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EXPORTING AND KNOWLEDGE-INTENSITY: A SURVEY OF FIRMS IN NEWFOUNDLAND AND LABRADOR

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EXPORTING AND KNOWLEDGE-INTENSITY: A SURVEY OF FIRMS IN NEWFOUNDLAND AND LABRADOR

This paper presents results from a mail survey, conducted in the spring of 1999, of small and medium-sized firms in Newfoundland and Labrador concerning exporting activities and experiences. Export activities and experiences of entrepreneurs in high knowledge firms are compared to those in less knowledge-intensive businesses. Findings provide insight into export assistance used by firms, as well as barriers to becoming an exporter. Findings also confirm the importance of knowledge-intensity and firm size to export activity.

Introduction[1]

Research over the past twenty years has clearly established the important contribution of small and medium-sized enterprises (SMEs) to the economies of most industrialized countries and regions, including Canada and Atlantic Canada (Arend *et al*., 1997; Gorman & King, 1998). Coincident with the growth in the SME sector and the recognition of its importance is the growing consensus among policy-makers and academics that most industrialized economies are increasingly becoming "knowledge-based." According to the Organization for Economic Cooperation and Development (OECD), the term "knowledge-based economy" recognizes the important role of knowledge and technology in economic growth (OECD, 1996). Knowledge, as an input and an output, is increasingly seen as a key source of job creation, competitive advantage and long-term growth.

Recent research by the Atlantic Provinces Economic Council (APEC) indicates the knowledge-based sector is making a significant contribution to the economy of Newfoundland and Labrador (APEC, 1997). Estimates by APEC indicate high knowledge-intensive firms account for 14 percent of business-sector gross domestic product (GDP) while the medium knowledge-intensity group accounts for an additional 61 percent. In terms of employment, the percentages are 11 and 35 percent respectively. Further, over the period from 1983 to 1995, high-knowledge firms accounted for 47 percent of the new jobs.

[1] The Centre for International Business Studies, Memorial University, provided funding to support this research. The author would also like to acknowledge the contribution of Neil Pickup, MBA graduate, Memorial University of Newfoundland.

Notwithstanding the importance of knowledge-based businesses (KBBs) to the economy of Newfoundland and Labrador, little is known about the relationships between knowledge-intensity and export activity. As a result, the present study was undertaken to gather data on the exporting activities and experiences of SMEs in Newfoundland and Labrador. A previous study (Gorman and Withey, 1996) indicated firms in Newfoundland and Labrador place a relatively low emphasis on export-related activities, thus any information gathered would be of interest in developing this area. Further, in light of the increasing attention being paid to the knowledge-based economy, the study provided the opportunity to compare the exporting activities of KBBs to traditional firms.

Previous Research

There is no generally accepted definition of a knowledge-based industry or knowledge-based business. As pointed out by Howitt (1996; 10), "we have no generally accepted empirical measures of such key theoretical concepts as the stock of technical knowledge, human capital, the resource cost of knowledge acquisition, the rate of innovation or the rate of obsolescence of old knowledge."

In the absence of standard economic methods to measure knowledge, a number of definitions of knowledge-based industries (KBIs) have been put forward by industry and government groups (Harris, 2000). Industry Canada focuses on the use of information or other advanced technology and scientific research to define knowledge-based sectors. On that basis, 20 industries, as defined in the Standard Industrial Classification (SIC) codes used by Statistics Canada, are considered to represent knowledge-based sectors. Lee and

Has (1996), categorize SICs as high, medium or low knowledge-intensity, utilizing research and development (R&D) and human capital indicators. The indicators of R&D activity include R&D intensity, the proportion of R&D personnel to total employment, and the proportion of professional R&D personnel to total employment. The following three indicators are used to measure human capital: the ratio of workers with post-secondary education to total employment, the ratio of knowledge workers to total employment, and the ration of the number of employed scientists and engineers to total employment. Industries are ranked by the six indicators and divided into three equal groups. Industries are classified as high knowledge if two of the three R&D indicators and two of the three human capital indicators are in the top third. Industries with two of the R&D indicators and two of the human capital indicators in the bottom third are classified as low knowledge. All remaining industries are classified as medium-knowledge. A third definition, developed for the venture capital industry, defines KBIs as follows: biotechnology and information technology, communications, electronics, energy and environmental technology and some industrial equipment, including advanced materials (Canadian Venture Capital Association, 1997).

The Canadian Bankers Association (CBA) has adopted the 20 SIC code classification for reporting data on lending to the knowledge-based sector. However, a recent study completed for the CBA by Thompson Lightstone & Company Ltd. (1998) indicates SICs do not necessarily reflect the views of entrepreneurs. Self-identification by entrepreneurs in this study indicated 68 percent felt their businesses were knowledge-based whereas only 4 percent were considered KBI under the Industry Canada definition.

Opinions obtained from a recent focus group of entrepreneurs in Newfoundland and Labrador (Gorman and McCarthy, 2000) indicate characteristics associated with human resources are viewed as a primary difference between KBBs and traditional firms. Focus group participants believe employees of KBBs possess higher educational credentials, receive above average compensation, work in a team environment, and are involved in continuous learning. Differences in marketing were also noted by entrepreneurs who consider KBBs to be more export-oriented. Export orientation is considered essential since most KBBs sell a specialized product or service. In small market areas such as Newfoundland and Labrador or even Canada, the domestic market is not considered large enough to sustain a company employing a niche strategy for highly specialized products.

Notwithstanding the divergence of agreement concerning the definition of a KBB, recent research by Lefebvre and Lefebvre (2000) confirms the importance of knowledge intensity as a determinant of export performance and behaviour. This same study concludes that despite significant research effort directed to SMEs, there are still significant gaps in our knowledge of their export behaviour and performance and of the process by which they participate in the global economy.

Methodology

To achieve the objectives of the present study, input from entrepreneurs was required to determine exporting activities and experiences and to compare those of high knowledge firms to those in less knowledge-intensive businesses. To this end, a mail

survey was undertaken in the spring of 1999. As Mangione (1998) suggests mail surveys are ideally suited to situations where human resources to conduct research are limited, where respondents have a stake in the topic, where the number of research objectives is limited, and where the vast majority of questions can be framed in a closed-ended style.

The mailing list for the survey consisted of a database obtained from the provincial Department of Industry, Trade and Technology, supplemented with additional contacts provided by a number of provincial and federal agencies[2]. While the database is not representative of all firms in the Province, it was chosen to ensure adequate representation of knowledge-based firms. The modified database, considered a purposeful sample (Patton, 1990), consisted of 1715 private sector firms located in Newfoundland and Labrador. Purposeful sampling may be used to ensure heterogeneity in the population, to include cases that are critical for developing theory, and to examine differences between individuals or settings (Maxwell, 1998). As such, purposeful sampling is well suited to the present study.

The first part of the survey was designed to collect basic demographic data on the firms (for example, type of business, Standard Industrial Classification (SIC) code, age, ownership structure, location, number of employees, gross sales or revenues, research and development expenditures, and educational level of employees) and on the owners/managers (for example, gender, age, education, and years of experience). To determine the degree of knowledge-intensity of each firm, two additional questions were included in the background section. The first asked respondents to rate the importance of a number of factors to success in their industry, while the second asked respondents to

[2] The Department of Development and Rural Renewal, the Atlantic Canada Opportunities Agency and the Canadian Centre for Marine Communications.

indicate the extent to which these factors apply to their firm. The factors included in these two questions were adapted primarily from the work of Lee and Has (1996).

The second part of the survey was designed to gather data on the exporting experiences of the firms. The questions were designed to provide general exporting data and to provide direction for further study.

Following a pre-test, surveys with personalized cover letters and postage paid return envelopes were sent by first class mail during February of 1999. Surveys were coded to permit tracking. Follow-up letters were sent after three and six weeks. Survey responses were compared to Statistics Canada data on the population of firms in the Province to determine representativeness of respondents.

Given the primary purpose of the survey was to compare exporting experiences of high knowledge firms to less knowledge-intensive businesses, descriptive statistics, crosstabulations and comparison of means are the main methods used to analyze survey data.

Results and Discussion

Of the total of 1715 mailings, Canada Post returned 185 surveys as undeliverable and another 58 were returned by firms for a variety of reasons, such as the firm had ceased operations, the business was not locally owned and the survey was not considered applicable. A total of 235 surveys were received. From these, 225 surveys were returned with the exporting section completed, representing a response rate of 15.3 percent. Survey data were analyzed to determine the exporting experiences of the firms and to

determine any perceived barriers to exporting. In addition, cross tabulation statistics were employed to compare the demographic profile of the sample to the level of exporting activity.

Very few respondents provided SIC codes. As a result, descriptions of the primary type of business provided by respondents were used to identify SIC codes. Firms were subsequently categorized as high, medium or low knowledge-intensive using the SIC categories employed by Lee and Has (1996). Table 1 provides a breakdown of respondent firms by level of knowledge-intensity.

In the absence of a generally accepted definition of a knowledge-based business or a knowledge-based industry, the present study uses SIC information and input from entrepreneurs to classify firms by level of knowledge-intensity. In addition to providing descriptive information on the primary type of business, survey respondents were asked to rate the importance of a number of factors to success in their industry and to indicate the extent to which these factors apply to their firm.

Initially, factor analysis was employed with the 12 items included in these two questions. Results (Table 2) indicate the items load onto two primary factors at both the industry level and the firm level: innovation and growth (component 1) and human capital (component 2). At the industry level, the following four factors relate primarily to innovation and growth: the importance of research and development activity, the importance of patents, the importance of innovative products and processes, and the ability to compete internationally. Also at the industry level, two items, the importance of intangible assets and the importance of a highly educated workforce, group together under human capital. Similarly, at the firm level, three items, “invests heavily in research

and development (R & D)", "exhibits a high level of innovation", and "has the potential to grow rapidly", relate primarily to innovation and growth. Also at the firm level, three items, "depends heavily on human capital", "has a high proportion of intangible assets", and "success is based primarily on knowledge", group together under human capital.

Four new variables were created on the basis of the results of the factor analysis by computing a simple average of the underlying factors: industry innovation, industry human capital, firm innovation, and firm human capital. Subsequently, discriminant analysis was employed to test the effectiveness of these four new predictor variables at classifying firms by level of knowledge-intensity. A process of random selection was used to select approximately half of the cases for the analysis phase with the remainder being used for the classification phase. Results indicate the predictor variables are effective at classifying firms correctly, particularly in the case of the high knowledge-intensity group.

Further, analysis of variance was used to determine whether or not significant differences exist among the three categories of knowledge-based firms for each of the four variables. Results indicate significant differences exist between groups for only two variables, industry human capital and firm human capital. Post hoc tests confirm significant differences exist between the high knowledge group and each of the medium and low knowledge categories but not between the medium and low knowledge groups. As a result, the medium and low knowledge categories were combined for the remainder of the analysis.

A modest 36 percent of respondents indicated their firms were involved in exporting or providing goods or services to foreign visitors, while 31.9 percent of those

who were not currently exporting indicated they had explored the potential for exporting. Among the firms who indicated they didn't currently export, the most frequent reasons given are summarized in Table 3. Many of these responses appear highly consistent with the traditional approach of establishing local market presence before exploring export market potential. The emphasis on local market opportunities could also be interpreted as an indication of a lack of export willingness and possibly even a lack of growth willingness.

Under the category "other", the most frequent responses included, the business is not large enough, difficulty obtaining exporting data, transportation costs too high, not enough staff, market is too competitive, and the firm is in a service industry. A number of these responses, as well as "lack of financing" and "unaware of possibilities" provide useful insights into perceived barriers and possible interventions.

Of the firms that export, the average length of exporting experience was 6.6 years, with a range between 1 and 42 years. The percentage of total sales derived from exporting in the last three years averaged 31.5 percent among exporting firms. While 65.8 percent of respondents export to fewer than three markets, it is notable that 15.2 percent of firms exported to 5 or more markets, with one firm reporting 26 markets. The United States was indicated by 44.9 percent of respondents as their most important market, with the United Kingdom and Japan a distant second and third respectively. A proliferation of other markets was cited by a majority of respondents.

Among firms that currently export, 35.7 percent have made use of government programs/agencies to assist with their exporting activities. The most frequently used are the Program for Export Market Development (PEMD), the Atlantic Canada Opportunities

Agency (ACOA), the Market and Product Development Program (MAPD), and the Export Development Corporation (EDC), with 56.3 percent of respondents taking advantage of more than one program/agency. Satisfaction with these programs is quite high with 89.7 percent of respondents rating their satisfaction level at 3 or higher on a 5-point scale.

Private sector export assistance and advice from others was utilized by 37.5 percent of firms that exported, with individuals in a similar business being the most frequently cited source of support. Advice from others related to information about difficulties encountered selling into certain markets, and information about exporting documentation, especially international letters of credit.

Problems or challenges to becoming an exporter were identified by 83.7 percent of exporting firms. Financial problems and lack of information were cited as the main issues (Table 4). The most common responses in the "other" category were: finding distributors, regulations, shipping, culture/language barrier, and finding trustworthy partners. Concerning this last point, one respondent stressed that "marketing was not the answer - networking was." In terms of reasons for not exporting, as indicated previously, these barriers provide a basis for discussing, designing and implementing interventions designed to stimulate export activity.

Similarly, 47.2 percent of respondents suggested types of support or assistance that would help to establish or to expand their exporting activities. A summary of suggestions is presented in Table 5. The consistency between the problems and challenges noted above and desired support in the areas of finance and marketing is especially noteworthy. Lack of information and lack of awareness are also consistent

themes underlying impediments to, and support for, exporting. Top responses in the "other" category were cheaper web space, reduced shipping costs, help establishing contracts, advertising support, and product research and development. These findings are consistent with a recent study of export needs and challenges of SMEs located in the Province (Innova Quest, 2001).

One of the characteristics associated with firms in the so-called "new economy" is that very often services and goods are intertwined. The result is that even traditional manufacturing businesses are selling services in the form of expertise and know-how. To examine this issue, participants were provided with a definition of a "knowledge-based service exporter[3]" and asked to indicate whether or not, based on this definition, they consider their business to be a knowledge-based service exporter. Of the 200 firms that responded, 42.0 percent indicated they consider their firm to be a knowledge-based service exporter. Finally, exporters were asked to identify the percent of export sales accounted for by services or know-how. Results from 69 exporting firms indicate an average of 42.8 percent of total export sales are accounted for by services or know how. It is noteworthy that 37.7 percent of respondents report zero percent of export sales accounted for by services and know-how, while 34.8 percent report these sales as accounting for 100 percent of total revenues.

In response to the question "do the demographics of the firm affect its exporting activity?" cross tabulation statistics were performed against variables that might be able to generalize the data group. The demographic variables chosen for analyses were: knowledge intensity, age of the business, gender of the owner/manager, age of the

[3] A knowledge-based service exporter is any firm that has a service or technological know-how that may be sold outside the Country or to foreign visitors.

owner/manager, educational background of the owner/manager, professional designation of the owner/manager, and ownership structure. The two demographic variables used to generalize the size of the firm were the number of full-time employees, and gross revenue or sales last fiscal year. Finally, the demographic variables used to gauge the level of R&D the firms undertake were total R&D expenditures last fiscal year, and the percentage of employees that are scientists and engineers.

Cross tabulations of these variables using the statistical package SPSS were performed against the following exporting variables: have done exporting, have explored the potential for exporting, years of exporting experience, the percentage of total sales derived from exporting, use of government programs, level of satisfaction with government programs, use of private programs and sources of advice, whether they consider themselves to be a knowledge-based exporter, and services as a percentage of total exports. After consideration of the exporting variables and the SPSS output, the following variables were rejected as the information did not significantly add to the analysis: percentage of total sales derived from exporting, use of government programs, level of satisfaction, use of private programs, and services as a percentage of exports. A summary of statistically relevant results is presented in Table 6.

This analysis revealed two demographic variables that are significantly associated with exporting activity: level of knowledge-intensity and firm size. It is arguable that educational background, professional designation, and the percentage of scientists and engineers contribute to the knowledge of the firm, and the higher the knowledge of the firm, the more likely they are to export. Of the respondents, 49.4 percent of the high knowledge group exported, compared to only 28.2 percent of the medium/low knowledge

group ($p < .01$). As well, larger firms, represented by gross revenue, are more likley to be involved in exporting ($p < .01$). Although not significant ($p < .106$), the relationship of firm size to exporting activity is also confirmed by the cross-tabulation of the number of full-time employees to exporting activity. Also notable is that the age of the firm is not significant to whether they export or not, lending support to the perception that many of the firms of the new economy pursue export markets immediately at start-up.

Level of knowledge-intensity is also significant to whether the firm has explored the potential for exporting, while the length of time the firm has been exporting is largely associated with gross revenue and, of course, age of the firm. Not surprisingly, whether the firm considers itself to be a knowledge-based exporter is significantly associated with level of knowledge intensity, and also with educational background, professional designation, and the percentage of employees that are scientists and engineers.

In summary, results of the cross tabulations indicate level of knowledge-intensity and size of the firm are significantly associated with exporting involvement, findings consistent with recent research undertaken for Industry Canada (Lefebvre and Lefebvre, 2000).

Summary

Survey results from a relatively small sample of SMEs in the Province indicate a modest level of involvement in export activity with 36 percent of respondents deriving an average of 31.5 percent of revenues from exporting. Approximately two-thirds of these exporting firms focus on three or fewer markets with the United States being the major

market followed distantly by the United Kingdom and Japan. A little more than a third of exporting firms have made use of government assistance programs and are well satisfied with the support received. Interestingly, firms involved in exporting rely on private sector support and assistance slightly more than government assistance. Exporting firms turn to individuals in similar businesses as their primary source of advice.

The road to becoming an exporter has clearly not been an easy one with the vast majority (83.7%) of respondents citing significant problems or challenges to becoming exporters. Financing heads a lengthy list that also includes a lack of knowledge and information, especially concerning foreign markets. Similarly, non-exporters cite barriers to exporting that reflect similar issues related to lack of financing and lack of awareness of possibilities. At the same time, it appears as though a significant percentage (27.5%) of firms have chosen not to pursue exporting because local markets are providing sufficient business. It is not clear whether such rationale reflects the traditional growth model of small, local, independent goods-producing firms evolving gradually into larger, international operations or whether the focus on local markets reflects a lack of export willingness and maybe even a lack of growth willingness. In any event, both exporting and non-exporting firms identified various types of support and assistance that would help to establish or expand their export activities. Again, financial support tops the list followed by assistance related to marketing and information.

Survey findings confirm the growing importance of services and know-how to exporting firms in the new economy, even traditional manufacturing firms. Of 200 responding firms, 42 percent perceive their businesses to be knowledge-based service exporters. Further, 69 exporting firms report an average of 42.8 percent of export sales

accounted for by services or know-how, although this average is heavily influenced by a third of the firms that derive all of their export revenues from the sale of services.

Finally, the comparison between demographic variables and exporting activity and experience confirms the importance of knowledge-intensity and firm size. High knowledge firms and larger firms are significantly more likely to export. Also noteworthy is that age of the firm is not significantly associated with propensity to export. This finding combined with the relative importance of services and know-how to exporting noted previously, lend support to the view that many of the firms in the new economy pursue international markets immediately at start-up.

Limitations and Implications

There are three limitations associated with the sampling procedure and representativeness of survey respondents that should be noted. Two of these are closely related, namely, sampling on a purposeful rather than random basis, and the response rate of 15.3 percent. Unfortunately, no data were available on the database used for the mailing, thus it was not possible to determine the extent to which respondents are representative of firms surveyed.

A comparison of respondents to firm population data based on number of employees, geographic location, and industry sector confirms survey respondents are not representative of the entire population of firms in this Province. This is not surprising since the primary objective of the sample selection was to ensure critical cases were included to facilitate comparison among firms by level of knowledge-intensity. The

study achieved the desired heterogeneity in terms of level of knowledge-intensity. Random sampling would have required an extremely large sample to mitigate the risk of inadequate representation of critical cases necessary to the investigation. Nonetheless, potential response bias and generalizability are limitations to the external validity of the survey findings.

A third limitation concerns the exclusion of certain cases, namely non-starts and businesses that have closed. These groups were not included in the survey. As a result, study findings do not account for differences that may exist between high knowledge firms and less knowledge-intensive businesses that did not make it to the start-up stage or that subsequently ceased operations.

A final limitation reflects the empirical focus of the paper. Space limitations prohibit discussion of the wider body of literature related to internationalization, export behaviour and export strategies of SMEs.

Notwithstanding these limitations, study findings provide important insights into the export activities and experiences of a small sample of Newfoundland firms and provide confirmation of previous research in this area. Findings concerning impediments and barriers to exporting, as well as suggested assistance to establish or expand exporting activity should be of considerable benefit to support organizations and agencies offering programs and services targeted to SMEs. Study results confirming the importance of level of knowledge-intensity to export activity also raise questions surrounding the specific needs of knowledge-based businesses and the appropriateness of existing export-oriented support programs. This is an area clearly deserving further research.

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Table 1
Firms by Level of Knowledge-Intensity

Knowledge-Intensity	n	%
High	85	36.2
Medium	91	38.7
Low	59	25.1
Total	235	100.0

Table 2
Rotated Component Matrix of Knowledge-Intensity Factors

Item	Component	
	1	2
Importance of research and development activity	**.843**	.177
Importance of patents obtained	**.747**	-.115
Importance of innovative products and processes	**.571**	.368
Importance of intangible assets	.421	**.624**
Importance of highly educated work force	.142	**.643**
Importance of ability to compete internationally	**.619**	.322
Invests heavily in R and D	**.787**	.127
Exhibits a high level of innovation	**.545**	.472
Depends heavily on human capital	.204	**.726**
Has the potential to grow rapidly	**.581**	.318
Has a high proportion of intangible assets	.229	**.762**
Success is based primarily on knowledge	-3.143E-02	**.712**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 3 iterations.

Table 3
Reasons Given for Not Exporting

Reasons for Not Exporting	Frequency	Percentage
Local market provides sufficient business	38	27.5
Lack of financing	20	14.5
Nature of the business	19	13.8
Still learning and developing	18	13.0
No interest in exporting	10	7.2
Unaware of possibilities	10	7.2
Other	23	16.7
Total	138	100.0

Table 4
Most Significant Problems or Challenges to Becoming an Exporter

Problems or Challenges	Frequency	Percentage
Financing	18	25.0
Market information	6	8.3
No knowledge of foreign markets	6	8.3
Information transfer	5	6.9
Other	37	51.4
Total	72	100.0

Table 5
Suggested Assistance to Establish or Expand Exporting Activity

Suggestions	Frequency	Percentage
Financial support	31	27.9
Help with marketing strategies	10	9
Mentors	10	9
More awareness of opportunities	9	8.1
Assistance from the government	8	7.2
Support for conferences/trade show participation	7	6.3
Local training in industry	7	6.3
Exchange information with consultants in other countries	5	4.5
Other	24	21.6
Total	111	100

Table 6
Cross-Tabulation of Demographic and Exporting Variables

	Done Exporting		Explored Exporting Potential		Years of Exporting		Is a Knowledge-Based Exporter	
	Chi-square value	Sig.	Chi-square value	Sig.	Chi-square value	Sig.	Chi-square value	Sig.
Knowledge group	10.246	0.001***	6.865	0.009**	8.474	0.076	78.827	0.000***
Age of firm	40.688	0.353	27.617	0.641	131.512	0.019*	27.943	0.859
Gender	0.365	0.546	0.008	0.930	6.238	0.182	0.163	0.686
Age of owner/manager	32.711	0.751	34.850	0.616	112.221	0.582	42.002	0.263
Educational background	15.509	0.004**	8.624	0.071	13.338	0.648	37.264	0.000***
Professional designation	3.016	0.221	1.384	0.501	7.166	0.127	6.407	0.041*
Ownership structure	2.801	0.246	0.154	0.926	12.253	0.140	0.727	0.695
Full-time employees	53.739	0.106	26.923	0.413	117.278	0.449	40.188	0.507
Gross revenue	16.529	0.005**	4.528	0.476	35.795	0.016*	8.141	0.149
R&D expenditures	44.282	0.224	34.073	0.106	94.585	0.522	47.359	0.118
Scientists and engineers	35.777	0.215	19.832	0.228	78.439	0.651	50.508	0.006**

(Chi-square results significant at: *p <.05; **p<.01; ***p<.001)