The Australian Economic Review, vol. 40, no. 1, pp. 1–7

Policy Forum: Industry Dynamics

The Role of Firm Dynamics in Australia's Productivity Growth

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1. Introduction

One seldom-explored factor explaining industry productivity growth in Australia is the role of firm entry and exit. The importance of firm dynamics has been highlighted by a growing number of international studies on large-scale longitudinal micro datasets; however, only one such study has been undertaken on Australian firms (see Bland and Will 2001).

Firm dynamics which result in a reallocation of output shares and resources from low to high productivity firms can substantially impact aggregate productivity growth. Accordingly, policies aimed at enhancing aggregate productivity and economic growth should take into account the costs of entry (such as excessive administrative regulations) and exit (such as insolvency regimes).[1] In this light, the role of firm dynamics in Australia's productivity growth merits greater attention, and it is the aim of this article to document its importance.

In this article we review patterns of firm movements and present estimates of the contribution of firm dynamics to the productivity growth of Australian industries. Our estimates are principally drawn from the Business Longitudinal Survey (BLS), which covered the period 1994–95 to 1997–98.[2]

* The authors would like to thank the Australian Bureau of Statistics for providing access to the data and, in particular, Shiji Zhao and Valentin Valdez for their support and assistance. The content of this article does not reflect the views of the Productivity Commission.

2. Explanations of Firm Dynamics

Explanations of firm dynamics have centred around three themes. The first is the Schumpeterian notion of 'creative destruction', where entrants armed with new technology compete with incumbents. If the entrants' innovations succeed, they replace the incumbents. If not, they fail to survive. Thus, aggregate productivity evolves with successive waves of innovation through entry and exit and the resulting resource reallocation. The second explanation is based on the concept of experimentation under uncertainty, where firms in an industry make different bets on technologies, goods and production facilities. These generate differences in outcomes and firms make decisions to expand, contract or exit as they learn about the environment and their capabilities. Approaching the issue from a slightly different angle, the third premise links firm dynamics with product life cycles. Entry is relatively easy and there are many players when a successful new product appears. As the market matures, the growth of demand decelerates and economies of scale become more important. Consequently, the number of firms declines sharply, and then levels off. For evidence, see the review by Ahn (2001).

Another common way of thinking about firm-level and overall productivity changes is to distinguish between movements of firms from an inefficient point to an efficient point on the frontier and between movements of the entire frontier. This is elaborated in, for example, Dawkins and Rogers (1998). 'Level' effects involve reducing a firm's inefficiency and

moving it towards the production frontier. By definition, any productivity growth from such changes will be short-lived. 'Growth' effects impact on the long term and relate to moving the frontier outwards through, for example, innovation and human capital investment. Some factors may affect both level and growth, such as the degree of competition in an industry, which is likely to shape both the level of efficiency and nature of innovation. Using Dawkins and Rogers' (1998) differentiation, firm dynamics and resource shifts are likely to have both level and growth effects on productivity at any time, depending on the composition of the factors driving firm dynamics.

3. Patterns of Firm Dynamics

3.1 International Evidence

Extensive surveys on firm churning may be found in Caves (1998), Tybout (2000) and Ahn (2001). While these surveys cover a variety of countries, industries and time periods, there is general agreement on the empirical regularities. To begin with, many firms enter and exit most markets every year, and large changes in market shares across continuing firms are common. Entrants are typically small and initial failure rates are high, but successful entrants grow quickly. One implication is that new firms are on average less productive than incumbents. New firms, at start-up, may even be less productive than exiting firms. However, over a longer time horizon of five to ten years, most surviving entrants catch up with incumbents.

In a recent study of 24 industrial and developing economies in Europe, North America, Latin America and East Asia by Bartelsman, Haltiwanger and Scarpetta (2004), it was found that annual gross entry and exit rates varied between 10 and 25 per cent. Both entering and exiting firms were, on average, smaller than continuing incumbents. New firms were generally only 20 to 60 per cent of the average size of incumbents. Turnover rates were higher in the services sector (particularly in wholesale and retail trade) compared with manufacturing. However, some high technology industries such as office, accounting and computing machinery had relatively high entry rates in most countries.

The initial years for entrants were tough. Only 60 to 80 per cent of new firms survived the first two years of life and 40 to 50 per cent of firms survived beyond the seventh year.

3.2 Australian Evidence

In Australia, entry rates across 25 2-digit industries ranged from 4.1 to 22.7 per cent and the exit rate varied between 6.9 and 22.8 per cent over the period 1994–95 to 1997–98. The overall annual entry rate was 4.7 per cent, and the average exit rate was 4.6 per cent, which gave a turnover rate of 9.3 per cent.[3] This is near the lower end of the range of turnover rates in other countries for the same time period.

Entrants were on average 13 per cent of the size of incumbents across all industries. This was below the differential in most countries, but similar to the entrant–incumbent size gap in the United States and Canada, which was between 10 and 20 per cent in the 1990s (Bartelsman, Haltiwanger and Scarpetta 2004). Exiting firms also tended to be smaller and younger compared with incumbents, and this is consistent with international findings. However, the mean (median) age of an exiting firm in the BLS of 9.8 (7.4) years implies that the majority of firms that eventually exit survived beyond the initial few years. This supports the observation in Bickerdyke, Lattimore and Madge (2000) that Australian firms appear to survive longer than their overseas counterparts. Consistent with the evidence from other countries, service industries experience greater flux, with large turnover rates in sub-sectors such as retail trade, accommodation, cafes and restaurants, sport and recreation, and personal services.

We also compared the entry and exit picture yielded by summary statistics from the BLS with summary statistics compiled from the Australian Tax Office's (ATO) unpublished business income tax data. We found that ATO entry rates were much higher than those for the BLS. The ATO figures include 'illegitimate' entrants—for example, when companies that

have undergone restructuring form new subsidiaries, or break up into several new firms, and identify themselves as 'commencing business'. However, the higher entry rates may also indicate an understatement of entry in the BLS.[4]

The ATO exit rates over a three-year interval in the 1990s were moderately lower than the BLS exit rates. The evidence from both ATO and BLS statistics, then, seems to point to a modest pace of firm exits in Australia. Similar to the BLS, the ATO data showed that service industries had greater turnover compared with manufacturing industries. Food retailing and accommodation, cafes and restaurants recorded the highest volatility.

The pattern of a high entry rate alongside a relatively low exit rate across industries in Australia is different from most other countries. One possible reason is that Australia has been experiencing a sustained period of economic growth. The annual average turnover rate from ATO data of 12.1 per cent appears to support the finding from BLS figures that Australia is among the developed countries with the lowest firm turnover rates.

More recent aggregate figures compiled by the Australian Bureau of Statistics (2005) from ATO data show that the pattern of high entry rate and low exit rate has continued. Between 2002–03 and 2003–04, the average annual entry rate was 11.2 and the exit rate was 4.2 for all industries.

4. Productivity Decomposition Analysis

We have estimated the contribution of firm dynamics to aggregate productivity growth through decomposing productivity change into two components: intra-firm productivity change and inter-firm market share reallocation. A measure of multifactor productivity (MFP) has been constructed from production function estimates, following Olley and Pakes (1996), that incorporates firm-specific productivity differences and endogenises firms' exit decisions.[5] Aggregate productivity for each of 25 industries is then obtained as the sum of firm-level MFP weighted by each firm's share of industry output (market share).

The decomposition method used is an extension to a method proposed by Fox (2004) (which we call the 'extended-Fox decomposition'[6]), as follows:

$$\Delta P_{0,1} = \sum_{i \in C} \theta_{i0} \Delta P_{i1} + \sum_{i \in C} \left(\frac{1}{2}\right) \Delta\theta_{i1} \Delta P_{i1} - \sum_{i \in C} \left(\frac{1}{2}\right) \Delta\theta_{i1}(a) + \sum_{i \in N} \left(\frac{1}{2}\right) \theta_{i1}(P_{i1} - a) - \sum_{i \in X} \left(\frac{1}{2}\right) \theta_{i0}(P_{i0} - a) \quad (1)$$

where $\Delta P_{0,1}$ is the growth of industry MFP between periods 0 and 1; θ_i is the output share of firm i; P_i is each firm's productivity level; and a is a scaling factor, which is the average aggregate productivity level between the two periods in our formulation. i indexes individual firms in C, N and X, which are the sets of continuing, entering and exiting firms, respectively. The five terms on the right-hand side represent, in order, the fractions of industry productivity change attributable to 'within-firm' changes, 'between-firm' output share reallocation effects, 'pure share' changes, entry and exit. Table 1 presents the results from our decomposition.[7]

Our detailed findings provide evidence that firm dynamics was a key factor behind changes in Australian industries' MFP performance in the mid-1990s. The last column of Table 1 shows that the net effect of entry and exit is positive for 20 of the 25 industries considered. This arises more from the positive impact of firms with below average industry productivity exiting the market, as entrants are more likely to contribute negatively to MFP change in the first few years following entry.

Looking at the other results in the table, the contribution from within-firm productivity change is negative in over half of the industries. In several industries such as personal and household goods retailing and services to transport, the overall MFP increase is due entirely to firm dynamics, as the within-firm component is negative. By contrast, the between-firm reallocation effect is positive in nearly all industries; that is, activities have shifted rationally from the less to more productive incumbents.

Where industries experiencing MFP growth enjoy both positive within-firm and between-firm contributions, the share of between-firm reallocation is usually greater. Positive reallocation terms are also important in offsetting negative within-firm effects in industries registering MFP decreases. This is the case, for example, in the textile, clothing, footwear and

Table 1 Contributions to Industry Productivity Growth

		Share of components in normalised MFP change[a] (1995–1998)						
Industry	*ANZSIC*	*Within-firm*	*Between-firm*	*Pure share change*	*Entry*	*Exit*	*MFP change*	*Net entry effect[b]*
Manufacturing	C							
Food, beverage and tobacco	21	0.821	0.295	–0.365	–0.010	0.259	1.000	0.248
Textiles, clothing, footwear and leather	22	–0.809	0.207	–0.532	0.002	0.132	–1.000	0.134
Wood and paper product	23	–1.657	1.174	–0.509	–0.019	0.012	–1.000	–0.007
Printing, publishing and recorded media	24	–0.344	–0.064	–0.345	0.019	–0.266	–1.000	–0.247
Petroleum, coal, chemical and associated product	25	–0.891	0.155	–0.283	–0.007	0.027	–1.000	0.020
Non-metallic mineral product manufacturing	26	–0.378	0.201	–0.952	–0.005	0.134	–1.000	0.129
Metal product	27	–0.208	0.090	–1.402	0.014	0.506	–1.000	0.520
Machinery and equipment	28	–2.394	1.843	–0.639	–0.003	0.193	–1.000	0.190
Other	29	–2.627	4.177	–0.588	–0.036	0.074	1.000	0.038
Construction	E							
General construction	41	–0.750	0.397	–1.516	0.008	0.861	–1.000	0.868
Construction trade services	42	0.531	0.306	0.049	0.117	–0.003	1.000	0.114
Wholesale trade	F							
Basic material wholesaling	45	–1.311	0.318	–0.099	0.050	0.043	–1.000	0.093
Machinery and motor vehicle wholesaling	46	–2.976	2.354	–0.455	0.049	0.029	–1.000	0.078
Personal and household good wholesaling	47	0.431	0.537	–0.007	0.013	0.025	1.000	0.038
Retail trade	G							
Food retailing	51	0.446	0.668	–0.141	–0.003	0.029	1.000	0.027
Personal and household good retailing	52	–1.257	3.018	–0.611	–0.026	–0.124	1.000	–0.150
Motor vehicle retailing and services	53	0.515	0.677	–0.184	–0.025	0.018	1.000	–0.007
Accommodation, cafes and restaurants	H/57	–0.470	0.734	–2.846	–0.013	1.595	–1.000	1.583
Transport and storage	I							
Road transport	61	0.930	0.479	–1.908	0.020	–0.521	–1.000	–0.501
Services to transport	66	–0.963	0.939	0.260	0.849	–0.084	1.000	0.765
Property and business services	L							
Property services	77	0.281	0.659	0.044	–0.006	0.022	1.000	0.016
Business services	78	1.272	0.052	–0.406	–0.024	0.107	1.000	0.083
Cultural and recreational services	P							
Motion picture, radio and television services	91	0.398	0.892	–0.392	–0.002	0.105	1.000	0.102
Sport and recreation	93	1.637	–0.470	–0.316	0.000	0.149	1.000	0.149
Personal and other services	Q							
Personal services	95	0.848	0.116	0.011	0.041	–0.017	1.000	0.024

Notes: (a) The MFP change indicator is normalised to one for each industry. The within-firm, between-firm, pure share change, entry and exit effects sum to one.
(b) The net entry effect sums the entry and exit components in the 'Entry' and 'Exit' columns.

leather industry, where positive reallocation effects compensated for 30 per cent of the negatively contributing terms. In sum, our detailed findings support firm dynamics and the reallocation of output to more productive firms as the key factors behind the aggregate positive productivity performance of Australian industry in the mid-1990s.

4.1 Comparison with Other Studies

Our study, along with many using longitudinal firm-level data, has identified an important effect of firm dynamics in contributing to aggregate productivity growth. Firm dynamics are demonstrated to be an important factor in productivity growth in manufacturing industries by Baily et al. (1992) and Foster, Haltiwanger and Krizan (2001) for the United States, Levinsohn and Petrin (1999) for Chile, and Hahn (2000) for Korea.

Our finding that exit contributes more than entry is also found in Bartelsman, Haltiwanger and Scarpetta (2004) for a wide range of developed and developing countries. We share the view of Scarpetta et al. (2002), who found that service industries in the United Kingdom showed more varied outcomes than manufacturing industries. We find that firm dynamics contribute equally to productivity growth across manufacturing and services, unlike Foster, Haltiwanger and Krizan (2002) and van der Wiel (1999) who find that services are more affected by market share reallocation, in particular entry and exit.

Bland and Will (2001), using only the small- and medium-sized firms in the BLS, find, in contradiction to our study, that within-firm effects make the most important contribution to labour productivity increases. Furthermore they find small, mostly negative, net entry effects and, in accordance with our results, that entering and exiting firms have lower than average (labour) productivity. These differences are driven by several factors: our study uses 2-digit industries instead of 1-digit industries; we include the large firms which they exclude; we analyse MFP instead of labour productivity; and we use a decomposition that we believe is theoretically superior.[8]

5. Summary Remarks

Firm entry and exit is a regular feature of production around the world and Australia is no exception. An examination of the pattern of firm dynamics based on BLS and ATO data indicates that Australian industries are characterised by average (compared with other developed countries) entry rates alongside relatively low exit rates. Our analysis reveals that, despite being amongst the countries with lower firm turnover, the exit of low productivity firms from the market nevertheless has made a non-negligible contribution to industry-level productivity increases. Our analysis also shows that market share reallocation among continuing firms accounts for a significant share of industry MFP growth and/or compensates for MFP declines. Studies, and policies, based upon a model of a representative firm which is increasing its productivity are flawed in a world where firm dynamics, a growing role for more productive firms, competition from entrants, and failure of low productivity firms are important sources of aggregate productivity growth.

December 2006

Endnotes

1. New firms which start out with low productivity may have the potential to become high productivity firms in the future, as pointed out by Webster, Buddelmeyer and Jensen (2007) in this Policy Forum. However, this would only be a basis for a policy of saving low productivity entrants from failure if the government could successfully pick which firms will fulfill their potential or if the average expected productivity of these low productivity entrants is higher than the average expected productivity of incumbents.

2. See Breunig and Wong (2006a). Analysis reported in this article is based on the Main Unit Record File (MURF) of the BLS, which includes large firms in addition to small- and medium-sized firms. MURF is available only on site at the Australian Bureau of Statistics for confidentiality reasons.

3. This is lower than Webster, Buddelmeyer and Jensen (2007) report in this Policy Forum. See below, where we discuss possible understatement of entry in the BLS.

4. Several different users of the BLS have documented the problem of correctly identifying 'new' entrants in the BLS. See Breunig and Wong (2006a) and Will and Wilson (2001). In our analysis of the BLS data reported in this article, we have removed some 'illegitimate' births. Readers interested in obtaining a more detailed write-up on the correction for true births and deaths can email the corresponding author at <Robert.Breunig@anu.edu.au>.

5. See Breunig and Wong (2005) for detail of the estimation technique and Breunig and Wong (2006a) for the detailed regression results. There is no unique decomposition method and a variety of decomposition methods has been used on a mix of labour productivity and multifactor productivity measures.

6. This decomposition method is a new formulation, and differs from commonly applied decompositions, as it corrects for a problem with the conventional measure of aggregate productivity change in firm-level studies, namely that it captures a mixture of productivity and market share changes, instead of solely the former (as highlighted in Fox 2004).

7. See Breunig and Wong (2006b) for more detail on this proposed new decomposition and its calculation. The pure-share change term arises as a statistical artefact of our new method, and can be viewed as the contribution to aggregate productivity growth arising purely from continuing firms' changing market shares weighted by the average aggregate productivity. Our improved decomposition completely separates productivity changes from market share changes, allowing identification of pure entry and exit effects. Previous decompositions mistakenly combine pure productivity changes with market share changes.

8. See Breunig and Wong (2006b) for more detail.

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