Differences in Innovator and Non-innovator Profiles: Small Establishments in Business Services

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Abstract

This paper explores differences between innovative and non-innovative establishments in business service industries. It focuses on small establishments that supply core technical inputs to other firms: establishments in computer and related services, engineering, and other scientific and technical services.

The analysis begins by examining the incidence of innovation within the small firm population. Forty percent of small businesses report introducing new or improved products, processes or organizational forms. Among these businesses, product innovation dominates over process or organizational change. A majority of these establishments reveal an ongoing commitment to innovation programs by introducing innovations on a regular basis. By contrast, businesses that do not introduce new or improved products, processes or organizational methods reveal little supporting evidence of innovation activity.

The paper then investigates differences in strategic intensity between innovative and non-innovative businesses. Innovators attach greater importance to financial management and capital acquisition. Innovators also place more emphasis on recruiting skilled labour and on promoting incentive compensation. These distinctions are sensible – among small firms in R&D-intensive industries, financing and human resource competencies play a critical role in the innovation process.

A final section examines whether the obstacles to innovation differ between innovators and non-innovators. Innovators are more likely to report difficulties related to market success, imitation, and skill restrictions. Evidence of learning-by-doing is more apparent within a multivariate framework. The probability of encountering risk-related obstacles and input restrictions is higher among establishments that engage in R&D and use intellectual property rights, both key elements of the innovation process. Many obstacles to innovation are also more apparent for businesses that stress financing, marketing, production or human resource strategies.

Keywords: innovation, small firms, service industries

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1. Introduction

Small firms play a central role in innovation systems. They overcome the inertia built into larger firms and capitalize on new technologies. They develop new products in the early stages of an industry's life-cycle when product standards are fluid, when production processes are in flux, when turnover is high, and when competition is based on new features.[1] This study focuses on small establishments in business service industries—computer and related services, engineering, and other scientific and technical services.[2] All of these industries are examples of dynamic services—they stress the development and integration of advanced technologies, and, through the dissemination of technological innovations, play a key role in supporting the production, distribution and innovation activities of other sectors.

It is the purpose of this paper to investigate three issues. First, we examine the incidence of innovation within small business service establishments. Innovation in this sector is important. New products developed in these industries are core business inputs—they provide the impetus for innovation and growth in other areas of the economy. Given the importance of advanced technology within business services, one may be tempted to conclude *a priori* that all establishments share a commitment to innovation. We find evidence to the contrary: innovation strategies are evident in only a minority of small businesses. This is consistent with the conceptual framework proposed by Baldwin and Gellatly (1998)—advanced competencies are more firm- than industry-specific. Even in highly dynamic sectors, innovation intensities are far from uniform.

The analysis then explores strategic differences between innovators and non-innovators in several key areas—marketing, management, production, human resources, and financing. Certain elements of financing, human resource, and marketing strategies are more important among innovators. Many of these strategies are strongly correlated with the innovation process.

Finally, we ask whether this innovator/non-innovator dichotomy stems from differences in the set of obstacles facing these two groups. Obstacles to innovation may reflect a variety of factors (e.g., market and technical risk, cost factors, corporate style). It may be the case that non-innovators face greater obstacles which preclude the development of innovation programs. An alternative view is that innovation represents a learning-by-doing process, with obstacles becoming more apparent to those that pursue innovation activities. In general comparisons between innovators and non-innovators, the former are more likely to stress obstacles pertaining to market success, imitation and labour skills. Multivariate analysis reveals greater evidence of learning-by-doing—obstacles are more evident in businesses that make substantial investments in the innovation process and in the development of certain strategic competencies.

[1] For a discussion of innovation in small firms, see Baldwin and Gellatly (1998).
[2] Computer and related services is comprised of two separate industry groups: computer services and computer equipment maintenance and repair.

2. Data Source: Survey of Innovation 1996

This study is based on Statistics Canada's *Survey of Innovation 1996*. The survey included a sample of 3830 establishments engaged in business services. The overall response rate in this sector was 88%.[3] Detailed firm-level data were collected on:

- elements of the innovation process (i.e., sources of innovative ideas, objectives of innovation activities, the impact of innovation on firm performance, the barriers to innovation);
- R&D activities;
- intellectual property use;
- business strategies (e.g., production, management, marketing, financing and human resources);
- competitive environment (e.g., sources of market uncertainty).

Respondents provided information on the above topics in several ways. For certain questions, responses were binary in nature (yes/no).[4] An establishment's innovation status was determined in this fashion. Businesses were asked:

- if they had offered any new or improved products (goods or services) to their customers;
- if they had introduced any new or improved processes to affect their supply of products;
- if they had made any significant improvements in terms of organizational structure or internal business routines.[5]

An affirmative response to any of the above items identified the business as an innovator. Alternatively, if the business answered 'no' to all three items, it was deemed a non-innovator.

For other questions, the business was asked to rate the significance of a particular factor on a five-point Likert scale ranging from 1 (low importance) to 5 (high importance). Respondents were also given the option of identifying the factor as 'not applicable'. The majority of questions pertaining to innovation activities, business strategies, and competitive conditions were structured in this manner.

In what follows, we focus exclusively on single-unit establishments within the business services sample that have less than 50 employees.[6] The vast majority of businesses within this target group, however, are very small—95% of these businesses have fewer than 20 employees.

[3] See Baldwin et al. (1998).
[4] For certain questions, respondents were also given a third option: (do not know).
[5] All of these pertain to the 1994-96 period.
[6] Single-unit establishments refer to those that are not legally related to other establishments in the sample. In all, 2536 units are used in the present analysis.

3. Innovation in Business Services

Forty percent of small businesses self-identify as innovators, that is, they report the introduction of new or improved products, processes, or organizational forms.[7] Among these businesses, product innovation constitutes the core activity (with 81% of innovators reporting new or improved goods or services), followed by process innovation (46% of innovators) and organizational innovation (33% of innovators).

Slightly less than half of all innovators (46%) report multiple forms of innovation activity. Of these, product and process combinations occur most frequently (19% of innovators), followed by comprehensive strategies that encompass product, process and organizational innovation (14% of innovators). Data on innovation intensities suggest a strong commitment to ongoing innovation programs within these businesses. Roughly 70% of small innovative establishments report introducing new products or processes, on average, at least once per year. Slightly less than half of all innovators (44%) report that they introduce multiple innovations during an average year. A sizeable minority, 26% of all innovative small establishments, generally introduce three or more innovations per year.

While the above characteristics reveal something of the success rate, they do not provide an exhaustive measure of innovation activity within small businesses. To obtain such a measure, we examined the incidence of non-commercialized innovation within both the innovative and non-innovative groups. These represent innovation activities that did not lead to the introduction of new or improved products or processes. While 36% of innovators report activities that did not result in an innovation, only 5% of non-innovators do so.[8] This reveals a population that divides into two basic groups: (1) those that develop innovation strategies, introducing, with varying degrees of intensity and success, new products and processes, and (2) those that forego innovation altogether. Even among establishments in business services, innovation is not uniformly stressed.

Additional evidence supporting this innovator/non-innovator distinction is found in activities that are strongly correlated with the innovation process. Fifty-seven percent of innovators report engaging directly in research and development—a primary source of innovative ideas in business service industries—compared to only 10% of non-innovators. In terms of protecting investments in intellectual capital—a key component of many innovation strategies—just under one-half of all innovators (46%) report using one or more legal property rights, compared to just 9% of non-innovators.

[7] All results reported herein are establishment-weighted to reflect population data.
[8] All comparisons are statistically significant at the 1% level unless otherwise stated.

4. Differences Between Innovators and Non-innovators

The remainder of this paper focuses on exploring differences between innovators and non-innovators. It examines strategic differences in the development of business competencies. It then looks at differences in factors that hamper the development of innovations. Both exercises require a clear methodological foundation. We begin by addressing this below.

4.1 Comparing Innovators and Non-innovators

The strategic profile developed herein is derived using data from scale-based questions. Innovators and non-innovators are compared using extreme scores—the percentage of respondents that report a factor to be very important, a score of 4 or 5 on a Likert scale. This measure is useful for two reasons. First, it provides the reader with a comparative metric that is highly intuitive—(x)% of businesses in group (a) deem (e.g.) high costs to be a critical factor, compared to only (y)% of respondents in group (b). Second, extreme scores yield robust estimates of the percentage of respondents that felt they were above the midpoint of the distribution—defined as a score of 3—without worrying about distinctions beyond this point.

The use of scale-based metrics raises an immediate concern: non-innovators are more likely than innovators to classify a given factor as 'not applicable'.[9] One's convention for handling 'not applicable' responses, then, will have a substantial effect on the outcome of any comparative exercise. Table 1 presents response rates for two groups of questions, one dealing with business strategies and the other with the impediments to innovation.

Table 1. Response Rates, Select Sections—Establishment-weighted

% of businesses responding to questions on:	Innovators	Non-innovators
Business strategies	97	77
Impediments to innovation	91	47

In each case, respondents are defined as businesses that grade at least one factor within a related set of questions within the 1 to 5 range. Different groups of questions, then, will have different respondent sets. To illustrate, consider the section dealing with innovation impediments. Businesses were asked to evaluate the significance of 18 potential factors that impede innovation activity. Ninety-one percent of the innovative population responded to this section by offering, at minimum, at least a single grade within the 1 to 5 range. Only 47% of the non-innovative population did so.

Focusing on a respondent set, as defined above, affects the characteristics of the non-innovative group under study. It may be the case that respondents are drawn randomly from the non-innovator population, such that the subset of 'respondent' non-innovators does not differ systematically from 'non-respondent' non-innovators. On net, however, there is much evidence to the contrary. While non-innovative respondents to the impediments section differ little from

[9] For certain questions, the term 'not relevant' was used. We use these terms interchangeably.

non-innovative non-respondents in terms of their industry characteristics, clear differences emerge in other areas of firm activity. For example, respondents were more likely to perform R&D and use intellectual property. Probit regression analysis supports these distinctions. Accordingly, then, our focus on respondents truncates the non-innovator distribution, eliminating many of the 'low-activity' businesses from the non-innovator sample. This effect is less evident when one focuses on business strategies, due to a lower incidence of non-response within the non-innovator group. Nonetheless, qualitative differences between respondents and non-respondents are again evident.

In comparing innovative and non-innovative respondents, we have two potential approaches, each a variant of the extreme score metric. At issue is whether the remaining 'not applicable' responses should be treated as legitimate. One approach treats these as valid, giving them a score of zero. This creates a six-point scale ranging from 0 (not applicable) to 1 (low importance) through to 5 (high importance). This approach gives 'not applicable' responses equal weight to those in the 1 to 5 range. In an earlier study of strategic differences between innovators and non-innovators, Baldwin and Johnson (1995) adopt this convention. In this earlier study, the percentage of 'not applicable' responses was relatively small. In the present case, however, the percentage of 'not applicable' responses is considerably greater, particularly within the non-innovative group.

A second approach is to base comparisons solely on responses in the 1 to 5 range. This treats 'not applicable' responses, in effect, as missing or invalid observations. This restricts the calculation of extreme scores to only those businesses that express a *definite opinion* of a factor along a continuum of low to high importance. This approach also allows the respondent set to vary, often significantly, for each of the factors under consideration.[10]

The choice of metric is not without consequence. Consider the evaluation of business strategies. The use of unrestricted extreme scores (the first approach) reveals a much greater strategic intensity on the part of innovators—innovators pursue *all* business strategies more intensively than do non-innovators. These findings, however, presume that 'not applicable' responses should receive a score of zero (and should thus be included in the calculation of extreme scores). This introduces a potential bias, if, among non-innovators, 'not applicable' responses are more likely to represent a form of non-response, rather than a score of zero on a scale of 0 to 5.

Many of the strategic differences between innovators and non-innovators are less evident when we move to more restricted comparisons based solely on those businesses that assign a 1 to 5 grade directly—that is, when we focus on establishments that express a definite opinion of the factor under consideration. In what follows, we examine differences based on this more restrictive metric. This represents the more conservative of the two approaches. We favour this method because the large number of 'not applicable' responses within the non-innovator group makes us uncomfortable when it comes to inferring that they *all* implicitly score these factors as zero. It is worth noting that all strategic differences (favoring innovators) that are statistically

[10] That is, the number of firms that grade one factor within the 1 to 5 range (e.g., financial management) may be quite different from the number that grade a second factor within the 1 to 5 range (e.g., using high quality suppliers).

significant using restricted extreme scores (the second approach) remain so in unrestricted comparisons.

4.2 Strategic Differences Between Innovators and Non-innovators

The *Survey of Innovation 1996* investigates the importance given to a set of strategic factors within key functional areas (i.e., marketing, management, production, financing and human resources). Businesses were asked to rate the importance of various factors in each of these areas to the overall success of their firm.

Restricted extreme score estimates are presented in Table 2. Several strategies are pursued more intensively by innovators. Many of these are related to the innovation process.

Table 2. Restricted Extreme Scores, Business Strategies—Establishment-weighted

	Innovators	*Non-innovators*	*Differences between extreme scores*
Financing:			
Flexibility in meeting unforeseen circumstances	67	62	+
Financial management (costs, cashflow)	73	64	+***
Finding/maintaining capital	63	53	+***
Marketing:			
Using third party distributors	45	37	+
Promoting company or product reputation	76	74	+
Satisfying existing customers	93	92	+
Improving position in existing markets	79	73	+**
Targeting new domestic markets	66	62	+
Targeting new foreign markets	52	39	+***
Management:			
Consensus decision-making	56	62	-
Delegating decision-making	42	49	-*
Using information technology	76	73	+
Continuous quality improvement	80	73	+**
Production:			
Using high quality suppliers	71	72	-
Using computer controlled processes	70	67	+
Reducing production times	65	64	+
Improving efficiency of input use	67	66	+
Human Resources:			
Providing incentive compensation plans	49	40	+**
Recruiting skilled employees	75	63	+***
Training	62	58	+

***Significant at 1% level, **significant at 5% level, *significant at 10% level.

Sound financing strategies are often required for the development of innovation programs. Earlier work (Baldwin and Johnson, 1995) found that innovators place more emphasis on financing than do non-innovators. Our findings support this view. Small businesses that introduce innovations are more likely to cite financial management and capital acquisition/retention as important determinants of their success. There is a sensible explanation for this. Small R&D-intensive firms often experience difficulty acquiring financing (Hall, 1992; Himmelberg and Peters, 1994). This reflects an uncertain return on innovation, particularly in technology-based sectors. In developmental phases, innovation programs yield few hard assets. What is more, many product ideas embody substantial amounts of market and technical risk, and may require concomitant investments in legal property rights. Accordingly, then, one would expect a greater emphasis on developing financial competencies within innovative businesses.

Previous research has shown a close connection between innovation and technology strategies and the development of worker skills (Baldwin and Johnson, 1996; Baldwin et al., 1996). Human resource strategies play a key role in service sector innovation (Baldwin, 1999). In business services, innovators are more likely to stress the recruitment of skilled workers than are non-innovators. The former also attach greater weight to incentive compensation plans. At first blush, differences in training are not apparent. These do emerge, however, when examining human resource activities directly. Innovators are more likely to invest in the development of labour skills—16% of innovators have formal development programs compared to only 4% of non-innovators. The former are also three times as likely to report planned future expenditures in personnel development.

Marketing strategies and innovation are closely related (Baldwin and Johnson, 1995; Johnson et al., 1997). In business services, innovators place more weight on developing foreign markets for their products. They also attach more emphasis to improving positions in existing markets. In terms of managerial strategies, innovators attach greater importance to continuous quality improvement.

5. Obstacles to Innovation

The gains from innovation have been widely reported. In a study of small and medium sized enterprises, Baldwin et al. (1994) demonstrate that innovators perform better than other firms based on a composite measure of market share, growth, productivity, and profitability. Baldwin and Johnson (1995) found that innovators excel in several areas—including market share and return on investment. Johnson et al. (1997) show that new innovative firms develop financial structures that enhance flexibility and reduce their exposure to risk. Crepon, Duguet and Mairesse (1998) demonstrate that innovation in French firms leads to productivity gains.

Given the benefits that accrue from innovation, one is left to ask why many firms choose not to develop innovation strategies. One possibility is that non-innovators face greater obstacles to innovation, and that these impede the adoption of innovation programs. On this view, the impediments to innovation occur *ex ante*, prior to making substantial investments in the innovation process.

A contrarian view is that the impediments to innovation are, to a greater extent, 'experienced', emerging out of the development of innovation programs. In this sense, innovation mirrors a learning-by-doing process similar to that evident for technology adoption (Baldwin and Rafiquzzaman, 1995). Herein, firms that adopt innovation programs are in a better position to evaluate the factors that hamper the development of new products, processes or organizational forms, while non-innovators, lacking comparable experience, are less likely to find such obstacles consequential.

5.1 Differences Between Innovators and Non-innovators

To examine these conflicting views, we compared the significance of various impediments across the innovative and non-innovative groups. Restricted extreme scores are presented in Table 3.[11]

Table 3. Restricted Extreme Scores, Obstacles to Innovation—Establishment-weighted

	Innovators	*Non-innovators*	*Differences between extreme scores*
Risk:			
High risk related to feasibility	44	39	+
High risk related to market success	50	39	+***
Innovation easily imitated	43	28	+***
Cost:			
Costs difficult to predict	45	43	+
High costs	53	56	-
Long amortization period	44	45	-
Availability of Inputs:			
Lack of equity capital	54	59	-
Lack of outside capital	54	55	-
Lack of skilled labour	37	27	+***
Lack of technical equipment	23	31	-**
Corporate Style:			
Internal resistance	11	16	-
Long administrative approval	11	18	-**

***Significant at 1% level, **significant at 5% level, *significant at 10% level.

A review of the impediments to innovation does not support the general proposition that non-innovators encounter greater obstacles than those that invest in innovation programs. Among establishments that grade impediments in the 1 to 5 range, many of the obstacles to innovation are equally shared, irrespective of innovation status. Technical constraints and long administrative approval constituted slightly greater difficulties for non-innovators.[12]

[11] We focus here on a subset of impediments across several well defined areas – factors pertaining to risk, cost, the availability of inputs, and corporate style. We have omitted a group of 'other factors' from our discussion. Note, however, that a positive (1 to 5) response to any impediment, including this residual group, signaled inclusion in the respondent set discussed in Section 4.1.

[12] Both these results are invalid when comparisons are based on unrestricted extreme scores (i.e., when 'not applicable' responses are included).

Innovators do encounter greater obstacles in several areas. First, two risk-related factors—concerns over market success and imitation—are more consequential within the innovative group. Second, innovators are more likely to report that a lack of skilled labour is a major obstacle. This suggests that such factors are 'experienced'—while there may be a general appreciation of their importance prior to innovation, these factors acquire more weight as businesses develop innovation competencies.

5.2 Multivariate Analysis

In this section, we use a multivariate framework to investigate the role that innovation activities and firm strategies play in conditioning the impediments to innovation. This represents, in effect, a more sophisticated test of the learning-by-doing hypothesis. In a learning-by-doing framework, the probability of encountering obstacles will increase as the firm engages in innovation activities. Moreover, if obstacles arise due to a greater *intensity of effort*, then it is also possible that impediment patterns are directly correlated with the development of strategic competencies in several areas—marketing, management, production, human resources, and financing.

5.2.1. Firm Characteristics

We model the probability of encountering a major impediment as a function of an underlying set of firm characteristics. In our exercise, innovation activities are measured in several ways.

First, we include a binary variable that captures the establishment's innovation status. It takes a value of 1 if the business reports the introduction of an innovation (product, process, or organizational) and a value of 0 if no innovation is introduced.

Second, we include direct measures of two activities that are strongly correlated with the innovation process—R&D and intellectual property use. Although neither a necessary nor sufficient condition for innovation, R&D plays a critical role in the development of innovations, particularly in business services (Baldwin et al., 1998). A binary variable takes a value of 1 if the establishment engages in R&D, and a value of 0 if no R&D activities are reported. The protection of intellectual capital via legal property rights is also characteristic of complex innovation strategies (Baldwin, 1997). We include a variable that takes a value of 1 if the firm reports the use of any legal property right, and a value of 0 if no use of intellectual property is reported.[13]

In service industries, a firm's investment in human capital and its propensity for innovation are strongly related (Baldwin, 1999). To capture the importance of human capital, we include a final innovation variable—a (0,1) binary variable that takes a value of 1 if the business performs formal training.

[13] The legal property rights under consideration included *inter alia* copyrights, patents, industrial designs, trade secrets, and trademarks.

A second group of variables addresses the role that strategic factors play in conditioning the impediments to innovation. Strategic factors are proxies for the development of competencies. It is our hypothesis that more active innovative businesses are more likely to run into obstacles. As we have shown in Section 4.2, innovators are more likely to stress financing and human resource strategies than are non-innovators. The former are thus more likely to develop competencies in these areas. Accordingly, greater activity is modeled here not simply as innovation activity, but also by the emphasis that businesses place on developing complementary skills.

In a learning-by-doing framework, businesses that develop strategic competencies are more likely to report obstacles. We use a series of (0,1) binary variables to measure strategic intensity in five areas—human resources, production, marketing, management, and financing. If, within a given area, the establishment scores an average of 4 or better across the set of factors under consideration, the corresponding binary variable takes a value of 1. For example, the human resource variable takes a value of 1 if the establishment reports a combined score of 12 or more (out of a possible 15) for the following factors: training, recruiting skilled employees and providing incentive compensation plans.

A final set of variables addresses the role of industry characteristics. Industry effects are modeled using four different (0,1) binary variables, representing each of the four business service industries under study (computer services, computer equipment maintenance and repair, engineering, and other scientific & technical services).

5.2.2. Dependent Variables

Dependent variables are constructed in the following manner. For each of the four groups of impediments under study—risk-related, cost-related, input restrictions, and corporate style—we create a dichotomous dependent variable that takes a value of 1 if the establishment assigns a score of 4 or 5 to any factor within the group, and a value of 0 if otherwise. For example, the dependent variable for risk-related impediments takes a value of 1 if the establishment reports a score of 4 or 5 for any of the three risk-related factors under consideration: feasibility, market success or imitation.

5.2.3. Regression Analysis

We use a probit model to evaluate the relationship between the impediments to innovation and our set of firm characteristics. The sample group is defined as establishments that responded to both the impediments and business strategies questions.[14] The regression coefficients are calculated against a reference group that is non-innovative, in the scientific and technical services industry, performs no R&D, uses no intellectual property, has no formal training

[14] Respondent sets are defined in accordance with the method outlined in Section 4.1—establishments had to grade at least one factor within a set of related questions (e.g., the various business strategies) within the 1 to 5 range. This restricts the regression to 1799 possible units, or 70% of the sample. Within this group, innovators are better represented than non-innovators, comprising 59% of the respondent population. The possibility of correcting for non-response using a Heckman procedure is, at the time of writing, being investigated.

program, and does not emphasize business strategies in any of the areas outlined above. Results are presented in Table 4.

Table 4. Probit Regression Results—Establishment-weighted

	RISK-RELATED OBSTACLES *(1)*	*COST-RELATED OBSTACLES* *(2)*	*AVAILABILITY OF INPUTS* *(3)*	*CORPORATE STYLE* *(4)*
Intercept	-1.059***	-0.494***	-0.634***	-1.623***
Activities:				
Innovator	0.405***	0.163	-0.085	-0.179
RD User	0.300***	0.186*	0.265**	0.090
IP User	0.425***	0.159	0.277**	0.082
Trainer	0.067	0.052	0.132	0.012
Strategies:				
Production	0.224**	0.095	0.071	0.308**
Management	0.150	-0.000	-0.108	0.048
Marketing	0.251**	0.189	0.245**	-0.037
Human Resources	0.075	0.079	0.199*	-0.124
Financing	0.127	0.273***	0.543***	0.185
Industries:				
Computer Services	0.409***	0.125	0.364***	0.316*
Computer M&R	0.246	0.151	0.638	1.044**
Engineering	0.236*	0.113	0.252*	0.373**
Log likelihood	-1055	-1162	-1091	-603
Pr>chi-square	0.000	0.000	0.000	0.148
Number of observations	1770	1768	1768	1768

***Significant at 1%, **significant at 5%, *significant at 10%.

Innovators have a higher probability than non-innovators of encountering difficulties pertaining to market and technical risk (Table 4, column 1). This is also true of businesses that engage in activities that are strongly correlated with the innovation process by either performing R&D or using intellectual property rights. The likelihood of encountering risk-based impediments is also related to certain strategic intensities. Businesses that develop production and marketing competencies have a higher probability of experiencing risk-related obstacles than those that lack commitments in these areas, respectively. Both results are sensible. In a learning-by-doing framework, businesses that invest in production strategies may have better knowledge of the risks associated with the feasibility of process innovations. Similarly, those that stress marketing strategies may express greater concerns over imitation and market success. Industry effects are also apparent. Establishments in computer services and engineering are more likely than those in other industries to report risk-related obstacles.

There are fewer determinants of cost-related problems (Table 4, column 2). There is some evidence that establishments that engage in R&D are more likely to report cost-related impediments. One notable result is that establishments that stress financing strategies are more likely than other businesses to experience cost-related obstacles to innovation.

Generally stronger results are evident in terms of input restrictions (Table 4, column 3). Once again, establishments that perform R&D and use intellectual property are more likely to report input restrictions than are non-performers and non-users, respectively. This reflects the substantial investment—in human capital, technical equipment, and financing—that R&D often requires. Comparable investments in human capital and financing are often required when devising intellectual property strategies. Establishments that demonstrate a commitment to these areas encounter greater barriers.

We find additional evidence at the strategic level. Establishments that stress the importance of marketing, human resource and financing strategies are more likely to report problems associated with input availability than are businesses that do not emphasize these strategies, respectively. Industry effects are again apparent.

Little evidence of systematic determinants exists in relation to corporate style (Table 4, column 4). Of the strategic variables, only production is significant. The fact that innovation activities do not exert any significant effect on impediment probabilities suggests that corporate obstacles, in contrast to risk-related factors or input restrictions, lack a strong learning-by-doing foundation. Once again, some industry effects are evident.

Two basic findings emerge from the multivariate analysis. First, businesses that make substantial investments in the innovation process—either in terms of R&D or intellectual property use—are more likely to encounter risk-related and input-related obstacles to innovation. Both R&D and intellectual property use are hallmarks of complex innovation strategies. This is evidence of learning-by-doing—businesses that engage in complex activities are more likely to encounter impediments.

Second, the obstacles to innovation are not unrelated to the development of strategic competencies. Businesses that stress financing strategies are more likely to experience cost-related impediments and input restrictions. These are sensible findings. Businesses that focus on developing financial competencies may be more knowledgeable of cost requirements or input restrictions pertaining to equity or external capital. Input restrictions—which also include skill shortages—are also more apparent in establishments that stress human resource strategies. In several cases, marketing and production competencies are also positively related to the probability of encountering certain obstacles. These factors provide additional support for the learning-by-doing hypothesis—difficulties arise out of activity, not out of inexperience.

6. Conclusion

Innovation and success are complementary. Firms that develop new products, processes and organizational forms often perform better than those that forego innovation. This has led researchers to ask how the strategic profile of innovators differs from other businesses. Our analysis has focused on small establishments in business service industries. These businesses supply core technological inputs to other sectors. Our investigation reveals several key findings.

First, although these services accord with conventional notions of the 'high-tech sector', innovation is not uniformly stressed. Only 40% of businesses innovate, that is, report the introduction of new or improved products, processes or organizational forms. Among innovators, a majority introduce innovations on a regular basis. Among non-innovators, only a small residual (5%) report any non-commercialized innovation activity. The population thus divides into two basic groups: those that develop ongoing innovation programs and those that forego innovation altogether. This is consistent with the conceptual framework proposed by Baldwin and Gellatly (1998) which demonstrates that advanced competencies are more firm- than industry-specific. Even in dynamic sectors, innovation competencies are far from uniform.

Second, innovators attach more importance to financial management, capital acquisition/retention, recruiting skilled labour, and incentive compensation. This provides additional evidence that, among small, R&D-intensive firms, the development of financing and human resource competencies are strongly correlated with the innovation process. Innovators also place more emphasis on foreign expansion than do other businesses.

Third, in many cases, the obstacles to innovation are 'experienced'—they intensify as businesses pursue activities and develop competencies. Concerns over imitation, market success, and labour skills are more significant among innovators. R&D performers and intellectual property users have a higher probability of experiencing risk-related obstacles and input restrictions than do non-performers and non-users, respectively. Similarly, strategic competencies are often directly correlated with the obstacles to innovation.

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