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

By F. Hubert and N. Pain

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Abstract

Foreign direct investment in the European Economic Area (EEA) has grown rapidly in recent years. 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. The findings are mixed. Some measures, 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.

Outline

Non-Technical Summary

Inward investment in the European Economic Area has grown rapidly in recent years 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 affected the locational attractiveness of all European economies. However national policies and institutions do still appear to matter. Some countries have been noticeably more successful than others in attracting inward investment.

Developments in national economies need to be viewed in the context of ongoing integration 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. Our empirical analysis allows for the potential changes in the geographical and industrial pattern of cross-border investments that might result from this. Using a panel data set of foreign direct investments by German companies over the period from 1980 to 1996 in seven industries and eight host economies 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 by German companies in the EU, even in manufacturing industries.

We also investigate the scope, if any, for national governments to affect location choice through the use of fiscal incentives and other investment promotion policies. 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 measured current public expenditure. The true worth of others, such as tax incentives, will become apparent only over time if the investment is profitable. Instead we evaluate the impact of fiscal instruments indirectly, using total government expenditure on subsidies and fixed investment, the effective rate of corporation tax and grants from the European Regional Development Fund.

We control for market size, the firm-specific assets of German companies and other centripetal and centrifugal forces that are known to affect location choice, such as agglomeration economies and relative unit labour costs. 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. Whilst this finding is sensitive to the empirical specification, it would suggest that concerns about the potential for tax competition in Europe are not unfounded.

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. But viewed in conjunction with an additional finding of significant agglomeration forces, it does mean that particular fiscal policies could have a long-lasting influence on the location of economic activities. A temporary expansion in fixed investment expenditure could have permanent effects on the level of inward investment, particularly if it was not financed through higher corporate tax rates.

I. Introduction And Overview

Inward investment in the European Economic Area has grown rapidly in recent 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. This 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 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 informal indication that agglomeration economies may be attracting investors. Germany, Italy and the Iberian economies have all seen their share of new direct investment inflows decline.

Developments in national economies 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. Our empirical analysis allows 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 using a panel data set of foreign direct investments by German

companies over the period from 1980 to 1996 in 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. 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.

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. 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. This drop coincided with a rise of similar magnitude in the level of new manufacturing investments in neighbouring economies in Central and Eastern Europe.

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 market size, the firm-specific assets of German companies and other centripetal and centrifugal forces that are known to affect location choice, such as agglomeration economies and relative unit labour costs. 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 finding 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. But viewed in conjunction with the finding of significant agglomeration forces, it does mean that particular fiscal policies could have a long-lasting influence on the location of economic activities, as suggested by Martin and Rogers (1995).

The structure of this paper is as follows. In the next two sections we provide brief surveys of the respective literatures on the impact of European integration and fiscal instruments on the location of industry and highlight some important questions to investigate in the empirical analysis. The model used in the empirical work is outlined in Section IV and the main empirical results are described in Section V, with some concluding comments given in Section VI.

II. The Impact Of Integration On FDI

It is well established that earlier stages of European integration had an important effect on both the level and location of FDI. Studies using data for the United States, the primary source of inward investment in post-war Europe, suggested that in the 1960s the initial eradication of tariff barriers within the then European Community diverted some investments within Europe from the leading non-EC recipients, notably the UK, to EC members (United Nations, 1993). 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.[1] In a study of the location of US manufacturing foreign direct

[1] 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.

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.

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. A wide variety of measures to ease non-tariff barriers have been introduced since the start of the Single Market Programme (SMP), including the harmonisation of technical standards and regulations, the removal of customs controls, and moves to open public procurement and remove constraints on capital markets. An early evaluation of the SMP is provided by European Commission (1996). Work for that evaluation by Pain (1997) and Pain and Lansbury (1997) found that the SMP had already begun to have a positive effect on the level of intra-EU FDI by 1992.

There are reasons to expect that the impact of the different measures included in the SMP will vary across sectors and across countries. Some of the former non-tariff barriers, notably customs controls, would have affected trade, but not market entry by means of direct investment. Others, such as technical requirements and lack of competition in public procurement would affect both (potential) exporters and foreign investors. Capital controls might have affected investors more than exporters. In some service sectors there may continue to be little scope for trade, but plenty for direct investment as access to national markets is improved.

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. This implies that the extent of structural change across sectors will vary over time. In manufacturing, labour intensive, assembly activities would become concentrated in locations on the periphery of Europe with relatively lower labour costs, including those in Central and Eastern Europe. Other, more capital-intensive manufacturing activities would be located closer to the industrial core of Western Europe. Evidence in Midelfart-Knarvik *et al* (2000) suggests that there has indeed been greater centralisation in industries with scale economies and high proportions of intermediate inputs. However they also find that some small, geographically peripheral economies, such as Ireland and Finland, have become more specialised in high technology industries.

There are other reasons for believing that structural change in individual industries and locations may vary over time. The timing of the implementation of Single Market legislation has varied over both dimensions. Two countries in our sample, 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.

The argument in favour of greater concentration within manufacturing industries may also understate the continued scope for intra-EU direct investment as product market barriers are removed. Many country-specific 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. 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 can be a means of achieving greater market power.

Models arising out of the new literature on economic geography and international trade under imperfect competition 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). 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 their 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.

III. 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. Fiscal incentives may also be used as a strategic instrument if agglomeration economies mean 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, unilateral abolition of incentives might well have significant costs (Head *et al*, 1999).

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 as well as to existing investors in 'after-care' programmes (Young and Hood, 1994). Examples of tax incentives include preferential tax rates, and capital allowances. Even if production costs are equalised across locations, international differences in corporate taxes may affect the location decision if they affect post-tax returns. 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, includes 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. 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.[2] 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 (Head *et al*, 1999), possibly because different levels of assistance are offered in different regions, and there is some evidence that measures of public infrastructure can matter (Martin and Velázquez, 1997; Ferrer, 1998).

To date there are only a few studies on the role of fiscal incentives on the country location decision in Europe. Mayer and Mucchielli (1998) examine the factors that affect the probability of Japanese investments being located in five host economies, France, Germany, the UK, Italy and Spain, over the period 1984-93. They include 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

[2] 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.

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.

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 different 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 although the average effective tax rate of different host economies does not influence the probability of a US firm locating in Europe, it does have a significant effect on the probability of locating in an individual country once the firm has decided to locate production somewhere within Europe.[3] 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.

[3] 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.

- 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, including Germany. This is because location choice depends upon the relative costs of competing locations, not just the costs of any one particular location.[4] 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.

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 to domestic and foreign firms.

Trends in the level of general government expenditure on fixed investment and subsidies over time are summarised in Tables 1A and 1B using data from the OECD Annual National Accounts. 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 Germany, Austria and Sweden. These countries also maintained a comparatively high level of expenditure on fixed investment in the early 1990s.

[4] For example, in the model developed by Martin and Rogers (1995) 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.

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 general government 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 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 1C, 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 as 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,[5] and make the implicit assumption that this effective rate, which reflects the past profitability of all firms in the host location, corresponds to the one that might be faced by the representative foreign firm in that location in the future. 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. There is considerable time series variation in this measure of tax competitiveness; the profile for the four largest host economies – UK, France, Italy and Spain, is shown in Figure 1. The UK and, to a lesser extent, France have become more competitive over time, whilst Italy and Spain have become less competitive.

IV. 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 economies and currency volatility. We briefly discuss each of these and a number of econometric issues, before outlining the methodology used to test for structural change.

Indicators of market size and relative production costs remain important factors in many recent empirical studies of the determinants of foreign investment. 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. For instance income in the host location, or in a wider supra-national region such as the European Union, has been found to be a significant factor in the growth of foreign investment by German (Jost, 1997; Hubert and Pain, 1999), American (Barrell and Pain, 1998 and 1999b), British (Pain, 1997) and Japanese firms (Barrell and Pain, 1999a) over time. These studies also indicate that measures of the real exchange rate of the host

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

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 measured at constant prices and 1990 PPPs. 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 costs in the host relative to a (GDP) weighted aggregate of unit labour costs in 15 other economies, all expressed in a common currency.[6] 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 be used so as to allow for the impact of any differences in the user cost of capital across countries, although such data are 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. There may still be differences in the post-tax cost of capital across locations, but at least some of these will be partially reflected in the tax competitiveness measure we employ.

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 ownership advantages stemming from firm-specific knowledge-based assets and practices.

We follow Barrell and Pain (1999b) and proxy the 'stock' of knowledge-based 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

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

the OECD ANBERD database, with adjustments applied prior to 1979 to allow for changes in coverage.[7] 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.

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 that generates positive externalities for nearby firms. Examples include the availability of skilled labour and clusters of innovating firms, proximity to markets and publicly financed infrastructure.

Several recent studies have suggested that agglomeration effects can be an important determinant of investment decisions by multinational firms. For instance, Devereux and Griffith (1998), Barrell and Pain (1998 and 1999b) and Mayer and Mucchielli (1998) find that agglomeration effects help to determine the location choice of US and Japanese multinationals in Europe. Barrell and Pain use two distinct measures, the size of host economy GDP relative to EU GDP and the share of EU patenting 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 econometric 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.

[7] 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).

We investigated 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 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. We use this source of patent data as it includes internationally comparable patents originating from a large number of countries. The expected impact of 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).

The FDI literature suggests a variety of ways in which exchange rate volatility might affect direct investment. 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 and returns from planned transactions.

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 an important destination for many tradable goods produced by German companies located elsewhere within Europe. One 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. We use 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:

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

where h=3. 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.

In the econometric analysis we also 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 time dummies for each year prior to 1990. Separate dummies are included for each industry and country from 1990, as we discuss below. The fixed effects will capture all industry-specific and country-specific factors that do not vary over time. 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.

Estimation is undertaken over a sample period running from 1981 to 1996.[8] 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 some data to preserve confidentiality. We use 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 and then deflated by the dollar value of the GDP deflator in the host economy.

We estimate a dynamic partial adjustment panel model, allowing for the existence of adjustment costs by including a lagged dependent variable. There is plenty of empirical evidence 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

[8] The endpoint of the sample was determined by the availability of data for some of the explanatory variables.

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.[9]

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.

Testing For Structural Change

There are a variety of ways of attempting to allow for the possibility of structural change. The arguments above indicate that it is possible that the extent of structural change arising from factors such as the Single Market Programme, entry into the EEA or the opening up of Central and Eastern Europe will vary across industries, countries and time. One option is to begin with a general model that has separate (0,1) dummies for each industry in each host country, with the dummies set to 1 during the period in which structural change is being tested. If there are *n* industries and *m* locations, the general model would have *n*m* dummies in each time period in which structural change was thought to have occurred. The *(n-1)*(m-1)* restrictions on the general model required to return to the more commonly employed model with *n+m-1* dummies[10] (Pain and Lansbury, 1997) 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. To test whether the extent of structural change has varied over time, separate sets of *n*m* dummies can be included for each individual subperiod.

V. Empirical Results

Our focus in this paper is on whether there were any structural changes in the pattern of German FDI from 1990, a period which has seen both the Single Market Programme and

[9] In the results reported below we find that the coefficient on the lagged dependent variable is significantly different from unity, implying that 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. This is consistent with what would be expected if there are costs of adjustment.

[10] One for each country and one for each industry, less one to avoid linear dependence. The results are invariant to whichever industry or country dummy is excluded.

the opening up of Central and Eastern Europe. We therefore began with a general model with two sets of *n*m* dummies, one for 1990-92 and the other for 1993-96.[11] This model provided strong evidence that the degree of structural change has varied across countries, across industries and across time. For instance the restrictions required to impose common coefficients on the two sets of *n*m* dummies were strongly rejected by the data [Wald(55)=156.16], suggesting that the extent of structural change has varied across time. The restrictions required to return to the simple model with *n+m-1* single industry and country dummies were also (jointly) rejected by the data in each of the two subperiods [Wald(41)=84.28 and Wald(41)=65.94], suggesting that the extent of structural change has varied across industries and/or countries.

In Table 2 we report the results of three further sets of restrictions. The test statistics in the second and third columns are for 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, only the country dummies for France and Spain (one for each industry) and the industry dummies for electrical engineering (one for each country) 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 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, along with their corresponding t-statistics is reported in Table 3. The coefficients imply that, for instance, the level of German inward investment in the chemicals sector in the UK in 1990-92 was, on average, some 20 per cent higher than can otherwise be accounted for.[12] 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 10 out of the 110 coefficients are negative, and none of these are significantly different from zero. There is little evidence to suggest that manufacturing activities have become more concentrated in a smaller number of locations.

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[11] It would be possible to have a larger number of subperiods and to test for changes in the late 1980s as well, although this would obviously reduce the available degrees of freedom. Any changes common to all panel members in the 1980s will be captured by the separate time dummies included for these years.

[12] As the dependent variable has a logarithmic form the exponent of the reported coefficient has to be used; exp(0.182)=1.1996.

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 simplifying restrictions [Wald(40)=52.3; p-value=0.091]. The resulting regression is reported as Model 1 in Table 3, with the coefficients on the structural change dummies reported in Table 4. In a second regression, reported as Model 2 in Table 3, we drop the thirteen dummies in Table 4 with a t-statistic less than unity [Wald(13)=6.30]. The coefficients on the remaining dummies are reported in Table 5. All of these are now positive or zero. In interpreting the results of these models 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 data-acceptable restrictions that could be imposed.

Before turning to the findings with regard to the fiscal measures it is useful to summarise the country and industry variation in the structural change dummies and highlight some of the other main findings in the reported models.

In Table 5 the largest number of significant country dummies are in Belgium and Italy, with investment being significantly higher than expected in six and five industries respectively. The evidence also suggests that agreement to enter the EEA may have been of some benefit to Austria and Sweden, since both countries have more significant dummies (4 each) in the 1993-96 subperiod than in the 1990-92 subperiod. 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 raw FDI data for Germany suggest that the UK has been much more successful in attracting investment than Italy, even though both countries have a domestic market of similar size. However the explanatory variables that vary over time can more than account for the differences in many industries. 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 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, since German investments there have been concentrated in engineering and transport industries. In the 93-96 period there is only one significant dummy for electrical engineering. There are three significant dummies in the financial services sector in both sub-periods; in each case the same three countries – the UK, Belgium and Italy have gained, possibly indicating effects from agglomeration economies over and above those already captured in the model.

The models reported in Table 3 clearly indicate that foreign investment by German firms is driven by ownership-specific advantages as well as by the relative characteristics of the host locations, confirming the findings of Hubert and Pain (1999). The accumulation of proprietary assets through R&D is shown to be an important source of the growth 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 1.52 per cent.

There are also well determined effects from two measures of EU 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 both models we impose the data-acceptable restriction of a unit long-run output elasticity [Wald(1)=0.58 in Model 1], 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.[13] 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 0.78 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 0.22 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 2.77 per cent. Sustained overvaluations of the real exchange rate 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 these findings with those reported by Barrell and Pain (1999b) for US FDI in Europe. The importance of ownership-specific advantages is far larger for Germany than for the US, whereas the impact of the agglomeration measures is approximately half the size of those found for the US. 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 variable for nominal exchange rate volatility has an insignificant negative coefficient in both models. Although some 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 impact of the fiscal measures is mixed. One measure, expenditure on government subsidies was found to be insignificant in all specifications, and is excluded from the results reported here.[14] But there is a positive effect from tax competitiveness, in line with the findings of Young (1999), although it is significant only in Model 2 once the structural

[13] The third agglomeration measure based on industry output was not significant and is not included here.

[14] When added to Model 1 the variable had a coefficient of –0.024 with a standard error of 0.08.

change dummies are reparameterised. The positive coefficient implies that a rise in the relative effective corporate tax rate in the host location will act to deter inward investment.

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 in Model 1, but not Model 2. One 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.

The theoretical model developed by Martin and Rogers (1995) model suggests that the impact on location of regional aid policies designed to improve infrastructure can vary according to the type of infrastructure that is financed. Their 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.

To understand what effect changes in the various fiscal measures may have, it is useful to examine the long-run steady state solution to Model 2. 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 and SF_j are the ratios of government fixed investment and ERDF funds to GDP, and w_k is the weight attached to each.

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 raise it by only 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 in Model 2 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.

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 also 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 2 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 6. 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 FDI had become more responsive to these factors.

This issue probably merits further investigation. However the evidence does suggest that Model 2 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.

Further support for the empirical validity of the model is provided in the last row of Table 3 which reports a test for first order serial correlation described in Barrell and Pain (1999a). It suggests that there is no evidence of serial correlation in either of the reported specifications.

Fiscal Incentives and the growth of Inward Investment

The primary factors behind the growth of German FDI in all the locations in our model 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. But host country policies have also mattered. A clearer idea of the importance of variation in the fiscal policies of the different host locations 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 using the methodology set out in Pain (1997). 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 independent variables 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: $\sum_{k=0}^{p} \alpha^{k} \beta Z_{t-k}$, where p denotes the number of periods over which the impact of taxes are assessed. The illustrative calculations shown below set p=6.[15] We use Model 2 to compute the extent to which changes in tax competitiveness and government fixed investment have changed the stock of inward FDI between 1989 and 1996. The results are reported in Table 8.

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. Italy and Austria are the two countries that have lost the most inward investment as a result of a deterioration in tax competitiveness. Both have also lost investment as a result of 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 in Italy than might otherwise have been the case. Belgium has 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. 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 others were reducing their investment considerably in order to undertake fiscal consolidation, may prove to have been extremely beneficial.[16]

VI. 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. We augment a conventional supply-side model

[15] The results should be regarded as illustrative since the choice of dates and parameter estimates is arbitrary. It should also be noted that the accounting exercise provides estimates of the impact of *changes* in the independent variables on the stock of inward investment, so countries can show gains simply by becoming less uncompetitive than before.

[16] To put the magnitude of the effect of changes in fiscal measures in some perspective, similar calculations for relative labour costs showed country gains ranging from 37 per cent (Sweden) to losses of 33 per cent (Belgium). Detailed results are available on request from the authors.

of production location with measures to reflect internal firm-specific developments within industries, the potential for agglomeration economies from large markets and various fiscal measures. 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, and allow also for the possibility of structural change across countries, industries and time.

The results reported here show significant effects from some 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. 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. However it would suggest that concerns about the potential for tax competition in Europe are not unfounded.

Our results also provide an indication that there may be considerable benefits to be had from attracting inward investment. The development of knowledge-based assets, measured by the cumulated stock of R&D expenditures of German corporations, is found to be one of the main factors 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.

We find evidence of significant structural change since 1990, with the extent of change varying across industries, countries and time. This is consistent with the hypothesis that the different dimensions of the ongoing process of European economic integration have 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.

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Figure 1. Tax Competitiveness (1980=1.0)

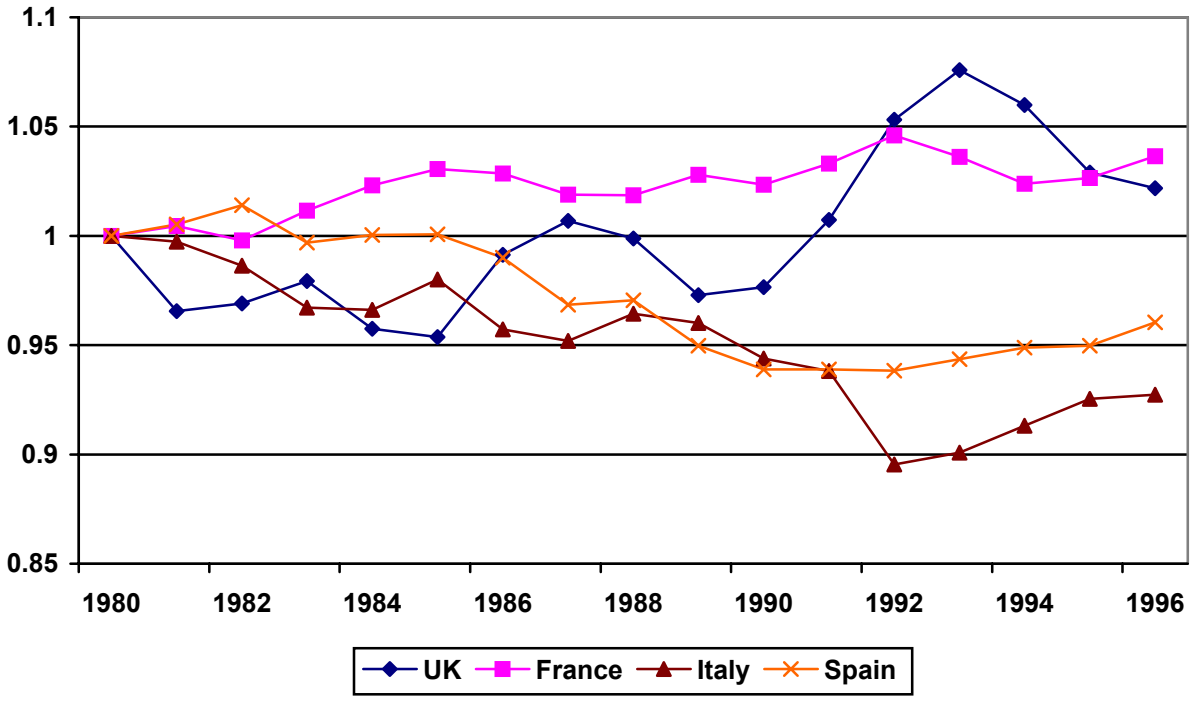

Table 1A. General government investment (% of GDP, annual average)

	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
Germany	2.87	2.51	2.61

Table 1B. 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
Germany	1.98	2.16	2.04

Table 1C. 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
Germany	0.01	0.01	0.04

Table 2. Tests Of Time-Varying Structural 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 3. Coefficients On Unrestricted 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 4 The Determinants Of German FDI

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

Explanatory Variables	Model 1	Model 2
$\ln(FDI_{ij,t-1})$	0.6092 (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)
$\overline{R}^2$	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 5. Industry and Country Dummies For Model 1

	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 6. Industry and Country Dummies For Model 2

	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 7. Tests For Structural Change in Slope Parameters, Model 2

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 8. 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	
		Corporate Taxes	Government Fixed Investment
UK	189	14.5	7.6
France	31	2.3	6.9
Italy	65	-10.3	-18.8
Spain	13	-4.8	1.7
Austria	52	-10.2	-7.5
Belgium	77	-8.8	-7.0

Netherlands	38	-8.9	2.1
Sweden	217	-4.9	8.4