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## Multinational companies and the development of firm start-up size: evidence from quantile regressions for Ireland

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**Multinational Companies and the  
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by

**Holger Görg and Eric Strobl**

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# **Multinational Companies and the Development of Firm Start-up Size: Evidence from Quantile Regressions for Ireland**

by

**H. Görg and E. Strobl**

## **Abstract**

This paper analyses the impact of foreign multinationals on the development of start-up size of new entrants in Irish manufacturing industries over the period 1973 to 1996. We provide a theoretical rationale as to why we would expect an effect of multinationals on entrants' start-up size. In the empirical estimation we use the regression quantile estimator, which allows us to take account of the heterogeneity of firm start-up size. Our estimation results show that the presence of foreign multinationals in a sector impacts negatively on the start-up size of indigenous entrants. This latter effect may be attributed to competition of indigenous firms with foreign multinationals in the final goods market and/or with indigenous firms in the intermediate goods market.

## **Outline**

1. Introduction
2. Development of Firm Start-up Size
3. Effect of Multinationals on Firm-Start-up Size
4. Empirical Model of Firm Start-up Size
5. Econometric Estimation
6. Summary and Conclusions

## **Non-Technical Summary**

It has been argued in both the theoretical and empirical economics literature that multinational companies can foster the development of indigenous firms in the host country by inducing the entry of new firms. This has obvious positive effects for the host economy, as new entrants are widely acknowledged in the industrial organisation literature to play a vital role in the development of markets by promoting efficiency, competition, and innovation.

While the stimulation of firm entry is an important effect of the presence of MNCs on the host economy, it is also important to examine the effects of multinationals on the size that entrants choose at start-up. At a most basic level, the start-up size determines employment created in the new firm. Also, start-up size has been found to be an important determinant for subsequent firm growth and firm survival.

This paper analyses the impact of foreign multinationals on the development of start-up size of new entrants in Irish manufacturing industries over the period 1973 to 1996.

We provide a theoretical rationale as to why we would expect an effect of multinationals on entrants' start-up size. Utilising a model recently developed in the new economic geography literature we argue that the effect of multinationals is not clear cut. On the one hand, if multinationals compete directly with domestic firms on final good markets, or if the presence of multinationals leads to more entry of domestic firms and increases competition among domestic firms, such a competition effect should lead to lower start-up sizes for new entrants. On the other hand, expansions in demand by multinationals for intermediate goods supplied by domestic firms, as well as reductions in prices (leading to increases in demand) due to greater competition can lead to increases in start-up size of domestic entrants.

We investigate the theoretical hypotheses using firm-level data for manufacturing industries in the Republic of Ireland for the period 1973 to 1996. We estimate an empirical model of the industry determinants of firm's start-up size, one of which is the presence of foreign multinationals in the sector. In the empirical estimation we use the regression quantile estimator, which allows us to take account of the heterogeneity of firm start-up size.

Our estimation results show that the presence of foreign multinationals in a sector impacts negatively on the start-up size of indigenous entrants, and that these effects are larger in absolute terms for large entrants than for small entrants. This effect may be attributed to competition of indigenous firms with foreign multinationals in the final goods market and/or with indigenous firms in the intermediate goods market. We do not find an impact of foreign presence on the start-up size of foreign multinational entrants.

## 1 Introduction

In a recent paper, Markusen and Venables (1999) show that multinational companies (MNCs) may foster the development of indigenous firms in the host country by inducing the entry of new firms. This has obvious positive effects for the host economy, as new entrants are widely acknowledged in the industrial organisation literature to play a vital role in the development of markets by promoting efficiency, competition, and innovation.

While the stimulation of firm entry is an important effect of the presence of MNCs on the host economy, it is also important to examine the effects of multinationals on the size that entrants choose at start-up. At a most basic level, the start-up size determines employment created in the new firm. Also, start-up size has been found to be an important determinant for the subsequent performance of new firms, in terms of firm growth (Wagner, 1994, Hart and Oulton, 1996) and firm survival (Audretsch and Mahmood, 1995, Audretsch et al., 2000, Mata and Portugal, 1994).<sup>1</sup> In a related paper (Görg and Strobl, 2000) we find that firm start-up size is positively related to firm survival in Irish manufacturing industries, i.e., small entrants have a higher probability of subsequent exit than large firms, *ceteris paribus*.

There have been recent studies analysing the determinants of firm start-up size using data for Portugal (Mata and Machado, 1996) and the Republic of Ireland (Görg et al., 2000). These papers, however, do not examine the possible effects of foreign multinational companies (MNCs) located in the host country on the choice of start-up size of firms. In the context of the Markusen and Venables (1999) model, foreign multinationals located in the host country can be expected to have an impact on the entry of domestic firms and the choice of start-up size through linkage effects, i.e., customer-supplier relationships with domestic suppliers as well as through competition effects with indigenous final good producers.<sup>2</sup>

This paper analyses the impact of the presence of foreign multinationals in an industry on firm start-up size in the host country, controlling for other industry specific factors. Using data for manufacturing industries in the Republic of Ireland for 1973 – 1996, we examine explicitly whether there are size differences between indigenous and foreign (multinational)

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<sup>1</sup> See Geroski (1991, 1995) and Caves (1998) for concise reviews of the literature on firm entry and subsequent firm performance.

<sup>2</sup> Empirical evidence of an effect of multinationals on entry in Irish manufacturing industries has been provided by Görg and Strobl (1999).

entrants, and whether the presence of foreign multinationals in an industrial sector has any positive or negative effects on the start-up size of entrants.

Ireland provides a model example for studying these effects, as the development of the Irish manufacturing sector has relied heavily on foreign multinational companies. Data from the Central Statistics Office show that foreign multinationals in Ireland accounted for roughly 47 percent of employment and 77 percent of net output in manufacturing in 1996. The corresponding figures in 1983 (the first year for which these data are available) were 38 percent and 58 percent respectively, which illustrate the increasing importance of multinationals for Irish manufacturing industries.

The results of our empirical analysis indicate that, on average, foreign entrants start with a larger size than indigenous entrants, *ceteris paribus*. We also find evidence that the presence of multinational companies in a sector has a negative effect on firm start-up size of indigenous firms. This may be due to a competition effect if indigenous firms are competing with multinationals on product markets. If indigenous firms enter as suppliers, the negative effect of the presence of multinationals may also be due to a competition effect, albeit due to competition among indigenous suppliers which are encouraged to enter due to the presence of multinationals.

The paper proceeds as follows. Section 2 describes the data set and outlines the development of the start-up size distribution in Irish manufacturing between 1973 and 1996. In Section 3 we provide a theoretical rationale as to why one may expect effects of foreign multinational companies on the start-up size decision of new entrants in the same industry. Section 4 presents an empirical model of the determinants of start-up size and Section 5 outlines the econometric methodology and presents our empirical results of estimating the model. In Section 6 we provide a decomposition of the effects of individual variables on the changing distribution of firm start-up size over time. The final section summarises the main issues of the paper, and presents conclusions.

## **2 Development of Firm Start-up Size**

Our analysis of firm start-up size in Irish manufacturing between 1973 and 1996 is based on data from the annual employment panel survey carried out by Forfás, the government agency for industrial development in Ireland since 1973. This survey covers virtually all known

active manufacturing companies in that the response rate has on average been extremely high, generally over 99 per cent. The unit of observation is the individual plant, for which the number of permanent full-time employment is reported. Each plant is, amongst other things, identified by a unique plant number, year of start-up, nationality of ownership and its 4-to-5 digit NACE code sector of location.<sup>3</sup> These identifiers are only changed if there is an actual change of ownership.

We measure firm size in terms of employment for two main reasons. Firstly, employment may give a more accurate picture of size than output since output figures may be distorted due to transfer pricing (see, for example, Stewart 1989). Secondly, our dataset does not include data on capital assets, which could be used as an alternative measure of firm size.

While the dataset includes all manufacturing firms irrespective of size we exclude firms with less than 3 employees from our sample. These firms are likely to be self-employed professionals or family businesses, where the choice of start-up size may be influenced to a large extent by factors which may not be captured in economic models of industry determinants of firms entry, such as the model presented below.

We show the development of firm start-up size in Irish manufacturing in Figure 1. The figure shows a three-year moving average of average firm start-up size relative to minimum efficient scale (MES) in the industry, for the period 1974 - 1995. We calculate the ratio of start-up size to MES in order to control for the fact that, if industry MES increases (decreases) one would expect the size of entrants to increase (decrease) as well, even if there are no other external factors impacting on the decision of size at entry. We calculate MES as average size of all incumbents in the industry (see Sutton, 1991, p. 96).<sup>4</sup>

*[Figure 1 here]*

Given the importance of multinationals for the Irish manufacturing sector we calculate firm start-up size for Irish and foreign firms separately as shown in Figure 1. It is apparent that foreign firms enter the market at a much larger size than indigenous firms. This may not be

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<sup>3</sup> Forfás defines foreign firms as firms which are majority-owned by foreign shareholders, i.e., where 50 per cent or more of the shares are owned by foreign shareholders.

<sup>4</sup> Lyons (1980) suggests to measure MES as one half of the average number of workers in firms that, on average, operate 1.5 plants, but we do not have data available to calculate such a measure. In the econometric estimation below we also use median firm size as a measure of MES.

surprising, as one may expect foreign multinationals setting up a production facility abroad to start with a larger size than indigenous firms for at least two reasons.

First, the larger size may be due to multinationals' economies of scale. To the extent that multinationals locate abroad to exploit their firm-specific asset or ownership advantages (see Caves, 1996; Dunning, 1988) economies of scale may only be exhausted if the foreign plant is sufficiently large. Baldwin (1995, p. 265) refers to this as "lumpiness" in asset use which means that the fixed cost or minimum capacity associated with the firm-specific asset is large relative to the size of the market, which suggests that foreign firms enter the market at a large size. Secondly, foreign entrants may have better access to funds through their parent companies which allows them to raise sufficient funds for large scale entry, while indigenous entrants are constrained by the lack of internal funds and capital market constraints (Brito and Mello, 1995; Dunning, 1993).

Before commenting upon the development of start-up size over the period, we should point out that minimum efficient scale, as measured by average firm size, has remained fairly constant over the period, implying that the developments apparent in the figure cannot be attributed solely to changes in the minimum efficient scale in the industry. Note that start-up size for indigenous firms decreased fairly consistently up to 1987, recovered slightly between 1988 and 1992 and then experienced a decline again. Over the same period, the start-up size of foreign firms has fluctuated considerably. In the following sections we attempt to analyse whether industry variables, and in particular the presence of foreign multinationals, may have had an effect on the changing distribution of firm start-up sizes.

### **3 Effect of Multinationals on Firm Start-up Size**

This section sets out a rationale of why one may expect foreign multinationals to have an effect on entrants' start-up size. Our argument is based on a recent model by Markusen and Venables (1999) which shows that multinationals can foster the development of domestic firms in imperfectly competitive industries. Their model features two types of industries, namely, intermediate and final consumer good producing, which are assumed to be imperfectly competitive with increasing returns to scale of production. Multinationals operate in the final good producing sector, which implies that they compete with domestic final good producers. As to the effects on intermediate good suppliers, multinationals create additional demand for domestically produced intermediate goods through linkages with

indigenous suppliers. In an imperfectly competitive domestic supplier industry, this may induce entry into the intermediate good producing sector. This entry causes a fall in the price of intermediates which favours customer firms (both domestic and multinationals) through lower input prices. Thus, multinationals may induce the entry of domestic intermediate good producers as well as domestic final good producing firms.<sup>5</sup>

Markusen and Venables do not discuss in any detail whether the presence of multinationals also impacts on the start up size of new entrants in either the intermediate good or final good producing industries. We utilise their model to shed some light on this issue.

Markusen and Venables construct price indices for the intermediate good and final good producing sectors,  $q_i$  and  $q_d$ , respectively as

$$q_i = (n_i p_i^{1-q})^{1/(1-q)} \quad (1)$$

$$q_d = (n_d p_d^{1-m} + n_m p_m^{1-m})^{1/(1-m)} \quad (2)$$

where  $n_i$ ,  $n_d$ ,  $n_m$  denote the number of domestic intermediate good, domestic final good and multinational final good producing firms, each of which produce a slightly different variety of the intermediate or final product,  $p_x$  is the price of variety  $i$ ,  $d$ ,  $m$ , and  $q$  and  $m$  measure the degree of product differentiation in the intermediate good and final good sector respectively. Products become better substitutes as  $q$  and  $m$  increase.<sup>6,7</sup>

The demand for the output of a single intermediate good producing firm is given as

$$x_i = p_i^{-q} I q_i^q \quad (3)$$

where  $I$  is the total volume of intermediate goods demanded. Demand for a domestic final good producing firm,  $x_d$ , is derived as

$$x_d = p_d^{-m} C q_d^{m-1} \quad (4)$$

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<sup>5</sup> Görg and Strobl (1999) provide evidence that this has in fact happened in Ireland; they find that the presence of MNCs is positively related to the number of new firm entrants in the same industry.

<sup>6</sup> We assume, in line with Markusen and Venables (1999) that  $m > 1$  and  $q > 1$ .

<sup>7</sup> To be precise, the Markusen and Venables model also includes foreign firms which serve the domestic markets via exports in the price index of final good producers. The effect of foreign exporters is, however, not relevant to our analysis of start-up size and is therefore omitted in (2).

where  $\eta$  ( $> 1$ ) is the price elasticity of demand and  $C$  is a constant.

These equations allow us to analyse the effects of multinationals on start-up size of domestic intermediate good and final good producers. In the case of the former, Markusen and Venables show that  $I$  is positively related to the number of multinationals in the host country, i.e., multinationals increase the demand for intermediate goods through linkage effects with domestically located suppliers. The increase in  $I$  increases market size for domestic intermediate good producers which, other things being equal, leads to an increase in demand  $x_i$  and thus to an increase in firm start-up size.

As pointed out above, in the Markusen and Venables model, the presence of multinationals may also lead to an increase in the number of intermediate goods producing firms  $n_i$ . Equation (1) shows that an increase in  $n_i$  reduces the price index  $q_i$  which, in equation (3) leads to a reduction in the demand for  $x_i$  and, thus, to a reduction in firm size. Hence, an increase in the number of multinationals may have positive or negative effects on firm start-up size of intermediate good producing firms.

In the case of final good producing firms, equation (2) shows that an increase in the number of multinationals lowers the price index in the final good producing sector which leads to a reduction in demand for  $x_d$  (in equation (4)), leading to a reduction in firm size. This is a standard competition effect, i.e., competitors (in this case multinational firms) crowd out business for other firms competing in the same product market. However, Markusen and Venables also show that  $p_d$  is positively related to  $q_i$ , i.e., the price index in the intermediate good sector. As pointed out above,  $q_i$  decreases as the number of multinationals increases, which also drives down  $p_d$ . Because the price for intermediate goods (which are used as inputs for final good production) decreases, final good producers are also able to lower their prices, increasing demand for their products (equation (4)). This process is exacerbated by multinational firms. Thus, the effect of multinationals on the start-up size of domestic final good producers is also ambiguous. It is an empirical question as to whether the positive or negative effects dominate in practice.

#### **4 Empirical Model of Firm Start-up Size**

When transforming the above ideas into an empirical model of firm start-up size we need to take into consideration other industry-specific factors that may have an effect on the choice

of start-up size. The industry-level determinants of start-up size have recently been discussed by Mata and Machado (1996). Following their analysis, we postulate the following empirical model of the relationship between the start-up size (measured in terms of employment) of firm  $i$ ,  $E_{it}$ , and other factors,

$$E_{it} = b_0 + b_1 FOR_{jt} + b_2 MES_{jt} + b_3 SUB_{jt} + b_4 IND_{jt} + b_5 TUR_{jt} + b_6 GRO_{jt} + b_7 NAT_i + b_8 D_t + e_{it} \quad (3)$$

where  $FOR_{jt}$  denotes the proportion of industry employment in foreign multinational companies, as a proxy for the effect of foreign multinationals on start-up size.  $MES_{jt}$  represents the minimum efficient scale in industry  $j$ ,  $SUB_{jt}$  is the percentage of employment employed in firms with less than MES (i.e., operating at suboptimal scale),  $IND_{jt}$  is the log of the industry size,  $TUR_{jt}$  denotes turbulence in industry  $j$ ,  $GRO_{jt}$  denotes the growth rate of industry  $j$  and  $NAT_i$  represents a dummy variable equal to 1 if the firm is under foreign ownership. Furthermore,  $D_t$  is a time dummy and  $e_{it}$  is a white noise error term.

$MES_{jt}$  is measured as the log of average employment size as suggested by Sutton (1991).<sup>8</sup> It seems reasonable to assume that, the higher MES in an industry, the larger, on average, will be new start-ups in order to be able to compete effectively in the market. We would, hence, expect a positive relationship between the size of entrants and the MES.

$SUB_{jt}$  is a measure of the proportion of employment in firms operating at less than minimum efficient scale, i.e., at suboptimal scale. As such, it provides an indirect measure of the cost disadvantage such firms have to face in the industry. All other things equal, the larger the proportion of firms operating at suboptimal scale, the lower seems to be the cost disadvantage to such firms and, hence, the lower may be the start-up size a new entrant will choose.

The size of the industry,  $IND_{jt}$  is measured as the log of total employment in the industry. The rationale for including this variable is that, the larger the industry (for a given MES), the larger will be the size of new entrants, as the probability of retaliation from incumbents is lower in a large than in a small market.

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<sup>8</sup> In an alternative specification we defined MES as (the log of) median firm size in the industry. These results, which are not reported here but can be obtained from the authors upon request, yield similar results to the results obtained using average firm size.

$TUR_{jt}$  is measured as the product of employment shares in firms that enter or exit industry  $j$ .<sup>9</sup> Turbulence provides us with an indirect measure of sunk costs, as a large extent of simultaneous entry and exit in an industry can be taken as evidence of low sunk costs. Assuming that entrants are risk averse, one may expect that, the lower are sunk costs, the higher will be the start-up size of new entrants as the losses associated with a possible failure are lower.

The growth rate of the industry,  $GRO_{jt}$  is calculated as the difference, in natural logs, between industry size in subsequent years. In a fast growing industry, the probability of a firm surviving is higher than in a slow growing (or declining) industry as incumbents may be less likely to retaliate in a fast growing market. This implies that firms may choose to enter at a larger size in fast growing markets, due to the higher probability of survival.

As argued above, we would expect differences in the choice of start-up size between indigenous and foreign-owned firms. Therefore, we include a dummy variable in the equation to control for nationality differences. The time dummy is included to control for possible changes in the macroeconomic environment over the period analysed.

## 5 Econometric Estimation

### 5.1 Methodology

We estimate the empirical model specified in equation (3) using the Regression Quantiles (RQ) estimator as introduced by Koenker and Bassett (1978, 1982). In a recent application of quantile regression to analysing the determinants of firm start-up size, Mata and Machado (1996) point out a number of advantages in using the RQ estimator instead of standard least square regression models to examine the determinants of start-up size. One of the advantages is that the least squares estimators can be sensitive to even modest deviations of the residuals from normality, whereas the RQ is robust to such. Also, Mata and Machado argue that, under the belief that the distribution of firm size was approximately lognormal a standard practise in the literature on firm size has been to use the logarithmic transformation of the dependent variable. If, however, the distribution is actually not lognormal, then the OLS estimator may not be optimal given that it is only equivariant to linear transformations

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<sup>9</sup> Even though Beesley and Hamilton (1984) originally proposed to measure turbulence as the sum of entry and exit in an industry, Mata and Machado (1996) suggest to measure turbulence as the product of entry and exit as the product will only take on high values if entry and exit are both important.

of the dependent variable. In contrast, the RQ estimator is equivariant to both monotonic linear and non-linear transformations of the dependent variable.

The summary statistics in Table 1 show that average firm start-up size for firms in our sample is at roughly 14 employees over the analysed period, although the high standard deviation implies that there is a large spread of size around this mean. The coefficient for skewness indicates that the distribution of firm start-up sizes is highly right skewed which is also shown by the result that the median of 6 is far less than the arithmetic mean of 14. In line with the data in Figure 1, the summary statistics also show that there are considerable differences between Irish and foreign-owned plants with regard to firm start-up size. While Irish firms start, on average, with 11 employees, the start-up size for foreign firms is at an average of 30 employees. The median size for foreign firms is also higher than for Irish firms. As pointed out above, this result is not surprising, as one may expect foreign multinationals to start with a larger size than indigenous entrants.

These statistics suggest that firm start-up size is not normally distributed, and formal tests for normality based on skewness and kurtosis (D'Agostini et al., 1990) allow us to reject the null hypothesis of an underlying normal distribution for start-up size of all firms, and foreign Irish firms separately. Hence, we may conclude that an OLS estimation would not be appropriate for our purposes.

*[Table 1 here]*

## 5.2 Results

The results of estimating equation (3) using data for all firms in the sample are reported in Table 2.<sup>10</sup> In the first column we present the results obtained using the standard OLS procedure, i.e., the estimation of the conditional mean using least squares technique. In the further columns we report the regression results for five different quantiles of the firm size distribution, namely for the 0.2, 0.25, 0.5 (i.e., median), 0.75 and 0.9 quantiles.

*[Table 2 here]*

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<sup>10</sup> All estimations were performed in Stata. The regressions reported in Tables 2 to 4 include time dummies, the coefficients of which are not reported but can be obtained from the authors upon request. The standard errors are bootstrapped standard errors to take account of possible heteroskedasticity (see Deaton, 1998).

Examining the standard OLS results we find that, as expected, the nationality dummy, MES, industry growth and turbulence all exert statistically significant positive effects on firm start-up size. The coefficient on the suboptimal size variable is statistically significant negative, which is also in line with prior expectations.<sup>11</sup> The foreign presence variable has a negative coefficient indicating that there appears to be a negative effect of the presence of foreign firms on firm start-up size in the industry.

The regression quantile results give a more precise picture of the importance of the explanatory variables for firms at different points of the firm start-up size distribution. Comparison of the results for the different quantiles shows that the magnitude of the coefficients changes as we move along the size distribution of firms. The coefficient of the nationality dummy increases from 1.9 in the 0.2 quantile to 43.5 in the 0.9 quantile, which indicates that there is a larger difference between foreign and indigenous firms' start-up size in the higher than in the lower ends of the size distribution. The foreign presence variable also appears to have a larger impact on firms in the higher quantiles than in the lower, as indicated by the increase in the coefficient on the variable, which suggests that large firms reduce firm start-up size by a larger absolute value due to foreign presence.

The coefficients for MES, suboptimal size, industry growth, and turbulence are also higher for the higher quantiles than for lower quantiles which suggests that they become more important variables for larger start-ups. Industry growth is a statistically insignificant explanatory variable in the estimation of the 0.2 quantile, indicating that the choice of start-up size of very small entrants does not appear to be influenced by a growing industry. Industry size is highly statistically significant and negative for the 0.2 and 0.9 quantile but only weakly significant for the 0.25 and 0.75, and insignificant for the median regression.

Since the positive coefficient on the nationality dummy, as well as the discussion and summary statistics above suggest that there are differences between the start-up size of foreign and indigenous firms, we estimate equation (3) using data for foreign and Irish-owned firms separately. The results of the regression for Irish-owned firms are reported in Table 3, while Table 4 shows the results for foreign-owned firms.

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<sup>11</sup> The statistically significant positive coefficients on MES and turbulence and the negative coefficient on suboptimal size are in line Mata and Machado's (1996) results for a sample of Portuguese manufacturing firms. They do not find a statistically significant effect of industry growth of firm start-up size, however. See also Görg et al. (2000) for a discussion of industry determinants of start-up size for Ireland.

*[Table 3 here]*

The results in Table 3 show that the coefficients on foreign presence, MES, suboptimal scale and turbulence are similar in their magnitude and statistical significance to the results for all firms reported in Table 2. This may be because the sample is dominated by Irish firms; 5,764 out of 6,850 observations in the sample relate to Irish-owned firms. The only notable difference with regard to these variables is the statistical insignificance of all coefficients in the estimation of the 0.2 quantile. This suggests that the start-up size decisions of very small Irish-owned firms do not appear to be influenced by the industry variables captured in our model. We also find that, for the 0.2 – 0.75 quantiles, industry size and growth do not appear to matter for the choice of start-up size for indigenous firms.

The negative coefficient on the foreign presence variable lends support to the view that the presence of foreign multinationals has a negative effect on the start-up size of Irish-owned firms. The higher coefficients for higher quantiles also suggest that larger firms reduce their start-up size more, in absolute terms, than smaller entrants.

As pointed out above, the negative effect of foreign presence may be due to two reasons. If indigenous firms produce final goods and compete directly with multinationals on product markets our result illustrates a straightforward competition effect. If indigenous firms are suppliers, the negative size effect is due to an increase in competition at the level of suppliers. As we showed in a related paper (Görg and Strobl, 1999), multinationals in Ireland have a positive effect on the entry of indigenous firms, mainly in supplier industries, through a linkage effect as modelled by Markusen and Venables (1999). The increasing number of indigenous suppliers, however, implies that there is increasing competition among supplier firms which, for a given market size, leads to a reduction in firm size. Unfortunately, given the nature of our data we are unable to distinguish the relative importance of these two different competition effects.

In order to draw a clearer, more isolated, picture of the effect of foreign presence on the changing distribution of start-up size of indigenous firms over the analysed period, we use the regression results in Table 3 to predict average start-up size for different quantiles for different years. To this end, we predict average start-up size in the initial year  $t$  using the estimated coefficients  $b_k$  and the means of all variables, calculated as the mean of all

indigenous firms in time  $t$ . In subsequent years, we predict start-up size by letting the mean of the foreign presence variable change over time, while keeping the means of the other variables constant at their initial value in time  $t$ .

Figure 2 presents the result of this exercise, using the coefficients from the 0.25, 0.50 and 0.90 quantile regressions. The figure is drawn setting the predicted firm start-up size in 1973 equal to 1 and showing subsequent changes in the predicted average start-up size relative to the initial value in 1973.

The presence of foreign multinationals seems to have had a negative effect on start-up size of indigenous firms since the late 1970s and particularly over the mid-eighties and early-nineties. The variable has had the most adverse effects on firms in the 0.25 percentile, i.e., small firms experienced the most pronounced reductions in average start-up size, relative to average start-up size in 1973. This indicates that, relatively speaking, small firms have reduced their size at entry most as a result of the increasing competition of other small-scale suppliers setting up in response to the increasing presence of foreign multinationals or, feasibly, as a result of increasing competition with the multinationals themselves. Thus, while the regression results in Table 3 show that large firms (in the 0.9 percentile) experience the largest effect (as measured by the estimated coefficient) of foreign presence on *absolute* start-up size, small firms are affected most in *relative* terms.

[Figure 2 here]

The most marked difference in the estimation of equation (3) for the sample of foreign firms, as reported in Table 4, is that the coefficient on the foreign presence variable turns out to be statistically insignificant in all quantiles and the OLS estimation. This suggests that the presence of multinationals in a sector does not have any effect on the choice of start-up size of other foreign multinationals locating in Ireland in the same industry. This may not be a surprising result since many multinationals use Ireland as an export base to serve mainly the European or other world markets (Foley, 1991), which would imply that they may not necessarily compete with other MNCs located in Ireland on the same geographic product market. If this were the case one would not expect any competition effect of the sort described above to take place.

[Table 4 here]

## 6 Summary and Conclusions

This paper analyses the effect of the presence of foreign multinational companies in the host country on the development of start-up size of new entrants, using data for the Irish manufacturing sector. Ireland is arguably a model example for studying these effects given the importance of foreign MNCs for the development of the manufacturing sector. Our argument of the possible effects of MNCs on entrants is based on a recent model by Markusen and Venables (1999) and runs as follows: A high presence of multinationals in the host country may have a negative effect on start-up size of new entrants which compete with MNCs on product markets. This is a competition effect. Multinationals may also impact on the start-up size of suppliers through a linkage effect, as the presence of MNCs may foster entry of indigenous suppliers. The choice of start-up size is then affected in two ways. First, a high presence of multinationals represents a large market for suppliers which has a positive effect on entrants size. Second, a high presence of MNCs, through the linkage effect, leads to an increase in the entry rate of indigenous suppliers which, *ceteris paribus*, reduces entrants size.

We estimate an empirical model of industry determinants of firm start-up size using the regression quantiles estimator. This estimation technique allows us to take account of firm heterogeneity by estimating the determinants of firm start-up size at different points of the size distribution. Our results indicate that the presence of foreign multinationals has a negative effect on the start-up size of indigenous entrants, and that these effects are larger in absolute terms for large entrants than for small entrants. We do not find an impact of foreign presence on the start-up size of foreign entrants.

These results have implications for the expected survival of indigenous firms. As we found in a related paper (Görg and Strobl, 2000), small firms have a higher probability of exiting the industry, *ceteris paribus*, which, combined with our finding in this paper implies that a reduction in start-up size due to the presence of multinationals impacts negatively on firm survival. However, Görg and Strobl (2000) also find that foreign presence has a positive direct impact on the survival of indigenous firms; this effect is attributed to the presence of technology spillovers from foreign to indigenous firms.

Our result also has implications for employment generated in newly established firms. As we found elsewhere (Görg and Strobl, 1999), foreign firms have a positive effect on the entry of

indigenous firms. However the results in this paper suggest that increasing competition in intermediate good producing sectors (for indigenous suppliers) and final good producing sectors (for indigenous final good producers) leads to a reduction in start-up size of indigenous entrants. In other words, the employment generated in newly established firms is less than would have been generated in the absence of multinationals, but in the absence of multinationals, new firm entry might have been less than the actual level. This is an issue for Irish policy makers, where employment generation has been an important policy objective (see Fitzpatrick and Storey, 1991).

As to foreign entrants, Barry and Bradley (1997) and Krugman (1997) argue that the presence of foreign MNCs in Ireland has a positive “demonstration effect”, i.e., induces other MNCs to locate in Ireland as well. While our analysis does not address this issue directly, our result of no impact of foreign presence on foreign firms’ size at entry suggests that, even if foreign entrants are attracted by the presence of other multinationals, their decision of start-up size is independent of the presence of other foreign firms.

## Tables

**Table 1: Summary Statistics for Firm Start-up Size**

	All Firms	Irish	Foreign
Observations	6850	5764	1086
Mean Size	14.12	11.14	29.95
Std. Dev.	26.63	19.18	47.29
Minimum	3	3	3
Median	6	6	14
Maximum	557	485	557
Skewness	7.81	8.98	4.78
Kurtosis	97.66	139.66	35.95

**Table 2: Quantile Regression Results for All New Firms**

Quantiles	OLS	0.2	0.25	0.5	0.75	0.9
Nationality	17.172 (0.887)***	1.939 (0.212)***	2.632 (0.351)***	7.638 (0.698)***	20.474 (1.634)***	43.450 (5.652)***
Foreign Presence	-10.849 (1.436)***	-0.828 (0.197)***	-0.959 (0.182)***	-3.154 (0.391)***	-9.895 (1.102)***	-17.240 (3.443)***
MES	7.657 (0.560)***	0.491 (0.083)***	0.668 (0.064)***	1.826 (0.144)***	5.600 (0.529)***	12.692 (1.592)***
Suboptimal Size	-65.607 (8.325)***	-3.397 (0.782)***	-4.942 (0.957)***	-16.139 (1.823)***	-53.625 (3.353)***	-102.349 (15.903)***
Industry Size	-0.360 (0.399)	-0.096 (0.036)***	-0.102 (0.053)*	-0.143 (0.116)	-0.480 (0.279)*	-1.804 (0.917)**
Industry Growth	27.446 (3.650)***	0.273 (0.332)	0.677 (0.401)*	2.338 (1.164)**	7.170 (2.790)**	21.643 (5.266)***
Turbulence	1181.351 (136.395)***	62.934 (16.462)***	67.762 (14.727)***	210.765 (32.210)***	898.157 (263.207)***	2738.865 (461.153)***
Constant	5.330 (3.853)	4.094 (0.377)***	4.687 (0.649)***	6.659 (1.085)***	12.971 (4.816)***	29.418 (8.657)***
F ( $H_0: \beta_i=0$ )	29.21	58.63	79.37	233.10	80.66	149.15

Note: Standard Error in parentheses. Regressions include time dummies.

\*\*\* = significant at 1 percent, \*\* at 5 percent, \* at 10 percent level.

**Table 3: Quantile Regression Results for Irish-owned New Firms**

Quantiles	OLS	0.2	0.25	0.5	0.75	0.9
Foreign Presence	-12.305 (1.178)***	-0.561 (0.357)	-0.742 (0.147)***	-2.950 (0.531)***	-9.724 (1.071)***	-18.797 (1.629)***
MES	6.289 (0.455)***	0.332 (0.212)	0.623 (0.099)***	1.584 (0.222)***	5.020 (0.558)***	11.112 (0.921)***
Suboptimal Size	-59.823 (6.630)***	-2.191 (1.435)*	-4.816 (0.854)***	-13.963 (2.049)***	-51.184 (4.463)***	-103.486 (11.255)***
Industry Size	-0.170 (0.318)	-0.071 (0.066)	-0.080 (0.057)	-0.105 (0.125)	-0.429 (0.315)	-1.196 (0.623)*
Industry Growth	12.512 (2.989)***	0.314 (0.279)	0.683 (0.410)*	1.233 (0.790)	2.314 (3.283)	11.447 (5.3385)**
Turbulence	763.062 (108.672)***	36.052 (23.191)	41.504 (17.370)**	133.578 (51.615)***	624.992 (173.942)***	1964.083 (305.511)***
Constant	9.474 (3.106)***	4.261 (0.619)***	4.617 (0.665)***	6.946 (1.311)***	13.778 (3.936)***	30.122 (7.590)***
F ( $H_0: \beta_i=0$ )	12.36	177.43	35.04	60.06	37.00	40.74

Note: Standard Error in parentheses. Regressions include time dummies.

\*\*\* = significant at 1 percent, \*\* at 5 percent, \* at 10 percent level.

**Table 4: Quantile Regression Results for Foreign-owned New Firms**

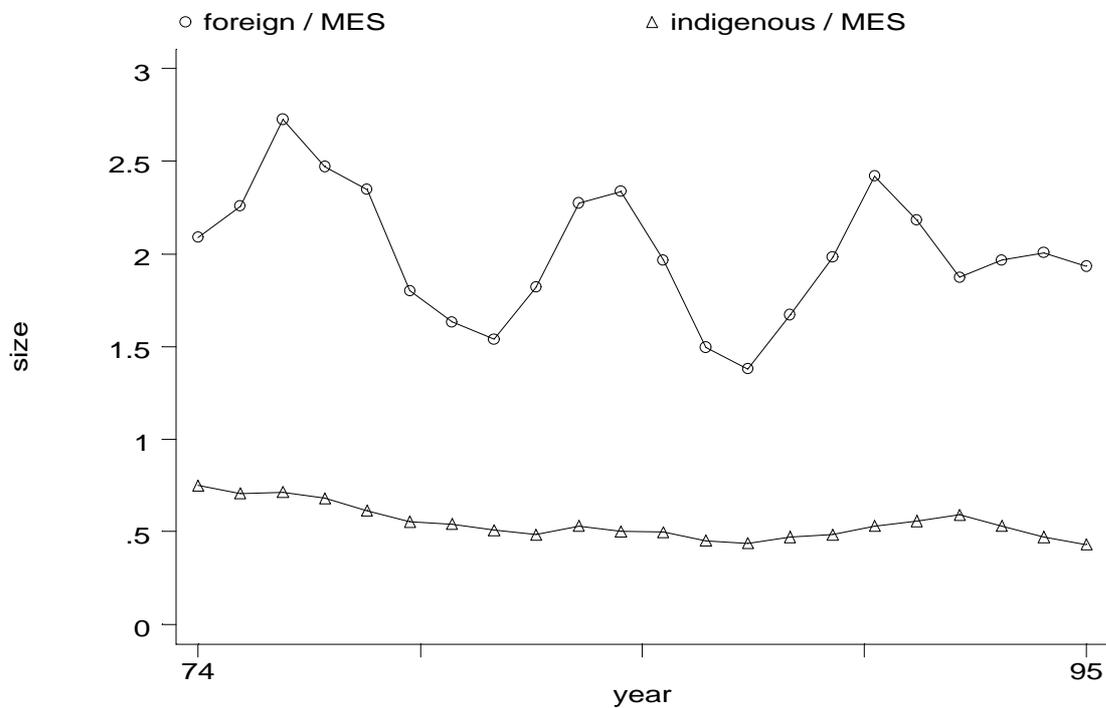
Quantiles	OLS	0.2	0.25	0.5	0.75	0.9
Foreign Presence	-5.991 (6.233)	-1.247 (0.888)	-2.012 (1.476)	-4.099 (2.974)	-4.747 (8.694)	10.321 (15.666)
MES	16.982 (2.578)***	1.448 (0.470)***	2.102 (0.478)***	6.879 (1.221)***	18.308 (4.337)***	30.098 (5.472)***
Suboptimal Size	-129.362 (43.114)***	-4.640 (5.936)	-7.262 (9.241)	-43.318 (15.837)***	-84.781 (47.827)*	-154.850 (77.786)**
Industry Size	0.714 (1.739)	-0.410 (0.374)	-0.714 (0.365)*	0.540 (0.713)	-0.846 (2.220)	-1.781 (2.535)
Industry Growth	89.602 (16.185)***	4.220 (3.714)	5.101 (5.627)	24.127 (12.059)**	48.492 (22.067)**	86.490 (63.013)
Turbulence	3892.468 (690.774)***	644.709 (168.946)***	878.131 (230.379)***	2694.380 (880.770)***	7422.130 (1604.655)**	9254.674 (1952.088)**
Constant	-11.394 (18.519)	5.497 (3.076)*	9.105 (4.412)**	-8.296 (9.494)	11.001 (21.375)	19.082 (59.098)
F ( $H_0: \beta_i=0$ )	4.66	8.11	29.88	10.00	81.19	22.54

Note: Standard Error in parentheses. Regressions include time dummies.

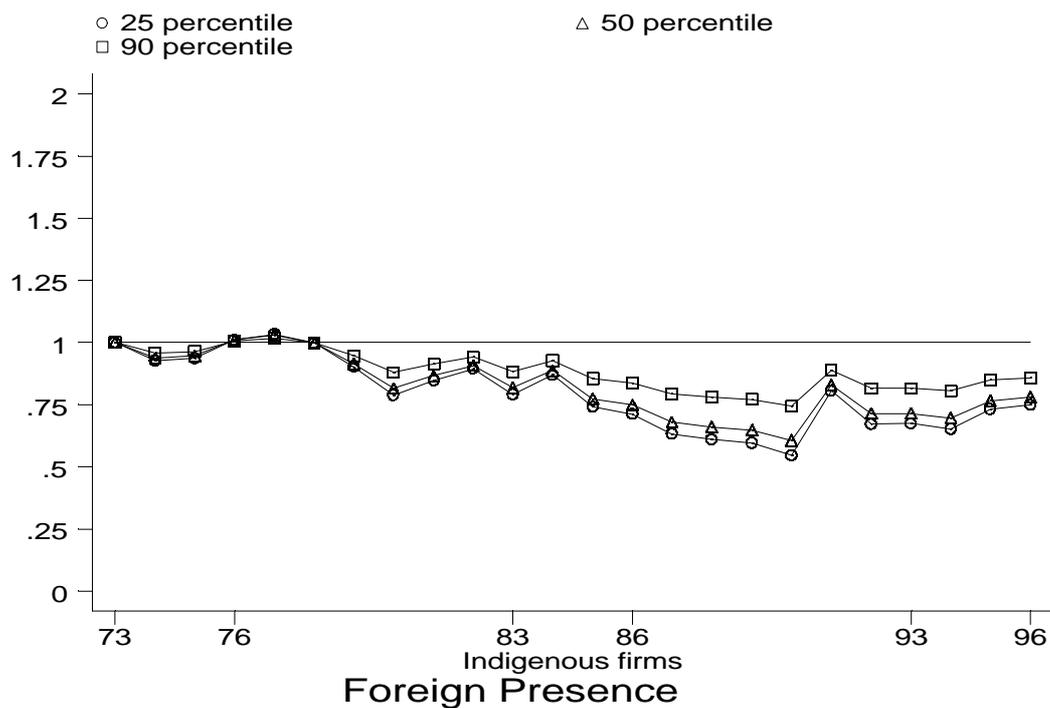
\*\*\* = significant at 1 percent, \*\* at 5 percent, \* at 10 percent level.

## Figures

**Figure 1: Development of firm start-up size, 1974-1995**



**Figure 2: Effect of foreign presence on predicted start-up size (indigenous firms)**



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