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The market disciplining effects of FDI: Does the mode of entry matter?

by

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Abstract

We investigate both theoretically and empirically the competitive discipline effect exerted by FDI on plant-level price-cost margins. Using plant level data for manufacturing industries in the United Kingdom we find robust evidence supporting our theoretical predictions: greenfield FDI has a discipline effect on margins, whilst acquisition FDI increases price-cost margins.

JEL classification: F2, L1, L6

Keywords: Greenfield FDI, Acquisition FDI, Price-Cost Margins, Price Effect, Efficiency Effect

Outline

1. *Introduction*
2. *Effects of Inward FDI on Domestic Firms' Profits*
3. *The empirical model*
4. *Analysis of results*
5. *Conclusions*

Non-Technical Summary

It is well established in the literature that imports can play an important role in fostering competitive discipline among domestic producers through lowering price-cost margins. Surprisingly, however, while economic integration has increasingly taken the form of foreign direct investment (FDI), rather than that of trade, little work has been done to study the impact of FDI on the profitability of domestic firms. Our paper seeks to fill this gap in the literature by providing a systematic analysis of the link between inward FDI and price cost margins in the host country. In particular we provide a theoretical and empirical analysis of the market discipling effects of inward FDI distinguished by its mode of entry. To motivate our study we discuss a simple theoretical background which, in a nutshell, suggests a negative impact of greenfield-FDI on firms' price-cost margins and a positive impact for acquisition-FDI. Based on this prediction, we then carry out an empirical analysis using data for manufacturing plants in the UK over the period 1991-2001.

Our paper circumvents the shortcomings of earlier papers by using plant-level data, which is arguably the most appropriate unit of observation for this type of study, and distinguishing between greenfield and acquisition FDI. In our empirical model we deal with the potential endogeneity of FDI and other covariates by using efficient generalized method of moments (GMM) estimation technique.

We find that greenfield FDI dampens price-cost margins, whilst acquisition FDI does increase them. So the disciplining effect that enhances competition is found only for greenfield-FDI, and this is more pronounced in less concentrated industries. These results have important implications for research and policy makers. Firstly, they suggest that it is imperative to distinguish FDI into greenfield and non-greenfield, rather than treat it as a homogenous entity. Otherwise opposing effects could cancel out and might give a distorted picture of the situation. Secondly, beside the relationship between inward FDI and domestic productivity that has been stressed in recent academic and policy works, it is also important to focus on the market discipling effects of FDI, as these have direct bearing on the design of policies aimed at fostering industrial competition in the host economy.

I Introduction

It is well established in the literature that imports can play an important role in fostering competitive discipline among domestic producers through lowering price-cost margins.[1] However, economic integration has increasingly taken the form of foreign direct investment (FDI), rather than that of trade. According to the UNCTAD *World Investment Report 2005* the value of the aggregate production of multinational firms in host countries nowadays outweighs aggregate exports.[2] It is therefore surprising that, relatively to the literature on trade and price-cost margins, little work has been done to study the impact of FDI on the profitability of domestic firms. Our paper seeks to fill this gap in the literature by providing a systematic analysis of the link between inward FDI and price cost margins in the host country. In particular we focus on the question as to whether the market disciplining effects of FDI vary according to its mode of entry.

To motivate our study we develop a simple theoretical model which, in a nutshell, suggests a negative impact of greenfield-FDI on firms' price-cost margins and a positive impact for acquisition-FDI. Based on this prediction, we then carry out an empirical analysis using data for manufacturing plants in the UK over the period 1991-2001.

Although there is a recent buoyant literature on the effects of FDI, in particular on productivity and technological spillovers of domestic firms (Görg and Greenaway, 2004), there is little investigation of the direct effects of FDI on price-cost margins (used in the empirical literature to gauge the degree of competitiveness in an industry or market). To the best of our knowledge only two studies [Co (2001) for the US and Sembenelli and Siotis (2005) for Spain] have addressed this issue in any detail.

Co (2001) makes the distinction between grenfield and non-greenfield FDI, but is only able to use aggregate industry level data. By contrast, Sembenelli and Siotis (2005) use firm-level data but only consider aggregate FDI, not distinguishing the two forms of investment. Our paper circumvents the shortcomings of these papers by using plant-level data, which is arguably the most appropriate unit of observation for this type of study, and distinguishing between greenfield and acquisition FDI. In our empirical model we deal with

[1] For example, Pugel (1980) and Geroski and Jacquemin (1981) propose models in the context of an open oligopoly where competitive imports constrain the ability of domestic oligopolists to charge a high price and extract monopoly profits in the domestic market, predicting that imports and domestic price-cost margins are negatively related. The empirical evidence generally finds evidence for this relationship; see, e.g., Levinsohn (1993), Harrison (1994), Katics and Petersen (1994) and Krishna and Mitra (1998). However, there are some exceptions, e.g., Zaralis (1991), Ståhlhammer (1991) and Co (2001).

[2] For example, in 2004 the sales of foreign affiliates were 18677 billions of dollars, whereas exports of goods and non-factor services were 11069 billions (cfr. table I.3, p. 14, of the mentioned UNCTAD Report).

the potential endogeneity of FDI and other covariates by using efficient generalized method of moments (GMM) estimation technique.

The remainder of the paper is organised as follows. In section II we provide a theoretical motivation for our empirical analysis by analysing the effects of inward FDI on rival firms' profits. In section III we specify the empirical model while we present our main findings in Section IV. Section V concludes. A detailed description of the data used can be found in the appendix.

II Effects of Inward FDI on Domestic Firms' Profits

To provide a motivation for our empirical analysis we outline a short theoretical background concerning the link between the two types of inward FDI and profitability in this section. In order to focus ideas we may think of a particular theoretical set up to tease out the relevant effects. To this end, consider a foreign firm's entry decision into a host-country product market that is populated by $N-1$ local firms. Assume that, historically, the foreign firm has served the product market by exporting from a plant elsewhere, which incurs a specific trade cost of t and that it has just acquired (at the start of our analysis) the "competence" to operate a production plant in the host country (i.e. to undertake FDI). In this set up, we could study the following two-stage game. At stage 1, the foreign firm chooses how to serve the host-country market: continuing to export (X), greenfield-FDI (G), or acquisition-FDI (A). Both FDI strategies eliminate the trade cost from the firm's marginal cost. The G strategy incurs a plant fixed cost of F. Under A, the foreign firm makes a single host-country incumbent a take-it-or-leave-it offer.[4] If its acquisition offer is rejected, the MNE selects its preferred candidate of X and G. In stage 2, market equilibrium is established via either Cournot or Bertrand competition.

Even before solving our game for its subgame perfect Nash equilibrium (i.e. the firm's optimal decision), we can show, for a broad class of demand and cost specifications, how the effects of the two forms of FDI on local firms' equilibrium price-cost margins and profits contrast:

> **Proposition.** *If the system of demand functions is linear and symmetric across firms, and marginal costs are constant, then for both Cournot and Bertrand competition in the market stage: (i) a switch by the MNE from exporting to greenfield-FDI cuts local firms' equilibrium price-cost margins and profits; and (ii) a switch by the MNE from exporting to acquisition-FDI raises local firms' equilibrium price-cost margins and profits.*

The Proposition invokes standard assumptions from theoretical modelling in industrial organization, and the results are well known.[3] Part (i) follows because greenfield-FDI reduces the firm's marginal cost by t.[4] This makes the MNE more aggressive on the product market (with a higher equilibrium quantity under Cournot and a lower equilibrium price under Bertrand), which shifts the local firms' residual demand functions inwards and cuts their equilibrium prices. It is, of course, quite intuitive that firms are harmed if a rival's marginal cost falls.[5] Part (ii) follows from well-known results in the literature on horizontal merger. For both Cournot and Bertrand competition, "outside" firms benefit from horizontal merger (Salant, Switzer and Reynolds, 1983; Deneckere and Davidson, 1985). In an attempt to prevent "cannibalization," the insiders are less aggressive following merger (with a lower equilibrium quantity under Cournot and a higher equilibrium price under Bertrand), which shifts the ("outside") local firms' residual demand functions outwards and increases their equilibrium prices.[6] The robustness of the results in the Proposition to changes in the strategic variable in the market stage is particularly useful for our empirical work because, in reality, the mode of product market competition is unobservable.

Starting from this model we can derive the firm's optimal choice. Given that the subsequent empirical analysis only considers the link between FDI and price cost margins, this is relegated to the Theory Appendix.

Determining the effect of greenfield and non-greenfield FDI is hence an empirical issue, to which we turn in the next section.

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[4] We do not allow the MNE to purchase more than one firm, perhaps because the sunk costs of administering anything more complex than a two-firm merger are prohibitive. Our formulation implies that an acquisition will occur in equilibrium whenever it generates a "surplus" over the combined "disagreement profits" of the MNE and target.

[3] Indeed, the conditions in the Proposition are sufficient for its results. Martin (2002, section 3.6) reviews two of the most widely-adopted specifications for demand when firms' products are differentiated (Bowley and Shubik-Levitan), both of which are consistent with the Proposition. Note that the Proposition does not rest on the assumption that firms' marginal costs are identical.

[4] This implicitly assumes that marginal production costs are independent of location. The necessary requirement for part (i) is that greenfield-FDI cut the MNE's overall marginal cost; due to plant fixed costs, this is also necessary for greenfield-FDI to arise in equilibrium. Motta (1992) provides a simple model of greenfield-FDI along these lines.

[5] Note that our simple theoretical analysis ignores potential productivity Spillovers between local firms and the MNE's branch plant. For example, if local firms received productivity Spillovers from the MNE's (high productive) plant following greenfield-FDI, then their price-cost margins could rise following greenfield entry. However, these more complex effects are unnecessary to account for the patterns in our data.

[6] Part (ii) implicitly assumes that acquisition-FDI has only "market power" effects. If "synergies" between MNE and target significantly reduce marginal production costs, then local firms might be harmed (Davidson and Ferrett, 2005 present a model of horizontal merger along these lines).

III The empirical model

To investigate empirically the market disciplining effect of FDI we propose to estimate the following model:

$$PCM_{it} = \beta_1 FDI_{jt} + \beta_2 Z_{jt} + \beta_3 X_{it} + \gamma_t + \varepsilon_{it} \qquad i=1, \ldots, N \quad t=1, \ldots, T \qquad (1)$$

where i indexes plants and t time. PCM_{it} is a measure of price cost margins, FDI_{jt} are measures of greenfield and acquisition FDI in i's industry j, Z_{jt} and X_{it} are vectors of industry and plant level controls, respectively, γ represents time specific effects (captured with a full set of time dummies) and ε is the remaining error term. We estimate equation (1) with and without the inclusion of industry dummies at three-digit level, to capture possible time invariant industry characteristics and within-industry correlation.

Arguably the FDI variables are endogenous as inward investment tends to locate in those industries with higher price-cost margins (e.g., Tybout, 2000). While the inclusion of industry dummies goes some way towards correcting for this, we also instrument for FDI (and some other covariates as discussed below) and estimate equation (1) using an efficient two-step generalized method of moments (GMM) estimator as described in detail by Baum et al. (2003). This estimator is the most efficient one in the presence of arbitrary heteroskedasticity and intra-group correlation.[9]

The empirical analysis uses plant level data from the Annual Respondents Database (ARD) for manufacturing plants in the United Kingdom. The dataset consists of individual establishments' records underlying the Annual Census of Production and the data used cover the period 1991 to 2001. Barnes and Martin (2002) provide a useful introduction to the ARD. A detailed description of the characteristics of the data, and summary statistics, can be found in the data appendix.

The price-cost margin is calculated at the plant level, as suggested by, e.g., Domowitz *et al.* (1986), De Ghellinck *et al.* (1988), and Co (2001) as

$$PCM = \frac{VA - W}{Y}$$

where VA is value added, W is the total payroll and Y is output defined as the sum of value added and the cost of intermediate inputs.[7]

[7] We did not estimate Roeger's (1995) type of markup based on an elaboration of the dual Solow residual because that approach would have constrained us to estimate a common slope coefficient for the Lerner index, resulting in a common markup across all plants. Here, having the price-cost margin on the LHS of the estimating equation allows the heterogeneity in price-cost margins, shifting the burden of a common slope on the RHS terms explaining the price-cost margins.

In the data we can observe the number of new foreign investments in the UK. A new foreign greenfield investment is defined as a new plant (i.e., non-existent in *t*-1) with a "foreign" nationality identifier. Also, we can identify acquisitions of domestic firms by foreign owners as plants that change ownership from domestic to foreign. More specifically, given that for each plant we can observe the change in nationality of ownership and each plant is uniquely identified through an identifier number, the plants that do keep the same identifier but change the ownership from domestic to foreign are defined as foreign acquired, whilst those foreign plants that enter the dataset for the first time are defined as greenfield.[11] Based on the count of new greenfield and acquisition investments we then construct the FDI indices as the ratio of the employment of those foreign-owned firms involved in either acquisition (ACQV) or greenfield investment (GFV) over total employment in each industry.[8]

Table 1 shows the pattern of FDI occurrences during the period of our study, and a further table showing the number of FDI occurrences by two-digit industry can be found in the data appendix.

[Table 1 here]

In order to identify the effect of inward FDI on margins we employ a number of control variables at the industry and plant level. We include a measure of openness to trade (OPEN) of the industry, which has been found in the literature to be important for explaining price-cost margins. We define our variable OPEN as imports divided by the sum of imports and exports. As explained in De Ghellick *et al.* (1988) this variable measures the state of the commercial balance. As OPEN approaches zero, the industry is characterised by an absence of imports; as OPEN approaches 1, exports fall to zero; and as OPEN reaches 0.5, intra-industry trade characterises the industry.

We also control for the market share (MS) of a firm and the level of concentration in the industry, measured as the Hirschman-Herfindahl index (HHI). These two variables are crucial when modelling the price-cost margins at firm or plant-level. The theoretical foundation for the profit-market share (or HHI) relationship was provided by the generalised Cournot model by Cowling and Waterson (1976). When data are at firm or plant level the literature estimating price-cost margins includes the Herfindahl index in

[8] We use employment instead of production to avoid the problem of inflated output when firms engage in transfer-pricing.

addition to the market share.[9] We therefore experimented with both measures, keeping the specification with market share as our baseline.

The market shares (which are also used to calculate the HHI) are in terms of employment, not sales, again in order to avoid any distortions through transfer pricing. It is important to point out that the market shares are calculated at the firm level instead of plant level, aggregating therefore all the plants operating in the same industry under the same common firm's organisation. It seems sensible to assume that a multi-plant firm would practise the same pricing policy in all its plants that belong to the same industry.

A further industry level variable included in the estimation is turbulence. This is calculated as the sum of entrants and exitors in the industry for each year divided by the number of plants within that industry (see Beesley and Hamilton, 1984). The higher the plant turnover in an industry the more dynamic and, therefore less prone to collusive agreements, it should be. The expected relationship between turbulence and profitability is thus negative.

The estimation also contains a number of controls at the plant level. These are labour productivity, capital-output ratio, and a nationality dummy. Labour productivity is calculated as real value added per worker.[10] While this variable is not usually found in empirical estimations of price-cost margins we feel it is important to isolate price effects from efficiency or cost effects. Tougher competition could result in either lower prices, and therefore lower margins (a *price effect*), or increased efficiency and therefore lower costs and higher margins (an *efficiency effect*).[11] The capital-output ratio (*Kor*) at the plant level is calculated as real plant and machinery capital stock divided by real gross output. It is included in the regression as a proxy of capital intensity to reflect barriers to entry. The definition of price-cost margin assumes a constant marginal cost and therefore the numerator of PCM is equal to the value of output minus variable costs, so price-cost margin contains also fixed costs, like the cost of capital and advertising expenses. To neutralise

[9] For example Sembenelli and Siotis (2005) include both, or just market share, Feeny *et al.* (2000) include both.

[10] We preferred this simple measure of labour productivity instead of estimating the more complex total factor productivity since TFP is difficult to measure and there is no consensus on which is the optimal way of estimating it.

[11] A more formal theoretical justification for including labour productivity in a price-cost margin regression could be broadly retraced in Bernard *et al.* (2003), who develop a model of international trade that comes to grips with what goes on at the producer level. They introduce heterogeneity across plants through differences in technological efficiency. Under imperfect competition any change in efficiency is translated into a change in measured productivity, so efficiency and productivity are associated with a positive relationship and they are related to the markup. Note also that in Bernard *et al.* (2003) productivity is measured as the value of output per unit input, i.e. value added per worker, as in our empirical model.

their inclusion in the margins, the literature suggests including capital intensity and advertising intensity in the analysis (Geroski, 1981; Gupta, 1983).

We also include a dummy variable that takes the value of 1 if the ownership of the plant is foreign, and 0 if domestic. This serves to control for the different structural characteristics that usually distinguish foreign MNEs and domestic firms. Finally, we include a dummy variable for plants located in areas receiving government support for its development. Since these areas are relatively underdeveloped, the dummy variable is expected to attract a negative coefficient.

In addition to the above variables, in all specifications we included one-period lagged values of GF and ACQ, and a series of interaction terms between HHI and OPEN, HHI and labour productivity, and HHI and each FDI variable. For example the presence of the interaction terms of FDI with the Herfindahl index is meant to capture differences in the effect of FDI across industries with varying degrees of concentration. A negative coefficient would imply that FDI would have larger competitive effects in more concentrated industries.[17]

In applying the GMM estimator we instrument the FDI variables, OPEN and HHI at the industry level and plant-level labour productivity, as these regressors are arguably endogeneous.[12] As instruments we use lags of the endogenous variables as well as three external instruments: minimum efficient scale, cost-advantage ratio and industry growth. Minimum efficient scale (MES) in the industry is calculated as the average size, in terms of value added, of the largest firms accounting for 50% of industry value added. As pointed out in Zaralis (1991) MES is not generally included in profitability studies as it is a determinant of concentration. This makes it an ideal instrument for HHI. The Cost Advantage Ratio (CDR) is defined as value added per worker in the smallest enterprises accounting for 50 percent of industry employment, divided by the value added per worker in the largest enterprises accounting for 50 percent of industry employment. As argued in Zaralis (1991), CDR is a proxy for the slope of the long-run average-cost curve at small scale. Finally, market growth (GROWOUT) captures short-run changes in demand and it is calculated as the annual change in industry output divided by the lagged output.

IV Analysis of Results

[17] See Geroski and Jacquemin (1981) for theoretical support for such a specification in the context of the margins-imports nexus.
[12] These relationship of endogeneity are explored in the theory appendix.

The results of the estimations using the GMM estimator (with clustering correction) are reported in Table 2. The validity of the instruments employed in the estimation is supported by Hansen's test for overidentifying restrictions.

The coefficient on OPEN is negative, albeit not statistically significant, but its interaction term with the Herfindahl is negative, and statistically significant. This would appear to suggest that the pro-competitive effect of imports is stronger for more concentrated industries.[19] We uncover strong evidence that labour productivity exerts a positive influence on price-cost margins, suggesting that as plants become more efficient they are able to reduce some costs which translate into higher price-cost margins (a price effect). We also find that foreign owned plants have lower price cost margins than domestic plants, similar to the finding by Sembenelli and Siotis (2005) for Spanish manufacturing firms. By contrast, the effects of market shares, capital-output ratio, turbulence and the assisted area dummy are all short of statistical significance.

Turning now to the impact of inward FDI on price-cost margins, we find that greenfield FDI has a negative impact on margins, while acquisition FDI has a positive and statistically significant contemporaneous effect and a negative and statistically significant lagged effect. Given that the coefficient on lagged term is of lower magnitude in absolute value than the contemporaneous term, the combined effect of acquisition FDI is positive. These results are in line with our theoretical predictions, as set out in Section II, where we showed that the impact of FDI on host country firms' profitability depends on the mode of entry. It appears that greenfield FDI acts as a disciplining device on the competition environment of incumbents firms by adding new productive capacity, whereas acquisition-FDI seems to contribute to the creation of a more concentrated market structure and therefore increases the profitability of the incumbent firms.

It is worth noting that the interaction term of GFV with the Herfindahl index is positive and statistically significant, indicating that as we move towards more concentrated industries the negative impact of greenfield investment on price-cost margins diminishes.[20]

The results reported above do not include a main HHI effect. In order to check their robustness, we re-estimate our model by specifying a direct HHI effect and the findings are reported in column (2) - the results remain largely the same.[21] Another potential concern is that our results on the industry level variables may just reflect the effects of other unobserved industry characteristics that are not controlled for. In order to deal with this issue we include a full set of three-digit industry dummies in the equation in column (3). In terms of the FDI variables, the main findings reported earlier carry through.

[Table 2 here]

The sample used thus far includes both domestic and foreign owned plants in UK manufacturing. It is well known that these two types of establishments have different characteristics (e.g., Girma et al., 2001). In a further robustness check we use only the sample of domestic plants in order to check whether our results in Table 2 are not driven by the different characteristics of foreign and domestic establishments. The econometric estimates are reported in Table 3 and it is reassuring to note that the market discipling effects of FDI exhibit the same pattern as discussed above.

[Table 3 here]

V – Conclusions

This paper provides a theoretical and empirical analysis of the market discipling effects of inward FDI distinguished by its mode of entry. It reports that greenfield FDI dampens price-cost margins, whilst acquisition FDI does increase them. So the disciplining effect that enhances competition is found only for greenfield-FDI, and this is more pronounced in less concentrated industries

These results have important implications for research and policy makers. Firstly, they suggest that it is imperative to distinguish FDI into greenfield and non-greenfield, rather than treat it as a homogenous entity. Otherwise opposing effects could cancel out and might give a distorted picture of the situation. Secondly, beside the relationship between inward FDI and domestic productivity that has been stressed in recent academic and policy works, it is also important to focus on the market discipling effects of FDI, as these have direct bearing on the design of policies aimed at fostering industrial competition in the host economy.

Tables

Table 1 – Number of FDI occurrences per year

	Greenfield occurrences	**Acquisition occurrences**
1991	266	283
1992	189	217
1993	156	191
1994	1159	103
1995	1080	113
1996	915	509
1997	838	217
1998	626	377
1999	803	316
2000	530	494
2001	826	1026
Sub-total	**7388**	**3846**
Total FDI	**11234**	

Table 2 - Impact of Greenfield- vs. Acquisitions-FDI on All Plants Using Efficient GMM estimator

Dependent variable PCM	(1)	(2)	(3)
Market Share	0.0575	0.0932*	-0.0106
	(0.0527)	(0.0510)	(0.0512)
HHI_t		-0.8307	
		(0.5700)	
Lab_prod_t	1.2878***	1.3308***	2.019***
	(0.2632)	(0.2355)	(0.4185)
Lab_prod_t * HHI_t	1.0758	1.5994	0.4836
	(1.5852)	(1.6717)	(1.7180)
$OPEN_t$	-0.0573	-0.1694**	-0.1588
	(0.0769)	(0.0806)	(0.3787)
$OPEN_t$ * HHI_t	-2.1900***	-0.5213	-0.5276
	(0.5862)	(0.8498)	(0.3281)
GFV_t	-3.0024***	-5.9488***	-5.9517***
	(0.7077)	(1.2176)	(1.8748)
GFV_{t-1}	-0.2798	-1.7508***	-1.1391***
	(0.1928)	(0.4376)	(0.4054)
$ACQV_t$	2.4714***	1.1404***	2.7265***
	(0.8133)	(0.4077)	(0.7220)
$ACQV_{t-1}$	-0.2887**	-0.0767	0.2813
	(0.1213)	(0.1229)	(0.1686)
GFV_t * HHI_t	57.9897***	99.5845***	97.2347***
	(12.5336)	(20.0814)	(23.2648)
$ACQV_t$ * HHI_t	8.3217	15.5610***	-2.7962
	(7.3767)	(5.7073)	(5.6924)
Kor_t	-0.0001	-0.0002	-0.0001
	(0.0001)	(0.0001)	(0.0001)
$Turbulence_t$	-0.0096	-0.0572**	-0.0487**
	(0.0282)	(0.0283)	(0.0203)
Ass_area_t	-0.0034	-0.0023	-0.00037
	(0.0027)	(0.0027)	(0.0020)
Foreign	-0.0627***	-0.0532***	-0.0425***
	(0.0099)	(0.0080)	(0.0055)

3-digit industry dummies			✓
Number observations	70197	68617	70197
Number of plants	25874	25718	25874
Hansen's J test over-identifying restrictions (p-value)	0.0610	0.4803	0.2219
R-squared	0.1879	0.1646	0.2210

Standard errors are in brackets. The goodness-of-fit measure is calculated as in Windmeijer (1995) by taking the square of the correlation between the predicted level of price-cost margins and the actual ones. For IV regressions this is equivalent to the standard R^2 for OLS regressions. Time dummies and constant not reported.

Variables instrumented: Lab_prod_t, $Lab\_prod_t * HHI_t$, MS_t, (HHI_t), $OPEN_t * HHI_t$, GFV_t, $ACQV_t$, $GFV_t * HHI_t$, $ACQV_t * HHI_t$.

Instruments: Lab_prod_{t-1}, $Lab\_prod_{t-1} * HHI_{t-1}$, kor_t, kor_{t-1}, $OPEN_{t-1}$, $turbulence_t$, $foreign_t$, ass_area_t, MS_{t-1}, HHI_{t-1}, (HHI_{t-2}), GFV_{t-1}, $GFV_{t-1} * HHI_{t-1}$, GFV_{t-2}, $ACQV_{t-1}$, $ACQV_{t-2}$, $ACQV_{t-1} * HHI_{t-1}$, MES_t, $GROWTHOUT_t$, CDR_t, and the time dummies (and industry dummies where indicated).

Table 3 - Impact of Greenfield-FDI vs. Acquisitions-FDI on Domestic Plants

Dependent variable PCM	**(1)**	**(2)**
Market Share	0.0703	0.0961**
	(0.0502)	(0.0462)
HHI_t		-0.7828
		(0.6264)
Lab_prod_t	2.0860***	2.0807***
	(0.4590)	(0.4524)
Lab_prod_t * HHI_t	-1.1875	-1.8399
	(1.8757)	(1.7172)
$OPEN_t$	-0.0071	-0.2304
	(0.1103)	(0.2299)
$OPEN_t$ * HHI_t	-0.5639**	0.8800
	(0.2423)	(1.1463)
GFV_t	-5.3622***	-4.5105**
	(1.8959)	(1.9364)
GFV_{t-1}	-1.1180**	-0.9329*
	(0.5027)	(0.5210)
$ACQV_t$	1.8015***	2.1747***
	(0.6680)	(0.7323)
$ACQV_{t-1}$	0.2490***	0.3143***
	(0.0757)	(0.0914)
GFV_t * HHI_t	87.3231***	78.0819***
	(24.5073)	(24.5096)
$ACQV_t$ * HHI_t	-1.1831	-0.3612
	(4.2900)	(4.0503)
Kor_t	-0.0001	-0.0001
	(0.0001)	(0.0001)
$Turbulence_t$	-0.0326*	-0.0328*
	(0.0195)	(0.0180)
Ass_area_t	-0.0026	-0.0022
	(0.0019)	(0.0019)
3-digit indu. dummies	✓	✓
Number observations	56290	54962
Number of plants	21949	21801
Test of over-identifying		

restrictions (p-value)	0.4073	0.3128
R-sq	0.2599	0.2463

Standard errors are in brackets. All the specifications consider plant expansions at the regional level. The goodness-of-fit measure is calculated as in Windmeijer (1995) by taking the square of the correlation between the predicted level of price-cost margins and the actual ones. Time dummies and constant not reported.

Variables instrumented: Lab_prod_t, Lab_prod_t * HHI_t, MS_t, (HHI_t), $OPEN_t$ * HHI_t, GFV_t, $ACQV_t$, GFV_t * HHI_t , $ACQV_t$ * HHI_t .

Instruments: Lab_prod_{t-1}, Lab_prod_{t-1}*HHI_{t-1}, kor_t, kor_{t-1}, $OPEN_{t-1}$, $turbulence_t$, ass_area_t, MS_{t-1}, HHI_{t-1}, (HHI_{t-2}), GFV_{t-1}, GFV_{t-1} * HHI_{t-1}, GFV_{t-2}, $ACQV_{t-1}$, $ACQV_{t-2}$, $ACQV_{t-1}$ * HHI_{t-1} , MES_t, $GROWTHOUT_t$, CDR_t, time dummies and industry dummies (where indicated).

Data Appendix

The data used in this study (except imports and exports) are taken from a longitudinal micro-database, the Annual Respondents Database (ARD) held at ONS (Office for National Statistics). More specifically, we use a plant-level version of the ARD whose detailed description can be found in Harris (2002). The dataset we use includes only manufacturing plants and it is unbalanced. For a discussion of the advantages, from both a methodological and economic point of view, of using plant-level (i.e. local productive unit) data instead of establishment (i.e. reporting unit) data see Harris (2002), where a meticulous description of the sample weighting used is also given. The calculation of sample weights for each establishment (or plant) is of utmost importance because it ensures that the data used reflect adequately the underlying distribution in the population.

Data were deflated to real values using 4-digit producer price indices for outputs and inputs (materials and fuel). Data on imports and exports are at four-digit industry level (SIC rev. 1992) and were calculated from the OECD trade statistics.

Table A1 presents some descriptive statistics for the variables used.

Table A1 – Descriptive Statistics of Main Variables

Variables	Mean	St. Dev.	Median	Obs.
Price-Cost Margins (PCM)	0.1556	0.1606	0.1321	242516
4-digit HH index (HHI)	0.0626	0.0985	0.0295	241964
Total FDI (FDI)	0.0379	0.0555	0.0175	242516
Greenfield FDI (GFV)**	0.0102	0.0256	0.0013	242516
Acquisition FDI (ACQV)**	0.0277	0.0457	0.0109	242516
Imp/(Imp+Exp) (OPEN)	0.5080	0.2907	0.5130	237737
Capital-output ratio (kor)	0.3178	6.5886	0.0910	238153
Labour produc. (lab_prod)	0.0434	10.6547	0.0172	242274
dummy Foreign (foreign)	0.1482	0.3553	0.0000	242516
Min. efficient scale (MES)	53.830	200.098	20.777	242516
turbulence	0.2194	0.0919	0.2032	241999

Output growth (growthout)	1.7496	86.5047	-0.0036	123599
Dummy assisted area	0.3628	0.4808	0	242496
Market share (MS)	0.0558	0.0999	0.0156	242516
Cost disadvantage ratio	1.1431	20.5075	0.8978	242493

Variables PCM, kor, lab-prod, and foreign are at plant-level. The remainder variables are at 4-digit industry level.

Tables A2 and A3 present the distribution of observations by year and 2-digit industry, respectively.

Table A2 – Observations Count by Year

Year	Observations
1991	23725
1992	23051
1993	20244
1994	25085
1995	26928
1996	20400
1997	18164
1998	20472
1999	22232
2000	20823
2001	21392
Total	**242516**

Table A3 – Observations Count by 2-digit Industry

Industry	Observations	Industry	Observations
15 - Food & beverages.	36507	26 – Other non-metallic mineral products	22106
16 – Tobacco	321	27 – Basic metals	6415
17 – Textiles	10866	28 - Fabricated metal products	20060
18 – Wearing apparel, fur manu.	8161	29 –Machinery and equipment	22054
19 – Leather and	2416	30 – Office machinery	2807

leather products		and computers	
20 – Wood and wood products	4667	31 – Electrical machinery and apparatus	9160
21 – Pulp, paper & paper products	7137	32 – Radio, TV and communication equipme.	4414
22 - Publishing, print., & recorded media	23954	33 – Medical, precision, and optical instruments	8421
23 – Coke, refined petrol. & nuclear fuel	543	34 –Motor vehicles, trailers and semi-trailers	7129
24 – Chemicals, man-made fibres	15684	35 – Other transport equipment	4520
25 – Rubber and plastic products	13542	36 – Furniture and manufacturing N.E.C.	11632

Table A4 presents the occurrences of greenfield FDI vs. acquisitions by 2-digit industry.

Table A4 – Number of FDI Occurrences by 2-digit Industry

UK SIC 1992 code	Greenfield occurrences	Acquisition occurrences
15 - Food & beverages.	563	389
16 – Tobacco	10	N.A.
17 – Textiles	139	95
18 – Wearing apparel, fur manu.	92	40
19 – Leather and leather products	N.A	10
20 – Wood and wood products	34	33
21 – Pulp, paper & paper products	263	177
22 - Publishing, print., & recorded media	462	357
23 – Coke, refined petrol. & nuclear fuel	68	N.A
24 – Chemicals, man-made fibres	1239	476
25 – Rubber and plastic products	381	233
26 – Other non-metallic mineral products	639	314
27 – Basic metals	139	116
28 - Fabricated metal products	416	232
29 –Machinery and equipment	982	456

30 – Office machinery and computers	287	66
31 – Electrical machinery and apparatus	394	196
32 – Radio, TV and communication equipment	249	103
33 – Medical, precision, and optical instruments	397	176
34 –Motor vehicles, trailers and semi-trailers	271	181
35 – Other transport equipment	202	92
36 – Furniture and manufacturing N.E.C.	152	94
Sub-total	**7388**	**3846**
Total FDI	**11234**	

Table A5 presents endogeneity tests for selected variables.

Table A5 - Endogeneity Test of Selected Variables

	$OPEN_t$	**GFV_t and $ACQV_t$**	**HHI_t**	**Kor_t**	**$Turbulence_t$**	**foreign**
p-value of Hansen J statistic (overidentification test of all instruments)	0.0000	0.0000	0.1159	0.9619	0.9619	0.8733
Hansen J statistic (equation excluding suspect orthogon. conditions)	0.6542	0.8392	0.8943	0.7868	0.8908	0.6814
p-value of C statistic (exogeneity/orthogonality of suspect instruments)	0.0000	0.0000	0.0171	0.9462	0.8083	0.7490
Conclusions	Endog.	Endog.	Endog.	Exogen.	Exogen.	Exogen.

The tests have been performed using the option 'orthog' of the command ivreg2 in Stata, which allows testing the exogeneity of selected instruments, using the following specification:

Dependent variable: PCM

Variables instrumented: Lab_prod_t, $Lab\_prod_t * HHI_t$, MS_t, HHI_t, $OPEN_t$, $OPEN_t * HHI_t$, GFV_t, $ACQV_t$, $GFV_t * HHI_t$, $ACQV_t * HHI_t$.

Included instruments: kor_t, $turbulence_t$, $foreign_t$, ass_area_t, , GFV_{t-1}, $ACQV_{t-1}$, and the time dummies

Excluded instruments: kor_{t-1}, Lab_prod_{t-1}, $Lab\_prod_{t-1}*HHI_{t-1}$, HHI_{t-1}, HHI_{t-2}, MS_{t-1}, $GFV_{t-2} * HHI_{t-2}$, $ACQV_{t-2} * HHI_{t-2}$, MES_t, $GROWTHOUT_t$, CDR_t, $OPEN_{t-1}$.

The first Hansen J statistic tests the overidentification of all instruments, treating the variable being tested as exogeneous, whereas the second Hansen J statistic treats the variable in question as endogenous.

Theory Appendix: Deriving the firm's optimal choice

When deriving the MNE's optimal choice, we impose three simplifying assumptions. First, the firms' products are homogeneous with demand on the host-country market given by

$$\sum_{1}^{N} q_i = \mu(1-p),$$

where p is price and μ measures "market size." (μ can be interpreted as an index of the number of homogeneous consumers in the host country, all of whom have a reservation price of 1.) Second, marginal production costs are zero in all locations.[13] Third, we assume that Cournot competition obtains on the product market.[14]

The table below shows the firms' profits in Cournot equilibrium when the trade cost is non-prohibitive.[15]

		MNE's profits	**Local Firm's profits**
MNE's choice	Exports	$\mu\left(\frac{1-Nt}{1+N}\right)^2$	$\mu\left(\frac{1+t}{1+N}\right)^2$
	Greenfield-FDI	$\frac{\mu}{(1+N)^2}-F$	$\frac{\mu}{(1+N)^2}$
	Acquisition-FDI	$\frac{\mu}{N^2}$	$\frac{\mu}{N^2}$

[13] Therefore, following *X*, *N* firms compete on the product market: $N-1$ local firms with zero marginal costs and the MNE with a marginal cost of *t*. Following *G* and *A*, there are, respectively, *N* and $N-1$ firms in the market stage, all of whom have zero marginal costs. In addition to enhancing mathematical tractability, this assumption also removes the problem of which acquisition target the MNE chooses. We expect our qualitative results to generalize to the case of differentiated products.

[14] Our qualitative results will not generalize to the case of Bertrand competition. For example, under Bertrand competition with differentiated products, the MNE would optimally choose acquisition-FDI for all parameter values. (This is clear at $t = F = 0$, where acquisition-FDI confers no cost benefits over either *X* or *G* and the results of Deneckere and Davidson (1985) apply, and increases in *t* and *F* merely cut total – i.e. MNE plus target – disagreement profits under, respectively, *X* and *G*.) Davidson and Ferrett (2005) detail, and propose a solution to, the dilemma for the modelling of mergers created by the Cournot/ Bertrand choice.

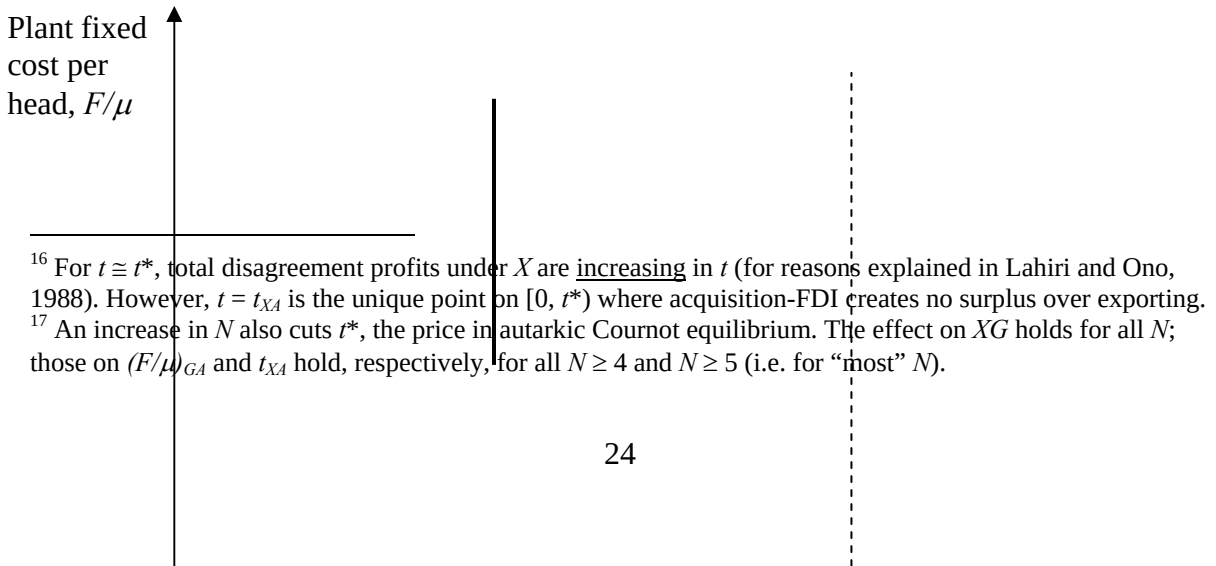
[15] A non-prohibitive trade cost implies that all Cournot equilibria are interior. Note that our results would be unaffected if local firms also had to pay plant fixed costs. However, in that case we would have to respect a break-even condition for local firms.

Figure 1 below shows the MNE's optimal decision in (t, F/μ)-space, where the plant fixed cost F can be interpreted as a measure of economies of scale. Along locus XG the MNE is indifferent between exporting and greenfield-FDI. Below XG, the MNE strictly prefers greenfield-FDI to exporting (and vice versa), and XG's upward slope reflects the strengthening "tariff-jumping" motive for greenfield-FDI as the trade cost rises: an increase in t raises the MNE's reservation price for a local plant. Therefore, below XG, the MNE chooses between greenfield-FDI and acquisition-FDI, and acquisition-FDI arises in equilibrium if it generates a surplus (for the MNE and target). This choice is independent of t (because under both G and A all firms produce locally), but as F/μ rises acquisition-FDI becomes more attractive: a "substitution effect" from greenfield- to acquisition-FDI as the plant fixed cost rises. At $F/\mu = (F/\mu)_{GA}$ acquisition-FDI creates zero surplus over greenfield-FDI.

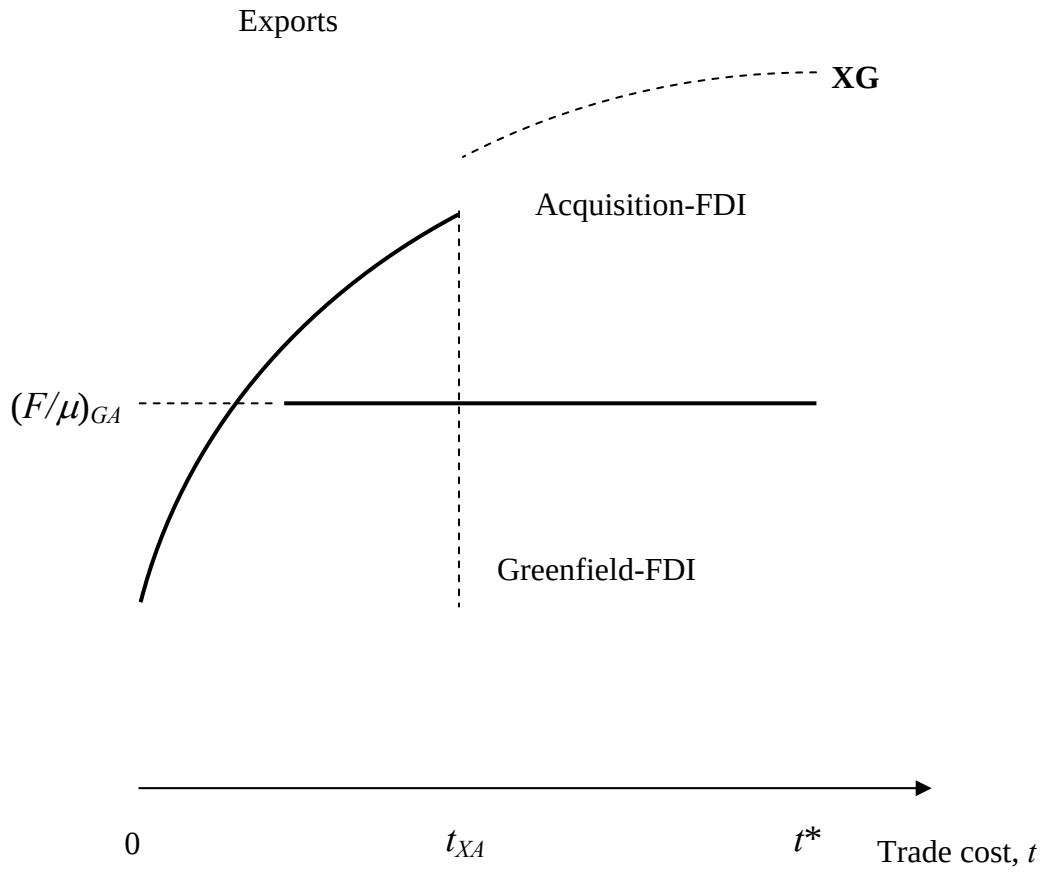
Alternatively, above XG, the MNE chooses between exporting and acquisition-FDI, again opting for acquisition-FDI whenever it generates a surplus. This choice is independent of F/μ (because no plant fixed costs are paid under X or A), but rises in t make acquisition-FDI more attractive because they cut the MNE's exporting profits (by more than the target firm's rise).[16] At $t = t_{XA}$ acquisition-FDI creates no surplus over exporting.

Finally, we briefly consider the effects of an increase in the degree of "competition," as measured by a rise in N. In our plot of the MNE's optimal choices, it is straightforward to show that an increase in N shifts the XG locus and $(F/\mu)_{GA}$ downwards, and it shifts t_{XA} leftwards.[17] Therefore:

Figure 1- The MNE's Optimal Decision



[16] For $t \cong t^*$, total disagreement profits under X are <u>increasing</u> in t (for reasons explained in Lahiri and Ono, 1988). However, $t = t_{XA}$ is the unique point on [0, t^*) where acquisition-FDI creates no surplus over exporting.
[17] An increase in N also cuts t^*, the price in autarkic Cournot equilibrium. The effect on XG holds for all N; those on $(F/\mu)_{GA}$ and t_{XA} hold, respectively, for all $N \geq 4$ and $N \geq 5$ (i.e. for "most" N).



Notes: Along locus *XG*, the MNE is indifferent between exports and greenfield-FDI. The MNE strictly prefers exports (resp. greenfield-FDI) to acquisition-FDI if and only if $t < t_{XA}$ (resp. $F/\mu < (F/\mu)_{GA}$). *t** is the prohibitive trade cost.

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