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Ekonomihögskolan

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Determinants of Chinese investments within the EU

Sigurdur-Freyr Bjarnason

fek06sbj@student.lu.se

Abstract: Since opening up their economy Chinese ODIs has started to be a large part of the country's economic development. In recent years the share of ODI from China into the EU has increased dramatically. In this paper, an empirical estimation on the determinants of Chinese ODIs in EU is made. The data used for calculations are collected from different databases at the World Bank as well as at the Ministry of Commerce of the People's Republic of China. The results indicate that Chinese investors focus on Europe as an investing opportunity of two reasons. Firstly, investments are made in order to increase efficiency of firms and production. Secondly, as Europe is relatively large market the opportunities for increased market share seems to be an important indicator.

Key words: *Outward direct investments, China, EU, market seeking, efficiency seeking*

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1. Introduction

Foreign direct investment (FDI) has gained significant weight over the past decade as the tool for accelerating growth and development of economies in transition. Since opening up their economic system in 1978, China has been one of the fastest growing economies in the world with an average annual GDP growth of more than 9% (World Bank, The (2011a)). By opening up the country's economy, China has in recent years become one of the largest recipients of FDI in the world while their share of Outward Direct investments (ODI) has been quite small (Cheng, L. K., & Ma, Z. (2010)).

After the start of the economic transformation, China continued to maintained control on financial outflow. In the following years of opening up the economy the ODI flows were practically zero. In the 1990s and until 2004 the annual ODI flows in China were only around \$2 billion. Although, in recent years Chinese investors has been increasing their influence on the global economy in terms of providing loans, ODI's and other financial activities. Chinas ODI have been increasing in recent years from \$19,3 billion in 2000 up to \$57,8 billion in 2010 (Cheng & Ma, 2008). Even though Chinas share in the total global ODI flow is quite small, their share have been increasing from less than 1% in 2007 up to around 5% in 2010. In 2010, China ranked as the world's fifth biggest outward investor after the US, Germany, France and Hong Kong (Hanemann, T. and Rosen, D.H. (2012)).With Chinas increasing in international reserves and trade surplus, they are expected to be the main factor as a provider in the international capital market in the future (Cheung & Qian, 2009). Chinas ODI are mainly faced towards other countries in Asia as well as developing countries in Africa, although in recent years their investments towards other parts of the world have been increasing. The Chinese ODI to Africa are mainly focused on natural resources as the demand for those has increased in recent years followed by the country's economic growth. Followed by this, China has in recent years become one of the world's largest importers of oil (Taylor, I. (2009)).

Buckley et al (2007) finds that Chinese ODI is attracted to countries with bad institutions (high political risk), while Cheung and Qian (2008) find no significant effect of institutions in determination of investing location. China's importance as a source of capital is even greater for certain industries, and for the countries and regions that rely on these industries. Chinese firms are now major players in global mergers and acquisitions (M&A) in many extractive

industries, from oil and gas to iron ore, copper and other metals. For some resource-rich economies, China is the largest source of ODI. This is often in those countries that are often considered to have high political risk (Hanemann, T. and Rosen, D.H. (2012)). Chinese ODI is now maturing and evolving, seeking not just natural resources but operating platforms, brands and technology in developed economies. Chinese investments in the US have grown steeply since 2007, targeting a broad range of sectors and states. High profile deals demonstrate that Chinese firms are making similar inroads in Europe (Clegg, J., & Voss, H. (2012)).

With this enormous amount in foreign reserves and increasing economic clout, China is able to send numerous firms abroad to acquire technologies, brands, resources, and better access to international markets. In some industries at least, rising capacity and rising domestic price competition are cutting profit margins, and Chinese managers see ODI as a way to upgrade technology and increase their earnings. While these are all valid strategies under broad ranges of circumstances, it is important to identify specific drivers of the current flow in Chinese ODIs, and to estimate its broader implications with economic theories.

China has in recent years been increasing their share of investments within the European Union (EU). By investing in the EU, Chinese firms are focusing on gain access to foreign markets, technologies and factors of production. The economic crises in Europe have given Chinese investors enlarger opportunities to enter the European market than before. Chinese investments have increased from less than \$1 billion in 2000 up to around \$12 billion in 2010 (MOFCOM, 2010). The reason for these remarkable increases in investments within the EU in the recent years is therefore interesting to look at. Why has Chinese firms been increasing their share of investments into the EU in recent years? The determinants of those investments are complexes and exciting to follow. Given the theoretical ODI structure, firms investing aboard are mainly focusing on three main factors, natural resources, increased market share and more efficiency driven business. The reason for Chinese investments in other Asian countries as well as in Africa has been the focus in many empirical studies in the past. The question this study is focusing on is the determinants of Chinese investments within EU countries. While Chinese investments into developing countries have often been linked with natural resources the determinations of investments into the EU might be concentrated to other factors. As studies have shown the determinants for investing in developed economies are often connected with gaining access to foreign markets, technologies and certain factors of

production. In this study different variables will be used to control for those different motivations for investments.

This paper is organized as followed. In the next section the historical overview of Chinese ODIs will be introduced and their investments in the EU. Followed by this, the theoretical framework will be presented in chapter 2, included previous studies within this area as well as the hypothesis of the study. In the third chapter the methodology of the study will be introduced. This includes the model specification and the description of relevant variables. Finally, the results will be presented in chapter 4 and the study will be concluded in the final chapter.

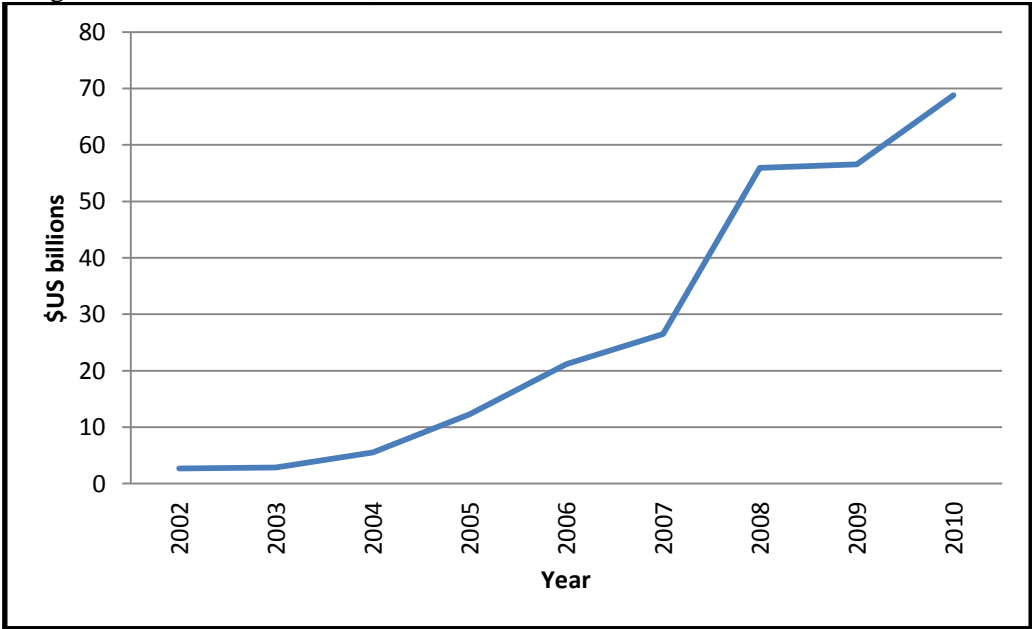
1.1. Historical overview – The Going global policy

Although China opened up their economy, their ODI did not establish until some years after the open door policy. The Chinese ODI has gone through four different stages of development since the transformation in 1978. The first stage, starting in 1978 until 1985 is the period where only state-owned companies, as well as provincial and municipal economic enterprises, were able to invest overseas. At this time only 189 investments projects were approved with the total investment amounting to just about \$197 million. The second period from 1886 until 1991 is where the Chinese government began gradual liberalization to allow a wider range of firms to invest overseas, including non-state owned enterprises. With these actions from the government, ODI from Chinese firms went up to 891 approved projects with the amounting of \$1.2 billion. The third period from 1992 until 1998 experienced both success as well as disappointment. With the liberalization reforms firms began to invest overseas mostly within Asia. As the financial crises struck the area in 1997 many countries suffered from serious losses due to institutional weakness, corruption, and lack of management expertise. This affected the ODI from China where the China's Ministry of Foreign Trade and Economic Cooperation (MOFTEC) tightened approval procedures, and monitored any overseas venture of over \$1 million. As a result of this, ODI activities slowed down but still increased by \$1.2 billion in total investment. The fourth period and Chinas current stage of ODI began in 1999. At this time important legislation was enacted to aid foreign investment (Salidjanova, 2011). In the tenth Five- Year plan in 2001 the Chinese government introduced the Go global (zouchuqu) policy. In the sixth national congress of the China Communist Party in 2002, President Jiang Zeming stated the go overseas policy. The Going global policy is related with

FDI, the undertaking of foreign construction and engineering projects, and the export of Chinese employment. (Cheng and Ma, 2008). In 2004 another change in the ODI policy was made. The government pronounced their roles of, in addition to approving applications, supervising and providing services. With these changes Chinese enterprises are now more and more aggressive in the international capital market. The Chinese ODIs are brought under this attention following some recent attempts to secure natural resources in developing countries and large-scale acquisition activities in developed countries (Cheung & Qian, 2009).

The increase in Chinese ODI flows followed by the Going global policy were significant and grew from around \$2,7 billion in 2002 up to \$68,81 billion already in 2010 (Figure 1). An additional boost for the Chinese ODI's started with the world economic crises in 2007. In the year of 2010 the total value of Chinese ODI were up to \$68,81 billion (mofcom.gov.cn) Despite this remarkable increase in ODI, the share of those is still just a small part of the countries inward foreign investments. China's ODIs is still a long way from FDI's into China, but it is slowly catching up. Already in 2011 the outbound investment was equal to 69% of inbound, A Capital said, up from 59% in the year of 2010. The ODIs are supposed to be equal to the FDI's within the next three years (<http://online.wsj.com>).

Figure 1 – Chinese total ODI, 2002-2010



Source: MOFCOM, 2010

The Chinese ODI's are still related to political objectives where a large share of these investments is still today made by state owned firms. In 2006, 82% of China's non-financial ODI was made by state-owned enterprises (Yeung and Liu, 2008). Those private firms that invest overseas need governmental approval for its investments. Because of the incentives the firms may face when investing in foreign countries they are generally influenced by political actions (Cheng and Ma, 2008). As a result of this only two of the thirty largest Chinese ODI companies are non-state controlled. Although, many of those firms are listed on a stock exchange, the state still remains as a majority power and appoints executives, often from party ranks (Morck et al, 2008). This means that their investment decisions reflect political objectives, and not just profit maximization as is often the case for privately owned multinationals (Cheng and Ma, 2008).

In the past 20 years, China has moved from being East Asia's largest oil exporter to becoming the world's third largest oil importer in 2008, behind the United States and Japan. Where in recent years more and more of people have moved out of poverty, the demand on oil and other natural resources like aluminum, copper, nickel, iron ore, and other key commodity products has increased significantly. The natural resource-seeking ODI of the Chinese energy majors is closely connected with the government's pursuit of a national energy security plan to secure overseas assets and supply agreements (Salidjanova, 2011).

As mentioned earlier some studies of Chinese ODI suggest that Chinese companies have competitive advantages in countries with weak institutions. Chinese firms are, in contrast to companies from developed economies, more experienced in handling complex client relationships and personal and institutional favors in relatively unclear and difficult business environments. They should also be more used to deal with compounded regulations and manage to navigate around political constraints (Yeung and Liu, 2008; Morck et al 2008). Because of this, many Chinese firms face lesser liability as a foreign investor than firms from developed countries. (He and Lyles, 2008; Child and Rodrigues, 2005). Moreover, Chinese firms have less stringent regulation which makes ethically questionable activities such as corruption less risky and financially costly. This may also result in a morally less costs in a country where such behavior is relatively common. Additionally, extensive personal or ethnic networks may serve as a replacement for formal institutions (Tong, 2005; Park and Luo 2001). These arguments are in line with previous studies that Chinese ODI may be attracted to countries with poor institutions.

In sum, since China opened up in 1978, the ODI policy has evolved together with other economic reform policies. Specifically, the ODI strategy has been transformed from a purely political device to a more market-oriented operation. The group of firms participating in ODI in China has expanded from mainly state-owned enterprises to a mix of state-owned and privately owned firms. Despite of that, there is still a heavy state involvement in the ODI activity. This is at least, what is perceived by the rest of the world. While the absolute magnitude of China's ODI is quite small compared with other sources of FDI, China is expected to increase their share of ODI in the nearest future and level up their ODIs compared with investments into the country (Cheung & Qian, 2009).

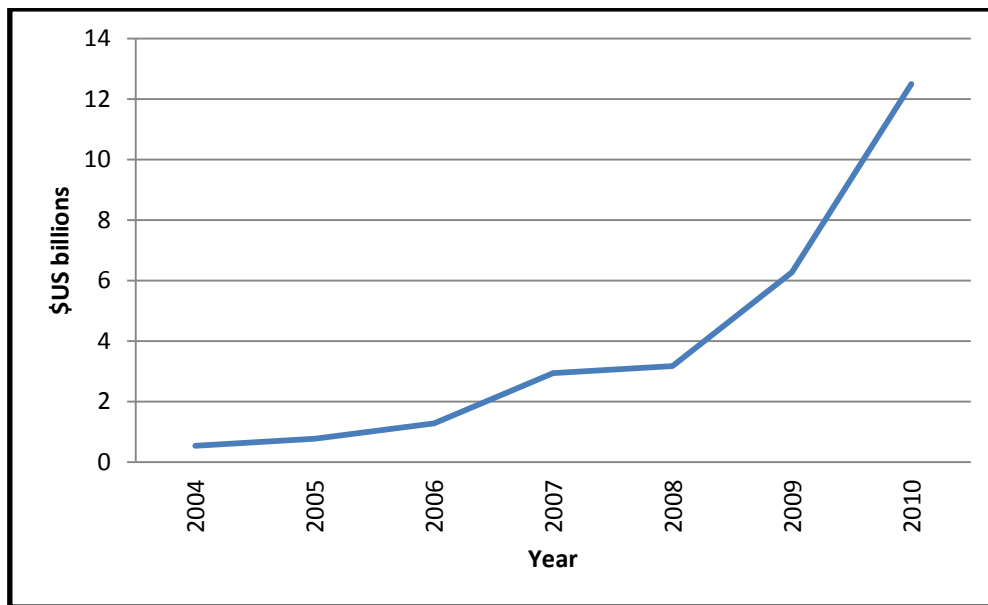
1.2. Investments in EU

The share of Chinese investments within the EU has like in the rest of the world, increased rapidly in recent years. Going from around \$500 million in 2004 up to \$12,26 billion in 2010. (Figure 2). The EU is currently the largest foreign investor into the Chinese economy and is the Chinese market considered to be more and more important for the future. Just in recent years China has been expanding its investment into the EU. Beginning with a very small share, Chinese firms and investors are now rapidly increasing their share of investments in Europe and this development is set to continue (Gavin, B. (2012)). Although Chinese investments are made all across the EU the main focus lies in France, Germany and the United Kingdom, which had together attracted on average 36.8 per cent of annual Chinese investment from 2003 to 2009 (MOFCOM, 2010). Although in recent years the shares of Chinese investments into other countries within EU have been increasing. The total list of Chinese investments in the EU in the years of 2004-2010 is shown in Appendix A. The motives and targets of China's ODI are changing rapidly as it has become more and more driven by China's economic growth model rather than just political thoughts. The distribution of Chinese investment across the EU is an important indication of the ability of Chinese firms to invest and of their motivation for investment. Chinese ODIs in the economically developed countries within the EU indicate a motivation to obtain technologies and brands as well as a degree of capability and competitiveness intrinsic to the firms concerned. On the other hand, investments in the less developed economies within the EU have pointed towards low cost production that shall target only the European market without upgrading the abilities of the

investing Chinese firms (Clegg, J., & Voss, H. (2012)). Many Chinese investors regard Europe's current weakness as an opportunity to jump in. Positive effects of the financial crisis on the Chinese ODIs include the weakening of foreign competitors' power, and the market value shrink of the assets of many foreign firms, providing the conditions for purchasing those foreign assets and companies at lower costs (China Council for the Promotion of International Trade, (2010)). These Chinese investors that enter Europe are often looking for technology, know-how, high-value brands. Many European firms are world leaders in sectors like industrial and auto manufacturing as well as sectors concerning both the environment and health care (Claus Hecking, (2013)).

Chinese firms identify the EU as a stable investment environment with advanced technologies, skilled labour and a transparent legal environment. Chinese investors are seen to bring both direct and indirect benefits into the economies they invest in. ODI should provide indirect opportunities for local firms in the host country by encouraging better understanding of Chinese businesses and how they work. This should also help the local firms to get easier access to the Chinese market. The direct benefits are often in the form of employment. Another factor the host country can benefit from is the transfer of technology and the expatriation of very skilled Chinese workers to the foreign affiliate. This beneficial factor is often though related with the investments in developing countries rather than in the developed ones. However, uncertainty remains over the managerial ability of Chinese enterprises and the extent to which the claimed potential benefits can therefore be achieved.

Figure 2 – Chinese ODI into the EU, 2004-2010



Source: MOFCOM, 2010

The driving force behind Chinese investment in EU is to gain access to foreign markets, technologies and factors of production. On top of this open strategy there are certain other factors that encourage Chinese firms to invest in foreign markets. They help to explain why investing is preferred to exporting or manufacturing sales to foreign investors, and why Chinese firms from so many sectors are deciding to invest in so many countries at the same time. The decision for Chinese firms to invest in Europe rather than export is sometimes precipitated by actual or threatened protectionism in the largest markets. The increased trade surplus with the EU has raised the sensitivity of Chinese exporters to this possible threat. In addition, the enlargement of the EU in 2004 and 2007 have led to increased attraction of Chinese firms to lower cost countries and allowed them to gain easy access to the rest of the EU. Among the factors pushing Chinese firms to invest in EU are governmental policies as well as strong and successful competition within the country of the investment. Also, Chinese firms are not used to have the advantage in generation of high technologies and internationally known brands. Their advantage lies, rather, in exploiting them in sectors where the importance of brands is diminishing but has not totally vanished (Cheng, L. K., & Ma, Z. (2010)).

The main advantages of investing the EU is thought to be this integrated market and having a large currency (Euro). It is also an important that EU have a good regulatory environment. The quality of infrastructure, the quality of R&D environment and the existence of attractive investment incentives seem also important for Chinese firms when they consider to invest in the EU. The perception of Chinese firms regarding business costs and tax systems in the EU as compared to other developed regions is more mixed. The most promising sectors for investing in EU is that Chinese companies mainly choose manufacturing, wholesale and retail trade (China Council for the Promotion of International Trade, (2010)).

A positive future investment relation between the EU and China is likely to be successful. Chinese firms view the EU as an important market that is safe and stable for their ODIs. The maintenance of social stability in times of such economic difficulties as the EU is experiencing now, further underlines confidence in future investments. The transparent and predictable legal environment within EU countries is positive indication for Chinese investors. Other factors that Chinese investments see as an advantage are highly-skilled and educated workforce with advanced international management expertise, and the availability of advanced and innovative technologies in the EU. Many Chinese firms have indicated that they are likely to expand existing investments and invest more and at larger amounts in the future. As firms increase investments to acquire technology, skills and brands that will help them better compete both domestically and internationally, the increase in investments through M&A could be significant.

Countries within the EU are aggressively competing with each other for Chinese investment. In some circumstances they may not wish to see greater European cooperation which could help Chinese investors because of this competitiveness. European government agencies has indicated that any moves to create a united European body to provide information and services to Chinese investors and other potential investors, might be negative in terms of those EU nations with well-established investment promotion activities in China because it undermines their competitive advantages. The EU should seek to manage this and provide the resources needed by Chinese investors for the overall improvement of the investment environment in Europe. As a result of this, the EU should welcome Chinese investment for the economic benefits that it brings and continue to encourage those investments. (European Union Chamber of Commerce in China, 2013,).

The maturity or 84% of all Chinese investment in the EU comes from state owned enterprises. Between 2005 and 2010, only three of the main Chinese investors there were not state owned: Huawei Technologies, Great Wall Motors and the Midea Group. As most investments are made by state owned enterprises, investment decisions in the EU often reflect political objectives, not just profit maximization as in the case of privately owned companies (Apoteker, T. (2012)). FDI can be seen as an important source of capital and have contributed to the amazing economic growth in China. Firms have gained from technology and knowledge spillovers, which also have created linkages to the foreign economy. Chinese firms have been affected by those factors since opening up their economy and allowing foreigners to invest.

As the Chinese ODIs is relatively recent phenomenon in the global economic system, it gives a reason to question which impact those Chinese investments have had in Europe. The following reasons can explain why this impact has not been as large as one might think (European Union Chamber of Commerce in China, (2013)):

- The total share of Chinese investments made into the EU are relatively small as well as most of the investments has been made very recently.
- Many acquisitions have not yet been successful in restoring weakly driven European firms to health.
- Most the investments are not made in labour intensive sectors where the impact on employment can be anticipated in the host country.
- Finally, European firms have already in some sectors transferred a large share of production to China.

Although the Chinese investments still have relatively small impact on the EU those investments are thought to have a significant affects on the EU economic development. Factors affecting the EU with Chinese investments can be seen as following (European Union Chamber of Commerce in China, (2013)):

- The industrial restructuring in Europe can develop if production of maturing industries is transferred to China.

- The access for European firms to the Chinese will be greater as well as the connection to other emerging markets through with Chinese MNEs.
- Chinese firms pay premium prices for Western technologies embodied within European firms that should result in higher returns for European investment in R&D.
- The resuscitation of some European firms that are going through difficulties.
- This may give European firms to discharge underperforming assets profitably.
- Chinese investments bring much needed capital into the EU banking sector.

While Chinese investments into the EU can both been seen as a risk as well as an challenge the meaning for those investments can have an significant affects to the European economy and supported the development of the EU (European Union Chamber of Commerce in China, (2013)):

- Within certain sectors, Chinese investors represent a true competitive threat to European firms, especially as they become more adept at managing brands and adapting to European tastes.
- Corporate governance among Chinese firms is often weak. This is in form of lack of transparency, poor accountability and close ties with the government.
- Hierarchical and inflexible management techniques in some Chinese firms can sometimes lead to instability within the employees.
- The support Chinese state owned enterprises receive may lead to unfair competition for European rivals.
- The opportunities for European firms to acquire Chinese firms are not always the same as those that Chinese investors often do in Europe.
- The security concerns arise from the possible outflow of critical European high technologies to China.

It seems that Chinese investors have a lot of opportunities in countries within the EU. A number of indications are probable why those investors to enter EU. As Chinese firms are increasing their influence on the financial environment in Europe it is interesting to see what it is that determines Chinese investors to enter EU.

2. Theoretical framework

FDI take place when a foreign firm purchases the assets of a firm in the host country, for example through a merger or acquisition, or when a foreign firm builds a new production plant abroad which is known as Greenfield investments. These foreign investments are determined by the real decisions of the managers of multinational corporations (MNCs) who devise their international investment strategy as a means of expanding their international operating situation. (Nicolas, F., & Thomsen, S. (2008)). FDI are defined by the UNCTAD as followed: “Foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest and control of a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate). Foreign direct investment implies that the investor exerts a significant degree of influence on the management of the enterprise resident in the other economy. Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates, both incorporated and unincorporated” (UNCTAD 1998: 350).

Economic growth and development, job creation and technology transfer are often associated as positive effects of FDI (Jenkins & Thomas 2002). The determining factors of FDI are a complex problem to identify which depends on several characteristics specific for each country, sectors and companies.

2.1.General ODI theory

The general principles of the ODI theory are twofold according to Buckley and Casson (1976).

- Firms internalize missing or imperfect external markets until the costs of further internalization outweigh the benefits.
- Firms choose locations for their investment activities that minimize the overall costs of their business operations.

In his location aspect of the mainstream or general ODI theory, Dunning (1977), suggests three primary motivations for a countries outward investment. These three aspects are:

resource seeking, market seeking, and efficiency seeking ODIs. In the following sections these aspects will be introduced.

The general theory of ODI has been built largely on the experience of industrialized country investors. While in certain respects this can be readily applied to emerging economy investors, there are inevitably gaps. Market seeking ODI will be undertaken by emerging economy firms for traditional trade supporting reasons, to access distribution networks, to facilitate the exports of domestic producers and to improve exports from the host country to other large and rapidly growing markets. Efficiency seeking ODI will occur when outward investors seek lower cost locations for operations, particular in the search for lower cost labour. Given China's comparatively low labour cost levels, especially compared with Europe, this motivation is unlikely and is not explicitly considered in this study. Increased efficiency seeking investments by Chinese firm are rather thought to be focused towards technology and production development.

Some studies (Dunning, 2002) have pointed out that the motives for and the determinants of ODI have been changing in recent years. According to Dunning (2002), ODI in developing countries has been changing from market-seeking and resource-seeking ODI to more efficiency-seeking investment decisions. Due to increased competitiveness in global markets, firms are concentrating more and more to relocate some of their production facilities in low labour developing countries to lower cost of production. Despite of this and in contrast to ODI into industrial countries, ODI into the developing countries is still in a large number directed towards the natural resources and national or regional markets (Dunning, 2002).

2.2.Resource seeking

According to Buckley et al. (2007) "resource-seeking FDI from emerging economies occurs to acquire or secure the supply of raw materials and energy sources in short supply at home." Countries enrichment in natural resource is therefore thought to be a corresponding determinant for ODIs. Natural resources has for a long time been the most important determinant of ODI. Until the middle of the nineteenth century the share of investments in natural resources were around 60%. Since then the share of those investments has been declining as other sectors have increased their share (UNCTAD 1998: 106). The investments

in developing natural resource rich countries take place when those countries either lacked the large amounts of capital required for resource extraction or they do not have the technical skills needed to extract or sell those resources to the global market. In addition, the infrastructural facilities for sending the raw materials out of the host country and to its receiving destination had to be in place or had to be created (UNCTAD 1998: 106).

Resource seeking FDI from emerging economies are thought to acquire and secure the supply of raw materials and energy sources when the supply at home market comes short. This can involve Chinese ODI in fairly high income countries that have significant energy reserves and raw material deposits. This may also involve the search for detailed assets such as R&D capacity and output, design facilities as well as brand names that are embedded in high developed country firms and that can normally only be accessed by takeover of these firms or subdivisions of them (Dunning, 2001).

2.3. Market seeking

The main reason for market-seeking ODI is to enter and take advantage of new markets, respectively to sustain or protect those markets (Dunning & Lundan 2008). The advantage for Chinese firms to access beneficial markets is an important indicator in this aspect. According to Buckley et al. (2007), market seeking ODI from emerging economies are made to access distribution networks and to facilitate the exports of home country producers. Additionally, Dunning & Lundan (2008) stress that physical presence of the firm plays an increasingly important role in global marketing strategies. The corresponding ODI determinant is therefore thought to be the market size “in absolute terms as well as in relation to the size and income of its population, and market growth” (UNCTAD 1998: 107).

Host market characteristics, such as market size, are generally recognized as a significant determinant of ODI. With a host country larger market, opportunities for efficient utilization of resources and the gain of economies of scale and scope via ODI can be obtained (UNCTAD, 1998). Studies have shown that there is positive relationship between ODI flow and market size. Rapidly growing economies should provide more opportunities for generating profits than those which are growing more slowly or not at all. This should give firms opportunities to invest in those markets to expand their market share (Lim, 1983).

2.4. Efficiency seeking

Buckley et al. (2007) characterizes efficiency-seeking ODI when investors seek lower-cost locations for operations, in particular in the search for lower labor cost as a determinant of investment. Efficiency seeking investments are supposed to restructure the firms existing investments so as to achieve an efficient allocation of international economic activity. With efficiency seeking investments firms expect to increase their efficiency by exploiting the benefits of economies of scale and scope and also those of common ownership.

Chinese ODI has been directed to the acquisition of information and knowledge on how to operate internationally, especially in the 1980s (Buckley, et al., 2006; Zhan, 1995). In recent years, an expressed goal of state directed Chinese ODI has been to access advanced technology, immobile strategic assets (brands, local distribution networks) and other competences in foreign markets (Warner et al., 2004; Deng, 2003; Zhang, 2003), through both acquisitions and other financial investments. It is expected that Chinese firms would direct such efficiency seeking ODI towards economies with significant levels of human and academic capital, in particular towards more industrialized countries, to help them to strengthen their competitiveness (Dunning et al., 1998).

2.5. Previous studies

Some empirical evidence on host country determinants of Chinese ODIs are available. As the financial presence of China abroad has been increasing, a number of studies have been published in recent years on Chinese ODI. Most of these present simple descriptive data on Chinese investment and the theoretical arguments followed by them. These studies have used a number of relevant variables that are thought to be included in this study. The results from those studies are both different and mixed, which may be based on the complexity of these Chinese investments as well as some flaws in the data used and their specifications. Now some relevant studies will be presented and introduced for theoretical reasons.

Buckley et al (2007) use panel data on approved Chinese FDI to 49 countries, for the period 1984-2001. The study shows that more Chinese investment are faced towards countries with poor institutions (measured by an index of political risk), whereas natural resources (measured as the share of ores and metals exports in total merchandise exports) are

insignificant. Dividing the sample into two shorter periods, their results show that institutions are significant only in the period 1992-2001 and that natural resources show significant results towards Chinese FDI in this period. This suggests that these factors (institutions and natural resources) have become more important in recent years. This might be following the liberalization connected with Deng Xiaoping's South China Tour in 1992. Buckley et al. also shows in their study that Chinese FDI is attracted to countries with large GDP, high inflation, high exports and imports, and cultural proximity to China. On the other hand, variables like patents, exchange rates, distance from China and total FDI as a share of GDP, showed insignificant results.

In their study, Cheng and Ma (2008) conduct an analysis on actual Chinese FDI data for 90 host countries over the period 2003-2006. Panel data estimation is used but the exact method is not entirely described in their paper. In their model specification either institutions or natural resources are not include. Cheng and Ma find that GDP and cultural closeness as well as a common border with China are factors that attract Chinese FDI. Variables that show negative connection to Chinese investments are the host countries distance from China and landlocked countries.

Cheung and Qian (2008) perform in their study fixed effect estimation on data approved on Chinese ODI flows to 31 countries over the period 1991-2005. In their base specification, they find that institutions (measured as the host country risk) are insignificant, while natural resources (the ratio of fuels, ores and metals exports in total merchandise exports) show significant results in attracting Chinese ODI. They find that Chinese ODI is attracted by host country GDP and deterred by GDP per capita, but as both these are measured relative to Chinese GDP, the interpretation of this is difficult. Additionally they find that low wages economies attract Chinese ODI. Cheung and Qian also run their estimation on data on actual Chinese ODI for the years 2003-2005, getting just a few significant results, which is not unexpected given the shortage of variation.

In sum, previous empirical studies do not give a clear picture of the determinants of Chinese ODI to the host countries. The results suggest that countries with poor institutions both attract or do not matter for ODI from China, and that the same counts for natural resources. The two studies that include both institutions and natural resources as explanatory variables have used data on approved rather than actual ODI flows. This may lead to biased results. The only

study which uses data on actual ODI flows does not include institutions and natural resources as explanatory variables.

2.6. Is China different?

The studies mentioned above suggest that Chinese investors may respond differently to host country factors with respect to the countries' different strengths. The share of Chinese investments within developing countries has been highly discussed in recent years. Those investments are often related to the institutional environment within those economies. Theoretical studies argue that good institutions within the host country can reduce risk and costs of doing business and increase productivity (Blonigen, 2005), and attract foreign investments. Some recent empirical studies of ODIs also document a positive relationship to host country institutions (Asiedu, 2006; Harms and Ursprung, 2002; Wei, 2000). While natural resources show a locational advantage in the OLI framework of Dunning (1977, 1993), their impact on ODI has not been much examined empirically. Harms and Ursprung (2002) get mixed results for investments in the natural resource of oil, and Asiedu (2006) finds resources significant for ODIs into African countries.

Chinese companies that invest abroad are mainly state-owned. In 2006, 82% of China's non-financial ODI were made by state-owned enterprises (Yeung and Liu, 2008). Of the thirty largest companies that made investments abroad, all except two are state owned, and even though most of those firms are listed on a stock exchange, the state retains majority power and appoints executives, largely from party members (Morck et al, 2008). The investment decisions are therefore often thought to be of a political nature and not just profit-maximization as in the case of investments from privately owned firms from other countries. These investments may therefore be to promote domestic development (Deng, 2004), ensure governmental survival or increase the wealth or status of those in charge (Morck et al, 2008), to support Chinese foreign policy, or support the host country development (Yeung and Liu, 2008). Some studies support that Chinese ODI is becoming more commercial (Cheng and Stough, 2008; Hong and Sun, 2006) and that political objectives are likely to become relatively more important for Chinese investments than for investments from other countries. Even ODI by privately owned Chinese firms may be reflected by political objectives, because of the incentives they face when investing abroad (Cheng and Ma, 2008). Chinese ODI can

also reflect different opportunities or incentives than ODI from other countries. In particular, China has a quite different institutional environment than the major source countries of ODI from the developed world. The level of corruption in China is much higher than in other major industrialized source countries of ODI. Also, the firms listed in China the stock market regulations are relatively weaker than within other countries, and only 15% of Chinese overseas listing is in the United States (Hung et al., 2008). A number of studies support that home country institutions affect their competitive advantages (Belloc, 2006, Costinot, 2009). In terms of ODI, some studies suggest that investment patterns are not just related with good or bad institutions, but also similarities between the home and host country institutions. The institutional setting in China may thus be an important determinant of the sectors and countries Chinese firms may invests in.

2.7.Hypothesis

The market seeking ODI from the investing economy is undertaken to access distribution networks and to facilitate the exports of the home country producers. The host market characteristics, such as market size, are generally recognized as a significant determinant of ODI flows. That means that when markets increase in size, so do opportunities for the efficient utilisation of resources and the exploitation of economies of scale and scope via ODI.

Chinese investments are made all across the EU the main focus lies in the following three countries, France, Germany and the United Kingdom. Although in recent years the shares of Chinese investments into other countries within EU have been increasing. This leads to the first hypothesis where:

H1: Chinese investments are made in countries with high GDP per capita rater than in those countries with lower GDP per capita (Market seeking).

With the demand for natural resources increasing in China, firms have been investing abroad to maintain the optimal level of supply at home markets. Chinese firms have been a large player in developing countries in Africa and invested in natural resources in order to keep up the increased demand in China. As a number of studies have suggested, China invests in

resource rich countries to obtain greater security of access to energy and other resources (Cheng and Ma, 2008; Morck et al. 2008). Chinese investors are, with increased demand from the home market, thought to secure natural resources in developing countries and invest in large-scale acquisition activities in developed countries. The security for energy is thought as a necessary to maintain a high rate of a countries economic development, where the future of the government also depends on this resource. Given experiences of unrest in other countries due to shortages or rising prices of energy, this may be viewed as particularly important to maintain political control. Given this information the second hypothesis of this study is:

H2: Chinese investments are made in countries with high production level of energy rather than in countries that has lower level of energy production (Natural recourses).

Firms are seeking for more efficiency in terms of restructuring the firms existing investments to achieve an efficient allocation of international economic activity. It is expected that Chinese firms would direct such efficiency seeking ODI towards economies with significant levels of human and academic capital. Economies where the academic capital is high, it is thought to support the investing firms to have better access to technology based knowledge and increase the firm's global competitiveness. The discussion about the transfer of technology to China has been substantial in recent years. EU investors are still the central role of this process as they account for approximately 40% of the total technology transfer into China. Much has been mentioned about the growth of China and their catch up with foreign firms. Nevertheless, recent research indicates that China is still relatively small actor in the global economy for the assembly of final products based on the import of higher value parts and components. Chinese investment into the EU is often thought to gain access to foreign markets, technologies and factors of production. This leads to the third hypothesis where:

H3: Chinese investments are made in countries with high level of technology based export rather than in countries with lower technological export (Efficiency seeking).

3. Method

China has only published its ODI data in a format that is consistent with the OECD and IMF standard since 2003. The data is published in The Statistical Bulletin of China's Outward Foreign Direct Investment by the Ministry of Commerce of the People's Republic of China. The Ministry of Commerce was formed in the spring of 2003 through re-organizing the former Ministry of Foreign Trade and Economic Co-operation. The relatively short sample period makes it difficult to assess the evolution of China's ODI.

The approved ODI data is from the Chinese enterprises that are approved by the Chinese government. Similar to most data on China, there are concerns about the accuracy of this published data. For instance, the approved ODI data are different from the contracted or realized ODI data. The investment that does not go through the formal approval process is often omitted. In general it is believed that these data understate China's overseas investment.

While some previous studies have included institutions as an explanatory variable in their calculations, this will not be used in this study. Because the study only determinates investments within the EU, the role of institutions should not be a relevant factor. Countries within the EU work with in the same legal environment, where the security for investments should be similar in the different countries. Also, in this study the distance from China is excluded. Where the study focuses on countries within the EU, the distance from China is not thought to be an important factor for investments, rather the decision itself to invest in the EU.

3.1.Data and model specification

Required data were obtained from different sources and databases. It is conceived that data scarcity imposes a severe constraint on analyzing China's ODI. The data on Chinese ODIs has only been published in a format that is consistent with the Organisation for Economic Co-operation and Development (OECD) and the International Monetary Fund (IMF) standard since 2003. Certain data used for this study is gathered from The Statistical Bulletin of China's Outward Foreign Direct Investment by the Ministry of Commerce of the People's Republic of China (MOFCOM). MOFCOM was formed in the spring of 2003 through re-organizing the former Ministry of Foreign Trade and Economic Co-operation. Because of this

relatively short period of data samples, it can be difficult to evaluate the development of China's ODI (Cheung & Qian, 2009).

The data were also obtained from the different World Bank datasets. The quality of the data gained from the World Bank is collected from national statistical agencies, central banks, and customs services. These primary data collectors use different methods and conventions that are possible to a significant inconsistency over time both within countries as well as across them. Delays in reporting data and the use of old surveys as the base for current estimates may further compromise the quality of data reported (The World Bank 2011b: 393). Another aspect that has to be concerned is that within the data considerable margins of error can occur. Also, the usual care must be taken in interpreting the ratios, mainly for the most recent years, because figures may be preliminary and subject to revision (The World Bank 2011a: 327).

The bulletin provides data for the 27 countries within the EU. From an econometric perspective this is a relatively small number of observations, particularly when the complexity of the topic is at this high level as this. One should notice that the reliability of the results from the regression should not be overestimated. Models covering relatively small number of observations and corresponding significances are generally extremely sensitive and also at very great risk of being distorted by possible extreme values. In the model for this study, all the variables of the dataset were examined for potential outliers that might affect the results. OLS regression model is conducted using the average of Chinese ODI to countries within the EU for the period 2004-2010 as the dependent variable. This is consistent with other studies of ODI flows, which smooth FDI flows by using period averages. Similarly, the explanatory variables will be presented using their average values for the period 2000-2010.

3.2. Variables

Data for the dependent variable – Chinese ODI to the countries within the EU were obtained from the 2010 Statistical Bulletin of China's Outward Foreign Direct Investment by the Ministry of Commerce of the People's Republic of China. The dataset consists of the total outward investments in the period 2004-2010. All the values are reported in million \$US. The dependent variable is expressed in a logarithmic form. The variables used for calculations are presented with their statistic summary in table 1 below.

Table 1 - Statistic summary for main variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
LN ODI	27	3,149	2,215	0,769	7,097
GDP per capita (PPP)	27	26085,39	17412,61	4299,469	82494,68
GDP growth	27	2,577	1,242	0,672	4,707
LN reserves	27	23,303	1,394	19,819	25,597
LN energy	27	8,93	2,704	-0,665	12,222
Forest	27	57432,58	72841,8	3	279995
Technology export	27	15,252	11,486	3,954	56,218
R & D expenditure	27	1,424	0,925	0,381	3,649
Inflation	27	3,444	3,18	0,858	17,841

Three aspects of the market-seeking motive are captured by the explanatory variables GDP per capita, GDP growth, and the total reserves of the host country. These three variables are expected to have a positive coefficient under the market seeking strategy as Chinese investments are expanding their market share. Data on these variables were collected from the World Development Indicators database provided by the World Bank. The variable GDP per capita counts for the GDP divided by midyear population. A country GDP is the total sum of the gross value added by all resident producers within the economy added with any product taxes and minus subsidies not included in the value of the products. It is calculated without making deductions for depreciation of the production or for reduction and degradation of natural resources. The data for GDP per capita is calculated in current U.S. dollars. Annual percentage growth rate of GDP at market prices is based on constant local currency. Aggregates are based on constant 2000 \$U.S. The variable counting for countries total reserves include holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. The share of gold of these reserves is valued at the end of every year in London prices. The data for total reserves is calculated in current U.S. dollars. Because rapidly growing

economies should provide more opportunities for generating profits than those which are growing more slowly or not at all, the role of GDP growth should be positive in terms of investments. Economies that show higher growth in GDP should give firms opportunities to expand their market share.

As a proxy for natural resources the host countries energy production and the land of forest area is used. The variable for energy production refers to forms of the host countries primary energy. This includes petroleum (crude oil, natural gas liquids, and oil from nonconventional sources), natural gas, solid fuels (coal, lignite, and other derived fuels), and combustible renewable and primary electricity, all fuels converted into oil equivalents. To maintain a high rate of economic development, the role of energy security is seen as necessary, upon which the future of the government also likely depends. Given the experiences of instability in other countries because of shortages or rising prices of energy, this situation may also be seen as an important factor to maintain political control. The variable forest area is measured by the land under natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excludes tree stands in agricultural production systems and trees in urban parks and gardens. As the most rapidly growing economy in the world, China will become in the nearest future, increasingly more dependent on the global supply of raw materials and energy, and have those China's investments within natural resources been in focus in the world economy. There were many reports of billion dollar deals involving oil producing in 2006 and 2007 to both African countries as well as other developing countries (Taylor 2009). This impression of foreign investment activities in natural resources indeed found support in the ODI statistics, which have shown that Chinese investors made investments for around \$8.54 billion in 2006 in mining, quarrying, and petroleum, accounting for 40,4% of China's total ODI in that year.

The main variables used for measurement of efficiency-seeking investments are the host countries high-technology export and the countries share of research and development expenditure. High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. The data for high technology export is calculated in current U.S. dollars. For calculations of the efficiency-seeking the variable of expenditures for research and development (R&D) are current and capital expenditures on innovative projects undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. Within the R&D the areas with basic research, applied research, and

experimental development are found. Inflation is included into the regression where this is commonly used as a measure of macroeconomic stability in host countries. As Chinese investors are seeking for increased efficiency the macroeconomic stability should have a positive effect on their choice of location. Therefore, the coefficient for inflation is expected to be negative as higher inflation results in a less investment willingness.

3.3. Model specification

The theory of ODI and its determinants gives a reason to investigate the motives for Chinese investments into the EU. The increased number of Chinese investments within the EU shows that Chinese firms are looking for some economic opportunities within the union. The model is build with the aspects of the different ODI theories, market seeking, natural resource seeking and efficiency seeking, taken into account. The model for the regression in this study is supposed to explain the relationship between the Chinese ODIs and factors that might affect them. By including relevant variables that are thought to concern the choice of location the following model is introduced:

$$\text{Ln}(\text{ODI}_{\text{EU}}) = \alpha + \beta_1 * \text{GDP_cap} + \beta_2 * \text{GDP_grow} + \beta_3 * \text{ln_reserv} + \beta_4 * \text{ln_energy} + \beta_5 * \text{forest} + \beta_6 * \text{R\&D} + \beta_7 * \text{tech} + \beta_8 * \text{Infl} + \epsilon_i$$

OLS estimations is performed using the average of Chinese outward FDI to the host countries for the period 2004-2010 as our dependent variable. This is also consistent with other studies of FDI flows, which smooth FDI flows by using period averages. The average for the period 2000-2010 for the explanatory variables will be used. In the following section the results of the regression will be presented.

4. Results and discussion

In Table 2 the main results from the economic analysis are presented, where the annual average of Chinese ODI into the EU for the period 2004-2010 are regressed on annual averages of the explanatory variables.

Table 2 – OLS regression results

Variable	Coefficient (standard error)	
GDP per cap.	0,0001 (0,00002)	***
GDP growth	0,698 (0,309)	**
LN Total reserves	1,199 (0,418)	***
LN Energy production	0,166 (0,207)	
Forest area	0,00000596 (0,00000458)	
R & D expenditure	-1,256 (0,507)	**
High-tech export	0,060 (0,028)	**
Inflation	0,126 (0,0878)	
Constant	-31,673 9,053	***
Observations	27	
Adj. R ²	0,7091	
***=p<0.01; **=p<0.05; *=p<0.10		
All models estimated via ordinary least squares (OLS).		
The dependent variable is the log of Chinese outward investments		

The results from the regression analysis show that the variables measuring for the host country market size and are significant with Chinese ODI, are the host country GDP per capita as well as the GDP growth with 1% respectively 5% significance. Both coefficients are positively related to investments. In other words, Chinese ODIs are directed toward countries with both large and growing markets. Although the GDP per capita is statistically significant, the value of 0,01% is so low that it is difficult to say it is economically significant. On the other hand show the results for a country's GDP growth high economic significance with 69,8%. This confirms that rapidly growing economies should provide more opportunities for

generate profits than economies that are growing more slowly. This should give firms opportunities to invest in those markets to expand their market share. The variable for the host country total reserves does not give a significant result. These results are in favor of Hypothesis 1 (market seeking), and supports that Chinese investments are made in countries with high GDP per capita rather than in those countries that have lower GDP per capita. These results are in line with previous studies showing that host countries with high GDP per capita are attracting Chinese investors.

The results for the natural resources do not show significant results. In other words, the Chinese investments into EU are not focused on natural resource seeking in form of energy and forestry. This is in line with previous studies that show that Chinese investments toward natural resources have mainly been focused to developing countries. With these results the second hypothesis (resource seeking) is rejected. The study does not confirm that Chinese investments are made in countries with higher level of energy production rather than in countries that has lower level of energy production. As some previous studies have pointed out, investments focused on natural resources are often mainly directed towards poor developing countries. As the countries within the EU are thought to be developed and therefore more likely to be able to produce and make use of the natural resources themselves, the connection between the Chinese investments and those resources is not significant.

Both research and development expenditure and high-technology export show significant results at 5% level. The results for those variables show both positive and negative values, which indicates that Chinese investments are rather faced towards countries that export high-technology products than the countries focusing on research and development. This is in favor of the third hypothesis (efficiency seeking), that Chinese investments are made in countries with high level of technology based export rather than in countries with lower technological export. There has been much discussion about the transfer of technology to China. EU investors are at the forefront of this process as they account for about 40% of total technology transfer to China. Much publicity has also been focused on the rise of China and their catch up with foreign firms. Nevertheless, recent research indicates that China still remains a relatively low value economy for the final production based on the importance of higher value parts and components (Moran, 2011). The transfer of technology will be from the foreign subsidiary in Europe to the parent company in China. The technology may be acquired in

Europe but exploited more profitably in China. This is because domestic firms enjoy preferential treatment at their home market where protectionism in the form of non-tariff barriers is extensive. Additionally, as the Chinese currency appreciates further relative to the Euro in the future, investors will have an additional incentive to acquire European firms to satisfy the need for advanced technology.

Chinese investments into the EU are mainly directed towards both market seeking as well as efficiency seeking. Catching up with developed economies requires a fast transformation toward higher technology based production and more efficiently driven businesses. Europe can therefore be seen as an optimal location for Chinese investments where Europe consist of large markets as well as high level of technology based knowledge. Those results confirm that Chinese natural resources investments are mainly not focused into Europe. This has also been shown in previous studies that investments toward natural resources are primarily made in developing economies both in Africa and Latin America.

5. Conclusion

This paper set out to explain the determinants of Chinese ODIs into the EU. As the EU is currently the largest foreign investor in China and considers the Chinese market to be increasingly important for the future, the Chinese investments are still not a large share of total investments in EU. Although, in recent years those Chinese investments has been expanding at a fast phase. Beginning at a very small base, Chinese investors are now rapidly increasing their presence in Europe and this trend is set to continue. The driving force behind Chinese investment in Europe seems to be mainly to gain access to foreign markets, technologies and factors of production. This support both the market as well as the efficiency seeking theories linked with foreign investments.

Chinese investors have in recent years been increasing their share of acquiring assets across a broad range of commercial and financial sectors in an increasing number of EU countries. The growing number of acquisitions, made by Chinese investors through international financial markets and with very little transparency, has caused some concerns regarding the economic security in Europe. China protects its own economic security by maintaining strict regulations over the countries capital markets and restrictions on European ownership of shares in

Chinese companies. Europe needs to address the issues of economic security with regard to Chinese investment in the European capital markets.

As investments from China has increased at a high rate in the recent years indicates that the economic crises has had some influence on that. Where many countries within the EU are in need of capital, foreign investments included Chinese investments are welcomed, that brings additional capital into the needed economy. Also, many firms within EU have suffered from the crises, which have resulted in increased acquisitions by Chinese firms. These financial difficulties faced by many European firms as a result of the economic crisis may provide interesting opportunities for Chinese investors. ODI provides an inflow of capital into these suffering economies and can have positive effects on the host country's employment. Also, jobs in foreign affiliates are typically better rewarded than similar jobs in domestically owned companies. Keeping the EU open to foreign investment shows an international openness from the European site. Chinese investments refused by the EU could alternatively be directed to competitors that could affect firms within the EU in negative ways. The expansion of Chinese investment in Europe is expected to maintain in the nearest future as the China will invest its large current account surpluses overseas mainly to satisfy its growing need for high technology production in the home market. With Europe's recovering period from the economic crises the opportunities for acquiring a wide range of companies will still be in place for Chinese investors. Additionally, the privatization of state owned assets under strengthening programs debt suffering countries in the EU should open up further opportunities for Chinese investors to enter Europe.

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7. Appendix

7.1. Appendix A – Chinese investments in EU – \$US millions

Country	2004	2005	2006	2007	2008	2009	2010	Total
Austria	0,7	0,1	4,0	1,2	4,0	1,6	2,0	13,6
Belgium	1,6	2,3	2,7	34,0	33,3	56,9	101,0	231,9
Bulgaria	1,5	3,0	4,7	4,7	4,7	2,3	18,6	39,6
Cyprus	-	1,1	1,1	1,4	1,4	1,4	1,4	7,6
Czech Republic	1,1	1,4	14,7	19,6	32,4	49,3	52,3	170,9
Denmark	67,2	96,6	36,5	36,8	38,1	40,8	42,5	358,4
Estonia	-	1,3	1,3	1,3	1,3	7,5	7,5	20,0
Finland	-	0,9	0,9	0,9	3,6	9,0	27,3	42,7
France	21,7	33,8	44,9	126,8	167,1	221,0	243,6	859,0
Germany	129,2	268,4	472,0	845,4	845,5	1 082,2	1 502,3	5 145,0
Greece	-	0,4	0,4	0,4	1,7	1,7	4,2	8,7
Hungary	5,4	2,8	53,7	78,2	88,8	97,4	465,7	791,9

Ireland	0,0	0,0	25,3	29,2	107,8	106,8	139,9	409,1
Italy	20,8	21,6	74,4	127,1	133,6	191,7	223,8	793,1
Latvia	1,6	1,6	2,3	0,6	0,6	0,5	0,5	7,8
Lithuania	-	3,9	3,9	3,9	3,9	3,9	3,9	23,6
Luxembourg	-	-	-	67,0	122,8	2 484,4	5 786,8	8 461,0
Malta	0,4	1,4	2,0	1,9	4,8	5,0	0,2	15,6
Netherlands	9,0	15,0	20,4	138,8	234,4	335,9	486,7	1 240,1
Poland	2,9	12,4	87,2	98,9	109,9	120,3	140,3	571,9
Portugal	0,2	-	0,2	1,7	1,7	5,0	21,4	30,2
Romania	31,1	39,4	65,6	72,9	85,7	93,3	125,0	513,0
Slovakia	0,1	0,1	0,1	5,1	5,1	9,4	9,8	29,7
Slovenia	-	0,1	1,4	1,4	1,4	5,0	5,0	14,3
Spain	127,7	130,1	136,7	142,9	145,0	205,2	247,8	1 135,4
Sweden	6,4	22,5	20,0	146,9	157,6	111,9	1 479,1	1 944,5
UK	108,5	108,0	201,9	950,3	837,7	1 028,3	1 358,4	4 592,9

7.2. Appendix 2 – Correlation matrix

	LN ODI	GDP p.cap	GDP growth	LN reserves	LN energy	Forest	Tech. export	R & D expend.	Inflation
LN ODI	1.0000								
GDP p.cap	0.5377	1.0000							
GDP growth	-0.2976	-0.4581	1.0000						
LN reserves	0.4695	-0.1104	-0.4466	1.0000					
LN energy	0.4528	-0.0176	-0.1734	0.7963	1.0000				
Forest	0.3072	0.1149	-0.1543	0.4288	0.4073	1.0000			
R&D expend.	0.4052	0.6243	-0.4669	0.3386	0.3892	0.5811	1.0000		
Tech. export	0.1087	0.2358	-0.3233	-0.1293	-0.4370	-0.1122	0.1606	1.0000	
Inflation	-0.0571	-0.4192	0.4332	-0.0866	-0.0187	-0.1240	-0.4394	-0.2534	1.0000