NOTE


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Abstract—This paper compares the performance of U.K. plants that were acquired by the foreign-owned sector during 1987–1992 with other comparable subgroups of plants operating at the same time (including plants acquired by U.K.-owned companies). The principal aim is to consider the types of plants that were acquired and whether after acquisition they performed above or below average when compared to other manufacturing plants. The results show that foreign-owned enterprises acquired the most-productive plants previously operated by U.K. enterprises. After acquisition, there is some evidence that productivity declined, which would be consistent with difficulties associated with assimilating these established plants into the new organization.

I. Introduction

The importance of foreign direct investment (FDI) into the United Kingdom has attracted a significant level of interest over many years. Early work had more of an emphasis on why (and how much) firms invested overseas and why they chose particular host countries such as Britain (some examples included Vernon (1966) and Barrell and Pain (1997)). Subsequently, there has been considerable interest in the relative performance of foreign-owned firms in the United Kingdom and their impact on indigenous firms through “spillover” effects (cf. Davies & Lyons, 1991; Dunning, 1993; Driffield & Munday, 1998).

Most studies for the United Kingdom have used either aggregated data drawn from the census of production or a case-study approach. This study is based on the individual plants comprising what is now called the Annual Business Inquiry Respondents Database (or ARD). The period 1987–1992 was chosen for study because it was a period when the United Kingdom attracted more than £27 billion of manufacturing net inward investment. Previous studies have not considered foreign direct investment (FDI) within the context of ownership change. The aim here, therefore, is to compare the type of plants that are acquired by the foreign-owned (FO) sector with other plants and acquisitions, and whether after acquisition they performed above or below average. This is an important issue from a policy viewpoint as inefficient plants will be taken over and surviving plants will perform better, post-acquisition.

II. Reasons for Plant Acquisition

The motivation for ownership change has been the subject of much discussion in economics and finance, initially focusing on the concern that such change may lead to (or be driven by) the concentration of market power (Stigler, 1964; Capron & Mitchell, 1998). The neoclassical approach (cf. Meade, 1968) assumes that takeovers and mergers are a form of natural selection, resulting in the replacement of poor management as inefficient plants are taken over. Long-term survivors will benefit from any economies of scale and other synergies generated (Jensen, 1988). Thus, the theory of “managerial discipline” predicts that inefficient plants will be taken over and surviving plants will perform better, post-acquisition.

Lichtenberg and Siegel (1987, 1990) take this approach further, arguing that changes in ownership are driven by plant-level lapses in efficiency, wherein plants look for a better “match” with an enterprise to improve their performance. Their approach is comparable to the theory of job turnover, whereby workers separate from their existing employers for a better job match. Lichtenberg and Siegel provide empirical support for their view by noting that, in the data they used, plants with lower productivity were more likely to change owners than those with higher productivity (that is, those with good matches). Once again, this theory implies that a low level of productivity increases the likelihood of a change in ownership and improvements in productivity over time, with the most-efficient plants surviving in the long run.

A wider body of empirical work based on U.S. data suggests that these theories alone do not adequately explain the causes of change in ownership nor the consequences. Many empirical analyses of post-acquisition performance have not demonstrated the improved levels of efficiency that the neoclassical theories would suggest. For example, Ravenscraft and Scherer (1987) and Matsusaka (1993a) found that acquired firms were highly profitable before acquisition with little or no gain to the acquiring firms post-acquisition, and Ravenscraft and Scherer (1989) also find no clear evidence that acquisition enhances efficiency.

An alternative theory is explored by McGuckin and Nguyen (1995), who consider ownership changes to be motivated by a desire to acquire operating efficiency rather than through gains associated with improving managerial discipline. In their study using the LRD, they found that plants with higher productivity were more likely to change ownership. In a different study, McGuckin, Nguyen, and Reznek (1998) report the typical motive for ownership changes as being improvements in operating efficiency such that “acquiring firms...
are high productivity firms that acquire firms with above average productivity and improve them. In contrast to the earlier neoclassical approach, the operational efficiency theory implies that plants with high levels of productivity are more likely to change ownership, resulting in improvements in productivity post-acquisition. These studies (Matsusaka, 1993a, 1993b; McGuckin et al., 1998) also find differences between small and large plant acquisitions. Matsusaka (1993b) found that the managerial discipline motive for ownership change was relevant for a few large takeovers, suggesting (as do McGuckin and Nguyen (1995)) that ownership changes between large and small plants are often motivated by different factors.

None of these studies of ownership change explicitly consider the motivation for foreign firms acquiring plants in a host country, and whether they would look to buy existing plants with relatively high or low levels of productivity. Multinational enterprises (MNEs) have several options when looking to expand productive capacity beyond their domestic market. Exporting may not be the most cost effective or profitable approach, given the presence of tariffs and transportation costs. Similarly, licensing or franchising arrangements with domestic firms (Hennart, 1991) are likely to involve significant costs, not least because of the potential loss of control over firm-specific advantages. Thus, acquiring capacity in the host nation is preferred when firm-specific advantages are strong enough to overcome the various spatial “barriers to entry” (Markusen, 1995). Such advantages include economies of scale and scope, brand names, management know-how, and other advantages that may be exploited at several locations without incurring additional costs (Pfaffermayr, 1999; Caves, 1996).

Once the choice to invest in the host market has been made, foreign firms can purchase a new (greenfield) site or acquire an existing (brownfield) one. The decision of how to enter the foreign market will depend on the nature of the firm-specific advantage(s) and on market conditions. Hennart and Park (1993) argue that, if the MNE’s specific advantage is firmly associated with the management of its labor force, then a greenfield site may be less risky in terms of organizational control than an acquisition (especially if it allows the MNE to bring in its own managerial practices and avoid trade unions). In contrast, brownfield acquisitions are favored if the entrant has little previous experience of producing in the host country or if they are entering a market to manufacture a product not produced at home.

A number of explanations are in favor of acquisitions of brownfield sites; the new model of asset seeking FDI (cf. Wesson, 1999) states that FO firms hope to create advantages for themselves through acquiring and internalizing valuable assets in the host nation. Buckley and Casson (1998) also use the “internalization” approach to FDI and compare a wide range of alternative strategies for foreign market entry. They find that acquisition is favored over greenfield production when there are high costs of learning about the foreign market (including the net loss of local production expertise that the FDI faces if greenfield entry is used), and when there are high costs of competition in the host market because greenfield investment increases local capacity and intensifies competition. In contrast, brownfield entry incurs costs through having to establish internal trust post-acquisition in the new organization, and through the cost of adapting the production facility of the acquired plant. Such costs are likely to be incurred in the immediate post-acquisition phase.

It is implicit in this literature that, if brownfield sites are chosen, MNEs will be relatively risk adverse and establish capacity by acquiring plants with superior productivity levels and technological characteristics more closer to their own (for example, capital- and intermediate-input intensive). Otherwise, MNEs face excessive costs adapting and modifying different technology, gaining expertise and experience in the host market, and building up trust. As Wesson (1999, pp. 2–3) notes: “in order for asset-seeking FDI to be profitable, it must be the case that . . . local assets have greater value when combined with some asset already possessed by the investing firm than they do in the hands of local rivals. If not, local firms would be able to exploit the value of the local assets more efficiently than a foreign investor.”

Even though they might acquire better plants, it is likely that (post-acquisition) MNEs may have problems with assimilation. As such, it is quite probable that productivity will suffer in the short run, leading to the overall prediction that MNE takeovers and acquisitions are of high-caliber plants but that there may be a decline in performance in the immediate period post-acquisition (cf. Ravenscraft & Scherer, 1989). This discussion suggests that the motivation behind acquisition in the case of FDI may be quite different from that of a domestic firm’s acquisition activity. Given this, one might expect distinct differences between the plants acquired by domestic companies and MNEs, particularly in terms of the (total factor) productivity. Such differences need to be separated to establish the true relationships between plant acquisition and performance.

Industry differences are also likely to affect the motivation behind acquisitions, by both the FO and domestic sector. The product life cycle theory (Vernon, 1966) suggests that industries in a more mature state, exhibiting slow growth rates and lower levels of competition, are more likely to follow the neoclassical models of acquisition. Thus, under-performing plants may be acquired to allow improved technology and management practices to increase productivity (and hence profitability) and in this way help reduce costs of the organization post-acquisition. In younger industries where growth and competition are high, the operating efficiency argument suggests that plants with higher productivity are more likely to be acquired as they offer better prospects for growth in such markets (in part because they reduce competition and thus consolidate the acquiring firm’s hold on technology and its market share).

In summary, there are two theories as to why plants are acquired, and these lead to differing predictions as to the relative productivity levels of acquired plants. The theories also differ in terms of the likely post-acquisition performance of plants, although this is less clear cut with respect to the operating efficiency approach to takeovers and mergers. MNEs may acquire plants for different reasons to those that motivate domestic organizations, and industry differences (in terms of market conditions and the state of the product life cycle) are likely to play a potentially important role. Thus, hypotheses suggested by this brief review of the literature are

1. if the operating efficiency approach is correct, acquired plants have relatively high total factor productivity levels, especially in the case of the FO sector;
2. the managerial discipline motive for ownership change is more relevant for larger plants, with these having relatively low productivity;
3. the post-acquisition performance of plants is more likely to be negative if the operating efficiency approach is correct, especially in plants acquired by MNEs in which assimilation problems may be more acute;
4. in the case of acquisition by MNEs, acquired plants are likely to operate with similar technology to that used by plants already belonging to the FO sector (that is, more capital- and intermediate-input intensive); and
5. there are differences across industrial sectors, reflecting product life cycle effects.
III. Plants Acquired by the Foreign-owned Sector, 1987–1992

The individual records of the annual Census of Production contained in the Annual Business Inquiry Respondents Database (ARD) provide the data used in this study. The ARD has been discussed in some detail by Oulton (1997) and Harris and Drinkwater (2000), and thus only the salient features of the database are discussed here. For present purposes, it is important to note that we use plant-level data that has been weighted to ensure that our estimates adequately reflect the underlying distribution of plants in the population.

In section IV, we compare the total factor productivity characteristics of those plants that changed ownership during 1987–1992 (and in particular the plants that were acquired by the FO sector), making use of the financial data in the ARD. We separate out all the plants in operation in any of the years covered by the 1987–1992 period that were also in operation during 1982–1986 (and 1993–1995). The focus of this study is on those plants that were acquired (especially by FO companies) between 1987 and 1992. However, we also want to compare their performance at least in the five years prior to acquisition (as well as after acquisition), and this necessitates including the 1982–1986 and 1993–1995 periods. Note, it is worth emphasizing that, for the 1982–1986 and 1993–1995 periods, we retain only those plants that existed during all or some part of 1987–1992.

Using this subset of the ARD, it is possible to identify those plants that were acquired by U.K.- or foreign-owned companies during the 1987–1992 period. Other plants existing during this period are classified into six other subgroups for comparison with those units that were acquired. Hence, the eight subgroups that span the entire data set are

(1) those plants that were foreign owned throughout 1982–1992 (some 2.7% of the observations in the sample data set used in the following model);
(2) U.K.-owned, single-plant enterprises (14.1% of observations);
(3) those plants that did not change ownership during 1982–1992 and were owned by U.K. multplant firms that sold plants to the FO sector during 1982–1992 (13.4% of observations);
(4) those plants that were acquired by U.K.-owned enterprises during 1982–1986 (15.1% of observations);
(5) those plants that were acquired by FO enterprises during 1982–1986 (1.5% of observations);
(6) those plants that were acquired by FO enterprises during 1987–1992 (3.4% of observations);
(7) those plants that were acquired by U.K.-owned enterprises during 1987–1992 (19.1% of observations); and
(8) those plants that did not change ownership during 1982–1992 and were owned by U.K. multiplant firms that did not sell plants to the FO sector during 1982–1992 (30.7% of observations).

Subgroups (1)–(5) and (8) form a basis against which the performance of the acquired U.K.- and foreign-owned plants can be compared, and are described in greater detail by Harris and Robinson (2001).

IV. Comparisons of Performance

We compare the performance of the subgroups on the basis of their total factor productivity (TFP) levels. Hence, a (pooled) Cobb-Douglas production function7 is estimated that allows for each of the eight subgroups to have different parameter estimates. In addition, various dummy variables covering the subgroups of interest (that is, those plants acquired by the U.K.- and foreign-owned sectors between 1987–1992) are also included to test whether country of ownership of the acquiring enterprise matters. We also allow for differential effects following acquisition. The following dynamic specification is used, which allows for an autoregressive error term within a (unbalanced) panel data model:

$$\ln Y_{it} = \beta_0 + \sum_{j=1}^{4} \pi_{ij} x_{ijt} + \sum_{j=1}^{4} \pi_{ijp} x_{ipj-1} + \sum_{i=1}^{7} \pi_{ijq}(D_i x_{ijq})$$

$$+ \sum_{i=1}^{4} \pi_{ij}(D_i x_{ij-1}) + \pi_3 \ln Y_{i,t-1} + \sum_{i=1}^{5} \lambda_i D_i$$

$$+ \sum_{k=1}^{4} \kappa_k ACQ_k + \sum_{k=1}^{4} \kappa_j(SIZE_k ACQ_k)$$

$$+ \sum_{k=1}^{92} \gamma_k AQR_k + \sum_{n=1}^{107} \varsigma_n REG_n + \sum_{p=1}^{107} \tau_p IND_p$$

$$+ (1 - \pi_4)v_i + (1 - \pi_7 L)\delta_t + \omega_{it},$$

where

i and t represent the ith plant and the tth year of observation, respectively;

Y represents real gross output (in £ million 1990 prices);
xj represents the logarithm of total employment, e;
x2 represents the logarithm of plant and machinery capital stock (in £ million 1980 prices), k;
x3 represents the logarithm of intermediate inputs (in £ million 1990 prices), m;
x4 represents a time trend to take account of technical progress, t;
D is a dummy variable taking on a value of 1 for each subgroup (l = 1, . . . , 7) with those owned by U.K. multiplant firms that did not sell any plants to the FO sector during 1982–1992 forming the reference group;
ACQ are dummy variables taking on a value of 1 depending on whether plants that were acquired during 1987–1992 were E.U., U.S., R.o.W., or U.K. owned;
SIZE is a dummy variable taking on a value of 1 if the plant acquired during 1987–1992 employed 500 or more employees.

7 The translog specifications were attempted, but these proved difficult to estimate.
8 Note, aggregating those plants belonging to the subgroups ACQ4 to ACQ7 is equal to the overall subgroup acquired by FO enterprise 1987–1992 (subgroup D3), whereas ACQ1 is equivalent to D1.
(as such, it tests the hypothesis that there are different motives for acquiring larger plants); $ACQYR$ are dummy variables for each of the six years (1987–1992) that take on a value of 1 if the plant was acquired in that year, separately for foreign and U.K. owned ($m = 1, 2$); $REG_n$ is a dummy variable if the plant is located in the standard U.K. region $n (n = 1, \ldots, 10)$; $IND_p$ is a dummy variable if the plant belongs to a three-digit SIC $p (p = 1, \ldots, 107)$; and the composite error term has three terms with $v_i$ affecting all observations for cross-sectional plant $i$, $\delta_i$ affects all plants for time period $t$, and $w_{it}$ affects only plant $i$ during period $t$.

The 24 nonlinear (common factor) restrictions (for example, $\pi_{21} = -\pi_{11}\pi_{22}$) implied in equation (1) can be tested and, if appropriate, imposed. The model was estimated using the general method of moments (GMM) systems approach available in DPD98 (Arellano & Bond, 1998). This is sufficiently flexible to allow for both endogenous regressors (through the use of appropriate instruments) and a first-order autoregressive error term. All data were weighted to ensure that the samples are representative of the population of U.K. manufacturing plants.

The detailed results obtained from estimating equation (1) for all manufacturing industries and for three subsectors are presented in the appendix. Table 1 provides details on the subgroup dummies as well as the results obtained after imposing various restrictions to collapse the model to a simpler version. Because the parameter estimates for $\kappa_{st}^i$ were always insignificant and because the full model including the $(SIZE_n \times ACQY)$ variables provided significantly inferior results (in terms of model diagnostics), we imposed the restriction that $\kappa_{st}^i = 0$ in the model reported. Thus, this study finds no evidence to support the hypothesis that the motive for acquisitions (in terms of their productivity) during 1987–1992 by either foreign- or U.K.-owned enterprises differed for larger plants. The various models estimated appear to be well specified. When the disturbances $\epsilon_{it}$ are not serially correlated and given that DPD98 reports tests for the first-differenced residuals, there should be evidence of significant negative first-order serial correlation in differenced residuals and no evidence of second-order serial correlation in the differenced residuals, which is the case here. The common factor restrictions are not rejected, and the Sargan ($chi^2$) test of overidentifying restrictions is not able to reject the null that the instrument set is valid. (See Arellano and Bond (1991) for details of all these tests.)

The “subgroup dummy” estimates show that, with respect to U.K.-owned enterprises not selling plants to the FO sector (the benchmark), plants belonging to FO enterprises were generally more productive throughout the 1982–1995 period that is considered here (especially those acquired between 1987 and 1992 that were more than 24% to 72% more productive across the various industry sectors). Overall, FO firms tended to have higher TFP and to acquire “good” plants rather than “bad” plants; as such, we find support for the operating efficiency theory for acquisitions.

There are some significant differences depending on the industry sector and country of origin of the acquirer. Plants acquired by enterprises from the E.U. and from the rest of the world tended to have slightly lower total productivity when compared to those plants acquired by U.K. enterprises from the E.U. and from the rest of the world.

A referee suggested that it might also be useful to consider differences between plants acquired by FO firms that operated in the United Kingdom prior to the acquisition of a new plant in 1987–1992, as opposed to plants acquired to establish capacity for the first time during this period. However, too few observations for the “new foreign-owned” subgroup precludes such an analysis here.

Note, the parameter estimates are converted into $\exp(\lambda) – 1$ because the dependent variable is in natural logs.

It is also interesting to note that plants that did not change ownership but which belonged to U.K. enterprises that sold to the FO sector during 1987–1992 had higher levels of productivity.
acquired by U.S.-owned enterprises. Plants acquired by the FO sector in engineering and vehicles (the fastest growing manufacturing sector) were overall the most productive. In contrast, plants that were acquired during 1987–1992 by the U.K.-owned sector (whether from internal U.K.-to-U.K. transfers or purchases of FO plants) were usually more productive than the benchmark subgroup, but by a margin considerably less than that displayed for FO acquisitions. In particular, plants acquired by U.K.-owned enterprises during 1987–1992 in the “Other Manufacturing” sector were some 11% less productive when compared to the benchmark subgroup. Thus, these results show that there were both important differences across industrial subsectors and support for the managerial discipline approach to acquisitions in the slowest growing “Other Manufacturing” sector, when acquisitions by the U.K.-owned sector are considered.

As to whether the inherent higher productivity of acquired plants was maintained post-acquisition, the picture is rather mixed (see the results relating to the post-acquisition dummies in table A1), but it overall suggests that post-acquisition productivity tended to decline slightly and more particularly for those plants acquired during 1987–1992 by U.K.-owned enterprises (especially in the metals and chemicals sector).14 These results are consistent with the operational efficiency theory for acquisitions, but the time period considered (and especially the number of years that plants are observed post-acquisition) means that it is not possible to draw any firm conclusions as to whether longer-term productivity improves or declines after a plant is acquired. This can be contrasted with the results obtained by McGuckin and Nguyen (1995) when considering the impact of changes in ownership on U.S. food manufacturing plants. Generally, they were able to track plants during the boom period of the mid-to late 1980s for a longer period of time than that considered here (only a maximum of eight years of post-acquisition performance is available in this study), and found that, although there was a short-run negative effect, “plants that experienced ownership change improved their productivity 5–9 years after being acquired” (p. 273).

Finally, and to test whether acquired plants are likely to operate with similar technology to that used by plants already belonging to the FO sector, we have calculated the various elasticities of output with respect to inputs obtained by differentiating equation (1) with respect to each factor input. The results are available in Harris and Robinson (2001, table 3) and show that, in general across the various industry sectors covered, those plants that changed to foreign ownership between 1987 and 1992 typically had much higher capital-to-labor ratios and high intermediate elasticities of output when compared to those plants that changed to U.K. ownership in the same period. (The exception is in the metals and chemicals industry.) As such, they were similar to those plants operating in 1987–1992 that had already been acquired by the FO sector during 1982–1986. Thus, there appears to be some initial evidence that suggests (FO) companies do look for acquisitions that match more closely with their own use of (capital- and intermediate-intensive) technologies, and that this may in part explain why such plants do better (in terms of TFP differences). Clearly, further and more-detailed work needs to be undertaken at a more disaggregated industry level to examine further these issues, with the ARD lending itself to this type of analysis.

14 If takeovers by U.K.-owned enterprises were primarily to boost efficiency in the acquiring enterprise, more “teething problems” might be expected because of greater mismatching post-acquisition. This compares to acquisitions by the foreign-owned sector that were more likely to have occurred in order to expand their capacity in the U.K. market, and where post-acquisition falls in productivity seem to have been smaller.

V. Summary and Conclusions

The principal aim of this note was to consider the types of plants that were acquired and then to formally test whether after acquisition they performed above or below average when compared to other manufacturing plants. Individual panel level data on U.K. manufacturing plants was available from the government’s Annual Business Inquiry Respondents Database (ARD), and thus a particularly detailed study was possible.

The results show that FO enterprises “cherry picked” in the sense that they acquired the most-productive plants previously operated by U.K. enterprises. Specifically, plants operating in the U.K. manufacturing sector that were acquired between 1987 and 1992 were on average more than 41% more productive when compared to plants belonging to U.K. enterprises that did not sell plants to the FO sector, and around twice as productive as plants that changed owner during the same period and were bought by U.K.-owned enterprises. As such, we find support for the operational efficiency theory for plant acquisitions. However, we did find differences across industry sectors that suggest that, when plants were acquired by the U.K.-owned sector in the more mature and slower-growing industries, the motives for ownership change may be more in line with the traditional neoclassical “managerial discipline” approach.

In policy terms, the results presented here do not point to any specific spill-over benefits from FDI in the sense that FO enterprises bought inefficient plants to improve their performance. Indeed, the remaining U.K. enterprises (which of course still provided the majority of manufacturing output) were left producing with plants that were generally less efficient and thus productive, and in markets that did not experience (post-FDI) greater competition through the establishment of new greenfield capacity. In contrast, asset-acquiring FDI does offer the longer-term prospect of yielding higher rents because it is worth noting that belonging to the FO sector generally implies the highest levels of TFP, and U.K. enterprises that “trade” plants with this sector also do relatively well (thus bringing productivity benefits to the wider manufacturing sector through interfirm linkages and through the impact on skills in the labor market). In this way, FDI is apparently setting a standard to which the majority of U.K. enterprises may want to aspire and against which international productivity comparisons can be made.

REFERENCES


### APPENDIX

#### Table A1: Weighted estimates of dynamic Cobb-Douglas production function (equation (1))

<table>
<thead>
<tr>
<th>Dependent Variable: Gross Output, ln $y_t$</th>
<th>All Manufacturing (SIC Orders 2–4)</th>
<th>Metals &amp; Chemicals (SIC Order 2)</th>
<th>Engineering &amp; Vehicles (SIC Order 3)</th>
<th>Other Manufacturing (SIC Order 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_s$</td>
<td>0.534 13.78</td>
<td>0.277 18.47</td>
<td>0.450 9.16</td>
<td>0.321 14.69</td>
</tr>
<tr>
<td>$e_s \times D_1$</td>
<td>-0.238 3.83</td>
<td>0.030 1.25</td>
<td>-0.087 1.32</td>
<td>-0.110 2.89</td>
</tr>
<tr>
<td>$e_s \times D_2$</td>
<td>0.568 8.36</td>
<td>0.130 2.77</td>
<td>0.518 5.89</td>
<td>0.260 8.13</td>
</tr>
<tr>
<td>$e_s \times D_3$</td>
<td>-0.269 6.02</td>
<td>0.053 2.94</td>
<td>-0.127 2.10</td>
<td>-0.040 2.00</td>
</tr>
<tr>
<td>$e_s \times D_4$</td>
<td>-0.162 3.17</td>
<td>0.030 1.50</td>
<td>0.215 3.25</td>
<td>-0.068 3.78</td>
</tr>
<tr>
<td>$e_s \times D_5$</td>
<td>0.053 1.32</td>
<td>-0.071 2.54</td>
<td>0.207 3.60</td>
<td>0.030 1.15</td>
</tr>
<tr>
<td>$e_s \times D_6$</td>
<td>-0.203 4.24</td>
<td>0.033 1.32</td>
<td>-0.135 2.04</td>
<td>-0.081 4.26</td>
</tr>
<tr>
<td>$e_s \times D_7$</td>
<td>-0.078 1.68</td>
<td>-0.013 0.76</td>
<td>0.177 1.07</td>
<td>0.042 2.33</td>
</tr>
<tr>
<td>$k_0$</td>
<td>0.216 6.36</td>
<td>0.236 8.51</td>
<td>0.221 5.24</td>
<td>0.214 4.72</td>
</tr>
<tr>
<td>$k_0 \times D_1$</td>
<td>0.128 6.36</td>
<td>0.034 2.62</td>
<td>0.055 2.37</td>
<td>0.072 5.54</td>
</tr>
<tr>
<td>$k_0 \times D_2$</td>
<td>0.113 4.14</td>
<td>0.069 2.46</td>
<td>0.140 3.84</td>
<td>0.040 3.33</td>
</tr>
<tr>
<td>$k_0 \times D_3$</td>
<td>0.105 10.44</td>
<td>0.051 8.50</td>
<td>-0.060 3.44</td>
<td>0.034 6.80</td>
</tr>
<tr>
<td>$k_0 \times D_4$</td>
<td>0.122 10.22</td>
<td>0.042 5.25</td>
<td>0.070 4.21</td>
<td>0.027 5.40</td>
</tr>
<tr>
<td>$k_0 \times D_5$</td>
<td>0.088 4.55</td>
<td>-0.015 1.36</td>
<td>0.008 0.83</td>
<td>0.036 4.50</td>
</tr>
<tr>
<td>$k_0 \times D_6$</td>
<td>0.061 4.31</td>
<td>0.065 4.33</td>
<td>0.083 3.86</td>
<td>0.036 4.50</td>
</tr>
<tr>
<td>$k_0 \times D_7$</td>
<td>0.085 7.01</td>
<td>0.027 3.86</td>
<td>-0.030 1.77</td>
<td>0.028 5.60</td>
</tr>
<tr>
<td>$m_0$</td>
<td>0.521 13.96</td>
<td>0.751 17.77</td>
<td>0.520 12.67</td>
<td>0.707 18.92</td>
</tr>
<tr>
<td>$m_0 \times D_1$</td>
<td>0.121 1.92</td>
<td>-0.047 2.14</td>
<td>0.068 1.03</td>
<td>0.012 0.34</td>
</tr>
<tr>
<td>$m_0 \times D_2$</td>
<td>-0.426 9.07</td>
<td>-0.121 3.90</td>
<td>-0.239 4.15</td>
<td>-0.165 8.25</td>
</tr>
<tr>
<td>$m_0 \times D_3$</td>
<td>0.197 4.63</td>
<td>-0.072 1.88</td>
<td>0.117 2.41</td>
<td>0.013 0.68</td>
</tr>
<tr>
<td>$m_0 \times D_4$</td>
<td>0.016 0.37</td>
<td>-0.075 3.75</td>
<td>-0.226 3.93</td>
<td>0.036 2.12</td>
</tr>
<tr>
<td>$m_0 \times D_5$</td>
<td>-0.158 3.29</td>
<td>0.043 1.48</td>
<td>-0.194 4.22</td>
<td>-0.050 2.17</td>
</tr>
<tr>
<td>$m_0 \times D_6$</td>
<td>0.122 2.53</td>
<td>-0.068 2.96</td>
<td>0.187 3.08</td>
<td>0.018 0.95</td>
</tr>
</tbody>
</table>
### Table A1. (Continued)

<table>
<thead>
<tr>
<th>Dependent Variable: Gross Output, ln $y_{jt}$</th>
<th>All Manufacturing (SIC Orders 2–4)</th>
<th>Metals &amp; Chemicals (SIC Order 2)</th>
<th>Engineering &amp; Vehicles (SIC Order 3)</th>
<th>Other Manufacturing (SIC Order 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m_{jt} \times D_7$</td>
<td>par. est.</td>
<td>t-value</td>
<td>par. est.</td>
<td>t-value</td>
</tr>
<tr>
<td>$t \times D_1$</td>
<td>0.024</td>
<td>0.53</td>
<td>0.007</td>
<td>0.09</td>
</tr>
<tr>
<td>$t \times D_2$</td>
<td>0.010</td>
<td>0.56</td>
<td>0.015</td>
<td>3.43</td>
</tr>
<tr>
<td>$t \times D_3$</td>
<td>0.016</td>
<td>0.56</td>
<td>0.003</td>
<td>1.50</td>
</tr>
<tr>
<td>$t \times D_4$</td>
<td>0.011</td>
<td>0.75</td>
<td>0.001</td>
<td>1.00</td>
</tr>
<tr>
<td>$t \times D_5$</td>
<td>-0.001</td>
<td>1.23</td>
<td>-0.001</td>
<td>0.13</td>
</tr>
<tr>
<td>$t \times D_6$</td>
<td>0.000</td>
<td>0.23</td>
<td>0.018</td>
<td>9.28</td>
</tr>
<tr>
<td>$t \times D_7$</td>
<td>0.002</td>
<td>0.93</td>
<td>-0.006</td>
<td>3.11</td>
</tr>
<tr>
<td>$t \times D_h$</td>
<td>0.001</td>
<td>0.81</td>
<td>0.005</td>
<td>5.45</td>
</tr>
<tr>
<td>$y_{jt}-1$</td>
<td>0.549</td>
<td>49.00</td>
<td>0.599</td>
<td>34.57</td>
</tr>
</tbody>
</table>

Subgroup dummies
- FO 1982–1992 ($D_4$)
- U.K. single plant 1982–1992 ($D_5$)
- U.K. enterprise sold to FO sector ($D_6$)
- Changed owner 1982–1986 but not to FO ($D_7$)
- Changed to FO 1982–1986 ($D_8$)
- Change to E.U. 1987–1992 ($ACQ_1$)
- Change to U.S. 1987–1992 ($ACQ_2$)
- Changed owner 1987–1992 but not to FO ($ACQ_4$)
- Acquired in 1987, FO ($AQYR_1$)
- Acquired in 1988, FO ($AQYR_2$)
- Acquired in 1989, FO ($AQYR_3$)
- Acquired in 1990, FO ($AQYR_4$)
- Acquired in 1991, FO ($AQYR_5$)
- Acquired in 1992, FO ($AQYR_6$)
- Acquired in 1987, U.K. ($AQYR_7$)
- Acquired in 1988, U.K. ($AQYR_8$)
- Acquired in 1989, U.K. ($AQYR_9$)
- Acquired in 1990, U.K. ($AQYR_{10}$)
- Acquired in 1991, U.K. ($AQYR_{11}$)
- Acquired in 1992, U.K. ($AQYR_{12}$)

Post-acquisition dummies
- Acquired in 1987, FO ($AQYR_{14}$)
- Acquired in 1988, FO ($AQYR_{15}$)
- Acquired in 1989, FO ($AQYR_{16}$)
- Acquired in 1990, FO ($AQYR_{17}$)
- Acquired in 1991, FO ($AQYR_{18}$)
- Acquired in 1992, FO ($AQYR_{19}$)
- Acquired in 1987, U.K. ($AQYR_{20}$)
- Acquired in 1988, U.K. ($AQYR_{21}$)
- Acquired in 1989, U.K. ($AQYR_{22}$)
- Acquired in 1990, U.K. ($AQYR_{23}$)
- Acquired in 1991, U.K. ($AQYR_{24}$)
- Acquired in 1992, U.K. ($AQYR_{25}$)
- No. of significant (three-digit) SIC dummies
- No. of significant region dummies
- Constant

Diagnostic tests
- Conform $\chi^2 (df = 24)$
- Sargan $\sim \chi^2 (df = 935)$
- $m_1 \sim N(0,1)$ ($df = n_{plants}$)
- $m_2 \sim N(0,1)$ ($df = n_{plants}$)
- Zero-slopes $\sim \chi^2 (10^f)$
- No. of plants
- No. of observations

All models are estimated in DPD98; common factor restrictions have been tested and imposed in the results reported here; all t-values are based on robust standard errors; all regressions included significant three-digit SIC and regional dummies (the first SIC in each subgroup and the southeast region of England forming the benchmarks); $m_1$ and $m_2$ are tests for first- and second-order serial correlation; in all models the GMM estimator has instruments back to $t = 3$ for the model in first differences and $\Delta t = 2$ for the model in levels.

*p-values in parentheses.