Fiscal Incentives, European Integration and the Location of Foreign Direct Investment

Florence Hubert and Nigel Pain

National Institute of Economic and Social Research

June 2001, Second Draft

Abstract

Foreign direct investment in the European Economic Area (EEA) has grown rapidly during the past fifteen years, helped by the collective drive towards deeper European integration. This paper tests for structural change in the geographical and industrial pattern of FDI in Europe using a panel data set on outward investment by German companies in the EEA since 1980. There is evidence of significant structural change since 1990, with nearly all locations and industries seeing a higher level of cross-border investment than might have been expected.

We also investigate the scope for national governments to affect location choice through the use of fiscal instruments such as corporation taxes, investment in infrastructure and other forms of development grants and subsidies, including those from the European Regional Development Fund. The findings with regard to the different investment incentives examined are mixed. Some, such as tax competitiveness, appear important, but are sensitive to the specification of the model. But the level of government fixed investment expenditure relative to that in other economies is found to have a significant positive impact, particularly in locations with less need for EU structural funds. Although the direct marginal impact appears relatively small, an additional finding of significant agglomeration forces suggests that fiscal policies could still have a permanent influence on the location of economic activities.

† We are grateful to Donald Hepburn, DeAnne Julius, Steve Redding, Tony Venables and other members of the NIESR Macro Group and participants in a Trade Policy seminar at the LSE for helpful comments. Financial support from the ESRC is gratefully acknowledged.

National Institute of Economic and Social Research,
2, Dean Trench Street,
Smith Square,
London SW1P 3HE.
e-mail: npain@niesr.ac.uk, fhubert@niesr.ac.uk

I Introduction And Overview

Inward investment in the European Economic Area has grown rapidly during the past fifteen years. New inflows of foreign direct investment per annum over 1996-98 were nearly three times the level seen in the latter half of the 1980s, and the aggregate stock of inward direct investment in the EEA doubled between 1990 and 1998. The growth of inward investment has occurred at a time when controls over the movement of financial capital across national borders have been relaxed, and other barriers to market entry have been lowered as a result of the Single Market Programme and the widespread use of privatisation policies. New investment opportunities have also appeared in the transition economies of Central and Eastern Europe. These collective developments have made an important contribution to the growth of inward investment in Europe since the mid-1980s as well as to the process of European integration.

This does not mean that national policies and institutions no longer matter. Some countries have been noticeably more successful than others in attracting inward investment. The UK has continued to be the single most important host in the EU during the 1990s. France, Belgium and the Netherlands have become relatively more important hosts for new investments, with the close proximity of the sites for many new investments in these countries providing an indication that agglomeration economies may be attracting investors. Germany, Italy and, in recent years, the Iberian economies have all seen their share of new direct investment inflows decline.

Developments in national economies still need to be viewed in the context of ongoing integration elsewhere in Europe. Location choice involves an assessment of the competing characteristics of a number of possible hosts and the reduction in barriers to market entry throughout Europe has raised the number of investment opportunities on offer. Empirical analysis has to allow for the potential changes in the geographical and industrial pattern of cross-border investments that might be expected to result from this. We find evidence of significant structural change across countries and industries since 1990, with nearly all locations and industries seeing a higher level of cross-border investment than might have been expected. There is little evidence that the integration process has acted to reduce the flows of cross-border investments in the EU, even in manufacturing industries.

We investigate the scope, if any, for national governments to affect location choice through the use of fiscal incentives and other investment promotion policies in an increasingly integrated Europe. Surprisingly little is known about the impact of various inward investment incentives and fiscal instruments on the choice of location for investments in European countries, either

from inside or from outside the EEA. Yet with many countries having now entered monetary union, pro-active fiscal policies have become one of the main channels left through which national governments can try and influence location choice.

We obtain econometric evidence on the influence of various types of fiscal instruments on the scale and location examine foreign direct investments undertaken by German companies over the period from 1980 to 1996 using a panel data set with seven industries and eight host economies. The industries are chemicals, mechanical engineering, electrical engineering, road vehicles, other manufacturing, distribution and business services, and the host countries are France, Italy, the UK, Belgium, the Netherlands, Spain, Austria and Sweden. The end point of the sample was determined by the availability of data for some of the explanatory variables used in the empirical analysis.

World-wide, German firms have the fourth largest stock of foreign assets of all investing countries. Within Europe, they are the second most important investors after the United States. At the end of 1997 1.9 million workers were employed in the foreign affiliates of German firms located in Europe, 1.28 million of which were in the EU. A striking feature of German FDI, as with that of many other large foreign investors, is the extent to which it has become increasingly concentrated in the developed economies and in other European countries. In 1981 some 38 per cent of the total stock of German outward investment was held in other EU economies. By 1996, this share had risen to 53 per cent.

It is not possible to collect statistics on the total value of fiscal incentives for inward investment. Measures such as the provision of public land and buildings involve indirect assistance, with little immediate impact on current public expenditure. The true worth of others, such as tax incentives, will become apparent only over time if the investment is profitable. Instead the impact of fiscal instruments has to be evaluated indirectly using measures such as total expenditure on subsidies and fixed investment, the effective rate of corporation tax and supranational expenditures such as development grants from the European Regional Development Fund to co-fund projects designed to reduce regional economic disparities.

The empirical evidence controls for other centripetal and centrifugal forces that are known to affect location choice. Agglomeration economies, proxied by the size of the country relative to the EU, and by the relative size of the national research base, are found to stimulate additional inward investment. Relative labour costs between the different European economies also appear to matter. The findings with regard to the different fiscal measures examined are mixed. Some

are insignificant. Others, such as corporate tax competitiveness, are found to have potentially large effects, although this result is sensitive to the empirical specification. There does appear to be relatively robust evidence that the level of government fixed investment expenditure relative to that in other economies has a significant positive impact on the level of inward direct investment, although the direct marginal impact on the level of investment is small compared to other factors. This positive linkage is found to be stronger in countries that make relatively little use of structural funds from the EU. Viewed in conjunction with the finding of significant agglomeration forces, it does seem that particular fiscal policies could have a permanent influence on the location of economic activities, as suggested by Martin and Rogers (1995).

The rest of this paper is as follows. In the next section we discuss the trends in the location and industrial composition of outward direct investment from Germany in the EU over our sample period from the early 1980s through to the mid 1990s. In Sections III and IV we provide brief surveys of the respective literatures on the impact of European integration and fiscal instruments on the location of industry. The model used in the empirical work is outlined in Section V. The main empirical results are described in Section VI, with some concluding comments given in Section VII.

II. The Regional and Industrial Pattern of German FDI

Around 90 per cent of all outward investment from Germany was held in OECD member states at the end of 1996. The European Union is the largest single regional location for German investment, accounting for half of all investments. The EU share rose especially rapidly in the latter half of the 1980s, but remained broadly stable in the first half of the 1990s. There was a further modest rise in the share of non-manufacturing investments in the EU, offset by a drop in the share of manufacturing investments. It is likely that the latter was associated with the increased outsourcing of activities to neighbouring economies in the East.

The distribution of investments within the European Union is summarised in Table 1. We report statistics for the seven separate industries used in the empirical analysis – chemicals, mechanical engineering, electrical engineering, transport, ‘other’ manufacturing, distribution and financial services. The latter excludes investments in holding companies. The figures shown are in D-marks at current prices. The data for Belgium also include investments in Luxembourg.

In five of the seven industries, France was the most important single host for German investment in Europe in 1996. This may reflect both the fact that there are common borders with

Germany as well as the agglomeration effect of a large market. In some industries, such as distribution, mechanical engineering and other manufacturing, France was the leading host throughout the period shown. The picture for the other large economies is mixed. The overall growth in the share of manufacturing investment located in the UK since 1981 can be seen to have been driven largely by developments in two sectors – transport and other manufacturing. The UK has also made considerable gains in financial services. However in five out of the seven sectors the proportion of investment in the UK is below the share of the UK in EU GDP excluding Germany.[1] This is true of the level of investment in Italy in all sectors. However the overall share of investments held in Italy was broadly stable in the first half of the 1990s, with a marked decline in the proportion of electrical engineering investments offset by strong growth in the other manufacturing sector.

The proportion of investments held in Spain has been relatively volatile. Although Spain still hosts a relatively large stock of manufacturing investment, inflows of new investments slowed in the 1990s, possibly reflecting some diversion of labour intensive investments into Eastern Europe. As a result there has been a marked decline in the proportion of chemicals, transport and other manufacturing investments in Spain, partially compensated for by strong growth in the mechanical engineering sector.

There is also a high level of investment in Belgium given the relative size of the economy in the EU. In part this reflects financial intermediation. Special tax regimes are offered in Belgium for 'co-ordination centres' that undertake financial and managerial tasks for a group of multinational companies. They receive a high level of inter-company financial transfers and transfer significant funds into other economies. However the mix of investments also reflects the industrial strengths of the economy, with investments concentrated in the chemicals and financial services industries.

The overall share of investments held in Austria and Sweden rose between 1990 and 1996, possibly helped by their accession into the EEA and then the European Union. There is a clear suggestion of proximity effects, with Austria having a considerably higher level of investment than Sweden.

The total level of investment in the EU showed strong growth in all industries between 1990 and 1996, with the notable exception of electrical engineering. This sector tends to be relatively

[1] The UK share in non-German EU GDP is 19.79 per cent based on 1995 GDP and PPPs (OECD Economic Outlook No.67, p.242).

export intensive and it is possible that some investments have moved to other geographically proximate locations such as Eastern Europe with lower labour costs. The largest single category of investment is in financial services, where the level of outward investment from Germany more than doubled after 1990. It is interesting to note that the share of EU-located investments held in the eight countries shown has fallen sharply in financial services since the mid-1980s. This primarily reflects the strong growth of investments in holding companies in Ireland since that time for tax reasons.

III. The Impact Of Integration On FDI

It has long been recognised that changes in supranational trade arrangements and technical standards can have an important effect on both the level and location of overseas investments. The initial eradication of tariff barriers within the then European Community and the adoption of a common external tariff in the 1960s prompted considerable empirical study into the question of whether investment was diverted into the region. Studies using data for the United States, the primary source of inward investment in post-war Europe, suggested that in the 1960s there was some investment diversion within Europe from the leading non-EC recipients, notably the UK, to EC members (United Nations, 1993). In contrast, the relative performance of the UK in attracting inward investment improved significantly following entry into the EC in 1973 (Blair, 1987). A similar pattern is apparent for Spain and Portugal after their accession into the EU in 1986 (Bajo-Rubio and Sosvilla-Rivero, 1994; Barrell and Pain, 1999a), and for Austria, Sweden and Finland in the 1990s.[2] In a study of the location of US manufacturing foreign direct investment in nine Western European countries since the mid-1960s, Barrell and Pain (1998) found that entry into the EU had a significant positive impact on the stock of investment in the UK, Ireland, Spain and Sweden. Pain and Young (2001) find a similar impact on the pattern of fixed capital investments carried out by US manufacturing affiliates in Europe. They also report an additional significant positive effect on investment from membership of the EEA.

More recently, integration within Europe has involved the removal of non-tariff barriers to market entry. For EU investors it is likely that such barriers have been the main impediments to cross-border investments within Europe over the time period we study, given that the potential investor and host country are members of a common customs union. Survey evidence suggests

[2] Inward FDI into Spain and Portugal averaged 1.03% of GDP per annum during 1981-85, and 2.04% of GDP per annum during 1986-90. Inward FDI into Austria, Finland and Sweden averaged 0.6% of GDP per annum during 1986-90, but 1.64% of GDP per annum during 1991-97.

that institutional barriers were a significant barrier to investment in Europe in the 1980s (Millington and Bayliss, 1991).

A wide variety of measures to ease non-tariff barriers have been introduced since the start of the Single Market Programme (SMP). These include steps to harmonise technical standards and regulations, the removal of customs controls, and moves to open public procurement and remove constraints on capital markets. An overview of the Programme up until the mid-1990s is provided by European Commission (1996).[3] Some of the non-tariff barriers, notably customs controls, would previously have restrained trade linkages but not market entry by means of direct investment. Others, such as technical requirements and lack of competition in public procurement would affect both exporters and (potential) foreign investors. Capital controls might have affected investors more than exporters.

Thus the impact of the removal of all these different forms of non-tariff barriers might be expected to vary across sectors and across countries. In some sectors there may continue to be little scope for trade, but plenty for direct investment. Legislation based on the single licence principle has helped to facilitate cross-border market entry in financial services and the principle of mutual recognition of national standards has improved market access in other sectors where common community wide standards have not been agreed.

Studies prior to the start of the SMP predicted that it would generate a considerable degree of industrial restructuring in manufacturing sectors. This was largely expected to come about through greater industrial specialisation, with firms able to produce in a single location, exploit any economies of scale arising from the existence of firm-specific fixed costs and serve the wider European market through trade (Emerson *et al*, 1988). In a recent study of the changing trends in specialisation in the EU, Midelfart-Knarvik *et al* (2000) find that countries have indeed become somewhat more specialised over time, but that the process is only gradual.

Little mention was made of intra-EU foreign direct investment in the initial studies of the Single Market. The implication of the specialisation argument is that intra-EU FDI might ultimately be lower than would otherwise be the case in the manufacturing sector, but higher than would otherwise be expected in non-tradeable sectors. Labour intensive, assembly activities would be concentrated in sites on the periphery of Europe with relatively lower labour costs,

[3] The European Commission also produces annual reports on the functioning of product and capital markets following the decision of the Cardiff Economic Council of June 1998.

including those in Central and Eastern Europe. Other, more capital-intensive manufacturing activities would be located closer to the industrial core of Western Europe.[4]

Evidence for the EU in Midelfart-Knarvik *et al* (2000) suggests that there has been greater centralisation in industries with scale economies and high proportions of intermediate inputs. However they also point to some small, geographically peripheral economies, such as Ireland and Finland, which have succeeded in becoming more specialised in high technology industries. Work by Pain (1997) and Pain and Lansbury (1997) for the evaluation of the SMP published in European Commission (1996) indicated that the programme generated significant growth in the level of intra-EU investments over the period from 1987-92 both in the manufacturing and non-manufacturing sectors.

There are a number of reasons why the argument in favour of greater concentration within national industries may understate the scope for intra-EU direct investment as product market barriers are removed. At a practical level, the SMP legislative process has taken much longer than initially anticipated. By October 1996, approximately at the end of the sample we use in the empirical work, an average of 91 per cent of all directives were on member states' statute books (Commission, 1996, pg.8). The continuing existence of some impediments to trade at that time may make it difficult to get a full picture of the eventual impact of market integration.

Moreover it is clear that many national factors continue to impose costs on market access. Some of these are regulatory, arising from differences in factors such as environmental and health and safety provisions. Examples include the continuing use of national health insurance price controls within the pharmaceuticals industry, regulations on the movement of waste and standards of labelling and packaging. In other cases markets remain differentiated as a result of consumer preferences. In such cases, direct investments are often made either to enter local markets or to establish facilities for adapting products to local needs.

A number of models arising out of the new literature on economic geography and international trade also suggest that changes in technology and production costs can help to support the existence of multinationals, even at a time of reductions in barriers to trade (Markusen and Venables, 1996). The key features of these models are the interactions between firm-specific assets, economies of scale and transport (or trade) costs. Firm-specific knowledge-

[4] Within North America there is some evidence that such a restructuring process has occurred in some industries following deeper regional integration, with a number of US multinationals closing subsidiaries

based assets include process innovations, marketing skills and managerial expertise. All can be utilised simultaneously in different plants under common ownership, giving economies of scale at the level of the firm rather than at plant level. Multinational firms can thus have lower variable costs but higher fixed costs than national firms in different locations. Markusen and Venables (1996) argue that continuing integration, and hence expansion in market size, may lead to a gradual substitution of 'horizontal' foreign investment for intra-industry trade between countries within integrated regions. This is because the variable cost advantage of multinational firms arising from the use of a joint input across plants comes to dominate the higher fixed costs of multi-plant operations. However, such a result would depend upon the structure of both industries and countries.

It should also be noted that direct investment may be motivated at times by strategic considerations as much as by a desire to seek out low-cost locations (Buigues and Jacquemin, 1994). If product markets are imperfectly competitive, the sunk-costs occurred in undertaking foreign direct investment may be a means of achieving the market power required to exploit fully intangible assets such as brand names, managerial expertise and other firm-specific knowledge. Such factors imply that direct investment might continue to take place even as trade liberalisation occurs.

IV. Fiscal Incentives and Foreign Investment

In recent years governments have actively competed to attract inward investment through policy inducements and promotional campaigns in so-called 'location tournaments' (Wheeler and Mody, 1992). Such incentives are often justified by the view that inward investors bring externalities which can benefit host country firms (Pain, 2000). One reason why fiscal incentives may be used as a strategic instrument is the potential existence of agglomeration economies (Martin and Rogers, 1995), with the recognition that the initial entry of individual firms may eventually lead to a major concentration of industrial activity. Even if new investment incentives are subsequently matched by other countries, the temporary advantages gained by the first mover may have a permanent impact, if new investments then attract further investments. Equally, any country or region that unilaterally abolished its incentive packages might well lose significant amounts of investment (Head *et al*, 1999).

---

within Canada and substituting exports for FDI. In contrast cross-border investments have strengthened in Mexico (Blomström and Kokko, 1997).

There are three broad categories of investment incentives which can be distinguished - tax incentives, financial incentives and other non-financial measures. These can be granted to new investors and to existing investors in 'after-care' programmes (Young and Hood, 1994). Examples of tax incentives include preferential tax rates, investment and R&D allowances and accelerated depreciation. Even if production costs are equalised across locations, international differences in corporate taxes may affect the location decision if they affect post-tax returns. Social security taxes may also matter, as they affect the cost of labour in different locations. Financial incentives cover factors such as government grants and subsidies, loan guarantees, preferential loans and government equity participation in high-risk investments. These measures are often discretionary, with the size of payment depending upon the scale of investment and the activities that the inward investor plans to undertake. The third category, other non-financial measures, covers the provision of subsidised infrastructure, such as prepared industrial sites, the establishment of free-trade zones and the use of preferential government contracts.

The total funds spent on all these different forms of state assistance are very difficult to measure. In many cases it is difficult, if not impossible, to obtain detailed national evidence on total expenditure on investment incentives over time. Mody and Srinivasan (1998) note a similar problem. Some information does exist on the current budgets of public sector bodies and local development agencies, but these are unlikely to capture the hidden social costs of many investment incentives.[5] Grants and concessions are often made on a discretionary basis, and the value of tax incentives can depend upon the eventual profitability of an investment. Thus proxy measures have to be used in any empirical exercise. Even if data on ex-post expenditures were available, it should be borne in mind that they would not necessarily be an accurate guide as to what might be on offer for other potential investors.

The majority of empirical studies conclude that there appears to be little evidence that investment incentives have been an important determinant of either the scale or the form of foreign investment in individual countries (OECD, 1983 and 1989; UNCTAD, 1998). However there is evidence that fiscal incentives can affect the choice of location within a given country (Coughlin *et al*, 1991; Head *et al*, 1999), possibly because different levels of assistance are

[5] The biggest aid package given to a single investor in the UK was granted to the Korean conglomerate LG, who planned to establish two new plants employing 6,100 people in Wales. In 1996 LG received an aid package worth an estimated £247 million, including grants, a free 250 acre site, and commitments to provide training for employees and help with the sourcing of components (Phelps et al., 1998). The eventual value of the aid would be well above the total annual budget of the Welsh Development Agency, which was £165 million in 1997-98.

offered in different regions, and there is some evidence that measures of public infrastructure can matter (Coughlin *et al*, 1991; Martin and Velázquez, 1997; Ferrer, 1998).

To date relatively little detailed econometric work appears to have been undertaken on the role of fiscal incentives on the country location decision in Europe. Mayer and Mucchielli (1998) estimate a conditional logit model for the probability of Japanese investments being located in five host economies, France, Germany, the UK, Italy and Spain, over the period 1984-93. Their firm-level model includes four different measures of state assistance; the level of capital grants and subsidies, the effective corporate tax rate, labour subsidies and the level of expenditure financed by 'structural funds' from the European Regional Development Fund in each location. The results are inconclusive. The state assistance variables are significant only if country-specific fixed effects are excluded from the model. This exclusion would clearly be rejected by the data given the reported log-likelihood statistics for the different models. However it results in a significant negative coefficient on the corporate tax rate and the level of capital grants, and a small positive effect from the level of structural funds.

The failure to find any significant terms when fixed effects are included suggests that although there may be important effects over time from differences in the average level of taxes and expenditure between different locations, variation over time in the level of national tax and subsidy rates within locations have not had much effect. In a related study of Japanese firms in 49 European regions and 8 host countries, Mayer and Mucchielli (1999) again find that whilst the effective tax rate has an influence on location decisions, it is not significant.

Ferrer (1998) finds that the level of EU structural funds granted to particular regions and the level of investment incentives granted by host country governments to their assisted areas both have a significant negative influence on the number of employees in the foreign affiliates of French multinationals in 94 EU regions. One interpretation of this result is that investment has primarily taken place in high-income regions. The high level of public assistance simply provides a signal that a region is relatively under-developed and has not been able to fully compensate for the weaker comparative advantages of the region and the absence of agglomeration economies. A similar argument could be applied to the findings from capital grants in the Mayer and Mucchielli study. Related results are obtained by Cantwell and Mudambi (1998), who find that assisted areas in the UK tend to attract foreign multinationals with less R&D intensive operations.

A number of recent studies, completed since the surveys in OECD (1989) and UNCTAD (1998), suggest that the effective rate of corporate tax faced by potential investors may have become an increasingly important influence on location over time. The effective rate reflects allowances and credits as well as the marginal rate of tax. Devereux and Griffith (1998) find that the average effective tax rate of different host economies does not influence the probability of a US firm locating in Europe but it does significantly affect the probability of locating in an individual country once the firm has decided to locate production somewhere within Europe.[6] Young (1999) finds that the tax competitiveness of the UK against other economies has a significant effect on the total level of fixed investment expenditure in the UK.

In this paper we explore the importance of four different types of fiscal incentives:

- gross fixed general government investment as a share of host country GDP.
- general government expenditure on subsidies as a share of host country GDP.
- the level of structural funds from the European Regional Development Fund (ERDF) allocated to the host economy as a share of GDP.
- the effective corporate tax rate in the host economy.

Comparable data can be obtained for all these measures for all European countries. In the econometric work the host country levels are entered as ratios to a (GDP) weighted average of the levels in other European Union economies. This is because location choice depends upon the relative costs of competing locations, not just the costs of any one particular location.[7] As the variables are entered as ratios, it would not be expected that they could account for the permanent upward trend in the stock of inward direct investment in many locations. However they may be important indicators of fluctuations in the level of fiscal assistance over time, and can affect flows of new investment for several years.

[6] The US taxes foreign source income upon repatriation if the tax paid in the host economy is less than would have been paid if the income had been earned in the United States. Hence Devereux and Griffith find that the US effective tax rate is the main channel through which tax considerations affect the total level of US investment in Europe.

[7] For example in the model developed by Martin and Rogers the costs of trade within and between countries are directly related to the quality of a country's infrastructure and public services. In their model the location decision depends on differences in infrastructure provision between locations.

Expenditure on fixed investment and the level of ERDF resources are both indicators of expenditure on infrastructure. The level of government subsidies provides a broad indicator of the amount of assistance provided in current government expenditure, and will include expenditure on interest and labour market subsidies both to domestic and foreign firms.[8]

Trends in the level of general government expenditure on fixed investment and subsidies over time are summarised in Tables 2A and 2B. There are marked differences between the policies followed in different countries. Some, such as France and Spain have raised the proportion of GDP accounted for by expenditure on fixed investment over time. Others such as Italy, the UK and Belgium have reduced the level of expenditure significantly since the early 1980s. Most of the countries have reduced their expenditure on subsidies over time, with the notable exception of Austria and Sweden, possibly reflecting their delayed entry into the EEA and the extent to which they were subject to EU competition policies. These two countries also maintained a comparatively high level of expenditure on fixed investment in the early 1990s.

It is possible that the level of new government investment expenditures may not be a good guide to the overall stock of investment, particularly if investment expenditures are temporarily cut back for budgetary reasons or if privatisation takes important elements of infrastructure from the public sector into the private sector. However there is little comparable international data on the stock of public sector tangible assets or on the value of infrastructure. This suggests that care is required in interpreting the findings from an investment flow variable, although cutbacks in the level of replacement investment can of course send a strong signal to potential investors.

The structural fund payments made by the European Union are paid through four different funds, the European Regional Development Fund, the European Social Fund (ESF), the European Agricultural Guidance and Guarantee Fund and the Financial Instrument for Fisheries Guidance. Payments through the ERDF account for around 40 percent of total structural fund payments. The ERDF fund was first introduced in 1975 and is intended to help support investment projects which aim to reduce economic disparities between regions of the EU. We follow Mayer and Mucchielli (1998) and Ferrer (1998) and concentrate on this form of structural funds for two main reasons. First, it is possible to obtain a consistent source of data back to 1975. In contrast, the other forms of structural payments have been channelled through different schemes over time. Secondly, the ERDF payments are the ones that are most relevant for

[8] In many cases the level of aid granted to individual projects is subject to limits imposed by the European Commission which vary according to the region in which the investment takes place.

location choice, in that they help to support factors such as infrastructure. Other forms of structural funds, such as support for agriculture and fisheries, matter for those concerned, but there is little reason why they should affect the choice of location for mobile investments. In our sample Spain is the country which has clearly benefited the most from Structural Funds, as shown in Table 2C, although these have been payable only since entry into the EU in 1986.

German companies have a clear incentive to avoid countries with high corporate tax rates if pre-tax profits are equal across different locations, as most of their foreign source income is exempt from domestic taxation (Weichenrieder, 1996). It is difficult to capture all the features of host country corporate tax systems in a single indicator. Account needs to be taken of capital allowances and tax credits as well as the marginal rate of tax on profits. We follow Mendoza *et al.* (1993) and compute the effective rate of corporation tax as the ratio of cash receipts from taxes on income and profits of corporations to the total operating surplus,[9] and make the implicit assumption that this effective rate corresponds to the one that might be faced by the representative foreign firm in that location. We follow Young (1999) and define a tax competitiveness variable as:

$$TAX_{jt} = (1-\tau_j) / \sum_{k \neq j} w_k (1-\tau_k) \qquad [1]$$

where: τ_j = effective corporate tax rate on non-labour income in host country

τ_k = effective corporate tax rate on non-labour income in other hosts

If a lower effective tax rate helps to attract investment this measure should have a positive effect in the empirical analysis. The weights used are based on country shares of OECD GDP at constant prices. The constructed measure of tax competitiveness for the four largest host economies – UK, France, Italy and Spain, is shown in Figure 2. The UK and, to a lesser extent, France have become more competitive over time, whilst Italy and Spain have become less competitive.

V. The Econometric Specification

Although our main focus lies in the impact of European integration and the importance of fiscal instruments, the empirical analysis attempts to control for a number of other potential determinants of location choice, including market size, relative labour costs, agglomeration

[9] We do not include taxes on capital gains or financial transactions. The data are taken from OECD Revenue Statistics and OECD Annual National Accounts.

economies and currency volatility. We briefly discuss each of these below, and then highlight a number of other econometric issues, along with the methodology used to test for structural change.

Market Size And Relative Costs

Indicators of market size and relative production costs remain important factors in many recent studies of the determinants of foreign investment, even though most FDI is now concentrated in relatively high-cost and capital rich OECD economies with similar factor endowments. Given that there is a cost advantage to producing outside the home country of the investor, the level of final demand and the growth rates of different markets would be expected to raise the level of foreign investment. Jost (1997) and Hubert and Pain (1999) illustrate the significant relationship between the aggregate level of FDI by German residents and measures of foreign income. Income in the host location, or in a wider supra-national region such as the European Union, has also been found to be a significant factor in the growth of foreign investment by American (Barrell and Pain, 1996, 1998 and 1999b), British (Pain, 1997) and Japanese firms (Barrell and Pain, 1999a) over time. All these studies also indicate that measures of the real exchange rate of the host location, constructed using unit labour costs in a common currency, remain a significant factor in location choice.

We assume that investments by German companies in Europe are targeted at the wider European market and investigate two measures of market size. The first is aggregate European Union GDP at constant prices and the second is the sum across the eight host locations plus Germany of output in the industry in which investment takes place. To investigate whether costs in the host economy are an important determinant of the scale of inward investment we use a measure of the real effective exchange rate given by the ratio of manufacturing unit labour cost in the host relative to a (GDP) weighted aggregate of unit labour costs in 15 other economies, all expressed in a common currency.[10] The majority of the labour cost data comes from the US Bureau of Labour Statistics. Unit costs are used so as to allow for differentials in productivity levels as well as wages and payroll taxes.

In principle a more extensive measure of costs could also be used so as to allow for the impact of any differences in the user cost of capital across countries, although such data are

[10] These include all the other hosts in our sample, plus Germany, Ireland, Switzerland, Norway, the US, Canada, Australia and Japan.

difficult to obtain on a time series basis. In practice it is likely that many multinationals will face similar borrowing costs wherever they choose to locate in Europe.

Firm-Specific Assets

The majority of the foreign investments undertaken by German companies are located in other OECD economies. This indicates that models of location choice must involve more than just considerations of relative costs. Theories of the multinational firm (Dunning, 1988; Markusen, 1995) and econometric evidence on the determinants of foreign direct investment both highlight the extent to which the decision to establish foreign subsidiaries is influenced by the need to appropriate the rents accruing from the development of firm-specific knowledge-based assets and practices. The productive use of these assets need not be confined to a single location. They have characteristics similar to a public good in that they can generate economies of scale at the level of the firm, rather than at the level of the individual plant, by acting as a joint input across plants.

Recent empirical evidence suggests that registered patents and R&D expenditures help to explain the industrial pattern and level of foreign investment by British and US companies, with companies from research-intensive industries being more likely to invest abroad (Pain, 1997; Barrell and Pain, 1998 and 1999b). Hubert and Pain (1999) also find an important role for proprietary assets in their study of German manufacturing investment in a sample of developing and developed economies.

We follow Barrell and Pain (1999b) and proxy the 'stock' of firm-specific assets by an industry-specific measure of the stock of business enterprise R&D undertaken by firms located in Germany. Consistent data for the flow of such expenditures was obtained from the OECD ANBERD database, with adjustments applied prior to 1979 to allow for changes in coverage.[11] These data were converted into constant prices using the German GDP deflator. A benchmark stock (S_0) for 1973 was obtained using the Griliches approximation formula [$S_0 = R_0 / (g + \delta)$], where g is the average annual logarithmic growth rate of R&D expenditures over the period for which data is available, δ is the annual depreciation rate, which was assumed be 11 per cent, following Carson *et al*. (1994), and R is the initial observation on the flow of R&D. This benchmark stock was then updated using a standard perpetual inventory model.

[11] The 1979 survey of the German business sector was extended in coverage to include a number of small and medium-sized enterprises that were not previously included, see OECD (1984).

The constructed stocks of R&D are shown in Figure 1. All of the industry groupings have seen steady growth over time. As might be expected, the R&D level in the manufacturing industries is higher than in the service ones, although the amount of R&D in these sectors, particularly financial and business services, has risen rapidly in recent years.

Agglomeration Economies

Models of the location of activities under perfect competition cannot explain why regions with similar factor endowments and similar factor prices may have very different industrial structures. Location patterns are viewed as being determined by geographical endowments, transport costs and production costs in different regions. There are few reasons to locate anywhere for long, and competitive disadvantage can be remedied quickly. Investment incentives might succeed in attracting new industries, but these would soon depart if subsidies were withdrawn (Wheeler and Mody, 1992; Barrell and Pain, 1998).

New theories of international trade and economic geography, arising from the seminal paper by Dixit and Stiglitz (1977) on imperfect competition and increasing returns to scale, stress that comparative advantage is path dependant. In these models temporary differences in national or regional characteristics, such as investment incentives, can have permanent effects on the location of activities if firms are subsequently drawn to particular regions by the possibility of obtaining agglomeration economies (Krugman, 1991). Such economies arise from any location-bound economic activity in an area that generates positive externalities for nearby firms. Examples include the availability of skilled labour and clusters of innovating firms, proximity to firms in other industries with whom there are close business linkages (Venables, 1996) and publicly financed infrastructure.

Several recent studies have suggested that agglomeration effects can be an important determinant of investment decisions by multinational firms. Wheeler and Mody (1992) and Mody and Srinivasan (1998) find that the global location of foreign direct investment by US and Japanese multinationals is positively related to variables reflecting the total stock of past inward investment in the host economy. In two detailed studies using plant-level data, Head *et al*. (1995 and 1999) report that the location of new Japanese investments in the US is closely related both to the location of existing investments in the industry in which investment takes place and to the location of investments by other Japanese companies. Mayer and Mucchielli (1998 and 1999) report related effects in their models of the location of Japanese subsidiaries in Europe.

Devereux and Griffith (1998) and Barrell and Pain (1998 and 1999b) find that agglomeration effects also help to determine the location choice of US multinationals in Europe. Barrell and Pain use two distinct measures, the size of host economy GDP relative to GDP in the whole EU, and the share of EU patenting or R&D undertaken in the host economy. Both are found to have a significant positive effect on the stock of foreign direct investment in different host economies. There are fewer relevant studies of the investments made by firms from European countries. However Ferrer (1998) finds that agglomeration variables based on the relative importance of particular industries within regions are positively associated with the regional distribution of employment in the foreign affiliates of French multinationals in Europe. There are also case studies of individual regions or industries where agglomeration economies are important and help to attract inward investment. Within the UK, the financial services industry in the City of London is an obvious example (Hood and Young, 1997).

We investigate the potential role of host economy agglomeration forces on the location of German investments by experimenting with three different measures. The first is the ratio of national GDP to EU GDP. The second is the ratio of industry output in the host economy to total output in that industry in the EU economy. Both are defined at constant 1990 prices and with country data converted into dollars using base year PPPs. These should have positive effects if there are additional economies arising from the relative size of the host country.

The third agglomeration measure is a five year moving average of the stock of patents granted in the United States to firms resident in the host country compared to the total stock of patents granted to all EU firms. A similar measure was used by Barrell and Pain (1998). We use this source of patent data as it includes internationally comparable patents originating from a large number of countries. The findings from earlier studies suggest that the expected sign on this variable is ambiguous. If 'technology-sourcing' and asset-enhancing investments are important, then inward investors should be attracted to relatively research-intensive locations. However it could also be that investors seek to avoid locations with strong competitors, with higher R&D acting to deter the entry of rivals (Mayer and Mucchielli, 1998).

Exchange Rate Volatility

The FDI literature suggests a variety of ways in which exchange rate volatility might affect direct investment. Simple portfolio models imply that a rise in the risk associated with a particular asset might reduce the level of investment in that asset, although this is dependent on the extent to which the risks associated with different assets are correlated. Whilst it is possible

to insure against currency risk, this is not without cost. Volatility in the exchange rate may directly contribute to uncertainty over the timing of planned transactions. If companies are risk-averse then uncertainty over the level as well as the variance of future exchange rates may act as a barrier to foreign purchases. For instance, Barrell and Pain (1996) illustrate that expectations of future movements in the dollar have a significant effect on the level and timing of current investments by US parent companies.

It may also be the case that the impact of currency variability on investment from a particular location is dependent upon the importance of that location within the wider regional market. This is particularly true of Germany, since the German market will still be the primary destination for many tradable goods produced by German companies located elsewhere within Europe. An implication of this is that German firms may prefer to produce in countries whose nominal exchange rates are closely linked to the D-Mark. It may also be the case that exchange rate volatility might prove more costly for smaller host economies, since it is more likely that some of the goods and services produced by inward investors in these countries will be exported to other larger markets.

There is no unique way of measuring exchange rate volatility. Here we experiment with a three year moving sample standard deviation of the rate of change of the bilateral exchange rate of the host economy with Germany. Letting $e_{j,t}$ denote the nominal, bilateral D-mark exchange rate of the host country (or region) *j* at time *t*, nominal volatility is given by:

$$NVOL_{j,t} = \left[(1/m) \sum_{k=1}^{m} [\Delta \ln(e_{j,t+1-k})]^2 \right]^{0.5} \qquad [2]$$

This measure will be zero for any county whose exchange rate is fully pegged against the D-Mark, and a constant for any country whose bilateral exchange rate changes at a constant rate.

V.2 Econometric Issues

In the econometric analysis we include fixed effects a_{ij} for each industry in each host location (where *i* denotes industry and *j* denotes country in the tables of results), and *N-p* time dummies, where *N* denotes the number of years in the sample.[12] The fixed effects will capture all industry-specific and country-specific factors that do not vary over time. These may include

[12] We have to exclude *p* time dummies to avoid perfect colinearity with the other variables that do not vary across each panel members. These are the fixed effects and the growth of aggregate EU GDP.

factors such as distance and language, both of which have been found to be important determinants of location choice in cross-section studies or gravity models (Cooke and Noble, 1998). The fixed effects will also reflect the average, within-sample values of the independent variables. The time dummies will pick up the effect of any excluded variables whose common impact on all panel members has varied over time. Common slope parameters are imposed across all industries and host locations.

We follow Barrell and Pain (1997, 1998 and 1999b) and Pain (1997) in using the stock of inward FDI measured in US$ at constant 1990 prices as the dependent variable. The stock of investment in each location was converted into dollars using the end year bilateral DM-dollar exchange rate, and then deflated by the dollar value of the GDP deflator in the host economy.

We also allow for the existence of adjustment costs by including a lagged dependent variable and estimate a dynamic, partial adjustment, panel model. It is widely accepted in economics that adjustment costs matter, whether in affecting the behaviour of the firm or the behaviour of individuals. For example it is well known that adjustment costs affect the timing and implementation of the fixed investment decisions of firms, see Bean (1981). *A priori*, there is no reason why such costs should not be expected to affect the timing and implementation of foreign investments as well. The existence of adjustment costs arising from factors such as delivery lags and delays in finding suitable locations or targets for foreign investments, means that the desired and actual stocks of investment are unlikely to be equal period by period.

The inclusion of a lagged dependent variable necessitates the use of an instrumental variable estimator. Although our panel has a relatively rich time dimension, with sixteen observations per panel member, the inclusion of a lagged dependent variable will still induce some small sample bias into panel estimates with fixed effects (Nickell, 1981). We use higher order lags of the dependent variable and EU demand as additional instruments.

Estimation is undertaken over a sample period running from 1981 to 1996. With eight countries – France, the UK, Sweden, Spain, Austria, Netherlands, Italy and Belgium - and seven separate sectors – chemicals, electrical engineering, transport, mechanical engineering, other manufacturing, distribution and financial services - there is a total potential sample size of 896 annual observations. However we exclude transport investments in Sweden. The reason for this is that data are published only intermittently, reflecting the withholding of data to preserve confidentiality.

V.3 Structural Change

To allow for the possibility of structural change either from the Single Market Programme or the opening up of Central and Eastern Europe we initially include separate (0,1) dummies for each industry and each host country. These dummies take the value 1 from 1990-96 and are zero at all other times. They will capture any industry or country-specific effect which has changed systematically since 1990 and is otherwise unaccounted for in the model. Because there are many possible sources of structural change it is not possible to have a precise hypothesis about the likely pattern of coefficients across industries. We omit one country dummy, for Belgium, to ensure that the dummies are not linearly dependent.[13] This means that the coefficients on the seven industry dummies actually give the implied effects for Belgium. For all other countries the industry effects are given by the sum of the coefficients on the industry dummy plus the country dummy.

VI Empirical Results

The initial estimation results are summarised in Table 3. The first model shown is termed Model 1. The second model, which omits three variables whose t-statistic is less than unity, is reported as Model 2. In both cases the intercept dummies for 1990-96 confirm that structural change has occurred over this period. Nine of the 14 coefficients are significant and the dummies are jointly significant on the basis of a Wald test [Wald(14)=44.38 in Model 1]. We discuss the other key findings before considering the results for the structural change dummies in more detail.

The main results suggest that foreign investment by German firms is driven by strategic factors and firm-specific competitive advantages as well as by the relative costs of producing in different locations, confirming the findings of Hubert and Pain (1999). The accumulation of proprietary assets through R&D is shown to be an important factor helping to raise the level of outward investment over time. To this extent high levels of outward investment could be construed as a sign of competitive health rather than a sign that Germany is an unattractive business location. In Model 2 for instance a permanent rise of 1 per cent in the stock of R&D in a particular sector will eventually raise the stock of outward investment in that sector by 1.75 per cent.

[13] The results are invariant to which dummy is dropped.

There are also well determined effects from EU market size. There are two measures of market size, the level of EU-wide output in each individual sector, and the overall growth of EU GDP. This latter measure was found to be a better indicator of market growth than the growth of sector-specific demand. In Model 2 we impose the restriction of a unit long-run output elasticity [Wald(1)=0.34], implying that, other things being equal, that the stock of investment in each sector will rise at the same rate as the level of EU-wide output in that sector.

The results also indicate that both centrifugal and centripetal forces are important. There is evidence of significant positive agglomeration economies from both the relative size of the national market (measured in terms of GDP) and the national research base, with firms preferring large markets other things being equal. The coefficients in Model 2 imply that a permanent increase of 1 percentage point in the host location share of EU GDP will eventually raise the stock of inward investment by 0.87 per cent. A permanent increase of 1 percentage point in the host location share of EU patenting will eventually raise the stock of inward investment by 0.32 per cent. However centrifugal forces are also important. A 1 per cent rise in unit labour costs in the host economy relative to other potential hosts, is associated with a reduction in the stock of inward investment, other things being equal, with a long-run elasticity of 3.9 per cent. Sustained currency overvaluations in Europe are thus not without cost. A similar picture emerges from studies of the forces determining the location of Japanese and US FDI in Barrell and Pain (1998, 1999a and b).

It is of interest to compare the size of the elasticities we obtain for German FDI with those obtained by Barrell and Pain (1999b) for US FDI. The importance of technological developments in the investing economy appears far larger for Germany, with the long-run elasticity on the R&D stock over four times the size found for the United States. In contrast the impact of the agglomeration measures for Germany is approximately half the size of those found for the US. Hence the impact of host country capabilities may vary according to the nationality of the investor. Taken together, these comparisons suggest that German investment is primarily driven by their own technological advantages rather than the need to exploit those available in other countries. In contrast relative labour costs appear to have a considerably larger impact on location choice for German investors than on US investors.

The impact of the four fiscal measures is mixed in Models 1 and 2. The clearest evidence concerns the level of general government fixed investment (as a share of GDP) in the host relative to that in other EU countries. This has a significant positive effect on the stock of inward investment in both models, possibly reflecting the importance of infrastructure for potential

investors. The positive effect from public investment is partially offset by a negative effect from the ratio of ERDF structural funds to GDP, which is significant at the 10 per cent level in Model 2. The interpretation of this finding is that higher government investment is more likely to attract greater investment if it occurs in those locations which are already relatively well-developed, with higher than average per capita incomes and a substantial stock of assets owned by the public sector. Higher investment in poorer regions, assisted by structural fund grants, may be necessary to catch-up with the more advanced regions, but it is not sufficient to offset all the inherent locational disadvantages.

It is useful to relate this finding to the economic geography literature and the theoretical model developed by Martin and Rogers (1995). Their model suggests that the impact on location of regional aid policies designed to improve infrastructure will vary according to the type of infrastructure that is financed. The model distinguishes between domestic infrastructure, which facilitates trade within countries and raises final demand, and international infrastructure, which facilitates trade between countries. Policies that improve domestic infrastructure should prove beneficial, particularly if countries have a good international infrastructure, since higher demand will encourage investment to exploit any economies of scale. However policies that improve international infrastructure may prove counter-productive in countries with a low quality of domestic infrastructure, since firms can now locate in other higher income locations and still access the market of the lower income country. Our results are consistent with this model if the main types of investment financed by the ERDF are in international infrastructure, such as docks and airports, whilst general government investment predominantly finances domestic infrastructure.

We also find a positive effect from tax competitiveness, as defined in equation [1] above, in line with the findings of Young (1999), although it is not significant in either of the two models reported in Table 3. The positive coefficient implies that a rise in the relative effective corporate tax rate in one location, will act to deter inward investment. In contrast expenditure on subsidies in the host location relative to that in other locations has a small, but again insignificant, negative effect on inward investment.

The variable for nominal exchange rate volatility has a negative coefficient, but is not significant. Thus whilst some German companies may have been more inclined to invest in countries which have been able to maintain a greater degree of nominal exchange rate stability with the D-Mark, it does not appear to have been of particular concern for the majority of investors. The EU membership dummy is also insignificant.

The size of the coefficient on the lagged dependent variable in both models in Table 3 suggests that there is considerable inertia in the pattern of outward investment, implying the presence of significant adjustment costs. The coefficient is significantly different from unity, implying that the use of a model specified in first difference form, i.e. for the flow of new investments, without any affect from the lagged stock level, would be rejected by the data.

In the last row of Table 3 we report a test for the presence of first order serial correlation. The test is described in greater detail in Barrell and Pain (1999a). It suggests that there is no evidence of serial correlation in any of the reported specifications.

VI.2 The Impact of European Integration

In Models 1 and 2 there is clear evidence that investment in Belgium has been significantly higher than might otherwise have been expected since 1990, as the majority of the coefficients on the industry-specific dummies are positive and significant (see section V.3). The findings for other countries are mixed. The dummies for the UK, Sweden, Austria and Italy are all insignificant, indicating that the average industry effects in these countries are similar to those in Belgium. In contrast, the country dummies for France, Spain and the Netherlands all have significant negative coefficients. This means that the industry level effects in these countries are lower than given by the coefficients on the industry dummy variables, although it is still the case that for the majority of sectors in these countries investment has been higher than might have been expected, since the sum of the coefficients on the respective industry and country dummies are positive.

Of course it needs to be remembered that the form of the dummy variables used here, with separate sets of dummies for each industry and each partner country, is a restricted version of a more general model with a separate dummy for each individual industry in each individual country. If there are *n* industries and *m* locations, the general model would have *n*m* dummies, whereas in the models used so far we have *n+m-1* dummies. The *(n-1)*(m-1)* restrictions on the general model can be tested. These restrictions are that the differences between the coefficients on the industry dummies for any pair of locations are identical across all industries. On re-estimating Model 2 with the separate *n*m* dummies we found that the restrictions required to return to the single industry and country dummies were (jointly) accepted by the data [Wald(41)=53.26].

The full matrix of coefficients implied by the combination of the industry and country dummies in Model 2 is reported in Table 4, along with the resulting t-statistics. The coefficients imply that, for instance, the level of German inward investment in the 'other manufacturing' sector in the UK is, on average, some 53.5 per cent higher between 1990-96 than can otherwise be accounted for.[14] It is clear that the primary effect of European integration since 1990 has been to raise the level of outward investment from Germany in nearly all industries and all locations. Only 4 out of the 55 coefficients are negative, although over half are not significantly different from zero. There is little evidence that the reduction in barriers to trade has led to manufacturing activities becoming concentrated in a smaller number of locations.

VI.3 Time-Varying Structural Change

The form of the dummies also assumes that the extent of structural change has been constant over the period 1990-96, rather than evolving over time. Yet there are good reasons for believing that the impact in individual industries and locations may vary over time, since the timing of the implementation of Single Market legislation has varied over both dimensions. Sweden and Austria did not become committed formally to membership of the European Economic Area prior to the end of 1992. The extent of change arising from the opening up of the transition economies may also have had a time varying impact, particularly once privatisation polices accelerated in the mid-1990s. To test whether the extent of structural change has varied over time we re-estimated Model 2 with two separate sets of *n*m* dummies, one for 1990-92 and the other for 1993-96 and tested whether common coefficients could be imposed. These restrictions were strongly rejected by the data [Wald(55)=156.16], suggesting that the extent of structural change has varied across time.

In Table 5 we report the results of three separate tests. In the second and third column we report a test of the joint significance of each of the sets of country and industry dummies in the two individual sub-periods. There is clear evidence of structural change in nearly all cases. For the period from 1993-96 it is only the country dummies for France (one for each industry) and the industry dummies for electrical engineering (one for each country) which are jointly insignificant. In the fourth column we report a test of imposing common coefficients on the individual country and industry dummies across both sub-samples. This restriction is rejected for

[14] As the dependent variable has a logarithmic form the exponent of the reported coefficient has to be used; exp(0.429)=1.535.

5 out of 8 countries and 5 out of 7 industries, confirming the extent of time-varying structural change. The full set of parameters on the dummies is reported in Table 6.

Although the imposition of common coefficients on all the dummies across both sub-samples was rejected, it proved possible to impose a smaller number of restrictions [Wald(40)=52.3; p-value=0.091]. The resulting regression is reported as Model 3 in Table 7, with the coefficients on the structural change dummies reported in Table 8. In a final regression reported as Model 4 in Table 7 we drop the thirteen dummies in Table 8 with a t-statistic less than unity [Wald(13)=6.30]. The coefficients on the remaining dummies are reported in Table 9.

In interpreting the results it should be remembered that the specification of the dummies is somewhat arbitrary, although consistent with the data. We have not searched across all possible break points, and there are clearly some further restrictions that could be imposed.

One of the main differences between the results in Table 7 and those shown in Table 3 is that the tax competitiveness term becomes significant once the structural change dummies are re-parameterised. There is relatively little change in the coefficients on either the public investment variable or the structural funds variable. However there are some changes in the long-run impact of the other explanatory variables. The coefficients in Model 4 imply that a 1 per cent rise in relative unit labour costs in the host economy will reduce the stock of inward investment by 2.77 per cent. A permanent increase of 1 percentage point in the host location share of EU GDP will eventually raise the stock of inward investment by 0.78 per cent, and a permanent increase of 1 percentage point in the host location share of EU patenting will eventually raise the stock of inward investment by 0.22 per cent. The accumulation of firm-specific assets in Germany remains the most important driving force behind the growth of direct investment, with a permanent rise of 1 per cent in the stock of R&D in a particular sector eventually raising the stock of outward investment in that sector by 1.52 per cent.

To understand what effect the fiscal measures used in our empirical work may have, it is useful to draw on the parameters in the long-run steady state solution to Model 4. This may be expressed as:

$$\ln(FDI_{ij}) = 2.843\left[\frac{(1-\tau_j)}{\sum_{k\neq j} w_k(1-\tau_k)}\right] + 0.569\left[\frac{GI_j}{\sum_{k\neq j} w_k GI_k}\right] - 0.073\left[\frac{SF_j}{\sum_{k\neq j} w_k SF_k}\right] + \cdots \qquad [3]$$

where τ_j denotes the effective corporate tax rate in country *j*, GI_j is the ratio of government fixed investment to GDP, SF_j is the ratio of ERDF resources to GDP and w_k is the weight attached to each.

One feature which is immediately apparent is that the proportionate impact of any host government policy change on inward investment will be partly dependent on the policies pursued elsewhere. For example, a rise of 1 percentage point in the ratio of government investment to GDP in the host country will raise the stock of inward investment by 0.569 per cent if government investment averages 1 per cent of GDP in other countries, but it will only raise it by 0.285 per cent if government investment averages 2 per cent of GDP in other countries. A rise of 1 percentage point in the ratio of structural funds to GDP in a host country will reduce the stock of inward investment by 0.073 per cent if structural funds average 1 per cent of GDP in other countries.

It is also interesting to note that although the tax competitiveness variable is not always well determined, the long-run coefficient implies that it may be a more powerful means of influencing investment. A reduction of 1 percentage point in the effective corporate tax rate in a host country is estimated to raise the stock of inward investment by 3.55 per cent if the effective rate averages 20 per cent in other countries, and by 3.16 per cent if it averages 10 per cent. Whilst it may not be sensible to base strong policy recommendations solely on this result, given the sensitivity of the coefficient on the tax term to the parameterisation of the dummy variables, the potential scale of the impact of a change in tax competitiveness suggests that it would also be unwise to ignore it completely.

There are some interesting differences between the picture presented by the set of coefficients in Table 9 and that in Table 4. The magnitude of the coefficients is quite different in some cases, and the degree of structural change is quite different, more so for countries than industries. All the coefficients are now positive or zero. In the restricted set of dummies used to obtain Table 4, the UK, Belgium and Sweden appeared to have gained the most investment since 1990 compared to what otherwise could be explained. However in Table 9 the largest number of gains are made by Belgium and Italy, with investment being significantly higher than expected in 5 out of 7 industries, followed by Austria and Belgium. The UK has gained in 3 out of 7 industries (during 1993-96); the difference with the other countries lies in the magnitude of the effects in those industries where the UK has gained additional investment, notably transport and

financial services. France and Spain have experienced the smallest ‘unexplained’ gains since 1990.

It is of interest to contrast the UK with Italy, since the data in Table 1 suggest that the UK has performed relatively well in attracting German investment, particularly compared to Italy which offers a comparable sized domestic market. The explanatory variables can account for much of the difference. The UK has gained investment through an improvement in labour cost and tax competitiveness. Whilst Italy also gained from a reduction in the real exchange rate, this was offset by a deterioration in tax competitiveness and a sharp cutback in the level of public investment in order to help ensure that the fiscal criteria for entry into EMU were met. Hence a bigger proportion of the growth of investment located in Italy has to be explained by the separate dummy variables included for 1990-96.

Looking at the distribution of coefficients by industry, structural change is found most frequently in the 'other' manufacturing sector, followed by chemicals and mechanical engineering. The pattern of change differs across industries, with the extent of structural change in the former three industries rising over time, but diminishing in electrical engineering and, to a lesser extent, distribution and transport equipment. The lower frequency of structural change in location in these industries might reflect improved market access, or it may reflect the increasing relocation of productive facilities from Germany into Eastern Europe over this period.

VI.4 Have Fiscal Instruments Become More Important?

It is clearly important to account carefully for the impact of structural change on location. The results so far simply allow for changes in the individual fixed effects. It is obviously of interest to ask whether increasing integration has made investment decisions more sensitive to changes in policy instruments. To investigate this hypothesis we took Model 4 and included two additional terms in each of the main explanatory variables, interacting each with separate time dummies for 1990-92 and 1993-96 respectively.

The resulting tests for the joint significance of the dummied parameters are reported in Table 10. There is no evidence that the responsiveness of direct investment to any of the main explanatory factors has changed significantly since 1990. None of the individual dummied parameters was significant, although those on the agglomeration and relative labour cost variables were jointly significant at the 20 per cent level. In both cases the signs on the

parameters were as might be expected if investment had become more responsive to these factors.

This issue probably merits further investigation. However the evidence does suggest that Model 4 provides a reliable model with which to assess the influence of policy measures on direct investment during the first half of the 1990s. The explanation for often cited phenomena such as the apparent growing incidence and effect of factors such as tax competition may be simply that governments are choosing to compete more heavily, rather than that investment has become more responsive to any given change in tax competitiveness.

VI.5 Accounting For The Growth Of Inward Investment

The primary factors behind the growth of German FDI in the EU have been the increase in the stock of knowledge-based assets in the German economy and the expansion in overall market size, as measured by EU-wide industry output. However there are also a variety of channels through which host country macroeconomic and industrial policies can affect location choice. For instance the UK has benefited from relatively low labour costs and improvements in tax competitiveness.

A clearer idea of the importance of variation in the factors in our model that are directly influenced by host country policies can be obtained by using the estimated equations to calculate the effects of actual changes in the independent variables on the level of inward investment from Germany. The policy-specific variables which vary across host countries are labour costs, volatility and the fiscal measures. The aggregate impact of changes in German R&D and EU output will also vary across locations, since these are industry-specific and the industrial composition of inward investment differs across countries.

For any of the independent variables (denoted Z_{jt}) the regressions can be expressed as:

$$\ln(FDI)_{ijt} = \alpha \ln(FDI)_{ijt-1} + \beta Z_{jt} \qquad [4]$$

Any quantitative evaluation of the estimated impact of the impact of changes in the competitiveness of particular host countries has to take account of the presence of the lagged dependent variable which embodies past movements in the independent variables. At any given period the implied direct effect of the independent variable on the stock of direct investment in a given location can be calculated from the regression coefficients as:

$$\sum_{k=0}^{n} \alpha^k \beta Z_{t-k} \qquad [5]$$

where *n* denotes the number of periods over which the impact of taxes are assessed. Our illustrative calculations shown below set n=6. We compute the extent to which changes in tax competitiveness, structural funds, fixed investment, exchange rate volatility, relative labour costs and the agglomeration variable have changed the stock of inward FDI between 1989 and 1996. The results should be regarded as illustrative since the choice of dates and parameter estimates is arbitrary. We use the estimates from Model 4. The results are reported in Table 11.

The accounting exercise provides estimates of the impact of changes in the independent variables on the stock of inward investment at 1990 prices, so countries can show gains simply by becoming less uncompetitive than before, or from hosting investment in industries in which there is rapid change, even if from a low base. For instance the growth in the German R&D stock between 1989 and 1996 was fastest in the financial services sector, although this sector continued to have a comparatively low level of R&D in absolute terms (see Figure 1). Thus the economies with a relative concentration of financial services investments in 1989 – Belgium, Netherlands and the UK show greater gains from the growth in German R&D.

The estimates of the actual growth in the stock of direct investment at constant prices indicate that investment has risen much more rapidly in the UK and Sweden than elsewhere.[15] They also indicate that in all countries most, if not all, of the growth in inward investment has to be accounted for by factors other than those directly influenced by national policies. In the current model the main driving forces are the accumulation of technological capabilities in Germany and the growth of the EU wide market. In most countries the growth in the German R&D stock is estimated to have been sufficient to raise the stock of inward investment by 40-50 per cent. The impact of the growth in EU output has been more modest, but still sufficient to add around 14-16 per cent to the investment stock. Agglomeration economies also matter. The UK and Italy are shown to have performed poorly in this respect, reflecting the relative decline in their share of total EU-wide output and patenting in the early 1990s. France and Sweden have

[15] The estimated growth rates differ from those in Table 1 as they reflect the growth of the stock of investment in dollars at constant 1990 prices. The data in Table 1 are in D-marks at current prices.

also lost agglomeration economies. In contrast Spain and, to a lesser extent, the Netherlands have gained investment through this channel in the 1990s.[16]

It is clear that the UK and, to a lesser extent, France have gained investment as a result of an improvement in tax competitiveness in the 1990s compared to the 1980s. The lower relative effective tax rate in the UK is estimated to have generated a 14.2 per cent rise in the stock of inward investment from Germany. The UK has also gained a significant amount of investment as a result of improved labour cost competitiveness in the 1990s. This is also true of Sweden and Italy. All three countries experienced a sizeable currency depreciation in the early 1990s which appears to have helped to generate additional inward investment. Belgium and Spain have lost investment as a result of a higher real exchange rate in the present decade. France and the Netherlands have also been affected in this way. Although the real exchange rate for France was broadly constant during the 1990s, helped by strong productivity growth, it has remained at a higher level than seen in the first half of the 1980s.

The cost competitiveness gains made by Italy have been offset by losses arising from greater volatility and the sharp cutbacks in government investment in order to improve the public finances prior to the formation of the European Monetary Union. The parameter estimates imply that the reduction in the volume of public investment has resulted in the stock of investment being some 18.8 per cent lower than might otherwise have been the case. Austria and Belgium have also lost inward investment through a similar route. However France, the UK and Sweden have gained through having higher levels of government investment relative to their competitors in the 1990s. The structural funds effects are small, with the exception of Spain. Most countries in the sample made small gains as a result of receiving a lower level of structural funds in the 1990s than in the 1980s. Two of the countries receiving a high level of support – Greece and Portugal – are not in our sample, although they will affect the time series profile of the variable we use.

[16] One point to note is that the losses from agglomeration economies outweigh the gains in our sample of host economies. In part this reflects a general decline in their share of EU GDP following German unification. Some small economies such as Ireland, Finland and Portugal have also enjoyed a rising share of output.

VII Conclusions and Implications

This paper has sought to investigate the impact of fiscal incentives on the location of FDI in Europe by undertaking an econometric study of the determinants of location choice by German companies in the European Union. The approach used augments a conventional supply-side model of production location with measures to reflect internal firm-specific developments within industries, the potential for agglomeration economies from large markets and various measures of state assistance. We seek to control for a number of host country characteristics which are often believed to be important determinants of the level of inward investment, such as relative labour costs and exchange rate volatility, and allow also for the possibility of structural change.

The results reported here show significant effects from host country fiscal instruments on the location of intra-EU direct investment. The most robust finding appears to be the significant positive effect obtained from the relative level of government investment expenditure in the host economy. Although the direct impact of this is found to be relatively small compared to some other determinants of location choice, it needs to be viewed in the context of the finding of significant agglomeration effects. A temporary expansion in fixed investment expenditure could in fact have permanent effects on the level of inward investment and the level of output, particularly if it was not financed through higher corporate tax rates. In retrospect the decision of some governments, such as those of France, to maintain a relatively high level of public investment in the 1990s, at a time when countries such as Italy, Belgium and Austria were reducing their investment considerably in order to undertake fiscal consolidation, may prove to be extremely beneficial. However it remains the case that the channels through which government investment expenditure affects location choice are imperfectly understood and are undoubtedly worthy of further research. We also find a significant effect from a measure of corporate tax competitiveness. The marginal impact of this is greater than that of government investment, but the magnitude is estimated less precisely and appears sensitive to the specification of the model.

Although European-wide policies and agglomeration economies appear to have become more important influences on location choice, it does not mean that national governments are now powerless to influence location decisions. However it does limit the options available. The contingent nature of location and the scope for self-reinforcing agglomeration effects have important implications for macroeconomic, industrial and political policies. The direct benefits

from fiscal incentives may be limited if all competitors also have them, but the losses from unilateral abolition of them could be large and difficult to reverse.

Our results also provide an indication that there may be considerable benefits to be had from attracting inward investment. The development of firm-specific assets, measured by the cumulated stock of R&D expenditures of German corporations, is found to be the main factor behind the rising level of outward investment from Germany. This suggests that German foreign direct investment may be an important vehicle for the transmission of innovations throughout Europe, potentially helping the growth prospects of host economies. Movements in unit labour costs in Germany do not appear to have been particularly important in the growth of outward investment, although this may just reflect the fact that we are looking only at investments in other relatively high cost locations.

We find evidence of significant structural change since 1990. This is consistent with the hypothesis that the process of European integration has helped to generate significantly higher levels of cross-border direct investments in most locations and industries. This appears to be occurring in both manufacturing and non-manufacturing industries, with little evidence that improvements in market access are leading to investments in some industries becoming more concentrated. We do not find any evidence to suggest that direct investment became more responsive to cross-country differences in policies and institutions over the first half of the 1990s. It would obviously be of interest to extend the data set to see whether this has changed as the Single Market has neared completion and monetary union has begun.

References

Bajo-Rubio, O. and Sosvilla-Rivero, S. (1994), 'An econometric analysis of foreign direct investment in Spain, 1964-89', *Southern Economic Journal*, 61, 104-120.

Barrell, R. and Pain, N. (1996), 'An econometric analysis of US foreign direct investment', *Review of Economics and Statistics*, LXXVIII, 200-207.

Barrell, R. and Pain, N. (1997), 'Foreign direct investment, technological change and economic growth within Europe', *Economic Journal*, vol.107, pp.1770-1786.

Barrell, R. and Pain, N. (1998), 'Real exchange rates, agglomerations and irreversibilities: macroeconomic policy and FDI in EMU', *Oxford Review of Economic Policy*, 14/3, 152-167.

Barrell, R. and Pain, N. (1999a), 'Trade restraints and Japanese direct investment flows', *European Economic Review*, 43, 1, 29-45.

Barrell, R. and Pain, N. (1999b), 'Domestic institutions, agglomerations and foreign direct investment in Europe', *European Economic Review*, vol.43, pp.925-934.

Barrell, R. and Pain, N. (1999c) (eds.), *Investment, Innovation And The Diffusion Of Technology In Europe*, Cambridge University Press.

Bean C.R. (1981), 'An econometric model of manufacturing investment in the UK', *The Economic Journal*, 91, 106-21.

Blair, A.R. (1987), 'The relative distribution of United States direct investment: the UK/EEC experience', *European Economic Review*, 31, 1137-1144.

Blomström, M. and Kokko, A. (1997), 'Regional integration and foreign direct investment', National Bureau of Economic Research Working Paper No. 6019.

Blomström, M. and Kokko, A. (1998), 'Multinational corporations and spillovers', *Journal of Economic Surveys*, vol.12, pp.247-278.

Buigues P. and A.Jacquemin (1994), 'Foreign direct investment and exports to the European Community', in Encarnation D.J. and Mason M. (eds.) *Does Ownership Matter? Japanese Multinationals in Europe*, Oxford.

Cantwell, J. and Mudambi, R. (1998), 'The location of MNE R&D activity: the role of investment incentives', University of Reading Discussion Papers in International Management and Investment No.250.

Carson, C., Grimm, B. and Moylan, C. (1994), 'A satellite account for research and development', *Survey of Current Business*, vol. 74/11, 37-71.

Cooke, W.N. and Noble, D.S. (1998), 'Industrial relations systems and US foreign direct investment abroad', *British Journal of Industrial Relations*, 36, 581-609.

Coughlin, C.C., Terza, J.V. and Arromdee, V. (1991), 'State characteristics and the location of foreign direct investment within the United States', *Review of Economics and Statistics*, LXXIII, 675-683.

Cushman, D.O. (1985), 'Real exchange rate risk, expectations and the level of direct investment', *Review of Economics and Statistics*, 67, 297-308.

Devereux, M.P. and Griffith, R. (1998), 'Taxes and the location of production: evidence from a panel of US multinationals', *Journal of Public Economics*, 68, 335-368.

Dixit, A.K. and Stiglitz, J.E. (1977), 'Monopolistic competition and optimum product diversity', *American Economic Review*, 67, 297-308.

Dunning, J.H. (1988), *Explaining International Production*, Harper Collins, London.

Eaton B.C., Lipsey R.G. and Safarian, A.E. (1994), 'The theory of multinational plant location in a regional trading area', in Eden L. (ed.) *Multinationals In North America*, The University of Calgary Press, Calgary.

Emerson, M., Aujean, M., Catinat, M., Goybet, P. and Jacquemin, A. (1988). *The Economics of 1992: The EC Commission's Assessment of the Effects Of Completing The Internal Market*, Oxford University Press, Oxford.

European Commission (1996), *The Single Market And Tomorrow's Europe*, Kogan Page, London.

Ferrer, C. (1998), 'Patterns and determinants of location decisions by French multinationals in European regions', in Mucchielli J-L. (ed.) *Multinational Location Strategy, Research In Global Stategic Management Vol.6*, JAI Press, London.

Head, C.K., Ries, J.C. and Swenson, D.L. (1995), 'Agglomeration benefits and locational choice: evidence from Japanese manufacturing investments in the United States', *Journal of International Economics*, 10, 92-116.

Head, C.K., Ries, J.C. and Swenson, D.L. (1999), 'Attracting foreign manufacturing: investment promotion and agglomeration', *Regional Science and Urban Economics*, 29, 197-218.

Hood, N. and Young, S. (1997), 'The United Kingdom', in Dunning, J. (ed.), *Governments, Globalisation And International Business*, Oxford University Press.

Hubert, F. and Pain, N. (1999), 'Innovation and the regional and industrial pattern of German foreign direct investment', in Barrell and Pain (1999c).

Jost, T. (1997), 'Direct investment and Germany as a business location', Economic Research Group of the Deutsche Bundesbank Discussion Paper 2/97.

Krugman, P. (1991), *Geography And Trade*,: MIT Press Cambridge MA.

Markusen, J.R. (1995), 'The boundaries of multinational enterprises and the theory of international trade', *Journal of Economic Perspectives*, 9, 169-189.

Markusen, J.R. and Venables, A.J. (1996), 'The increased importance of direct investment in North Atlantic economic relationships: a convergence hypothesis', in.Canzoneri, M.B, Ethier, W.J. and Grilli, V. (eds.), *The New Transatlantic Economy*, Cambridge University Press.

Martin, C. and Velázquez, F.J. (1997), 'The determining factors of foreign direct investment in Spain and the rest of the OECD: lessons for the CEECs', CEPR Discussion Paper No.1637.

Martin, P. and Rogers, C.A. (1995), 'Industrial location and public infrastructure', *Journal of International Economics*, 39, 335-351.

Mayer, T. and Mucchielli, J-L. (1998), 'Agglomeration effects, state policies and competition in the location of Japanese FDI in Europe' in Mucchielli J-L. (ed.) *Multinational Location Strategy, Research In Global Stategic Management Vol.6*, JAI Press, London.

Mayer, T. and Mucchielli, J-L. (1999), 'La localisation à l'étranger des entreprises multinationales', *Économie et Statistique*, No. 326-327, 159-176.

Mendoza, E.G., Razin, A. and Tesar, L.L. (1993), 'An international comparison of tax systems in industrial countries', *IMF Staff Studies For The World Economic Outlook*, December, 86-105.

Midelfart-Knarvik, K., Overman, H., Redding, S. and Venables, A. (2000), 'The location of European industry', report prepared for the European Commission.

Millington A.I. and B.T.Bayliss (1991), 'Non-tariff barriers and UK investment in the European Community', *Journal of International Business Studies*, 91(4), 695-710.

Mody, A. and Srinivasan, K. (1998), 'Japanese and US firms as foreign investors: do they march to the same tune?', *Canadian Journal of Economics*, 31, 778-799.

Nickell, S. (1981), 'Biases in dynamic models with fixed effects', *Econometrica*, 49, 1399-1416.

OECD (1983), *Investment Incentives And Disincentives And The International Investment Process*, OECD Paris.

OECD (1984), *OECD Science And Technology Indicators: Resources Devoted To R&D*, OECD Paris.

OECD (1989), *Investment Incentives And Disincentives: Effects On International Direct Investment*, OECD Paris.

Pain, N. (1997), 'Continental drift: European integration and the location of UK foreign direct investment', *The Manchester School Supplement*, LXV, 94-117.

Pain, N. (2000), *Inward Investment, Technological Change And Growth: The Impact Of Multinational Corporations On The UK Economy*, Palgrave.

Pain, N. and Lansbury, M. (1997), 'Regional economic integration and foreign direct investment: the case of German investment in Europe', *National Institute Economic Review*, no.160, 87-99.

Pain, N. and Wakelin, K. (1998), 'Export performance and the role of foreign direct investment', *The Manchester School Supplement*, 66, 62-88.

Pain, N. and Young, G. (2001), 'The macroeconomic impact of UK withdrawal from the EU', presented to Money, Macro and Finance Research Group Annual Conference, South Bank University, September 2000; NIESR Discussion Paper forthcoming..

Ruane, F. and Görg, H, (1999), 'Irish FDI policy and investment from the EU', in Barrell and Pain (1999c).

Stokman, A.C.J. and Vlaar, P.J.G. (1996), 'Volatility, international trade and capital flows', De Nederlandsche Bank Reprint Series No. 453.

United Nations (1993), *From The Common Market to EC92: Regional Economic Integration in the European Community and Transnational Corporations*, Transnational Corporations and Management Division of the United Nations Department of Economic and Social Development, New York.

UNCTAD (1998), 'Investment policy issues', *World Investment Report 1998*, Chapter 3, United Nations, Geneva.

UNCTAD (1999), *World Investment Report 1999*, United Nations, Geneva.

Venables, A.J. (1996), 'Equilbrium locations of vertically linked industries', *International Economic Review*, 37, 341-359.

Weichenrieder, A. (1996), 'Fighting international tax avoidance: the case of Germany', *Fiscal Studies*, 17, 37-58.

Wheeler, D. and Mody, A. (1992), 'International investment location decisions: the case of U.S. firms', *Journal of International Economics*, 33, 57-76.

Young, G. (1999), 'The influence of foreign factor prices and international taxation on fixed investment in the UK', *Oxford Economic Papers*, 5, 355-373.

Young, S. and Hood, N. (1994), 'Designing developmental after-care programmes for foreign direct investors in the European Union', *Transnational Corporations*, 3, 45-72.

Figure 1. Industry R&D Stocks (DM mns, 1990 prices, log scale)

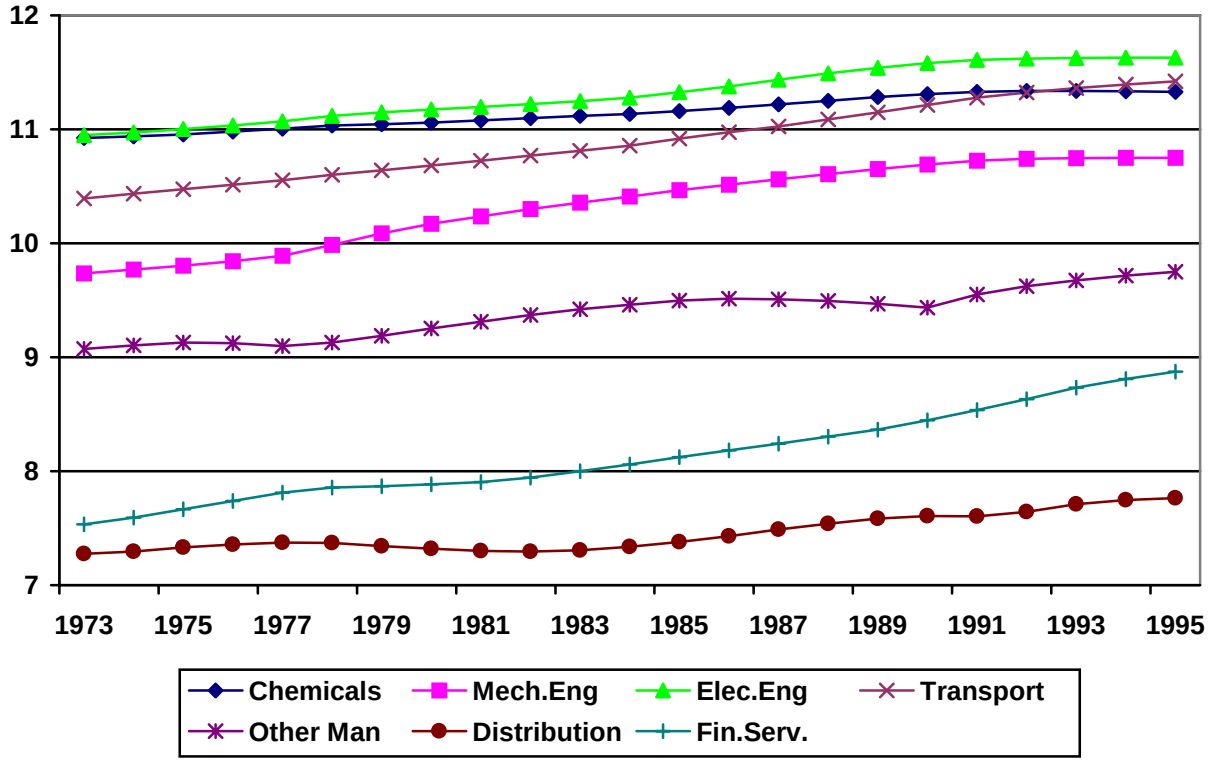

Figure 2. Tax Competitiveness (1980=1.0)

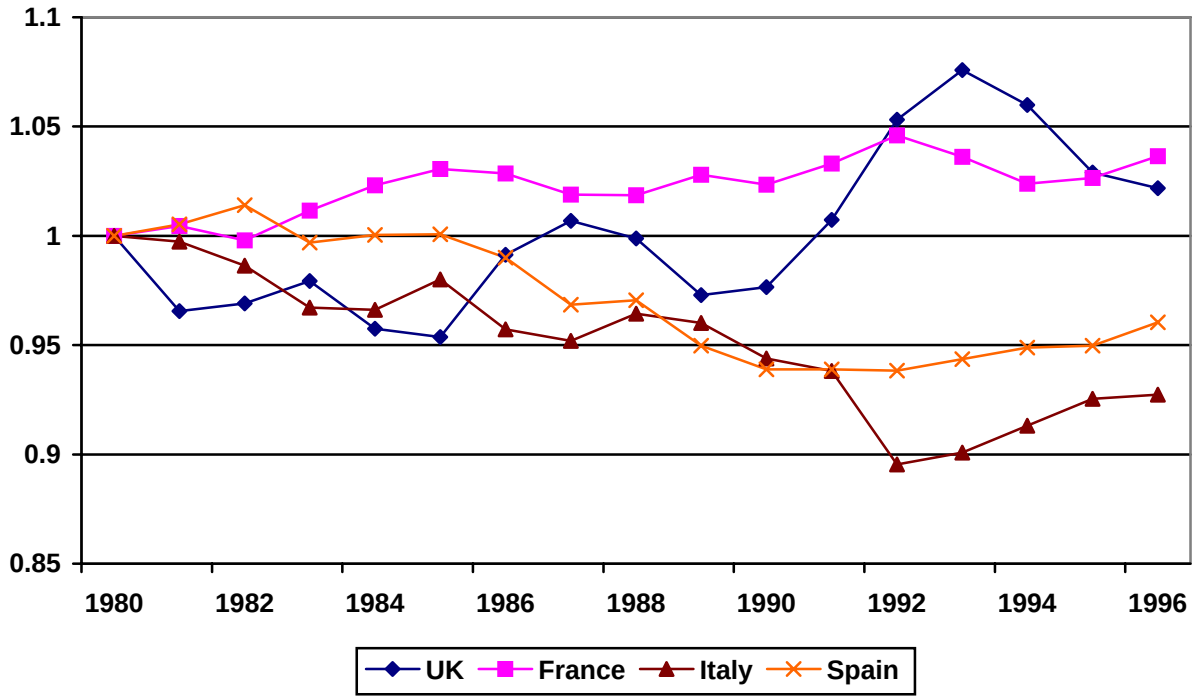

Table 1 The Distribution of The Stock of German Outward Direct Investment

Chemicals

A. Levels (DM, Millions)

	1981	1984	1990	1996
EU(*) Total	5901	7905	14749	21611

B. EU(*) Share (per cent)

France	21.86	17.71	19.91	23.65
UK	6.17	11.90	10.52	9.13
Italy	6.10	7.31	14.69	12.91
Neths	13.13	12.87	7.11	5.20
Belgium	21.89	21.99	22.20	22.34
Spain	19.22	18.08	17.16	12.89
Austria	4.80	5.00	3.93	7.08
Sweden	1.85	0.57	0.49	1.30
Total	95.02	95.42	96.01	94.49

Mechanical Engineering

C. Levels (DM, Millions)

	1981	1984	1990	1996
EU(*)Total	1292	1690	3968	7331

D. EU(*) Share (per cent)

France	30.73	33.73	31.63	28.52
UK	19.89	17.63	13.99	14.69
Italy	8.28	13.96	13.48	12.14
Neths.	7.82	6.69	6.22	7.91
Belgium	2.79	2.49	1.13	1.16
Spain	2.01	2.13	9.80	6.66
Austria	13.62	11.72	14.59	11.54
Sweden	1.24	1.30	0.35	1.10
Total	86.38	89.64	91.20	83.73

Electrical

E. Levels (DM, Millions)

	1981	1984	1990	1996
EU(*) Total	3139	3402	7882	6252

F. EU(*) Share (per cent)

France	13.89	11.49	10.70	18.43
UK	5.86	7.91	15.74	9.80
Italy	11.47	13.55	16.86	7.65
Neths	4.75	5.44	5.38	7.18
Belgium	8.25	8.08	9.68	11.42
Spain	26.25	24.51	15.53	17.19
Austria	15.00	13.96	11.38	14.28
Sweden	4.87	4.41	4.78	2.46
Total	90.35	89.36	90.05	88.42

Transport

G. Levels (DM, Millions)

	1981	1984	1990	1996
EU(*)Total	1311	1757	6003	12052

H. EU(*) Share (per cent)

France	27.61	28.12	11.99	13.81
UK	1.30	1.20	2.50	29.80
Italy	5.42	2.50	4.85	4.41
Neths	0.23	0.17	0.30	0.52
Belgium	35.01	41.66	16.09	13.17
Spain	12.36	10.53	51.32	20.92
Austria	18.08	15.82	12.63	7.24
Sweden	na	na	0.27	2.51
Total	100.00	100.00	99.95	92.37

Other Manufacturing

I. Levels (DM, Millions)

	1981	1984	1990	1996
EU(*) Total	4763	5895	11538	24760

J. EU(*) Share (per cent)

France	33.34	26.11	24.22	24.20
UK	4.81	6.29	14.32	14.89
Italy	6.28	9.70	8.17	12.67
Neths	6.80	8.36	9.14	7.04
Belgium	14.44	6.12	12.24	9.70
Spain	19.42	19.36	10.95	7.85
Austria	13.10	14.39	12.98	12.53
Sweden	0.92	1.71	1.63	3.24
Total	99.12	92.04	93.65	92.13

Total Manufacturing

K. Levels (DM, Millions)

	1981	1984	1990	1996
	16406	20649	44142	70919

L. EU(*) Share (per cent)

France	24.34	21.28	19.37	22.71
UK	6.50	9.20	11.66	15.23
Italy	7.22	9.16	11.93	10.59
Neths	8.13	8.77	6.33	5.45
Belgium	14.56	15.25	14.63	13.52
Spain	18.94	17.56	19.23	12.28
Austria	11.11	10.63	9.77	10.04
Sweden	2.26	1.54	1.51	2.29
Total	93.07	93.37	94.41	92.11

Source: *Bundesbank, Kapitalverflechtung mit dem Ausland, various issues.*

Notes: *(*)Excludes Finland.*

(Table 1 continued)

	Distribution					Finance(**)			
M. Levels (DM, Millions)					O. Levels (DM, Millions)				
	1981	**1984**	**1990**	**1996**		**1981**	**1984**	**1990**	**1996**
EU(*) Total	10962	14484	27611	38976	EU(*) Total	8436	11954	41058	93150
N. EU(*) Share (per cent)					P. EU(*) Share (per cent)				
France	34.08	32.07	27.27	23.20	France	8.43	7.46	6.30	6.07
UK	15.74	17.27	20.55	19.38	UK	4.52	7.42	11.79	23.19
Italy	10.88	14.88	12.77	11.42	Italy	3.58	3.17	6.92	7.25
Neths	9.30	9.69	10.03	9.82	Neths	12.38	15.58	15.22	10.14
Belgium	6.81	6.41	6.41	6.29	Belgium	61.47	58.54	35.79	36.15
Spain	4.66	4.17	7.29	7.51	Spain	2.55	2.93	5.69	2.68
Austria	9.99	8.23	8.30	13.16	Austria	5.16	4.84	3.80	3.47
Sweden	2.55	2.37	2.28	2.56	Sweden	0.31	0.33	0.10	1.45
Total	94.02	95.08	94.90	93.35	Total	98.39	100.28	85.61	90.40

Source: *Bundesbank, Kapitalverflechtung mit dem Ausland, various issues.*

Notes: *(*)Excludes Finland. (**) Finance excludes holding companies*

Table 2A. General government investment (% of GDP, annual average)

	1980-85	1986-90	1991-96
UK	3.26	1.63	2.23
France	3.14	3.51	3.76
Italy	3.40	3.43	2.65
Spain	2.48	3.92	4.02
Belgium	2.94	1.72	1.46
Netherlands	2.75	2.30	2.38
Austria	3.79	3.41	3.08
Sweden	2.43	2.05	2.46

Table 2B. General government subsidies (% of GDP, annual average)

	1980-85	1986-90	1991-96
UK	2.31	1.38	1.10
France	2.22	1.91	1.65
Italy	2.89	2.40	1.86
Spain	2.24	1.95	1.89
Belgium	3.78	3.08	2.56
Netherlands	2.90	3.33	2.36
Austria	2.98	3.14	2.92
Sweden	4.82	4.63	5.24

Table 2C. ERDF Payments (% of GDP, annual average)

	1980-85	1986-90	1991-96
UK	0.10	0.10	0.08
France	0.04	0.05	0.05
Italy	0.12	0.11	0.18
Spain	-	0.28	0.58
Belgium	0.02	0.03	0.04
Netherlands	0.01	0.01	0.01
Austria	-	-	0.01
Sweden	-	-	0.02

Table 3 The Determinants Of German FDI

Dependent Variable: $\ln(FDI)_{ijt}$ **Sample Period:** 1981-1996; **Number of observations**: 880

Explanatory Variables	Model 1	Model 2
$\ln(FDI_{ij,t-1})$	0.7485 (10.7)	0.7461 (10.7)
$\Delta \ln(\text{EU GDP})_t$	3.0116 (2.4)	3.3075 (2.6)
$\ln(\text{EU Industry Output})_{i,t-1}$	0.3246 (2.6)	0.2539 (3.6)
$\ln(\text{German R\&D Stock})_{i,t-1}$	0.4268 (2.6)	0.4461 (2.8)
$\ln(\text{Relative Unit Labour Costs})_{j,t}$	-1.0074 (5.3)	-0.9918 (5.4)
$(100*\text{GDP/EUGDP})_{j,t-1}$	0.2344 (3.4)	0.2217 (3.4)
$(100*\text{Host Patents / EU Patents})_{j,t-1}$	0.0840 (2.2)	0.0832 (2.2)
$(100*\text{Host Output / EU Output})_{ij,t-1}$	-0.0127 (0.8)	
$(\text{Nominal exchange rate volatility})_{j,t-1}$	-0.6569 (1.1)	-0.6197 (1.1)
$(\text{EU Membership dummy})_{j,t}$	-0.0415 (0.6)	
$(\text{Tax competitiveness})_{j,t}$	0.5174 (1.1)	0.6173 (1.3)
$(\text{Relative government subsidies / GDP})_{jt}$	-0.0231 (0.3)	
$(\text{Relative Structural Funds/ GDP})_{jt}$	-0.0206 (1.1)	-0.0260 (1.8)
$(\text{Relative Government Investment / GDP})_{jt}$	0.1749 (2.5)	0.1673 (2.5)
$(\text{Chemicals dummy 90-96})_{i,t}$	0.2387 (2.9)	0.2509 (3.2)
$(\text{Electrical Engineering dummy 90-96})_{i,t}$	0.1127 (1.3)	0.1195 (1.3)
$(\text{Transport dummy 90-96})_{i,t}$	0.2522 (2.0)	0.2808 (2.3)
$(\text{Mechanical Engineering dummy 90-96})_{i,t}$	0.2420 (2.6)	0.2821 (3.1)
$(\text{Other Manufacturing dummy 90-96})_{i,t}$	0.3505 (3.9)	0.3913 (4.3)
$(\text{Distribution dummy 90-96})_{i,t}$	0.1762 (2.0)	0.1915 (2.3)
$(\text{Financial Services dummy 90-96})_{i,t}$	0.2427 (2.2)	0.2428 (2.3)
$(\text{UK dummy 90-96})_{j,t}$	0.0464 (0.5)	0.0379 (0.4)
$(\text{France dummy 90-96})_{j,t}$	-0.2267 (3.5)	-0.2149 (3.4)
$(\text{Sweden dummy 90-96})_{j,t}$	0.1090 (0.9)	0.0814 (0.9)
$(\text{Spain dummy 90-96})_{j,t}$	-0.1286 (2.2)	-0.1303 (2.3)
$(\text{Austria dummy 90-96})_{j,t}$	-0.0591 (1.1)	-0.0760 (1.7)
$(\text{Netherlands dummy 90-96})_{j,t}$	-0.1488 (2.1)	-0.1451 (2.1)
$(\text{Italy dummy 90-96})_{j,t}$	-0.0094 (0.1)	-0.0198 (1.3)
$\overline{R}^2$	0.9756	0.9756
Standard Error	0.2263	0.2260
Serial Correlation	LR(1)=0.67	LR(1)=0.73

Notes: The figures in parentheses are heteroscedastic-consistent t-statistics. The dependent variable is the stock of FDI from Germany in industry *i* in country *j* in US dollars at 1990 prices.

Table 4. Coefficients On Structural Change Dummies

	Chemicals	Electrical Engineering	Transport	Mechanical Engineering	Other Manufacturing	Distribution	Financial Services
UK	0.289 (2.9)	0.157 (1.4)	0.319 (2.3)	0.320 (2.9)	0.429 (3.8)	0.229 (2.2)	0.281 (2.2)
France	0.036 (0.5)	-0.095 (1.1)	0.066 (0.6)	0.067 (0.8)	0.176 (1.9)	-0.023 (0.3)	0.028 (0.3)
Sweden	0.332 (3.0)	0.201 (1.6)	n.a.	0.363 (3.0)	0.473 (4.2)	0.273 (2.5)	0.324 (2.5)
Spain	0.121 (1.5)	-0.011 (0.1)	0.151 (1.3)	0.152 (1.7)	0.261 (3.0)	0.061 (0.7)	0.113 (1.0)
Austria	0.175 (2.4)	0.043 (0.5)	0.205 (1.7)	0.206 (2.5)	0.315 (3.9)	0.116 (1.5)	0.167 (1.7)
Netherlands	0.106 (1.1)	-0.026 (0.3)	0.136 (0.9)	0.137 (1.4)	0.246 (2.4)	0.046 (0.5)	0.098 (0.8)
Italy	0.231 (2.3)	0.100 (0.9)	0.261 (1.9)	0.262 (2.5)	0.371 (3.3)	0.172 (1.7)	0.223 (1.8)
Belgium	0.251 (3.2)	0.120 (1.3)	0.281 (2.3)	0.282 (3.1)	0.391 (4.3)	0.192 (2.3)	0.243 (2.3)

Note: Heteroscedastic-consistent t-statistics in parentheses.

Table 5. Tests Of Time-Varying Structrual Change

	Significance of 1990-92 dummies	Significance of 1993-96 dummies	Common Parameters on 90-92 and 93-96 dummies
UK	Wald(7)=26.43*	Wald(7)=19.26*	Wald(7)=23.98*
France	Wald(7)=12.32	Wald(7)=13.08	Wald(7)=6.76
Sweden	Wald(6)=14.29*	Wald(6)=23.46*	Wald(6)=15.20*
Spain	Wald(7)=10.72	Wald(7)=14.73	Wald(7)=4.44
Austria	Wald(7)=16.19*	Wald(7)=39.72*	Wald(7)=39.34*
Netherlands	Wald(7)=25.90*	Wald(7)=17.62*	Wald(7)=8.84
Italy	Wald(7)=20.42*	Wald(7)=21.14*	Wald(7)=20.40*
Belgium	Wald(7)=26.61*	Wald(7)=29.09*	Wald(7)=30.66*
Chemicals	Wald(8)=19.57*	Wald(8)=31.93*	Wald(8)=25.34*
Electrical Engineering	Wald(8)=29.25*	Wald(8)=4.41	Wald(8)=20.33*
Transport	Wald(7)=33.20*	Wald(7)=14.48*	Wald(7)=23.73*
Mechanical Engineering	Wald(8)=20.80*	Wald(8)=20.84*	Wald(8)=18.98*
Other Manufacturing	Wald(8)=17.94*	Wald(8)=35.35*	Wald(8)=11.76
Distribution	Wald(8)=27.43*	Wald(8)=28.63*	Wald(8)=29.29*
Financial Services	Wald(8)=19.24*	Wald(8)=22.54*	Wald(8)=15.47

Note: an * denotes a chi-squared test statistic significant at the 5% level.

Table 6. Coefficients On Structural Change Dummies

	Chemicals	Electrical Engineering	Transport	Mechanical Engineering	Other Manufacturing	Distribution	Financial Services
1990-92 Dummies							
UK	0.182 (1.3)	0.695 (3.9)	0.866 (4.1)	0.140 (0.9)	0.558 (2.8)	0.134 (1.1)	0.447 (2.7)
France	0.169 (1.8)	0.015 (0.1)	-0.036 (0.3)	0.172 (1.6)	0.227 (1.5)	-0.034 (0.4)	0.198 (1.5)
Sweden	0.082 (0.5)	0.575 (3.1)	n.a.	0.531 (1.8)	0.279 (1.3)	0.302 (2.4)	0.335 (1.7)
Spain	0.156 (1.2)	0.122 (1.0)	0.200 (1.2)	0.203 (1.6)	0.340 (3.0)	0.346 (2.2)	0.244 (1.5)
Austria	0.178 (1.8)	0.137 (1.5)	0.392 (3.3)	0.319 (2.7)	0.326 (3.3)	0.184 (2.2)	0.210 (2.0)
Netherlands	-0.016 (0.2)	0.089 (0.9)	0.320 (0.7)	0.286 (3.0)	0.379 (2.2)	0.170 (1.8)	0.321 (2.3)
Italy	0.646 (3.9)	0.231 (1.8)	0.287 (1.7)	0.279 (2.1)	0.165 (1.0)	0.265 (1.8)	0.501 (3.3)
Belgium	0.235 (2.3)	0.308 (2.9)	0.334 (2.3)	0.045 (0.3)	0.661 (3.8)	0.401 (3.4)	0.339 (2.9)
1993-96 Dummies							
UK	0.212 (1.4)	0.149 (0.8)	1.538 (3.2)	0.335 (2.5)	0.657 (3.6)	0.181 (1.4)	0.703 (3.5)
France	0.246 (2.2)	0.067 (0.5)	0.137 (0.9)	0.225 (1.8)	0.267 (2.1)	-0.071 (0.7)	0.089 (0.5)
Sweden	0.512 (2.0)	-0.112 (0.4)	n.a.	0.675 (3.5)	0.857 (3.8)	0.318 (2.6)	0.531 (1.5)
Spain	0.057 (0.6)	-0.054 (0.4)	-0.025 (0.1)	0.141 (1.1)	0.298 (3.1)	0.282 (2.4)	0.069 (0.4)
Austria	0.436 (4.6)	0.056 (0.4)	0.119 (0.6)	0.347 (3.3)	0.372 (4.2)	0.306 (3.5)	0.141 (0.9)
Netherlands	-0.062 (0.6)	-0.020 (0.2)	0.422 (0.7)	0.424 (3.7)	0.448 (2.4)	0.167 (1.9)	0.113 (0.6)
Italy	0.492 (2.6)	-0.142 (0.7)	0.470 (2.5)	0.461 (2.6)	0.609 (3.1)	0.199 (1.3)	0.605 (3.2)
Belgium	0.313 (3.4)	0.190 (1.4)	0.152 (1.0)	0.259 (2.0)	0.740 (4.7)	0.173 (1.6)	0.291 (1.9)

Note: Heteroscedastic-consistent t-statistics in parentheses.

Table 7 The Determinants Of German FDI

Dependent Variable: $\ln(FDI)_{ijt}$ **Sample Period:** 1981-1996; **Number of observations**: 880

Explanatory Variables	**Model 3**	**Model 4**
$\ln(FDI_{ij,t-1})$	0.6092 (5.1)	0.6771 (7.0)
$\Delta \ln(\text{EU GDP})_t$	4.0894 (3.0)	3.7816 (2.9)
$\ln(\text{EU Industry Output})_{i,t-1}$	0.3908 (3.3)	0.3229 (3.4)
$\ln(\text{German R\&D Stock})_{i,t-1}$	0.4786 (2.4)	0.4894 (2.8)
$\ln(\text{Relative Unit Labour Costs})_{j,t}$	-0.9462 (6.1)	-0.8927 (6.1)
$(100*\text{GDP/EUGDP})_{j,t-1}$	0.2409 (3.9)	0.2530 (4.4)
$(100*\text{Host Patents / EU Patents})_{j,t-1}$	0.0661 (1.9)	0.0720 (2.3)
$(\text{Nominal exchange rate volatility})_{j,t-1}$	-0.5430 (1.1)	-0.6004 (1.3)
$(\text{Tax competitiveness})_{j,t}$	0.7507 (1.7)	0.9180 (2.1)
$(\text{Relative Structural Funds/ GDP})_{jt}$	-0.0294 (2.1)	-0.0236 (1.6)
$(\text{Relative Government Investment / GDP})_{jt}$	0.1951 (3.1)	0.1838 (3.1)
$\bar{R}^2$	0.9785	0.9782
Standard Error	0.2123	0.2136
Serial Correlation	LR(1)=1.23	LR(1)=2.16

Notes: The figures in parentheses are heteroscedastic-consistent t-statistics.
The dependent variable is the stock of FDI from Germany in industry *i* in country *j* in US dollars at 1990 prices.

Table 8. Industry and Country Dummies For Model 3

	Chemicals	Electrical Engineering	Transport	Mechanical Engineering	Other Manufacturing	Distribution	Financial Services
UK	0.178 (1.4)	0.678 (3.8) 0.111 (0.6)	0.835 (4.1) 1.442 (3.3)	0.231 (1.8)	0.567 (3.3)	0.144 (1.5)	0.428 (2.6) 0.672 (3.4)
France	0.223 (2.2)	0.068 (0.5)	-0.009 (0.1) 0.179 (1.4)	0.217 (1.9)	0.256 (2.0)	-0.027 (0.3)	0.166 (1.3)
Sweden	0.087 (0.6) 0.487 (2.0)	0.576 (3.4) -0.142 (0.5)	n.a.	0.599 (3.3)	0.266 (1.3) 0.808 (3.8)	0.292 (2.9)	0.429 (2.0)
Spain	0.142 (1.7)	0.072 (0.7)	0.116 (0.7)	0.214 (2.1)	0.348 (3.6)	0.339 (2.6)	0.193 (1.4)
Austria	0.191 (2.0) 0.450 (4.8)	0.115 (1.1)	0.255 (1.7)	0.346 (3.2)	0.360 (4.1)	0.197 (2.5) 0.330 (4.1)	0.205 (1.9)
Netherlands	-0.017 (0.2)	0.049 (0.5)	0.377 (0.8)	0.299 (3.2) 0.437 (3.7)	0.415 (2.6)	0.186 (2.2)	0.228 (1.5)
Italy	0.553 (3.5)	0.242 (1.9) -0.012 (0.6)	0.405 (2.4)	0.389 (2.6)	0.170 (1.0) 0.621 (3.5)	0.240 (1.9)	0.579 (3.6)
Belgium	0.301 (3.2)	0.269 (2.4)	0.367 (2.7) 0.197 (1.3)	0.082 (0.8) 0.305 (2.8)	0.714 (4.6)	0.421 (3.6) 0.211 (2.0)	0.354 (3.1)

Note: Heteroscedastic-consistent t-statistics in parentheses. Cells with a single figure are ones with a common coefficient over both sub-samples (1990-92 and 1993-96). Cells with two figures are ones with different coefficients in each sub-sample.

Table 9. Industry and Country Dummies For Model 4

	Chemicals	Electrical Engineering	Transport	Mechanical Engineering	Other Manufacturing	Distribution	Financial Services
UK	0.136 (1.2)	0.580 (3.8) 0	0.691 (4.2) 1.161 (3.5)	0.161 (1.5)	0.459 (3.6)	0.091 (1.2)	0.307 (2.4) 0.527 (3.4)
France	0.160 (2.2)	0	0 0.141 (1.5)	0.137 (1.7)	0.184 (1.9)	0	0.075 (0.7)
Sweden	0 0.495 (2.3)	0.574 (3.3) 0	n.a.	0.567 (3.5)	0.222 (1.1) 0.752 (3.7)	0.256 (3.2)	0.321 (1.6)
Spain	0.092 (1.3)	0	0	0.146 (1.7)	0.272 (3.3)	0.233 (2.2)	0.078 (0.7)
Austria	0.151 (1.9) 0.408 (5.4)	0.075 (1.0)	0.175 (1.3)	0.268 (3.4)	0.303 (4.7)	0.145 (2.7) 0.282 (5.0)	0.134 (1.7)
Netherlands	0	0	0	0.227 (3.5) 0.356 (3.8)	0.324 (2.3)	0.127 (2.1)	0.132 (0.9)
Italy	0.486 (3.7)	0.217 (2.2) 0	0.329 (2.2)	0.321 (2.6)	0.131 (0.9) 0.600 (3.7)	0.195 (1.8)	0.492 (3.7)
Belgium	0.241 (3.5)	0.200 (2.4)	0.306 (2.6) 0.125 (1.0)	0 0.258 (3.4)	0.617 (4.8)	0.352 (3.7) 0.158 (1.8)	0.268 (3.3)

Note: Heteroscedastic-consistent t-statistics in parentheses. Cells with a single figure are ones with a common coefficient over both sub-samples (1990-92 and 1993-96). Cells with two figures are ones with different coefficients in each sub-sample.

Table 10. Tests For Structural Change in Slope Parameters, Model 4

Variable	Wald test p-value
All Variables, Both Sub-Periods	0.1741
All Variables, 1990-92	0.3225
All Variables, 1993-96	0.9410
Market Size	0.9948
Agglomeration Economies	0.1800
Relative Labour Costs	0.1399
Firm-Specific Assets	0.5053
Nominal Exchange Rate Volatility	0.5585
Tax Competitiveness	0.7068
ERDF Expenditure	0.2145
Government Investment	0.5380

Note: For individual factors, test of joint significance of dummied parameters over both sub-samples.

Table 11. Host Country Economic Policies And The Growth Of Inward Investment

Growth in FDI Stock 1989-96 (1990 prices; %)		Percent Change in Stock Implied By Movements In Independent Variables							
		Labour Costs	Corporate Taxes	ERDF Funds	Fixed Investment	Volatility	German R&D	EU Output	Agglomeration
UK	189	14.2	14.5	5.1	7.6	3.5	55.5	15.7	-32.7
France	31	-9.9	2.3	1.2	6.9	4.9	44.8	14.2	-18.0
Italy	65	28.6	-10.3	2.1	-18.8	-9.0	53.9	15.6	-38.5
Spain	13	-18.5	-4.8	-10.6	1.7	0.0	52.0	13.7	12.7
Austria	52	-1.8	-10.2	-0.5	-7.5	0.0	50.1	13.9	3.2
Belgium	77	-33.1	-8.8	0.4	-7.0	1.7	81.3	17.3	-4.3
Netherlands	38	-9.5	-8.9	0.3	2.1	0.3	67.1	16.4	7.6
Sweden	217	37.4	-4.9	-0.2	8.4	-4.8	40.2	15.0	-17.2