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Samaeemofrad, N.

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References

- Aaboen, L. (2009). *Explaining incubators using firm analogy*. *Technovation*, 29(10), 657–670.
- Adler, J. H. (1965). *Absorptive Capacity: The Concept and its Determinants*. Washington: Brookings Institution. Aiken.
- Allen D.N. & McCluskey R. (1990). *Structure, Policy, Services, and Performance in the Business Incubator Industry*. *Entrepreneurship Theory and Practice*. Winter pp. 61- 77.
- Ali, S., Green, P., and Robb, A. (2013). *Measuring Top Management's IT Governance Knowledge Absorptive Capacity*. *Journal of Information Systems*, 27 (1), 137–155.
- Ahmad, A. J., & Ingle, S. (2013). *Business incubators and HTSF development: Setting an agenda for further research*. In R. Oakey, A. Groen, C. Cook, & P. Van Der Sijde (Eds.), *New technology-based firms in the new millenium* (Vol. X, pp. 119–140). Bingley: Emerald Group Publishing Limited.
- Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple Regression: Testing and Interpreting Interactions*: Sage.
- Audretsch, D. B. (2012). *Determinants of High-Growth Entrepreneurship :High-Growth Firms*. *Local Policies and Local Determinants*, (March), 1–37.
- Autio, E., & Rannikko, H. (2016). *Retaining winners: can policy boost high-growth entrepreneurship?* *Res. Policy* 45, 42–55.
- Albort-Morant, G., & Oghazi, P. (2016). *How useful are incubators for new entrepreneurs?* *Journal of Business Research*, 69(6), 2125–2129.
- Amit, R., & Schoemaker, PJH. (1993). *Strategic assets and organizational rent*. *Strategic Management Journal*, 14(1), 33–46.
- Barbero, J. L., Casillas, J. C., Ramos, A., & Guitar, S. (2012). *Revisiting incubation performance*. *Technological Forecasting and Social Change*, 79(5), 888–902.

Baraldi, E., Havenvid, M.I. (2016). *Identifying new dimensions of business incubation: a multi-level analysis of Karolinska Institute's incubation system*. *Tech- novation* 50–51, 53–68.

Barney, J. (1991). *Firm Resources and Sustained Competitive Advantage*. *Journal of Management*, 17(1), 99-120.

Barney, J. B. & Arkan, A. M. (2001). The resource- based view: origins and implications in M. A. Hitt, R. E. Freeman and J.S. Harrison (eds), *Handbook of Strategic Management*. Oxford: Blackwell Publishing, pp. 124–188.

Barney, J. B., Ketchen, D. J., & Wright, M. (2011). *The future of resource-based theory: Revitalization or decline?* *Journal of Management*, 37(5), 1299–1315.

Bae, T. J., Qian, S., Miao, C., & Fiet, J. O. (2014). *The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review*. *Entrepreneurship: Theory and Practice*, 38(2), 217–254.

Becchetti, G. & Trovato, L. (2002). *The Determinants of Growth for Small and Medium Sized Firms. The Role of the Availability of External Finance*. *Small Business Economics* 19(4):291-306

Bergek, A., & Norrman, C. (2008). *Incubator best practice: A framework*. *Technovation* 28(1-2): 20–28.

Bott, R. (2014). *Networking behavior and contracting relationships among entrepreneurs in business incubators*. *Igarss 2014*, (1), 1–5.

Bøllingtoft, A. (2012). *The bottom-up business incubator: Leverage to networking and cooperation practices in a self-generated, entrepreneurial-enabled environment*. *Technovation* 32 (5): 304–315.

Bøllingtoft, A., & Ulhoi, J.P. (2005). *The networked business incubator—leveraging entrepreneurial agency?* *Journal of Business Venturing* 20 (2): 265–290.

Bruneel, J., Ratinho, T., Clarysse, B., & Groen, A. (2012). *The evolution of business incubators: comparing demand and supply of business incubation services across different incubator generations*. *Technovation* 32, 110–121.

- Brunner, M., & SÜß, H. M. (2005). *Analyzing The Reliability Of Multidimensional Measures: An Example From Intelligence Research*. Educational and Psychological Measurement, Vol. 65 No. 2, April 227-240.
- Brown, R., & Mason, C. (2014). *Inside the high-tech black box: A critique of technology entrepreneurship policy*. Technovation 34(12): 773–784.
- Bryman, A. (2012). *Social Research Methods*. Oxford University Press.
- Chan, K. F., & Lau, T. (2005). *Assessing technology incubator programs in the science park: the good, the bad and the ugly*. Technovation, 25(10), 1215–1228.
- Chen C. J. (2009). *Technology commercialization, incubator and venture capital, and new venture performance*. J Bus Res. 62:93-103.
- Chen, M.-H., & Wang, M.-C. (2008). *Social networks and a new venture's innovative capability: the role of trust within entrepreneurial teams*. R&D Management, 38(3), 253–264.
- Chen, YS., Lin, MJJ. & Chang, CH. (2009). *The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets*. Industrial Marketing Management 38(2): 152–158.
- Clarysse, B., Wright, M., Lockett, A., Van de Velde, E., & Vohora, A. (2005). *Spinning out new ventures: a typology of incubation strategies from European research institutions*. J. Bus. Ventur. 20, 183–216.
- Cohen, W.M., Levinthal, D.A. (1989). *Innovation and learning: the two faces of R&D*. The Economic Journal 99 (September), 569–596
- Cohen, W., & Levinthal, D. (1990). *Absorptive capacity: A new perspective on learning and innovation*. Admin. Sci. Q., 35, pp. 128–152.
- Cronbach, L. J. (1951). *Coefficient alpha and the internal structure of tests*. Psychometrika, 16(3): 297-334.
- Clarysse, B., & Bruneel, J. (2007). *Nurturing and growing innovative start-ups: the role of policy as integrator*. R&D Management, Volume 37, Issue 2, 139-149.

Colombo, M. G., & Delmastro, M. (2002). *How effective are technology incubators? Evidence from Italy*. Research Policy 31(7): 1103–1122.

Dahms, S., & Kingkaew, S. (2016). *University Business Incubators: An Institutional Demand Side Perspective on Value Adding Features*. Entrepreneurial Business and Economics Review, 4(43), 41–56.

Deeds, D.L. (2001). *The role of R&D intensity, technical development and absorptive capacity in creating entrepreneurial wealth in high technology start-ups*. Journal of Engineering and Technology Management, 18 (1), 29–47.

Dvouletý, O., Longo, M.C., Blažková, I., Lukeš, M., & Andera, M. (2018). *Are publicly funded Czech incubators effective? The comparison of performance of supported and non-supported firms*. Eur. J. Innov. Manag.

Dutta, S., Narasimhan, O., & Rajiv, S. (2005). *Conceptualizing and measuring capabilities: methodology and empirical application*. Strategic Management Journal 26, 277–285.

Duchek, S. (2013). *Capturing absorptive capacity: a critical review and future prospects*. Schmalenbach Business Review (SBR), 65 (3), 312–329.

Ebbers, J. J. (2013). *Networking behavior and contracting relationships among entrepreneurs in business incubators*. Entrepreneurship: Theory and Practice.

Eisenhardt, K. M., & Martin, J. A. (2000). *Dynamic capabilities: What are they?* Strategic Management Journal 21(10–11): 1105–1121.

Ethiraj, S., Kale, P., Krishnan, M.S., & Singh, J.V. (2005). *Where do capabilities come from and how do they matter? A study of the software services industry*. Strategic Management Journal, 26, 25–45.

Escribano, A., Fosfuri, A., & Tribó, J. A. (2009). *Managing external knowledge flows: The moderating role of absorptive capacity*. Research Policy, 38(1), 96–105.

Eveleens, C. P., van Rijnsoever, F. J., & Niesten, E. M. M. I. (2017). *How network-based incubation helps start-up performance: a systematic review against the*

background of management theories. Journal of Technology Transfer (Vol. 42). Springer US.

Fang, S.-C., Tsai, F.-S., & Lin, J. L. (2010). *Leveraging tenant-incubator social capital for organizational learning and performance in incubation programme*. International Small Business Journal, 28(1), 90–113.

Ferguson, R., & Olofsson, C. (2004). *Science parks and the development of NTBFs—location, survival and growth*. The Journal of Technology Transfer, 29(1), 5–17.

Fernández, M. (2012). *Promotion of social entrepreneurship through public services in the Madrid region: Successful aspects*. Amfiteatru Economic, XIV, 774–785

Fisher, G., Lahiri, A., & Kotha, S. (2013). *Changing with the Times: An Integrated View of Legitimacy, Logics and New Venture Lifecycles*. Academy of Management Proceedings, 17126–17126.

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics*. SAGE Publications Ltd.

Fini, R., Grimaldi, R., Santoni, S., & Sobrero, M. (2011). *Complements or substitutes? The role of universities and local context in supporting the creation of academic spin-offs*. Res. Policy 40 (8), 1113–1127.

Freel, M. S. (2005). *Patterns of innovation and skills in small firms*. Technovation, 25(2), 123–134

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan*. Frances Pinter, London.

Garrett, R. P., & Covin, J. G. (2013). *Internal Corporate Venture Operations Independence and Performance: A Knowledge-Based Perspective*. Entrepreneurship Theory and Practice.

Gao, S., Xu, K., & Yang, J. (2008). *Managerial ties, absorptive capacity, and innovation*. Asia Pacific Journal of Management, 25 (3), 395–412.

Giuliani, E., & Bell, M. (2005). *The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster*. *Research Policy* 34 (1), 47–68.

Gliem, J. A., & Gliem, R. R. (2003). *Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales*.

Grant, R. M. (1991). *The resource-based theory of competitive advantage Implications for strategy formulation*. *Strategic Management Journal*, 17(S2), 109–122.

Grant, R.M. (1996). *Toward a knowledge-based theory of the firm*. *Strategic Management Journal* 17, 109–122.

Gilbert, B. a., McDougall, P. P., & Audretsch, D. B. (2006). *New Venture Growth: A Review and Extension*. *Journal of Management* 32 (6): 926–950.

Grimaldi, R., & Grandi, A. (2005). *Business incubators and new venture creation: an assessment of incubating models*. *Technovation* 25 (2): 111–121.

Hackett, S. M., & Dilts, D. M. (2004). *A systematic review of business incubation research*. *The Journal of Technology Transfer* 29 (1): 55–82.

Hackett, S. M., & Dilts, D. M. (2008). *Inside the black box of business incubation: Study B—scale assessment, model refinement, and incubation outcomes*. *The Journal of Technology Transfer*, 33(5), 439–471.

Hair, J.F., Sarstedt, M., Pieper, T.M., & Ringle, C.M. (2012). *The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications*. *Long Range Plan.* 45 (5–6), 320–340. ISSN 0024-6301

Hayton, J., & Zahra, S.A. (2005). *Venture team human capital and absorptive capacity in high technology new ventures*. *International Journal of Technology Management* 31, 256–274.

Huynh, T., Patton, D., Arias-Aranda, D., & Molina-Fernández, L. M. (2017). *University spin-off's performance: Capabilities and networks of founding teams at creation phase*. *Journal of Business Research*, 78(October 2016), 10–22.

- Hall, J., & Hofer, C. W. (1993). *Venture capitalists' decision criteria in new venture evaluation*. *Journal of Business Venturing*, 8(1), 25–42
- Hansen, M.T., Chesbrough, H.W., & Sull, D.N. (2000). *Networked incubators: hothouses of the New Economy*. *Harvard Business Review* (September–October), 75–83.
- Henry, C. (2003). *Microsoft poverty assessment tool*: World bank publications
- Hughes, M., Hughes, P., & Morgan, R. E. (2007). *Exploitative learning and entrepreneurial orientation alignment in emerging young firms: Implications for market and response performance*. *British Journal of Management*, 18(4), 359–375.
- Huber, G.P. (1991). *Organizational learning: the contributing processes and the literatures*. *Organization Science* 2, 88–115.
- Jiménez-Barrionuevo, M. M., García-Morales, V.J., & Molina, L. M. (2011). *Validation of an instrument to measure absorptive capacity*. *Technovation*, 31(5–6), 190–202.
- Johnson C. D. (2013). *Social Capital: Theory, Measurement and Outcomes (Social Issues, Justice and Status)* UK ed. Edition.
- Jensen, A., & Clausen, T. H. (2017). *Origins and emergence of exploration and exploitation capabilities in new technology-based firms*. *Technological Forecasting and Social Change*, 120, 163–175.
- Joseph F., Hair Jr, J., Hult, G. T., Ringle, C., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* - SAGE Publications, Inc.
- Kaiser, H. F. (1960). *The application of electronic computers to factor analysis*. *Educational and psychological measurement*, 20: 141-151.
- Koryak, O., Mole, K.F., Lockett, A., Hayton, J.C., Ucbasaran, D., & Hodgkinson, G.P. (2015). *Entrepreneurial leadership, capabilities and firm growth*. *Int. Small Bus. J.* 33 (1), 89–105.

Kirwan, P., Van Der Sijde, P., & Groen, A. (2006). *Assessing the needs of new technology-based firms (NTBFs): An investigation among spin-off companies from six European Universities*. *International Entrepreneurship and Management Journal*, 2(2), 173–187

Kollmann, T., & Kuckertz, A. (2010). *Evaluation uncertainty of venture capitalists' investment criteria*. *Journal of Business Research*, 63 (7), pp. 741-747.

Lalkaka, R. (2001). *“Best practices” in business incubation: Lessons (yet to be) learned. Paper presented at the International Conference on Business Centers, Actors of Economic and Social Development*, Brussels, Belgium

Lerner, J. (2009). *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed--and What to Do about It*. Princeton University Press.

Lenihan, H., Andreosso-O’Callaghan, B., & Hart, M. (2010). *SMEs in a Globalised World: Conceptual Issues*. In: Lenihan, H., Andreosso-O’Callaghan, B., Hart, M. (Eds.), *SMEs in a Globalised World: Survival and Growth Strategies on Europe’s Geo- graphical Periphery*. Edward Elgar, Cheltenham, UK, pp. 1–15.

Lewin, A.Y., Massini, S., and Peeters, C. (2011). *Microfoundations of internal and external absorptive capacity routines*. *Organization Science*, 22 (1), 81–98

Ledesma, R. D., & Valero- Mora, P. (2007). *Determining the number of factors to retain in EFA: An easy-to-use computer program for carrying out parallel analysis*. *Practical Assessment, Research & Evaluation*, 12(2): 1-11.

Li, Y.-R., & Chen, Y. (2009). *Opportunity, embeddedness, endogenous resources, and performance of technology ventures in Taiwan’s incubation centers*. *Technovation*, 29(1), 35–44.

Lockett, A., & Wright, M. (2005). *Resources, capabilities, risk capital and the creation of university spin-out companies*. *Research Policy*, 34(7), 1043–1057.

Löfsten, H., & Lindelöf, P. (2001). *Science parks in Sweden—industrial renewal and development?* *R&D Management*, 31(3), 309–322.

- Löfsten, H. (2010). *Critical incubator dimensions for small firm performance - a study of new technology-based firms localised in 16 incubators*. Int. J. Bus. Innov. Res. 4 (3), 256–279.
- Lukeš, M., Longo, M. C., & Zouhar, J. (2019). *Do business incubators really enhance entrepreneurial growth? Evidence from a large sample of innovative Italian start-ups*. Technovation, 82–83(July), 25–34.
- Macpherson, a, Jones, O., & Zang, M. (2004). *Evolution or Revolution? Dynamic Capabilities In A Knowledge Depending Firm*. R&D Management 24 (2): 161–177
- Mas-Verdú, F., Ribeiro-Soriano, D., & Roig-Tierno, N. (2015). *Firm survival: the role of incubators and business characteristics*. J. Bus. Res. 68 (4), 793–798.
- March, J.G. (1991). *Exploration and exploitation in organizational learning*. Organization Science 2, 71–87.
- Maine, E., Lubik, S., & Garnsey, E. (2012). *Process-based vs. product-based innovation: value creation by nanotech ventures*. Technovation 32, 179–192.
- Maxwell, L., Jeffrey, S. A., & Lévesque, M. (2011). *Business angel early stage decision making*. Journal of Business Venturing, 26 (2), pp. 212-225.
- McAdam, M., & McAdam, R. (2008). *High tech start-ups in University Science Park incubators: The relationship between the start-up's lifecycle progression and use of the incubator's resources*. Technovation 28 (5): 277–290.
- McAdam, M., & Marlow, S. (2007). *Building futures or stealing secrets? Entrepreneurial cooperation and conflict within business incubators*. International Small Business Journal 25 (4), 361–382.
- McGuirk, H., Lenihan, H., & Hart, M. (2015). *Measuring the impact of innovative human capital on small firms' propensity to innovate*. Research Policy, 44(4), 965–976.
- Mian, S.A. (1996). *Assessing value-added contributions of university technology business incubators to tenant firms*. Research Policy 25, 325–335.

Mian, S., Lamine, W., & Fayolle, A. (2016). *Technology Business Incubation: An overview of the state of knowledge*. Technovation, 50–51, 1–12.

Musiolik, J., Markard, J., & Hekkert, M. (2012). *Networks and network resources in technological innovation systems: Towards a conceptual framework for system building*. Technological Forecasting and Social Change, 79(6), 1032–1048.

Neergaard, H. (2005). *Networking activities in technology based entrepreneurial teams*. International Small Business Journal 23 (3), 257–278.

Newbert, S. L. (2007). *Empirical research on the resource-based view of the firm: an assessment and suggestions for future research*. Strategic Management Journal 28 (2), 121–146.

Oakey, R. (2003). *Technical entrepreneurship in high technology small firms: some observations on the implications for management*. Technovation 23, 679–688.

Oakey, R. (2012). *High-Technology Entrepreneurship*. Routledge, London and New York.

Patton, D., Warren, L., & Bream, D. (2009). *Elements that underpin high-tech business incubation processes*. Journal of Technology Transfer, 34(6), 621–636.

Patton, D. (2014). *Realising potential: The impact of business incubation on the absorptive capacity of new technology-based firms*. International Small Business Journal.

Patton, D., & Marlow, S. (2011). *University technology business incubators: Helping new entrepreneurial firms to learn to grow*. Environment and Planning C: Government and Policy, 29(5), 911–926.

Pallant, J. (2010). SPSS Survival Manual 4th Edition- *A step guide to data analysis using the SPSS program*. Osterrike: Allen & Unwin Book Publisher.

Peeters, C., & de la Potterie, B.V.P. (2006). *Innovation strategy and the patenting behavior of firms*. Journal of Evolutionary Economics, 2006, vol. 16, issue 1, 109–135

Peteraf, M. A. (1993). *The Cornerstones of Competitive Advantage: A Resource-Based View*. Strategic Management Journal, 14(3), 179–91.

Phan, P. H., Siegel, D. S., & Wright, M. (2005). *Science parks and incubators: observations, synthesis and future research*. Journal of Business Venturing, 20(2), 165–182.

Pi, L. (2021). *External knowledge absorption in Chinese SMEs* (doctoral dissertation), Leiden University, the Netherlands.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). *Common method biases in behavioral research: A critical review of the literature and recommended remedies*. Journal of Applied Psychology, 88(5), 879-903

Prajogo, D.I. (2016). *The strategic fit between innovation strategies and business environment in delivering business performance*. International Journal of Production Economics, 171, 241–249.

Rivard, S., Raymond, L., & Verreault, D. (2006). *Resource-based view and competitive strategy: An integrated model of the contribution of information technology to firm performance*. Journal of Strategic Information Systems, 15(1), 29–50.

Ratinho, T., & Henriques, E. (2010). *The role of science parks and business incubators in converging countries: evidence from Portugal*. Technovation 30, 278–290.

Ratinho, T., Harms, R., & Groen, A. (2013). *Business incubators: (How) do they help their tenants? New Technology-Based Firms in the New Millennium*, 10(10), 161–182. doi:10.1108/S1876-

Rubin, T. H., Aas, T. H., & Stead, A. (2015). *Knowledge flow in Technological Business Incubators: Evidence from Australia and Israel*. Technovation, 41-42, 11–24

Rothaermel, F. T., & Thursby, M. (2005). *University–incubator firm knowledge flows: assessing their impact on incubator firm performance*. Research Policy 34 (3): 305–320.

Roper, S., & Hewitt-Dundas, N. (2008). *Innovation persistence: survey and case-study evidence*. Research Policy 37, 149–162.

Roper, S., Du, J., & Love, J.H. (2008). *Modelling the innovation value chain*. Research Policy 37, 961–977

Saemundsson, R. J., & Candi, M. (2017). *Absorptive capacity and the identification of opportunities in new technology-based firms*. Technovation, 64–65(November 2016), 43–49.

Samaeemofrad, N., & van den Herik H. J. (2020). *The Impact of Business Incubation Support: Moderating Role of Absorptive Capacity*. In the proceedings of the 2020 ICE/ITMC International Virtual Conference, 2020 (IEEE Xplore).

Samaeemofrad, N., & van den Herik H. J. (2018). *The Relation between Support by Business Incubators and Performance of NTBFs*. In the proceedings of the 2018 ICE/ITMC International Conference, Stuttgart, Germany.

Samaeemofrad, N., & van den Herik H. J. (2018). *The Effectiveness of Finance Mobilization by Business Incubators on the Performance of NTBFs*. In the proceedings of the 2018 ICE/ITMC International Conference, Stuttgart, Germany.

Samaeemofrad, N., van den Herik H. J., & Verburg, R. (2016). *A New Perspective on Business Incubators*. In the proceedings of the 2016 ICE/ITMC International Conference, Trondheim, Norway).

Sarstedt, M., & Mooi, E. (2019). *A Concise Guide to Market Research, The Process, Data, and Methods*. Using IBM SPSS Statistics.

Sandberg, W., & Hofer, C. (1987). *Improving new venture performance: the role of strategy, industry structure, and the entrepreneur*. Journal of Business Venturing, 14: 165–187

Schwartz, M. (2013). *A control group study of incubators' impact to promote firm survival*. Journal of Technology Transfer 38(3): 302–331.

Schwartz, M., & Hornych, C. (2008). *Specialization as strategy for business incubators: an assessment of the Central German Multimedia Center*. Technovation 28, 436–449

Schwartz, M., & Hornych, C. (2010). *Cooperation patterns of incubator firms and the impact of incubator specialization: empirical evidence from Germany*. Technovation

Scillitoe, J. L., & Chakrabarti, A. K. (2010). *The role of incubator interactions in assisting new ventures*. Technovation, 30(3), 155–167.

Shepherd, A. (1999). *Venture capitalists assessment of new venture survival*. Management Science. 45(5).

Shepherd, D.A., Douglas, E.J., & Shanley, M. (2000). *New venture survival: ignorance, external shocks, and risk reduction strategies*. Journal of Business Venturing 15, 393–410.

Siegel, D. S., Westhead, P., Wright, M., & Wright, M. (2018). *Science Parks and the Performance of New Technology-Based Firms: A Review of Recent U . K. Evidence and an Agenda for Future Research*. Small Business Economics. 20(2), 177–184.

Slotte-Kock, S. & Coviello, N. (2010). *Entrepreneurship research on network processes: A review and ways forward*. Entrepreneurship Theory and Practice, 34(1), 31–57.

Sobh., T. M. (2008). *Advances in computer and information science and engineering*. Springer Science and Business Media.

Soetanto, D., & Jack, S. L. (2018). *Slack resources, exploratory and exploitative innovation and the performance of small technology-based firms at incubators*. Journal of Technology Transfer, 43(5), 1213–1231.

Soetanto, D., & Jack, S. (2016). *The impact of university-based incubation support on the innovation strategy of academic spin-offs*. Technovation, 50–51, 25–40.

- Soetanto, D. P., & Jack, S. L. (2013). *Business incubators and the networks of technology-based firms*. *The Journal of Technology Transfer*, 38(4), 432–453.
- Soetanto, D. P., & van Geenhuizen, M. (2010). *Social capital through networks: The case of university spin-off firms in different stages*. *Tijdschrift voor Economische en Sociale Geografie*, 101(5), 509–520.
- Soetanto, D., & van Geenhuizen, M. (2019). *Life after incubation: The impact of entrepreneurial universities on the long-term performance of their spin-offs*. *Technological Forecasting and Social Change*, 141(October), 263–276. <https://doi.org/10.1016/j.techfore.2018.10.021>
- Somsuk, N., & Laosirihongthong, T. (2014). *A fuzzy AHP to prioritize enabling factors for strategic management of university business incubators: Resource-based view*. *Technological Forecasting and Social Change*, 85, 198–210.
- Spanos, Y. E. & Lioukas, S. (2001). *An examination into the causal logia of rent generation: Contrasting Porter's competitive strategy framework and the resource-based perspective*. *Strategic Management Journal*, 22, 907–934.
- Stal, E., Andreassi, T., & Fujino, A. (2016). *The role of university incubators in stimulating academic entrepreneurship*. *RAI Revista de Administração E Inovação*, 13(2), 89–98.
- Stam, W., Arzlanian, S., & Elfring, T. (2014). *Social capital of entrepreneurs and small firm performance: a meta-analysis of contextual and methodological moderators*. *J. Bus. Ventur.* 29, 152–173.
- Sternberg, R. (2014). *Success factors of university-spin-offs: Regional government support programs versus regional environment*. *Technovation*, 34(3), 137–148.
- St-jean, E., & Audet, J. (2009). *Factors Leading to Satisfaction in a Mentoring Scheme for Novice Entrepreneurs*. *International Journal of Evidence Based Coaching and Mentoring journal*, 2009, 7(1), 148–162.
- Storey, D.J., & Tether, B.S. (1998). *Public policy measures to support new technology-based firms in the European Union*. *Research Policy* 26, 1037–1057.

- Stokan, E., Thompson, L., & Mahu, R. J. (2015). *Testing the Differential Effect of Business Incubators on Firm Growth*. *Economic Development Quarterly*, 29(4), 317–327.
- Su, Z., Ahlstrom, D., Li, J., & Cheng, D. (2013). *Knowledge creation capability, absorptive capacity, and product innovativeness*. *R&D Management*, 43 (5), 473–485.
- Sullivan, D. M., & Ford, C. M. (2014). *How entrepreneurs use networks to address changing resource requirements during early venture development*. *Entrepreneurship Theory & Practice*, 38(3).
- Sullivan, D. M., & Marvel, M. R. (2011). *Knowledge acquisition, network reliance, and early-stage technology venture outcomes*. *Journal of Management Studies*, 48(6), 1169–1193.
- Szulanski, G., (1996). *Exploring internal stickiness: Impediments to the transfer of best practice within the firm*. *Strategic Management Journal*, 17 (S2), 27–43
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics*: Pearson Education, Limited.
- Tam, C. Thomas, K., & Zhang, H. (2007). *Decision making and operations research techniques for construction management*: City University of HK Press.
- Tehseen, S., Ramayah, T., & Sajilan, S. (2017). *Testing and Controlling for Common Method Variance: A Review of Available Methods*. *Journal of Management Sciences*, 4(2), 142–168. <https://doi.org/10.20547/jms.2014.1704202>
- Teece, D., Pisano, G., & Shuen, A. (1997). *Dynamic capabilities and strategic management*. *Strategic Management Journal*, 18(7), 509–533.
- Van Geenhuizen, M., & Soetanto, D. P. (2009). *Academic spin-offs at different ages: A case study in search of key obstacles to growth*. *Technovation*, 29(10), 671–681.
- Van Gelderen, M., van De Sluis, L., & Jansen, P. (2005). *Learning opportunities and learning behaviours of small business starters: Relations with goal*

achievement, skill development and satisfaction. *Small Business Economics*, 25(1), 97–108.

Van Praag, C.M., & Versloot, P.H. (2008). *The economic benefits and costs of entrepreneurship: a review of the research*. *Found. Trends Entrep.* 4 (2), 65–154

Van Rijnsoever, F. J., Van Weele, M. A., & Eveleens, C. P. (2017). *Network brokers or hit makers? Analyzing the influence of incubation on start-up investments*. *International Entrepreneurship and Management Journal*, 13(2), 605–629.

Van Weele, M., van Rijnsoever, F. J., Eveleens, C. P., Steinz, H., van Stijn, N., & Groen, M. (2018). *Start-EU-up! Lessons from international incubation practices to address the challenges faced by Western European start-ups*. *Journal of Technology Transfer*, 43(5), 1161–1189.

Van Weele, M., van Rijnsoever, F. J., & Nauta, F. (2017). *You can't always get what you want: How entrepreneur's perceived resource needs affect the incubator's assertiveness*. *Technovation*, 59

Vanderstraeten, J., & Matthyssens, P. (2012). *Service-based differentiation strategies for business incubators: Exploring external and internal alignment*. *Technovation* 32 (12): 656–670.

Verbano, Ch., & Crema, M. (2015). *Linking technology innovation strategy, intellectual capital and technology innovation performance in manufacturing SMEs*. *Technology Analysis & Strategic Management*. 28 (5), 424-540.

Voss, G. B., & Voss, Z. G. (2013). *Strategic ambidexterity in small and medium-sized enterprises: implementing exploration and exploitation in product and market domains*. *Organization Science*. 24 (5), 1459–1477.

Warren, L., Patton, D., & Bream, D. (2009). *Knowledge acquisition processes during the incubation of new high technology firms*. *International Entrepreneurship and Management Journal*, 5(4), 481–495.

Wang, C. L., & Chugh, H. (2014). *Entrepreneurial learning: Past research and future challenges*. *International Journal of Management Reviews*, 16(1), 24–61.

Webster, A. (2013). *Introductory Regression Analysis: With Computer Application for Business and Economics*: Routledge.

Wernerfelt, B. (1984). *A resource-based view of the firm*. Strategic Management Journal, 5: 171-180.

Witt, P. 2004. *Entrepreneurs' networks and the success of start-ups*. Entrepreneurship & Regional Development 16 (5): 391–412.

Wiklund, J., & Shepherd, D. (2003). *Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses*. Strategic Management Journal, 24(13), 1307–1314.

Wonglimpiyarat, J. (2016). *The innovation incubator, University business incubator and technology transfer strategy: The case of Thailand*. Technology in Society, 46, 18–27.

Wu, L. Y. (2007). *Entrepreneurial resources, dynamic capabilities and start-up performance of Taiwan's high-tech firms*. Journal of Business Research, 60(5), 549–555.

Wu, W. and Han, Q. (2017). *Revenue and Knowledge Cooperation Mechanisms between Business Incubators and Venture Capitalists for Collaborative Start-Ups*. Theoretical Economics Letters, 7, 1335-1356.

Zahra, S. A., & George, G. (2002). *Absorptive Capacity: A Review, Re-Conceptualization, and Extension*. Academy of Management Review 27 (2): 85–203.

Zobel, A.-K., (2017). *Benefiting from Open Innovation: A Multidimensional Model of Absorptive Capacity*. Journal of Product Innovation Management, 34 (3), 269–288.

Zolin, R., Kuckertz, A., & Kautonen, T. (2011). *Human resource flexibility and strong ties in entrepreneurial teams*. Journal of Business Research, 64(10), 1097–1103.

Appendices

The list of Appendices consists of ten parts as given below.

Appendix A: From Codes to Categories

Appendix B: Invitation Letter to Participate in a Research

Appendix C: The Measurement Instrument (Questionnaire)

Appendix D1: Correlation Matrix of Two Supports by Business Incubator Scales and
Innovation Strategy

Appendix D2: Correlation Matrix of Two Moderators

Appendix E1: Results of Kaiser's Criterion for Independent Variables

Appendix E2: Results of Kaiser's Criterion for Moderators

Appendix F: Syntax to Perform Parallel Analysis in SPSS

Appendix G: Residual Plots of The Variables Used in the Regression Analysis

Appendix H: Results of Common Method Bias

APPENDIX A: FROM CODES TO CATEGORIES

Appendix A presents the 36 codes obtained from interviews with entrepreneurs, and classifies them into the five different categories.

No.	Codes	Categories
1	Attract big cooperation and companies by incubator	Access to the networks
2	Partnership	
3	Cooperation with different well-known companies by incubator	
4	networks of incubators	
5	Strong communication of the incubator	
6	Get relationship with big companies by NTBF	
7	Interaction with university	
8	Reaching customers by NTBF	
9	Meeting Potential Customers/VS/Advisors	
10	Synergy	
11	Meetups/events	
12	Engagement	
13	Brand visibility	Creation of exposure
14	Reputation/ credibility	
15	Increase awareness about NTBF's brand, product, service	
16	Being present in the incubators' social media	
17	Knowledge creation	Knowledge development and dissemination
18	Learning from other startups	
19	Advisory / coaching	
20	Access to a default platform for legal issues	
21	Knowledge diffusion and development	
22	Develop personal skills	
23	Interactive Training	
24	Mentoring	
25	Evaluate the progress	Growth control
26	Evaluate the problems	
27	Monitoring	
28	Set Milestones by incubator	
29	Get loan	Finance and administrative mobilization
30	Fundraising	
31	Venture Capital	
32	Financial sponsor	
33	Facilities	
34	IT infrastructure	
35	Place to work	
36	Administrative Services	

APPENDIX B: INVITATION LETTER TO PARTICIPATE IN A RESEARCH

Appendix B shows the invitation letter of the survey for the entrepreneurs. This letter addresses the objective of the survey.



Universiteit Leiden

Dear Founder and Entrepreneur.

I invite you to participate in a research study entitled “Business Incubators: How effective are they?”

I am Negin Samaee a Ph.D. candidate in the field of Innovation Management in Leiden University. The purpose of the research is to determine the effect of the supports by business incubators or accelerators on the performance of startups. The enclosed questionnaire has been designed to collect information on the founder’s opinion on the received support by business incubators. Your participation in this research project is completely voluntary. Your responses will remain confidential and anonymous. Data from this research will be kept and reported only as a collective combined total. No one other than the researchers will know your individual answers to this questionnaire.

If you agree to participate in this project, please answer the questions on the questionnaire as best you can. It should take approximately 10-15 minutes to complete. If you have any questions about this project, feel free to contact: n.samaeemofrad@liacs.leidenuniv.nl or to my LinkedIn account (Negin Samaee)

Thank you for your assistance in this important endeavor.

Sincerely yours,

Negin Samaeemofrad

Ph.D. Candidate, Leiden University

Prof. Jaap van den Herik

Graduate School of Mathematics

Leiden University

APPENDIX C: THE MEASUREMENT INSTRUMENT QUESTIONNAIRE

Appendix C demonstrates the questionnaire that we disseminated among entrepreneurs to collect data. The questionnaire gathers (1) general information from the participants (Q1-Q4) and information on the supports by BIs and the performance of the NTBFs (Q5-Q16).

Q1: Email:

Q2: Name of Business Incubator/Accelerator

Q3: Prior working experience:

First working experience

Consultant

University and other R&D organizations

High-Tech firm

Others:

Q4: Graduate degree in:

Computer science

Mathematics

Physics

Chemistry

Economics and Business

Biology

Others:

Q5: Number of Founders:

Q6: Please state the year of your firm's establishment (start to work)

Q7 What is the total number of employees in your team?

Number of Full-Time Employees

Part-Time Employees

Q8 How many employees do you increase since last year?

Q9 Please indicate the industry of your business.

Computer and software industry (e.g., AI, Blockchain)

Energy industry

ICT

Life science

Healthcare and MedTech

Manufacturing industry

Robotics

Agriculture

General services

Aerospace and aviation industry

Complex technologies (e.g., Nanotech, CleanTech)

Others:

Q10 Please indicate whether or not your organization has a patented technology.

Yes / No

Q11 Has your firm produced one or more new products and/or services in the last two years?

Yes / No

Q12 Please assess the extent to which you agree or disagree with the following statements.

Statement	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
(1) The technology and innovation behind our existing products and services need improvement.							
(2) We invest in the development of new technologies, patents, products and /or services that are completely new to our company.							
(3) We aim to develop new products or services.							
(4) We invent new products and/or services.							
(5) We intend to add small adaptations to existing products and/or services.							
(6) We regularly attempt to use optimize resources, as well as less time and less money in producing our existing products and/or services.							
(7) We regularly monitor our existing products and /or services to be aligned with customer needs.							
(8) We have plan to increase the amount of production and/or services in our existing markets.							
(9) Our company builds new distribution channels.							
(10) We regularly search for new approaches into new markets.							
(11) We utilize new opportunities in new markets.							
(12) Our company develops at least two new services each year for our existing clients.							
(13) We introduce improved our existing products and services for our existing market.							

Q13 Business incubators attempt to support their tenants via offering business-oriented training programs. Please indicate the extent to which you find them effective in the development of your business.

Statement	Extremely satisfied	satisfied	Slightly satisfied	Neither satisfied nor dissatisfied	Slightly dissatisfied	dissatisfied	Extremely dissatisfied
(1) Marketing strategy and sales management skills							
(2) Negotiation and communication skills							
(3) Business strategy and agile management							
(4) Human Resource Management							
(5) Financial statements, tax, contracts, protectability (Intellectual Property)							

Q14 Please indicate the extent to which you are satisfied or dissatisfied with the following support offered to your business.

Statement	Extremely satisfied	satisfied	Slightly satisfied	Neither satisfied nor dissatisfied	Slightly dissatisfied	dissatisfied	Extremely dissatisfied
(1) Adviser's availability							
(2) Adviser's expertise and experience							
(3) Organization of meetings with your adviser (duration, frequency, and efficiency)							
(4) There is a relationship based on trust, respect and compliance with a moral contract between you and your adviser.							
(5) Increase in self-confidence as a result of the advisory experience							
(6) Access to a more extensive targeted network of contacts due to the collaboration with an adviser							
(7) Achieve real, observable results for your business through the advisory process							
(8) Adviser offers guidance regarding your successes, failures and methods for improving your business practice							

Q15 Business incubators attempt to support their tenants via the access to different capital resources. How do you evaluate their fundraising attempts to get access to capital resources for your business?

Statement	Extremely satisfied	satisfied	Slightly satisfied	Neither satisfied nor dissatisfied	Slightly dissatisfied	dissatisfied	Extremely dissatisfied
(1) For governmental subsidy							
(2) For Venture Capital funds, Private investors							
(3) For philanthropy (donations)							
(4) For a loan from your business incubator							
(5) For strategic alliance or partnership with established firms							

Q16 Emphasis is on characteristics of your relationship between your firm and whoever (e.g., customers. users. advisers) from whom you may obtain or exchange new information or useful knowledge. Please indicate the degree of agreement or disagreement with the following statements.

Statement	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
(1) Your firm has a close relationship with its customers that is characterized by mutual trust and respect							
(2) Our team is able to understand knowledge from outside our business focus or industry-niche							
(3) There are many informal conversations and formal meetings in our organization to discuss the development of our business practice							
(4) Our team publishes informative documents periodically (e.g., reports. bulletins)							
(5) When something important occurs. all members of our team are informed within a short time, and the knowledge is shared among all members of the organization							
(6) We frequently pivot our business based on the obtained knowledge from outside							

Q17 Please indicate the extent to which you rate yourself regarding your ability in raising capital.

Statement	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
(1) I am able to evaluate to risk well							
(2) Our team has direct and relevant experience							
(3) Our customers easily adapt to our product							
(4) Our product is ready to market							
(5) People can NOT copy our product/ service							
(6) Our product meets customer needs							
(7) We have a realistic marketing plan							
(8) There is a large market for our product (Over 20 Million \$)							

Q18 Regarding measuring the performance of your firm. please indicate to what extent you are satisfied with the following statements.

Statement	Extremely satisfied	satisfied	Slightly satisfied	Neither satisfied nor dissatisfied	Slightly dissatisfied	dissatisfied	Extremely dissatisfied
(1) Meet the planned milestones as scheduled							
(2) Able to achieve the defined business goals (excluding personal development and learning goals)							
(3) Developing my business and management skills							
(4) I am satisfied with the income							
(5) I am satisfied with the process of business development							

APPENDIX D1: CORRELATION MATRIX OF TWO SUPPORTS BY BUSINESS INCUBATOR SCALES AND INNOVATION STRATEGY

Appendix D1 describes the correlations between three measurement scales of the support by business incubators. These scales are: Innovation Strategy (Q1-Q12), Knowledge development (Q13-Q26), and finance mobilization (Q27-Q31).

Item	Q1	Q2	Q3-1	Q3-2	Q7	Q11	Q12	Q10	Q9	Q8	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31			
Q1	1																															
Q6	.069	1																														
Q5	.035	.345	1																													
Q4	-.015	.349	.232	1																												
Q2	-.011	-.113	.122	-.115	1																											
Q3-1	-.043	-.022	.010	-.008	.205	1																										
Q3-2	-.008	.140	.057	.123	.329	.299	1																									
Q7	.128	-.009	.092	.001	.416	.319	.251	1																								
Q11	.063	.087	-.094	.014	.236	.211	.205	.354	1																							
Q12	.016	.037	.105	.074	.128	.205	.371	.179	.305	1																						
Q10	.087	.210	.365	.051	.193	.174	.222	.172	.422	.539	1																					
Q9	-.110	.002	-.051	-.280	.296	.167	.187	.146	.284	.231	.124	1																				
Q8	.043	-.017	.033	-.093	.443	.154	.184	.411	.292	.188	.150	.420	1																			
Q13	.200	.222	.238	.102	.058	-.076	.109	.004	-.029	.076	.104	-.073	.124	1																		
Q14	.247	.258	.162	.186	.027	-.088	.165	.035	.069	-.018	.101	-.076	.040	.793	1																	
Q15	.246	.441	.253	.117	.130	-.011	.102	.050	.112	.001	.238	-.110	.042	.677	.682	1																
Q16	.362	.305	.026	.091	.126	.091	.093	.232	.189	.032	.096	-.124	.200	.523	.539	.666	1															
Q17	.077	.357	.177	.085	.114	.059	.181	.180	.117	.111	.280	-.070	.096	.545	.534	.560	.616	1														
Q18	.147	.297	.157	.038	.127	.032	.104	.198	.215	.061	.277	-.028	.123	.435	.425	.489	.534	.745	1													
Q19	.244	.378	.215	.161	.075	.079	.133	.127	.105	.121	.228	-.145	-.027	.492	.547	.652	.638	.701	.700	1												
Q20	.241	.393	.285	.072	.192	.070	.158	.275	.080	.051	.173	-.166	.066	.391	.424	.644	.669	.656	.695	.750	1											
Q21	-.063	.209	-.046	.053	.111	-.103	.272	-.043	-.011	.028	-.092	.026	.009	.171	.192	.163	.264	.196	.145	.230	.308	1										
Q22	-.002	.103	.135	.092	.190	-.042	.274	-.044	-.053	.089	-.047	-.017	.025	.282	.313	.235	.253	.190	.158	.223	.319	.654	1									
Q23	.028	.230	.063	-.032	.163	-.051	.195	-.053	.001	.030	-.019	-.046	.063	.439	.394	.336	.326	.272	.238	.305	.345	.682	.745	1								
Q24	.025	.171	.018	.141	.115	.035	.197	.073	.063	.132	-.030	.089	.133	.310	.296	.126	.208	.190	.134	.238	.259	.618	.671	.636	1							
Q25	.050	.025	.084	-.109	.204	.023	.106	.168	-.009	-.033	-.068	.032	.208	.254	.322	.116	.188	.144	.079	.186	.271	.555	.522	.579	.637	1						
Q26	-.099	.165	-.094	.130	-.133	-.154	-.022	-.057	-.066	-.094	-.154	.082	.041	.273	.363	.110	.210	.283	.198	.138	.587	.442	.479	.421	.416	1						
Q27	.111	.363	.285	.111	.014	-.112	.038	.067	-.072	.127	.192	-.056	.010	.298	.253	.198	.240	.223	.156	.309	.296	.314	.446	.404	.381	.352	.216	1				
Q28	.205	.246	-.010	.078	.204	.027	.169	.197	.169	.117	.098	-.001	.081	.277	.257	.320	.410	.227	.220	.356	.342	.364	.337	.381	.324	.266	.159	.522	1			
Q29	.237	.243	-.088	-.147	.057	.045	.067	.014	-.043	.036	.052	-.124	.146	.143	.097	.216	.233	.138	.078	.204	.189	.178	.130	.161	.295	.134	.070	.404	.635	1		
Q30	.108	.243	.101	-.008	.040	.044	.131	.146	-.115	.166	.022	-.010	-.027	.115	.127	.213	.201	.149	.150	.165	.312	.173	.254	.149	.111	.278	-.031	.461	.427	.312	1	
Q31	.201	.468	.146	.119	-.049	-.019	.118	.140	.132	.138	.262	-.152	-.026	.339	.370	.417	.369	.323	.363	.423	.304	.211	.280	.341	.337	.265	.133	.589	.588	.542	.416	1

APPENDIX D2: CORRELATION MATRIX OF TWO MODERATORS

Appendix D2 describes the correlations between two moderators. These scales are: Absorptive capacity (Q32-Q37), and Financial capability (Q38-Q45).

Items	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43	Q44	Q45
Q32	1.													
Q33	0.380	1.												
Q34	0.312	0.308	1.											
Q35	0.263	-0.031	0.099	1.										
Q36	0.342	0.410	0.288	0.336	1.									
Q37	0.175	0.338	0.111	0.209	0.310	1.								
Q38	0.121	0.231	0.126	0.210	0.077	0.082	1.							
Q39	0.231	0.310	0.113	0.112	0.130	0.224	0.512	1.						
Q40	0.047	0.002	0.211	-0.053	-0.028	0.146	0.004	0.080	1.					
Q41	0.246	-0.119	0.121	0.066	-0.050	-0.107	-0.028	-0.005	0.140	1.				
Q42	0.122	0.111	0.168	0.045	0.283	-0.097	0.246	-0.007	0.115	0.222	1.			
Q43	0.229	0.257	0.297	-0.015	0.283	0.018	0.133	0.220	0.014	-0.025	0.260	1.		
Q44	0.368	0.127	0.115	0.121	0.224	0.067	0.024	0.135	0.349	0.349	0.296	0.277	1.	
Q45	0.078	0.223	0.114	0.104	0.324	0.086	0.244	0.125	0.119	-0.059	0.435	0.333	0.068	1.

APPENDIX E1: RESULTS OF KAISER'S CRITERION FOR INDEPENDENT VARIABLES

Appendix E1 describes the results of Principal Component Analysis with the Eigenvalues for Independent Variables.

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	7.955	24.858	24.858
2	3.316	10.362	35.220
3	2.933	9.165	44.385
4	2.159	6.746	51.131
5	1.811	5.660	56.790
6	1.338	4.180	60.971
7	1.212	3.788	64.759
8	1.164	3.637	68.396
9	1.050	3.281	71.677
10	.905	2.828	74.505
11	.859	2.685	77.191
12	.820	2.562	79.752
13	.702	2.194	81.947
14	.658	2.057	84.004
15	.636	1.988	85.992
16	.535	1.671	87.663
17	.497	1.554	89.217
18	.454	1.420	90.637
19	.357	1.115	91.752
20	.347	1.085	92.837
21	.323	1.010	93.847
22	.314	.981	94.828
23	.280	.875	95.703
24	.252	.789	96.492
25	.235	.733	97.225

26	.204	.639	97.864
27	.164	.512	98.376
28	.122	.383	98.758
29	.121	.377	99.135
30	.117	.365	99.500
31	.097	.303	99.803
32	.063	.197	100.000

APPENDIX E2: RESULTS OF KAISER'S CRITERION FOR MODERATORS

Appendix E2 describes the results of Principal Component Analysis with the Eigenvalues for Moderators Variables.

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3,284	23,458	23,458
2	1,684	12,027	35,484
3	1,452	10,374	45,858
4	1,231	8,789	54,648
5	1,190	8,502	63,150
6	1,017	7,267	70,417
7	,861	6,147	76,564
8	,730	5,217	81,781
9	,581	4,151	85,932
10	,534	3,813	89,745
11	,446	3,188	92,933
12	,382	2,729	95,662
13	,306	2,187	97,848
14	,301	2,152	100,000

APPENDIX F: SYNTAX TO PERFORM PARALLEL ANALYSIS IN SPSS

In this appendix, the SPSS scripts for performing the Parallel Analysis are presented. The following article provides more information on the script: O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test, *Behavior Research Methods, Instrumentation and Computers*. 32. 396-402.

*** Parallel Analysis Program For Raw Data and Data Permutations.**

* To run this program, you need to first specify the data for analysis and then RUN, all at once, the commands from the MATRIX statement to the END MATRIX statement.

* This program conducts parallel analyses on data files in which the rows of the data matrix are cases/individuals and the columns are variables; Data are read/entered into the program using the GET command (see the GET command below); The GET command reads an SPSS data file, which can be either the current, active SPSS data file or a previously saved data file; A valid filename/location must be specified on the GET command; A subset of variables for the analyses can be specified by using the "/ VAR =" subcommand with the GET statement; There can be no missing values.

* You must also specify:

the # of parallel data sets for the analyses; the desired percentile of the distribution and random data eigenvalues; whether principal components analyses or principal axis/common factor analysis are to be conducted, and whether normally distributed

random data generation or permutations of the raw data set are to be used in the parallel analyses.

* Permutations of the raw data set can be time consuming;

Each parallel data set is based on column-wise random shuffling of the values in the raw data matrix using Castellán's (1992. *BRMIC*. 24. 72-77) algorithm; The distributions of the original raw variables are exactly preserved in the shuffled versions used in the parallel analyses; Permutations of the raw data set are thus highly accurate and most relevant. especially in cases where the raw data are not normally distributed or when they do not meet the assumption of multivariate normality (see Longman & Holden. 1992. *BRMIC*. 24. 493. for a Fortran version); If you would like to go this route. it is perhaps best to (1) first run a normally distributed random data generation parallel analysis to familiarize yourself with the program and to get a ballpark reference point for the number of factors/components; (2) then run a permutations of the raw data parallel analysis using a small number of datasets (e.g.. 100). just to see how long the program takes to run; then (3) run a permutations of the raw data parallel analysis using the number of parallel data sets that you would like use for your final analyses; 1000 datasets are usually sufficient. although more datasets should be used if there are close calls.

* These next commands generate artificial raw data (500 cases) that can be used for a trial-run of the program. instead of using your own raw data; Just select and run this whole file; However. make sure to delete the artificial data commands before attempting to run your own data.

```

set mxloops=9000 printback=off width=80 seed = 1953125.
matrix.
* Enter the name/location of the data file for analyses after "FILE =";
  If you specify "FILE = *". then the program will read the current.
  active SPSS data file; Alternatively. enter the name/location
  of a previously saved SPSS data file instead of "*";
  you can use the "/ VAR =" subcommand after "/ missing=omit"
  subcommand to select variables for the analyses.
GET raw / FILE = * / missing=omit / VAR = q1 to Q31.
* Enter the desired number of parallel data sets here.
compute ndatsets = 1000.
* Enter the desired percentile here.
compute percent = 95.
* Enter either
  1 for principal components analysis. or
  2 for principal axis/common factor analysis.
compute kind = 1 .

* Enter either
  1 for normally distributed random data generation parallel analysis. or
  2 for permutations of the raw data set.
compute randtype = 1.

***** End of user specifications. *****
compute ncases = nrow(raw).
compute nvars = ncol(raw).

* principal components analysis & random normal data generation.
do if (kind = 1 and randtype = 1).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute realeval = eval(d * vcv * d).
compute evals = make(nvars.ndatsets.-9999).
loop #nds = 1 to ndatsets.
compute x = sqrt(2 * (ln(uniform(ncases.nvars)) * -1) ) &*
      cos(6.283185 * uniform(ncases.nvars) ).
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute evals(:,#nds) = eval(d * vcv * d).
end loop.
end if.

* principal components analysis & raw data permutation.

```

```
do if (kind = 1 and randtype = 2).
  compute nm1 = 1 / (ncases-1).
  compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
  compute d = inv(mdiag(sqrt(diag(vcv)))).
  compute realeval = eval(d * vcv * d).
  compute evals = make(nvars.ndatsets.-9999).
  loop #nds = 1 to ndatsets.
    compute x = raw.
    loop #c = 1 to nvars.
      loop #r = 1 to (ncases - 1).
        compute k = trunc( (ncases - #r + 1) * uniform(1.1) + 1 ) + #r - 1.
        compute d = x(#r.#c).
        compute x(#r.#c) = x(k.#c).
        compute x(k.#c) = d.
      end loop.
    end loop.
  compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
  compute d = inv(mdiag(sqrt(diag(vcv)))).
  compute evals(:,#nds) = eval(d * vcv * d).
  end loop.
end if.
* PAF/common factor analysis & random normal data generation.
do if (kind = 2 and randtype = 1).
  compute nm1 = 1 / (ncases-1).
  compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
  compute d = inv(mdiag(sqrt(diag(vcv)))).
  compute cr = (d * vcv * d).
  compute smc = 1 - (1 &/ diag(inv(cr)) ).
  call setdiag(cr.smc).
  compute realeval = eval(cr).
  compute evals = make(nvars.ndatsets.-9999).
  compute nm1 = 1 / (ncases-1).
  loop #nds = 1 to ndatsets.
    compute x = sqrt(2 * (ln(uniform(ncases.nvars)) * -1) ) &*
      cos(6.283185 * uniform(ncases.nvars) ).
    compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
    compute d = inv(mdiag(sqrt(diag(vcv)))).
    compute r = d * vcv * d.
    compute smc = 1 - (1 &/ diag(inv(r)) ).
    call setdiag(r.smc).
    compute evals(:,#nds) = eval(r).
  end loop.
end if.
* PAF/common factor analysis & raw data permutation.
```

```

do if (kind = 2 and randtype = 2).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute cr = (d * vcv * d).
compute smc = 1 - (1 &/ diag(inv(cr)) ).
call setdiag(cr.smc).
compute realeval = eval(cr).
compute evals = make(nvars.ndatsets.-9999).
compute nm1 = 1 / (ncases-1).
loop #nds = 1 to ndatsets.
compute x = raw.
loop #c = 1 to nvars.
loop #r = 1 to (ncases - 1).
compute k = trunc( (ncases - #r + 1) * uniform(1.1) + 1 ) + #r - 1.
compute d = x(#r.#c).
compute x(#r.#c) = x(k.#c).
compute x(k.#c) = d.
end loop.
end loop.
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute r = d * vcv * d.
compute smc = 1 - (1 &/ diag(inv(r)) ).
call setdiag(r.smc).
compute evals(:,#nds) = eval(r).
end loop.
end if.
* identifying the eigenvalues corresponding to the desired percentile.
compute num = rnd((percent*ndatsets)/100).
compute results = { t(1:nvars). realeval. t(1:nvars). t(1:nvars) }.
loop #root = 1 to nvars.
compute ranks = rnkorder(evals(#root:)).
loop #col = 1 to ndatsets.
do if (ranks(1,#col) = num).
compute results(#root,4) = evals(#root,#col).
break.
end if.
end loop.
end loop.
compute results(:,3) = rsum(evals) / ndatsets.
print /title="PARALLEL ANALYSIS:".
do if (kind = 1 and randtype = 1).
print /title="Principal Components & Random Normal Data Generation".

```

```
else if (kind = 1 and randtype = 2).
print /title="Principal Components & Raw Data Permutation".
else if (kind = 2 and randtype = 1).
print /title="PAF/Common Factor Analysis & Random Normal Data Generation".
else if (kind = 2 and randtype = 2).
print /title="PAF/Common Factor Analysis & Raw Data Permutation".
end if.
compute specifics = {ncases; nvars; ndatsets; percent}.
print specifics /title="Specifications for this Run:"
  /rlabels="Ncases" "Nvars" "Ndatsets" "Percent".
print results
  /title="Raw Data Eigenvalues. & Mean & Percentile Random Data Eigenvalues"
  /clabels="Root" "Raw Data" "Means" "Prcntyle" /format "f12.6".
do if (kind = 2).
print / space = 1.
print /title="Warning: Parallel analyses of adjusted correlation matrices".
print /title="eg. with SMCs on the diagonal. tend to indicate more factors".
print /title="than warranted (Buja. A.. & Eyuboglu. N.. 1992. Remarks on parallel".
print /title="analysis. Multivariate Behavioral Research. 27. 509-540.).".
print /title="The eigenvalues for trivial. negligible factors in the real".
print /title="data commonly surpass corresponding random data eigenvalues".
print /title="for the same roots. The eigenvalues from parallel analyses".
print /title="can be used to determine the real data eigenvalues that are".
print /title="beyond chance. but additional procedures should then be used".
print /title="to trim trivial factors.".
print / space = 2.
print /title="Principal components eigenvalues are often used to determine".
print /title="the number of common factors. This is the default in most".
print /title="statistical software packages. and it is the primary practice".
print /title="in the literature. It is also the method used by many factor".
print /title="analysis experts. including Cattell. who often examined".
print /title="principal components eigenvalues in his scree plots to determine".
print /title="the number of common factors. But others believe this common".
print /title="practice is wrong. Principal components eigenvalues are based".
print /title="on all of the variance in correlation matrices. including both".
print /title="the variance that is shared among variables and the variances".
print /title="that are unique to the variables. In contrast. principal".
print /title="axis eigenvalues are based solely on the shared variance".
print /title="among the variables. The two procedures are qualitatively".
print /title="different. Some therefore claim that the eigenvalues from one".
print /title="extraction method should not be used to determine".
print /title="the number of factors for the other extraction method.".
print /title="The issue remains neglected and unsettled.".
end if.
```

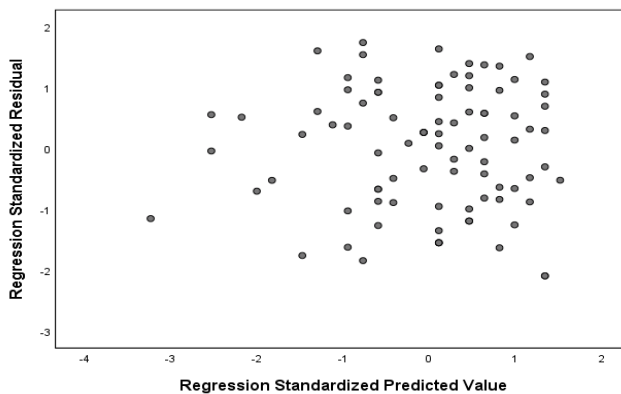


```
compute root = results(:,1).
compute rawdata = results(:,2).
compute percentyl = results(:,4).
save results /outfile= 'screedata.sav' / var=root rawdata means percentyl .
end matrix.
* plots the eigenvalues. by root. for the real/raw data and for the random data.
GET file= 'screedata.sav'.
TSPLOT VARIABLES= rawdata means percentyl /ID= root /NOLOG.
```

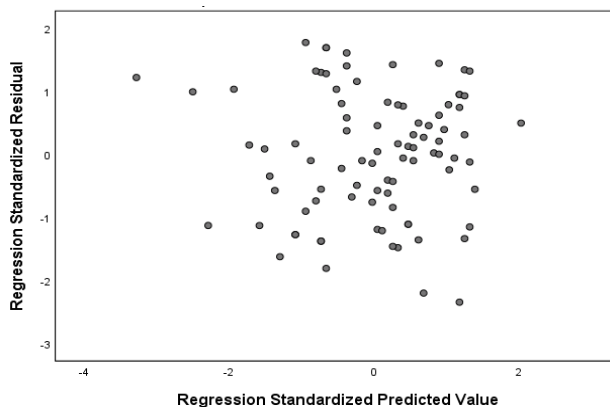
APPENDIX G: RESIDUAL PLOTS OF THE VARIABLES USED IN THE REGRESSION ANALYSIS

In this appendix, the residual plots are generated for three independent variables (innovation strategy, knowledge development and dissemination, and finance mobilization); one moderator (absorptive capacity); control variables (team size, NTBF's age, and the level of innovativeness); and the performance of the NTBFs as an independent variable. The plots use Standardized Residuals (Y-axis) and Standardized Predicted Value (X-axis). Below, the seven residual plots are depicted.

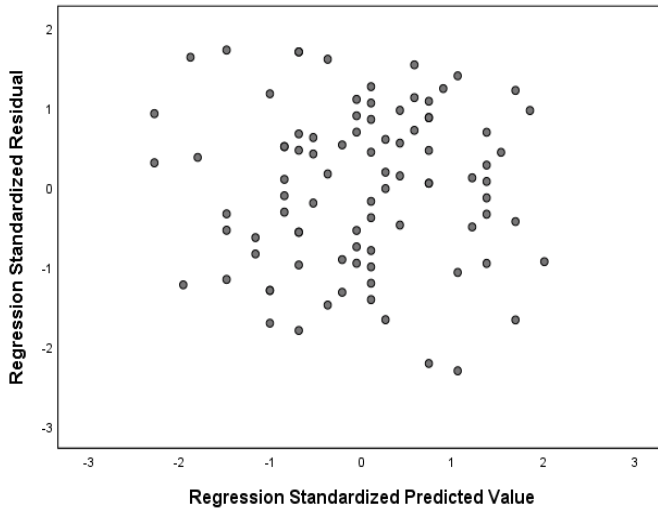
K1: Innovation Strategy on the Performance of the NTBFs



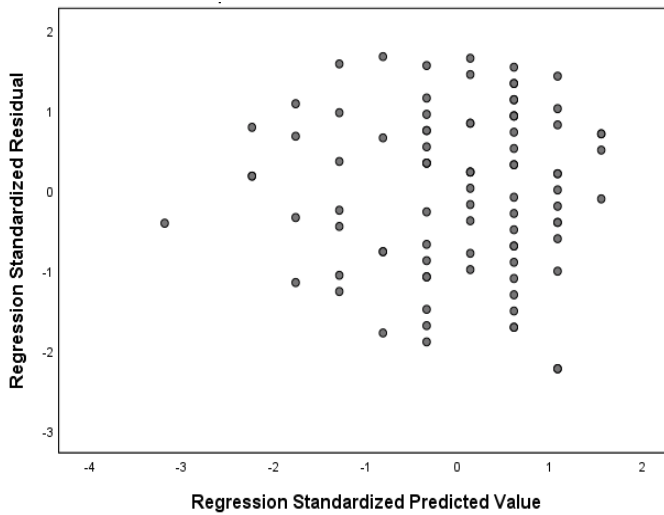
K2: Knowledge development and dissemination on the performance of the NTBFs



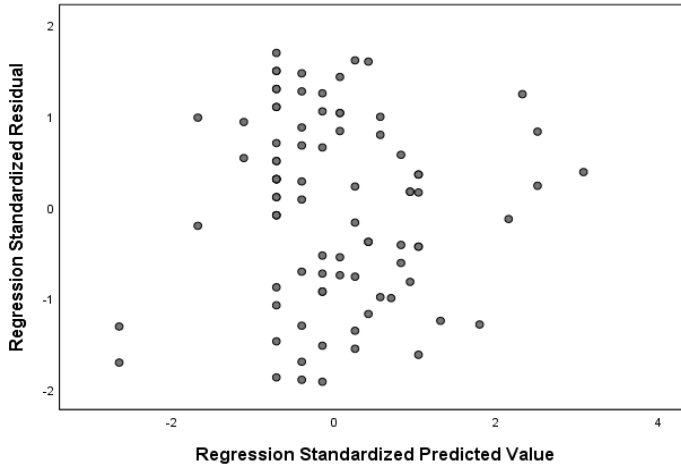
K3: Finance Mobilization on the Performance of the NTBFs



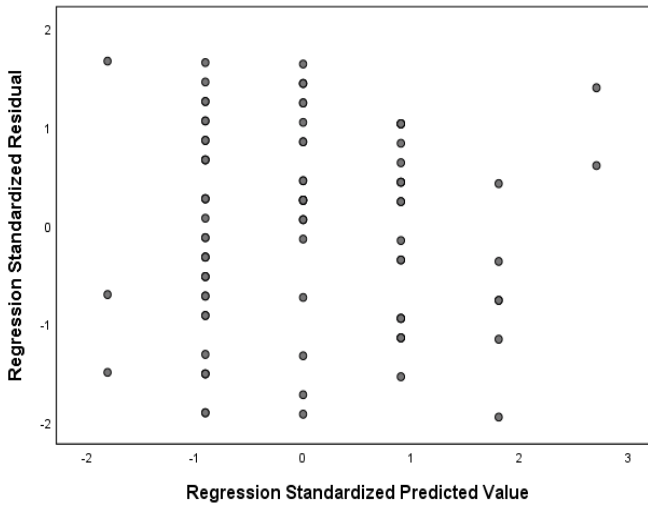
K4: Absorptive Capacity on the Performance of the NTBFs



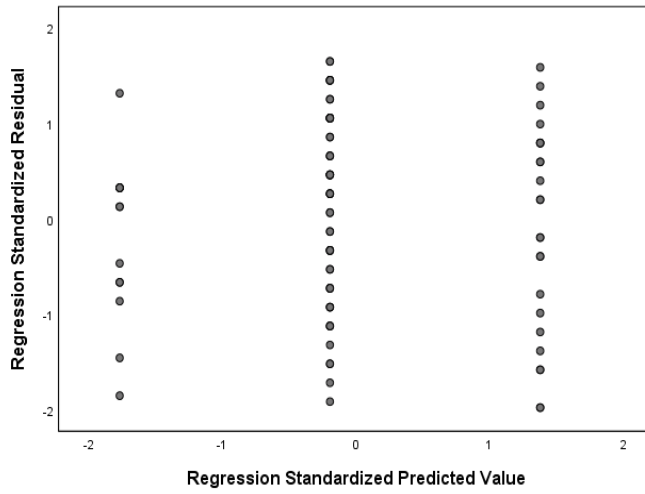
K5: The size of the NTBFs on the Performance of the NTBFs



K6: NTBF's Age on the performance of the NTBFs



K7: The Level of Innovativeness on the Performance of the NTBFs



APPENDIX H: RESULTS OF COMMON METHOD BIAS

Appendix H describes the results of Herman’s Single Factor Test associated with common method bias.

Component	Total Variance Explained			Extraction Sums of Squared Loadings		
	Total	Initial Eigenvalues	Cumulative %	Total	Loadings	Cumulative %
		% of Variance			% of Variance	
1	9,381	18,393	18,393	9,381	18,393	18,393
2	4,119	8,076	26,469			
3	3,538	6,937	33,406			
4	3,194	6,263	39,669			
5	2,748	5,387	45,057			
6	2,115	4,146	49,203			
7	2,019	3,960	53,163			
8	1,846	3,619	56,782			
9	1,691	3,316	60,098			
10	1,538	3,016	63,114			
11	1,317	2,583	65,697			
12	1,276	2,501	68,198			
13	1,197	2,348	70,546			
14	1,178	2,311	72,857			
15	1,106	2,168	75,025			
16	,952	1,867	76,891			
17	,940	1,842	78,734			
18	,820	1,607	80,341			
19	,791	1,551	81,892			
20	,709	1,390	83,283			
21	,651	1,277	84,560			
22	,638	1,250	85,810			
23	,560	1,099	86,909			
24	,536	1,050	87,959			
25	,525	1,029	88,989			
26	,482	,946	89,935			
27	,459	,899	90,834			
28	,435	,852	91,686			
29	,417	,818	92,504			
30	,368	,722	93,227			
31	,326	,640	93,866			
32	,323	,634	94,500			
33	,308	,604	95,105			

34	,280	,550	95,654		
35	,264	,518	96,172		
36	,240	,471	96,643		
37	,199	,390	97,033		
38	,190	,373	97,405		
39	,176	,346	97,751		
40	,165	,324	98,075		
41	,147	,288	98,363		
42	,137	,268	98,631		
43	,125	,245	98,875		
44	,114	,223	99,098		
45	,093	,183	99,281		
46	,086	,169	99,450		
47	,081	,159	99,609		
48	,065	,127	99,736		
49	,056	,111	99,846		
50	,044	,087	99,933		
51	,034	,067	100,000		

Extraction Method: Principal Component Analysis.

