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The Implementation of Open Innovation in Hungary

Theses of the Doctoral (PhD) Dissertation

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1. Background and Objectives of the Research

1.1. Relevance of the Topic and the Research Gap

Open innovation is one of the most dynamically developing areas of innovation management. According to the fundamental premise of Chesbrough (2003), companies should use both internal and external ideas, as well as internal and external paths to market, to advance their technologies. Over the past two decades, the concept has developed into a distinct research stream. Nevertheless, conceptual and empirical debates continue, particularly concerning the measurement of the phenomenon, the separation of levels of analysis, and the context-dependent validity of the concept (Bogers et al., 2017; Laursen & Salter, 2023).

A central motivation for this research is the geographical asymmetry of the literature: most open innovation studies originate from advanced innovation systems, large-company settings, and technology-intensive industries, while empirical research on Central and Eastern Europe remains limited (Gao et al., 2020). An open question, therefore, is how, and to what extent, the paradigm translates into firm-level practice in a peripheral innovation system characterized by comparatively low innovation performance.

Hungary offers a particularly illustrative case in this regard. In the 2024 European Innovation Scoreboard (EIS), Hungary was classified among Moderate Innovators (SII = 77.6% of the EU average). The domestic innovation system is characterized by a dual structure: a narrow group of high-performing firms (HIDE firms, representing approximately 0.3% of active enterprises) coexists with a broad SME segment exhibiting lower levels of innovation activity. Moreover, relatively few Hungarian studies focus specifically on the empirical investigation of open innovation.

Open innovation is a multilevel phenomenon involving intra-firm, organizational, interorganizational, and ecosystem-level processes (Bogers et al., 2017). In view of ongoing measurement debates (Laursen & Salter, 2023), the dissertation does not seek to construct a single aggregate indicator. Instead, it applies an analytical framework that examines and jointly interprets distinct dimensions of open innovation—from cultural framework conditions through institutional linkages to the use of tools at firm level.

1.2. Research Objectives and Research Questions

The dissertation has two objectives. First, it empirically examines how tools and opportunities associated with open innovation are manifested among Hungarian SMEs, including whether a lack of awareness of particular opportunities can be identified among some firms that do not use them. Second, it interprets how patterns identified at different levels of analysis—cultural profiles, institutional linkages, and firm-level tool use—complement one another in describing the emergence of open innovation in Hungary.

The research addresses three interrelated research questions:

- **RQ1 (macro level): How are national cultural characteristics—particularly the individualism (IDV) and indulgence (IND) dimensions of Hofstede's model—associated with innovation performance across EU Member States, and how does Hungary's cultural profile compare with the broader EU picture?**
- **RQ2 (meso level): To what extent do Hungarian SMEs engage in innovation cooperation with Triple Helix actors, and what associations can be observed between this engagement and firm size, ownership structure, and industry affiliation?**
- **RQ3 (micro level): What types of open innovation tools do Hungarian SMEs employ, and how is their use associated with ownership structure, proactive partner search, and awareness of specific open innovation opportunities?**

The three questions are interdependent: RQ1 examines the relationship between cultural profiles and innovation performance at the level of framework conditions; RQ2 investigates the extent to which institutional linkages are present among firms; and RQ3 addresses how open innovation manifests itself through the concrete tools used by companies.

2. Research Design and Methodology

2.1. Three-Level Research Architecture

The theoretical foundation of the multilevel analysis is the micro–meso–macro approach widely used in the social sciences, particularly Coleman's (1994) "boat model", which provides a framework for analyzing links between macro-level social phenomena and micro-level actions—in this case, firm behavior. Accordingly, the dissertation distinguishes three levels of analysis. Their theoretical frameworks, phenomena under study, and methods are summarized in Table 1. The empirical chapters follow a consistent sequence: research question, theoretical background, hypotheses, operationalization, methodology, findings, evaluation, and theses.

1. Table: Three-Level Research Architecture of the Dissertation (Source: author's compilation)

Level	Theoretical framework	Phenomenon examined	Data and methods	Hypotheses
Macro (RQ1)	Hofstede's cultural dimensions; European Innovation Scoreboard	National culture and innovation performance in the EU; Hungary's cultural profile	EU-26 country data; Pearson correlation, OLS regression, independent-samples t-test, descriptive comparison	H1–H3
Meso (RQ2)	Triple Helix (Etzkowitz & Leydesdorff, 1995, 2000)	Presence and firm-level determinants of university, government, and industry linkages	N = 250 SMEs; descriptive statistics, chi-square tests, binary logistic regression	H4/a–b
Micro (RQ3)	Dahlander & Gann (2010) typology; awareness gaps	Financial and non-financial tool use; ownership; proactive partner search; awareness of opportunities	N = 250 SMEs; McNemar and Wilcoxon tests, chi-square tests, logistic regression	H5/a–c

2.2. Data Sources and Sample

Macro level. The RQ1 analysis draws on two secondary data sources. Innovation performance is measured by the Summary Innovation Index (SII) of the EIS 2024, which combines 32 indicators into a single composite score. Cultural characteristics are operationalized using scores for Hofstede's six dimensions (PDI, IDV, MAS, UAI, LTO, and IND). The sample covers 26 EU Member States; Cyprus was excluded because of missing data. To examine temporal dynamics, a binary variable was constructed from EIS group classifications in 2017 and 2024 (1 = moved to a higher EIS group; 0 = did not move to a higher group).

Meso and micro levels. Analyses RQ2 and RQ3 are based on an original questionnaire survey conducted in September and October 2025. The final dataset contains 250 valid company responses from Hungarian firms with 10–249 employees, covering all Hungarian counties and nine industries. The questionnaire was completed by business owners or employees with knowledge of their company's innovation activities. As non-probability sampling was used, the sample cannot be considered statistically representative of the entire Hungarian SME population. The main sample characteristics are presented in Table 2.

2. Table: Main Characteristics of the Survey Sample (N = 250) (Source: author's calculations)

Characteristic	Distribution
Size (number of employees)	Small enterprises (10–49): 74.8%; medium-sized enterprises (50–249): 25.2%
Ownership background	Domestic private: 78.8%; foreign: 7.2%; mixed: 6.0%; state-owned: 2.4%
Export activity	Exports: 28.0%
Registered intellectual property (past five years)	Has registered IP: 6.8%

Triple Helix linkage is measured using three binary variables: the university helix (innovation cooperation with a university or research institute), the industry helix (cooperation with another company or within a corporate group), and the government helix, represented by receipt of R&D&I funding as a proxy, following the approach of Hernández-Trasobares and Murillo-Luna (2020). At the micro level, tool use is operationalized through 16 open innovation activities, classified—based on Dahlander and Gann's (2010) typology—into two aggregated categories: eight financial, formalized (FP) tools and eight non-financial, less formalized (NP) tools.

2.3. Analytical Methods

The RQ1 analysis follows the two-stage research design developed and published by Végh, Szabó, and Kovács (2025). First, Pearson correlation analysis and multivariate ordinary least squares (OLS) regression examine cross-sectional associations between cultural dimensions and the SII, using both a full six-predictor model and a reduced model based on multicollinearity diagnostics (variance inflation factors, VIFs). Second, an independent-samples t-test determines whether countries whose EIS group classification improved between 2017 and 2024 differ in their IDV and IND scores from countries whose classification did not

improve. The assumptions are checked using Shapiro–Wilk and Levene tests. Descriptive statistics position Hungary's profile within the EU ranking.

The RQ2 analysis consists of three sequential stages: descriptive statistics on the prevalence of linkages; contingency-table analysis and chi-square tests of differences by firm size and ownership; and binary logistic regressions estimated separately for each helix (and for linkage to any helix), with firm size, ownership background, export activity, and possession of intellectual property as explanatory variables.

In the RQ3 analysis, the presence of financial versus non-financial tools is compared using McNemar's test, since observations are paired within the same companies; the numbers of tools are compared using the Wilcoxon signed-rank test. The role of ownership is examined using chi-square tests, odds ratios, and logistic regression with control variables. The association between partner-search behavior and tool use is examined using chi-square tests, while barriers to tool use are explored through frequency analysis. All analyses were conducted in Python (statsmodels, scipy, pandas).

3. Hypotheses and Main Findings

3.1. Macro Level (RQ1): National Culture and Innovation Performance

The dissertation formulates three hypotheses for RQ1:

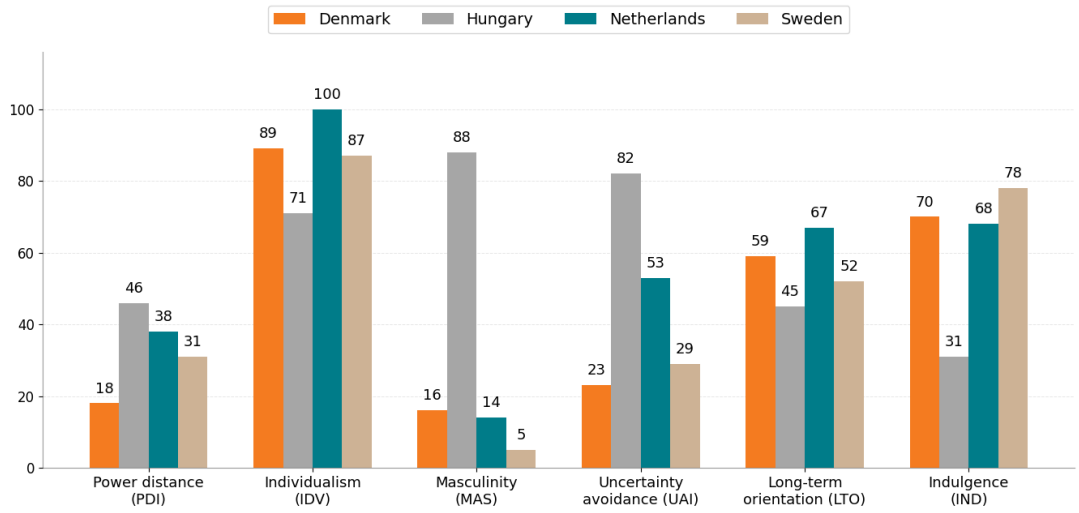
- **H1:** Individualism (IDV) and indulgence (IND) are positively and significantly associated with innovation performance, measured by the Summary Innovation Index (SII), across EU Member States.
- **H2:** EU Member States that improved their EIS group classification between 2017 and 2024 have significantly higher IDV and IND scores than countries that did not improve their classification.
- **H3:** In comparison with other EU Member States, Hungary's IDV and IND scores do not indicate a uniformly favorable cultural profile for innovation.

Correlation analysis reveals strong and significant positive associations between the SII and both IDV ($r = 0.70$; $p = 0.0001$) and IND ($r = 0.69$; $p = 0.0001$). PDI is negatively associated with the SII ($r = -0.58$; $p = 0.0017$), while LTO shows a moderate positive association ($r = 0.49$; $p = 0.011$); the relationships for MAS and UAI are not significant. In the six-predictor regression model ($R^2 = 0.692$; adjusted $R^2 = 0.595$), IND is the only significant predictor ($b = 0.639$; $p = 0.031$). The IDV coefficient is positive but not significant ($p = 0.187$), partly in the context of high multicollinearity (VIF = 40.9). In the reduced model containing only IDV and IND, both dimensions are significant (IDV: $p = 0.010$; IND: $p = 0.015$), while explanatory power is maintained (adjusted $R^2 = 0.591$). H1 is partially supported.

The group comparison shows that neither IDV ($p = 0.585$) nor IND ($p = 0.368$) significantly distinguishes countries that improved their EIS group classification from those that did not. H2

is not supported: the cultural dimensions are associated with the current level of innovation performance, but not with improvement over time.

Hungary's cultural profile is mixed (Figure 1). IDV (71; EU average 66.5; 10th place) indicates a relatively favorable position, whereas IND (31; EU average 42.5; 17th place) indicates a relatively unfavorable position; high uncertainty avoidance (UAI = 82) adds further nuance. H3 is supported: the profile may contribute to understanding domestic innovation performance, but by itself explains neither Hungary's EIS classification nor its change over time.



1. Figure: Hungary's Cultural Profile Compared with Countries Among the EIS Innovation Leaders (Source: author's compilation based on the Hofstede comparison tool, 2026)

3.2. Meso Level (RQ2): Triple Helix Linkages

Two hypotheses are associated with RQ2:

- **H4/a:** Innovation cooperation with Triple Helix actors is relatively uncommon among Hungarian SMEs, and its presence is significantly associated with firm size.
- **H4/b:** Foreign-owned and mixed-ownership firms are significantly more likely to exhibit Triple Helix linkages than domestically privately owned firms.

Triple Helix integration is selective and fragmented. The industry helix is the most common (34.4%), followed by the proxy for the government helix (18.4%); the university helix is the least common (9.2%). Of the firms, 58.0% have no linkage to any helix actor, 26.4% are linked to one helix, 11.2% to two, and only 4.4% to all three. Linkage is significantly associated with size for each helix (Table 3), and logistic regression indicates a size effect at the trend level (OR = 1.46–1.72; $p < 0.1$). **H4/a is supported.**

3. Table: Triple Helix Linkages by Firm Size and Ownership Background (N = 250) (Source: author's calculations)

Helix	10–49 employees	50–99 employees	100–249 employees	χ^2 (p) – size	Domestic private	Foreign / mixed	p – ownership
University	7.0%	3.2%	28.1%	16.18 (<0.001)	8.1%	12.1%	0.674
Government	15.0%	25.8%	31.2%	6.11 (0.047)	19.3%	21.2%	0.984
Industry	28.9%	48.4%	53.1%	10.19 (0.006)	30.5%	57.6%	0.005
Any helix	36.4%	54.8%	62.5%	10.06 (0.007)	38.6%	63.6%	0.012

The effect of ownership background is helix-specific. Foreign-owned and mixed-ownership firms are more frequently linked to the industry helix (57.6% vs. 30.5%; $\chi^2 = 8.06$; $p = 0.005$) and to at least one helix overall (63.6% vs. 38.6%; $p = 0.012$), but there is no significant difference for the university or government helices. In logistic regression, foreign/mixed ownership shows a negative association with the university helix (OR = 0.18; $p = 0.050$). The university-helix model has the greatest explanatory power (McFadden pseudo-$R^2 = 0.262$), with export activity (OR = 7.60) and possession of intellectual property (OR = 11.48) highly significant ($p < 0.001$). For the government helix, only intellectual property is significant (OR = 9.61; $p < 0.001$). **H4/b is partially supported.**

3.3. Micro Level (RQ3): Use of Open Innovation Tools

Three hypotheses are associated with RQ3:

- **H5/a:** Non-financial, informal open innovation tools are significantly more prevalent among Hungarian SMEs than financial, formalized open innovation tools.
- **H5/b:** Foreign-owned and mixed-ownership firms are significantly more likely to use financial, formalized open innovation tools than domestically privately owned firms, while the difference is not significant for non-financial, informal tools.
- **H5/c:** Proactive partner search is significantly associated with the use of open innovation tools, while a lack of awareness of specific opportunities can be identified as a barrier among some firms that do not use such tools.

All four of the most prevalent tools are non-financial: engagement of innovation intermediaries (17.2%), informal networking and knowledge exchange (13.6%), free-of-charge support from nonprofit organizations (12.4%), and customer involvement (11.2%). Among financial tools, patent purchases, sales, and licensing (10.4%) and contracted R&D services (10.0%) are most frequent. At least one non-financial tool is used by 41.6% of firms and at least one financial tool by 24.8%; 66 firms use only non-financial tools and 24 only financial tools (McNemar $\chi^2 = 18.678$; $p < 0.001$; Wilcoxon $W = 1726.5$; $p < 0.001$). A total of 48.8% of firms use no open innovation tools. **H5/a is supported.**

In the bivariate analysis, 42.4% of foreign-owned and mixed-ownership firms use financial tools, compared with 22.3% of domestic firms ($\chi^2 = 5.031$; $p = 0.025$; OR = 2.562), whereas the difference in non-financial tool use is not significant ($p = 0.706$). However, in logistic regression controlling for size, exports, and intellectual property (N = 230, excluding state-owned firms), the ownership effect is no longer significant (OR = 1.541; $p = 0.353$). Possession of intellectual property, by contrast, is strongly and positively associated with financial tool use (OR = 6.475; $p = 0.001$). **H5/b is partially supported.**

Among firms engaged in cooperation (N = 94), 96.5% of those proactively seeking partners use at least one open innovation tool, compared with 44.4% of firms approached as partners ($\chi^2 = 22.004$; $p < 0.001$). Among non-users (N = 122), the most frequently reported barriers are lack of knowledge (54.9%) and skills (54.1%); 24.6% also report that "the opportunity was not known". H5/c is supported.

3.4. Overall Evaluation of the Hypotheses

4. Table: Summary Evaluation of the Dissertation Hypotheses (Source: author's compilation)

Level	Hypothesis	Content (summary)	Result	Key evidence
RQ1	H1	Positive association of IDV and IND with SII in the EU	Partially supported	IND significant in both models; IDV in reduced model
RQ1	H2	Countries with favorable cultural profiles advance in EIS groups (2017–2024)	Not supported	IDV: $p = 0.585$; IND: $p = 0.368$
RQ1	H3	Hungary's IDV and IND profile is not uniformly favorable	Supported	IDV = 71 (10th); IND = 31 (17th)
RQ2	H4/a	Low prevalence of Triple Helix linkages; association with firm size	Supported	58.0% have no linkages; $p < 0.05$ for each helix
RQ2	H4/b	Foreign/mixed ownership and greater Triple Helix linkage	Partially supported	Industry helix $p = 0.005$; negative direction for university helix
RQ3	H5/a	Greater prevalence of non-financial tools	Supported	NP 41.6% vs. FP 24.8%; $p < 0.001$
RQ3	H5/b	Foreign/mixed ownership and financial tool use	Partially supported	Bivariate $p = 0.025$; not significant with controls; IP OR = 6.475
RQ3	H5/c	Proactive partner search and tool use; awareness gap	Supported	96.5% vs. 44.4% ($p < 0.001$); awareness gap 24.6%

4. Original Scientific Contributions – Theses of the Dissertation

Based on the findings, the dissertation puts forward the following theses. Each is associated with a particular level of analysis, while the integrative thesis synthesizes findings across all three levels.

Macro-Level Theses (RQ1)

Thesis T1

Based on an empirical analysis of EU Member States, indulgence (IND) is significantly and positively associated with aggregate innovation performance (SII) and is a significant predictor in both the full and reduced regression models. Individualism (IDV) also shows a strong positive correlation with the SII, but in the multivariate analysis it remains significant only in the reduced specification. The findings thus support the conclusion that IND, and to a more limited extent IDV, are cultural dimensions associated with innovation performance across EU Member States; the analysis cannot establish causality.

Thesis T2

In the comparison based on changes in EIS group classification between 2017 and 2024, no statistically significant differences were identified in either individualism (IDV) or indulgence (IND) between EU Member States that moved up in innovation classification and those that did not. Within the analytical framework applied, neither cultural dimension significantly differentiated improving from non-improving countries. This suggests that the relationship of IDV and IND with the current level of innovation performance cannot automatically be extended to explain changes in EIS group classification over time.

Thesis T3

Hungary displays a mixed cultural profile in terms of IDV and IND relative to other EU Member States. Its individualism score (IDV = 71; 10th among EU27) indicates a relatively more favorable position for innovation, whereas its indulgence score (IND = 31; 17th among EU27) indicates a relatively less favorable position according to the interpretive framework derived from the literature. Considered together, the two dimensions do not indicate a uniformly favorable or unfavorable cultural profile. Hungary's cultural profile may contribute to the interpretation of innovation performance, but does not, by itself, explain either the country's EIS classification or changes therein over time.

Meso-Level Theses (RQ2)

Thesis T4/a

Innovation cooperation with Triple Helix actors is uncommon among Hungarian SMEs and is significantly associated with firm size. Of the surveyed firms, 58.0% have no linkage to any helix actor, and only 4.4% have simultaneous linkages to all three. The association between size and linkage is significant for every helix according to chi-square tests; logistic regression also indicates a size effect at the trend level ($p < 0.1$).

Thesis T4/b

Foreign-owned and mixed-ownership firms are significantly more likely than domestically privately owned firms to exhibit Triple Helix linkages. However, this association is helix-specific rather than general. A positive association is observed for the industry helix, whereas logistic regression indicates an association in the opposite direction for the academic helix. This suggests that relationships between ownership structure and Triple Helix linkages differ among the individual helix actors.

Micro-Level Theses (RQ3)

Thesis T5/a

Non-financial, informal open innovation tools are significantly more prevalent among Hungarian SMEs (41.6%) than financial, formalized tools (24.8%). Both McNemar's test ($\chi^2 = 18.678$; $p < 0.001$) and the Wilcoxon signed-rank test ($W = 1726.5$; $p < 0.001$) statistically confirm the predominance of non-financial tools. The finding shows that, among the surveyed Hungarian SMEs, less formalized open innovation mechanisms are more common than formalized financial mechanisms.

Thesis T5/b

In bivariate analysis, financial, formalized open innovation tools are used significantly more often by foreign-owned and mixed-ownership firms than by domestically privately owned firms (42.4% vs. 22.3%; $\chi^2 = 5.031$; $p = 0.025$; OR = 2.562), whereas the difference for non-financial tools is not significant ($p = 0.706$). However, in multivariate logistic regression controlling for other factors, the association between ownership structure and financial tool use is no longer significant (OR = 1.541; $p = 0.353$), while possession of intellectual property shows a strong positive association with formalized tool use (OR = 6.475; $p = 0.001$). Accordingly, foreign or mixed ownership is associated with formalized tool use at the bivariate level, but the association cannot be interpreted as an independent ownership effect.

Thesis T5/c
Proactive partner search is significantly associated with open innovation tool use among cooperating Hungarian SMEs. At least one open innovation tool is used by 96.5% of firms proactively seeking partners, compared with 44.4% of those approached as partners (χ^2 = 22.004; $p < 0.001$). Among firms not using open innovation tools, 24.6% identify a lack of awareness of specific opportunities as a barrier. These findings support both the association between proactive partner search and tool use, and the existence of an awareness gap among some non-user firms.

Cross-Level Integrative Thesis

Integrative Thesis
The empirically identified patterns of open innovation in Hungary can be interpreted as reflecting an early stage of diffusion of the paradigm. This picture emerges from the combined presence of limited institutional linkages, the predominance of non-financial and less formalized firm-level tools, and a lack of awareness of certain open innovation opportunities. The integrative thesis does not amount to empirical proof of causal relationships between these factors; rather, it provides a synthesis of findings across the three levels of analysis. At the same time, this interpretation does not exclude the possibility that the observed patterns reflect a more persistent configuration adapted to the Hungarian innovation environment. Distinguishing these interpretations would require longitudinal and qualitative research.

5. Theoretical and Practical Applicability of the Findings

5.1. Theoretical Contributions

The theoretical contribution of the dissertation lies not in developing a new deterministic model of open innovation, but in contextualizing and connecting existing approaches. It interprets the emergence of open innovation in Hungary as complementary patterns identifiable at multiple levels of analysis. Relationships across the three levels are presented as an integrative interpretive framework rather than a causal model.

(1) Context-dependent diffusion of open innovation. Literature based on experience in advanced systems may implicitly assume that open innovation opportunities and tools are widely known among firms. The results qualify this assumption: some non-users lack awareness of particular opportunities, and less formalized, non-financial tools are more common than formalized ones. In this sense, paradigm asynchrony can be proposed as an interpretive possibility whereby an approach regarded as mature in the international literature may emerge at different rates and in different forms at firm level across innovation systems. Establishing its general validity requires further research.

(2) Refining the relationship between culture and innovation performance. The research distinguishes associations between cultural dimensions and the current level of innovation performance from associations with change over time. IDV and IND are positively associated with the level of the SII but do not differentiate countries that advance in EIS group classification. Culture can therefore be interpreted as a persistent but non-determinative framework condition rather than an independent mechanism explaining progress in innovation performance.

(3) Analytical distinction between institutional linkages and firm-level tool use. Triple Helix linkages and the use of open innovation tools are not identical phenomena: the former describes how a firm connects to the innovation system, while the latter refers to its application of specific mechanisms. Associations involving ownership background are both helix- and model-specific, whereas possession of intellectual property is consistently strongly associated with formalized tool use. Thus, the relationships among ownership, institutional linkages, and tool use are complex and context-dependent.

5.2. Practical Implications

The results suggest policy- and firm-level implications in four areas:

- **Strengthening intellectual-property awareness and formalization.** Possession of intellectual property shows the strongest association with the use of formalized, financial open innovation tools (OR = 6.475), yet only 6.8% of sampled firms hold registered intellectual property. Building IP-related knowledge and capabilities is therefore a relevant area for intervention.
- **Strengthening the intermediary system.** The proportion of companies connected to the academic and government helices is lower than the share involved in industry cooperation. Developing technology transfer offices, innovation agencies, and regional innovation networks could facilitate connections between SMEs and other innovation-system actors.
- **Increasing awareness of open innovation opportunities.** Among non-users, 24.6% report a lack of awareness of opportunities. Industry associations, chambers of commerce, innovation intermediaries, and university entrepreneurship-development programs could provide appropriate outreach channels.
- **Strengthening inter-firm cooperation.** The industry helix is the most common form of linkage, making clusters, industry associations, and supply-chain-based innovation programs potential entry points. These should complement, rather than replace, efforts to strengthen academic and government linkages.

6. Research Limitations and Directions for Future Research

Limitations. The RQ1 analysis is based on 26 country-level observations, which limits the statistical power of multivariate regression; high multicollinearity in the full model (IDV: VIF

= 40.9) makes it difficult to isolate individual effects. The most important limitation of RQ2 is the proxy-based measurement of the government helix: receipt of R&D&I funding captures only the financial dimension of such linkages. Cross-sectional data permit the identification of associations only, while the non-probability sample is not representative and inference from industry subsamples is limited. In RQ3, the partner-search variable is available only for cooperating firms (N = 94), which may produce upward-biased estimates. Tool use is self-reported, and the awareness gap is measured by a single survey variable. Organizational and cooperation culture are not examined directly.

Directions for Future Research:

- **Longitudinal study:** a three-to-five-year panel study of the same firms to test the dynamic effects of cultural and institutional factors.
- **Qualitative investigation of intermediary organizations:** interviews with technology transfer offices, incubators, and chambers of commerce to understand the reasons and mechanisms underlying weak academic and government linkages.
- **Improving the measurement of awareness gaps:** developing an instrument that distinguishes knowledge of the open innovation concept, awareness of individual tools, and intention to use them strategically.
- **International comparison:** applying the same methodology in Poland, the Czech Republic, and Romania to test the proposition of paradigm asynchrony.
- **Identifying transferable good practices:** comparative case studies (e.g., Estonia, Slovenia, Denmark) of institutional arrangements that could be adapted to the Hungarian context.

7. Author's Publications Related to the Dissertation

Peer-Reviewed Journal Articles

Végh, M., Szabó, I., & Kovács, A. (2025). Innovation in your blood? Exploring the influence of culture on national-level innovation performance in the European Union. *Journal of Innovation & Knowledge*, 10(5), 100791. https://doi.org/10.1016/j.jik.2025.100791

Kovács, A., Végh, M., & Szabó, I. (2025). Nyílt innováció és mesterséges intelligencia: az új innovációmenedzsment dimenziói [Open innovation and artificial intelligence: new dimensions of innovation management]. Marketing & Menedzsment, 59(Special Issue 1), 52–61.

Manuscripts Under Review

Végh, M., Birkner, Z., & Szabó, I. Relational access and formalized governance in SME innovation management systems: Evidence from open innovation practices in 250 Hungarian firms. Submitted to the Journal of Innovation Management; under review.

Szabó, I., Birkner, Z., & Végh, M. Route-specific external innovation access: University, inter-firm and public-funding linkages in a sample of 250 Hungarian SMEs. Submitted via EasyChair (Acta1034, ID: 7939); under review.

Preprint

Szabó, I., Kovács, A., & Végh, M. (2026). Government-based co-creation and eco-innovation in the European Union: Institutional foundations, innovation performance, and a mediation analysis. *SSRN*, 39 p. https://doi.org/10.2139/ssrn.6362171

Conference Proceedings and Abstracts

Végh, M. (2025). Mapping Hungary's business environment: Ownership, structure and regional disparities. In V. Nagy-Borsy (Ed.), European Conference on Innovation Management – "VALUE-ADDED: Prism of possibilities" (p. 79).

Végh, M. (2024). A nyílt innováció helyzete Európa gazdaságaiban: nyitottság és innovációs teljesítmény kapcsolata [Open innovation in European economies: the relationship between openness and innovation performance]. In Sz. Bene (Ed.), XXX. Ifjúsági Tudományos Fórum: Konferenciakötet [30th Youth Scientific Forum: Proceedings] (pp. 136–141). Keszthely: Hungarian University of Agriculture and Life Sciences, Georgikon Campus.

Kovács, A., & Végh, M. (2024). Nyílt innováció és mesterséges intelligencia: az innovációmenedzsment új dimenziói [Open innovation and artificial intelligence: new dimensions of innovation management]. In B. Fehérvölgyi, N. Obermayer, & T. Csizmadia (Eds.), I. Gaál Zoltán Konferencia: Absztraktkötet [First Zoltán Gaál Conference: Abstract Book] (p. 76). Veszprém: University of Pannonia, Faculty of Business and Economics.

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