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SOME ISSUES IN PRODUCTIVITY
AND THE SMALL FIRM

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Some Issues in Productivity and the Small Firm

Abstract

The focus of this paper is productivity and the small firm. This paper assesses the results of research that has been carried out into productivity at the firm level, and discusses its relevance for small firms. The paper presents the UK’s ‘productivity gap’, and identifies two others. After describing briefly some of the hurdles in the way of building robust measures of productivity, it notes that some manufacturing firms are 2.75 times more productive than others in the same industry. The difference between the most and least productive firms in services is even greater. Research that measures the role of entry, exits, existing firms, and shifts between firms is reported for both the US and across the OECD countries. The paper then discusses the theoretical reasons why firms are more or less efficient. The paper finds that most productivity growth at the industry level comes from within existing firms as they add capital to labour. However, owners of new firms need to have the entrepreneurial ability to survive and grow; and the wherewithal to add to their use of capital. In addition, to adopt new methods and technology firms need to be open and to give some power to workers who are skilled enough to use the latest techniques.

Introduction

This paper brings together research on productivity and the small firm. It presents the findings from a series of studies that use large sets of data to evaluate the sources of productivity growth at the industry level. In addition, it discusses these findings to link them with theories about how and why firms perform differently.

The living standards of a country can be increased in two ways. One, more inputs can be thrown into production. Two, these inputs can be used more efficiently. Adding to labour inputs can only boost each person’s living standards if a higher proportion of the country is working. There have been increases in this in the UK over the last twenty years, but there is a limit. Increases in capital can boost productivity, and one might expect that there is less of a limit to this. In capitalist economies, fixed assets become more advanced over time. Capital is linked to technology; moreover, the experience of adding to capital without technology as in Soviet Russia, for example, has been unhappy. Over long periods, living standards depend on increases to the efficient use of inputs in production – productivity.

These findings are important for small firms researchers. They show how new firms contribute to the economy. They point to further research on the way in which small firms decide to use capital and skilled labour and their ability to adopt new methods. These findings are important for policymakers who are charged with bringing down this gap. And they are important for small business owners who want to stay in business for the long term.

The findings point to three gaps in productivity: between countries, between sizes of firms, and between foreign and domestic ownership of firms. These differences boil
down to the amount of capital per worker in each firm. Capital per worker increases as a firm ages and grows, and increases the firm’s chances of survival. But why do firms choose to have a certain amount of capital per worker? The paper discusses how founders find their ability in business; how they develop routines and features of the business that complement new technology; and, how firms adopt new techniques.

The paper is organised as follows. First, a section discusses the UK productivity gap, and a gap between small and large firms. A short section on the issues concerned with measuring how productive a firm is, ends this section. The paper then discusses four main studies in the findings section. As it does, it identifies a further productivity gap, that between foreign and domestic ownership of UK based firms. A section on theory follows, in which the paper tries to explain why firms perform so differently in competitive markets. This starts with a model of investment. It examines how new firm founders learn about business and how this affects them most at the firm’s formative stage. The resource-based view and quality issues are included in this theory section.

How the findings and theory affects research and policy, precede the conclusion.

**Productivity gap**

Three stylised facts describe how national living standards have changed since 1945.

1. The United States consistently tops the rankings.

2. The growth rate per head for the US is low; so, other countries converge on the US level.

3. Convergence is not guaranteed. Many countries have not converged on the US (Barrell et al., 2000).

One of those countries that failed to converge on the US is Britain. Britain’s growth per head matched the US for the period 1950-1996; whilst in the earlier part of the period other Western European countries overtook Britain.

Table 1 shows the growth rates of GDP per head in two post-war periods. The years 1950-1973 were known as the post-war boom when European countries and Japan grew particularly strongly. The second period beginning with the 1973 Oil crisis marks the end of the boom. By then, growth in most of the industrialised countries had slowed noticeably, with the exception of Norway, Hong Kong and Singapore. In the second period, the European growth express appeared to face similar speed limits as the US and UK.

By 1999, the UK Treasury (2000) reports labour productivity gaps of 45% with the US, 18% with France, and 11% with Germany (East and West). The UK government set itself the challenge to close this gap i.e. to converge with the US. In order to do that the UK will have to grow faster than Germany, France and the US.
Table 1 Levels and post-war growth of GDP per head, selected countries.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>23,719</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>22,256</td>
<td>3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td>21,201</td>
<td>5.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>20,983</td>
<td>4.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>19,803</td>
<td>3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>19,582</td>
<td>8.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Germany</td>
<td>19,622</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>18,504</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>18,207</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>17,326</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>16,814</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>13,132</td>
<td>5.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: from Barrell et al., (2000)

SME productivity gap

In a similar manner to the gap between nations, productivity differs across firm size. Large firms are more productive than small (Selden, 1999). In the 1950’s and early 1960’s, static models of industry portrayed the small business as a firm that that produced below the optimal scale of output. The policy implied by this was that cuts in the share of jobs in small firms would boost both efficiency and wages (Audretsch, 2001). In the 1960’s, the UK’s Labour Government watched over a boom in the number of mergers by large firms. In the era of ‘national champions’, policy was driven by a strong accent on economies of scale, which were seen as important to the firm’s ability to compete overseas (Atkinson et al., 1996). The merger boom failed to provide any lasting progress; however, mergers had little or no effect on profits. Often the size of the acquiring firm was greater than any minimum efficient scale; so, few scale economies were realised either (Mueller, 1980). Aaronovitch et al (1981) reported ‘Between the thirties and 1968 the hundredth largest firms increased their share of net output from 23 to 41 per cent, but the proportion accounted for by the 100 largest plants (11 per cent) was still the same’ (1981: 263). By 1973 with the end of the long boom, the economic stability of the previous decades was overturned (Atkinson et al., 1996). Birch (1979) suggested that smaller firms had created more jobs then had larger firms in the 1970s. This began to switch attention towards the role of smaller firms. Although, it turns out that the pattern of job creation differs from small firms to large. Small firms create jobs more

1 Converted to dollars using 1990 purchasing power parity.

2 Nickell (1996) finds that market share reduces the level of total factor productivity within a fixed effects framework. Although the same result would be found if there is a shift of market share from firms with lower productivity to firms with higher productivity. Geroski (1990) in a similar type of study showed that monopoly power cut the rate that firms introduced new products.
consistently over the economic cycle. In recessions, small firms still create jobs, whereas large firms lay off workers. In booms, however, large firms create many more jobs. So crudely, static models find that large firms are more productive, whilst small firms create more jobs.

On the other hand, if we consider the dynamic effects of small firms; then small firms influence through their role as *change agents*. New firms start below the optimal scale but if they have entrepreneurial ability, they may grow quickly. At the same time new firms can be the vehicle for entrepreneurs to bring an innovation to market (Audretsch, 2001). Whilst large firms produce the most innovations; small firms hold more patents than one would expect, given their spending on R&D (Acs, Morck and Yeung, 1999). Given that innovation is central to productivity in the future (Cameron et al, 2000), it follows that the small firm is too. A thriving small firm sector enables new industries and innovations to come to the market. Most innovation in small firms is to do with new products (Hoffman et al., 1998). The small firms that innovate may not benefit from their innovation in the end; yet, its innovation may change many industries. For example, firms with new products are attractive prey for larger firms with cash to buy companies (Cosh, Hughes and Wood, 1999). Small firms are critical for innovation and change.

Moreover, firms are getting younger. Jovanovic (2001) shows that of the top twenty US firms by market value in August 1999, four were under twenty years old, and their value added up to nearly thirteen per cent of national income. All these firms were in high technology, mostly computers: Cisco, Dell, Microsoft and MCI. In addition, the average age of all firms listed on the US stock market is falling. Jovanovic (2001) finds a liability of age as older firms’ share of market value declines. From a different viewpoint, Carroll and Hannan (2000) argue that firms face an increased risk to their survival as they age. Younger firms are creating more wealth.

**Measuring productivity**

Measuring productivity is difficult (Barrell et al, 2000). The first problem is to measure output. Output measures in such industries as car manufacture can be found but in health, education and government services it is extremely difficult to measure. As a result, much of the data concerns the productivity of firms that make things. Often researchers use price indices to deflate sales (Bartelsman and Doms, 2000). Turning to the inputs, there are two main approaches: either to measure labour input or to try to measure all the inputs. Labour productivity measures the output for each unit of labour. This measure is useful for policymakers because of its links with GDP per head. Here there are issues concerned with whether one measures jobs or hours worked. For example, hours worked reduces the figures for the United States and Japan because of longer hours worked in those two countries.

Labour productivity does not tell the full story, however. One way to make labour more productive is to add to other inputs. Firms might choose a different blend of labour and capital. The approach that attempts to measure all the inputs is total factor productivity. This is a measure of output per unit of input and is usually measured by index numbers.
(Bartelsman and Doms, 2000). From a strict theoretical point of view, it is preferred. It is useful if studies use both types of measure.

Findings

The section on findings relies heavily on four main articles. First, Foster et al. (1988) studied the sources of productivity growth in US factories between the years 1977 and 1987. Second, Scarpetta et al (2002) has made a similar study across OECD countries. Third, Disney et al (2002) have examined the UK’s ARD data for the effects of entry and exit. And fourth, Oulton (2001) used the same data set to compare British-owned and foreign-owned plants located in the UK.

Entry, exit and existing firms

An industry can become more productive in four ways:

- existing firms can become more productive;
- more productive firms can increase their market share;
- more productive firms can enter; and,
- less productive firms can exit.

Foster et al. (1998) tried to separate out each of these factors for both total factor and labour productivity in US factories. These are shown in table 2.

Table 2 The decomposition of productivity growth for U.S. Manufacturing Establishments (method 2) 1977-87

<table>
<thead>
<tr>
<th>Measure</th>
<th>Total growth</th>
<th>Share of total growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Within plant</td>
<td>Between share</td>
</tr>
<tr>
<td>Total factor</td>
<td>10.24</td>
<td>65</td>
</tr>
<tr>
<td>Labour per hour</td>
<td>21.32</td>
<td>70</td>
</tr>
<tr>
<td>Labour per worker</td>
<td>23.02</td>
<td>69</td>
</tr>
</tbody>
</table>

Source: from Foster et al. (1998)

Existing firms that become more productive are the main source of increases in the productivity in the industry. Foster et al (1998) find that changes in the market share of firms adds little to industry productivity, although during recessions this makes more of an impact. However, the contribution of net entry to productivity growth is greater than that expected by the share of entrants and exits in the output.

The results of net entry show that less productive plants exit, whilst their more efficient peers continue. Indeed, the authors note that many studies show less productive firms to
be at risk of exiting the industry. In 1987, entering plants had similar multifactor productivity but lower labour productivity than existing plants. New plants seemed to have a more efficient mix of inputs, and following entry have added to their capital input. Plants that entered in 1977 were more productive as a group by 1987, for two reasons. Selection weeded out the less productive entrants; and those firms that entered in 1977 were more efficient by 1987. The authors find evidence for both selection and learning effects.

**International entry and exit**

Scarpetta et al (2002) make use of a firm-level data on ten OECD countries. Many of their findings are similar to those found by Foster et al. (1998) for the US. They find that one-in-five firms either will close down or has entered that year. Both studies agree that much of the increase in efficiency is accounted for by increases within existing firms in the industry. However, entry and exit into the industry boosts productivity more than one might expect given their share of jobs in the industry. The exit of the least productive firms boosts industry productivity, particularly in mature industries. The smallest firms are much more likely to fail. Both studies find that existing firms contribute more to the overall labour productivity of the industry than they do to the overall total factor productivity of the industry. This suggests that existing firms are adding more to their non-labour inputs. This would occur if existing firms become more productive by adding to the ratio of capital to labour. Besides which, firms become more capital intensive as they age.

Scarpetta et al (2002) find some differences between the firms in US and European countries, however. In the US new start-ups seem to be less productive than average. So that the net entry effect that Foster et al. (1998) find would appear to rely on the exit of poorly performing firms. Overall, for their ten nations, Scarpetta et al (2002) find that new firms contribute very much to the growth of total factor productivity. They conclude that the new firms enter with new methods and technology as well as an efficient mix of capital and labour.

Scarpetta et al. (2002) find a positive link between the entry rate in an industry and how productive it is. They find that for new industries new firms add more to the overall productivity. Further, in new, efficient sectors very high performers boost the industry average.

Scarpetta et al. (2002) argue that entry is cut by a more strict regulation of products. This burden appears greater for those countries that lag furthest behind the leading edge in technology.

**US, Germany and the UK**

The United States is seen as the proud possessor of an enterprise culture. We might expect that in the US there would be higher entry and exit rates than in Germany. We might expect that German start-ups are relatively large and with high rates of survival but
with relatively slower growing firms than those in the US. And we might expect that the UK is somewhere in between these two poles.

In fact, firm turnover rates for manufacturing are higher in the UK than in the US or Germany. Table 3 presents a comparison of small business conditions in West Germany, UK and US, for manufacturing. In comparison with European firms, US start-ups are smaller but then grow more rapidly. New firms generally show wide variations in their efficiency, these variations seem to be much greater in the US.

Table 3 Comparison of the UK, US and West Germany on small firm parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>UK</th>
<th>US</th>
<th>West Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm turnover rates</td>
<td>Highest</td>
<td>High</td>
<td>Lowest</td>
</tr>
<tr>
<td>Survivor rates</td>
<td>Lowest</td>
<td>Highest</td>
<td>Middling</td>
</tr>
<tr>
<td>Relative size of entrants</td>
<td>Middling</td>
<td>Lowest</td>
<td>Low</td>
</tr>
<tr>
<td>Relative size of exiting firms</td>
<td>Middling</td>
<td>Lowest</td>
<td>Low</td>
</tr>
<tr>
<td>Growth of survivors</td>
<td>Lowest</td>
<td>Highest by far</td>
<td>Middling</td>
</tr>
</tbody>
</table>

Source: derived from Scarpetta et al. (2002)

The real problem for European firms is not so much that they do not enter, more firms enter and exit production industries in France and Britain than in the United States; yet, the average jobs created by the entrants are 80% lower in Europe. They suggest that less strict worker protection makes it easier for innovative entrepreneurs to experiment on a smaller scale, test the market and then expand.

The survival rates for UK firms are also lower than for United States and Western Germany. The relative size of start-ups firms is higher in the UK than in Western Germany.

**UK Data**

Disney et al. (2002) explore some of these issues using the UK ARD database. Again, they find high rates of 'churning'. For every hundred firms in an industry, seventy-five are existing survivors, twenty will exit that year to be replaced by twenty others and five will enter and exit after one year only. The existing firms are significantly different in terms of size, as shown in table 4. A small number of very large firms skew the mean average; hence, median size differences are valuable. Even these show that the existing firms are twice as large as entrants.
Table 4 Size of Existing firms, Entrants and Exiting firm

<table>
<thead>
<tr>
<th>Year</th>
<th>All Mean</th>
<th>All Mdn</th>
<th>Existing Mean</th>
<th>Existing Mdn</th>
<th>Entrants Mean</th>
<th>Entrants Mdn</th>
<th>Exiting Mean</th>
<th>Exiting Mdn</th>
<th>One-year only Mean</th>
<th>One-year only Mdn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>33</td>
<td>4</td>
<td>42</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1987</td>
<td>33</td>
<td>4</td>
<td>43</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>1988</td>
<td>32</td>
<td>4</td>
<td>42</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1989</td>
<td>32</td>
<td>3</td>
<td>46</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1990</td>
<td>33</td>
<td>4</td>
<td>40</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>14</td>
<td>3</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1991</td>
<td>33</td>
<td>4</td>
<td>47</td>
<td>6</td>
<td>10</td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Disney et al. (2002)

As well as low productivity, Disney et al. (2002) find that size is an important forecaster of exit; again this finding is in sympathy with Scarpetta et al., (2002). The ARD database classifies new ventures by existing firms and new firms differently. Thus, Disney et al. (2002) show that more entrants into industry are new firms rather than new ventures by existing firms; but the ventures by existing firms create the most jobs. The ARD database shows that successful new industries exhibit a great deal of 'churning'. This is also supported by previous research. In her study of an American region, Birley (1986) showed that the high rate of entry in transport and business services was related to both net growth and high rates of firm deaths.

For their UK data, Disney et al. (2002) find that entry and exit rates correlate within short periods but not across longer time horizons, which is consistent with a speedy selection of firms. Firms find out quite quickly whether they have the means to survive. Sixty-five per cent of entrants will have exited after five years. Selection models imply that hazard rates should decline with age and with size because those firms that survive and grow show their ability in business3 (Jovanovic, 1982).

To explore how new firm founders learn about their ability, Disney et al. (2002) examine the survival prospects of new ventures by existing firms versus new firms. Existing businesses will have both a stock of corporate know-how and greater access to finance. This ought to reduce the learning required to survive. Therefore, hazard rates for new ventures by existing firms should be lower than for wholly new firms. Using Kaplan-Meier hazard functions, Disney et al. (2002) find that new firms are indeed less likely to survive than those new ventures of existing firms.

Disney et al. (2002) create a what-if scenario: what if new firms had the initial size and growth that new ventures had? Is it the growth and size of new firms or ventures that matters, or is it that they are either wholly new firms or just new ventures? They switched the size-growth features of new firms as opposed to new ventures by existing firms. This shows that it is the size and growth of the venture that matters. This leaves us with three possible conclusions. First, learning does not matter. Second, learning matters but only

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3 In many economic model the ability of the firm to survive is put at the individual's ability in business rather than the business idea.
within specific markets. Third, learning matters and it enables new ventures to gain more resources at start-up. The last explanation seems to be plausible.

Previous US research found that the initial size of a start-up is linked to a reduced chance of failure; furthermore, firms that start off very small but grow quickly lower their hazard rates (Phillips and Kirchoff, 1988; Audretsch, 1995). Disney et al. (2002) find that for UK firms, the advantage of initial size reduces rapidly beyond two employees. Employing one or two employees increases your chances of survival significantly but more than two increases the chances just a little bit more.

**Another Productivity Gap: Ownership**

There are 1752 factories or plants that always appear in the ARD data from 1973 to 1993. Oulton (2001) looked at how productive these plants were. He found that foreign owned (particularly US) firms are much more productive than are UK owned firms. Foreign owned plants operate with 50 per cent more capital per worker and achieve 38 per cent more value-added per worker. Workers in foreign owned plants are paid more and they employ more white collar labour than their UK counterparts. It seems that the productivity gap extends to the ownership of UK based plants.

US owned factories create 31.7 per cent more value-added per worker than UK firms. The amount of capital per worker and labour quality explain 61 per cent of the US lead. Non-US foreign owned factories create 14.6 per cent more value-added per worker than UK firms. The gap with the non-US firms is almost entirely due to the amount of capital per worker and labour quality. Moreover, foreign owned firms are not bunched in highly capital intense sectors; these differences are found right across industry. In services the foreign ownership leads in labour productivity are larger than in manufacturing: 49 per cent for US owned firms and 46 per cent for non-US foreign owned firms.

Oulton (2001) assumed that capital per worker was the same for all firms in 1973. The large differences between capital per worker found by 1993 can only have come about because foreign owned firms invested more than did UK owned firms. Most worrying was that the longer the foreign firms were based in the UK the more they invested like the UK firms. Something about the UK reduces firm investment in both capital and labour.

These four studies show a great deal of consensus. First, most productivity growth at the level of the industry comes from existing firms who increase their own efficiency; and they do it by adding to their capital per worker. Second, entry and exit 'punch above their (employment) weight, especially in new industries. About one-in-five firms are involved in exit and entry. Third, US firms start smaller than those in Europe, but they grow much more quickly. As new firms grow quickly they add to their chances of survival. Fourth, the least productive and smallest firms are more likely to exit the industry.

UK firms have lower productivity because they use less capital and skill input. A simple message for policymakers is that to increase labour productivity just add capital.
However, capital and technology are inextricably linked. Bartelsman and Doms (2000) argue that the simple story of productivity is that firms make choices about the technologies that they use. Then the market dictates the outputs that can be expected. The question to be answered is now: why would a firm choose inferior technology? To answer this we need to turn to some theory.

Theory

In this section the paper considers the theories that might explain and add light to the findings already discussed. The theory of the firm treats capital as a factor input whose demand derives from the output that the firm produces. This section tells us why firms invest. From then the paper examines specific differences between firms, in particular firm type and the ability of the manager. When the manager learns to manage a company is the subject of a section that focuses on imprinting and the resource-based view of the firm. From there the question of change is covered by the debates on quality within the firm. Finally, we return to adopting technologies and consider the complements needed including skills in the workforce.

Investment

Investment is usually seen as a macro problem, whereby government has to create a good climate for private firms to spend on capital goods. This good climate might include stable demand and secure property rights. In addition, the public sector can invest in infrastructure, such as roads, rail and telephone. This can add to the growth in the economy (World Bank, 1993). Nations that invest more in human and physical capital will enjoy more growth in per capita income.

At the level of the firm, economic theory suggests that firms will invest if the returns from doing so add to their future profits, over and above the cost of investment. However, there are good reasons for expecting that capital for smaller firms would be rationed. The costs of investment will involve the cost of the capital goods and include interest. So, low real interest rates might induce firms to invest more. Lower costs of capital goods would also induce firms to invest. In addition, high levels of uncertainty cut the effective future gains from the firm’s decision to invest. Uncertainty reduces the net present value. The level of uncertainty about the future output that customers’ demand would reduce investment. In addition, when firms invest in new capital they often adopt new technology. Consequently, investment can be researched in ways that model this adoption element, see table 5 (Stoneman and Kwon, 2000).

Stoneman and Kwon (2000) model the firm’s investment as a blend of two effects: the need to expand output and the need to adopt new methods. Table 5 shows those factors that were significant in the model, together with their elasticities. Elasticities show the effect on investment of an increase in the variable. A £1 increase in sales would lead to a 60p increase in gross investment. A £1 increase in the cost of the investment would cut the firm’s spend on it by 78p.
Table 5: Elasticities of Significant Effects on Firm Level Gross Investment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>.60</td>
</tr>
<tr>
<td>Industry R&amp;D</td>
<td>.37</td>
</tr>
<tr>
<td>Cost of investment</td>
<td>-.78</td>
</tr>
<tr>
<td>Industry price</td>
<td>.14</td>
</tr>
<tr>
<td>Increase in the firm’s output since last peak</td>
<td>.04</td>
</tr>
</tbody>
</table>

Source: Stoneman and Kwon (2000)

They find that the log of sales is linked to the firm’s gross investment, as you would expect. They find that the amount of research and development carried out within the industry is also linked positively to gross investment. This stands for the opportunities that the technical change affords the firm. The higher the cost of an investment the less it is made. The prices in an industry matter as they reflect some of the benefits from adopting a technology. Finally, they find that an increase in output from the firm’s previous peak adds to investment. Besides, the authors cannot reject the presence of firm specific impacts on investment. Investment depends on future sales, the presence of new methods and firm specific effects. Now the paper turns to firm specific effects.

Entrepreneurial learning

The most influential paper on entrepreneurial learning is by Jovanovic (1982). This paper set out to show the process of selection amongst new firms. In it Jovanovic (1982) argued that founders of new firms are no more aware of their ability in business when they start a new firm than anybody else. In addition, as the firm begins trading the founder find out what their ability is; and this ability reveals itself in a short time. Jovanovic calls this ability their firm type. This is a discovery view of firm type. The entry of the entrepreneur into business is a learning-by-doing experiment. Once found, the firm keeps its type. Thus, entrepreneurial ability is reflected in the firm’s efficiency and by implication its productivity.

Haltiwanger et al. (2000) suggest that as firms find out their type they adjust the skill mix of their workers. Haltiwanger et al. (2000) divides labour productivity into two parts:

1. That which would be expected due to the firm’s choice of level of skilled workers; and,
2. a residual.

The residual is considered to be the error of the new firm founder’s estimate of their firm type. Thus, overly optimistic entrepreneurs will employ a workforce with higher skills than the resulting productivity. By relating skill mix and type the answer to the problem of why a firm chooses a low productivity approach is that their firm type (entrepreneurial ability) is low.
Imprinting

Haltiwanger et al. (1999) find that the choices that managers make about the skills of the workforce persist over time. This is akin to organisational ‘imprinting’. This describes the tendency of firms to adopt the management and social mores of their time of birth (Stinchcombe, 1965). Once adopted, these routines are very difficult to change. Organisational ecologists call this structural inertia. They argue that firms resist change once their core routines become habits (Carroll and Hannan, 2000).

Further, the way the human brain works makes us liable to repeat behaviour, especially if that behaviour brought success in the first place (Langer, 1989). When a person does something once, and sees no reason to change, then they repeat the action time after time. It becomes automatic. Langer calls this ‘mindless behaviour’. The problem is that this behaviour pattern can persist even when it produces poor results. If someone learns the wrong way to do something or if conditions change, then people need to be ‘mindful’ to change their actions.

Under normal conditions, firms that survive are those who are gain most customers rather than those who are most efficient (Romanelli, 1989). So, firms learn to concentrate on sales rather than profits or efficiency. The ‘mindless’ firm owner, therefore, might concern themselves more with sales and the ‘top-line’. The aphorism ‘top line vanity, bottom line sanity’ may describe the effects on the owner’s actions of those first, successful months. Thus, small firms may not be mindful of the need to increase efficiency, only of the need to sell more.

The resource-based view

Reasons for this structural inertia also are found in the resource-based view of the firm. The resource-based view set out to explain why firms in the same markets perform very differently. Hence, it is of interest.

The RBV stresses that organisations have features, routines and procedures that are difficult to imitate. Because these routines are difficult to imitate they can provide the firm with high profits time and again. Resources in the RBV include both the inputs: land, labour, capital, and crucially, the know-how to blend these resources together most effectively.

In the resource-based view, the need to establish firm processes and routines is a crucial task of the new firm. Once established, it may be difficult to alter the firm’s routines. Hence, advice to firms on organisational matters might be targeted early in the life cycle at or before start-up. There is a tension between help towards those firms most likely to survive and the possible ability to influence firms most easily at the early stages.

Total quality management and complementary assets

Total quality management (TQM) is a programme that is intended to improve the processes within each plant. Its leading lights view that the primary purpose of the organisation is to stay in business and TQM was designed to help the firm to do that (Hackman and Wageman, 1995). TQM succeeds because the costs of poor quality
(inspection, rework and lost customers) exceed the costs of developing processes to produce high quality goods and services.

There are four further assumptions.

- To survive in the long run, the firm must supply quality products.
- Employees care about quality and, provided with the tools, training, and that managers pay attention to their ideas, they will take initiatives to improve it.
- The functions within organisations, such as accounts, manufacture and sales, depend on each other. The most important problems cut across the traditional functions.
- Quality is the job of top management. Employees’ work effectiveness is a direct function of the quality of the systems that managers create.

The primary cause of quality problems is uncontrolled variance in processes (Hackman and Wageman, 1995). Only when the roots of variability are clear are employees in a position to improve work processes. These analyses should be based on collecting data using statistics and testing solutions by experiment.

In the US, small firms are adopting quality at a phenomenal rate and the few management layers in smaller firms can help them implement it (Meyer, 1998). Social network ties alert firms to innovations and they increase the rate of adoption (Rogers, 1983). At the early stages, these ties decreased conformity to normative TQM adoption. They help decision-makers to identify those TQM practices that take advantage of the organisations’ strengths. Westphal et al (1997) found that US hospitals who were late adopters of TQM conformed more closely to the normative pattern of quality practices, in comparison with early adopters. Early adopters used their networks to learn about TQM. They implemented it for internal reasons and adapted the programme as they did so. Late adopters used their networks to find out the ‘right’ way to implement TQM. Therefore, policy to encourage all firms to adopt is likely to reduce the average benefits from adoption.

The failure to achieve with TQM is linked to either the failure to implement it fully (Hackman and Wageman, 1995) or the absence of complementary assets that need to be combined with TQM to make it effective (Carmen et al, 1996; Waldman and Gopalakrishnan, 1996). Powell (1995) controlled for firm size and industry factors (such as entry barriers and rivalry). Success with TQM depends critically on the commitment of top management, the creation of an open organisation and the empowerment of employees. He suggests that firms should focus on creating a culture within which these procedures thrive. Powell (1995) concludes that: if TQM can provide a framework to help firms understand and acquire the complementary resources of commitment, openness and employee empowerment, then it serves a useful purpose; yet he suggests that those underlying intangible resources produce success with or without TQM. An executive is a successful non-TQM firm said ‘If a firm needs a fancy program to listen to their customers, then I think they’d better get one.’ (pp. 31).
Technology adoption and characteristics

Barrell et al. (2000) argue that there are strong links between the capacity to adopt advanced technology and the skills within the workforce. Arguably, the UK has been caught in a ‘skills gap’ where the lack of skilled workers stops firms from adopting technology (Finegold and Soskice, 1988). Given the higher wages paid by large firms, smaller firms would arguably bear the brunt of these skill shortages. Estimates by Nickell and Nicolitsas (2000) show a one-for-one relation between the fraction of firms that report skill shortages and the amount that they invest in the future. Thus, a 10% rise in the number of companies in the firm’s industry that report a lack of skilled labour cuts investment later on by 10%. Thus, we return to the problems of labour quality.

Discussion

At the industry level, most growth in productivity is the result of existing firms who add to their capital per worker. Entry by new firms contributes to the industry usually through the poorly performing firms that they displace. Exiting firms are small and have low productivity. New firms that survive add to their efficiency by adding to the amount of capital that they employ. In attempting to explain why firms that serve the same market perform so differently, three themes emerge: the technology adopted by the firm, the ability of its managers, and its routines and complementary assets. These three elements interact.

Put simply, the technology that the firm adopts determines how productive it is. Firms differ in their know-how, however. These differences will determine whether the firm has the capacity to absorb a new technique (Cohen and Levinthal, 1990). For the smallest firms, the high level of uncertainty can reduce the incentive to invest. Further, the ability of the manager that they discover as they begin in business will control the skills that the firm is able to pay for. These skills are complementary to the technology that the firm can adopt. The routines that the firm must create and the tone within the firm: open with empowered workers, again can affect the methods that firm can adopt. There are relatively few management practices that are suitable for firms that do not plan, for example (Mole, 2002b). Besides, there are factors outside of the firm’s control: the number of technologies that are available, the level of skills in the workforce, and the amount funds that can be used to invest, see figure 1 (after references).

For small firm-owners, these findings provide a warning. Those who want to survive for a long time must grow to a sufficient size and then continue to add to their technology. Thus, small firms need to make enough profit to fund their investments. They need to sell enough output to surpass their breakeven point. One of the messages from this survey of productivity is that firms need to pay attention to both their top line sales as well as their bottom line profits, not to mention their cash; and having paid attention to it recycle the

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4 A colleague pointed out recently that all small firm owners have some expectation of lifestyle.
profits back into the business. In the end, those small firms that cannot keep up with technology are faced with closure.

**Implications for policy**

In terms of policy, there are three issues. The first thing to note is that new firms provide a boost to the productive potential of the economy in excess of their share of jobs. However, the UK is a country with relatively high numbers of new firms. Hence, the policy response to increase the number of start-ups would seem unwarranted. What appears to mark the UK is the number of firms that are both efficient and stable. Either the UK is home to a more significant number of ‘lifestyle’ businesses\(^5\), or there are some barriers for firms to grow. Policy needs to focus on the number of efficient firms that do not grow.

Hitherto, targeting has been aimed at the small number of firms that create the most jobs. However, many of the new firms that create the most jobs are labour intensive, (Mole et al., 2002). Fast growing firms are not typically found in high technology sectors (Almus, 2002). Mole et al. (2002) found that new firms that were highly productive in terms of sales per job were found in two groups: in the 5-9 employee size band, and in those that had more than one million pounds in sales. If policy tries to increase the market share of more efficient companies, then the 5-9 size band firms might need to be targeted. There has been some debate about the ability of Business Links and their PBAs to adopt targeting in the past (Mole, 2002a). One might suggest, therefore, that targets might need to be specified clearly.

The paper suggests that attempts to influence the way firms are organised is best done early in the life of the firm. The research on imprinting suggests that support can be well received at the pre-start stage. At this stage, some support will be aimed at business founders that have little chance of success. Nonetheless, more firms take advice prior to launch than subsequently.

**Implications for theory**

Theories that focus on firm differences are not new. In the 1930’s, economists like Joan Robinson developed theories about monopolistic competition. Firms can charge higher prices for their products if they can convince consumers that their goods are better. Similarly, the resource-based view of the firm offers to explain why firms, and not industries, differ.

In terms of how productive firms are, the conclusion of this paper is a proximate one. It depends on the technology of the firm. Firms with high levels of capital per worker have higher levels of productivity. This is something of a tautology, however. Instead of explaining the source of productivity, we must find out what influences the amount of

\(^5\) A colleague pointed out recently that all small firm owners have some expectation of lifestyle.
capital per worker that companies employ. Thus, the determination of firm level investment plays a role.

One of the key determinants of the firm’s willingness to invest is its anticipation of increased output in future. However, if increases in output are a function of firm type then we have a link between issues of managerial ability and the firm’s capital per worker. The amount of uncertainty in the ability of the firm to predict demand is important. And we know that many small firms’ face demand that is more uncertain. In terms of theory development, this paper suggests that research on investment and how entrepreneurs learn to organise their business needs to be brought together.

**Future research**

The areas for future research on productivity seem to centre on the ‘firm type’, and the ability of the managers in small firms to learn. In particular, despite many assessments of programmes to teach managers in small firms, little is known about the way in which the new small firm learns to organise itself. Further, we need to examine the links between investment, firm type and the ability of the manager.

A second area for research is the growth of small firms. Compared with US and German small firms, UK firms are relatively large on start-up suffer the highest rates of churning and those who survive grow slowly. Whilst this area has been researched extensively, much of the research is on fast growing firms or ‘flyers’. The research presented here warrants research to understand why a group of very productive small firms do not grow.

**Conclusion**

Productivity gaps result from differences in capital, technology and skill. This paper has identified three ‘productivity gaps’. There is a gap between nations based on GDP per head. There is a gap between larger firms and small firms. Finally, there is a gap between the domestic and foreign-owned companies in the UK. All of these gaps are the result of differences in the capital and skill intensity of each firm. Most productivity growth comes from within existing firms as they add capital to labour.

Nonetheless, entry and exit increases productivity more than one might expect given its share of jobs in the industry. And, in new industries, entry and exit is more important still. The emphasis on large firms, most prevalent in the 1960’s failed because small firms herald new methods and products. As founders start their businesses, they find out the ability in business. Selection, where firms whose managers lack ability exit, seems to be mercifully quick. If their ability is adequate, they survive and grow. At this point, they may adopt new technologies. To adopt new technology, however, firms need to be open and to give some power to workers who are skilled enough to use the latest techniques. So, to increase the productivity of small firms, policy might shift its target to those firms with the capacity to adopt new methods.
References


Figure 1: Influences on productivity

Technologies
Skills in Workforce
Funds available

Firm Type
The Ability of the Manager
Technology: The know-how to adopt
Routines: Complementary assets