

International financial competitiveness and incentives to foreign direct investment

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Abstract

In this paper an index of financial competitiveness is calculated that corresponds to the market-to-book ratio of inward FDI stocks. For a panel of five advanced economies from 1980 to 2006 it is shown that price competitiveness, stable inflation rates and registered patents have a positive impact on the index. Institutional factors like EMU membership or Anglo-Saxon legislation also play a role. Financial competitiveness in turn encourages FDI inflows whereas it benefits fixed investment relative to M&A. There is also some evidence that an innovative environment accelerates investment decisions by promoting competition among investors.

Keywords:

Competitiveness, foreign direct investment, international integration

JEL-Classification:

F21, F23, F41

Non-technical summary

International financial integration has become an important factor for economic performance in the globalisation process. Access to international capital markets is crucial for a country's ability to meet its financial needs and to keep up with the challenges of a changing global landscape. In this paper, "financial competitiveness" is interpreted as the attractiveness of a country as perceived by foreign investors which is reflected in refinancing costs in international capital markets. The study concentrates on foreign direct investment (FDI), which is an essential feature of the globalisation process and has immediate implications for the real economy.

An index of international financial competitiveness is calculated which is given by the ratio of the market value to the book value of inward FDI stocks. The indices of France, Germany, Japan, the UK and the US showed substantial dispersion during the 1980s and the 1990s. There are strong signs of convergence after 2000, when all the five economies underwent a sharp fall in financial competitiveness which bottomed out in 2002. Since then, the indicators have somewhat recovered but moved mainly sideways.

An empirical analysis using a panel of the five countries and an observation period from 1980 to 2006 shows that price competitiveness, stable inflation rates and EMU membership have a positive impact on financial competitiveness. The impact of factors that are commonly used to represent non-price competitiveness is ambiguous. While registered patents seem to raise the market value of the capital stock under consideration, current national R&D expenditure rather has a detrimental effect. Furthermore, both variables become insignificant if a dummy for Anglo-Saxon countries is introduced that mirrors the fact that legislation in the US and the United Kingdom is friendlier to investors than in Continental Europe or Japan. This institutional factor is shown to be beneficial to financial competitiveness.

According to a real option model, uncertainty regarding future earnings may entail an "option value of waiting" and hereby delay investment decisions. This phenomenon is contrasted by the possible existence of a first-mover-advantage, where the pioneering investor has the chance to earn extra profits.

There is empirical evidence that the effect of financial competitiveness on FDI inflows is indeed positive. It is shown that patents of resident firms accelerate investment decisions by promoting competition among investors. By contrast, an impeding effect of share price volatility cannot be verified. After all, substantial deviations of the real effective exchange

rate from its long-term average seem to affect FDI inflows to some extent. Possibly, such a misalignment is a more appropriate indicator of uncertainty about future prospects of investment in a given country than stock market volatility.

The role of mergers and acquisitions, the link to corporate valuation of which remains unclear, loosens the theoretical relationship between financial competitiveness and FDI inflows. A simple regression of M&A sales relative to FDI inflows on financial competitiveness confirms the hypothesis that an increase in financial competitiveness benefits the inflow of fixed investment relative to the takeover of domestic firms by foreigners.

Nichttechnische Zusammenfassung

Internationale finanzielle Wettbewerbsfähigkeit ist zu einem wesentlichen Faktor für die wirtschaftliche Entwicklung eines Landes im Globalisierungsprozess geworden. Der Zugang zu den internationalen Kapitalmärkten ist von zentraler Bedeutung für die Fähigkeit eines Landes, seinen Finanzbedarf zu decken und die Herausforderungen einer sich verändernden Weltwirtschaft zu meistern. In diesem Papier wird „finanzielle Wettbewerbsfähigkeit“ als die Attraktivität eines Landes in den Augen ausländischer Investoren interpretiert, die sich in den Refinanzierungskosten an den internationalen Kapitalmärkten widerspiegelt. Die Untersuchung konzentriert sich auf ausländische Direktinvestitionen, die ein wesentliches Merkmal des Globalisierungsprozesses darstellen und einen unmittelbaren Bezug zur Realwirtschaft haben.

Es wird ein Index der internationalen finanziellen Wettbewerbsfähigkeit berechnet, der dem Verhältnis von Marktwert zu Buchwert der inländischen Bestände an Direktinvestitionen entspricht. Die Indizes von Frankreich, Deutschland, Japan, Großbritannien und den USA wiesen in den 1980er und 1990er Jahren eine erhebliche Streuung auf. Nach der Jahrtausendwende, als die finanzielle Wettbewerbsfähigkeit in allen fünf Volkswirtschaften drastisch einbrach, konvergierten die Entwicklungen. Seitdem die Indizes im Jahr 2002 die Talsohle erreichten, haben sie sich etwas erholt, im Wesentlichen aber seitwärts bewegt.

Eine empirische Untersuchung auf Basis eines Panels mit den fünf Ländern über einen Zeitraum von 1980 bis 2006 bestätigt die Hypothese, dass preisliche Wettbewerbsfähigkeit, stabile Inflationsraten und die Mitgliedschaft in der Europäischen Währungsunion einen positiven Einfluss auf den Index haben. Der Einfluss von Faktoren, die gewöhnlich zur Abbildung von nicht-preislicher Wettbewerbsfähigkeit herangezogen werden, ist nicht eindeutig. Während Patente die Marktbewertung des betrachteten Kapitalstocks offenbar erhöhen, machen sich hohe Ausgaben für Forschung und Entwicklung in einem Land eher negativ bemerkbar. Hinzu kommt, dass beide Variablen ihre Signifikanz verlieren, wenn eine Dummy-Variable für angelsächsische Länder eingeführt wird. Sie steht für die Tatsache, dass die Gesetzgebung in den USA und Großbritannien in der Regel investorenfreundlicher ist als in Kontinentaleuropa oder Japan. Dieser institutionelle Faktor kommt der finanziellen Wettbewerbsfähigkeit nachweislich zugute.

Gemäß einem Real-Option Modell kann Unsicherheit über künftige Gewinne einen „Optionswert des Wartens“ generieren und Investitionsentscheidungen entsprechend

verzögern. Diesem Phänomen steht möglicherweise ein „First-Mover-Advantage“ gegenüber, der dem ersten Investor die Aussichten auf überdurchschnittliche Gewinne eröffnet.

Die empirische Überprüfung zeigt, dass finanzielle Wettbewerbsfähigkeit einen positiven Einfluss auf Direktinvestitionszuflüsse hat. Es ergeben sich auch Belege für die Vermutung, dass Patente ansässiger Firmen die Investitionsentscheidung beschleunigen, indem sie den Wettbewerb unter den Investoren anregen. Ein verzögernder Effekt von Aktienkursvolatilität kann hingegen nicht nachgewiesen werden. Allerdings scheinen erhebliche Abweichungen des realen effektiven Wechselkurses von seinem langfristigen Durchschnitt die Zuflüsse von Direktinvestitionen bis zu einem gewissen Grade zu beeinträchtigen. Möglicherweise sind derartige Fehlbewertungen ein geeigneterer Indikator für Unsicherheit bezüglich der Zukunftsaussichten von Investitionen in einem Land als die Volatilität des Aktienmarktes.

Die Rolle von Fusionen und Firmenübernahmen, deren Beziehung zur Unternehmensbewertung unklar bleibt, lockert die theoretische Beziehung zwischen finanzieller Wettbewerbsfähigkeit und Zuflüssen von Direktinvestitionen. Eine einfache Regression von Fusionen und Zusammenschlüssen in Relation zu den gesamten Direktinvestitionszuflüssen bestätigt die Hypothese, dass ein Anstieg der finanziellen Wettbewerbsfähigkeit den Zufluss von Sachinvestitionen im Verhältnis zu Firmenübernahmen durch Ausländer begünstigt.

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International Financial Competitiveness and Incentives to Foreign Direct Investment*

1. Introduction

International financial integration has become an important factor for economic performance in the globalisation process. Access to international capital markets is crucial for a country's ability to meet its financial needs and to keep up with the challenges of a changing global landscape. In this paper, "financial competitiveness" is interpreted as the attractiveness of a country as perceived by foreign investors.¹ A high degree of financial competitiveness should be reflected in favourable refinancing conditions in international capital markets which can be measured by international return differentials for given classes of investment as defined in the studies of Curcuru et al (2007) or Gourinchas and Rey (2005). While international returns on debt securities are readily available, equity yields as shown in the balance of payments are less reliable since they are heavily biased by the scope of multinational corporations in the ascertainment of profits.

The approach adopted in this paper therefore compares the prices of international assets instead of returns. While international competitiveness can essentially be analysed for any component of a country's international investment position, this study concentrates on foreign direct investment (FDI), which is an essential feature of the globalisation process and has immediate implications for the real economy.

FDI took off in the 1980s, when most countries in the western world induced a far-reaching abolition of capital controls. In 2006, foreign affiliates of transnational corporations sold goods and services for US\$25 trillion which is US\$10 trillion more than world exports. Their gross product amounted to US\$5 trillion or 10% of worldwide value added. In terms of employment, foreign-owned firms also play a significant role in most countries. The number of employees engaged by affiliates of a foreign firm exceeded 70 million in 2006, growing by an annual rate of 14 %.²

* For valuable comments, I thank Heinz Herrmann, Stefan Gerlach, Ulrich Grosch, Sabine Herrmann and Stefan Reitz.

¹ This concept must not be confused with the competitiveness of the financial sector. The terminus instead refers to a country's ability to attract financial resources.

² All data in this paragraph are provided by UNCTAD (2007).

In this paper, an index of international financial competitiveness is calculated which is given by the ratio of the market value to the book value of inward FDI stocks. The literature on the determinants of corporate valuation usually concentrates on corporate governance variables. La Porta and al (2002), for example, provide evidence that corporate valuation is generally higher in Anglo-Saxon countries where legislation is relatively benign to shareholders than in Continental Europe. Lee and Ng (2006) identify a detrimental impact of corruption on the value of national firms. In line with this finding, Bhattacharya and Daouk (2002) and Claessens et al (2002) show that enforcing laws against insider trading substantially reduces the equity costs of capital. Chua et al (2007) find that, in addition to corporate governance variables, an aggregated Tobin's q across all corporations listed in a broad national index varies greatly between countries and that differences are driven by R&D intensities, capital expenditure and the macroeconomic environment.

Another strand of the literature analyses corporate valuation in the home country as a determinant of outward FDI. De Santis et al (2004), for example, explain the FDI of euro area countries in the United States using stock prices in the euro area as a proxy for Tobin's q. Andrade and al (2001), Forssbaeck and Oxelheim (2008), Jovanovic and Rousseau (2002) as well as Servaes (1991) show that Tobin's q has a significant impact on mergers and acquisitions (M&A) and Blonigen (1997) identifies stock prices as a determinant of Japanese FDI in the United States.

This paper differs from the literature cited above since it concentrates on inward FDI stocks and establishes a relationship to future inflows. The indicator used is similar to Tobin's q, which indicates an incentive to invest as long as it exceeds unity.³ While in principle this concept can be applied to the overall capital stock of a country, this paper focuses on the market-to book value of foreign direct investment for two reasons. First, foreign investors are primarily interested in assets that are indeed open to foreign ownership. This can best be insured by using data of firms where foreign investors already play a significant role. Second, FDI data like book values and investment flows are

³ See Tobin (1969). Due to differing accounting rules, the book value of a firm is only an imperfect proxy for replacement costs. Data limitations, however, do not allow for a more precise measure. For this reason, the bulk of the literature refers to share prices and book values when calculating Tobin's q at the country level. See Chua et al (2007), La Porta et al (2002), Claessens et al (2002) or Lemmon and Lins (2003). Furthermore, data on FDI stocks only comprise equity. The ratio used here therefore differs from Tobin's q as it compares the market and the book value of equity, whereas Tobin's q also includes debt. Differences between the market-to-book ratio and Tobin's q are of interest with regard to the effects of business financing but are less relevant with regard to incentives to invest.

available for a large set of countries in the comprehensive UNCTAD Foreign Direct Investment database which ensures a certain degree of comparability.⁴

The paper is organised as follows. Section 2 presents the essential elements of a real option model which identifies factors that influence financial competitiveness. Furthermore, it explains the investment decision subject to financial competitiveness and explicitly takes into account two aspects of uncertainty. Uncertainty about the future development of potential profits causes an “option value of waiting” that tends to delay an investment decision. Foreign direct investment, however, may at the same time be associated with a first-mover-advantage that leads to an investment race and at least partly compensates for the incentives to wait. Section 3 provides empirical evidence on the determinants of financial competitiveness using data from five advanced economies since 1980. It also analyses whether financial competitiveness does indeed reveal incentives to invest, which should manifest themselves in rising FDI inflows. Finally, the effects of financial competitiveness on the ratio of mergers and acquisitions (M&A) to total FDI inflows are investigated. Section 4 concludes.

2. Corporate valuation and real options

A central concept in the theory of fixed investment is the ratio of the market value of a firm to its replacement costs. This indicator, introduced by Tobin (1969), has become known as “Tobin’s q” and is based on the idea that additional investment is advantageous as long as the present value of expected earnings exceeds the initial investment (the replacement costs). The profit margin of an investment project (Π) that ignores fixed costs of the invested capital stock is given by

$$(1) \quad \Pi_t = (p_t - k_t)X_t = m_t X_t$$

with t = time index, p = price of good x , k = marginal costs of good x , m = cost mark-up of good x and X = produced and sold amount of good x .

The value of the investment project before subtracting the fixed initial investment costs (V) depends on current and expected future profit margins, which are discounted at the rate r :

⁴ However, the principles of data collection still differ between countries. See UNCTAD (2008).

$$(2) \quad V_t = E \left[\int_t^{\infty} e^{-r(\tau-t)} m_{\tau} X_{\tau} d\tau \right]$$

If investment costs F are interpreted as the replacement cost or the book value of the investment, a measure similar to Tobin's q can be defined:

$$(3) \quad f_t \equiv \frac{V_t}{F}$$

Instead of calculating V_t on the basis of current and future earnings, it can immediately be equated with the firm value revealed in the capital market. A high ratio of the market value to the book value of inward FDI stocks signals a high willingness of foreign investors to pay for national financial assets, which is why it is taken as a measure of international financial competitiveness in this paper. The measure is without dimension and can be used directly for international comparisons.

A high value of f , however, does not necessarily give rise to large amounts of FDI inflows for two reasons. First, FDI is usually linked with high and partly irreversible costs of market entrance. If future returns are uncertain, an investor might want to gather some further information before investing, even though the net value of expected returns exceeds investment costs, ie f exceeds unity. Second, FDI flows as shown in the balance of payments comprise fixed (especially Greenfield) investment as well as mergers and acquisitions (M&A). While a high price for existing firms clearly reveals incentives for fixed investment, its effect on acquisitions is ambiguous since it might reflect a (speculative) overvaluation rather than high expected future earnings. In the following, both aspects are discussed in more detail.

The first caveat concerning the role of uncertainty can be illustrated in analogy to European call options in financial markets. The so called "option value of waiting" goes back to a model of McDonald and Siegel (1986) and has been further developed by Dixit and Pindyck.⁵ Its presentation in this paper differs from their basic model by also taking into account the effects of competition between potential investors.⁶ A first-mover-advantage consisting of exclusive access to intellectual knowledge or economies of scale may lead to an "investment race" that substantially reduces the net value of waiting. In some cases, investment is only profitable for the pioneering investor and competitors keep

⁵ See Dixit and Pindyck (1994), Dixit (2004), Pindyck (2004).

⁶ For technical details, see Appendix A.

out of the market.⁷ If the risk of market entrance by competitors during the next period of waiting is given by the constant hazard rate h , equation (2) becomes

$$(4) \quad V_t = E \left[\int_t^{\infty} e^{-r(\tau-t)} m_{\tau} X_{\tau} d\tau \right] = e^{-(r+h)(k-t)} E \left[\int_k^{\infty} e^{-r(\tau-k)} \cdot m_{\tau} X_{\tau} d\tau \right]$$

Competition for market entrance appears to shift the optimal moment of investment k to the present as long as expected future earnings are positive. Uncertainty with regard to the behaviour of rival firms contrasts with the uncertainty of future prospects. To the extent that initial investment costs cannot be retrieved in the event of permanent losses, an increase in risk may cause investors to delay their investment decision. As a consequence, an investment project is only realised if the present value of expected returns clearly exceeds fixed (irreversible) investment costs F :

$$(5) \quad \tilde{V} > F$$

where \tilde{V} denotes the threshold of the project value which defines the entry barrier.

Correspondingly, a defined critical value of f determines the entry decision of a firm:

$$(6) \quad \tilde{f} \equiv \frac{\tilde{V}}{F} > 1$$

The option value of waiting raises the investment threshold above unity, which is the benchmark of traditional q-theory.

The second caveat applies to the relationship between f and FDI inflows and is based on different characteristics of M&A and fixed investment. The amount of Greenfield investment approximately corresponds to the replacement costs of fixed assets, and the logic of Tobin's q is straightforward. In the case of mergers and acquisitions, by contrast, the investor has to pay the market price of the firm acquired but not the book value. Indeed, there is some evidence that "high-q" firms usually buy "low-q" firms since financially strong foreign investors generally look for relatively "cheap" firms to take

⁷ A corresponding scenario is discussed by Weeds (2002) who models the decision on R&D investment when the success of R&D is random and subject to the risk of being outpaced. Another aspect that may compensate for the option value of waiting is the ability of firms to adapt to changing conditions which translates into a convex profit function and a stimulating effect of uncertainty on investment. See von Kalckreuth (2000) or Fisch (2006).

over.⁸ However, subtracting M&A from gross FDI flows involves substantial data problems. First, FDI flows are recorded on a net basis, whereas M&A data are expressed as the total transaction amount of particular deals. In addition, transaction amounts are those at the time of closure of the deals, but the value is not necessarily paid out in the same period.⁹ Both effects tend to bias the calculated value of Greenfield investment if measured as the difference between total FDI inflows and M&A sales. In this paper, the impact of f on FDI inflows is therefore analysed in two steps: first, the (a priori unclear) effect on total FDI inflows is estimated and then the effect on the ratio of M&A to total FDI flows, which should be negative.

3. Empirical analysis

3.1 Financial competitiveness

The following analysis refers to Germany, France, Japan, the United Kingdom and the United States. It uses annual data from 1980 to 2006. The *index of financial competitiveness* (f) as defined in equation (3) is given by the ratio of the market value to the book value of inward FDI stocks. In some cases, it may be advantageous to compute indices relative to a specific group of countries or the world average. This should be done, if the total amount of investment is taken as given and only the distribution between host countries is of interest. In this paper, however, the total amount of worldwide investment is seen as an endogenous variable that may vary in dependency of global financial competitiveness, and therefore f is calculated in absolute terms.

The *market value of inward FDI* (V) is calculated according to the method used by the Bureau of Economic Analysis (BEA). Market values of inward FDI stocks are assumed to perform in line with a broad national stock market index adjusted for the effects of annual earnings per share.¹⁰ Stock market data are based on the CDAX and the S&P 500 index for Germany and the United States, respectively. For France, Japan and the United Kingdom,

⁸ See Andrade and al (2001), Forssbaeck and Oxelheim (2008), Jovanovic and Rousseau (2002) or Servaes (1991).

⁹ See UNCTAD (2007). Besides the methodological problems, M&A data are reported only as far back as 1988, thus reducing the number of observations.

¹⁰ See Kozlow, R. (2002) and Appendix B. The stock markets of the countries included in this empirical analysis are assumed to be highly integrated in the world economy so that the development of share prices reflects the price performance of internationally traded firms.

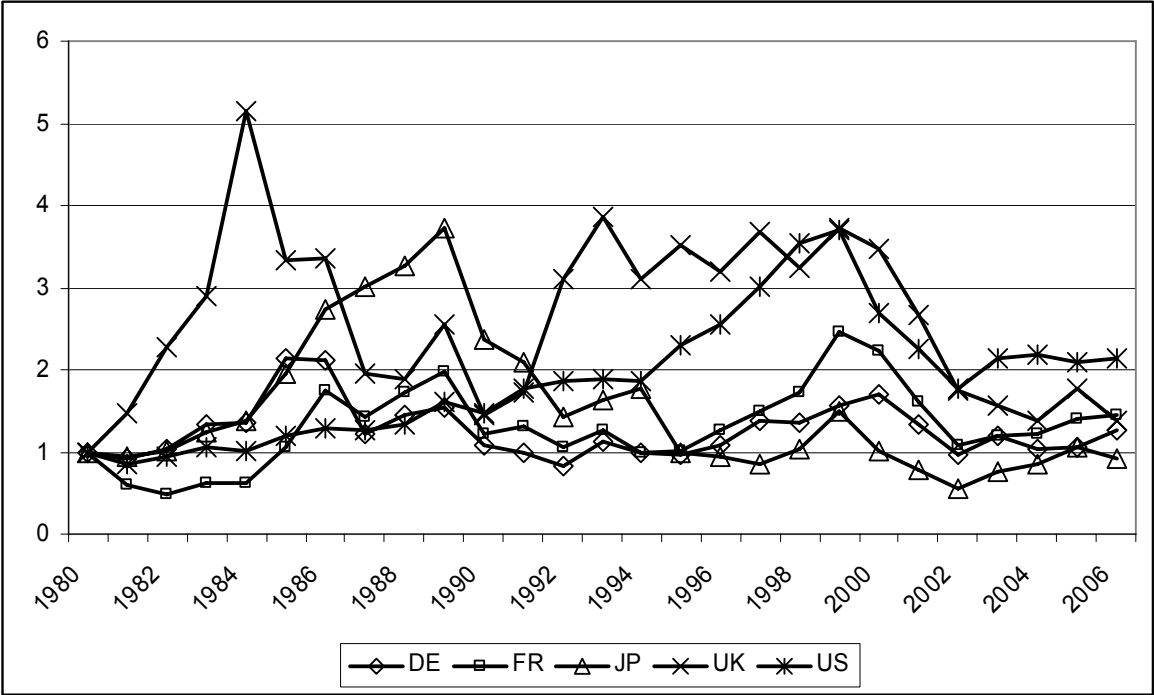
the broad national Thompson Financial Datastream index is used. Exchange rates to convert national currencies into USD are taken from the IMF International Financial Statistics.

The *book value of inward FDI stocks* (F) is published in the UNCTAD Foreign Direct Investment database at current USD prices.¹¹ To calculate the *ratio of the market to the book value* (f), FDI stocks are measured at national level. This is because this paper concentrates on the overall financial competitiveness of a country and not on individual investment decisions. In principle, however, f can also be calculated at sector or individual firm level.

Graph 1 illustrates the performance of financial competitiveness for the given sample. For the year 1980, market values of inward FDI stocks are normalised at book values, ie f equals unity for each country. During the following two decades, the index usually exceeds this initial value. However, substantial dispersion among countries can be observed. Financial competitiveness of the UK was both relatively high and relatively volatile. Both phenomena may originate from the prominence of the UK's financial sector. The performance of US financial competitiveness showed a clearly upward trend, while the same indicator for Japan rose significantly until the late 1990s only to fall back to values near unity in the following years. In Germany and France, the index number was more stable than in the other three countries under review. There are strong signs of convergence after 2000, when all the five economies underwent a sharp fall in financial competitiveness which bottomed out in 2002. Since then, the indicators have somewhat recovered but moved mainly sideways.

¹¹ In principle, market and book values of FDI can also be measured in national currencies which yields the same results. Exchange rate developments have no direct effect on the index of financial competitiveness.

Figure 1: Market-to-book ratio of inward FDI stocks



Sources: IMF, Thompson Financial, UNCTAD, own calculations.

Interestingly, the widening of the US current account deficit from 4.4 % of GDP in 2002 to 6.2 % in 2006 did not cause a deterioration in its financial competitiveness.¹² It seems that US firms were still highly valued and foreign investors were willing to pay prices above average to enter the US market. This supports the view that global imbalances at that time were mainly driven by an “investment drought” in Asia and a “savings glut” in oil exporting countries. For lack of alternatives, surplus capital flew into the US market which alone was able to absorb global excess liquidity.¹³ In that vein, the performance of US financial competitiveness is in line with international return differentials in favour of the United States, which have been largely analysed to assess the sustainability of the US current account deficit.¹⁴ They also indicate that the refinancing conditions of US residents did not worsen in response to the US current account deficit.

¹² In 2007, the US current account deficit shrunk substantially to 5.3 % of GDP. The turnaround was mainly due to the lasting weakness of the US dollar and to the financial crisis which began in April 2007 with the bankruptcy of a first mortgage company. It fully erupted in late summer, when a number of banks in the US and Europe acknowledged substantial losses associated to collateralised debt obligations (CDO) and other asset-backed securities.

¹³ A prominent advocate of this argument is the Chairman of the Federal Reserve. See Bernanke (2005).

¹⁴ See, for example, Cline (2005), Gourinchas and Rey (2005) or Curcuru et al (2007).

3.2 Determinants of financial competitiveness

According to the real option model described in Appendix A, international financial competitiveness as defined in this paper crucially depends on factors that determine the current profit margin, the underlying trend and the discount rate on future earnings. At aggregate level, international price competitiveness and non-price competitiveness are deemed to be important determinants.

International price competitiveness is usually measured by the real effective exchange rate. It is of special relevance if a significant percentage of foreign-owned affiliates operate in the tradeables sector and are exposed to international competition.¹⁵ In this case, real effective depreciation tends to increase the profit margins of domestic firms. Data on real effective exchange rates are provided by the IMF International Financial Statistics. The empirical analysis below uses the *natural logarithm of the real effective exchange rate (rer)* based on consumer prices.¹⁶

Technological knowledge is often seen as an important element of non-price competitiveness. It may reduce competitive pressure in the product market by allowing for product differentiation. Common measures of a country's innovative spirit are *expenditure for research and development as a ratio to GDP (rad)* and *registered patents of residential firms as a share of total patents (pat)*.¹⁷ Research and development (R&D) activities mirror current efforts to increase technological knowledge. They are published in the OECD Main Science and Technology Indicators (MSTI). Registered patents, by contrast, are the result of successful research in the past. The database of the United States Patent and Trademark Office (USPTO) is used to calculate the index.¹⁸

In the macroeconomic context, stable inflation rates are an important indicator of a sound economic environment and a consistent economic policy. In advanced economies, an

¹⁵ According to Blonigen (1997), this argument is of special relevance when firm-specific assets come into play which have to be purchased in the domestic market.

¹⁶ An increase in the index denotes real effective appreciation, ie a loss in international price competitiveness. From an economic point of view, other bases like producer prices or unit labour costs may be preferable. However, they are not as broadly available as consumer prices.

¹⁷ See, for example, Jarvis et al (2002) or ECB (2005) for R&D and patents as a factor of non-price competitiveness.

¹⁸ Given that statistics of the USPTO only relate to patents registered in the US, they are biased towards US firms. However, they are comprehensive in terms of length of sample period and country coverage.

increase in inflation rates (*dinfl*) usually entails a restrictive monetary policy and an increase in real interest rates.¹⁹ As a result, the present value of expected future returns should decrease. In the empirical analysis, consumer price indices published by the IMF International Financial Statistics and the Bank of International Settlement are used.²⁰

Finally, the introduction of the euro in 1999 is thought to have promoted integration of European financial markets. An increase of efficiency in capital markets facilitates corporate financing and should eventually be reflected in firm valuation. Furthermore, the common currency is embedded in an institutional framework of economic coordination like the Stability and Growth Pact that is deemed to ensure fiscal discipline in all EU countries and especially in the euro area. In the regressions below, a dummy for *European Monetary Union (emu)* indicates membership in the Eurosystem.

The real effective exchange rate, which is used as a measure of international price competitiveness, can also be interpreted as an asset price which rises with the appetite of foreigners for domestic assets. Consequently, it may simultaneously be influenced by the market value of foreign-owned firms. In order to avoid the resulting endogeneity problem, the empirical analysis uses lagged, ie predetermined, values of *rer*. The same applies to inflation developments, which may also be influenced by the performance of asset prices. R&D expenditure and EMU membership are considered exogenous and are factored in contemporaneously. The share in registered patents is calculated with end-of-year data for the preceding period. In addition to the determinants mentioned thus far, hysteresis may also influence the current degree of financial competitiveness. It can be interpreted as the role of past reputation which endures some time, even if the underlying fundamental factors have changed. The corresponding dynamic panel regression is given by:

$$(7) \quad f_{i,t} = \alpha_0 + \alpha_1 f_{i,t-1} + \alpha_2 rer_{i,t-1} + \alpha_3 rad_{i,t} + \alpha_4 pat_{i,t-1} + \alpha_5 dinfl_{i,t-1} + \alpha_6 emu_{i,t} + \varepsilon_{i,t}$$

where *i* and *t* denote the country and the time index, respectively. The coefficients α_1 , α_3 , α_4 and α_6 are expected to be positive, whereas α_2 and α_5 should be negative. Panel unit root

¹⁹ Another argument to control for inflation in the analysis of corporate valuation is that it may distort the book value for accounting reasons, see Chua et al (2007). Since inflation rates are I(1), they enter the estimates below in first differences. See footnote 21.

²⁰ Other aspects of macroeconomic policy, which are also discussed in the literature on FDI, are not explicitly modelled. Real interest rates turn out to be statistically insignificant and to dilute the significance of other variables. See De Santis et al (2004) for a similar finding. Fiscal aspects like corporate tax rates are widely constant over time and therefore difficult to be distinguished from other institutional aspects, see for example Wolff (2006). However, they are implicitly incorporated by price competitiveness and the country dummies introduced below.

tests confirm the stationarity of all variables in (7).²¹ The regression is carried out using Stata SE 10.0. The specification test of Hausman (1978) does not reject the hypothesis that cross-section effects are random. A Wald test on fixed time effects indicates that they are significant and that they should not be omitted. Due to the large number of time observations (37) relative to the number of cross sections (5), the Nickell-bias that results from including the lagged endogenous variable $f_{di,t-1}$ can be neglected.²² The estimates of the variance-covariance-matrix are robust in relation to correlation within individual countries and heteroscedasticity.²³ The results are presented in the first column of table 1.

Table 1: Determinants of financial competitiveness

	<i>Version 1</i>	<i>Version 2</i>
	f_t	f_t
f_{t-1}	0.816*** (20.9)	0.794*** (11.7)
rer_{t-1}	-0.489*** (-3.90)	-0.394*** (-4.03)
rad	-19.786*** (-3.45)	-
pat_{t-1}	0.186*** (3.51)	-
$dinfl_{t-1}$	-14.520** (-1.98)	-13.748** (-2.11)
emu	0.057* (1.72)	0.183** (2.50)
ang	-	0.184** (1.98)
c	0.745*** (3.95)	-0.180 (-1.02)
R^2	0.84	0.84

t-values in parentheses.

*** (**) [*] denote significance at the level of 1% (5%) or [10%].

There is a high degree of hysteresis in financial competitiveness, which points to the role of reputation earned in earlier periods. Furthermore, a close link to price competitiveness and aspects of non-price competitiveness, captured by registered patents, can be

²¹ The ADF Z-test of Choi (2001) and the test of Im/Pesaran/Shin (2003), which both allow for individual unit root processes, reject H_0 that a unit root exists at the 5 % level for all variables. The tests are executed with EViews 6.0 using the AIC criterion to determine the number of lags included.

²² See Nickell (1981).

²³ See Froot (1989), Rogers (1993) and White (1980).

established. The coefficients of these three variables have the expected sign and are highly significant at the level of 1%. Current R&D expenditure, however, seems to have a detrimental effect on firm valuation. This outcome is somewhat surprising, but can possibly be explained by the dichotomy of high current costs and uncertain future returns. Furthermore, only intellectual property rights (ie patents) can ensure that technological leadership translates into a lasting exceptional position in the relevant markets.²⁴ With regard to the external economic environment, inflation performance clearly influences financial competitiveness. This relates to the task of national central banks to stabilise inflation rates. Finally, European Monetary Union seems to enhance the financial competitiveness of member states, even if the influence is significant at only the 10% level.

In the alternative regression, a dummy for Anglo-Saxon countries (US and United Kingdom) has been included. As mentioned above, legislation in Anglo-Saxon countries is generally more benign to investors than legislation in Continental Europe which should result in a higher market value of resident firms.²⁵ This hypothesis can indeed be verified at the 5% significance level (second column in table 1). However, this institutional variable cannot be combined with the variables of non-price competitiveness, *rad* and *pats*. Otherwise, all the three coefficients become statistically insignificant. This points to a high degree of correlation between the three variables which, in turn, is partly due to the fact that patent registration at the USPTO is biased towards US firms.²⁶

3.3 Financial competitiveness and incentives to invest

A high present value of expected earnings relative to the initial investment sum should generally indicate an incentive to invest. According to the real option model presented in the appendix, this link may be affected by the existence of uncertainty. In this paper, a distinction is made between two types of uncertainty. On the one hand, the investor bears the risk of changing economic prospects, which raises a barrier to engaging in a new project. On the other hand, foreign direct investment is often associated with a first-mover-advantage that consists of exclusive access to technological knowledge or economies of

²⁴ See Greenhalgh and Rogers (2006) for the role of intellectual property on corporate valuation.

²⁵ See La Porta and al (2002), for example.

²⁶ See footnote 18. Furthermore, the share of national patents in total patents varies only slightly over time, which complicates the econometric distinction from country dummies.

scale. This phenomenon reduces the net option value of waiting and should have a stimulating effect on the investment decision.

In the following, uncertainty of future earnings is measured by the *conditional variance of a broad national stock index (vol)*. The respective time series are produced on the basis of daily percentage changes in the stock indices that were also used to calculate f .²⁷ Uncertainty with regard to the behaviour of other potential investors is of special relevance in monopolistic markets, where competition is shifted from the product market to the stage of investment. These markets are usually characterised by technological leadership or high economies of scale. Therefore, the *share in registered patents (pat)* is again used as a proxy.

A priori, the link between a country's financial competitiveness and total FDI inflows is unclear because of the ambitious effects of corporate valuation on M&A. Especially if speculation drives market valuation above the net value of expected earnings, enterprises become less attractive for strategic investors. Undervalued firms, by contrast, are generally susceptible to takeovers. The effect of financial competitiveness on Greenfield investment, on the other hand, should clearly be positive. Since the available database does not allow a clear distinction between these two components of FDI flows, the overall relationship between f and FDI inflows can only be analysed empirically.²⁸

In order to account for endogeneity, f and vol are factored into the estimates with a lag, the share in registered patents is again calculated with end-of-year-data for the preceding period. FDI flows are taken relative to the existing FDI stock so that the dependent variable fdi represents the growth rate of inward FDI stocks ignoring valuation effects. Allowing for hysteresis in FDI inflows, the corresponding dynamic panel regression is given by:

$$(8) \quad fdi_{i,t} = \beta_0 + \beta_1 fdi_{i,t-1} + \beta_2 f_{i,t-1} + \beta_3 vol_{i,t-1} + \beta_4 pat_{i,t-1} + \eta_{i,t}$$

The coefficients β_1 , and β_4 are expected to be positive, whereas β_3 should be negative. The sign of β_2 is ambiguous.

²⁷ Conditional variances are estimated for each country separately assuming a GARCH (1,1) process of relative changes in the stock indices.

²⁸ See footnote 8 and the corresponding paragraph.

Panel unit root tests confirm at a level of 5% that the variables fdi and vol are stationary.²⁹ The Hausman specification test does not reject the assumption that cross-section effects are random. A Wald test accepts H_0 that fixed time effects are all zero. Again, the Nickel-bias can be neglected and the estimates of the variance-covariance-matrix are robust in relation to correlation within individual countries and heteroscedasticity. The results are presented in table 2.

Table 2: Financial competitiveness and FDI inflows

	<i>Version I</i>	<i>Version II</i>
	fdi_t	fdi_t
fdi_{t-1}	0.341*** (5.61)	0.336*** (5.53)
f_{t-1}	0.018*** (2.72)	0.017*** (2.72)
vol_{t-1}	-14.391 (-0.14)	
pat_{t-1}	0.031*** (2.78)	0.031*** (3.30)
mis_{t-1}		-0.397*** (-3.47)
c	0.044** (2.19)	0.048*** (3.24)
R^2	0.16	0.17

t-values in parentheses.

*** (**) [*] denote significance at the level of 1% (5%) or [10%].

Financial competitiveness appears to have a stimulating net effect on FDI inflows. The corresponding coefficient is significant at the level of 1%. FDI inflows in the preceding year are also highly significant. However, share price volatility, which is assumed to raise the option value of waiting, has no significant impact on investment. By contrast, an innovative environment measured by the share of residential firms in registered patents actually seems to push investment decisions. This outcome qualifies Dixit and Pindyck's statement on the role of real options in investment decisions.

In a second regression, however, an alternative measure of uncertainty about future earnings is introduced. It relies on the current degree of misalignment, which is defined as

²⁹ Again, the Choi Z and the IPS test were implemented. See footnote 21.

the square deviation of the real effective exchange rate from its long run average.³⁰ It can be argued that such a divergence gives rise to doubts about a change in the “equilibrium” value. Therefore, misalignment may be a more appropriate indicator of risks relating to economic prospects than stock market volatility. The corresponding coefficient in the second column of table 2 is indeed significant at the 1% level and supports the hypothesis that uncertainty tends to impede foreign direct investment. The other coefficients differ only slightly from the values that arose from the first regression. They therefore affirm the robustness of the supposed relationship between FDI flows and financial competitiveness. However, R^2 remains rather low and indicates that the model can explain only a small part of FDI flows. Given the high volatility of FDI flows and the possible relevance of just a few “big deals”, the limited explanatory power of the model is not really surprising.

In a final step, the effect of f on the *ratio of M&A sales to total FDI inflows (maa)* is analysed. Essentially, high prices of domestic firms are expected to discourage buyouts. Identifying an existing overvaluation or undervaluation should rely on the ratio of the predicted value to the actual value of f . A high value of f may be fundamentally justified if it is driven by favourable dividend prospects. A priori, the isolated effect of f on M&A sales is therefore ambiguous. According to Andrade and al (2001), Jovanovic and Rousseau (2002) and Servaes (1991), however, a low market-to-book ratio makes a firm susceptible to a takeover. Even if these studies were conducted at individual firm level and do not necessarily apply in the aggregate, a rise in the market-to-book value of FDI stocks should generally benefit the inflow of fixed investment relative to takeovers, and the ratio of M&A sales to total FDI flows should fall.

The following regression controls for institutional factors, ie membership in the EMU or appliance of Anglo-Saxon legislation, which may influence the composition of FDI inflows.³¹

$$(8) \quad maa_{i,t} = 0.275 - 0.288 f_{i,t-1} + 0.122 ang - 0.620 emu + \varepsilon_{i,t}$$

(0.36)
(-3.02)***
(0.47)
(-4.46)***

The hypothesis that financial competitiveness has a detrimental effect on M&A sales relative to total FDI inflows is verified at the 1% level of significance. While the dummy

³⁰ For the rationale for drawing on the long-term average as an “equilibrium” concept of the real effective exchange rate, see Deutsche Bundesbank (2004).

³¹ The panel unit root tests of Choi (2001) and Im/Pesaran/Shin (2003) confirm at the 5% level that the variable *maa* is stationary. The Hausman specification test does not reject the assumption that cross-section effects are random. A Wald test on fixed time effects indicates that they are significant. They are therefore included in the regression. Again, the estimates of the variance-covariance-matrix are robust in relation to correlation within individual countries and heteroscedasticity.

for Anglo-Saxon countries fails to be significant, EMU member states seem to attract relatively more FDI inflows other than M&A.

4. Conclusion

The paper has introduced an index of international financial competitiveness that is based on the market-to-book value of inward FDI stocks. Financial competitiveness as defined here reflects the attractiveness of a country for foreign investors with long-term strategic interests. It provides information not only on a country's prospects as a business location, but also on its access to global capital markets and international refinancing conditions. Other than data derived from the balance of payments, the concept does not rely on flows, but on prices. The indices of France, Germany, Japan, the UK and the US showed substantial dispersion during the 1980s and the 1990s. There are strong signs of convergence after 2000, when all the five economies underwent a sharp fall in financial competitiveness which bottomed out in 2002. Since then, the indicators have somewhat recovered but moved mainly sideways.

An empirical analysis using a panel of the five countries and an observation period from 1980 to 2006 shows that price competitiveness, stable inflation rates and EMU membership have a positive impact on financial competitiveness. The evidence of factors that are commonly used to represent non-price competitiveness is ambiguous. While registered patents seem to raise corporate valuation, current R&D expenditure rather has a detrimental effect. Furthermore, both variables become insignificant if a dummy for Anglo-Saxon countries is introduced that mirrors the fact that legislation in the US and the United Kingdom is friendlier to investors than in Continental Europe or Japan. This institutional factor is shown to be beneficial to financial competitiveness.

A rise in the market-to-book value of inward FDI stocks, however, does not necessarily induce additional inflows. According to a real option model, uncertainty regarding future earnings may entail an "option value of waiting" that can cause an investor to delay the decision on a pending project. This phenomenon is contrasted by the possible existence of a first-mover-advantage, where the pioneering investor has the chance to earn extra profits. The result would be an "investment race" which may partly or fully outweigh the "option value of waiting". Furthermore, the role of mergers and acquisition, the link to corporate valuation of which remains unclear, loosens the theoretical relationship between financial competitiveness and FDI inflows.

There is empirical evidence that the net effect of financial competitiveness on FDI inflows is indeed positive. It is shown that patents of resident firms accelerate investment decisions by promoting competition among investors. By contrast, an impeding effect of share price volatility cannot be verified. After all, substantial deviations of the real effective exchange rate from its long-term average seem to affect FDI inflows to some extent. Possibly, such a misalignment is a more appropriate indicator of uncertainty about future prospects of investment in a given country than stock market volatility.

Finally, a panel regression of M&A sales relative to FDI inflows on financial competitiveness confirms the hypothesis that an increase in financial competitiveness benefits the inflow of fixed investment relative to the takeover of domestic firms by foreigners.

This paper has concentrated on a country's attractiveness with regard to inward FDI. Financial competitiveness, however, can be interpreted in a much larger context. From a methodical point of view, an index similar to the one presented here can be derived for other components of the international investment position – notably debt securities. The development of a corresponding model and the empirical verification of the predicted determinants is a topic for future research.

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Appendices

Appendix A Entry decision under uncertainty and competition

The value of a firm before subtracting initial investment costs (F) is given by equation (4) in the text:

$$(A1) \quad V_t = E \left[\int_t^{\infty} e^{-r(\tau-t)} m_{\tau} X_{\tau} d\tau \right] = e^{-(r+h)(k-t)} E \left[\int_k^{\infty} e^{-r(\tau-k)} \cdot m_{\tau} X_{\tau} d\tau \right]$$

Competition among investors is modelled as a special case of first-mover-advantage where the investment is only profitable for the pioneering investor and competitors keep out of the market. This is a classical example of a winner-takes-all scenario.

The expected change in the project value during the next period of time influences the decision whether a project, which in principle is profitable, is realised at once or postponed. Differentiating (A1) with respect to t yields

$$(A2) \quad \frac{E[dV_t]}{dt} = (r+h)V_t$$

According to the conventional net present value method, an investor should realise an investment project whenever its value exceeds investment costs. To calculate V_t an investor has to build expectations on future values of the cost mark-up m . A positive mark-up is essential to cover fixed costs but tends to be eroded by competition. Furthermore, it is subject to external shocks. Consider the variance of mark-up changes to grow with m , so that the stochastic process can be written as a geometric Brownian motion with mean reversion.³²

$$(A3) \quad dm_t = \mu \cdot m_t \cdot dt + \sigma \cdot m_t \cdot dz$$

where $\mu < 0$ determines the tendency of the mark-up to return to zero, σ is the standard deviation of relative mark-up changes and dz is the increment of a standard Wiener process where $dz \sim N(0, dt)$.

³² The process is similar to an Ornstein-Uhlenbeck process (Uhlenbeck and Ornstein 1930) but assumes that the variance of dm is growing with m .

Equation (A3) defines expected values of future cost mark-ups in dependency on its current value and a (given) trend. *After investment*, k lies in the past and is substituted by t . For the sake of simplicity, an active firm is supposed to produce and sell always at its constant capacity limit X without the possibility of adjustment. Equation (A1) becomes

$$(A4) \quad V_t^1 = E \left[\int_t^{\infty} e^{-r(\tau-t)} m_{\tau} X \, d\tau \right] = \int_t^{\infty} e^{-(r-\mu)(\tau-t)} m_t X \, d\tau = \frac{m_t X}{r-\mu}$$

Before investment, however, the value of the project is still unknown, as long as the expected time of investment is not determined. If m_t is high and the outlook auspicious, it is advantageous to invest at once, but if m_t is rather low and prospects are uncertain, it may be better to monitor its further development for some more time - even if this delay entails opportunity costs. The simplest way to approximate a continuously differentiable function is a polynomial of degree 1. Furthermore, the value of a project with $m_t < 0$ is obviously non-positive and the project will never be realised. Given this information, the value of an idle project can be written as

$$(A5) \quad V_t^0 = \begin{cases} b \cdot m_t^{\xi} & \text{if } m_t \geq 0 \\ 0 & \text{if } m_t < 0 \end{cases}$$

Since the solution of the investment problem is trivial for a negative cost mark-up (the project is simply not realised), the following reasoning only refers to $m_t \geq 0$. The expected change in the value of a not yet realised project during the next period of time can be calculated using Ito's Lemma³³

$$(A6) \quad \frac{E[dV_t^0]}{dt} = \xi b m_t^{\xi-1} \cdot \mu \cdot m_t + \frac{1}{2} \xi(\xi-1) b m_t^{\xi-2} \cdot m_t^2 \cdot \sigma^2$$

Substituting (A2) leads to:

$$(A7) \quad (r+h)V_t^0 = \xi b m_t^{\xi-1} \cdot \mu \cdot m_t + \frac{1}{2} \xi(\xi-1) b m_t^{\xi-2} \cdot m_t^2 \cdot \sigma^2$$

or

$$(A8) \quad V_t^0 = \varphi(\xi) b m_t^{\xi}$$

³³ The general expression of Ito's Lemma for $V(m_t)$ is $\frac{E[dV_t]}{dt} = \frac{\partial V_t}{\partial m_t} \frac{E[dm_t]}{dt} + \frac{1}{2} \frac{\partial^2 V_t}{\partial^2 m_t} \frac{Var[dm_t]}{dt}$.

with

$$(A9) \quad \varphi(\xi) = \frac{1}{r+h} \left[\mu\xi + \frac{1}{2} \sigma^2 \xi(\xi-1) \right] = 1$$

so that

$$(A10) \quad \xi_{1,2} = \frac{1}{2} - \frac{\mu}{\sigma^2} \pm \sqrt{\left(\frac{\mu}{\sigma^2} - \frac{1}{2} \right)^2 + \frac{2(r+h)}{\sigma^2}}$$

Since $r > 0$, $p \geq 0$ and $\mu < 0$, it can be shown that $\xi_1 > 1$ and $\xi_2 < 0$.

Assume that investment costs F are completely irreversible, then an investment project will be realised if its net value after realisation exceeds the worth of the idle project:

$$(A11) \quad V_t^1 - F \geq V_t^0$$

or using (5) and (6)

$$(A12) \quad \frac{m_t X}{r - \mu} - F \geq b m_t^\xi$$

It is now possible to define a critical value of the cost mark-up, which defines the threshold when an investor should enter the market. For the critical value of $m_t = \tilde{m}$ the right and the left side of (A12) are just equal. Furthermore, the smooth-pasting condition requires that the first derivatives with respect to m are also equal. This “high-order contact” ensures differentiability of $V(m_t)$ in $m_t = \tilde{m}$.³⁴

$$(A13) \quad \frac{X}{r - \mu} = \xi_1 b \tilde{m}^{\xi_1 - 1}$$

Solving for b yields

$$(A14) \quad b = \frac{1}{\xi} m^{1-\xi} \frac{X}{r - \mu}$$

³⁴ For a detailed reasoning of the smooth pasting condition see Dixit and Pindyck (1994), p. 130 ff.

Apparently, b has the same sign as ξ . Furthermore, the value of an investment opportunity is strictly non-negative and should rise with the cost mark-up. From (A5) immediately follows:

$$(A15) \quad \xi = \xi_1 > 1$$

Substituting (A15) and (A14) in (A12) defines \tilde{m} :

$$(A16) \quad \tilde{m} = \frac{\xi_1}{\xi_1 - 1} (r - \mu) \frac{F}{X}$$

It is easy to see that for $m_t = \tilde{m}$, apart from the factor $\frac{\xi_1}{\xi_1 - 1}$ and a possible trend μ , annual returns just equal the capital costs of investment. While the trend adjusts for the expected development of the cost mark-up, the “wedge” $\frac{\xi_1}{\xi_1 - 1}$ results from the investor’s possibility to choose the moment of market entry. The chance to get some further information on future prospects by delaying the investment decision has to be balanced against omitted earnings. This implies that the value of an investment opportunity has to exceed investment costs in order to be realised. This reasoning is confirmed if (A16) is substituted in (A4) with $m_t = \tilde{m}$:

$$(A17) \quad V^1(\tilde{m}) = \frac{\tilde{m}_t X}{r - \mu} = \frac{\xi_1}{\xi_1 - 1} F$$

If F is interpreted as the replacement cost or the book value of the investment, an index similar to Tobin’s q can be defined:

$$(A18) \quad f_t \equiv \frac{V(m_t, \mu, r)}{F}$$

Financial competitiveness crucially depends on factors that determine the current profit margin, the underlying trend and the discount rate on future earnings.

Correspondingly to the critical cost mark-up, a critical value \tilde{f} exists:

$$(A19) \quad \tilde{f} \equiv \frac{V(\tilde{m})}{F} = \frac{\xi_1}{\xi_1 - 1}$$

Partial derivations of (A18) and (A19) yield the following conclusions with regard to the role of uncertainty for the investment decision:

$$(i) \quad \frac{\partial \tilde{f}}{\partial \sigma^2} = \underbrace{\frac{\partial \tilde{f}}{\partial \xi}}_{<0} \cdot \underbrace{\frac{\partial \xi}{\partial \sigma^2}}_{<0} > 0$$

Uncertainty, represented by σ^2 , raises the option value of waiting since monitoring the market entails more information on future prospects. In a deterministic world, by contrast, no additional information can be gathered by delaying the investment decision. The risk of a negative development in combination with sunk costs of investment raises \tilde{f} . This effect is irrespective of the investors risk attitude.

$$(ii) \quad \frac{\partial \tilde{f}}{\partial h} = \underbrace{\frac{\partial \tilde{f}}{\partial \xi}}_{<0} \cdot \underbrace{\frac{\partial \xi}{\partial h}}_{>0} < 0$$

The entrance probability of competitors (h) raises the risk of missing an investment opportunity in a winner-takes-all scenario as long as an investor is hesitating. Competition among investors therefore raises the opportunity costs of waiting and lowers the threshold \tilde{f} .

Appendix B Calculating the market value of FDI stocks

FDI market values in this paper are calculated in accordance with the calculations of the BEA for the market value of FDI in the US. The benchmark for changes in the value of equity is the performance of a broadly based stock index for the respective economic area. Changes in the stock index, however, have to be adjusted for changes that result from (estimated) earnings during the period: Furthermore, the market value of foreign direct investment rises in accordance with FDI inflows, valued at the end of period.³⁵

$$(B1) \quad FDI_t^M = FDI_{t-1}^M \frac{PFI_t^E - EPS_t \cdot x_t}{PFI_{t-1}^E} + FDI_t^F x_t$$

³⁵ See Kozlow, R. (2002). The calculation method of the BEA, however, ignores the impact of retained earnings on the average stock index and the flow variables, i.e. $x = PFI_t^E / PFI_t^A$ in (B1).

with FDI_t^M = market value of FDI stocks at the end of year t ; FDI_t^F = FDI inflows in year t ; PFI_t^E = yearend performance index; PFI_t^A = annual average performance index; EPS_t = earnings per share in year t .

x_t describes the factor that revalues earnings and investment flows at the end of period. It is given by

$$(B2) \quad x_t = \frac{PFI_t^E - EPS \cdot x}{PFI_t^A - \frac{1}{2} EPS} = \frac{PFI_t^E}{PFI_t^A + \frac{1}{2} EPS_t}$$

The current market value can be calculated recursively going back to the base year $t=0$. There is a variety of methods to determine FDI_0^M .

- (i) FDI_0^M is given by an exogenous source like annual financial statements of the individual firms. In principal, this is the most accurate measure, but generally data are not fully available.
- (ii) $FDI_0^M = 0$ In this case only FDI accumulated after the reference year $t=0$ is considered. This version brings about the problem that changes in the book value cannot be clearly broken down into changes concerning the previous and the new stock balance.
- (iii) $FDI_0^M = FDI_0$ at current costs (book value). This is the method chosen in this paper. The index of financial competitiveness equals unity in $t=0$. For $\lim_{t \rightarrow \infty}$ the impact of the initial value of FDI_0^M on FDI_t^M is limited and the effect on the ratio to the book value vanishes.

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