Determinants of R&D Activities in SMEs Located in Peripheral Regions

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1. Introduction

An examination of industrialized countries reveals that R&D activities are performed in growth centers of the country, with peripheral regions receiving less than their proportional share.[1] The connection between R&D and productivity or between R&D and technological progress and, ultimately, to economic growth is well established in the literature.[2] Furthermore, since a prerequisite for an area to reap the productivity benefits that R&D can bring is that the R&D activity be undertaken at a certain level and for a prolonged period, the lower levels of R&D by the business sector in peripheral regions do not bode well for long-term economic prosperity of those areas. The implications of low levels of R&D are compounded by the realization that past knowledge and research makes it easier to develop new technological innovations that will contribute to future productivity.[3] Specifically, the ideas embodied in current R&D initiatives

[1] For example, Newfoundland and Labrador was responsible for 1% of research and development performed in Canada in 2000, while Ontario and Quebec accounted for 80%. When focusing on business research and development activities only, these percentages become 0.2% and 85%, respectively. Similarly, the East and South East regions of the UK accounted for approximately one-half research and development performed by the business sector in the UK, while Wales, Scotland and Northern Ireland together account for 6% of business sector research and development. Likewise, California accounted for 21% of all research and development activity in the US while states like Maine, Montana and North Dakota each had less than 0.1% of the US research and development activity.

[2] These relationships are so well established that are almost accepted as stylized facts, to be accepted on face value. For example, Blinder (2000) simply assets that technology is the primary driver of productivity gains, Government of Canada (2002) states that "knowledge is the main source of competitive advantage", OECD (2000) reports that "innovation and technical change are…among the most important drivers of economic growth", Wolfe and Salter (1997) suggests that "knowledge is becoming the most important factor contributing to the health of the economy", Government of Canada (1994b) reports that "Knowledge is becoming the most important factor contributing to the health of the economy", Feldman, Link and Siegel (2002) declares that "technology drives economic growth" Baldwin, Hanel and Sabourin (2000) demonstrated that Canadian firms who perform research and development are four times more likely to introduce an innovation. Other studies that show the link between research and development and productivity are: Centre for the Study of Living Standards (1998), Coe and Helpman (1995), Kao, Chiang and Chen (1999), Crisculo and Haskel (2002) and Visco (2000). Government of Canada (2002) suggests that "innovation means greater competitiveness in markets that are increasingly global. Canada's most productivity industries have better productivity performance, grow faster, and generate higher quality, higher paying jobs". As well, OECD (2000) finds that "countries with larger increases in the intensity of business R&D to GDP and in the share of business R&D in total R&D … appear to have experienced a pick-up in productivity growth in the 1990s." The connection between research and development by the industrial sector and innovation in Canada was also noted in Government of Canada (1999) and Globerman (2000). As well, Lejour and Nahuis (2000) finds that research and development activity reinforces the benefits countries gain from trade liberalization.

[3] Research and development and the knowledge acquired from the same have a snowball effect. Specifically, the acquisition of knowledge facilitates and promotes the development of new knowledge, further increasing

spill over to other industries through their R&D activities. Consequently, the acquisition of knowledge facilitates and promotes the development of new knowledge, further increasing productivity in an area. This concept is generally reflected in the statement that the social return on R&D exceeds the private return.[4]

The empirical evidence demonstrates that in addition to generating spillovers, R&D activities are associated with very high private rates of return – in fact, these returns seem to be high in relation to other investment opportunities available to the firms.[5] Given these high rates of return, one might expect to observe even higher levels of R&D being undertaken by private sector firms. This, of course, would be as relevant in the periphery as in the growth regions. However, as Bessen (2001) highlights, it is not costless for a firm to utilize its own R&D for productive purposes. These costs, referred to as "adoption costs", are strong complements to R&D expenditures. It is argued in that study that if adoption costs were included with normal R&D expenditures, then the rates of return estimated for private sector R&D would be more in line with the returns earned on other private sector investments. Other reasons for why R&D might not be undertaken at optimal level in private sector are found in Mohnen (1999), Griffith (2000), Eaton, Guitierrez and Kortum (1998) and Feldman (2001). The explanation that are probably most relevant for peripheral areas are:

- Financial market imperfections, combined with informational asymmetries, result in insufficient access to private sector capital to fund all of the research and development opportunities that have a rate of return in excess of the opportunity cost of capital;
- There may be supply constraints in existence. For example, there is not an infinite supply of research scientists and engineers around to undertake these activities. Consequently, since these specialized skills are required to undertake research and development and may be in short supply, firms have to be selective in which projects are undertaken. This, of course, implies that not all research and development activities will proceed, even if they pass the hurdle rate of return employed by private sector firms;
- Even if the gross-of-tax rate of return to the private sector is high, the presence of high tax rates in a jurisdiction can lower the after-tax rate of return sufficiently to deter investments in some research and development activities; and

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productivity in an area. These points were emphasized by an OECD (1991) report, which stated: *technical change does not occur randomly for two main reasons: (1) in spite of considerable variations with regard to specific innovations, the directions of technical change are often defined by the state-of-the-art of the technologies already in use, and (2) the probability of technological advances by firms, organizations and even countries is, among other things, a function of the technological levels already achieved by them. In other words,… technical change is to a large extent a cumulative activity*.

[4] The fact that the social return on R&D is higher than the private return is demonstrated by: Bernstein (1996), Bernstein and Nadiri (1988), Bernstein (1989), Bernstein. and Nadiri (1991), Goto and Suzuki (1989), Griffith (2000), Griliches (1995), Funke and Niebuhr (2000), Mansfield, Rapoport, Romeo, Wagner and Beardsley, (1977), Mohnen (1992), Nadiri, (1993), OECD (2000), Scherer (1982), Scherer (1984), and Sveilkauskas.

[5] See, Hall (1996) for a summary of private sector returns.

- The size of the market in which the firm is operating may be too small for the investor to recoup his/her investment. The extent of this problem is lessened with an elevated export propensity on the part of the firm.

While there may be good reasons why SMEs in peripheral region do not undertake an optimal level of R&D, that may not be a serious concern if they can benefit from the activities of others through the diffusion of technology to peripheral regions. Unfortunately, the diffusion of technology may be a panacea for these businesses because not all firms have the same capacity to absorb R&D innovations from outside sources.[6] As Rosenberg (1990) points out, in order for firms to effectively benefit from the diffusion of R&D activities of other firms, they need to possess a certain knowledge base that is fostered by their own R&D activities.[7] That is, the spillover effects of R&D are contingent upon the R&D activities of the recipient firms. This implies that the lack of R&D activities in the private sector limits their productivity growth through direct and indirect mechanisms.[8] The direct effect results because their innovation activity is low and their development of new goods or processes for their own benefits is suboptimal. The indirect effect occurs because they have a diminished capacity to take advantage of R&D spillovers that occur through the activities of other firms. Consequently, peripheral areas characterized by lower R&D are disadvantaged in two ways – less goods and processes developed locally and a lower ability to utilize R&D from elsewhere.

Given that R&D activities of SMEs have significant implications for the productivity achieved by those firms and for the growth potential of the area in which they reside and given that peripheral regions are deficient in terms of the relative levels of R&D exhibited by their business sectors, it is important to investigate ways in which R&D activity in these areas can be stimulated. The first step in that exercise is to identify the factors that influence R&D activities of SMEs located in peripheral regions. This paper makes an important contribution to this objective by estimating which characteristics of SMEs in a peripheral region of Canada significantly influence whether these firms engage in R&D.

Including the Introduction, this paper consists of six sections. Section 2 explains the modeling approach adopted in this analysis. This is followed in Section 3 by a brief description of the data. The empirical results for the bi-variate analysis are presented and discussed in Section 4 and the results of the multi—variate analysis are provided and discussed in Section 5. The section, Section 6, contains the conclusion. Finally, the results of the reported Chi-square tests and a copy of the survey are attached as separate appendicies.

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[6] The absorptive capacity of firms, as described in Cohen and Levinthal (1989) and (1990), relates to its ability identify and use relative external knowledge for its own activity and this appears to be tied to their own research and development intensity.

[7] Mohnen and Hoareau (2002) and Griffith, Redding and Van Reenen (2000) provide empirical support for the absorptive capacity hypothesis. As well, Mansfield, Swartz and Wagner (1981) finds that there are substantial costs associated with copying innovations developed by others.

[8] Griffith (2000) highlights the empirical support for the dual role of research an development – it stimulates innovation and facilitates the adoption of existing technology.

2. Modelling R&D Activities at the Firm Level

The likelihood that SMEs engage in R&D is modeled as a classification problem, where the characteristics of those that undertake R&D are separated from those who do not. The dependent variable is binary, where firms engaging in R&D are recorded as 1 and all other firms are denoted by 0.

The probability that SMEs undertake R&D can be written as:

$$\Pr(Engage\ \mathrm{R\&D}) = \frac{1}{1+e^{\left(-(\alpha+\sum_{i=1}^{n}\beta_i * X_i)\right)}} \cdots\cdots eqn.(1)$$

where: X_i is one of the firm's characteristics that influences its decision to engage in R&D.

This approach allows for the calculation of the odds ratio, which is the probability that firms engage in R&D divided by the probability of not engaging in R&D and can be used to determine how important certain characteristics of the firm are to the R&D process. The odds ratio, which forms the basis for the logistic regression utilized in this analysis, can be represented as:

$$ODDS = \alpha + \sum_{i=1}^{n}\beta_i * X_i \cdots\cdots eqn.(2)$$

3. Data Sources

Data was obtained from a survey commissioned by the Atlantic Canada Opportunities Agency and Industry Canada. The survey was administered in the spring of 2002 to 932 small and medium-size enterprises in Newfoundland and Labrador, Canada. For this study, there were 228 responses that could be used in this analysis, 89 of which indicated that they were engaged in R&D activities. The objective of the survey was to provide information to the federal government to enable it to develop an innovation strategy for SMEs in Newfoundland and Labrador, the most eastern province of Canada.

4. Empirical Results – Bi-Variate Analysis

The sample was spit into two groups, according to whether they engaged in R&D activities. Cross tabulations were performed on the relevant responses to the survey to identify possible relationships between variables. The cross tabulation procedure forms two-way and multi-way tables that allows for a variety of tests to determine statistical association between the variables. The cross tabulation procedure allows for a Chi-Square test for homogeneity of proportions. These tests are presented in Appendix 1. The test results indicate that there is a significant difference between the responses of SMEs that engage in R&D and those that do not. Table 1 summarizes the responses of both groups to key survey questions.

The Chi-Square tests indicate that there are statistically significant differences between the proportions presented in Table 1. This suggests that SMEs engaging in R&D are more likely to: (1) introduce new goods or services to the market; (2) introduce new or improved internal processes; (3) improve competitive position; (4) benefit from innovative solutions offered by employees; (5) increase exporting; (6) engage in market research online; (7) plan to partner with government or educational institute; (8) commence exporting; (9) apply for government funds for innovation activities; (10) attempt to partner with university; and (11) possess a post graduate education (Owner/Manager).

Table 1: Percent of Firms Who Answered Yes To the Following Questions

In the past 3 years have you:	R&D	No R&D
Introduced new goods or services to the market	75%	56%
Introduced new or improved internal processes	74%	47%
Improved competitive position	79%	50%
Benefited from innovative solutions offered by employees	71%	42%
Increased exporting	45%	21%
Company does market research online	74%	46%
Planning to partner with government or educational institute	40%	12%
Commenced exporting	37%	17%
Applied for government funds for innovation activities	63%	23%
Attempted to partner with university	38%	18%
Post graduate education (Owner/Manager)	23%	6%

The contribution of each factor above can be calculated using simple bi-variate logistic regressions where the dependant variable is the probability that a firm engages in R&D. Table 2 presents the results of these logistic regressions. As a classification problem, the regressions predict between 62 to 71 percent of the correct responses. The probability that a firm engages in R&D can be calculated by substituting the estimated logits (B column from Table 2) into equation (1). The estimated probabilities are shown in Figure 1 below.

Figure 1: Probability that Firms Engage in R&D (Bi-Variate Analysis)

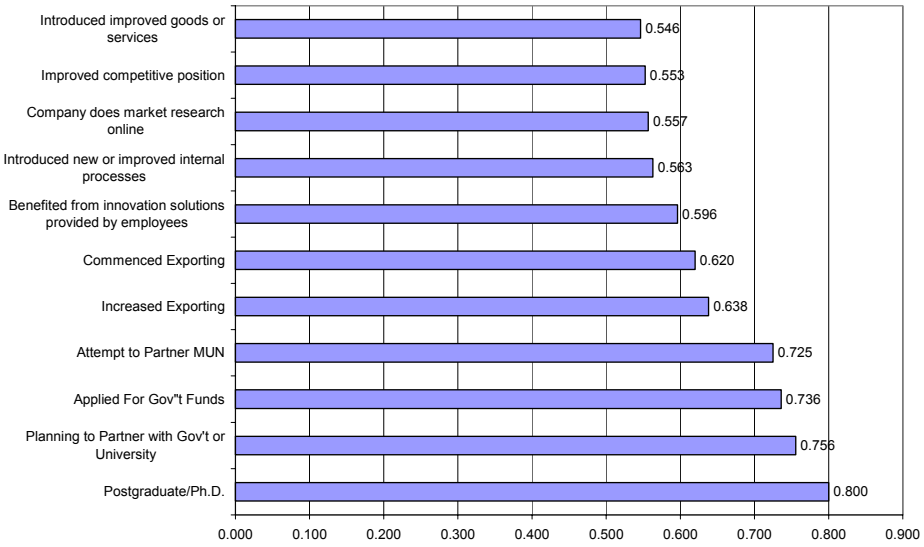


Table 2: Bi-Variate Logistic Regression Results

Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Commenced Exporting	0.996	8.489	0.004	2.708
	Constant	-0.507	8.015	0.005	0.602
Percentage Correct 62.3					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Increased Exporting	1.177	12.617	0	3.243
	Constant	-0.61	10.617	0.001	0.543
Percentage Correct 64.5					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Applied For Government Funds	2.074	35.39	0	7.955
	Constant	-1.048	21.954	0	0.351
Percentage Correct 71.1					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Attempt to Partner With University	1.51	14.273	0	4.528
	Constant	-0.541	8.503	0.004	0.582
Percentage Correct 65.5					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Introduced improved goods or services	1.284	15.857	0.000	3.612
	Constant	-1.099	18.104	0.000	0.333
Percentage Correct 63.3					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Introduced new or improved internal processes	1.474	20.475	0.000	4.366
	Constant	-1.220	20.704	0.000	0.295
Percentage Correct 64.6					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Company does market research online	1.257	14.895	0.000	3.515
	Constant	-1.030	15.623	0.000	0.357
Percentage Correct 63.2					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Benefited from innovation solutions provided by employees	1.460	22.227	0.000	4.306
	Constant	-1.070	20.479	0.000	0.343
Percentage Correct 66.7					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Improved competitive position	1.348	16.065	0.000	3.851
	Constant	-1.137	16.642	0.000	0.321
Percentage Correct 63.0					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	Planning to Partner with Government or University	1.812	21.817	0	6.12
	Constant	-0.683	15.502	0	0.505
Percentage Correct 63.0					
Dependant Variable Engaged in R&D		B	Wald	Sig.	Exp(B)
	EDUCATION		15.118	0.002	
	University or college	0.616	2.027	0.155	1.852
	Professional designation	0.647	1.374	0.241	1.910
	Postgraduate/Ph.D.	2.408	14.455	0.000	11.111
	Constant	-1.022	6.907	0.009	0.360
Percentage Correct 65.1					

The last column (the odds ratios) from Table 2, provides an estimate of how likely a firm engages in R&D given the independent variable. For example, firms with owners/managers who possess a PhD are 11.1 times more likely to engage in R&D. Those firms planning to partner with government or the university are 6.1 times more likely engage in R&D activities. It is not surprising that firms that are innovative are more likely to engage is R&D. Specifically, firms that introduce improved goods and services are 3.6 times more likely to engage in R&D and firms that introduce new or improved internal processes are 4.4 times more likely to engage in R&D. Finally, it is not surprising that firms who look inward to their employees (benefit from innovative solutions offered by employees) and firms that look outward (commenced exporting and increased exporting) are more likely to engage in R&D.

5. Empirical Results – Multi-Variate Analysis

Following a step-wise approach, the probability that firms engage in R&D is given by the following:[9]

$$\Pr(Y = 1 \mid Z) = \frac{e^{Z}}{1 + e^{z}}$$

Where:

$$Z_t = \alpha_0 + \beta_1 \text{EDUC} + \beta_2 \text{INNEMPL} + \beta_3 \text{IMPCOMP} + \beta_4 \text{APPGOVT} + \beta_5 \text{PTGOVTED}$$

EDUC is a categorical variable taking on the value, 0 for high school, 1 for university, 2 professional designation and 3 for PhD. INNEMPL represents the variable benefited from innovative solutions provided by employees, IMPCOMP represents improved competitive position, APPGOVT represents applied for government funding and PTGOVTED represents those who will attempt to partner with government or the university. Table 3 shows that results from the regression. The percentage predicted correct is 77%. Note there is no statistical deference between the education levels up to Postgraduate/PhD.

Table 3: Multi-Variate Logistic Regression

Dependent Variable: Probability of Engaging in R&D	B	Wald	Sig.	Exp(B)
EDUCATIO		5.336	0.149	
University or college	0.400	0.506	0.477	1.492
Professional designation	0.539	0.582	0.446	1.714
Postgraduate/Ph.D.	1.972	5.058	0.025	7.187
Benefited from employees' innovative solutions	0.911	4.886	0.027	2.487
Improved competitive position	0.997	5.157	0.023	2.710
Applied for Gov't funding for innovative activities	1.837	18.701	0.000	6.275
Plan to Partner With Gov't or Educational Institutions	0.997	3.935	0.047	2.710
Constant	-2.892	18.807	0.000	0.055

[9] The step-wise approach involved dropping the variables that were not significant at 5% and re-estimating the equation.

The following table shows the results after recoding the education variable into two categories: with PhD and without. The percentage classified as correct is 76.1 %.The results from the table suggest that those firms that have applied for government funding for innovative activities are 6 times more likely to engage in R&D[10] and 2.8 times more likely to engage in R&D if they plan to partner with the government or educational institutions[11]. Firms who look inward for innovative solutions and work to improve their competitive position are 2.5 times more likely to engage in R&D. Finally, those firms whose owner/manager has earned a PhD are 5 times more likely to engage in R&D.

Table 4: Multi-Variate Logistic Regression

Dependent Variable: Probability of Engaging in R&D	B	Wald	Sig.	Exp(B)
Applied for Gov't funding for innovative activities	1.800	18.485	0.000	6.051
Postgraduate/Ph.D.	1.617	4.733	0.030	5.036
Plan to Partner With Gov't or Educational Institutions	1.037	4.349	0.037	2.820
Improved competitive position	0.949	4.823	0.028	2.584
Benefited from employees' innovative solutions	0.929	5.099	0.024	2.532
Constant	-2.514	33.066	0.000	0.081

[10] While Mamuneas and Nadiri (1996) and David, Hall and Toole (2000) report that research and development funded through government grants simply crowds-out company private sector activity in many industries. And this finding is corroborated by Goolsbee (1998), which finds that government subsidies mainly increase the salaries of scientists and engineers and may not generate any new innovations, other studies, Jaffe (1997), Trajtenberg (2001), David, Hall and Toole (2000) and Feldman (2001), suggest that these findings are peculiar to particular programs and do not carry over to all types of support. Moreover, Feldman (2001) finds that government support, rather than discouraging private sector research and development activity, was integral to the research and development undertaken by private sector firms. This was demonstrated by the fact that these firms would not have proceeded with the research and development activity in the absence of the government support or they would have substantially scaled back their plans. As well, Feldman (2001) finds that government subsidies attract additional funds from other sources for research and development activities within private sector firms. These latter findings are clearly consistent with the regression results presented in Table 4.

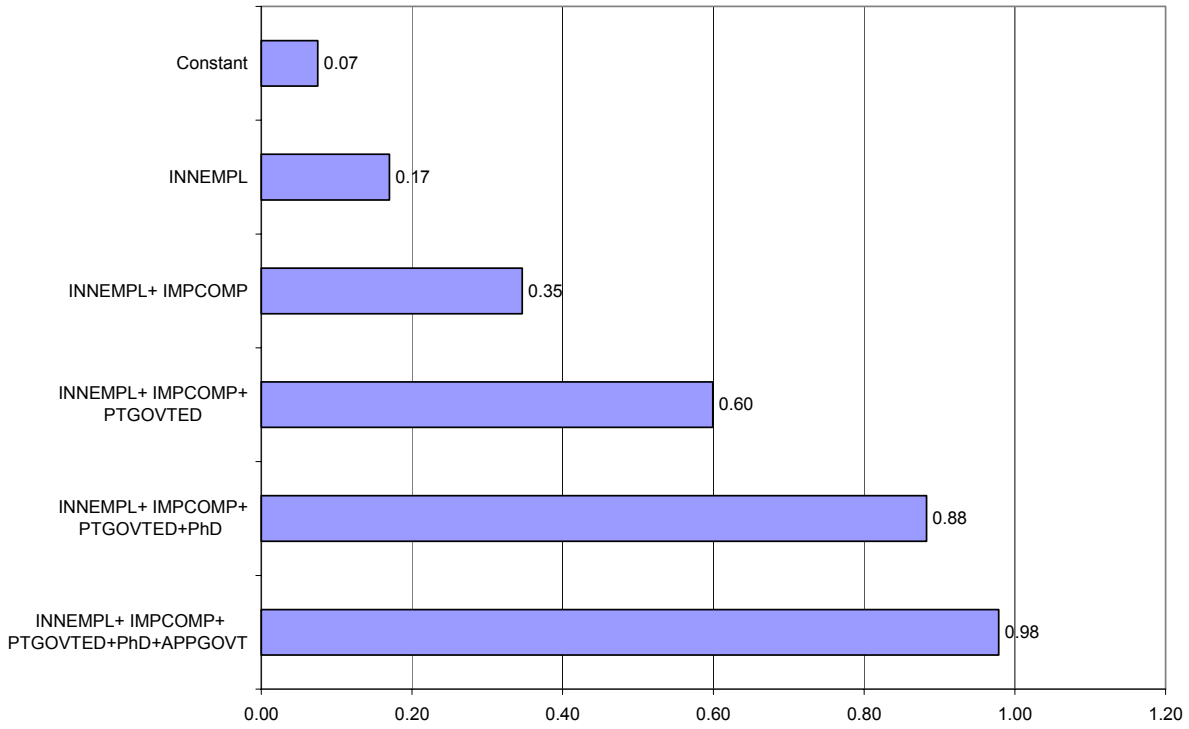
[11] These result indicate that university-industry collaboration enhances productivity. This is consistent with the literature. For example, Mansfield and Lee (1996) demonstrates that firms located close to academic research centers have an advantage over others; Feldman (2001) reports exchanges between university and industry scientists enhance innovation; Cohen (1995) suggests that a significant determinant of innovation activity is the geographic proximity of the firm to basic science; and Wolfe (1998) notes that firms located close to centers of academic research have an advantage over other firms. As well, Cockburn and Henderson (1998) demonstrates that knowledge spillovers between universities and industry are tied to the degree to with the two collaborate; Adams (1990), Jaffe (1989) and Acs, Audretsch and Feldman (1992) establish the presence of knowledge spillovers between the university and industry and that being close to a university is an important determinant of the extent of these spillovers; Link and Rees (1990), and Acs, Audretsch and Feldman (1994) find that SMEs benefit more from university-based knowledge spillovers than larger firms, who have the capacity to undertake their own research; Feldman (2001) reports that collaboration between industry and university researchers have had a positive impact on innovation; Globerman (2000) indicates that closer ties between academic and industry research promotes the accumulation and diffusion of technical knowledge; Martin, Salter, Hicks, Pavitt, Senker, Sharp and Von Tunzelmann (1996) argues that good personal links between industry and public sector are crucial for collaboration between the two and are vital to maintain the connection between basic research and technological development; and Doutriaux (2000) suggests that there is an increased probability of innovation, profitability and growth for firms that collaborate with universities.

As before, the probability that firms engage in R&D can be calculated using the estimated logits from Table 4 above. Figure 2 illustrates how the probability engaging in R&D changes for firms with different characteristics. For this illustration, we consider six types of firms that are consistent with the results of Table 4. These are:

1. firms that do not benefit from employees' innovative solutions, have not experienced an improved competitive position, that have no plans to partner with government or educational institutions, for with the owner/manager does not posses a Phd or had postgraduate experience and have not applied for government funding for their innovative activities. These firms are denoted by the term CONSTANT in Figure 2, indicating that there are the reference firms for the multi-variate regression run in Table 4 and whose probability of engaging in R&D is calculated on the basis of the constant term;
2. firms that have all the characteristics of the reference group, except they report benefits from innovative solutions offered by their employees. These firms are reference by the term INNEMPL is Figure 2;
3. firms that have all the characteristics of INNEMPL, but they indicated that an improved competitive position. There firms are denoted by INNEMPL + IMPCOMP in Figure 2;
4. Firms that have all the characteristics of INNEMPL+IMPCOMP firms, but have plans to partner with government of with educational institutions. In Figure 2, this group of firms are indicated by INNEMPL+IMPCOMP+PTGOVTED;
5. firms that have all the characteristics of INNEMPL+IMPCOMP+PTGOVTED, but the owner/manager has a Phd. INNEMPL+IMPCOMP+PTGOVTED+Phd represents this group of firms in Figure 2; and
6. finally, firms that have all the characteristics of INNEMPL+IMPCOMP+PTGOVTED+Phd firms, but have applied for government funding for innovative activities.

Using the information from Figure 2, one observes that the probability of undertaking R&D for firms belonging to the reference group is 7%. Group 2, firms who benefit from innovative solutions from their employees only, have a 17% probability of engaging in R&D, while firms who benefit from innovative solutions from employees and experience an improved competitive position, have a probability of 35%. When the characteristics of the firms are expanded to include those who plan on partnering with government or educational institutions, this probability increases to 60%. By the time the group is adjusted to allow for firms whose manager/owner has a Phd. or had done postgraduate work the probability increases to 88%. For firms characterized by the complete set of regressors in Table 4, the probability of engaging in R&D is 98%.

Figure 2: The Probability that Firms Engage in R&D



6. Conclusion

A bi-variate regression and chi-tests were performed on the survey responses obtained from a sample of SMEs in Newfoundland and Labrador, a province on the periphery of Canada. These results indicate the probability of engaging in R&D is increased in innovative firms that benefits from innovative solution provided by employees, engage in trade, collaborate or partner with universities and government research institutions, have an improving competitive position, have an owner or manager who has a Phd. and apply for government funding for their innovative activities. As well, similar findings prevail for the multi-variate regressions.

These finding suggest that policies designed to increase collaboration between SMEs and the educational sector should translate into higher levels of R&D in peripheral regions. Likewise, policy designed to encourage export-oriented focus in these businesses should also result in enhanced R&D in peripheral regions. More education on the part of the owners and managers of firms, as well, should result in higher levels of R&D in SMEs in peripheral regions. Given the importance that R&D activity plays in the health of an economy and given the relatively low levels that exist in peripheral regions, the finds in this paper should help policy makers in their efforts to improve the standard of living and economic growth in the peripheral regions of their country.

Appendix A – Chi-Squared Testing

Past 3 Yrs - Intro. New Goods or Services - No R&D					
Test 1		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	59	42.1	44	44
	Yes	75	53.6	56	100
	Total	134	95.7	100	
Missing	System	6	4.3		
Total		140	100		
Past 3 Yrs - Intro. New Goods or Services – R&D					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	22	24.7	25	25
	Yes	66	74.2	75	100
	Total	88	98.9	100	
Missing	System	1	1.1		
Total		89	100		
Results					
Critical Value				**3.841455338**	
Chi-Square Test Statistic				**8.300553968**	
p-Value				**0.003963299**	
Reject the null hypothesis					

Company do mrkt research online? No R&D					
Test 2		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	64	45.7	53.8	53.8
	Yes	55	39.3	46.2	100
	Total	119	85	100	
Missing	System	21	15		
Total		140	100		
Company do mrkt research online? R&D					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	21	23.6	26.3	26.3
	Yes	59	66.3	73.8	100
	Total	80	89.9	100	
Missing	System	9	10.1		
Total		89	100		
Results					
Critical Value			**3.841455338**		
Chi-Square Test Statistic			**6.329832854**		
p-Value			**0.011872352**		
Reject the null hypothesis					

Past 3 Yrs - Benefited from Innov. Sol'n by Empl – No R&D					
Test 3		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	76	54.3	58	58
	Yes	55	39.3	42	100
	Total	131	93.6	100	
Missing	System	9	6.4		
Total		140	100		
Past 3 Yrs - Benefited from Innov. Sol'n by Empl – R&D					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	25	28.1	28.7	28.7
	Yes	62	69.7	71.3	100
	Total	87	97.8	100	
Missing	System	2	2.2		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**8.350952305**			
p-Value		**0.003854853**			
Reject the null hypothesis					

Past 3 Yrs - Commenced Exporting - No R&D					
Test 4		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	107	76.4	82.9	82.9
	Yes	22	15.7	17.1	100
	Total	129	92.1	100	
Missing	System	11	7.9		
Total		140	100		
Past 3 Yrs - Commenced Exporting - R&D					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	52	58.4	62.7	62.7
	Yes	31	34.8	37.3	100
	Total	83	93.3	100	
Missing	System	6	6.7		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**8.32100495**			
p-Value		**0.003918923**			
Reject the null hypothesis					

Past 3 Yrs - Increased Exporting - No R&D					
Test 5		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	104	74.3	79.4	79.4
	Yes	27	19.3	20.6	100
	Total	131	93.6	100	
Missing	System	9	6.4		
Total		140	100		
Past 3 Yrs - Increased Exporting - R&D					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	46	51.7	55.4	55.4
	Yes	37	41.6	44.6	100
	Total	83	93.3	100	
Missing	System	6	6.7		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**9.759317806**			
p-Value		**0.001784161**			
Reject the null hypothesis					

No R&D: Past 3 Yrs - Improved Comp. Position					
Test 6		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	62	44.3	50	50
	Yes	62	44.3	50	100
	Total	124	88.6	100	
Missing	System	16	11.4		
Total		140	100		
R&D: Past 3 Yrs - Improved Comp. Position					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	17	19.1	21	21
	Yes	64	71.9	79	100
	Total	81	91	100	
Missing	System	8	9		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**6.70968058**			
p-Value		**0.009589091**			
Reject the null hypothesis					

No R&D: Past 3 Yrs - Apply for Gov't Funding for Innov.					
Test 7		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	98	70	77.2	77.2
	Yes	29	20.7	22.8	100
	Total	127	90.7	100	
Missing	System	13	9.3		
Total		140	100		
R&D: Past 3 Yrs - Apply for Gov't Funding for Innov.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	30	33.7	36.6	36.6
	Yes	52	58.4	63.4	100
	Total	82	92.1	100	
Missing	System	7	7.9		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**21.17173226**			
p-Value		**4.19912E-06**			
Reject the null hypothesis					

NO R&D: Attempt to Partner - MUN					
Test 8		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	101	72.1	82.1	82.1
	Yes	22	15.7	17.9	100
	Total	123	87.9	100	
Missing	System	17	12.1		
Total		140	100		
R&D: Attempt to Partner - MUN					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	48	53.9	62.3	62.3
	Yes	29	32.6	37.7	100
	Total	77	86.5	100	
Missing	System	12	13.5		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**7.262891261**			
p-Value		**0.007039388**			
Reject the null hypothesis					

Past 3 Yrs - Intro. Imp. Goods or Services - No R&D					
Test 9		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	69	49.3	53.5	53.5
	Yes	60	42.9	46.5	100
	Total	129	92.1	100	
Missing	System	11	7.9		
Total		140	100		
Past 3 Yrs - Intro. Imp. Goods or Services - R&D					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	21	23.6	26.3	26.3
	Yes	59	66.3	73.8	100
	Total	80	89.9	100	
Missing	System	9	10.1		
Total		89	100		
Results					
Critical Value		**3.841455338**			
Chi-Square Test Statistic		**6.434207055**			
p-Value		**0.011194313**			
Reject the null hypothesis					

NO R&D: Plan to Partner – Government or University					
Test 10		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	111	79.9	88.1	88.1
	Yes	15	10.8	11.9	100
	Total	126	90.6	100	
Missing	System	13	9.4		
Total		139	100		
R&D: Plan to Partner – Government or University					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	51	57.3	60	60
	Yes	34	38.2	40	100
	Total	85	95.5	100	
Missing	System	4	4.5		
Total		89	100		
Results					
Critical Value		**3.8414553**			
Chi-Square Test Statistic		**17.25277**			
p-Value		**3.272E-05**			
Reject the null hypothesis					

NO R&D--- Postgrad					
Test 11		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	0	127	91.4	94.1	94.1
	PhD	8	5.8	5.9	100
	Total	135	97.1	100	
Missing	System	4	2.9		
Total		139	100		
R&D Firms -- Postgrad					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	0	67	75.3	77	77
	PhD	20	22.5	23	100
	Total	87	97.8	100	
Missing	System	2	2.2		
Total		89	100		
Results					
Critical Value		**3.8414553**			
Chi-Square Test Statistic		**12.211932**			
p-Value		**0.0004748**			
Reject the null hypothesis					

Appendix B: Business Innovation Study

For the purposes of this survey, innovation occurs when a new or changed product (good or service) is introduced to the market, or when a new or changed process is used by a firm. The innovation process is the combination of activities including design, research, market investigation, process development, organizational restructuring and employee development that are necessary to support an innovative product (good or service) or process. The product or process simply needs to be new to your firms. It does not have to be new to the industry.

Introduction: It has been well established that innovation activity has accounted for the majority of economic growth that has occurred in the developed countries within the last 100 years. Equally well documented are the concerns that Canada is falling behind other G7 countries in terms of R&D, innovation, productivity and competitiveness. The potential long-term consequence of Canada lagging other countries in these areas is that the standard of living that Canadians have come to expect will be adversely affected. Consequently, the Government of Canada has made innovation one of its key policy initiatives in the immediate and longer terms. Specifically, the Government of Canada has set the goal to double its R&D activity and make Canada the most connected nation in the world by 2004.

The objective of this study is to identify the factors that contribute, positively or negatively, to Newfoundland and Labrador's SMEs ability to engage in innovative activities. The output of this research will facilitate government's efforts to plan and implement strategies targeted at improving the innovation performance of Newfoundland and Labrador's SME sector. As well, it should help ACOA and Industry Canada to identify areas within national programs that require advocacy efforts.

Confidentiality: All responses will be kept in strict confidence, only research staff will have access to your answers and there are no identifying codes on the returned surveys so it will be impossible to identify individual respondents from the returned surveys. As a further protection of confidentiality and anonymity, all data will be summarized for the purpose of analysis. That is, no individual survey responses will be provided in the final report.

The Questionnaire: This questionnaire should take 15 minutes to complete. It should be completed by a senior management person who is knowledgeable about products (goods or services) and processes in your company. Please ensure all questions are answered.

Speedy Completion and Return: If you have any questions about the study, please telephone Barry Sheppard, at 754-3235.It is important the questionnaire be completed as soon as possible and returned in the postage paid envelope by no later than **March 8th** to:

Barry Sheppard Consulting
P.O. Box 8001
St. John's, NF
A1B 3M7

Thank you for taking the time to complete and return this survey. You input in this process is appreciated and should help Industry Canada and ACOA more effectively formulate their policies with respect to innovation.

1. Location of company _____

2. What is the number of years in which your company has been operating?
○ **<1 year** ○ **1 – 3 years** ○ **6 – 10 years** ○ **>10 years**

3. What are top 3 products or services of your company?
   a) _____
   b) _____
   c) _____

4. Please indicate whether you are a member of any of the following industry associations.
   ○ **Newfoundland Environmental Industries Association**
   ○ **Newfoundland and Labrador Association of Technology Industries**
   ○ **Canadian Manufacturers and Exporters**
   ○ **Newfoundland Offshore Industries Association**
   ○ **Other** _____
   ○ **Not a member of any industry association**

5. The number of people directly employed full time by your company currently is:
○ **1** ○ **2 - 5** ○ **6 – 20** ○ **21-50** ○ **> 50**

6. In the last 3 years, the number of employees in my company has increased by:
○ **not at all** ○ **declined** ○ **< 5%** ○ **6 – 10%** ○ **>10%**

7. In the next year, I expect the number of employees in my company to increase by:
○ **not at all** ○ **decline** ○ **< 5%** ○ **6 – 10%** ○ **>10%**

8. In the last 3 years, my company's sales has:
○ **not increased** ○ **declined** ○ **increased < 10%** ○ **increased >10%**

9. In the next 3 years, I expect my company's sales to:
○ **stay the same** ○ **decline** ○ **increase < 10%** ○ **increase >10%**

10. The amount of my company's sales accounted for by sales outside the province is:
○ **0%** ○ **1 – 10%** ○ **11 – 50%** ○ **51 – 99%** ○ **100%**

11. Please indicate which of the following statement most accurately reflects your business. In establishing my priorities and goals my attention is focused on:

○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
Next Week	Next Month	Next Year	Next 5 years	Beyond 5 years

12. During the last three years, did your company change your

business strategy	○ **Yes**	○ **No**
management techniques	○ **Yes**	○ **No**
organizational structure	○ **Yes**	○ **No**
marketing strategy	○ **Yes**	○ **No**

13. (a) Does your company have a web page? ○ **Yes** ○ **No**

(b) Does your company use the internet for info retrieval? ○ **Yes** ○ **No**

(c) Does your company buy or sell over the internet? ○ **Yes** ○ **No**

(d) Does your company collaborate with other businesses over the internet? ○ **Yes** ○ **No**

(e) What percent of your employees have their own personal computer at the office?
○ **0%** ○ **1-10%** ○ **11 – 50%** ○ **51 -99%** ○ **100%**

(f) What percent of your employees have access to email or the internet at the office?
○ **0%** ○ **1-10%** ○ **11 – 50%** ○ **51 -99%** ○ **100%**

(g) Are the computers in your company connected via a net work?
○ **Yes** ○ **No**

(h) Do your employees have access to office technologies, network, internet, etc, from home?
○ **Yes** ○ **No**

14. Does innovation rank among your company's top three priorities? ○ **Yes** ○ **No**

15. Please indicate whether you feel that innovation is critical for your bottom line
○ **1** Strongly Disagree ○ **2** ○ **3** ○ **4** ○ **5** Strongly Agree

16. During the last 3 years, did your firm engage in research and development (R&D) linked to new or significantly improved products (goods or services) or production/supply processes?
○ **Yes** ○ **No**

17. What share of your operating budget is devoted to R&D?
○ **0%** ○ **no set amount** ○ **<10%** ○ **10 -20%** ○ **21 - 50%** ○ **>50%**

18. Does your company plan to increase its R&D activity in the next 3 years?
○ **Yes** ○ **No**

19. Is there a separate individual (including owner) or department who is tasked with R&D?
○ **Yes** ○ **No**

20. If yes, what percent of their time is taken up with R&D?
○ **no set amount** ○**<10%** ○ **10-20%** ○ **21-50%** ○ **50-99%** ○**100%**

21. Did your company apply for the R&D tax credit?
○ **Applied & Successful** ○ **Applied, Not Successful** ○ **Never Applied**

22. Have you received investment in your firm's R&D from outside sources? ○ **Yes** ○ **No**

23. If you undertook R&D and did not apply for the R&D tax credit, please indicate why?
_____

24. How many patents does your company hold?
○ **none** ○**1** ○ **2** ○ **3 - 5** ○ **6-10** ○**>10**

25. In the last 3 years, your company applied for how many patents?
○ **none** ○**1** ○ **2** ○ **3 - 5** ○ **6-10** ○**>10**

26 How often does your company benchmark its innovation performance against other companies?
○ **Monthly** ○ **Semi-Annually** ○ **Annually** ○ **Infrequently** ○ **Never**

27. Does your company reward or recognize individuals or department who are successful in helping the company to innovate?
○ **Yes** ○ **No**

28. During the last 3 years, how many new or significantly improved products (goods or services) did your firm offer to the market?
○ **0** ○ **1** ○ **2-5** ○ **6-10** ○ **>10**

29. During the last 3 years, did your firm introduce new or significantly improved production/supply processes?
○ **Yes** ○ **No**

30. Briefly describe the most significant innovation that has been undertaken by your company in the last 3 years _____
_____

31. During the last 3 years, did your firm have any unsuccessful or uncompleted innovation projects?
○ **Yes** ○ **No**

32. Are you likely to be more innovative in the next 3 years
○ **Yes** ○ **No**

If you answer no to questions 28, 29 or 31, jump to question 49.
Otherwise continue with question 33.

33. During the last 3 years, did your firm participate in any of the following activities linked to new or significantly improved products (goods or services) or production/supply processes?

(a) acquire machinery, equipment or other technology ○ **Yes** ○ **No**
(b) engage in industrial engineering and industrial design ○ **Yes** ○ **No**
(c) engage in tooling up and production start-up ○ **Yes** ○ **No**
(d) conduct training ○ **Yes** ○ **No**

34. What percentage of your company's growth in the last 3 years came from the sale of new product or service?
○ **none** ○**<5%** ○ **5-10%** ○ **11-20%** ○ **21-50%** ○ **> 50**

35. How much time is management willing to allocate to explore new ideas and innovative solutions?
○ **none** ○**<5%** ○ **5-10%** ○ **11-20%** ○ **21-50%** ○ **> 50**

36. Please indicate the degree of importance your firm attaches to the following reasons for introducing new/significantly improved products (goods or services) or new/improved processes and please indicated in the second row the degree of impact that your innovation activity has had on your firm in the last 3 years

	Not Important				**Very Important**	**No Impact**				**Large Impact**
reduced costs	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
increased productive capacity	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
reduced production time	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
improved production flexibility	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
opened new markets	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
increased market share	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
improved quality of goods & services	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
increased speed of delivering products to the market	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
replaced products being phased out	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
reduced environmental impacts	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
met regulations or standards	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
Other _____	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

37. Please indicate the importance of each of the following items in slowing down or causing problems for your firm in terms of innovation during the last 3 years?

	No Impact				**Significant Impact**
high cost compared to expected payoff	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of staff	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of skilled personnel	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
inability to qualify for government programs or R&D tax credits	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
no government programs fund the activities with which my company is involved	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unsure of how to access relevant government programs	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too much red tape and time required to qualify for government assistance	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
complying with regulations and standard too onerous	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of enforcement of government environmental regulations	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of private sector financing	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unavailability of private sector financing	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of marketing capability to market new or significantly improved products	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of information on relevant technology	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of external, private sector technical support services	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of access to expertise at Memorial University	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
difficult to network with other firms because of location	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
difficult to generating ideas for new products or processes	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

difficult to define target market or lack of information on markets	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of consumer responsiveness to new goods and services	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
competitive pressures/market conditions are such that there is no need to innovate	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of time to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of budget to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
no need because prior innovations still effective	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of receptor companies to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

Other _____

_____

38. Did your company apply for government funding to support innovation-related activities in last 3 years.
○ **Yes** ○ **No**

39. If yes, please indicate under which programs your company applied for innovation-related funding and please indicate whether you were successful in receiving the funding requested.

_____ ○ **Successful** ○ **Not Successful**
_____ ○ **Successful** ○ **Not Successful**
_____ ○ **Successful** ○ **Not Successful**

40. Please indicate your level of satisfaction with the application process.

○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
Not Satisfied				Very Satisfied

41. If you did not apply for government funding, please indicate the degree of importance the reasons for not applying

	Not **Important**				***Very*** **Important**
no program that fit my needs	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too much time required					

for application process	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

	Not **Important**				***Very*** **Important**
no local contact for program delivery	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
application process too complex	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unable to provide required matching funds	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
business is going fine and do not need additional funding	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
not interested in government funding	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

Other _____

42. In the future will you be seeking government funds to help with your R&D? ○ **Yes** ○ **No**

43. Have you attempted to partner with the university, college or local research institute in your innovation activities?

○ **Yes** ○ **No**

44. If yes, was it successful?

○ **Yes** ○ **No**

45. If you did not partner, please indicate the importance of why you did not attempt to utilize the services of the university to enhance your innovation efforts?

	Not Important				**Very Important**
did not know how	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unaware of what services are	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
offered by the university	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
skill required not available at the university	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too expensive	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

other _____

46. Are you likely to be more innovative in the next 3 years

○ **Yes** ○ **No**

47. Has your company received any external recognition for its achievements in innovation?

○ **Yes** ○ **No**

48. What percentage of your revenue come from products and services developed in the past 5 years?

_____

If you answered question 32-48, then the survey is finished.
Otherwise, continue to question 49.

49. If you did not innovate (i.e., introduce new/significantly improved products (goods or services) or new/improved processes) in the last 3 years, please indicate why not

	No Impact				**Significant Impact**
high cost compared to expected payoff	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of staff	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of skilled personnel	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
inability to qualify for government programs or R&D tax credits	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
no government programs fund the activities with which my company is involved	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unsure of how to access relevant government programs	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too much red tape and time required to qualify for government assistance	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
complying with regulations and standard too onerous	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of enforcement of government environmental regulations	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of private sector financing	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unavailability of private sector financing	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of marketing capability to market new or significantly improved products	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

lack of information on relevant technology	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of external, private sector technical support services	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of access to expertise at Memorial University	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
difficult to network with other firms because of location	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
difficult to generating ideas for new products or processes	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
difficult to define target market or lack of information on markets	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of consumer responsiveness to new goods and services	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
competitive pressures/market conditions are such that there is no need to innovate	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of time to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of budget to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
no need because prior innovations still effective	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
lack of receptor companies to take ideas forward	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

Other _____

_____

50. Did your company apply for government funding to support innovation-related activities in last 3 years.

○ **Yes** ○ **No**

51. If yes, please indicate under which programs your company applied for innovation-related funding and please indicate whether you were successful in receiving the funding requested.

_____ ○ **Successful** ○ **Not Successful**

_____ ○ **Successful** ○ **Not Successful**

52. Please indicate your level of satisfaction with the application process.

○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
Not Satisfied				Very Satisfied

53. If you did not apply for federal funding, please indicate the degree of importance of the reasons for not applying

	Very Important				Not Relevant
no program that fit my needs	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too much time required for application process	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
no local contact for program delivery	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
application process too complex	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unable to provide required matching funds	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
business is going fine and do not need additional funding	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
not interested in government funding	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

Other _____

54. In the future will you be seeking government funds to help with your R&D? ○ **Yes** ○ **No**

55. Have you attempted to partner with the university, college or local research institution in your innovation activities?
○ **Yes** ○ **No**

56. If yes, was it successful?
○ **Yes** ○ **No**

57. If you did not partner, please indicate the importance of why you did not attempt to utilize the services of the university to enhance your innovation efforts?

	Not Important				Very Important
did not know how	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
unaware of what services are	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
offered by the university	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
skill required not available at the university	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**
too expensive	○ **1**	○ **2**	○ **3**	○ **4**	○ **5**

other _____

58. Has your company received any external recognition for its achievements in innovation?

○ **Yes** ○ **No**

59. What percentage of your revenue come from products and services developed in the past 5 years?

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