
Business Indicators ♦ January 2000

The Lifecycle of High Technology Firms, 1991–1995

Highlights

- **Growth in the number of firms in the high technology sector (17.4%) exceeded the provincial rate (9.7%), due in part to relatively low exit rates.**
- **In high tech, BC's exit rates are among the highest in Canada, while entry rates are average.**
- **High tech firms have better survival rates than firms in other sectors.**
- **New firms were responsible for all the net employment growth in the high technology sector between 1991 and 1995.**

Introduction

Technology has been changing rapidly for over a century. It is clear that entrepreneurs have continually seized the opportunities from this change, opening avenues for new businesses and industries, and driving growth. Despite this, growth is not automatic and there are limitations as to how fast it can occur. Limitations of growth can stem from barriers to entry or from factors that cause firms to go out of business prematurely. Barriers can be manifested in many forms. These include some government policies, market conditions, availability of financing, training levels of entrepreneurs, availability of skilled labour, and even the pace at which society is able to keep up with and accept technological change.

This issue of Business Indicators exam-

ines the pattern of business births and deaths in the high technology sector. Analysis of the firm lifecycle, or "business demographics", can suggest whether or not there are barriers to growth. For high technology it begins by asking the questions:

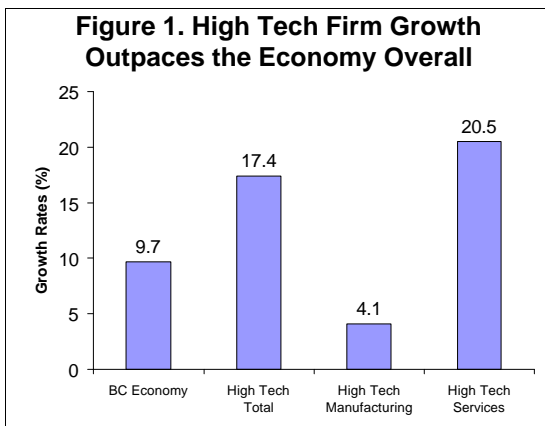
1. Are new firms being formed more or less quickly in high technology than in other sectors or jurisdictions?
2. Are high technology firms going out of business more or less quickly than those in other sectors or jurisdictions?
3. What is the life expectancy of a firm in the high technology sector?
4. Is growth in high technology employment due to expansion of existing firms, or to new business startups?

The answers to these questions are developed from Revenue Canada taxation records for successive years.¹ Employer firms in each industry sector are identified in a start year, and then traced in each subsequent year. Once the record for a firm is located, payroll information is extracted, and from this full year equivalent employment is estimated. Initial work covered the time period 1991 to 1995, and is the basis of results reported here. However, some updated indicators have recently been developed at BC STATS. These will be reported in a later edition of Business Indicators.

¹A database linking records of firms from 1991 to 1995 has been created by Statistics Canada.

Births, Deaths, and Growth

The BC economy was volatile between 1991 and 1995, with an average annual firm entry rate of 16.9 per cent and an exit rate of 14.6 per cent. Since entries exceeded exits, the net result was an increase in the number of firms that made up the total economy. By comparison, the high technology sector over the same period had a slightly lower entry rate (15.9 per cent), and a disproportionately lower exit rate (12.0 per cent). That is, while there was a lower rate of firms entering the high technology sector than other sectors, a greater proportion of high technology firms remained in operation.



Consequently, growth in the number of firms in the high technology sector exceeded the provincial rate. Figure 1 shows the high technology and overall provincial growth rates in the number of firms for the years covered by the study.

From 1991 to 1995 the high technology sector expanded by 17.4 per cent (driven by a 20.5 per cent growth in high technology service firms), while the number of firms in the BC economy grew 9.7 per cent.

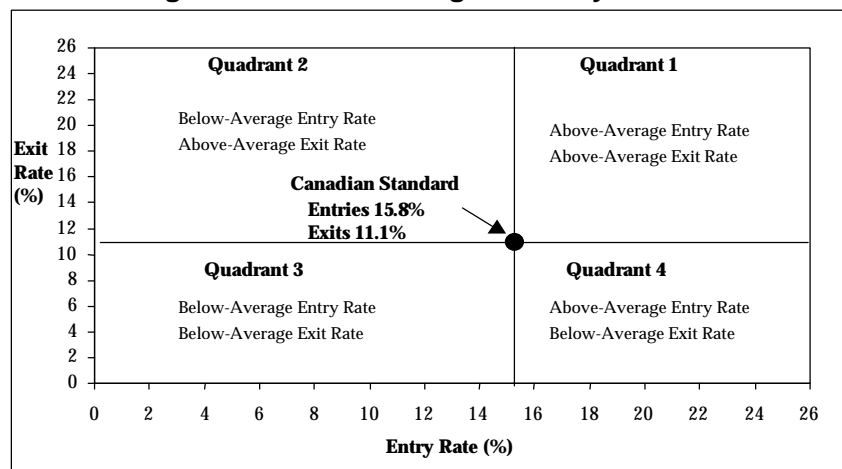
Sector Dynamism: High Tech Sector Ins and Outs

Growth or decline in the number of firms is a valuable indicator of the health of a sector. However, the entry and exit rates that lie behind the net change can provide some valuable insights about the forces affecting the firms involved, particularly in comparison to other jurisdictions.

Figure 2 gives a framework for analysing entry and exit rates. In this framework, the Canadian average for the high technology sector is taken as a standard, and set as the centre point of lines drawn as cross-hairs. The four resulting quadrants each describe an environment that characterizes the dynamism (or lack of it) of high technology firms.

For example, Quadrant 1 describes a dynamic situation in which there are relatively many startup firms (perhaps stemming from a healthy innovation culture, availability of venture capital, etc.) but also relatively many exits. The exits could result simply from the abundance of ideas being floated by the startups, or they could be symptomatic of working capital or skilled labour shortages, inexperienced management, etc. Quadrant 3, on the other hand, would seem to represent a stagnant sector, with barriers to entry or a poor innovation culture, coupled with established, often large firms that do not fail but perhaps lag in innovation.

Figure 2. Characterizing Sector Dynamism



Quadrant 2 describes a declining sector, lacking in startups and with many failures, while in quadrant 4 growth is rapid, with many entries and few failures. Quadrants 2 and 4 do not presently describe any Canadian economies.

It should be stressed that the quadrant position of an industry is only suggestive of whether it is working well or not, and what may be required to improve performance. More detailed research at the firm level would always be required to confirm any diagnosis.

Using the framework to describe the high tech sectors of British Columbia, Alberta, and Ontario reveals only Alberta firmly in quadrant 1. Ontario is straddling the border between quadrant 2 and quadrant 3, with somewhat below average entry rates, and average exit rates. British Columbia, however, has above average exit rates and average entry rates. Our exit rates, nonetheless, are no higher than those in Alberta. The challenge, rather, is in fostering new entries

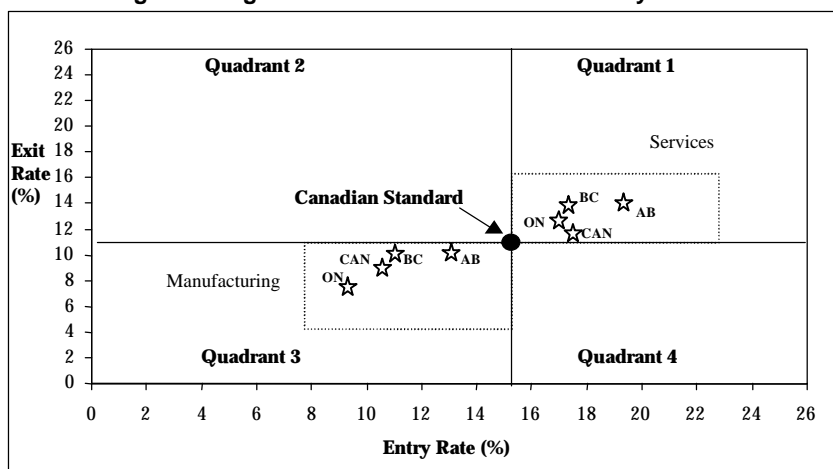
entry and exit rates are at least as sensitive to specific lines of business as they are to the jurisdiction which they are located.

Survival

The comparisons of entry and exit rates presented above are one way to describe the environment faced by individual firms in the high technology sector. The exit rates, for example, show the annual probability of business exits. However, the underlying data also supports the tracking of firms over more extended periods of time. Consequently, direct measurement of years of survival is also possible. Survival, in this study, is defined as the number of firms that were in existence in 1991 and that continue to be identified each year until 1995.

The finding of this tracking is that 60 per cent of the firms in the BC economy existing in 1991 remained in business after five years. The chance of survival in the high technology sector was over four points better, at 64.4 per cent. It was also observed that firms in the BC economy and the high technology sector cease to exist in a relatively constant pattern. That is, there is no abnormally dangerous year among the first five. By the

Figure 3. High Tech Service Sectors Lead in Dynamism



in British Columbia.

The picture of sector dynamism sharpens considerably when focussed on the distinction between high tech services and high tech manufacturing. Figure 3 reveals that the manufacturing portion of the high tech sector is located in quadrant 3, regardless of province, and that similarly all high tech service sectors are in quadrant 1. This implies that

same token, the risk of going out of business does not lessen in any of the first five years.

Both the high technology service and manufacturing sectors have higher survival rates than the average for the BC economy, but it is the manufacturing sector that appears to be the most stable,

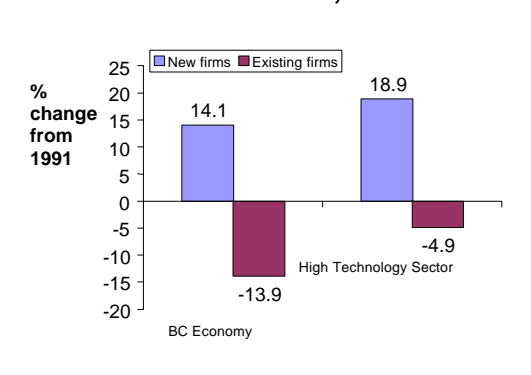
with a 69 per cent chance of survival after five years. Among all industries within the high technology sector, - *Computer and Related Industries* appears to be an anomaly in that it has the lowest survival rate. Earlier findings indicate that this industry group experienced the highest rate of growth. With a survival rate of just 54.6 per cent, it may be that competition is also the fiercest in this industry group.

Employment Performance

The number of high technology firms in BC is growing at almost twice the rate of firms in the province overall. However, the employment effects of this are even more pronounced. In the most recent BC Stats' high technology sector report, "**Profile of the British Columbia High Technology Sector, 1999**," employment growth was reported at over 35 per cent between 1991 and 1995, compared to 11 per cent for the overall BC economy. That is, high technology sector employment grew at more than three times the rate for the economy overall.

Of the high technology firms in existence in 1991, the start year of this study, we have found (as indicated in the Survival section) that over 64 per cent survived until 1995, and recorded employment gains over the period. However, the 35 per cent that did not survive caused the sector to suffer some employment losses. These losses were such that by 1995 the employment of the cohort of 1991 firms had dropped by 4.9 per cent. This situation was also reflected in the economy overall, with firms existing in 1991 recording a 13.9 per cent drop in employment by 1995. For the economy overall, this reflected not only losses due to the exit of firms, but also declines in employment among firms that survived to 1995.

Figure 4. New Firms Are Responsible for All Net Job Creation, 1992-95



The situation is much different for new firms (those that entered between 1992 and 1995). In the high technology sector, new firms brought over 6,600 full time equivalent jobs at the time of their birth. They went on to expand on average, creating an additional 2,480 jobs by 1995. Including a modest loss of about 600 jobs due to firm exits, the startup firms accounted for about 8,500 new jobs over the period. In this way, new firms can be seen as responsible for all the net job creation in the high technology sector.

Conclusion

In British Columbia, as in other jurisdictions, the high technology sector outperforms the general economy in growth rates of number of firms, in firm survival over time, and in the rate of job creation. However, the rate of new entries is lower than the BC average. Since new entries are the primary source of new job creation, the various possible barriers to entry require further investigation. Since entry rates are significantly lower in high technology manufacturing, this sub-sector should receive special attention.

British Columbia's high technology entry rates are slightly above the Canadian average. They are lower than those in Alberta, and higher than those in Ontario. Further comparisons of the innovation and entrepreneurial environment in these provinces may also yield useful insights for fostering growth in high technology locally.