Application of Open Innovation in Regional Clusters: Empirical Evidence from Europe

ABSTRACT *Open innovation seeks to assess knowledge exchange between organisations, but generally much of the research into open innovation ignores issues relating to proximity and geographical clustering. To remedy this relative paucity of research into open innovation and proximity issues, we look at various open innovation constructs within a sample of 3,468 European firms. We find that co-location within clusters facilitates open innovation effectiveness in terms of enhanced knowledge flows between firms and between firms and universities. We note that this concomitantly leads to a reduction on internal R&D investments within cluster-based firms. Our research has implications for both the economic geography and open innovation literature.*

Keywords: Open innovation, regional clusters, European firms

INTRODUCTION

The paradigm of open innovation has received considerable academic and practitioner attention since it was first popularized by Chesbrough (2003a, 2003b, 2006a, 2006b) as a counterpoint to the traditional 'closed innovation' approach. Among those previously existing factors that have explored the interconnectedness of innovating firms, the impact of regionality and proximity has been recognized as an important element of the open innovation paradigm (Cooke, 2005a; Simard & West, 2006; Vanhaverbeke, 2006).

LITERATURE REVIEW

The Definition of Open Innovation and Regional Clusters

The open innovation model builds upon the notion that innovations are often not always inspired and developed entirely within a single firm. It entails "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough, 2006b: 1). In essence, open innovation theories suggest that the generation of innovative outputs is facilitated by more openness towards external sources of knowledge. This openness encourages the fluidity of knowledge and information flows between firms.

Derived from the phenomena of industrial agglomerations (Marshall, 1920), Italian industrial districts (Bagnasco, 1977) and studies of the impacts of sectoral firm clustering in specific geographic zones (Callegati & Grandi, 2005), the definition of regional clusters is diverse. Porter's (1998a) definition is often used as the starting point to investigate the concept of clusters (Bergman & Feser, 1999). According to Porter (1998a: 199), a cluster is "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities".

Open Innovation and Regional Clusters

Evident in the theories of open innovation and regional clusters is the variety of complementary notions and thematic overlaps. These include the inter-organizational network effects, knowledge flows and spillovers, collaboration within groups of firms and between firms and other institutions. Vanhaverbeke (2006) has suggested that the link between open innovation and regional development is a promising area of research. Simard and West (2006) also recognized regional clusters as an ideal setting for the analysis of open innovation. However, other than the work of Cooke (1998, 2005a, 2005b) who explicitly studied the relationship between open innovation, clusters and regional innovation systems, there has been limited research around this issue so far (Vanhaverbeke, 2006).

HYPOTHESES

Conceptual Framework

In order to address this gap in the literature, we attempt here to establish a conceptual framework of three essential elements based on the intersection of these two concepts — networking with multiple sources, knowledge spillovers and flows, and relationship between internal R&D and external research. We seek to address our research question regarding whether open innovation works better in regional clusters based on empirical evidence from samples of clustered and non-clustered firms.

Networking with External Sources

Clusters have typically been understood as networks of interconnected companies and institutions (Breschi & Lissoni, 2001a; Porter, 1998b). Open innovation theories also underline the importance of networking that draws upon a wide range of external knowledge sources, including focal firms, universities, research labs, venture capitalists, and other knowledge generating agencies (Simard & West, 2006). It has been widely recognized that the diverse knowledge bases outside the firm's boundary act as a driver of a firm's internal growth, value creation and innovation performance (Grönlund, Sjödin & Frishammar, 2010; Laursen & Salter, 2006). The contribution of inter-firm networking to innovativeness and performance of firms has been also widely supported by empirical studies (e.g. Deeds & Hill, 1996; Faems, Van Looy & Debackere, 2005; Hagedoorn & Schakenraad, 1994). Given these studies, we hypothesize that inter-firm networking namely the linkages between firms will generally have a positive effect on innovation performance of firms regardless of their localization.

H1a. Inter-firm networking will have a significant effect on innovation performance of both clustered firms and non-clustered firms.

Universities and research institutes are also recognized as an important and primary source of knowledge that facilitates open innovation outcomes (Creplet, Dupouet, Kern, Mehmanpazir & Munier, 2001; Simard & West, 2006). However, compared with inter-firm networking, the practicalities of university-firm (research institute-firm) engagement as a source of innovation activities present some significant challenges. First, universities and research institutes often focus on theoretical or fundamental research domains where the created knowledge may not be directly applicable to industries or specific innovation processes of firms (Quintas, Wield & Massey, 1992;

Simard & West, 2006). Moreover, they are usually linked with firms by the contractual arrangements (Breschi, Lissoni & Montobbio, 2005), which entails the accrual of search and transaction costs (Christensen, Olesen & Kjær, 2005).

There is also some evidence which suggests that regional proximity between firms and universities can be an important driver of knowledge-based collaboration between these organizations (Chesbrough, 2003b; Fabrizio, 2006; West, Vanhaverbeke and Chesbrough, 2006). Regionally co-located firms may have face-to-face contacts with university researchers, facilitating specialized research which accords with the firm's demand (Breschi and Lissoni, 2001b), helping to mediate some of the cultural barriers to knowledge exchange and lower the direct and indirect transactional, search and knowledge transmission costs (Breschi & Malerba, 2005; Jaffe, Trajtenberg & Henderson, 1993). In summary, firms co-located near universities might tend to enjoy greater benefits from firm-university (firm-research institute) linkages than will non-clustered firms.

H1b. The effect of firm–university (firm-research institute) networking on innovation performance of clustered firms will be greater than that of non-clustered firms.

Knowledge Flows and Spillovers

Knowledge spillover is an intentional, or unintentional, process whereby knowledge transfers between organizations. In contrast to the traditional innovation model where spillovers were seen as a negative externality of knowledge creation and innovation, firms operating with an open innovation strategy purposively facilitate spillovers and enable the disclosure of knowledge and technology in order to participate in collaborative network arrangements (Schmidt, 2006). The openness of innovation enhances the fluidity of knowledge flows and catalyzes the knowledge and information exchanges between firms. Spillovers can also help overcome the intra-firm knowledge asymmetries while diversifying the firm's knowledge bases (Chesbrough, 2006b; Cooke, 2005b). Given the importance of knowledge flows and spillovers to open innovators, we hypothesize that:

H2a. Knowledge flows and spillovers will have a significant effect on innovation performance of both clustered firms and non-clustered firms.

Audretsch's (1998) study indicated that there is a higher propensity for innovation within spatial clusters, with greater tacit knowledge that needs to diffuse through direct and repeated contacts. This suggests that the flows of knowledge between co-located entities discussed by some studies are driven by various forms of inter-firm contacts and access to a pool of shareable tacit knowledge (Audretsch & Feldman, 2004; Jaffe et al., 1993). This finding is consistent with Breschi and Malerba (2005) who identified the specific properties of tacit knowledge, namely its dependence on co-located agents to transit as opposed to the codified knowledge that can transfer without geographical constraints. In that sense, we hypothesize that the tacit knowledge will play a more important role in facilitating innovation among clustered firms than non-clustered firms.

H2b. The effect of the spillovers and flows of tacit knowledge on innovation performance of clustered firms will be greater than that of non-clustered firms.

The Relationship between Internal R&D & External Research

According to the open innovation principles, in-house R&D need not become obsolete when open strategies are followed — indeed openness may even stimulate internal research investments in search of synergies between internal and external research (Howells, 1999; Veugelers, 1997). In addition to the traditional role of generating innovation alone, in-house R&D may act as a catalyst to the transformative effectiveness once the external knowledge reaches the focal firm (Cohen & Levinthal, 1989; Lane, Koka & Pathak, 2006). The overall status of knowledge base within the firm could be improved by such way of integrative knowledge management (Cassiman & Veugelers, 2006; Lichtenthaler & Lichtenthaler, 2009). This complementarity between internal R&D and open innovation practices has also been illustrated in empirical studies on open innovation (e.g. Chesbrough & Crowther, 2006; Lichtenthaler, 2008). Based on these considerations, we hypothesize that internal R&D can generally benefit innovation performance in the contexts of open innovation for both clustered firms and non-clustered firms.

H3a. Internal R&D will positively affect innovation performance in the context of openness, for both clustered firms and non-clustered firms.

Expanding on Hypothesis 3a, we would anticipate that the relative impact of internal and external research might differ between clustered and non-clustered firms. Within clusters, the density of network ties among multiple actors and the fluidity of knowledge flows may create variance in the impacts of internal research. According to Leitão (2007), firms in clusters may access significant research discoveries without carrying out much internal research of their own. This might be especially the case for start-ups who might survive by relying on external institutional and organizational networks while not deploying their scarce financial and operational resources as extensively to in-house R&D (Simard & West, 2006). Thus internal R&D may have a comparatively lower impact on cluster-based firms than those that are not embedded in regional clusters.

H3b. Internal R&D will have a greater effect on innovation performance of non-clustered firms than that of clustered firms.

METHODS

Data and Samples

The data source for this study is from the Flash Eurobarometer 187 "Innobarometer among enterprises in the EU and other European countries" telephone survey. This survey was conducted in 2006 by the Gallup Organization on behalf of the DG Enterprise and Industry of the European Commission (The Gallup Organization, 2006). This particular Flash Eurobarometer survey was designed to provide detailed information on the clustering-related issues among 3,468 European firms in 32 various European countries (The Gallup Organization, 2006). The subsamples involved in our study consist of 2,297 clustered firms and 1,171 non-clustered firms. The basic attributes of observations in these two subsamples such as age, size and country distributions are presented in the appendices.

Measures

Dependent variable

The dependent variable (*Innovation*) in this study is the dichotomous response (1 for yes and 0 for no) to the question of whether a company had introduced new or significantly improved products or services in the last two years, namely during the year 2004-2006 for respondents in this study.

Independent variables

For the independent variable inter-firm networking (*Interfirm*), firms were asked whether they had cooperated with large firms (*Interfirm1*) or small and medium enterprises (*Interfirm2*) in the cluster (or in the wider region for non-clustered firms). Data was also gathered on the linkages with universities (*Uni*) and research institutes (*RI*). Firms were asked whether they cooperated with "universities and other education institutions"; or "public laboratories or research centers". These were all provided as binary responses, which take the value of 1 for the response yes and 0 for no. Regarding information on knowledge flows and spillovers, firms were asked whether they exchanged information on technology (*Explicit1*); whether they exchanged information on market characteristics (*Explicit2*); and whether they exchanged information and knowledge on best practices (*Tacit*). They are also dummy variables with a value of zero (0) if no such form of knowledge exchange had occurred, and one (1) if it had. We interpreted the first two forms of knowledge exchange as being focused on explicit knowledge, and the third as being a measure of tacit knowledge, although we acknowledge the limitation of this typology. Firms were also asked to report on the role of internal R&D (*Internal*) and external research (*External*). Internal R&D was measured by the question relating to whether the firm carried out research in its own laboratories. Firms were also asked whether they contracted out research to other firms, universities or research institutes. These are included in our model as dummy variables taking the value 1 for yes and 0 for no.

Control variables

Basic organizational attributes which have been utilized as control variables in this study are firm size and firm age. Firm size (*Size*), is expressed as a categorical variable with ordinal values of the number of employees — 0 (less than 20, which had been excluded from the original micro data by the survey conductors), 1 (20-49), 2 (50-249), 3 (250-499), 4 (500 or more). Firm age (*Age*) is also a categorical variable based on an ordinal scale of measurement, taking the value from 1 (before 1986), 2 (between 1986 and 2001) to 3 (after 2001). Another two control variables included in this are industry dummies (*Industry*), and a measure of density of the given industry (*Density*). In order to control for the different effects of industry heterogeneity on open innovation practices and clustering activities, our study include 14 dummy variables for industry categories. Associated with the industry dummy, the effect of the density of this industry (*Density*) was also included. This was measured by the question of whether the concentration of firms working in the same business sector as the focal firm's was higher, similar, or lower than elsewhere in the country.

Results

Descriptive statistics and correlations for both subsamples are displayed in Table 1 and Table 2. The possibility of multicollinearity was considered for this study, though rejected as all of the Variance Inflation Factors (VIFs) are less than 1.5, thus within the generally acceptable level of less than 5 (Studenmund, 2006) and also below the general threshold 2.5 for logistic regression models (Allison, 1999). Table 3 shows our results of binary logistic regressions on the two subsamples. For both the subsamples of clustered and non-clustered firms, the values of Cox & Snell R Square and Nagelkerke R Square indicate a reasonable goodness of fit for the model. The highly significant Chi-square ($p < .001$) for both models also provides evidence of their overall significance.

<< Insert Table 1 about here >>

<< Insert Table 2 about here >>

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With regards to Hypothesis 1a, which suggests that inter-firm networking will improve firms' innovation performance, we find that only the variable *Interfirm2* (i.e. networking with smaller firms) positively and significantly ($p < .05$) covaries with the dependent variable of both subsamples. Thus H1a is not fully supported. We suggest that this may be an artefact of the limited number of large companies available for collaboration for many of the responder firms (evidence of which is provided in the descriptive statistics of firm size in appendices). Regarding H1b, that hypothesizes that the use of firm-university (firm-research institute) linkages will have greater impact on innovation performance of clustered firms than that of their non-clustered counterparts, the variable *Uni* is positive and significant ($p < .05$) in the model of clustered firms, while insignificant effect ($p > .10$) for the non-clustered subsample. We note, however, that the coefficients of research institutes (variable *RI*) are not significant ($p > .10$) for observations from both subsample groups. Therefore, H1b is partially supported.

H2a suggests that the flows and exchanges of knowledge will positively affect the innovation performance of firms in both subsamples. The variables *Explicit1*, *Explicit2* and *Tacit* are all significant and positive in anticipating the innovation performance of clustered firms ($p < .01$, $p < .001$ and $p < .01$ respectively) while only *Explicit2* (namely the knowledge on market) is significant for non-clustered firms ($p < .001$). H2a is thus partially supported, while H2b is fully supported, as tacit knowledge (variable *Tacit*) is only significant and positive ($p < .001$) for the subsample of clustered firms. This suggests that spillovers of tacit knowledge will have greater impact on innovation for clustered firms in comparison to non-clustered firms.

The coefficients for the variable measuring internal R&D (*Internal*) are found to be positive with strong significance ($p < .001$) for both of the subsamples. This supports our assertion in H3a that even in the context of openness, internal R&D is still a positive antecedent to innovation performance for both clustered firms and non-clustered firms. Moreover, we note that the magnitudes of the use of external research between both subsamples are similar, while the coefficient of internal R&D for non-clustered firms is larger than that for clustered firms. As such, H3b predicting that clustered firms might have a lower reliance on internal R&D for innovation finds support from our data.

DISCUSSION AND CONCLUSION

This study attempts to empirically investigate an under-explored area in the open innovation literature, namely the relationship between open innovation and geographical clustering. We have explored whether open innovation is more pervasive and effective in firms within regional clusters. It is found by our research results that regional clusters tend to optimize the benefits of open innovation in terms of the more efficient firm-university linkages, freer flow of tacit knowledge, and more limited dependence on internal R&D for cluster-based firms. This finding illustrates a consistency of core assumptions between open innovation and clusters theories, namely that the adoption of collaborative arrangements among firms and institutions which provide the platform for more unrestricted knowledge transfer with a high degree of reciprocity and limited costs (Belderbos, Carree & Lokshin, 2004, 2006; Stuart, 2000). In that sense, the cluster-based effects tend to facilitate the ‘connect and develop’ operational philosophy of open innovation (Sakkab, 2002). Despite the uncertainty associated with returns from the application of open innovation, our study suggests firms within regional clusters could initiate the open strategy because they possess the mechanisms through which the advantages of open innovation can outweigh its costs and potential risks thereby firms adopting this strategy could truly garner benefits from openness.

There are also some limitations of our study. First, the single respondent bias might exist as only the major decision maker of each business answered the survey questionnaire. Second, most of the variables in our model are based on the binary responses provided by the survey, therefore the extent or depth of associated open innovation strategies cannot be fully measured. These two issues will be taken into account in our future study.

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Appendices

Sample Attributes of Clustered Firms and Non-Clustered Firms

A. In which year the company established

Sample of Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
Before 1986	1217	53.0	53.0
1986 - 2001	923	40.2	93.2
After 2001	135	5.9	99.0
DK/NA	22	1.0	100.0
Total	2297	100.0	

Sample of Non-Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
Before 1986	606	51.8	51.8
1986 - 2001	514	43.9	95.6
After 2001	46	3.9	99.6
DK/NA	5	.4	100.0
Total	1171	100.0	

B. How many employees in the company

Sample of Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
20-49	875	38.1	38.1
50-249	859	37.4	75.5
250-499	277	12.1	87.5
500 or more	286	12.5	100.0
Total	2297	100.0	

Sample of Non-Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
20-49	487	41.6	41.6
50-249	465	39.7	81.3
250-499	104	8.9	90.2
500 or more	115	9.8	100.0
Total	1171	100.0	

C. Country distribution of observations in sample

Sample of Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
Belgium	82	3.6	3.6
Czech Rep.	23	1.0	4.6
Denmark	52	2.3	6.8
Germany	105	4.6	11.4
Estonia	45	2.0	13.4
Greece	50	2.2	15.5
Spain	40	1.7	17.3
France	149	6.5	23.8
Ireland	148	6.4	30.2
Italy	195	8.5	38.7
Cyprus	5	0.2	38.9
Latvia	47	2.0	41.0
Lithuania	38	1.7	42.6
Luxembourg	25	1.1	43.7
Hungary	53	2.3	46.0
Malta	31	1.3	47.4
Netherlands	26	1.1	48.5
Austria	51	2.2	50.7
Poland	56	2.4	53.2
Portugal	97	4.2	57.4
Slovenia	44	1.9	59.3
Slovakia	73	3.2	62.5
Finland	90	3.9	66.4
Sweden	84	3.7	70.0
UK	270	11.8	81.8
Bulgaria	82	3.6	85.4
Croatia	68	3.0	88.3
Romania	63	2.7	91.1
Turkey	86	3.7	94.8
Norway	54	2.4	97.2
Switzerland	37	1.6	98.8
Iceland	28	1.2	100.0
Total	2297	100.0	

Sample of Non-Clustered Firms

	Frequency	Valid Percent	Cumulative Percent
Belgium	18	1.5	1.5
Czech Rep.	22	1.9	3.4
Denmark	17	1.5	4.9
Germany	45	3.8	8.7
Estonia	16	1.4	10.1
Greece	18	1.5	11.6
Spain	39	3.3	14.9
France	75	6.4	21.3
Ireland	77	6.6	27.9
Italy	164	14.0	41.9
Cyprus	1	0.1	42.0
Latvia	13	1.1	43.1
Lithuania	27	2.3	45.4
Luxembourg	12	1.0	46.5
Hungary	55	4.7	51.2
Malta	10	0.9	52.0
Netherlands	8	0.7	52.7
Austria	51	4.4	57.0
Poland	24	2.0	59.1
Portugal	56	4.8	63.9
Slovenia	44	3.8	67.6
Slovakia	47	4.0	71.6
Finland	10	0.9	72.5
Sweden	20	1.7	74.2
UK	136	11.6	85.8
Bulgaria	12	1.0	86.8
Croatia	57	4.9	91.7
Romania	17	1.5	93.2
Turkey	29	2.5	95.6
Norway	13	1.1	96.8
Switzerland	29	2.5	99.2
Iceland	9	0.8	100.0
Total	1171	100.0	

TABLE 1.

Means, Standard Deviations, and Correlations for the Sample of Clustered Firms

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. *Innovation*	0.70	0.46												
2. *Interfirm1*	0.71	0.45	.18**											
3. *Interfirm2*	0.82	0.38	18**	.45**										
4. *Uni*	0.61	0.49	.21**	.21**	.20**									
5. *RI*	0.42	0.49	.19**	.23**	.18**	.40**								
6. *Ecpilict1*	0.72	0.45	.21**	.20**	.23**	.20**	.22**							
7. *Explicit2*	0.77	0.42	.18**	.20**	.27**	.13**	.10**	.36**						
8. *Tacit*	0.74	0.44	.21**	.23**	.26**	.22**	.17**	.41**	.37**					
9. *Internal*	0.38	0.48	.27**	.13**	.02	.23**	.31**	.12**	.01	.07**				
10. *External*	0.37	0.48	.22**	.12**	.08**	.28**	.30**	.13**	.07**	.16**	.30**			
11. *Size*	1.99	1.00	.14**	.15**	.05*	.19**	.14**	.05**	.02	.07**	.22**	.20**		
12. *Age*	2.48	0.61	-.01	-.10**	-.10**	.07**	.07**	-.03	-.03	-.04*	.06**	.02	.13**	
13. *Density*	2.71	0.57	.01	-.02	-.07**	-.05**	.00	-.01	-.10**	-.04*	.05**	-.01	-.08**	-.03

n=2297

** Correlation is significant at the 0.01 level (one-tailed)

* Correlation is significant at the 0.05 level (one-tailed)

TABLE 2.

Means, Standard Deviations, and Correlations for the Sample of Non-Clustered Firms

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. *Innovation*	0.61	0.49												
2. *Interfirm1*	0.62	0.49	.17**											
3. *Interfirm2*	0.77	0.42	15**	.51**										
4. *Uni*	0.51	0.50	.15**	.21**	.20**									
5. *RI*	0.31	0.46	.15**	.14**	.11**	.32**								
6. *Ecpilict1*	0.51	0.50	.15**	.17**	.14**	.13**	.14**							
7. *Explicit2*	0.56	0.50	.19**	.17**	.15**	.12**	.09**	.46**						
8. *Tacit*	0.50	0.50	.10**	.16**	.11**	.19**	.14**	.45**	.47**					
9. *Internal*	0.31	0.46	.32**	.09**	.04	.19**	.32**	.09**	.05	.08**				
10. *External*	0.28	0.45	.21**	.16**	.13**	.27**	.28**	.17**	.11**	.16**	.30**			
11. *Size*	1.87	0.94	.11**	.10**	.02	.23**	.10**	.-.01	.08**	.06*	.17**	.21**		
12. *Age*	2.48	0.57	.01	-.01	-.06*	.03	.03	-.07*	-.02	-.02	.05*	-.00	.17**	
13. *Density*	2.79	0.51	.00	-.06*	-.08**	-.09**	-.04	-.04	-.02	-.04	-.03	-.08**	-.04	.01

n=1171

** Correlation is significant at the 0.01 level (one-tailed)

* Correlation is significant at the 0.05 level (one-tailed)

TABLE 3.

Results of Binary Logistic Regression Analysis for Innovation Performance

Dependent Variable →	**Innovation Performance** (*Innovation*)	
Independent Variables & Control Variables ↓	**Clustered**	**Non-Clustered**
INDEPENDENT VARIABLES		
Inter-firm Networking		
With Large Firms (*Interfirm1*)	0.184	0.319 +
With SMEs (*Interfirm2*)	0.367 *	0.394 *
Linkage with Universities & Research Institutes		
Universities (*Uni*)	0.276 *	0.058
Research Institutes (*RI*)	0.129	0.032
Knowledge Flows and Exchanges		
Explicit Knowledge on Technology (*Explicit1*)	0.373 **	0.254
Explicit Knowledge on Market (*Explicit2*)	0.538 ***	0.749 ***
Tacit Knowledge on Best Practices (*Tacit*)	0.356 **	-0.248
The Role of Internal & External Research		
In-house R&D (*Internal*)	0.999 ***	1.494 ***
Contracting-out Research (*External*)	0.543 ***	0.593 **
CONTROL VARIABLES		
Firm Size (*Size*)	0.159 **	0.083
Firm Age (*Age*)	-0.040	0.111
Industry		
ICT and Communication Equipment	0.488	0.561
Aeronautics and Space	-0.198	-1.597
Pharmaceuticals and Medical Devices	0.676	0.152
Construction (Materials, Equipment, Heavy Construction)	-0.112	0.061
Automotive	0.055	0.289
Metal Manufacturing	-0.063	1.062 *
Plastics	0.452	0.309
Chemical Products	-0.265	0.766
Textiles, Leather and Footwear	0.556 *	0.292
Energy	0.458	0.425
Production Equipment (Machinery, Electrical)	1.041 **	0.635 +
Food	0.227	0.620 +
Entertainment	0.529	0.211
Services	0.267 +	0.189
Industry Density (*Density*)	0.177 +	0.249 +
(Constant)	-2.036 ***	-2.288 ***
n	2297	1171
Chi-square	348.98 ***	204.84 ***
-2 Log likelihood	2068.69	1086.33

Cox & Snell R Square	16.3%	18.9%
Nagelkerke R Square	23.0%	25.8%

+ $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$