DIMENSIONS OF PROXIMITY: CLUSTERS, INTELLECTUAL CAPITAL AND KNOWLEDGE SPILLOVERS

Maria (Mariza) Tsakalerou
Department of Production Engineering & Management,
Democritus University of Thrace, Xanthi, Greece

Abstract

Clusters of geographical concentrations of related business firms are assumed to confer competitive advantages to their members and their regions via knowledge management and knowledge spillovers of tacit knowledge. Despite mixed empirical evidence to support these claims, business clusters remain at the forefront of regional development policies. Past research indicates that cluster success factors may be distinct in different parts of the world, in different economies and in different stages of their development. Yet most studies focus on the success of a cluster as a whole and do not assess the impact of cluster membership on a single firm due to the absence of commonly agreed metrics. To address this problem, this article shifts the focus from mere spatial proximity to the flow of information in business networks and to the production, dissemination and absorption of knowledge. In this context, information flow in business clusters is aided and abetted by spatial proximity but the flow itself is the important success factor. Validation of the hypothesis that the advantage of clusters has to do with information flows, intellectual capital and knowledge spillovers will open new avenues in cluster research.

Keywords: Clusters; Intellectual Capital; Knowledge Management

Introduction

Businesses clusters are typically defined as geographical concentrations of vertically and horizontally integrated firms in related lines of business (Porter 1990). According to Porter (2000) clusters have the potential to increase the productivity of their member companies, to drive innovation, and to stimulate business growth in the field.

The underlying concept of business clusters is agglomeration economics (Chinitz 1961), which dates back to 1890 and the work of Alfred Marshall. Porter popularized the concept of clusters by bringing to the

forefront the importance of economic geography. It was primarily due to Porter and his active marketing of the concept that cluster development has since become the focus of many government programs. Since the late nineties, business clusters became extremely popular with policy-makers (Staber et al. 1996, Steiner 1998, Enright and Fflowcs-Williams 2000).

Clusters have been associated with innovation capacity (OECD 1999, 2001) and are assumed to confer competitive advantages to their members and their regions (Thuermer 2000, Porter 2003). Despite scant empirical evidence to support these claims, business clusters remain at the forefront of regional development policies (Abadli & Otmani 2014, Suire & Vicente 2014, Gafurov et al. 2014). Governments often try to use the clustering effect to promote a particular region for a certain type of business and to stimulate growth. Industrial districts, innovation zones and entrepreneurial ecosystems are all applications of the clustering effect. Yet about two decades of government support of the concept indicate that in many (if not most) cases cluster strategies do not produce enough of a positive impact to justify the costs of intervention (Motoyama 2008, Crawley & Pickernell 2012, Brakman & Van Marrewijk 2013).

At the same time that Porter was marketing the concept of clusters to governments around the world, many economists were already questioning whether clusters were indeed a panacea for regional development and economic growth (Storper 1992, Davies and Ellis 2000). The criticism of the concept centered around the alleged effect on innovation (Baptista & Swann 1998, Beaudry & Breschi 2003, Huber 2012) and on regional competitiveness (Rosenfeld 2001, Cortright 2006).

The most scathing critique came in a lengthy thirty-page manuscript from Martin and Sunley (2003) who (almost) deconstructed the concept which they characterized as “chaotic” and questioned basic tenets of economic geography.

Admittedly, there were (and are) successful clusters around the world and governments remained sympathetic because the concept is directly amenable to immediate policy interventions. The research focus thus shifted towards identifying the factors that are critical to the success of business clusters. It was becoming increasingly difficult to differentiate between academic disputes and legitimate practical issues as ambiguities in defining clusters and in identifying their members and their borders prevented accurate policy evaluation. Early efforts to define the drivers of industrial clusters that lead to regional competitive advantage met with limited success (Hill and Brennan 2000, Hallenkreutz and Lundequist 2001, Hanel and St. Pierre 2002).

It was understood though that the concept of clusters is multi-dimensional and that certain variables such as firm size (Smeral 1998,

Andersson 1999, UNIDO 2001, and Audretsch 2001, 2002), industry sector (Gallouj and Weinstein 1997, Sirilli and Evangelista 1998, Cooper and Folta 2000, and Metcalfe and Miles 2000) and economic environment (Saxenian 1994, Temple 1998, May et al. 2001, Nassimbeni 2003) play an important mediating role as predictors of cluster success.

Differences between clusters of small and large enterprises (Krywulak and Kukushin 2009, Wennberg and Lindqvist 2010), between clusters of service and manufacturing firms (Wall and Van de Knaap 2011, Ferreira et al. 2012) and between clusters operating in advanced and developing economies (INNOVA 2008, UNIDO 2010) have been observed in the past.

The most unusual development over the years though has been the questioning of the role of geography itself. From balanced reviews (Malmberg et al. 1996, Fujita et al. 2000, Hekansson et al. 2002, Gordon and McCann 2005) to detailed critiques (O'Brien 1992, Cairncross 1997, Schmitz 2000) the dogma "location matters" (Porter 2001) came under intense scrutiny. Geographic proximity appeared to have a very limited interpretive power in explaining the success or failure of clusters around the world and questions were posed regarding this defining component of the clustering phenomenon.

Dimensions of Proximity

The observed concentration of economic activity in an area does not necessarily constitute a cluster. Although all interpretations assume that geographical location is a defining characteristic of cluster activity, none of them defines the spatial scale on which such specialized activity should be construed as a cluster (Crawley & Pickernell 2012). The issue of spatial proximity is of course essential in assessing cluster performance and regional policies but the lack of an objective metric makes it difficult to define objectively cluster boundaries.

It would appear then that defining the geographical boundaries of clusters requires merely the consolidation of specialized economic activity without necessarily paying attention to the linkages between the actors involved. The existence of linkages of course does not automatically imply a clear understanding of their strength. Thus the issue of relational proximity remains as vague as that of geographic location and the definition of a cluster (Pessoa 2012).

If the concept of clusters has any merit, the critical factor is in the spatial and relational proximities. In an era of globalization, land-based advantages that have to do with labor, natural resources, taxation schemes and infrastructure costs quickly diminish. Apparently there is another distinct

dimension of proximity that may make all the difference (Gertler 2003, Chang & Hsieh 2011).

A number of researchers have theorized that the advantage of clusters, if there is one, has to do with knowledge management and the flow of information in business networks (Cooke 2001; Maskell 2001, Sureephong et al 2007; Christopherson, Kitson & Michie 2008). Indeed, many see as the fundamental characteristic of the contemporary knowledge-based economy the production, dissemination and absorption of knowledge (Maskell and Malmberg 1999; Charoensiriwath 2009, Diaz-Perez, Aboites & Holbrook 2012).

Business clusters have been associated with innovation capacity and are assumed to confer competitive advantages to their members and their regions. Knowledge or information flow maybe the variable that holds the interpretive solution to the clustering phenomenon (Pittaway et al. 2004). Spatial proximity may facilitate information flow but the reverse is not always true. Relational proximity through well-established channels of communication on the other hand is a reliable medium of information flow and a key factor in modeling this complex phenomenon. The key hypothesis of this article is thus that clusters confer distinct advantages to their members via information flows and knowledge spillovers.

Intellectual capital –from intellectual property and patents through staff technical skills to relationships and networking with customers– has been identified as the defining variable of information flow in the business world (Bontis 1998, Bounfour & Edvinsson 2005, Lee 2008). The focus then shifts to intellectual capital as the interpretive variable for modeling business clusters and for addressing the key hypothesis..

Intellectual Capital

The importance of intellectual capital is based upon the conjecture that it has a positive effect on a firm's performance (Cabrita & Vaz 2006; Diez et al. 2010). Yet the empirical evidence on the causal relationship between intellectual capital and organizational value has provided mixed results (Pulic 2004, OECD 2008). This is attributed to the fact that intellectual capital is a complex phenomenon of interactions, transformations and complementarities and thus its measurement is difficult and often vague (Edvinsson 2013).

The effect of intellectual capital on firm performance is mitigated by the same variables that affect business clusters, namely industry sector, company size and economic environment.

Intellectual capital flows follow varied patterns and have to be customized for individual companies based on their particular traits. Intellectual capital that is, has distinctly different characteristics across the

enterprise continuum and there should be a customization approach for policy recommendations.

Nevertheless, the fundamental advantage of using the intellectual capital as a vehicle for cluster research is that there is a plethora of published studies that assess its effect on firm performance (Dumay 2013). Such studies do not exist for the clustering effect due to the absence of commonly agreed metrics. In addition it is often very difficult to assess the impact of cluster membership on a single firm, and most studies focus on the success of the cluster as a whole (Schmitz 2000, Asheim & Isaksen 2002, Motoyama 2008). Researchers have theorized independently that variables such as industry sector, economic environment and firm size play an important mediating role as predictors of cluster success. Within this context, three possible demarcation lines for the effect of intellectual capital on firm performance have been suggested independently in the past:

- service vs. manufacturing (specialization affects information flows)
- developed vs. developing economies (primarily on capital and policy issues) and
- small and medium enterprises vs. multinational corporations (as size and company culture directly influence the quality and quantity of information flows).

The proposed approach herein is based on an initial modeling approach that considers all these three variables at the same time and integrates them in a novel modeling schema. Figure 1 summarizes the initial modeling approach with these potential three variables and its major shortcoming, which is the lack of data. To overcome this shortcoming and enable the examination of the main hypothesis on business clusters, it is proposed that the clustering effect is introduced as an additional demarcation line

- clustered vs. unclustered firms (as clustering implies proximity and thus facilitation of information flow)

joining the first three. The proposed modeling schema in Figure 2 creates a new framework within which it is possible to collect data and assess performance. The schema is of course a simplistic representation as there is significant crosstalk between the four variables, which will be addressed properly. This approach builds on knowledge-based development concepts to present a unified framework of the cluster concept in combination with the intellectual capital theory.

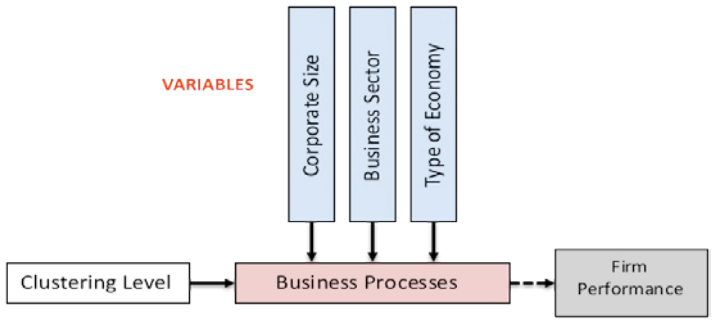

Figure 1: Initial modeling approach

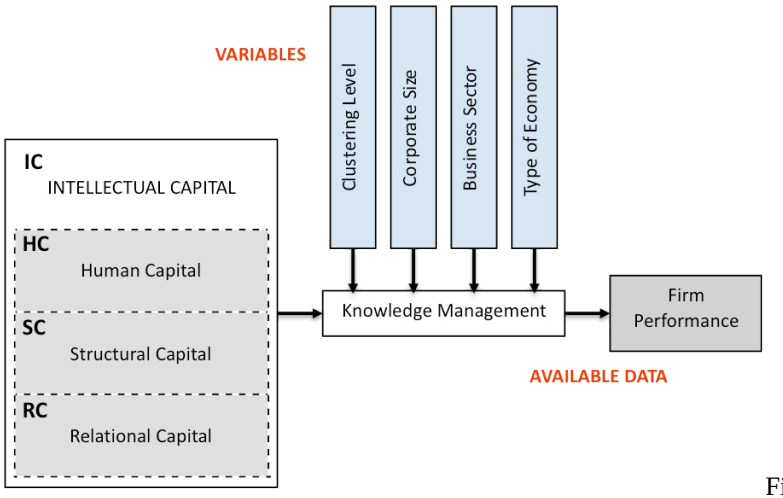

Figure 2: Proposed modeling schema

Conclusion

It has been well established since the last century that economic activity tends to agglomerate over time on a national, regional or urban scale. The observed concentration of economic activity in an area does not necessarily constitute a cluster. Porter's original definition gave rise to a multitude of interpretations (Martin & Sunley 2003), which either extend it to include a wider variety of possible members or reduce it to local supply chain relations alone. Although all interpretations assume that geographical location is a defining characteristic of cluster activity, none of them defines the spatial scale on which such specialized activity should be construed as a cluster. The observed concentration of economic activity in an area does not necessarily constitute a cluster.

If the concept of clusters has any merit, the critical factor is in the spatial and relational proximities. In an era of globalization, land-based advantages that have to do with labor, natural resources, taxation schemes

and infrastructure costs quickly diminish. Apparently there is another distinct dimension of proximity that may make all the difference. Spatial proximity enhances knowledge transfer and is thus a sufficient condition but not a necessary one. Modern modalities of communication and information dissemination may lead to a scenario where operating in the same geographic area is not a mandatory pre-condition of cluster success.

Intellectual capital, the all-encompassing term for tacit knowledge, has been identified as the defining variable of business information flows and can thus be used to characterize relational proximity. Shifting the focus to intellectual capital as the interpretive variable for modelling business clusters will enable the informed development of cluster policy recommendations to identify the optimal nexus for local and regional development.

References:

Abadli, R. & Otmani, A. (2014) "Clusters and outsourcing innovation activity", *International Journal of Business and Globalization*, 12(2):237-247.

Andersson, J. (1999) Business Process Development and Information Technology in Small and Medium-sized Companies. In Perspectives on Business Modeling, Nillson A.G. et al (eds.). Springer, Berlin, pp. 117-130.

Asheim, B. & Isaksen, A. (2002) "Regional Innovation Systems: The Integration of Local Sticky and Global Ubiquitous Knowledge", Journal of Technology Transfer, 27(1):77-86.

Audretsch, D.B. (2001) "Research issues relating structure, competition, and performance of small technology-based firms", Small Business Economics, 16(1):37-51.

Audretsch, D.B. (2002) "The Dynamic role of Small Firms: Evidence from the U.S.", Small Business Economics, 18(1/3): 13-40.

Baptista, R. & Swann, P. (1998) "Do firms in clusters innovate more?", Research Policy, 27:525-540.

Beaudry, B. & Breschi, S. (2003) "Are Firms In Clusters Really More Innovative?", Economics of Innovation and New Technology, 12(4): 325-342.

Bontis N. (1998) "Intellectual capital: An exploratory study that develops measures and models", Management Decision, 36(2):63-76.

Bounfour A. and Edvinsson L. (2005) Intellectual Capital for Communities, Nations, Regions and Cities. Butterworth- Heinemann, Oxford.

Brakman, S. & Van Marrewijk, C. (2013) "Reflections on Cluster Policies", Cambridge Journal of Regions, Economy and Society, 6(2):217-231.

Cabrita, M. and Vaz, J. (2006) "Intellectual Capital and Value Creation: Evidence from the Portuguese Banking Industry", Electronic Journal of Knowledge Management, 4(1):11-20.
Cairncross, F. (1997) The Death of Distance. Orion Business Books, London.
Chinitz, B. (1961) "Contrast in Agglomeration: New York and Pittsburgh", American Economic Review, 51:279-289.
Chang W.S. & Hsieh J.J. (2011) "Intellectual Capital and Value Creation- Is Innovation Capital a Missing Link?" International Journal of Business and Management, 6(2):3-12.
Charoensiriwath, C. (2009) "Analyzing Intellectual Capital Cluster Index in Thailand's Hard Disk Drive Cluster", Proceedings of the IEEE International Conference on Management of Engineering & Technology, pp. 200-204.
Christopherson, S., Kitson, M. & Michie, J. (2008) "Innovation, Networks and Knowledge Exchange", Cambridge Journal of Regions, Economy and Society, 1:165-173.
Cooke, P. (2001) Knowledge Economies: Clusters, Learning & Co-Operative Advantage. Routledge, London.
Cooper, A.C. & Folta, T.B. (Eds.) (2000) Entrepreneurship and High-Technology Clusters. Blackwell Publishers, Oxford.
Cortright, J. (2006) Making sense of Clusters: Regional Competitiveness and Economic Development. Brookings Institution Report, March 2006.
Crawley, A. & Pickernell, D. (2012) "An Appraisal of the European Cluster Observatory", European Urban and Regional Studies, 19(2):207-211.
Davies, H. & Ellis, P. (2000) "Porter's Competitive Advantage of Nations: Time for the Final judgment?", Journal of Management Studies, 37(8):1189-1214.
Diaz-Perez, C., Aboites, J. & Holbrook, A. (2012) "Intellectual Property Strategies, Collaboration and Technological Capabilities: The Fuel Cell Cluster in Vancouver", Proceedings of the IEEE Conference on Technology Management for Emerging Technologies, pp. 947-957.
Diez J.M., Ochoa M.L., Prieto M.B. & Santidrian A. (2010). "Intellectual capital and value creation in Spanish firms", Journal of Intellectual Capital, 11(3):348-367.
Dumay, J. (2013) "The third stage of IC: towards a new IC future and beyond", Journal of Intellectual Capital, 14(1):5-9.
Edvinsson L. (2013) "IC 21: reflections from 21 years of IC practice and theory", Journal of Intellectual Capital, 14(1):163-172.
Enright, M.J. & Fflowcs-Williams, I. (2000) "Local partnership, Clusters and SME Globalization", Proceedings of the OECD Conference for Ministers responsible for SMEs and Industry Ministers.

Europe INNOVA (2008) "Case Studies of Clustering Efforts in Europe: Analysis of their Potential for Promoting Innovation and Competitiveness", European Presidential Conference on Innovation and Clusters, Stockholm.
Ferreira, M.P., Sierra, F.R., Costa, B.K., Maccari, E.A. & Couto, H.R. (2012) "Impact of the Types of Clusters on the Innovation Output and the Appropriation of Rents from Innovation", Journal of Technology Management and Innovation, 7(4):70-80.
Fujita, M., Krugman, P. & Venables, A. (2000) The Spatial Economy: Cities, Regions and International Trade. MIT Press, Cambridge.
Gafurov, I.R., Platonova, O.U. & Pratchenko, O.V. (2014) "New state economic policy - Cluster policy cluster policy as the factor of innovative development of Europe", Mediterranean Journal of Social Sciences, 5(12):107-111.
Gallouj, F. & Weinstein, O. (1997) "Innovation in services", Research Policy, 26:537-556.
Gertler, M.S. (2003) "Tacit Knowledge and Economic Geography of Context", Journal of Economic Geography, 3:75-99.
Gordon, I.R. & McCann, P. (2005) "Innovation, Agglomeration, and Regional Development", Journal of Economic Geography, 5:523-543.
Hallenkreutz, D. & Lundequist, P. (eds.) (2001) Innovative Clusters in Sweden, Practical Lessons from Regional Cluster-Building. NUTEK – Swedish Business Development Agency Report. Alfa Print, Sundbyberg.
Hanel, P. & St-Pierre, A. (2002) "Effects of R&D Spillovers on the Profitability of Firms", Review of Industrial Organization, 20:305-322.
Hekansson, H., Tunisini, A. & Waluszewski, A. (2006) "Place as a Resource in Business Networks". In Taking Place: The Spatial Contexts of Science, Technology, and Business (Baraldi E. et al. eds.), pp. 223-246. Science History Publications, Sagamore Beach.
Hill, E.W. & Brennan, J. (2000) "A Methodology for identifying the Drivers of Industrial Clusters: The Foundation of Regional Competitive Advantage", Economic Development Quarterly, 14:65-69.
Huber, F. (2012) "Do Clusters Really Matter for Innovation Practices in Information Technology? Questioning the Significance of Technological Knowledge Spillovers", Journal of Economic Geography, 12:107-126.
Krywulak, T. & Kukushkin, V. (2009a) Big Gains With Small Partners: What MNCs Look For in their SME Suppliers. Conference Board of Canada and Business Development Bank of Canada Special Report, July.
Lee W.B. (2008). "On the relationship between innovation, intellectual capital and organizational unlearning", Essays in Honor of Professor Karl-Erik Sveiby on His 60th Birthday, Swedish School of Economics and Business Administration (Hanken), Helsinki, p.120.

Malmberg, A., Sölvell, Ö. & Zander, I. (1996) "Spatial Clustering, Local Accumulation of Knowledge and Firm Competitiveness", Geografiska Annaler, 78B(2):85-97.
Martin, R. & Sunley, P. (2003) "Deconstructing Clusters: Chaotic Concept or Policy Panacea?" Journal of Economic Geography, 3(1):5-35.
Maskell, P. & Malmberg, A. (1999) "Localized Learning and Industrial Competitiveness", Cambridge Journal of Economics, 23(2):167-185 .
Maskell, P. (2001) "Towards a knowledge-based theory of the geographic cluster", Industrial and Corporate Change, 10:921–943.
May, W., Mason, C. & Pinch, S. (2001) "Explaining Industrial Agglomeration: The Case of the British High-Fidelity Industry", Geoforum, 32(3):363-376.
Metcalfe, J.S. & Miles, I. (2000) Innovation Systems in the Service Economy, Measurement and Case Study Analysis, United States of America. Springer US.
Motoyama, Y. (2008) "What was new about the cluster theory? What could it answer and what could it not answer?", Economic Development Quarterly, 22(4):353-363.
O'Brien, R. (1992) Global Financial Integration: The End of Geography? Pinter, London.
OECD (1999) Boosting Innovation: The Cluster Approach. OECD Directorate for Science, Technology and Industry Report, Paris.
OECD (2008) Intellectual Assets and Value Creation - Synthesis Report. OECD Directorate for Science, Technology and Industry Report, Paris.
Pessoa, A. (2012) "Regional Cluster Policy: The Asian Model vs. the OECD Approach", MPRA Paper No. 42024. Available online at: mpra.ub.uni-muenchen.de/42024/.
Pittaway, L., Robertson, M., Munir, K., Denyer, D. & Neely, A. (2004) "Networking and Innovation: A Systematic Review of the Evidence", International Journal of Management Reviews, 5:137-168.
Porter, M. (1990) The Competitive Advantage of Nations. The Free Press, New York.
Porter, M.E & Stern, S. (2001) "Innovation: Location matter", MIT Sloan Management Review, 42(4):28-36.
Porter, M.E. (2003) "The economic performance of regions", Regional Studies, 37:549–578.
Pulic, A. (2004) "Intellectual capital – does it create or destroy value?", Measuring Business Excellence, 8(1):62-68.
Rosenfeld, S.A. (2001) "Backing into Clusters: Retrofitting Public Policies", Integration Pressures: Lessons from Around the World, John F. Kennedy School Symposium, Harvard University, Boston.

Saxenian, A. (1994) Regional Advantage, Culture and Competition in Silicon Valley and Route 128, United States. Harvard University Press, Boston.
Schmitz, H. (2000) "Does Local Co-operation Matter? Evidence form Industrial Clusters in South Asia and Latin America", Oxford Development Studies, 28(3):323-336.
Sirilli, G. & Evangelista, R. (1998) "Technological innovation in services and manufacturing: results from Italian surveys", Research Policy, 27(9):881-899.
Smeral, E. (1998) "The impact of globalization on small and medium enterprises: new challenges for tourism policies in European countries", Tourism Management, 19(4):371-380.
Staber, U.H., Schaefer, N.V. & Sharma, B. (eds.)(1996) Business Networks, Prospects for Regional Development. de Gruyter, Berlin.
Steiner, M. (1998) Clusters and Regional Specialization: On Geography, Technology and Networks. Pion, London.
Storper, M. (1992) "The limits to globalization: technology districts and international trade", Economic Geography, 68:60-93.
Suire, R. & Vicente, J. (2014) "Clusters for life or life cycles of clusters: in search of the critical factors of clusters' resilience", Entrepreneurship and Regional Development, 26 (1-2):142-164.
Sureephong, P., Chakpitak, N., Ouzrout, Y., Neubert, G. & Bouras, A. (2007) "Knowledge Management System Architecture for the Industry Cluster", Proceedings of the IEEE International Conference on Industrial Engineering and Engineering Management, pp. 1970-1794.
Temple, P. (1998) "Clusters and Competitiveness: A policy perspective". In The Dynamics of Industrial Clustering: International Comparisons in Computing and Biotechnology (Swann, P. et al. eds.). Oxford University Press, Oxford, pp. 257-307.
Thuermer, K.E. (2000) Companies and Regions Enhance Their Strengths by Building Clusters. Keller International Publishing.
UNIDO (2001) Development of Clusters and Networks of SMEs: The UNIDO Program. UNIDO Private Sector Development Branch, Vienna.
UNIDO (2010) Cluster Development for Pro-Poor Growth: The UNIDO Approach. UNIDO Business, Investment and Technology Services Branch, Vienna.
Wall, R. & Knaap, B.v.d. (2011) "Sectoral Differentiation and Network Structure within Contemporary Worldwide Corporate Networks", Economic Geography, 87(3):267-308.
Wennberg, K. & Lindqvist, G. (2010) "The effect of clusters on the survival and performance of new firms", Small Business Economics, 34(3):221-241.