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Business Cycles and FDI: Evidence from German Sectoral Data

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Kiel Working Paper No. 1245

by

Claudia M. Buch and Alexander Lipponer

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Business Cycles and FDI: Evidence from German Sectoral Data

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Abstract:

Globalization has affected business cycle developments in OECD countries and has increased activities of firms across national borders. This paper analyzes whether these two developments are linked. We use a new firm-level dataset on the foreign activities of German firms to test whether foreign activities are affected by business cycle developments. We aggregate the data by the sector of the reporting firm, the sector of the foreign affiliate, and the host country. Data are annual and cover the period 1989-2002. We find that German outward FDI increases in response to positive cyclical developments abroad and in response to a depreciation of the domestic currency.

Keywords: business cycles, multinational activity, FDI, panel regressions

JEL-Classification: E3, F23

Non-Technical Summary

So far, theoretical and empirical literature on multinational firms has focused on the reasons for becoming a multinational, on the reasons for going into a particular country, and on the host and home country effects of multinational activity. In this paper, we add another dimension to the discussion by analyzing the influence of short-term business cycle movements on multinational activity.

The starting point of our analysis is the idea that firms' activities might be linked to the business cycle either because of a financial accelerator mechanism or because of the presence of fixed costs of market entry. Since financial frictions and fixed costs of entry can be expected to vary across firms from different sectors, we construct a dataset which contains information on foreign activities of German firms at a sectoral level. Our data are annual and cover a time period of 14 years (1989-2002).

Our study has four main findings:

First, foreign activities of German firms increase in response to positive cyclical developments abroad. This effect was particularly strong in the first and second half of the 1990s. Adjustment to the cycle mainly takes place through changes in volumes rather than entry.

Second, a depreciation of the euro has stimulated foreign activities as well. This effect was particularly strong in the first half of the 1990s. In the second half of the 1990s, the real exchange rate effect was weaker, possibly because of the impact of the large valuation changes on global stock markets.

Third, business cycle and real exchange rate effects are especially important for activities of German firms outside Europe.

Fourth, business cycles have a stronger impact on FDI projects where the sector of the domestic firm and the foreign affiliate differ than they do in those cases where the sectors coincide. Sector-by-sector regressions provide relatively weak evidence that systematic differences with regard to information frictions are driving the results. Rather, the impact of real exchange rates and of the foreign cycle in the full sample seems to be driven to some extent by differences between the sectors.

Nicht technische Zusammenfassung

Bislang konzentrierte sich die theoretische und empirische Literatur über multinationale Unternehmen auf die Gründe, weshalb diese multinational werden, die Ursachen, sich in einem bestimmten Land niederzulassen sowie auf Gast- und Heimatlandeffekte multinationaler Aktivitäten. In diesem Beitrag dehnen wir die Diskussion auf einen weiteren Aspekt aus und analysieren den Einfluss kurzfristiger konjunktureller Schwankungen auf multinationale Aktivitäten.

Ausgangspunkt unserer Analyse ist die Idee, dass die Geschäftstätigkeit eines Unternehmens entweder aufgrund des finanziellen Akzeleratoreffekts oder der Fixkosten bei Markteintritt mit dem Konjunkturzyklus in Zusammenhang stehen könnte. Da finanzielle Friktionen und Fixkosten bei Markteintritt erwartungsgemäß bei Unternehmen aus verschiedenen Sektoren variieren können, erstellen wir einen Datensatz, der Informationen über die Auslandsaktivitäten deutscher Unternehmen nach Sektoren gegliedert enthält. Es handelt sich dabei um Jahresdaten, die einen Zeitraum von 14 Jahren (1989 bis 2002) abdecken.

In unserer Studie kommen wir zu vier wesentlichen Ergebnissen:

Erstens nimmt das Engagement deutscher Firmen im Ausland als Reaktion auf eine positive Konjunkturentwicklung im Ausland zu. Dieser Effekt war in der ersten und zweiten Hälfte der Neunzigerjahre besonders ausgeprägt. Anpassungen an den Konjunkturzyklus erfolgen hauptsächlich in Form von Anpassungen der Volumen und nicht beim Markteintritt.

Zweitens stimuliert eine Abwertung des Euro die Geschäftstätigkeit im Ausland. Dieser Effekt war in der ersten Hälfte der Neunzigerjahre besonders stark. In der zweiten Hälfte der Neunzigerjahre wirkte sich der reale Wechselkurs – vermutlich aufgrund der großen Bewertungsänderungen an den weltweiten Aktienmärkten – geringer aus.

Drittens sind die aus dem Konjunkturzyklus und dem realen Wechselkurs resultierenden Effekte für die Geschäftstätigkeit deutscher Firmen außerhalb Europas von besonderer Bedeutung.

Viertens wirkt sich der Konjunkturzyklus stärker auf jene Direktinvestitionen aus, bei denen sich der Sektor des gebietsansässigen Unternehmens und des ausländischen

Schwesterunternehmens unterscheiden, als auf jene Fälle, bei denen die Sektoren übereinstimmen. Sektorale Regressionen liefern relativ geringe Belege dafür, dass systematische Differenzen im Hinblick auf Informationsfraktionen die Ergebnisse beeinflussen. Die Auswirkungen der realen Wechselkurse und des ausländischen Konjunkturzyklus in der gesamten Stichprobe scheinen eher bis zu einem gewissen Grad durch Unterschiede zwischen den Sektoren getrieben zu werden.

Contents

1	Introduction	1
2	Theoretical Background	4
3	Data and Descriptive Statistics	6
3.1	The Data	6
3.1.1	Foreign Activities of German Firms	6
3.1.2	Measuring Business Cycle Developments	8
3.1.3	Exchange Rate Issues	8
3.2	Descriptive Statistics	9
4	New Empirical Evidence	11
4.1	The Empirical Model	12
4.2	Baseline Regression Results	13
4.3	Sectoral Effects	15
4.4	Robustness Tests	17
5	Concluding Remarks	18
	References	18

Lists of Tables and Figures

Table 1	Unit Root Tests	27
Table 2	Regression Results FDI and Affiliate Sales	28
Table 3	Sectoral Regressions	29
Table 4	Regional Effects (FDI)	30
Table 5	Loan versus Equity Components of FDI	31
Figure 1	Changes in FDI Stocks and Business Cycles	23
Figure 2	Volatility of Multinational Activity	24
Figure 3	Average Annual Growth Rates of FDI and Affiliate Sales	25-26

Business Cycles and FDI: Evidence from German Sectoral Data^{*}

1 Introduction

Two observations characterize the recent globalization period. First, business cycles in OECD countries have tended to become more synchronized, and they share key characteristics such as a recently observed decline in output volatility. (See, for example, Artis (2004), Bordo and Helbling (2004), or Prasad et al. (2003).) Second, firms have increasingly moved production across borders. This internationalization of production has, to a large extent, been market-driven, as evidenced by the dominance of foreign direct investment (FDI) among OECD countries. Recently, FDI that aims at lowering production costs has increased in importance as well (Barba-Navaretti and Venables et al. 2004).

The similarity of business cycle developments among OECD countries and the growing importance of multinational production raise the question of whether these two observations might be linked. Hanson and Slaughter (2003) have recently pointed out that the internationalization of production and international business cycle developments might be jointly determined.

Theoretical work studying business cycles and multinational activity simultaneously is a fairly underdeveloped area in international economics. To date, there are rather two separate lines of research.

A first branch of the literature has studied the determinants and effects of the activities of multinational firms, stressing long-term fundamentals (see, for example, Markusen (2002)). These long-term fundamentals are the absolute and relative factor endowments of countries, the distance between markets as well as trade and investment costs. Models are typically tested using aggregated data although, more recently, firm-

^{*} This paper represents the authors' personal opinions and does not necessarily reflect the views of the Deutsche Bundesbank. The authors would like to thank Jörg Breitung, Jörg Döpke, Ralph Heinrich, Heinz Herrmann, Vasso Ioannidou, Marc-Andreas Münder, Harald Stahl, Harald Uhlig, seminar participants at the WEA Annual Meeting 2004 (Vancouver), at the University of Oslo, at Tilburg University, and at the Conference on "Multinationals and International Integration", held at the Kiel Institute for World Economics in October 2004 (organized by the Deutsche Bundesbank) for their comments and helpful discussions. All errors and inaccuracies are our own.

level data have been employed as well. The impact of shorter-term business cycle fluctuations is typically not analyzed. In their review of the literature on multinationals, Barba-Navaretti and Venables et al. (2004) establish a number of facts on multinationals but they do not refer to business cycle developments. One of the questions that this literature tries to answer is why firms become multinationals and why multinationals go to specific countries. Taking into account business cycle developments is unlikely to change the basic answers to these questions. Rather, our research can be expected to add to the literature on multinationals by studying the short-term determinants of FDI.

A second branch of the literature has dealt with the impact of aggregated flows of FDI on business cycle developments and on the transmission of shocks across countries. These papers take a macroeconomic perspective, and capital flows are analyzed on what tends to be a more aggregated level. Recently, open economy macro models have paid greater attention to the impact of firm heterogeneity. (See Ghironi and Melitz (2004) or Niles Russ (2003) for two recent contributions.) In these models, the number of firms active at home and abroad is endogenous due to fixed costs of market entry and the fact that firms differ in their productivity levels. In contrast to models stressing the long-run determinants of multinational activity, these models assign an explicit role to macroeconomic fluctuations. Fixed costs and firm heterogeneity can be one reason why foreign activities of firms react to the cycle. An additional reason could be financial market frictions. As in a closed-economy setting (see Bernanke, Gertler and Gilchrist (2000)), financial market frictions may impinge on the foreign investment behaviour of firms through a net worth effect.

The purpose of this paper is to combine these two strands of research. While we analyze multinational activity on a fairly disaggregated level, the focus of our analysis is on the impact of business cycle developments on multinational activity. We use a new firm-level dataset on foreign activities of German firms. These data allow the study of heterogeneity across sectors, and they are available for a relatively long time span that covers several business cycle episodes. Our analysis proceeds in two steps.

As a first step, we isolate the cyclical and the trend component of GDP developments in Germany and in OECD countries, using a band-pass filter. We restrict our analysis to OECD countries because of the better availability of data. Since the bulk

of German FDI takes place in OECD countries, this does not restrict the representativeness of our sample much.

As a second step, we analyze the impact of business cycle developments on foreign direct investment of German firms and on the sales of their affiliates abroad. We estimate panel regressions using sectorally disaggregated bilateral German FDI data for the period 1989-2002.

Since our firm-level dataset starts in 1989 but allows tracing of individual firms only from 1996 onward, we use the data at the sectorally aggregated level. This has two advantages. First, we can use information on the sector of the reporting firm and the foreign affiliate to split the sample into same-sector and different-sector foreign direct investment projects. Second, we can include sector-specific control variables that are intended to capture, for instance, financial restrictions.

In order to focus on the effects of business cycle developments, we do not specify in detail the remaining determinants of FDI but rather include fixed effects that capture sector and country characteristics.

Our work is related to four strands in the empirical literature:

First, Desai and Foley (2004) find that profitability and investment within multinational firms are highly correlated. In contrast to our work, their focus is on the transmission of idiosyncratic shocks through multinational firms. Business cycle developments are captured through time and sectoral fixed effects. Hence, their work presents evidence of driving forces between correlations between shocks across countries while we take these correlations as exogenous.¹

Second, there has been research into the impact of macroeconomic shocks on domestic investment (see, for example, Chatelein et al. (2001) for a survey of the European evidence). Using Israeli firm-level data, Ber, Blass, and Yosha (2002) find that the degree of export-orientation does influence the impact of monetary policy shocks on firms' investment activities.

¹ While work by Desai and Foley (2004) suggests that real sector correlations increase during globalization, Heathcote and Perri (2004) argue that, from a theoretical point of view, financial sector globalization is likely to be associated with lower correlations of shocks in the real economy because possibilities for the diversification of risk increase.

Third, using aggregated data on bilateral FDI among OECD countries, Levy-Yeyati, Panizza, and Stein (2002) find FDI flows to be counter-cyclical with respect to the business cycle of the source country. Results by Jansen and Stokman (2003) are based on similar data and suggest that countries with tighter FDI linkages also have more correlated business cycles.

Fourth, factor models have been used to obtain insights into international channels of transmission. Brooks and Del Negro (2002) find that global factors gained in importance relative to country-factors during the 1990s. Eickmeier (2004) finds that, for Germany, flows of foreign direct investment have an impact on the transmission of shocks between Germany and the US.

Hence, earlier research suggests that business cycle developments do have an impact on the internationalization patterns of financial and non-financial firms. This may be one channel through which business cycle developments spill over into foreign countries. However, findings differ with regard to the quantitative and the qualitative importance of this transmission channel, and sectoral differences cannot be studied in most models. This is the focus of our paper.

In Part Two, we derive a hypothesis on links between multinational activities and macroeconomic developments. Part Three describes our data and provides descriptive statistics. Part Four describes our empirical approach and presents our results. Part Five provides a conclusion.

2 Theoretical Background

Theoretical literature has identified two main reasons why the investment of firms reacts to business cycle developments. One branch of the literature has argued that financial restrictions can lead to the pro-cyclicality of investment due to a financial accelerator effect. Another branch of the literature has stressed the impact of firm heterogeneity and of fixed costs of entry into foreign markets in open economy macroeconomic models. Here, we briefly discuss the implications of these two frameworks.

An initial reason why (foreign) investment of firms might react to the business cycle consists in financial market frictions. Bernanke, Gertler, and Gilchrist (2000)

show how financial market frictions, which give rise to a financial accelerator, can help explain key business cycle characteristics. Their general equilibrium model encompasses Keynesian-type, sticky-price models and real business cycle, and flexible-price models as special cases. Entrepreneurs need to obtain external finance for their projects but lenders and borrowers have asymmetric information on project returns. This information asymmetry gives rise to an agency problem, since lenders can observe project outcomes only after paying a monitoring cost. This implies that the net worth of firms has an impact on the cost of finance. The higher the net worth and the higher the share of investment financed through own funds, the lower is the external finance premium because the agency problem diminishes.

In this framework, investment becomes pro-cyclical if the net worth of firms depends on the development of the overall economy. A positive aggregated shock increases the net worth of firms, increases the share of own funds in total finance, lowers the external finance premium, and thus stimulates investment. One testable hypothesis of the model is that the external finance premium is counter-cyclical and that investment spending is pro-cyclical. Moreover, the response of investment and output depends on the intensity of financial market frictions that firms face. Bernanke et al. (2000) show that investment of firms which face greater credit market restrictions responds more to aggregated shocks than investment spending of firms which face only mild restrictions. By contrast, changes in output (or sales) are similar across different types of firms.

Although the above framework has been formulated in a closed-economy context, a similar reasoning can be applied to an international setting (see Gilchrist, Hairault, and Kempf (2002), Faia (2003), Gertler, Gilchrist, and Natalucci (2003), or Dietrich (2002)). If net worth is pro-cyclical, then foreign direct investment should behave pro-cyclically as well.

A second reason why firms' foreign activities might respond to business cycle developments is that entry into foreign markets involves some fixed costs. This has been the insight of a branch of the literature which has recently started to imbed firm heterogeneity into so-called new open economy (NOEM) models. One feature of these models is that they incorporate explicit micro-foundations into dynamic general

equilibrium models of open economies. Hence, these models lay the basis for studying the feedback effects between firm-level behaviour and macroeconomic dynamics.

Until recently, however, the majority of these models did retain the original NEOM assumption of perfect symmetry between individual firms and households. This assumption has been relaxed recently (Ghironi and Melitz 2004, Niles Russ 2003). The key assumption in this more recent class of models is that firms differ in their productivity. Moreover, there are fixed costs to the entry into new markets. One implication of these two assumptions is that the degree of internationalization of firms depends on their profitability. As a consequence, the degree of productivity also affects the extent to which firms are exposed to domestic compared with foreign macroeconomic shocks.

From this brief review of the theoretical literature, we can take two testable hypotheses.

First, firms' (foreign) activities should respond pro-cyclically to business cycle developments.

Second, the degree of pro-cyclicality should depend on the severity of asymmetries in information and on the importance of the fixed costs of market entry. These two factors, in turn, differ along the sectoral dimension.

3 Data and Descriptive Statistics

Testing the above hypotheses requires answering two main questions. First, is there a link between the foreign activities of firms and business cycle developments? And, second, what is the role of credit market frictions and of fixed costs of entry for this link? In this section, we describe the construction of our dataset as well as our empirical model.

3.1 The Data

3.1.1 Foreign Activities of German Firms

The *Deutsche Bundesbank* has been carrying out annual full sample surveys of direct investment stocks in accordance with the provisions of the Foreign Trade and Payments Regulation (*Außenwirtschaftsverordnung*) since 1976. In addition to

information on the foreign direct investment stocks of German firms (and affiliates of foreign firms in Germany), the data provide information on the sales of German firms' foreign affiliates. We use this variable as an additional proxy for multinational activity.

The database available for research project goes back to 1989. (For details, see Lipponer (2002a, 2002b) or Deutsche Bundesbank (2004).) Time series for individual firms, however, are available only from 1996–2002. From 1989–1995, firm-level data are available but observations for specific firms cannot be linked over time. For semi-aggregated data (by country and/or sector), data are available for the years 1989–2002. We use the data in a sectorally aggregated form in order to capture as much time series variation in the data as possible.

In 2002, some 6,000 domestic investors returned reports on roughly 22,000 foreign affiliates abroad. For inward FDI, data are available on around 10,000 affiliates in Germany, in which some 7,000 foreign investors had a participating interest.

In terms of country coverage, our database is very comprehensive. It includes information about German firms' foreign activities in all possible host countries. However, we restrict our analysis to the OECD countries for several reasons. First, on a practical level, reliable and consistent data needed to compute business cycle developments are hardly available for non-OECD countries. Second, there is a significant body of empirical evidence suggesting that business cycle developments in OECD countries differ from those in non-OECD countries (see, for instance, Prasad et al. (2003)). And, finally, the bulk of German FDI has been invested in OECD countries (more than 90% of total German FDI and of foreign affiliates' sales).

Rather than using the full firm-level information that our dataset provides, we aggregate the data at the sectoral level. This is done by both, home and foreign sectors. For each OECD country, aggregated data comprise information on 35 German primary, manufacturing, and services sectors investing into the respective foreign sectors.² For

² One feature of our data is that we can distinguish between the foreign activities of firms that set up affiliates in the same sector from firms that set up affiliates in different sectors. Since 1995, allocation to economic sectors has been based on the classification in NACE Revision 1. Before 1995, the classification was based on the Federal Statistical Office's classification of economic activities (WZ79). Originally, the database contains reports from about 65 different sectors, which we aggregated to 35 sectors. This aggregation does not lead to a big loss of information if we, for example, aggregate the four NACE sectors navy (610), aviation (620), transport intermediation (630), and information transmission (640) into one sector called 'transportation'.

the econometric analysis below, we use an unbalanced panel and keep, out of all combinations of country, home and foreign sectors, only those with at least five subsequent non-missing observations.³

We select two indicators of international activities. First, we use information on *foreign direct investment*, i.e. the sum of direct and indirect FDI computed according to the directional principle. Second, we use information on the *foreign sales* of German firms' foreign affiliates.⁴

3.1.2 Measuring Business Cycle Developments

To measure the cyclical component of GDP, we use the band/pass filter suggested by Baxter and King (1999) and Christiano and Fitzgerald (1999). This filter has the advantage of removing both the long-term trend and the irregular component from the time series. We remove fluctuations shorter than two years and longer than eight years from the cyclical part of the time series with a band/pass (2.8) filter.

We focus on aggregated business cycle developments rather than developments at the sectoral level. The reason is twofold. First, there tends to be a significant degree of co-movement between economic activities at the sectoral level. Christiano and Fitzgerald (1998), for instance, show that the business cycle properties of different sectors exhibit a high degree of co-movement with the overall cycle. Hence, by construction, it would be difficult to isolate sectoral from aggregated business cycle developments. Second, although time series for sectoral output for each of the OECD countries are generally available, it is difficult to find consistent time series for all countries, all sectors, and for the complete time period under study. In order to capture sectoral developments, we include a full set of dummies for each foreign and each domestic sector.

3.1.3 Exchange Rate Issues

One issue that we have to deal with is that we have to isolate the impact of exchange rate changes. Originally, our data are reported in D-mark or euro. Hence, the

³ If there are missing values in the individual time series, we select the longest available chain if it has at least five consecutive observations.

⁴ We use the investor's "share" in the total turnover of the affiliate to avoid double counting in the case of multiple German investors.

annual changes in FDI or foreign sales may, first, be due to real flows undertaken by the investor or the affiliate. Only these real flows are of interest for our analysis.

Second, our variables may vary because bilateral exchange rates change. In order to eliminate exchange rate effects, we correct all data for changes caused solely by exchange rates movements. Hence, if the value of a variable increases from x to $x+\Delta x$ during a year and if we assume an appreciation of the domestic currency of a , we then deduct $a \cdot x$ from Δx and, to compute the exchange rate adjusted value of the variable, as $x_{t+1} = x_t + (\Delta x - a \cdot x_t)$.

Even though we eliminate pure valuation changes from our data, real exchange rate developments might still have an impact on international investment decisions and on foreign sales for two reasons.

First, Froot and Stein (1991) have argued that real exchange rate developments might affect international investment decisions if financial market frictions prevail and if investment depends on the wealth of investors. An appreciation of the domestic currency would increase the wealth of domestic relative to foreign investors, hence allowing domestic investors to outbid foreign investors and thus stimulating FDI. To capture this effect, we include a real exchange rate measure which is based on the development of stock indices at home and abroad. We use Datastream stock indices, using 2001 as the base year, and we take the log of the real exchange rate (see Klein and Rosengren (1994) for a similar specification)

Second, (persistent) real exchange rate changes could affect the foreign investment decisions of firms since they affect the relative prices of exports. If the domestic currency appreciates, domestic goods become expensive relative to foreign goods. Hence, market-driven FDI such as the establishment of distribution networks might decline. At the same time, incentives of firms to locate production abroad might increase. The net effect of this ‘trade effect’ is ambiguous.

3.2 Descriptive Statistics

In Figures 1-3, we look at the changes in the investment patterns of German firms over the business cycle by sector and country. According to data of the Economic Cycle

Research Institute,⁵ which identify a peak in early 1991 (reflecting the reunification boom), a trough in late 1994 and another peak in early 2001, we can divide our sample period into four episodes.⁶ Cyclical developments abroad have been less pronounced, mainly because of the missing reunification effect.

Figure 1 shows the behaviour of the change in aggregated FDI over the cycle. The first thing to notice is that FDI increased almost throughout the entire period. The year 2002, which witnessed a sharp decline in FDI, was an exception. Moreover, changes in FDI have been relatively moderate until the late 1990s, when a significant peak in foreign activities was followed by a drastic reduction in foreign investments. To some extent, these changes in the aggregated numbers are driven by single large transactions such as in the automotive sector. However, single transactions are only one part of the story. Rather, multinational activity as a whole showed a quite significant slump in 2001, following the collapse of the stock exchange and the slowing down of the economy world-wide (Barba-Navaretti and Venables et al. 2004: 3).

In terms of the cyclicity of FDI, there is a weak positive correlation between FDI and the German cycle during the second half of the 1990s, whereas the correlation with the foreign cycle is negative, if anything.

While the aggregated numbers presented in Figure 1 give a first impression with regard to the cyclicity of FDI, it is also interesting to look beyond the aggregated figures and to break down developments by sector and country. Figure 3 presents such a breakdown for the largest sectors and countries. For each of the business cycle episodes classified above, we compute the annual percentage growth rates for FDI and foreign sales.

Data presented in Figure 3 show that there is a quite substantial degree of heterogeneity with respect to the response of foreign activities in different sectors and countries to business cycle developments. For FDI, we find cyclical patterns for financial services, information technology and machinery, but not for chemicals and wholesale trade. For foreign sales, there are cyclical patterns for the full sample, for

⁵ www.businesscycle.com

⁶ Data for the last period, which includes only the year 2002, are not included.

financial services, and for machinery. Also, looking at the patterns by country, we find foreign sales to be less volatile than FDI.

As a second step, we look at the volatility of different measures of firms' international activities. Since most determinants of multinational activity that are stressed by microeconomic models of multinational firms (market size, distance, similarity in terms of GDP per capita, and cost of market access) are relatively persistent over time, a high degree of volatility in foreign activities could be an indication that short-term business cycle fluctuations affect international activities.

To study the volatility of foreign activities, we compute the coefficient of variation for FDI, foreign sales, and foreign GDP over the period 1989-2002. We aggregate our data both along the sectoral and the country dimension.

Figure 2 shows that different measures of foreign activities of German firms exhibit relatively similar volatility patterns. Looking at bilateral scatter plots of the variation of foreign sales and FDI either by home sector or by country, we find most entries on the diagonal (row 1 of Figure 2). This result is somewhat in contrast to evidence at the domestic level where one typically finds a greater volatility of investment relative to that of production.

Next, we plot changes in FDI and in foreign sales against changes in host-country GDP (row 2 of Figure 2). Again, FDI and foreign sales exhibit relatively similar patterns. The link between volatility of GDP across countries and the cross-country variation in the foreign activities of multinational firms, however, is rather weak.

4 New Empirical Evidence

Our aim in this section is to determine the impact of macroeconomic developments on foreign activities of German firms. With regard to the macroeconomic developments, we isolate the cyclical from the trend component of GDP, and we include only the former in our regressions. With regard to the foreign activities of German firms, we distinguish the investment of German firms abroad (FDI) from their sales abroad.

4.1 The Empirical Model

Since foreign activities of German firms expanded rapidly during the 1990s, we might have to take a potential non-stationarity of the data into account. Yet, standard panel unit root tests do not provide evidence that FDI levels are non-stationary (Table 1). One reason for this could be that we are using disaggregated time series for each combination between sectors at home and abroad for each country. Moreover, the time series dimension of our panel ($T = 14$) is short compared to the cross section dimension (around 30,000 observations in more than 3,000 groups), and our asymptotics are thus driven by the cross-section.

We estimate the following equation

$$d\log(Y_{ijkt}) = \alpha_0 + \beta_1 \sum_{n=1}^2 d\log(Y_{ijkt-n}) + \beta_2 \sum_{m=0}^3 \log(cycle_{kt-m}) + \beta_3 \sum_{p=0}^1 d\log(RER_{kt-p}) + \varepsilon_{ijkt} \quad (1)$$

where Y_{ijkt} = activities of German multinationals in sector i in sector j of country k at time t (FDI or sales of foreign affiliates), $cycle_{kt}$ = foreign cycle, RER_{kt} = real exchange rate index in price notation, i.e. an increase in the index corresponds to a depreciation of the euro. We include the lagged endogenous variables in order to allow for sluggish adjustment. We have experimented with different lag lengths for the lagged endogenous and the explanatory variables. We report results for a maximum of three lags for the foreign cycle and of two lags for the real exchange rate. Lags of higher order have tended to be insignificant or to worsen the statistics properties of the estimated equations. A full set of time fixed effects is included to capture cyclical developments in Germany. We estimate equation (1), using an instrumental variables panel estimator which is corrected for heteroscedasticity in the residuals.

In contrast to earlier literature, we do not specify in detail the country-level and sectoral determinants of firms' foreign activities such as country size, similarity in GDP per capita, distance, or entry regulations. Rather, these determinants are captured through lagged endogenous variables as well as through the fixed effects.⁷ Fixed effects are specified for each combination of a particular home-country sector and a particular

⁷ Results in Buch et al. (2005) show that country-specific explanatory variables tend to become insignificant if country fixed effects are included.

foreign-country sector. Hence, they capture any sector-specific incentives, including long-term fundamentals, to invest into a particular sector abroad.

4.2 Baseline Regression Results

Table 2 summarizes the results of estimating equation (1) for FDI and affiliate sales. In addition to estimating our regressions for the full sample (1990-2002), we also report results for three equal-length sub-periods (the reunification and post-reunification period 1990-1995, the post-reunification period 1993-1999, and the final period 1996-2002).

As regards the impact of cyclical fluctuations abroad, we find differences in the adjustment of foreign sales and of FDI. For the full sample, FDI increases in response to a cyclical expansion abroad but only with a one-period lag. This positive expansion is sustained over the three-year window that we look at. Sales of German firms' foreign affiliates, by contrast, increase immediately in response to an expansion abroad, but this positive response is almost completely reversed after two years.

Looking at the development across different time periods shows that the 1993-99 sub-period differs significant from the rest of the sample. For FDI, the foreign cycle is insignificant in this period. In fact, the positive cyclical response is driven mainly by the last period (1996-2002). The slow down in growth abroad which has been associated with the slump in FDI could be one reason. For foreign sales, the positive contemporaneous effect of the foreign cycle is a feature shared by all sub-periods, but the negative lagged effect is driven only by the period 1993-1999.

Another feature shared by FDI and foreign sales is the strong responsiveness to real exchange rate developments. A 10% depreciation of the domestic currency increases FDI and foreign sales by about 3%, and this positive contemporaneous response is robust across sub-periods. This finding is in line with Görg and Wakelin (2001) who find a positive relationship between US outward FDI and a depreciation of the dollar.

However, the full positive effect of a depreciation was sustained over time only in the first half of the 1990s. In the period 1996-2002, the one-period lagged real exchange

rates enters with a negative and significant coefficient.⁸ Possibly, this is due to the global decline in stock market valuations between the end of 1999 and the end of 2002.

Hence, for the first half of the 1990s, we do not find support for the hypothesis that the real exchange rate affects FDI through a relative wealth effect. If such a wealth effect were important, then we should find an increase in FDI in response to a real appreciation of the domestic currency.⁹ Our findings are rather in line with the hypothesis that dominant effect of a real depreciation on FDI comes through its positive effect on exports. This interpretation would also be consistent with earlier findings that German FDI is mostly market-driven, horizontal FDI rather than production-cost driven, vertical FDI (Buch et al. 2005). If anything, the wealth effect might have been important in the second sub-period, which witnessed the stock market boom, but it was not strong enough to counterbalance the trade effect.

Interpreting the positive response to the foreign cycle as evidence for financial restrictions is difficult as well. If financial restrictions were important, then we would expect them to operate through the German rather than the foreign cycle. Most of the firms included in our sample are likely to earn the bulk of their revenues at home, and those who have a large share of their activities abroad often do not focus on one country.¹⁰ Hence, firms' overall net worth would be determined through cyclical developments in Germany rather than developments in a particular host country. The German cycle, however, is captured through the time fixed effect since it is identical for all cross-section units. Including the German cycle as an additional regressor instead (results are not reported) gives coefficients which are of much smaller statistical and economic significance than those for the foreign cycle. This would be inconsistent with a financial accelerator effect working through the German cycle.

⁸ For foreign sales, this negative lagged effect also occurs in the 1993-1999-period.

⁹ Note that we obtain this result even though we measure the real exchange rate by relative stock price indices, but it is also robust with regard to defining the real exchange rate as the ratio of consumer price indices.

¹⁰ We cannot directly test the validity of this argument since we do not have information on the ratio of domestic compared with foreign sales for each firm in the sample.

4.3 Sectoral Effects

Economic theory suggests that sectors react differently to cyclical fluctuations. If financial frictions are behind the cyclical investment, then sectors that rely more heavily on external finance and/or that are subject to more severe information frictions should show a greater response to business cycle developments (see also Gilchrist and Zakrajsek 1995).

Hence, we re-estimate the baseline regression for the nine most international sectors, i.e. for those sectors which have activities in 50 or more countries. Results are given in Table 3. The first result that can be taken away from this table is that FDI of some sectors does not react to the cycle or to the real exchange rate at all. This holds for business services, textiles, and transportation.

Evidence for a positive cyclical effect is rather limited. Only two sectors (motor vehicles and parts as well as machinery) react positively to the cycle; for the construction sector, the impact of the foreign cycle is, in fact, negative. Since these sectors are not those for which, a priori, financial frictions seem particularly important, it is difficult to argue that differences in the magnitude of financial frictions are driving the cyclical response.

Real exchange rate effects are somewhat stronger. We find a positive impact of the real exchange rate for financial services, wholesale trade, office equipment, and machinery. The magnitudes of these effects are similar to the ones found for the full sample. In terms of statistical significance, results for the sectoral regressions are weaker than those for the full sample. In terms of the economic interpretation, results for wholesale trade are particularly interesting. These results suggest that the positive effect of a real depreciation on foreign activities is indeed driven by the potential to increase sales abroad. Overall, the stronger results for the full sample than for the sector-by-sector regressions suggest that heterogeneity across sectors drives the significant impact of the cycle and of the real exchange rate in the full sample.

An additional potentially interesting split is between same-sector and different-sector FDI. Hanson and Slaughter (2003) have, for instance, argued that vertically integrated multinational firms might react differently to business cycle developments compared to horizontally integrated firms. Horizontally integrated multinational firms

invest abroad in order to facilitate entry into new markets. Essentially, they perform the same type of activity abroad as they perform in their home market. This is the type of multinational firms dominating in the sample of OECD countries that we study here. Vertically integrated firms, by contrast, move production abroad in order to lower costs of production and to exploit differences in factor endowments. Hence, one hypothesis could be that horizontally integrated multinationals react positively to a boom abroad because market opportunities improve while vertically integrated multinationals react negatively because factors of production become more expensive during a boom.

To check whether there are differences in the behaviour of these two types of multinationals over the business cycle, we estimate the regression separately for those observations where the sectors of the parent and of its foreign affiliate do not coincide. If the reporting company and the foreign affiliate are *not* active in the same sector, this is an indication that we are dealing with a vertically integrated firm. However, this proxy of vertically integrated multinationals is not perfect since the sectoral classification that we are using might not be detailed enough. Moreover, we do not have any information on the product actually produced by the foreign affiliate. Hence, our subgroup of cases where reporting company and foreign affiliate are in the same sector might also include cases of vertical FDI. The measure thus overstates the importance of horizontally integrated firms and understates the importance of vertically integrated firms.

Results are reported in Table 3 as well. The main difference that we see is that same-sector FDI is affected much less than different-sector FDI by the foreign cycle. Responses to exchange rates are, however, similar. At first sight, the missing response of same-sector FDI to the foreign cycle seems to contradict earlier findings that FDI is mostly market-driven. However, there is a quite significant share of investments of German firms abroad into the foreign retail and wholesale trade sector. These investments are counted as FDI in different sectors, but they are mostly market- rather than production-cost driven.

As an additional step towards exploring differences between sectors, we split our sample into services and manufacturing industries (results not reported). In terms of the number of observations, services are somewhat more important (10,000 against 8,500

observations). We find that FDI in manufacturing is not affected by the foreign cycle. FDI in services shows a weak positive response. FDI in both groups of sectors increases if the real exchange rate depreciates, but the lagged response of FDI in services to the exchange rate is negative.

4.4 Robustness Tests

Research on the co-movements of business cycles has found evidence that EU countries cluster more closely together than non-EU countries. Here, we additionally split our sample into these two groups of countries in order to test whether transmission channels differ between OECD countries inside and outside the EU. Results are reported in Table 4. We find significant differences between the EU and the non-European OECD countries. Within the EU, cyclical developments and real exchange rates have no impact on FDI. The significant responses that we find for the full sample are thus driven by the non-EU sub-sample. One interpretation of this finding is that real and monetary convergence within the EU has eliminated differences in cyclical developments as triggers for entry into foreign markets.

We also find no significant impact of real exchange rates and cycles for the accession states of central and eastern Europe. This suggests that fundamental, long-run determinants have been more important as determinants of FDI into these countries following the opening-up of markets in the early 1990s.

Additionally, we break up foreign direct investment into the loan and the equity component (Table 5). Distinguishing these two components is interesting since adjusting equity positions might be more costly than adjusting loan positions. This holds in particular in cases where several investors are involved in a foreign investment object as changes in equity positions would change relative ownership shares. Following this line of reasoning, one would expect that equity ownership is less responsive to business cycle developments than inter-company loans. However, our findings suggest rather the opposite. Equity investment reacts more to the foreign cycle (and to the real exchange rate) than inter-company loans.

To test further whether financial frictions affect international activities of German firms, we include cash flow and asset size at the sectoral level (not reported). These

variables are typically insignificant.¹¹ Moreover, for the few instances where the variables are significant, we do not find consistent signs. Size, for instance, has a positive impact on FDI in the services sector and on those investment projects that take place in sector of the reporting firm. The impact of size is negative, in contrast, for sales (both in levels and in first differences) in the period 1993-1999. Here, cash flow is positive and significant.

Finally, we test whether adjustment to business cycle developments occurs through the number of firms in a given market, i.e. through entry, rather than through an adjustment in the volume of activities. That is, we use the (change in the) number of German firms as a dependent variable. We find no significant impact of either the cycle or the real exchange rate, which would indicate that business cycle developments do not act as triggers of entry.

5 Concluding Remarks

So far, theoretical and empirical literature on multinational firms has focused on the reasons for becoming a multinational, on the reasons for going into a particular country, and on the host and home country effects of multinational activity. In this paper, we have added another dimension to the discussion by analyzing the influence of short-term business cycle movements on multinational activity.

The starting point of our analysis has been the idea that firms' activities might be linked to the business cycle either because of a financial accelerator mechanism or because of the presence of fixed costs of market entry. Since financial frictions and fixed costs of entry can be expected to vary across firms from different sectors, we have constructed a dataset which contains information on foreign activities of German firms at a sectoral level. Our data are annual and cover a time period of 14 years (1989-2002).

Our study has four main findings:

First, foreign activities of German firms increase in response to positive cyclical developments abroad. This effect has been particularly strong in the first half and in the

¹¹ Note that the empirical investment literature has recently questioned the interpretation of cash flow as a proxy for financial constraints.

second half of the 1990s. Adjustment to the cycle mainly takes place through changes in volumes rather than entry.

Second, a depreciation of the euro has stimulated foreign activities as well. This effect was particularly strong in the first half of the 1990s. In the second half of the 1990s, the real exchange rate effect was weaker, possibly because of the impact of the large valuation changes on global stock markets.

Third, business cycle and real exchange rate effects are especially important for activities of German firms outside Europe.

Fourth, business cycles have a stronger impact on FDI projects where the sector of the domestic firm and the foreign affiliate differ than for those cases where the sectors coincide. Sector-by-sector regressions provide relatively weak evidence that systematic differences with regard to information frictions are driving the results. Rather, the impact of real exchange rates and of the foreign cycle in the full sample seems to be driven to some extent by differences between the sectors.

This paper has taken only a first look at the links between business cycles and FDI. In future work, it would be interesting to extend this analysis in a number of different directions. First, it would be interesting to disentangle the effects of demand and supply side shocks on multinational activity. Second, in order to test whether the strength between business cycle developments and multinational activity is affected by the severity of credit market frictions, additional data on the structure of host country financial markets or proxies for access of sectors to external finance could be used. Using more information on sectoral characteristics might enable us to disentangle whether foreign investment reacts to the cycle because financial frictions or because entry costs and firm heterogeneity matter. Finally, one interpretation of our finding that the foreign cycle matters for multinational activity could be that cyclical developments act as triggers for entry into foreign markets. Since our dataset can, in principle, be used to identify the timing of entry,¹² it could be interesting to analyze entry decisions of firms in more detail. In that sense, research on multinationals and business cycles would help to answer the question “*When* do firms become multinationals?”.

¹² Individual firms can be traced over time at least in the sub-period from 1996 to 2002.

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Figure 1: Changes in FDI Stocks and Business Cycles

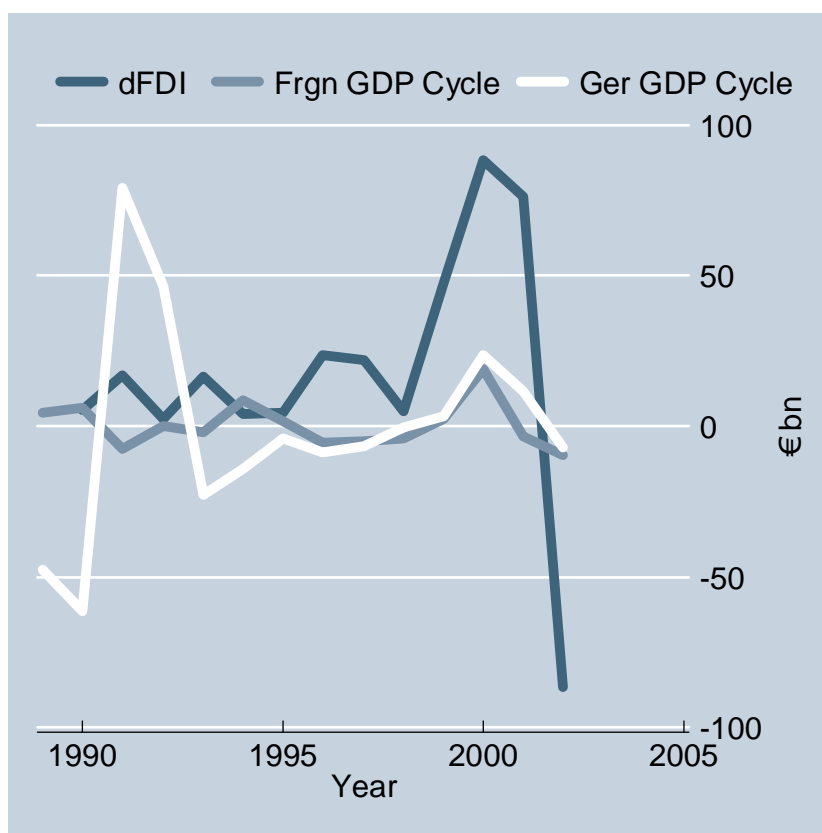


Figure 2: Volatility of Multinational Activity

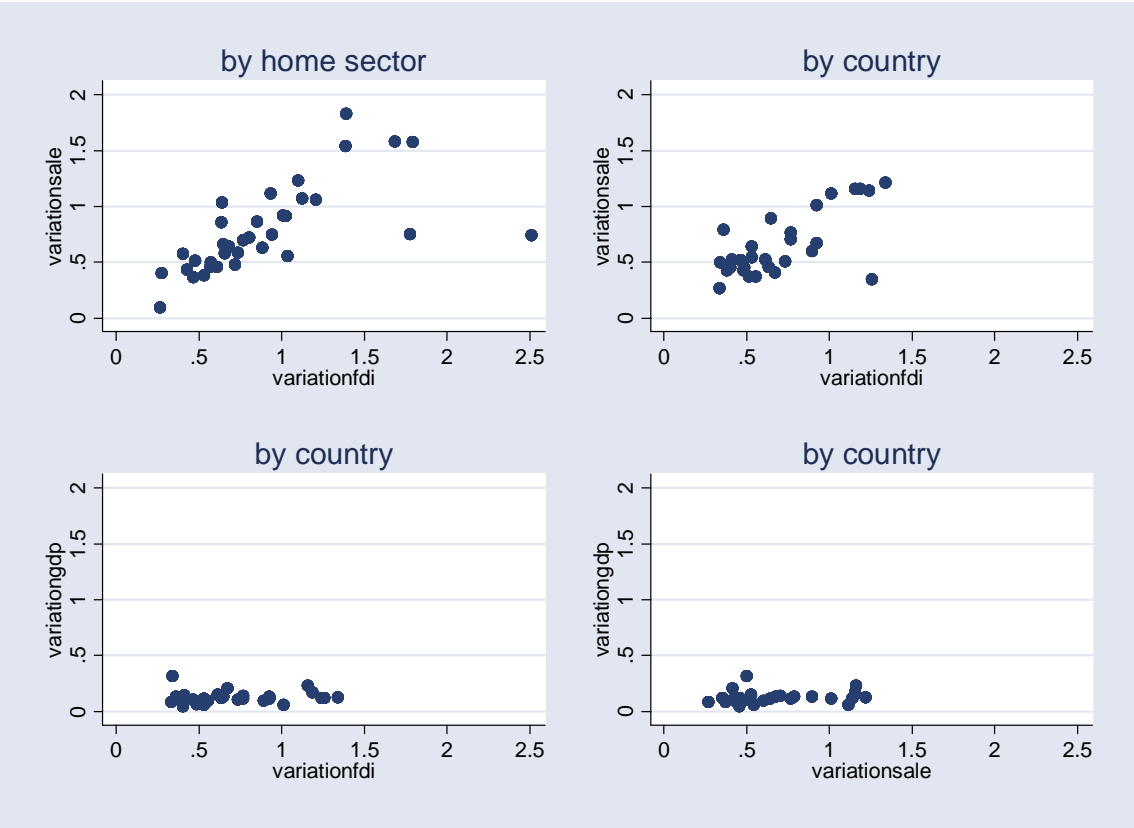
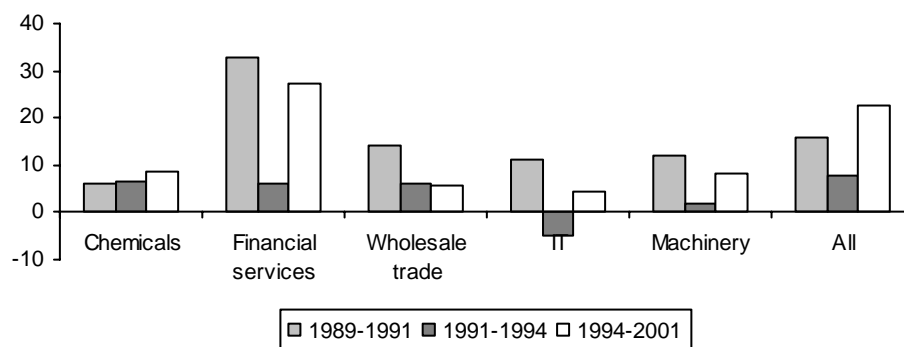
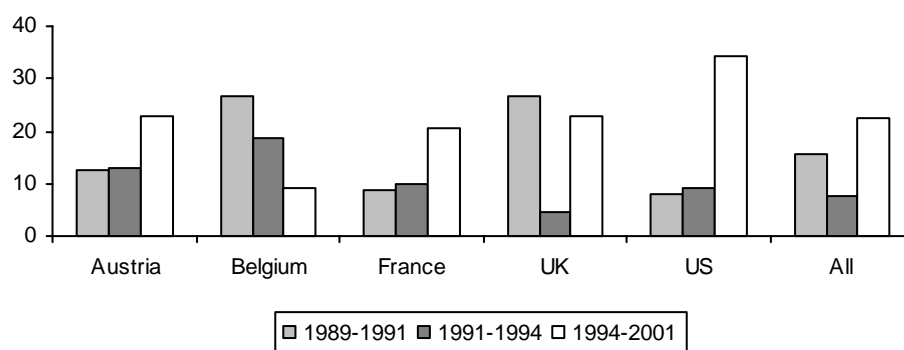


Figure 3: Average Annual Growth Rates of FDI and Affiliate Sales

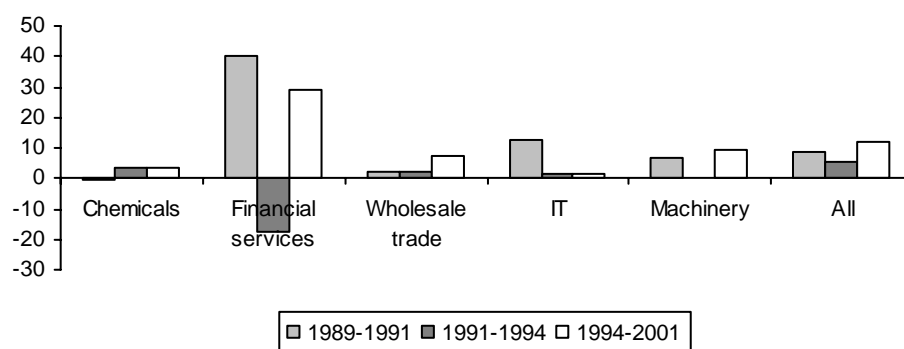
a) Growth of FDI by sector



b) Growth of FDI by country



c) Growth of affiliates' sales by sector



d) Growth of affiliates' sales by country

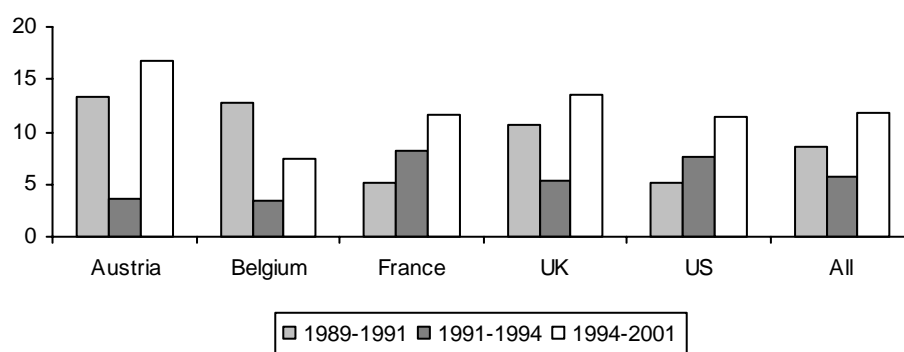


Table 1: Unit Root Tests

Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Exogenous variables: Individual effects. Automatic selection of lags based on SIC: 0 to 2. Newey-West bandwidth selection using Bartlett kernel. Sample 1989:2002. The Null-Hypothesis for Breitung und PP is the unit root (test assumes a common unit root process). The Null-Hypothesis for ADF is the unit root (test assumes individual unit root processes).

	Breitung t-stat	ADF Fisher Chi-square	PP Fisher Chi-square
FDI	-12.37***	8,612.03***	8,797.46***
FDI Equity	-11.99***	8,133.78***	8,051.63***
FDI Loans	-18.88***	9,486.39***	10,149.2***
Sales	-11.62***	8,107.00***	85,29.75***
Foreign Trend	-6.62***	16,148.4***	13,974.3***
Foreign Cycle	-57.12***	20,996.9***	16,734.4***

Table 2: Regression Results FDI and Affiliate Sales

Results of cross-sectional fixed effects panel FGLS regressions. All variables are in logs. ***, **, * = significant at the 1%, 5%, 10% level. Foreign variables are denoted by an asterisk. The cross-section dimension of our panel is defined through all combinations of the sector of the reporting firm, the sector of the foreign affiliate and the host country. The data are annual. T-values in brackets, based on White diagonal standard errors and covariances, adjusted for the degrees of freedom. Instrument list: C, FDI –2, FDI –3, (respectively Sales –2, Sales –3), Cycle*, Cycle*(–1 to –3), Real FX, Real FX –1, Real FX –2

	D (FDI)				D (Affiliates' Sales)			
	1990-2002 (1)	1990-1995 (2)	1993-1999 (3)	1996-2002 (4)	1990-2002 (5)	1990-1995 (6)	1993-1999 (7)	1995-2002 (8)
Constant	8.34*** (4.84)	4.41 (1.16)	5.18*** (3.28)	1.55 (1.02)	6.78*** (8.10)	10.99*** (4.09)	6.36*** (4.53)	5.60*** (3.51)
FDI –1 or Sales –1	–1.08*** (–3.55)	–0.32 (–0.71)	–0.41* (–1.65)	0.11 (0.56)	–0.76*** (–5.08)	–1.04*** (–3.20)	–0.59** (–2.54)	–0.19 (–0.98)
FDI –2 or Sales –2	0.20* (1.65)	–0.15*** (–2.93)	–0.14 (–1.61)	–0.27*** (–5.35)	0.12* (1.67)	–0.03 (–0.46)	–0.02 (–0.21)	–0.25*** (–3.53)
Cycle *	–0.0003 (0.36)	0.0026* (1.67)	0.0014 (1.50)	0.0009 (0.71)	0.0013** (2.14)	0.0029*** (2.58)	0.0023*** (2.93)	0.0015* (1.79)
Cycle* –1	0.0018*** (2.58)	–0.0002 (–0.15)	0.0007 (0.76)	0.0031*** (2.92)	0.0009 (1.47)	–0.0005 (–0.44)	0.0007 (0.88)	0.0005 (0.72)
Cycle* –2	–0.0007 (–1.03)	–0.0025 (–1.43)	–0.0013 (–1.54)	–0.0005 (–0.56)	–0.0012** (–2.31)	–0.0017 (–1.60)	–0.0015* (–2.08)	–0.0008 (–1.13)
Cycle* –3	–0.0007 (–0.82)	0.0006 (0.48)	–0.0002 (–0.22)	0.001 (0.90)	0.0002 (0.37)	–0.00001 (–0.02)	0.0003 (0.32)	0.0011 (1.49)
Real FX	0.25*** (4.80)	0.39*** (2.62)	0.41*** (6.33)	0.26*** (3.80)	0.30*** (8.03)	0.29*** (3.06)	0.35*** (6.03)	0.29*** (6.05)
Real FX –1	–0.048 (–0.63)	–0.23 (–1.59)	–0.28 (–3.68)	–0.27*** (–4.04)	–0.18 (–3.90)	–0.12 (–0.89)	–0.25*** (–3.26)	–0.28*** (–5.33)
Number of observations	19,028	6,002	11,840	13,026	19,454	6,108	12,035	14,837
Number of groups	3,049	1,826	2,791	2,662	2,998	1,805	2,745	2,704
Adjusted R ²	0.08	0.17	0.23	0.09	0.16	0.24	0.23	0.16

Table 3: Sectoral Regressions

Results of cross-sectional fixed effects panel FGLS regressions. The dependent variable is the change in FDI. All variables are in logs. ***, **, * = significant at the 1%, 5%, 10% level. Foreign variables are denoted by an asterisk. The cross-section dimension of our panel is defined through all combinations of the sector of the reporting firm, the sector of the foreign affiliate and the host country. The data are annual. T-values in brackets, based on White diagonal standard errors and covariances, adjusted for the degrees of freedom. Instrument list: C, FDI -2, FDI -3, Cycle*, Cycle*(-1 to -3), Real FX, Real FX -1, Real FX -2

	Full sample	Same sector	Different sector	Chemicals	Business service	Financial services	Motor vehicles and parts	Wholesale trade	Office equipment	Machinery	Textiles	Transportation
Constant	8.34*** (4.84)	9.23*** (3.13)	5.98*** (2.87)	6.81 (1.19)	-4.82 (-0.48)	11.85*** (2.78)	2.43 (1.05)	4.39 (1.24)	5.89** (1.97)	9.02 (1.28)	10.55** (2.15)	6.59** (2.35)
FDI -1	-1.08*** (-3.55)	- 1.27*** (-2.37)	-0.66* (-1.80)	-0.70 (-0.84)	1.05 (0.69)	-1.01* (-1.83)	-0.09 (-0.18)	-0.51 (-0.79)	-0.51 (-1.06)	-1.08 (-1.03)	-1.64* (-1.79)	-0.62 (-1.27)
FDI -2	0.20* (1.65)	0.40 (1.53)	0.0087 (0.063)	0.05 (0.20)	-0.49 (-0.16)	-0.07 (-0.38)	-0.13 (-0.46)	0.02 (0.09)	-0.03 (-0.16)	0.18 (0.53)	0.52 (1.23)	-0.07 (-0.34)
Cycle*	-0.0003 (0.36)	0.0017 (1.24)	-0.0007 (-0.75)	0.0006 (0.17)	0.006 (0.88)	0.00 (0.01)	0.007* (1.70)	0.0002 (0.07)	0.003 (1.18)	0.003* (1.65)	-0.004 (-0.83)	0.0004 (0.07)
Cycle* -1	0.002*** (2.58)	0.0018 (1.32)	0.002*** (2.62)	-0.001 (-0.58)	0.002 (0.43)	0.005 (1.60)	-0.002 (-0.52)	0.0008 (0.34)	0.001 (0.34)	0.002 (1.18)	0.001 (0.28)	0.005 (1.37)
Cycle* -2	-0.0007 (-1.03)	-0.0014 (-1.09)	-0.0009 (-1.18)	0.001 (0.74)	0.007 (0.84)	0.001 (0.25)	-0.0002 (-0.08)	0.0005 (0.22)	0.002 (0.84)	-0.001 (-0.61)	-0.004 (-1.20)	0.004 (0.59)
Cycle* -3	-0.0007 (-0.82)	-0.0001 (-0.10)	-0.0004 (-0.42)	-0.001 (-0.38)	0.004 (0.68)	-0.002 (-0.81)	0.0005 (0.15)	0.001 (0.71)	0.0001 (0.04)	0.001 (0.67)	-0.005 (-0.98)	0.004 (0.93)
Real FX	0.25*** (4.80)	0.33*** (3.58)	0.27*** (3.87)	0.10 (0.64)	-0.13 (-0.33)	0.32* (1.61)	0.12 (0.67)	0.27* (1.76)	0.19* (1.89)	0.28** (2.16)	0.15 (0.71)	0.32 (1.12)
Real FX -1	-0.048 (-0.63)	-0.20** (-2.47)	-0.07 (-0.60)	-0.0002 (-0.001)	0.15 (0.37)	-0.32* (-1.61)	-0.04 (-0.27)	-0.07 (-0.29)	-0.37 (-1.30)	-0.09 (-0.53)	-0.25 (-1.06)	-0.22 (-0.77)
Number of observations	19,028	4,700	14,328	984	831	643	787	1461	902	1219	525	469
Number of groups	3,049	574	2,475	161	149	117	136	245	143	165	69	69
Adjusted R ²	0.08	0.00	0.25	0.24	0.00	0.20	0.11	0.25	0.31	0.21	0.00	0.28

Table 4: Regional Effects (FDI)

Results of cross-sectional fixed effects panel FGLS regressions. The dependent variable is the change in FDI. All variables are in logs. ***, **, * = significant at the 1%, 5%, 10% level. Foreign variables are denoted by an asterisk. The cross-section dimension of our panel is defined through all combinations of the sector of the reporting firm, the sector of the foreign affiliate and the host country. The data are annual. T-values in brackets, based on White diagonal standard errors and covariances, adjusted for the degrees of freedom. Instrument list: C, FDI –2, FDI –3, (respectively Sales –2, Sales –3), Cycle*, Cycle*(–1 to –3), Real FX, Real FX –1, Real FX –2. Accession states are Czech Republic, Slovakia, Poland, and Hungary

	Full sample	EU	Non-EU	Accession states
Constant	8.34*** (4.84)	14.68* (1.71)	6.99*** (4.39)	5.84* (1.95)
FDI –1 or Sales –1	–1.08*** (–3.55)	–2.25 (–1.46)	–0.78*** (–2.91)	–1.45 (–1.62)
FDI –2 or Sales –2	0.20* (1.65)	0.70 (1.10)	0.05 (0.51)	0.23 (0.84)
Cycle *	–0.0003 (0.36)	0.00004 (0.02)	–0.0004 (0.51)	–0.0016 (–0.63)
Cycle* –1	0.0018*** (2.58)	0.002 (1.12)	0.002* (1.81)	0.0016 (0.37)
Cycle* –2	–0.0007 (–1.03)	0.002 (0.69)	–0.001 (–1.00)	0.0007 (0.22)
Cycle* –3	–0.0007 (–0.82)	–0.003 (–1.11)	–0.001 (–0.87)	–0.007 (–0.24)
Real FX	0.25*** (4.80)	0.07 (0.44)	0.36*** (5.88)	0.30 (0.92)
Real FX –1	–0.048 (–0.63)	0.32 (1.10)	–0.21*** (–2.72)	–0.23 (–1.14)
Number of observations	19,028	11,316	7,712	1,954
Number of groups	3,049	1,783	1,266	377
Adjusted R ²	0.08	0.00	0.21	0.00

Table 5: Loan versus Equity Components of FDI

Results of cross-sectional fixed effects panel FGLS regressions. The dependent variable is the change in FDI. All variables are in logs. ***, **, * = significant at the 1%, 5%, 10% level. Foreign variables are denoted by an asterix. The cross-section dimension of our panel is defined through all combinations of the sector of the reporting firm, the sector of the foreign affiliate and the host country. The data are annual. T-values in brackets, based on White diagonal standard errors and covariances, adjusted for the degrees of freedom. Instrument list: C, FDI –2, FDI –3, (respectively FDI Equity –2, FDI Equity –3, or FDI Loans –2, FDI Loans –3), Cycle*, Cycle*(-1 to –3), Real FX, Real FX –1, Real FX –2

	Full sample	FDI Equity	FDI Loans
Constant	8.34*** (4.84)	6.59*** (8.33)	5.85 (1.32)
FDI –1 or FDI Equity –1 or FDI Loans –2	–1.08*** (–3.55)	–0.79*** (–5.39)	–0.69 (–0.90)
FDI –2 or FDI Equity –2 or FDI Loans –2	0.20* (1.65)	0.09 (1.43)	0.001 (0.006)
Cycle*	–0.0003 (0.36)	0.001 (1.53)	0.0024* (1.86)
Cycle* –1	0.0018*** (2.58)	0.0019*** (2.81)	0.0018 (1.04)
Cycle* –2	–0.0007 (–1.03)	–0.0007 (–1.16)	–0.0014 (–1.45)
Cycle* –3	–0.0007 (–0.82)	0.0006 (0.86)	0.0008 (0.50)
Real FX	0.25*** (4.80)	0.40*** (9.00)	0.23 (1.52)
Real FX –1	–0.048 (–0.63)	–0.21*** (–4.10)	–0.19 (–1.03)
Number of observations	19,028	18,089	14,146
Number of groups	3,049	2,921	2,360
Adjusted R ²	0.08	0.19	0.27