

Barry, Frank G.; Hannan, Aoife

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**Product Characteristics and the Growth of FDI**

Frank Barry and Aoife Hannan, University College Dublin

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# Product Characteristics and the Growth of FDI

Frank Barry and Aoife Hannan  
University College Dublin  
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## **Abstract**

FDI and the activities of foreign affiliate firms have grown dramatically in recent decades, both in absolute terms and as a share of world GDP. Most explanations of this phenomenon focus on the impact of the macroeconomic environment on the choices facing individual firms over whether or not to engage in FDI. We focus instead on the characteristics of demand for the products produced in sectors known to be conducive to FDI. These characteristics are shown to help explain the recent growth in the FDI-to-GDP ratio.

## Corresponding author:

Frank Barry, Department of Economics, University College Dublin, Dublin 4. Ireland

[Frank.Barry@ucd.ie](mailto:Frank.Barry@ucd.ie)

Telephone: (353-1) 716-8239

Fax: (353-1) 283-0068

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## 1. Introduction

The strong growth in FDI flows and in the FDI-to-GDP ratio over recent decades is well documented. One obvious explanation for the former is the increasingly liberal investment climate of the period, as emphasised by Safarian (1999) for example. Other explanations focus on the microeconomics of firm behaviour.

It is widely accepted that firm-level scale economies arising from intangible assets or “knowledge capital” provide a basis for the existence of multinational firms; Markusen (1995, 1998). Given that plant-level economies of scale are generally found to be negatively associated with multinationality, an increase in FDI flows could be driven by technologically-induced changes in the ratio of firm-level to plant-level scale economies.

While these hypotheses - investment liberalisation and technological change of this type - can explain increased FDI flows, there are no implications for the FDI-to-GDP ratio once adjustment has taken place. A further hypothesis concerning horizontal FDI offered by Markusen (1998) has clearer implications for the latter. He analyses the effects of GDP growth on the choice facing a firm as to whether or not to engage in FDI. The alternative to horizontal FDI is to export directly instead. An increase in market size tips the balance in favour of the high fixed-cost FDI option as against the high marginal-cost exporting option. Hence “the volume of affiliate production should rise faster than total (two-country) income as total income grows”.

The present note proposes a further, possibly complementary, explanation for the recent growth in the FDI-to-GDP ratio. Our explanation is related to the second hypothesis discussed above, and applies to both horizontal and vertical FDI. We speculate that the kinds of products for which knowledge capital is important are characterised by high income elasticities of demand and, price effects notwithstanding, attract an increasing share of total expenditure. As growth occurs their share rises, thus raising the average ratio of firm-level to plant-level scale economies across manufacturing (rather than within individual sectors, as in the technological-change explanation). Thus both the pool of FDI and the FDI-to-GDP ratio increase.

Our paper is structured as follows. Section 2 summarises the data on historical and recent trends in FDI growth. Though the historical evidence is inconclusive, it appears that secular growth in the FDI-to-GDP ratio may be a post-war phenomenon, which is consistent with our view that it is associated with the demand characteristics of the particular goods that have tended to be produced by TNCs in this period. Section 3 reviews the arguments on the sectoral location of FDI activity, focusing on financial services and on manufacturing sectors intensive in the use of advertising and R&D. Section 4 then employs EU data to illustrate the increasing share in expenditure represented by the output of these sectors. Section 5 concludes.

## 2. FDI Growth

The activity of TNCs can be tracked through FDI stock or flow data or, more directly, by looking at the activities of foreign affiliate companies. Each method paints a broadly similar picture of recent developments. We focus first however on historical FDI stock data, to show that the rapid expansion in FDI is primarily a phenomenon of recent decades; Table 1.

**Table 1: Stock of Outward FDI by Source Countries (US\$ billion, 1900 prices)**

	1913	1929	1938	1950	1960	1971	1980	1990	1995
World total	11.5		14.6		15.7	29.4	41.9	102.9	156.1
Australia					0	0.1	0.2	1.7	2
Belgium					0.3	0.4	0.5	2.3	3.4
Canada	0.1	0.2	0.4	0.3	0.6	1.1	2.1	4.7	5.7
France	1.4		1.4		1	1.2	2.1	6.1	18.4
Germany	1.2		0.2		0.2	1.2	2.7	7	11.2
Italy					0.3	0.5	0.6	3.2	5.3
Japan	0.2	0.5	0.9		0.1	0.8	1.8	11.2	11.6
Netherlands	0.7		1.5		1.6	2.4	3.7	6.3	9.1
Sweden					0.1	0.4	0.5	2.7	3.4
Switzerland					0.5	1.6	1.8	3.7	7
UK	5.2		5.8	1	2.5	4	7	12.9	15.3
US	2.1	3.6	4	3.6	7.7	14.1	18.9	40.9	63.8

Source: Twomey (2000, page 33)

Markusen's hypothesis implies that growth in affiliate production should exceed GDP growth over most if not all sub-periods. It is difficult to discern from the data whether this was the case until recent decades. O'Rourke and Williamson (1999, p. 218) cast

doubt on it, writing that “we do not think that (direct foreign investment) had a very significant impact on late-nineteenth-century convergence. It is likely to be playing a much bigger role today”. Another piece of “soft” evidence comes from Chandler (1990, tables 14 and 15) who shows that the numbers of US industrial enterprises establishing operations in the UK and in Germany grew modestly in the decades from 1900 to the 1950s and exploded in the period thereafter.

Our hypothesis on the other hand is concerned specifically with the characteristics of the goods produced by TNCs in the recent era, which are quite different from the types of goods associated with TNC production in earlier decades. Dunning (1983) points out for example that more than four-fifths of the foreign capital stake in 1914 was directed to less developed economies outside Europe and the USA, reflecting the importance of railway building, the extractive sectors and the colonial control of international trade in that era.<sup>1</sup> The vast bulk of today’s FDI is between developed countries, on the other hand, and is associated with a different basket of goods.

That the FDI-to-GDP ratio has grown in recent decades at least is clear from Table 2.

**Table 2: Percentage annual growth rates in FDI-related aggregates and GDP**

	<b>1960-70</b>	<b>1970-80</b>	<b>1986-90</b>	<b>1991-95</b>	<b>1996-99</b>	<b>2000</b>
<b>FDI inflows</b>	10.2	15	23	20.8	40.8	18.2
<b>FDI inward stock</b>			16.2	9.3	18.4	21.5
<b>Cross-border M&amp;As</b>			26.4	23.3	50	49.3
<b>Gross product of foreign affiliates</b>			16.4	7.2	11	16.5
<b>GDP</b>	8.4	15.2	11.7	6.3	.7	6.1

Source: Grimwade (2000) for 1960s and 1970s; UNCTAD (2001).

### **3. The Sectoral Location of FDI Activity**

How do we determine which sectors are particularly conducive to FDI in the present era? In 1988, Manufacturing and Services each attracted between 40-45 percent of

FDI flows. By 1999, the shares were closer to 35 percent for Manufacturing and 55 percent for Services; UNCTAD (2001).

Within manufacturing, the shares of FDI flows to the 15 manufacturing sub-sectors for which UNCTAD gives data jump fluctuate haphazardly. Other evidence allows us pinpoint more precisely the disaggregated sub-sectors in which FDI is likely to be concentrated however. As Markusen (1998) notes, these are sectors in which knowledge capital such as “patents, blueprints, formulae, managerial and work procedures, marketing knowledge, reputations and trademarks” are important. In other words, they are likely to be characterised by high R&D and advertising intensities.<sup>2</sup>

Davies and Lyons (1996) provide a division of 3-digit NACE industrial sectors into just such groupings. A sector is classified as “Type A” (for advertising-intensive) if advertising expenditures in the UK exceed 1 percent of national consumption of the product.<sup>3</sup> R&D-intensive sectors are denoted “Type R”. R&D data from both Italy and the UK are used in the determination of these sectors, with relatively high R&D expenditures required in both countries if a sector is to be classified as such. Sectors that are intensive in both R&D and advertising are classified as “Type AR”. Of the roughly 100 NACE 3-digit sectors Davies and Lyons classify 13 as Type A, 22 as Type R and 9 as Type AR. These sectors, which are the ones we take to be associated with multinational production, are listed in Table 3 below.<sup>4</sup>

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<sup>1</sup> See also Twomey (2000).

<sup>2</sup> Surveying a range of studies carried out between the early 1970s and the 1990s, Caves (1996; page 8) concludes that “research and development intensity is a thoroughly robust indicator” of multinationality, and that “advertising intensity has proved nearly as robust”. Markusen (1995) concurs.

<sup>3</sup> The UK is used as it is the only EU country with appropriately comprehensive advertising-intensity data by sector.

<sup>4</sup> One simple verification of this is to look at the extent of foreign ownership in these sectors using data from the Irish Census of Industrial Production. We use employment rather than output data to surmount transfer-pricing problems. (FDI flow data are insufficiently disaggregated for present purposes). For 1990, the last year for which data were reported on the basis of the old NACE

**Table 3:** Advertising- and R&D-intensive sectors

Type A	Type R	Type AR
Oils and fats	Basic chemicals	Paint and ink
Dairy products	Industrial and agric. chemicals	Pharmaceuticals
Fruit and vegetable products	Domestic and office chemicals	Soaps and detergents
Confectionery	Man-made fibres	Tractors and agric.mach.
Animal foods	Machine tools	Radio and television
Other foods	Textile machinery	Domestic elec. appls.
Distilling	Transmission equipment	Motor vehicles
Wine and cider	Paper/wood machinery	Optical instruments
Beer	Other machinery	Clocks and watches
Soft drinks	Computers and office mach.	
Tobacco	Insulated wires and cables	
Musical Instruments	Electrical machinery	
Toys and Sports	Electrical equipment	
	Telecom and measuring equip.	
	Electric lights	
	Motor vehicle parts	
	Railway stock	
	Cycles and motor cycles	
	Aerospace	
	Measuring instruments	
	Medical instruments	
	Rubber	

Source: Davies and Lyons (1996), Appendix 2.

Turning now to services, we pointed out earlier that the share of total FDI stocks located in this sector is growing, from the level of 20 percent in the early 1950s reported by Twomey (2000, page 40) to more than 50 percent today; UNCTAD (2001; Annex tables A.II. 1-4). Within services, the share of FDI going into Finance and Business Activities is over 50 percent.<sup>5</sup>

#### **4. Product Characteristics of the Output of Sectors Conducive to FDI**

Our hypothesis is that the demand characteristics of the type of goods for which FDI is the appropriate vehicle for expansion cause them to account for a growing share of aggregate expenditure. We are suggesting essentially that these are high-income-

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categories used by Davies and Lyons, these three groups of sectors accounted for 62 percent of the jobs in foreign-owned industry, and for only 26 percent of jobs in domestically-owned industry.

<sup>5</sup> This is true for both years shown in the UNCTAD tables, 1988 and 1999, and for both Developed Country and World FDI stocks.



elasticity-of-demand products.<sup>6</sup> We are not concerned with estimating demand curves however. Rather, our concern is with outcomes, in terms of the share in total expenditure accounted for by these sectors.

Our hypothesis will be confirmed if we find that the output of R&D and advertising-intensive sectors is growing as a share of total spending on manufactures, and that Finance and Business Activities are growing as a share of spending on services.<sup>7</sup>

To determine this we would ideally like to have data on world production, which would then yield world demand. These data are unavailable however. We do have consistent trade and production data for EU manufacturing; if EU supply is sufficiently close to EU apparent consumption (i.e. production plus imports minus exports), then we can view the EU as a closed economy as far as these goods are concerned, and equate production and expenditure.

Table 4 below confirms that this is the case. For the year to which the data refer, 1995, the gap between EU production of these goods and EU expenditure on them is only around 5 percent.<sup>8</sup>

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<sup>6</sup> Even if this were the case, relative price changes could nevertheless cause them to decline as a share of expenditure. We do not think this is likely however. For the goods in which technical progress is rapid (primarily the Type R sectors), De Long and Summers (2000) argue that price elasticities of demand are likely to be high; as their relative price falls due to technical progress, this protects their expenditure shares. Given that advertising aims to reduce price elasticity we might expect generally low price elasticities for the advertising-intensive Type A sectors; as their relative price rises, their share of consumption is protected.

<sup>7</sup> Furthermore, several of the most service-intensive manufacturing industries (i.e. Office and Computing, Communications Equipment and Drugs and Medicines, out of the top 5 mentioned by Midelfart-Knarvik et al., 2000) are also FDI intensive, as measured by a higher than average share of foreign affiliates in total US firms' foreign sales, which is related to the measure employed by Dunning et al. (2001). Thus the growth in the share of services is not necessarily unrelated to FDI growth generally.

<sup>8</sup> Ideally one might wish to show that this is the case for each year of the analysis. This is a greater task than might appear at first sight however as the sectoral classifications and the membership of the EU both change over time. (In fact the definitions of the A, R and AR sectors in Table 4 use the Altomonte concordance discussed below). A cursory inspection of the data reveals that 1995 is not an atypical year however.

**Table 4:** Absolute Value of Imports minus Exports as a Share of Production, 1995.

	Total (A+R+AR)	A	R	AR
EU15	4.65	3.95	6.07	6.52
EU12	5.20	3.23	7.12	6.23

**Source:** Production data from the Daisie database, 1995, coded according to NACE Rev 1. Trade data from Eurostat Comext database, 1995, coded according to Combined Nomenclature 2001. A concordance between the two classifications was carried out, and the trade data converted to NACE Rev1.

The next two tables confirm that these sectors have expanded as a share of EU production over time. The tables differ in terms of the number of EU member states included (because the appropriate data typically become available only upon a country's accession to the EU ), and in terms of the time periods considered, because of the changes made to the NACE coding system in the early 1990s.

Our longest data series is for the EU9 (i.e. the original six member states plus the UK, Denmark and Ireland). Table 5 shows the share of EU9 manufacturing-sector production accounted for by the A, R and AR sectors rising by 14 percentage points between 1975 and 1990. We have a somewhat shorter data series for the EU12 (i.e. the EU9 plus Greece, Spain and Portugal). For these the share of manufacturing sectors particularly conducive to FDI activity rose by 3 percentage points between 1982 and 1990.<sup>9</sup>

**Table 5:** Shares of Type A, R and AR sectors in Total Production; various years (NACE 1970)

	<b>1975</b>	<b>1982</b>	<b>1990*</b>
<b>EU12 (A+R+AR)</b>		<b>48.08</b>	<b>51.13</b>
of which: A		12.15	10.72
R		23.95	25.24
AR		11.99	15.17
<b>EU9 (A+R+AR)</b>	<b>37.61</b>		<b>51.77</b>
of which: A	14.38		10.32
R	17.94		26.27
AR	5.28		15.18

Source: Eurostat Structure and Activity of Industry (NACE 1970)

\*: For Portugal and Belgium we only have the 1989 value which we use in place of 1990.

Because of the changes made to the NACE coding system in the early 1990s, the data for that decade are not directly comparable with those for previous periods. Altomonte (2000) has recently reclassified the Davies and Lyons sectors in line with the new NACE coding system however and we adopt his concordance for the post-1990 period.<sup>10</sup> Table 6 shows that while the share of A,R and AR sectors in NACE Rev1 appears to be lower than in NACE 1970, the share continues to rise over time.

**Table 6:** Shares of Type A, R and AR sectors in Total Production; various years (NACE Rev 1)

	<b>1990</b>	<b>1997</b>
<b>EU15 (A+R+AR)</b>	<b>41.18</b>	<b>43.75</b>
of which: A	8.44	6.49
R	19.85	22.60
AR	12.89	14.66
<b>EU12 (A+R+AR)</b>	<b>42.42</b>	<b>44.32</b>
of which: A	8.80	6.61
R	20.38	23.12
AR	13.25	14.58
<b>EU9 (A+R+AR)</b>	<b>42.86</b>	<b>44.57</b>
of which: A	8.62	6.29
R	20.93	23.78
AR	13.30	14.50

Source: Eurostat DAISIE (NACE Rev1).

Finally, we turn our attention to Services. Here data availability requires that we focus on gross value added rather than production. This means that we cannot carry out an analysis equivalent to that appearing in Table 4 above, which allowed us equate production with expenditure. In the case of services however this might not be overly problematic, given the presumption that services are less tradable internationally than are manufactured goods.

The equivalent to the Finance and Business Activities sub-sector in the FDI data is the FIRE sub-sector in the output data. This comprises Financial Institutions, Insurance,

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<sup>9</sup> Similar conclusions are arrived at in each case by looking at employment and value added shares in manufacturing.

Real Estate and Business Services. As in the case of manufacturing, the precise make up of this category changed in the 1990s with the switch from ISIC Rev 2 to ISIC Rev 3. As Tables 7 and 8 show, however, FIRE as a proportion of total services value added grew throughout the entire period under discussion.

**Table 7: Share of FIRE in Total Services – ISIC Rev 2**

	FIRE as % of Total Services GVA		
	1970	1982	1994
EU8	19.76	27.72	31.38
EU11		27.16	30.11
EU14		27.10	31.20

Source: Services GVA data: OECD Services Statistics on Valued Added and Employment, editions 1996 and 2000, exchange rates: IMF IFS Yearbook 2000.

Notes: No data for Ireland available.

**Table 8: Share of FIRE in Total Services – ISIC Rev 3**

	FIRE as % of Total Services GVA		
	1991	1995	1998
EU7	38.75	40.36	41.44
EU8		40.41	41.49
EU11		39.43	40.43
EU14		39.11	40.08

Source: as for Table 7; EU7=EU9-(Irl +Lux)

## 5. Conclusions

We have offered here an explanation for the growth in the FDI-to-GDP ratio seen over recent decades. We have argued that it reflects in part the fact that post-war FDI is concentrated in products that display high income elasticities of demand. As income grows, these sectors grow more rapidly, as does the scope for FDI. In microeconomic terms our argument is that as the share in expenditure of products embodying “knowledge capital” rises, so too does the average ratio of firm-level to plant-level scale economies. This raises both the pool of FDI and the FDI-to-GDP ratio.

Our use of trade and production data showed that R&D-intensive and advertising-intensive products do indeed account for a growing share of EU expenditure on

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<sup>10</sup> Again we can verify on Irish data the extent to which these sectors are associated with multinationality. For 1998, Altomonte’s grouping of the Davies and Lyons sectors accounts for 68 percent of jobs in foreign-owned industry, compared to just 24 percent of jobs in indigenous industry.

manufactures, and these are generally agreed to be the manufacturing sectors most conducive to FDI activity. Within services, we have seen that the same holds true for Finance and Business Activities.

Our findings are of relevance to at least one current policy debate, concerning the likely implications for current EU incumbents of eastwards enlargement of the EU. Some incumbents are fearful that FDI flows may be diverted away from them. Braconier and Ekholm (2001) have shown for example that the opening-up of Central and Eastern Europe (CEE) diverted Swedish multinational activity away from Southern Europe, while Barry and Hannan (2001) have suggested that Ireland's FDI inflows may also be threatened, given the low corporation tax rates and labour costs and reasonably high educational standards prevailing in some of the more advanced CEE countries. Such fears may receive further support from recent work by Neary (2002) who points out that the development of a free trade area (FTA) can reduce overall FDI, for two reasons. Firstly, reductions in inter-FTA tariffs reduce the tariff-jumping incentive to set up more than one FDI plant in the area, and secondly, reduced internal tariffs also lead to increased competition from domestic firms, which works against both FDI and exports.

If the products produced in the sectors that generate most FDI are income-elastic, on the other hand, as the present analysis suggests, this means that the growth effects of enlargement are likely to increase the total pool of FDI within the expanded EU, as the historical evidence adduced by Dunning (1997a,b) would also suggest.

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