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**Product Characteristics and the Growth of FDI**

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# Product Characteristics and the Growth of FDI

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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.

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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 this – particularly relevant, presumably, for countries such as China and the states of Central and Eastern Europe – is the increasingly liberal investment climate of the period, as emphasised by Safarian (1999).

Another perspective on the issue focuses on the microeconomics of firm behaviour. It is widely accepted that firm-level scale economies arising from intangible assets or “knowledge capital” provide a rationale 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 (because they favour single-plant as opposed to multi-plant production), an increase in FDI flows can also arise as a result of technologically-induced changes in the ratio of firm-level to plant-level scale economies; Brainard (1997).

While increased FDI flows can arise for either of these reasons, these processes have no implications for the FDI-to-GDP ratio once adjustment to the new equilibrium 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. We speculate that the kinds of products for which knowledge capital is important are characterised by high income elasticities of demand and, as such, price effects notwithstanding, these products attract an increasing share of total expenditure. As growth occurs their share of total production 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 as GDP itself increases.

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 states our empirical hypothesis succinctly. Section 4 reviews the arguments on the sectoral location of FDI activity and identifies the FDI-intensive sub-sectors within both manufacturing and services. Section 5 then employs EU and US data to illustrate the increasing share in expenditure accounted for by the output of these sub-sectors. Section 6 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)

It is clear that the FDI of recent decades is of a different nature to that of earlier times. 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. The vast bulk of today's FDI is between developed countries, on the other hand, and is associated with a different basket of goods.<sup>1</sup> Our hypothesis refers only to this more recent basket of goods.

That the FDI-to-GDP ratio has grown in recent decades 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>1996-2000</b>
<b>FDI inflows</b>	10.2	15	23.6	20	40.1
<b>FDI inward stock</b>			15.6	9.1	17.9
<b>Cross-border M&amp;As</b>			26.4	23.3	49.8
<b>Gross product of foreign affiliates</b>			18.8	6.7	12.9
<b>GDP</b>	8.4	15.2	11.5	6.5	1.2

Source: Grimwade (2000) for 1960s and 1970s; UNCTAD (2002).

### **3. The Hypothesis**

The basic point of the present paper can be stated as follows. Assume the economy consists of two sectors *i* and *j*. Letting FDI and *Y* stand for the total levels of FDI and GDP, and  $FDI_x$  and  $Y_x$  for the levels of FDI and GDP arising in sector *x*, it is clear that:

$$FDI/Y = (FDI_i/Y_i) Y_i/Y + (FDI_j/Y_j) Y_j/Y$$

Most analyses, including Markusen's, imply that the growth in the FDI-to-GDP ratio is driven by increasing FDI levels within sectors – i.e. by growth in  $FDI_i/Y_i$  and

<sup>1</sup> The same point is made by Chandler (1990, tables 14 and 15) who shows that the number of US industrial enterprises establishing operations in the UK and in Germany grew modestly in the decades from 1900 to the 1950s and exploded thereafter.

$FDI_i/Y_i$ . Let us assume to the contrary however that these levels are constant. If this is so, then differentiation yields:

$$d(FDI/Y) = (FDI_i/Y_i) d(Y_i/Y) + (FDI_j/Y_j) d(Y_j/Y) = [(FDI_i/Y_i) - (FDI_j/Y_j)] d(Y_i/Y)$$

Our point is that even if FDI intensities within sectors –  $(FDI_i/Y_i)$  and  $(FDI_j/Y_j)$  – are constant, the ratio of FDI to GDP will still grow as long as the sector with the expanding share in GDP is more FDI-intensive than the sector with the contracting share.

It is this that we wish to demonstrate empirically.

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

We use two methods of pinpointing the FDI-intensive sectors within manufacturing. We will then turn our attention to services.

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 (1998) concurs, noting that the FDI-intensive sectors will be ones in which in which knowledge capital such as “patents, blueprints, formulae, managerial and work procedures, marketing knowledge, reputations and trademarks” are important. Our first method then focuses on identifying which sectors are characterised by high R&D and advertising intensities.

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.<sup>2</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

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<sup>2</sup> The UK is used as it is the only EU country with appropriately comprehensive advertising-intensity data by sector.

100 NACE 3-digit sectors Davies and Lyons classify 13 as Type A, 22 as Type R and 9 as Type AR. These sectors are listed in Table 3 below.<sup>3</sup>

**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.

Our second method of pinpointing the FDI-intensive manufacturing sectors uses a higher level of aggregation, based on US data, and adopts the methodology of Ekholm and Midelfart-Knarvik (2003), as illustrated in table 4. The first column of Table 4 shows the share of total sales of US MNEs that consists of foreign-affiliate sales, and the second column shows the share of US industry GDP that is made up of

<sup>3</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 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.



the gross product of US affiliates of foreign firms.<sup>4</sup> Both measures are above average for only four sectors, viz. (i) Petroleum and Coal Products, (ii) Chemicals, (iii) Electronics and (iv) Transportation Equipment. These sectors can therefore be taken to be the FDI-intensive ones.<sup>5</sup>

**Table 4:** Foreign Affiliates' Share of US MNE Total Sales and Share of US GDP accounted for by affiliates of non-US firms in the US, 1998

	Foreign Affiliates' Share of US MNE Total Sales	Share of US GDP accounted for by affiliates of non-US firms in the US
<b>All industries</b>	<b>33</b>	<b>5</b>
Petroleum and coal	59	80
Food, beverages and tobacco	31	11
Textiles, apparel and leather	21	6
Chemicals	45	25
Non-metallic mineral products.	26	31
Primary and Fabricated metals	26	18
Plastics and Rubber Products	32	17
Machinery	36	1
Electronic Products	48	17
Transportation Equipment	36	22
Wood Products	24	2
Paper	32	11
Printing	15	3
Wholesale Trade	26	8
Retail trade	10	3
Finance and real estate	22	3
Professional services	36	2

Source: calculations based on Bureau of Economic Analysis data.

Both of the Ekholm and Midelfart-Knarvik (2003) measures yield fairly low values for the service sectors. As they point out however, a large share of affiliate sales in manufacturing sectors is likely to consist of sales of services rather than of goods

<sup>4</sup> Dunning, Kim and Lin (2001) use an equivalent method – focusing on the data in the first column only – to identify the “created asset”-intensive sectors upon which their analysis is based.

<sup>5</sup> In what follows we confine ourselves to the last three manufacturing sectors as production data for Petroleum and Coal Products are not readily available. The most recent Irish Census of Industrial Production reveals that 64% of foreign-industry employment is in these three sectors compared to only 16% of indigenous-industry employment.

To determine the FDI-intensive services sectors we therefore use a different set of data sources that focus specifically on services. The available FDI and production data yield information on 4 services sectors: (i) finance and business activities (which is the equivalent of the FIRE sub-sector – Financial Institutions, Insurance, Real Estate and Business Services – in the output data), (ii) wholesale and retail trade, restaurants and hotels, (iii) transport, storage and communications, and (iv) other services.

FDI-intensive services sectors will be those for which  $FDI_j/Y_j > FDI_s/Y_s$ , where the subscript  $s$  refers to aggregate values for services. Of these 4 sectors only Finance and Business Activities emerges as FDI-intensive.<sup>6</sup>

### **5. Product Characteristics of the Output of FDI-Intensive Sectors**

Our hypothesis is that the demand characteristics of the types 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-elasticity-of-demand products.<sup>7</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 the FDI-intensive manufacturing 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.

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

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<sup>6</sup> The value of  $(FDI_j/Y_j)/(FDI_s/Y_s)$  for finance etc. rises from 1.5 to 3 between the late 1980s and the late 1990s, the value for trade etc. remains at 0.6, the value for transport etc. rises from 0.02 to 0.1 and the value for other services rises from 0.35 to 0.56. The data on services as a share of GDP come from UNCTAD (1991 and 2001b); data on the output shares of the services sub-sectors come from OECD (2001) and data on sub-sectoral FDI shares come from UNCTAD (2001a).

<sup>7</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 characteristic 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.

some consistent trade and production data for EU and US manufacturing however, and these two regions account for the bulk of FDI in the world economy today.<sup>8</sup> If US and EU supply is sufficiently close to apparent consumption (i.e. production plus imports minus exports), we can view them as closed economies as far as FDI-intensive goods are concerned, and thereby treat production value as a reasonably accurate measure of expenditure on these goods.

Table 5 below confirms that this is the case. For the year to which the data refer, 1995, the gap between EU and US production of and expenditure on the output of the FDI-intensive manufacturing sectors is less than 5 percent.<sup>9</sup>

**Table 5:** Trade Surplus as a Share of Production for FDI-intensive sectors, 1995.

<i>Methodology</i>		
Davies and Lyons	EU15	4.65
Ekholm and Midelfart-Knarvik	EU15	3.3
..	US	-4.5

**Source:** Production data from the Daisie database, 1995, coded according to NACE Rev 1. Trade data from Eurostat Comext database, 1995, and UN Trade Statistics.

Unfortunately, as the services-sector data yield measures of value added rather than production, we cannot carry out an equivalent analysis for the services sector of interest. This might not be overly problematic however, given the presumption that services are less tradable internationally than manufactured goods.

Table 6 shows that the Davies-Lyons sectors have indeed expanded as a share of EU and US production (and, by implication, of consumption) over time. The first three rows in the table 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

<sup>8</sup> In 2001 for example, they accounted for 58 percent of the world's inward FDI stock and 74 percent of the outward stock.

<sup>9</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. A cursory inspection of the data reveals that 1995 is not an atypical year however.

EU ), and in terms of the time periods considered, because of the changes made to the NACE coding system in the early 1990s.<sup>10</sup>

No matter which group of countries we look at or which coding system is used, the share of advertising- and R&D-intensive sectors is seen to rise over time.

**Table 6:** Shares of Davies-Lyons sectors in Total Production

	NACE 70			NACE Rev 1	
	1975	1982	1990	1990	1997
<b>EU9</b>	37.6		51.8	42.9	44.6
<b>EU12</b>		48.1	51.1	42.4	44.3
<b>EU15</b>				41.2	43.8
<b>US</b>				45.1	49.9

Note: EU9 refers to the six original member states plus the UK, Denmark and Ireland; EU12 = EU9 + Greece, Spain and Portugal, and EU15 = EU12 + Austria, Sweden and Finland.

Source: Eurostat Structure and Activity of Industry (for NACE 1970) and Eurostat DAISIE (for NACE Rev1).

Next we turn our attention to the more aggregate manufacturing sectors classified as FDI-intensive according to the Ekholm and Midelfart-Knarvik methodology. Table 7 shows the equivalent data for this group of sectors, comprising Chemicals, Electronics and Transport Equipment.

Again we see that the share of FDI-intensive sectors, classified according to this alternative methodology, rises over time in both the EU and the US

**Table 7:** Share of Production of FDI-intensive sectors classified according to the Ekholm and Midelfart-Knarvik methodology.

	1985	1990	1993	1994	1996	1997
EU15		<b>30.24</b>			<b>31.59</b>	<b>32.32</b>
US	<b>37.89</b>				<b>39.33</b>	<b>41.67</b>

Source: Daisie database.

<sup>10</sup> We adopt Altomonte's (2000) recoding of the Davies and Lyons sectors in line with NACE Rev 1. 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.

We earlier identified Finance and Business Activities (FIRE) as the FDI-intensive sub-sector within services. As with the advertising and R&D-intensive manufacturing sectors however, the precise make up of this category changed in the 1990s with the switch from ISIC Rev 2 to ISIC Rev 3. As Table 8 shows, however, FIRE as a proportion of total services value added grew throughout the entire period under discussion, in both the EU and the US.

**Table 8:** Share of FIRE in Total Services – ISIC Revs 2 and 3

	FIRE as % of Total Services GVA (ISIC Rev 2)				(ISIC Rev 3)	
	1970	1982	1994	1997	1995	1998
EU8	19.76	27.72	31.38		40.41	41.49
EU11		27.16	30.11		39.43	40.43
EU14		27.10	31.20		39.11	40.08
US	29.31	33.28	36.45	38.69		

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

Notes: EU8, 9 and 11 = EU – Ireland .

It will be clear that a corollary of what we have shown is that the share of total FDI accounted for by the FDI-intensive sectors is rising. This can be seen directly by comparison of the data shown for 1988 and 1999 in UNCTAD (2001; Annex table A.ii.4) where the share in both developed country and world FDI stocks of the FDI-intensive sectors – defined here as Finance and Business Activities plus Chemicals, Electronics and Transportation Equipment (as sufficiently disaggregated data allowing identification of the Davies and Lyons sub-sectors is unavailable) – rises substantially, whether measured as inward or outward FDI stocks.<sup>11</sup>

## 6. 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 at least, the fact that post-war FDI within the developed world 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

<sup>11</sup> For developed countries, the share of these sectors in the inward stock rises by 8.2 percentage points, and in the outward stock by 15.3 points. For the entire world economy, the share in the inward stock rises by 4.4 points and in the outward stock by 15 points.

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 products and services which are conducive to FDI activity do indeed account for a growing share of total EU and US expenditure.

An important policy issue concerns the factors that allow firms and countries to break into these sectors. Caves (1996) presents a review of the literature on how and why particular firms become multinationals, while corporate strategy textbooks focus on the determinants of success in these fields. Barry (2003) discusses the range of factors that has allowed Ireland to become the most attractive location in the EU for foreign manufacturing-sector multinational firms.

The findings of the present paper 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 of a diversion of FDI flows to the east. Braconier and Ekholm (2001) have shown for example that the opening-up of Central and Eastern Europe has already diverted Swedish multinational activity away from Southern Europe, while Barry (2003) suggests 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 aggregate FDI in two ways. 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 FDI-intensive sectors 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. The historical evidence adduced by Dunning (1997a,b) and the recent findings of Pavlin

and Barry (2003) – that the coming into being of the Single Market increased the average number of EU countries in which leading firms located production plants – also support this more optimistic assessment.

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