDI that has been evidenced in previous literatures is largely referenced to the Asian financial crisis. During the crisis, the real depreciation of firms' assets in the host countries had attracted more foreign investors. The reason for the fire sale FDI observed in the Asian financial

crisis is unique and different from other crises. While previous researches focus on the Asian financial crisis and any particular affected country, this paper is conducted on a basis of an average financial crises in the developed countries. The sample used in this paper is broader both in terms of years and countries including financial crises that occurred in recent 20 years and all the affected developed countries that have been recorded. Secondly, as is the case with any macroeconomic data, the quality of FDI data, especially the M&A data, together with the data for control variables may not be good enough to be used to examine the pattern. Thirdly, the depth, length and structure of each type of financial crises together with using the right definition of crises are two important factors relating to the outcomes in this study. For instance, the currency crisis identified in this paper is based on the criteria of an annual depreciation versus the US dollar of 15 percent or more. If I use the definition introduced by Frankel and Rose (1996) that identify a currency crisis as nominal depreciation of a currency of at least 25 percent, much less number of currency crises would have been used in the empirical estimation, which may lead to different results about the link between currency crisis and FDI activity.

Given the increasing importance of FDI as a form of capital flows and the rapidly spreading global financial crisis, the results are expected to present some empirical implications for countries that are experiencing a financial crisis. The implications are provided not only in terms of the impact of financial crises on FDI activity, but also in terms of informing us about the particular type of financial crises the countries are facing with. However, the research results give little implication for

the current debt crisis in Europe. I do not include debt crisis in my sample of financial crises since the available data base provided by Reinhart and Rogoff (2010) record zero distinct debt crisis episodes in the developed countries.

The use of panel data analysis is not free from limitations. As listed in Hsiao (1986), there are problems in design and data collection. In terms of this paper, the sample period is only 21 years because of the lack of M&A dataset. During this period, no debt crisis has been covered for the sample countries. It is expected that a larger sample size gives rise to more efficient results. Other limitations relate to the measurement errors. One example of such an error is the measurement of currency crisis discussed above. The measurement of other macroeconomic indicators also imposes inevitable error in the analysis process.

The limitations of this paper, on the other hand, provide recommendation for future studies relating to the topic. One can include a debt crisis variable and follow Bogach and Noy (2012) in distinguishing debt crisis between external debt crisis and domestic debt crisis. Other recommendation for additional studies is to distinguish between different types of FDI according to differing motivations. In particular, one can expect that different motivations for FDI have different vulnerability to financial crises. Horizontal FDI with targets of neighboring markets may react adversely to a real depreciation. However, vertical FDI which is more concerned with production quality and costs may benefit from a real depreciation given the reduced costs. Finally, the results supporting the FDI reversals are

observed in the immediate aftermath of the financial crises. The long term effects exerted by financial crises on FDI activity are remained unexamined. Hence, future studies may introduce an empirical regression model which can be used to identify the immediate effects as well as the long term influences on FDI activity.

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Appendix

Table B: List of the sample of 23 developed countries by region

America (2): Canada, United States

Asia (1): Japan

Europe (18): Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, SIden, Switzerland, United Kingdom

Oceania (2): Australia, New Zealand

Table C: Summary of variables

Variable	Definition	Source
Dependent variables		
FDI flows	Net FDI inflow (in billions of current US $)	UNCTAD
FDI stocks	FDI stock (in billions of current US $)	UNCTAD
M&A	Value of cross-border M&A (in billions of current US $)	UNCTAD
Greenfield FDI	Value of greenfield investment (in billions of current US $)	Authors calculation, UNCTAD
Independent variables		
Banking crisis	Defined as the event in which significant fraction of the banking sector is insolvent but remains open. Moreover, sever situation can lead to bank closure, merging or takeover.	R&R
Inflation crisis	An annual inflation rate of 20% or higher	R&R
Currency crisis	An annual depreciation versus the US dollar of 15% or more	R&R
Control variables		
market size and potentials		
GDP per capita	Nominal GDP per capita at	UNCTAD

	current prices and current exchange rates (in millions of current US$)	
Real GDP growth	Annual percentage growth rate of GDP at market prices based on constant local currency (annual %)	WDI by World bank

Labor availability and cost

Labor force	Total labor force comprises people ages 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. (Total in millions)	WDI by World bank
Real GDP per capita	Real GDP per capita at constant prices (2005) and constant exchange rate (2005) (in millions of constant US$)	UNCTAD

Openness to international market

Trade openness	Degree of openness to international market. Measured by country openness index at 2005	PWT 7.1

	constant prices (%)	
Exports	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world (in millions of US$)	WDI by World bank

Political environment

Political rights	Political rights index	Freedom House
Civil liberties	Civil liberties index	Freedom House

Infrastructure

Telephone lines	Telephone lines are fixed telephone lines that connect a subscriber's terminal equipment to the public switched telephone network and that have a port on a telephone exchange. (per 100 people)	WDI by World bank
Internet users	Internet users are people with access to the worldwide network. (per 100 people)	WDI by World bank

Geography

Population	Total population (in millions)	UNCTAD

Land area	Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. (sq. km)	WDI by World bank
Other control variables		
Corporate tax	A levy placed on the profits earned by businesses during a given taxable period	OECD

Table 3: Descriptive statistics of data, 1990-2010

Variable	Mean	Std.	Min	Max	Obs.
FDI_inflow	20.2343	40.1276	-31.6893	313.9972	483
FDI_stock	256.4354	491.5594	0.1169	3551.307	483
M&A	12.3424	30.8729	-11.683	271.721	483
Greenfield	7.8820	19.2259	-56.2588	117.638	483
CRIS_banking	0.2195	0.4143	0	1	483
CRIS_inflation	0.0145	0.1196	0	1	483
CRIS_currency	0.0725	0.2595	0	1	483
CRIS_total	0.2733	0.4461	0	1	483
NCGDP	29275.33	13447.04	3291.861	93156.84	483
RGGDP	2.1383	2.5865	-11.8920	10.9172	483
TLABOR	18.6871	31.2127	0.1431	158.0122	483
CLABOR	33078.74	11306.87	7101.24	67467.5	483
OPENNESS	67.8977	33.8226	16.2053	186.1363	483
EXPORT	253811.3	305785	2007.902	1846800	483
POLITICAL	1.0103	0.1013	1	2	483
CIVIL	1.2754	0.4914	1	3	483
TEL	50.2978	10.7699	9.05972	74.6877	483
INT	33.9184	30.9531	0	95.6258	483
POP	37.7209	61.3076	0.2548	314.242	483
LAND	1313974	2856702	30280	9161920	483
INFLATION	3.1884	3.8210	-1.7	34.2	483
TAX	30.5191	8.7096	8.5	53.2	483