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TECHNOLOGY PARKS AND FIRM GROWTH

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ABSTRACT

We examine knowledge-based companies operating in Technology Parks and Innovation Centers located in the Basque region. Our test reveals that certain intangible assets may contribute to business growth. The experience accumulated by human capital and organizational experience are internal intangible elements that seem to influence firm growth. Beyond a threshold level of 8-10 years of firm existence, there is a positive relationship between these intangible assets and firm growth. About 80% of sample firms were involved in any sort of collaborative agreement with other partners. Our results show that firms experiencing highest growth, in general, establish formal agreements through contractual arrangements with R&D intensive partners (i.e., universities, innovation centers).

JEL Classification: O3, N8
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Introduction

In the early years of the new century, a new phenomenon known as the New Economy has emerged, a phenomenon centered on knowledge-based business activities. The so-called New Economy has attracted the interest of many scholars, policy makers and private companies because, among other reasons, it departs from the traditional neoclassical line of thinking and brings up new paradigms, many of which still remain unresolved. As it is understood in the academic community, knowledge is simultaneously an asset, an input and an output, which has a special incidence on business success, and consequently, on the economic development of industries and the wealth of regions. Being aware of this phenomenon, government authorities have designed different technology policies, among which the policy based on Technology/Science Parks has originated a remarkable economic impact. This impact affects firm start-ups, job creation, and product innovation (International Association of Science Parks, 2002).

Motivated by the lack of empirical work in the literature, this paper aims to examine the linkage between knowledge management, firm performance and innovation capacity of small and medium sized enterprises (SMEs) involved in high-technology activities (i.e., Optoelectronics, Lenses, ICTs, Telecommunications, Aeronautics, Software, Biotechnology, …). In particular, the SMEs analyzed in our study have in common that all of them operate in either Technology Parks or Innovation Centers located in the Basque region, a relatively small but currently wealthy and technologically advanced geographic area of Spain. Basque government authorities have implemented in recent years a technological policy aimed at enhancing the Basque Technology Network (BTN). This has resulted in reducing the gap between the Basque region and EU as far as technology and innovation indicators are concerned. If we look at GDP per capita and R&D spending as a percentage of GDP, the Basque region is ranked nowadays clearly above the Spanish average and close to the EU average as a result of the joined effort made by public and private agents.

We expect that companies located in Technology Parks operate in a favorable environment to achieve business survival and growth. A recent study on a similar policy implemented also in the Basque Country, a policy based on business incubation centers, Peña (2002a) examined the usefulness of such policy and identified firm internal and external factors which explained business success. Considering the basic premises analyzed in the literature regarding the internal (i.e., RBV research stream) and external view (i.e., strategic alliance research stream) of the firm, we conduct an empirical test on companies located in Technology Parks and Innovation Centers in order to verify our study propositions.

More specifically, we examine technology-based companies operating in six institutions, all of them members of the BTN: the three Technology Parks located in the region and three Innovation Centers. The Basque Technology Parks embrace over 200 firms, which employ approximately 8.000 people, and show annual revenues over 1.250 million euros. Clearly, these firms are nurtured in a unique environment, an atmosphere well suited to exchange knowledge and to expand business networks. Data have been collected from these companies through personal interviews. Data include information about knowledge management practices, firm resources and capabilities, strategic alliances, business financial performance and product innovation. Hipotheses are tested by conducting discriminant analyses.

Although still preliminary and with an exploratory character, the conclusions of our study are expected to provide useful insights into the academic community and policy makers concerning the relevance of Technology Parks and firm knowledge-based intangible assets as key drivers of business growth. Our study is organized as follows. The next, third and fourth section deal with a description of the regional context and a brief revision of the literature. In section five we describe the data and

methodology applied to conduct the empirical test. Main findings and results are outlined in section six. Finally, the paper ends with a section which includes main conclusions and implications.

Regional Context

The Basque Country is a European region with about two million inhabitants and a long entrepreneurial tradition. There are approximately 150.000 firms located in the three main provinces (Bizkaia, Gipuzkoa and Araba), of which, 110.000-120.000 firms represent the service sector. The Basque economy absorbs 18.000 new firm entrants, on average, every year and drives out 16.000 incumbents, leaving a positive net entry of approximately 2.000 new firms on an annual basis.

Basque government authorities have made a considerable effort to promote high-tech business start-ups among new entrants. An important policy aimed to achieving this goal has been the development of Technology Parks. Figure 1 and Figure 2 in the Appendix show how successful has been the implementation of this policy as far as the creation of new high-tech firms is concerned. Entrepreneurs have started their high-tech ventures within or nearby the three Basque Technology Parks. We observe a clear geographic concentration of high-tech start-ups in the surrounding areas of the Technology Parks (i.e., in the same county). After examining the location of the rest of service firms, we found a different location pattern. The non high-tech service firms seem to be dispersed all over the counties of the Basque Country. Therefore, the Technology Parks seem to attract new high tech firm entry within their respective space and locations.

An Internal Perspective: Resource-Based and Knowledge-Based Views

The intrinsic difficulty in identifying and assessing intangible assets creates an important concern widely shared by industry practitioners and the academic community. In the so-called New Economy era, the divergence between firm book-value and market-value has experienced a substantial growth and this gap seems to be attributable, to a large extent, to intangible assets (Cañibano et al., 2000). For the purpose of our study, we consider knowledge an important intangible resource, a resource which can render sustainable profits.

Certainly, intangible assets meet the properties advocated by the research stream known as the Resource Based View (RBV). The RBV approaches the question about the circumstances under which a resource will lead to high returns over longer periods of time. Recent studies claim that firm-specific resources and capabilities determine business strategies, and therefore, can be crucial for explaining business performance. In order to sustain competitive advantage, firm resources and capabilities must be scarce, rare, durable, non-transferable, non-substitutable, non-imitable, and most importantly, they must yield profits or value to an organization. For example, mutual trust between management and employees is an organizational intangible asset that cannot be traded (i.e., limited mobility) or replicated (i.e., uniqueness) by competitors (Wernerfelt, 1984; Amit and Schoemaker, 1993). According to this definition and considering these properties, it seems reasonable to consider knowledge as a critical intangible resource of an organization. This is particularly true among technology-based firms.

In a wide sense, resources include both tangible and intangible assets. Typically, an organization comprehends physical capital resources (i.e., plant, equipment, raw materials, …), human capital resources (i.e, experience, knowledge, intelligence, intuition, motivation, etc. of managers and workers of an organization) and organizational capital resources (i.e., reporting structure, coordinating systems, relations among individuals and internal teams). Firms are heterogeneous regarding the endowment and deployment of these resources and differ among them in terms of the flow and stock of knowledge accumulated within the organization. According to the RVB line of thinking, resource

heterogeneity is understood as a key factor to explain the existence of profitability differences across firms.

In sum, recent works in the literature suggest the existence of a positive influence of intangible assets on business performance. We consider the management practices of the flow and stock of knowledge embedded within an organization as an intangible asset that meets basic RBV properties and seems to be conducive of sustainable supra-normal profits. However, the internal view of the firm needs to be complemented with an external perspective. This external view should include the relationship with other stakeholders who are no part of the organization (i.e., customers, suppliers, competitors, investors, government authorities, etc.), and yet are important sources of new knowledge to an organization.

An External Perspective: Strategic Alliances as a Relational Capital Component

Companies investing in technology projects are facing new challenges in this new century. Through alliances, firms can acquire knowledge and minimize technological uncertainties by partnering with other firms. These types of agreements might be motivated by diverse reasons such as the exploration of new technologies or the exploitation of old technologies (i.e., manufacturing and commercialization).

The ability to learn and innovate depends to some extent on whether an organization belongs to a cluster or network with innovation linkages (Navarro, 2001a). Industry clusters typically arise from the geographic concentration of firms belonging to a particular industry sector. Companies within a cluster often take advantage of technological spillover effects, and also benefit from active and pasive collective actions undertaken by cluster members.

In Osborn and Baughn´s empirical work (1990), the authors found that a joint venture type of agreement was most likely when the purpose of the alliance was to pursue R&D activities, when the technological intensity of the product resulting from the alliance was high, and when the size of the parent firm was not large. It seems that joint ventures not only allow access to external knowledge, but also facilitate information flow, interest alignment among partners and closer coordination. Joint ventures let firms position themselves strategically in technological networks; networks on which the evolution of an industry may depend.

In a study of entrepreneurial US biotechnology firms, Shan (1990) analyzed the factors associated with the cooperative behavior of companies. Cooperative agreements provide an appropriate mechanism to exploit inter-firm synergy effects and diminish transactional hazards. Furthermore, cooperative arrangements, in addition to attenuating transactional problems, are also conducive to organizational learning, or to the effective transfer of tacit knowledge, skills, and reputation.

Other studies suggest that informal aspects of collaborative agreements also account for the success of alliances. In a study about informal collaboration in R&D, Kreiner and Schultz (1993) argued that the intensity of commitment, sentiments, etc., may explain the possibility of survival and growth in the face of harsh environmental conditions. For instance, the authors stated that networking and opportunity driven interaction between companies and other institutions (e.g., universities, research centers, government) have a functional relevance for the innovation success of researchers in biotech. When the purpose of the network is the exploration of new technologies, informal collaboration might be a very helpful way to share knowledge, but when the exploitation phase of the technology comes, new conflicts of interests may emerge (Peña, 2002b). Knowing what information to leak (and when and to whom to leak it) becomes a critical issue in this type of relationship. In order to remain competitive in dynamic markets firms may need to acquire necessary technological knowledge from external and less dependent sources (i.e., through licensing agreements with

universities). In such cases, inefficiencies in inter-organizational relationships may be outweighed by flexibility advantages derived from the access to a wider pool of knowledge sources (Grant, 1996).

In this study, we aim to test two broad propositions. First, we expect that internal knowledge-related intangibles such as the experience accumulated in the human capital of the organization (i.e., knowledge and experience of managers, R&D employees, …), organizational learning (i.e., entry and successful adaptation to foreign markets, development of new products, etc.), or knowledge management practices may lead to persistent firm growth. Secondly, we believe that an effective management of the strategic alliances of the organization may influence positively business performance. We expect that a formal (i.e., blueprinted contractual agreements), lengthy (i.e., long-period agreements) and governing (i.e., ownership control of the agreements) management style of conducting R&D alliances will be positively associated with business growth, because these alliances are more difficult to disrupt, and apparently, entail a more serious commitment to succeed.

Data and Methodology

- Data have been collected from 66 companies located in Basque Technology Parks and Innovation Centers. We interviewed the CEOs of the firms during the second quarter of year 2002. Data include information about knowledge management practices, firm resources and capabilities, strategic alliances, and business financial performance. These companies represent technology intensive industry sectors such as Optoelectronics, Lenses, Biotechnology, Aeronautics, Computer Software, and Telecommunications. About half of the firms are younger than 6-7 years old and have at most 25 employees. Approximately, 90% of firms do not exceed the age of 10 years and the size of 250 employees. Out of the 66 firms examined, 52 companies have established at least one strategic alliance with an external organization. More specifically, we have recorded 171 strategic alliances from our sample.

We define a categorical dependent variable based on firm sales growth, which takes values ranging from 1 to 4. Thus, if a firm experienced a negative sales growth during the last 3 years, g_s<0%, the dependent variables takes the value 1. If sales growth was 0< g_s <10%, then the dependent variable takes the value 2; if sales growth was 10< = g_s <100%, then the dependent variable takes the value 3, and finally, if g_s > = 100%, then the dependent variable takes the value 4. Once we set the four categories, we conduct a discriminant analysis in order to find out the significance of independent variables in differentiating among the four categories. A description of the independent variables is provided in the Appendix.

Discussion of Results

Effect of RBV on Firm Growth

Many scholars have often stated that measures of RBV variables should contribute positively to firm growth. An enriched pool of tangible and intangible assets (i.e., assets that add value to an organization and are difficult to be acquired or imitated by competitors) is expected to enhance the ability of a company to survive and grow. This assertion is partially supported by our results.

Once a critical survival threshold is reached (i.e., 9-10 years of existence), we observe a positive sales growth (See Table 1 in the Appendix). In particular, sales growth rises monotonically with firm age beyond that threshold point. In addition to firm age, we found that the work experience of R&D employees (variable IDEXP) accounts for sales growth. It seems to us that an inverse U-shape relationship exists between this human capital intangible and sales growth. Sales growth rises as the number of years of work experience accumulated by R&D employees increases, but once the peak of 4-5 years of work experience is reached this trend reverses and sales growth starts to decline.

Hence, our RBV results suggest that certain intangible resources, such as the experience accumulated by human capital and the organization measured by its age, have a positive effect on business performance. Certainly, these resources are idiosyncratic to the firm and can be considered as a critical source of sustainable competitive advantage.

Effect of KBV on Firm Growth

Our next test deals with the relationship between knowledge based view variables and firm growth. The majority of managers interviewed in our study associate the notion of knowledge management to the concepts of intellectual capital and transfer of knowledge rather than to the fact of using a codified information system or computerized equipment. Therefore, we notice from our respondents that managing knowledge is understood as a wider concept that managing just information.

Our sales growth analysis shows that there is an inverse relationship between the number of years of implementation of a knowledge management (KM) system (variable YEARSKM) and sales growth (See Table 2 in the Appendix). On average, the worst performing companies implemented their KM system about 3.5 years ago, whereas the best performing companies implemented it quite recently (i.e., 0.5 years ago).

Another puzzling result has to do with the source of knowledge. We ask the respondents of our questionnaire to specify the main source of critical knowledge to an organization. They were offered two choices: managers or employees. The response is represented by the variable KMGEREMP, which we found to be significant in discriminating among sales growth levels. Our finding suggests that respondents from highest-growth and lowest-growth companies consider more relevant the knowledge coming from employees. In contrast, companies with sales growth in the range of 0-100% value relatively more the knowledge of managers. In sum, given the similar effects observed in both worst and best performing companies we are not in a position to reach any conclusion. Certainly, additional testing is needed to verify more consistently the effect of KBV variables on business performance.

The effect of Strategic Alliances on Firm Growth

We mentioned earlier that companies are no longer self-sufficient to attend all their needs and seek to ameliorate their deficiencies or weaknesses by collaborating with stakeholders external to the firm. An important component of relational capital is the pool of partners with which an organization establishes collaborative agreements. We have tested the effect of these agreements -strategic alliances- on firm growth.

It seems that a larger percentage of formal (versus informal) agreements with partners who develop R&D activities contributes positively to sales growth (See Table 3 in the Appendix). In uncertain technological and market environments, it is difficult to predict the outcomes of technological projects and to assess the rents accrued to these projects. In such a turbulent competitive landscape, contracts and formal agreements are a reasonable alternative to establish the rights and liabilities of the partners, and thus, avoid eventual moral hazard problems (i.e., imperfect information, opportunistic behavior, and so on).

Interestingly, firms that grow most (i.e., sales growth larger than 10%) pursue a larger percentage of agreements in which they exert some controlling interest. On average, about 25% of all the alliances established by high growth firms have a majority ownership (i.e., more than 51% of assets of the partner firm). This behavior might be due to a particular interest in setting the strategic direction of the partner firm or to the desire of appropriating the rents derived from the partnership.

Results on the relational capital component of strategic alliances within an organization, in general, suggest that almost 80% of companies from our study sample seek collaborative agreements

to complement their own resources and capabilities. The agreements of companies that grow most are characterized by being formal contracts arranged with R&D-based partners.

Conclusion

In this study we have attempted to examine the effect of intangible elements on firm growth. Particularly, our focus has centered on knowledge-based companies operating in Technology Parks and Innovation Centers. We have analyzed firms from a double perspective: internal view (i.e., following a resource and knowledge base view rationale) and external view (i.e., strategic alliances as a relational capital component).

Our test for the hypothesized linkage of intangible elements to firm performance reveals that there might be certain intangibles that may contribute to business growth. The experience accumulated by human capital, such as R&D employees, or organizational experience (i.e., measured by firm age) are examples of internal intangible elements that may contribute to firm growth. In our study, we found that beyond a threshold level of 8-10 years of existence reached by a company there is a positive relationship between these intangible assets and firm growth. The majority of companies of our study sample, about 80% of firms, was involved in any sort of collaborative agreement with other partners. Our results indicate that firms experiencing highest growth, in general, establish formal agreements through contractual arrangements. Besides, most agreements included R&D intensive partners such as universities and innovation centers.

An implication for business practitioners is that a portion of firm value may come from intangible elements that are not contained in financial reports. It is difficult to assess the contribution of these intangible elements until end products reach the market and bring revenues or cash flows to the organization. In fact, some of these intangibles, such as knowledge, may be generated within the organization or jointly with other organizations, which adds more difficulty for an accurate assessment. Policy makers should be aware of the relevance of intangible elements on business performance and examine the convenience of alternative reporting practices. Considering the importance of strategic alliances in our study, directors of Technology Parks could act as facilitators and promote partnerships for the firms located in their Parks with other national and international organizations. The directors of Technology Parks, as catalysts of a regional innovation system, should identify local R&D resources and capabilities, and explore potential markets in other geographical locations in order to enable an efficiently sustainable flow of knowledge among R&D based institutions, universities, companies and end-users of innovation activities.

To conclude, results from this study should be interpreted with caution. We are aware of the limitations of our sample and methodology, and think that the outcomes of our study should be understood as they are. A larger set of observations and variables would allow us to apply other statistical methods and to obtain eventually new interesting findings. The nature of our results, therefore, is more exploratory than prescriptive.

This study leaves open avenues for further research. For instance, it would be interesting to examine inter-organizational networks and to test their effect on the ability to innovate of a company. Another suggestion would be to test the effect of both firm-resources and alliance strategies on innovation, and to verify the existence of endogeneous effects, that is, to find out whether innovation (or performance) measures lead to an enhancement of firm resources. Finally, our research work will be clearly enhanced by testing the comparative effect of the membership of a particular industry cluster or the involvement in local (even regional) innovation networks.

References

Amit, R., and Schoemaker, P., 1993. Strategic Assets and Organizational Rent. *Strategic Management Journal, Vol.14:* 33-46.

Cañibano, L., García-Ayuso, M., and Sánchez, P., 1999. The Value Relevance and Managerial Implications of Intangibles: A Literature Review. *Classification of Intangibles. Les Cahiers de Recherche. Groupe HEC, 2000.*

Grant, R.M. 1996. Prospering in Dynamically-competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science, Vol.7, No4:375-387.*

International Association of Science Parks. www.iaspworld.org

Kreiner, K. and Schultz, M. 1993. Informal Collaboration in R&D. The Formation of Networks Across Organizations. *Organization Studies, Vol.14,No.2: 189-209.*

Navarro, M., 2001. "Los sistemas nacionales de innovación: una revisión de la literatura". *Documento de trabajo del Instituto de Análisis Industrial y Financiero, Universidad Complutense de Madrid* nº 26, julio. (1-30). http://www.ucm.es/bucm/cee/iaif.

Osborn, R.N. and Baughn, C.C. 1990. Forms of Interorganizational Governance for Multinational Alliances. *Academy of Management Journal, Vol.33, No3: 503-519.*

Peña, I., 2002a. Intellectual Capital and Business Start-up Success. *Journal of Intellectual Capital, Vol. 3 No. 2: 180-198.*

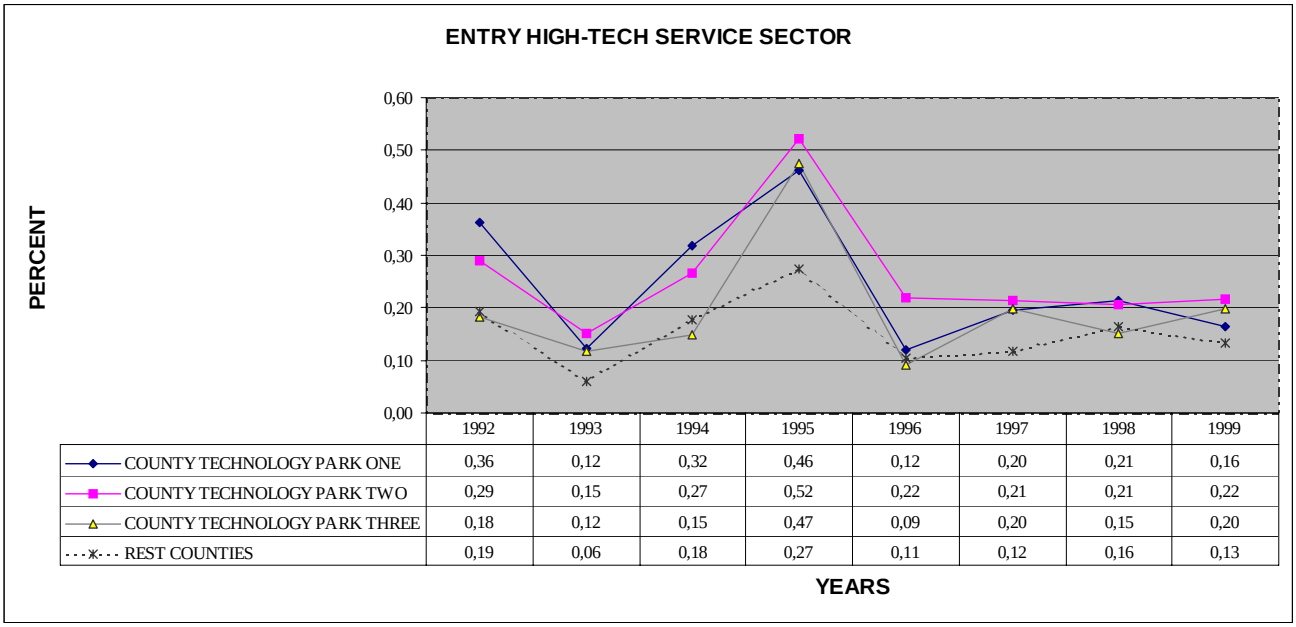
Peña, I., 2002b. Knowledge Networks as Part of an Integrated Knowledge Management Approach. *Journal of Knowledge Management, Vol. 6, Nº5: 469-478.*

Shan, W. 1990. An Empirical Analysis of Organizational Strategies by Entrepreneurial, High-Technology Firms. *Strategic Management Journal, Vol.11:129-139.*

Wernerfelt, B., 1984. A Resource-based View of the Firm. *Strategic Management Journal, Vol.5:* 171-180.

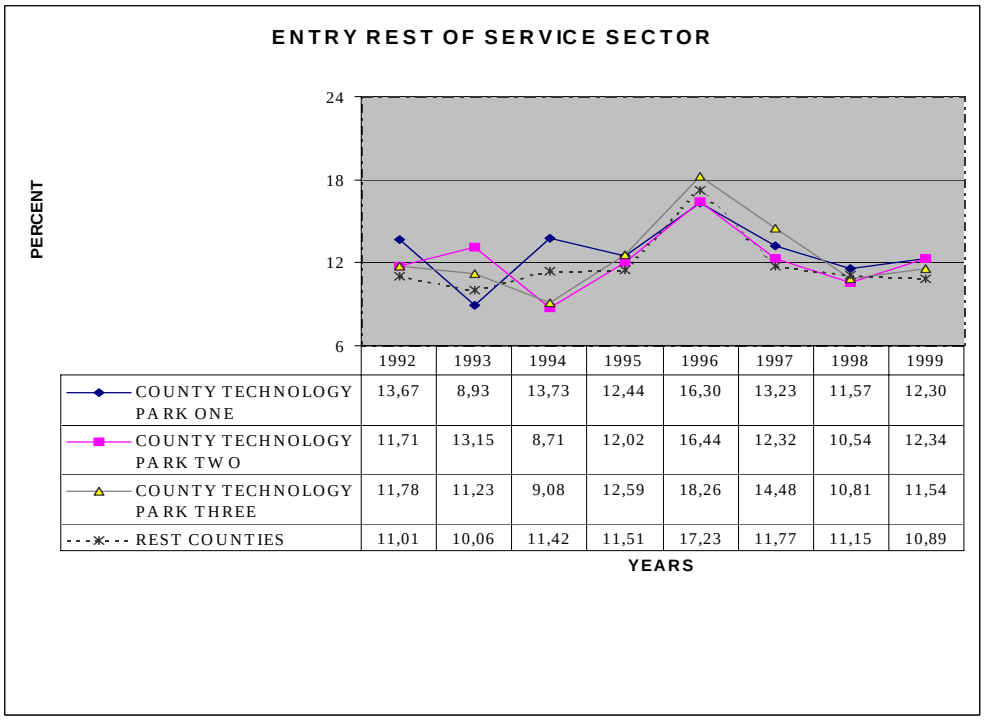
Appendix

Figure 1. Firm Entry in the High-Tech Service Sector in the Counties Where the Technology Parks Are Located.



	1992	1993	1994	1995	1996	1997	1998	1999
COUNTY TECHNOLOGY PARK ONE	0,36	0,12	0,32	0,46	0,12	0,20	0,21	0,16
COUNTY TECHNOLOGY PARK TWO	0,29	0,15	0,27	0,52	0,22	0,21	0,21	0,22
COUNTY TECHNOLOGY PARK THREE	0,18	0,12	0,15	0,47	0,09	0,20	0,15	0,20
REST COUNTIES	0,19	0,06	0,18	0,27	0,11	0,12	0,16	0,13

Figure 2. Firm Entry in the Rest of Service Sectors in the Counties Where the Technology Parks Are Located.



	1992	1993	1994	1995	1996	1997	1998	1999
COUNTY TECHNOLOGY PARK ONE	13,67	8,93	13,73	12,44	16,30	13,23	11,57	12,30
COUNTY TECHNOLOGY PARK TWO	11,71	13,15	8,71	12,02	16,44	12,32	10,54	12,34
COUNTY TECHNOLOGY PARK THREE	11,78	11,23	9,08	12,59	18,26	14,48	10,81	11,54
REST COUNTIES	11,01	10,06	11,42	11,51	17,23	11,77	11,15	10,89

Description of Variables

Independent variables:

Control variables

AGEFIRM: Number of months of the company since inception
FIRMSIZE: Number of employees of the company in year 2002

Resource-related variables:

SOCIO: Number of partners in the company
PORCVTAS: % of firm sales in international markets
NUMPLANT: Number of plants located abroad
MASTDOCT: % of employees with master and doctoral degrees
IDEXP: Number of years of work experience by R&D employees
RELAC: Relatedness of products and activities of the company (Yes/No)
PERCVAL: An index ranging from 0 to 100% which measures the level at which the sum of the cited intangible elements adds value to the organization.
(Intangible elements: know how of employees, know how of managers, know how of board of directors, firm reputation, product reputation, organizational culture, innovation capacity, ability to adapt to the environment, customer perception of product quality, and internal knowledge management routines)
PERCDUR: An index ranging from 0 to 100% which measures the average endurance level (or non-obsolescence) of the above mentioned intangible elements.

Knowledge-related variables:

YEARSKM: Number of years of implementation of a knowledge management system in the organization.
HETHOMO: An index which measures the generation of knowledge from firm internal heterogeneous groups (i.e., positive value of the index) as opposed to homogeneous groups (i.e., negative value of the index).
FORINF: An index which measures the generation of knowledge from formal and regular meetings (i.e., positive value of the index) as opposed to informal and non-planned meetings (i.e., negative value of the index).
KMGEREMP: An index which measures the generation of knowledge from management levels (i.e., positive value of the index) as opposed to non-management or worker levels (i.e., negative value of the index).
BOOKMIND: An index which measures the storage of knowledge in human brains (i.e., positive value of the index) as opposed to in organizational physical places (i.e., negative value of the index).
INTEREXT: An index which measures the transfer of knowledge developed internally (i.e., positive value of the index) as opposed to externally (i.e., negative value of the index).
GCPROD: Likert scale (1=Nothing, to 5=Very much)) to measure the amount of knowledge generated in the Manufacturing department of the organization.
GCID: Likert scale (1=Nothing, to 5=Very much)) to measure the amount of knowledge generated in the R&D department of the organization.
GCCOM: Likert scale (1=Nothing, to 5=Very much)) to measure the amount of knowledge generated in the Sales department of the organization.
INCENTIV: The organization has an incentive system to promote innovation (Yes/No)

Alliance-related variables:

NUMBERAL: Number of alliances established by the organization.
PERCFORM: % of formal alliances (alliances with contractual arrangements)
PERCONTR: % of controlling alliances (at least 51% ownership of the partner)
PERINNOV: % of alliances with R&D related entities (universities, innovation centers)
PERINTL: % of alliances with international partners

PERCID: % of alliances with R&D purposes
AVGDUR: expected average length of alliances
AVGSOC: average number of partners in alliances

Results

Table 1. Influence of Resource Based View Variables on Sales Growth (g_s). Discriminant Analysis.

	n_1 (g_s< 0%) =9		n_2 (0% <= g_s < 10%) =7		n_3 (10%<=g_s< 100%) =25		n_4 (g_s>=100%) =25	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AGEFIRM	114	120	139	78	201	223	60	42
FIRMSIZE	14	12	26	23	237	387	43	88
SOCIO	23	48	8	7	22.018	100.079	5	14
PORCVTAS	7	12	23	37	18	24	7	14
NUMPLANT	1	4	0	0	2	6	0	0
MASTDOCT	0	1	13	13	11	12	11	19
IDEXP	2	2	3	3	6	4	4	4
EXPGER	5	6	1	2	6	7	3	5
RELAC	1	0	1	1	1	1	1	1
PERCVAL	84	15	82	10	84	8	83	9
PERCDUR	82	9	81	13	85	7	82	12

	Wilks Lambda	F value	Sig.
AGEFIRM	0,85	3,72	0,02
IDEXP	0,73	3,48	0,00

	Estimated group			
Original group	1	2	3	4
1	44%	22%	0%	33%
2	43%	14%	14%	29%
3	12%	4%	60%	24%
4	44%	8%	8%	40%

45,5% of cases correctly classified.

Table 2. Influence of Knowledge Based View Variables on Sales Growth (g_s). Discriminant Analysis.

	n_1 (g_s< 0%) =4		n_2 (0% <= g_s < 10%) =7		n_3 (10%<=g_s< 100%) =23		n_4 (g_s>=100%) =18	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AGEFIRM	100	71	139	78	195	223	67	42
FIRMSIZE	16	12	26	23	249	401	55	102
YEARSKM	3,50	6,35	0,86	1,57	1,04	2,03	0,50	1,65
HETEHOMO	-1,00	1,63	-1,29	1,60	-0,26	1,36	-0,56	1,42
FORINFOR	0,25	1,26	-0,43	1,40	0,22	1,00	0,06	1,30
KMGEREMP	-1,25	1,26	0,14	0,90	0,17	0,89	-0,28	1,02
BOOKMIND	-1,00	2,31	-1,00	0,58	-0,17	1,90	-0,39	2,03
INTEREXT	0,50	1,29	0,57	0,98	0,30	1,26	0,56	0,86
GCPROD	3,75	1,89	3,29	1,25	3,65	1,34	3,94	1,21
GCID	4,00	2,00	3,57	1,51	4,39	1,08	4,22	1,17
GCCOM	4,50	1,00	3,57	1,13	3,70	1,02	3,89	1,02
INCENTIV	0,25	0,50	0,29	0,49	0,39	0,50	0,56	0,51

	Wilks Lambda	F value	Sig.
KMGEREMP	0,85	2,87	0,05
YEARSKM	0,72	2,85	0,01

	Estimated group			
Original group	1	2	3	4
1	50%	0%	0%	50%
2	14%	57%	14%	14%
3	4%	57%	22%	17%
4	17%	50%	6%	28%

30,8% of cases correctly classified.

Table 3. Influence of Strategic Alliances Variables on Sales Growth (g_s). Discriminant Analysis.

	n_1 (g_s< 0%) =8		n_2 (0% <= g_s < 10%) =3		n_3 (10%<=g_s< 100%) =23		n_4 (g_s>=100%) =18	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AGEFIRM	121	126	185	68	212	230	63	49
FIRMSIZE	16	12	11	5	255	399	30	42
NUMBERAL	3	1	3	1	4	1	3	1
PERCFORM	35	44	39	35	74	37	40	46
PERCONTR	16	35	0	0	36	41	16	31
PERINNOV	17	24	39	10	42	34	22	27
PERINTL	26	35	0	0	39	42	24	36
PERCID	38	46	83	29	47	42	28	37
AVGDUR	8	3	7	5	8	3	8	3
AVGSOC	2	0	3	1	3	2	3	1

	Wilks Lambda	F value	Sig.
PERCFORM	0,84	3,10	0,04
PERINNOV	0,70	3,03	0,01

	Estimated group			
Original group	1	2	3	4
1	38%	38%	25%	0%
2	25%	25%	50%	0%
3	4%	17%	78%	0%
4	30%	30%	40%	0%

40,0% of cases correctly classified.