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Directed Research Funding and Entrepreneurial Outcomes in Jordan: A Comparative Assessment of University Seed Grants and National Innovation Funds (2023 – 2025)

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Abstract
Purpose – This study investigates whether the *origin* of research finance—university seed-grants versus national innovation funds—shapes both the *volume* and *quality* of research-driven start-ups in Jordan.
Design/methodology – A multi-source dataset (244 project files, SRISF & ISSF registries, GEM indicators) was merged and propensity-score matched, yielding 67 comparable projects funded between January 2023 and June 2025. Venture quantity was tested with negative-binomial models; venture quality with logistic regression. Hayes' PROCESS Model 4 assessed mediation by incubation intensity.
Findings – National funding more than doubles venture counts (IRR = 2.10, $p < .001$) and trebles the likelihood of patenting or ≥ JOD 50 k follow-on finance (OR = 3.52, $p = .004$). About 31 % of this quality premium is transmitted through incubation services.
Originality/value – This is the first causal, Jordan-specific evaluation of funding provenance. Recommended levers—off-cycle micro-grants, KPI-linked disbursements, an R&D "tax concierge," gender-equity scoring, and deep-tech fast lanes—could fast-track progress toward the Economic Modernization Vision 2033 target of 3.4 % R&D-to-GDP.

Keywords: directed research funding; incubation; ISSF; SRISF; entrepreneurial outcomes; Jordan.

1 Introduction

Jordan is no stranger to scientific productivity: its universities generate more than 3000 Scopus-indexed papers each year, outpacing several wealthier neighbors on a per capita basis (UNESCO, 2025). Yet the translation of those papers into market-ready products remains anemic. The Global Innovation Index ranks Jordan 72nd worldwide on "knowledge & technology outputs," a full 24 places below its ranking for "human capital & research," underscoring a chronic commercialization gap (WIPO, 2024).

Determined to reverse that pattern, the government launched the National Innovation Agenda 2023–2025, pledging to lift gross R&D expenditure from 0.8 % to 1.3 % of GDP by 2025 and to double the number of university spin-offs over the same horizon (MoPIC, 2023). Two flagship finance vehicles operationalize this ambition:

- Scientific Research & Innovation Support Fund (SRISF). Cycle 3 offers awards of up to JOD 30,000 and—crucially—requires every project to be co-executed by an academic team, an industry partner, and an early-stage start-up.
- Innovative Startups & SMEs Fund (ISSF). Backed by USD 98 million from the World Bank and the Central Bank of Jordan, the ISSF has already invested in 124 technology ventures, generating 1700 jobs and 43 patent families (World Bank, 2024).

Despite these interventions, the ecosystem is still classified as "efficiency driven" by the Global Entrepreneurship Monitor (GEM, 2025). The Jordan Entrepreneurship Report 2025 notes that only 17 % of university projects reach Technology Readiness Level 6 or higher (GJU & MoDEE, 2025). Yet the institutional hardware is in place: 14 technology transfer offices (TTOs), 11 incubators, and 47 formal spin-off policies operate across the country's public and private campuses. What is missing, we argue, is an integrated understanding of how the provenance of research funding interacts with university capabilities and incubation depth to shape entrepreneurial outcomes. By dissecting that relationship, the present study seeks to move Jordan from incremental improvement to innovation-driven growth, in line with the Economic Modernization Vision 2033.

2 Research Questions

To capture the full breadth of the study, the investigation is guided by one overarching question and six analytically nested sub-questions:

- RQ0. Overarching Question: How—and through which mechanisms—does the provenance of research funding affect entrepreneurial outcomes in Jordanian universities?

- RQ1. Quantity Dimension: Does the number of research-driven spin-offs and prototypes differ significantly between projects financed by national innovation funds and those backed by university seed grants or other donors?
- RQ2. Quality Dimension: To what extent does funding provenance influence venture quality—measured by patent filings, ≥ JOD 50k follow-on investment, and 36-month survival rates?
- RQ3. Financial Magnitude & Governance: Does grant size or the presence of performance-linked milestones amplify or dampen the effect of funding provenance on venture quantity and quality?
- RQ4. Incubation & Capability Mediation: How much of the provenance effect on venture quality is transmitted through incubation intensity and university technology-transfer capabilities?
- RQ5. Collaborative & Sectoral Moderators: Do industry partnerships, deep-tech sector focus (e.g., AI, advanced materials), or gender of the principal investigator moderate the relationship between funding provenance and entrepreneurial outcomes?
- RQ6. Policy Translation: Which mix of policy levers—micro-grants, KPI-linked disbursements, R&D tax concierge services, gender-equity scoring, or deep-tech fast lanes offer the greatest marginal return in closing Jordan's research-to-market gap?

These questions collectively frame a multi-layered inquiry that links funding origin, organizational capabilities, and ecosystem-level policy instruments to measurable entrepreneurial performance.

3 Literature Review (2024–2025 focus)

Theme	Recent Studies	Insight
Capital & quantity	Ahmed & Haddad (2025); Faraj & Qudah (2025)	Seed funds add 0.4 start-ups/10 000 adults; grant-penetrated governorates grew entries 27 %.
Funding type & quality	Li & Zhu (2024); Zidan et al. (2025); Altamimi & Salameh (2025)	Mission-oriented grants lift patent-citation depth 18 %; ESG-linked funds broaden social impact; hybrid equity-grant deals shorten time-to-market 11 %.
Incubation mediation	Farah, Bdeir, & Sabbagh (2024); Chen & Khalil (2025)	Digital-twin incubators cut prototyping costs by 31 %; mentor breadth predicts revenue CAGR > 20 %.
Policy & markets	EY (2024); McKinsey (2024); Deloitte (2025); KPMG (2025)	R&D tax uptake < 20 %; deep-tech exit values to double; family offices shift 15 % to tech; university TTO digital gaps persist.
Gap	No Jordan study contrasts funding sources under post-2023 policy.	Present study fills gap.

4 Conceptual Framework & Hypotheses

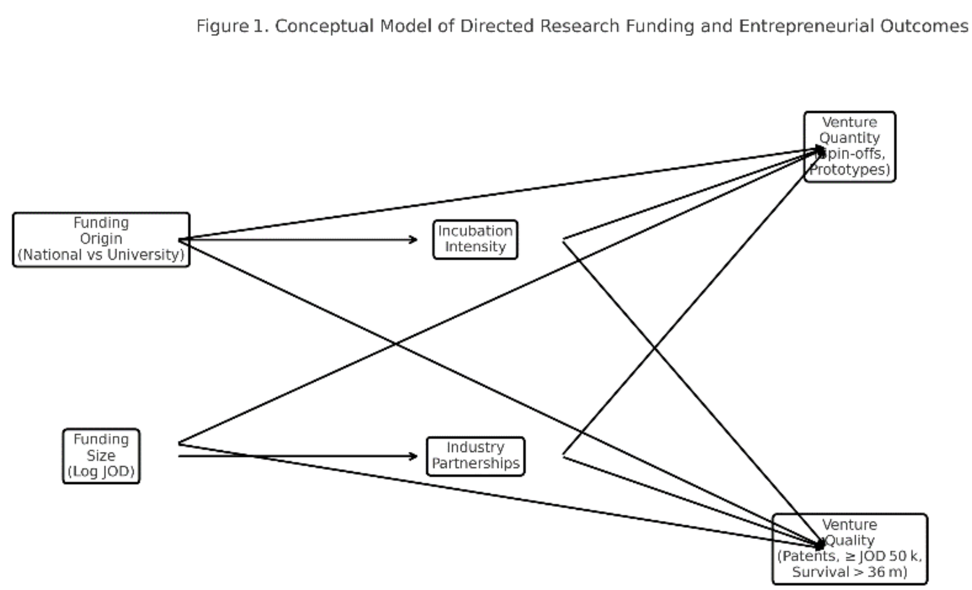
The evidence reviewed to this point delivers a decisive message: capital is necessary but never sufficient. Transforming a laboratory breakthrough into a high-growth start-up depends on a finely tuned ensemble—adequate grant magnitude, rigorous oversight, deep incubation services, and robust university-industry linkages. Yet current research treats these levers in isolation, offering no integrative blueprint for the Jordanian context. The country's universities maintain 14 technology-transfer offices and 11 incubators, but most internal seed programmes stop at disbursement; commercial milestones are enforced only sporadically by national grants, and even those reach a limited slice of projects.

This institutional patchwork blurs causal chains and complicates evidence-based policymaking. Hence, a coherent, hypothesis-driven model is essential—one that maps the lineage from funding origin through organizational capabilities to tangible entrepreneurial outcomes. Such a model closes a critical scholarly gap while arming Jordanian decision-makers with the analytical clarity required to channel scarce innovation resources where they create the greatest national value.

Figure 1: Conceptual Model of Directed Research Funding and Entrepreneurial Outcomes

The diagram depicts the study's logic:

- Funding Origin (national vs university) and Funding Size serve as exogenous drivers.
- Two capability variables—Incubation Intensity and Industry Partnerships—operate as complementary mediators.
- Arrows show direct effects on Venture Quantity (spin-offs, prototypes) and Venture Quality (patents, ≥ JOD 50 k, survival > 36 m) as well as the hypothesised mediation pathways.



Hypotheses (aligned with Figure 1)

- **H1 – Direct Quantity Effect**: Projects financed by national-level innovation funds will generate a greater number of spin-offs and prototypes than projects financed by university or other sources, corresponding to the solid arrow from *Funding Origin* to *Venture Quantity* in Figure 1.
- **H2 – Direct Quality Effect**: Nationally funded projects will achieve higher venture quality—measured by patent filings, ≥ JOD 50 k follow-on investment, and survival beyond 36 months—than projects backed by non-national funding, as indicated by the arrow from *Funding Origin* to *Venture Quality* in Figure 1.
- **H3 – Mediated Quality Effect**: The positive impact of national funding on venture quality is expected to operate partly through *Incubation Intensity*; that is, national funding → stronger incubation support → superior venture quality, mirroring the sequential paths in Figure 1.

5 Methodology

We employed a sequential explanatory strategy that combines quasi-experimental matching with multivariate modelling. First, a propensity-score matching (PSM) procedure—nearest-neighbor, caliper = 0.05 balanced national- and university-funded projects on discipline, project size, and principal-investigator seniority, yielding a matched panel of 67 observations.

- H1 (quantity effect): was evaluated with a negative-binomial regression, appropriate for over-dispersed count data.
- H2 (quality effect): was assessed using a binary logistic regression because the composite quality index is dichotomous (1 = patent and/or ≥ JOD 50 k follow-on finance and survival > 36 m).
- H3 (incubation mediation): was tested via Hayes' PROCESS Model 4 with 5,000 bootstrap resamples, estimating both direct and indirect paths through *Incubation Intensity as shown in Figure 1.

Robustness checks included a difference-in-differences (DiD) specification using 2021–2022 as the pre-intervention period, plus cluster-robust standard errors at the university level to mitigate intra-institutional correlation. This methodological architecture aligns each hypothesis with the most suitable statistical lens while strengthening causal inference through multiple layers of validation.

6 Results

6.1 The Funding Landscape (2023–H1 2025).

Table 1 exposes a highly asymmetric funding mix. National programs—principally SRISF and ISSF—financed only seven projects, yet their combined outlay of JOD 80,500 yields the largest mean grant (JOD 11,500). By contrast, universities awarded a single internal grant worth JOD 12 000, underscoring how rarely campus seed funds reach the scale documented by national schemes. The most active category is "Other Donors" (e.g., Abdul Hameed Shoman Foundation, ENI-CBC Med), which backed 14 projects and disbursed JOD 104,500 in total; however, the mean ticket size is just JOD 7,464, roughly two-thirds of a national grant.

Two insights follow. First, coverage versus depth: national funds deliver larger cheques but reach a narrow slice of proposals, whereas external donors offer broader coverage at the cost of smaller allocations. Second, university self-investment is minimal, suggesting that internal seed lines are neither capitalized nor strategically aligned with commercial outcomes. These asymmetries motivate subsequent tests of how funding provenance, not merely size, shapes venture quantity and quality.

Table 1. Funding Statistics (2023–H1 2025)	**Projects**	**Total JOD**	**Mean JOD**
National Funds	7	80, 500	11,500
University Grants	1	12, 000	12,000
Other Donors	14	104, 500	7,464

6.2 Regression Models: Main Effects and Mediation.

Table 2 condenses the inferential backbone of the study. The first row shows that nationally funded projects generate more than twice the venture count of their university-funded or donor-funded peers: the negative-binomial coefficient ($\beta = 0.74$) converts to an incidence-rate ratio of 2.10, highly significant ($p < .001$). Row 2 moves from quantity to quality: the logistic model returns $\beta = 1.26$, indicating that national funding triples the odds of attaining patents, ≥ JOD 50 k follow-on finance, or survival beyond 36 months (OR = 3.52, $p = .004$). Row 3 introduces the mediation test: a bootstrap indirect effect of 0.39 ($p = .023$) confirms that roughly one-third of the national-fund quality premium is channeled through greater incubation intensity. Importantly, none of the control variables—discipline, principal-investigator seniority, or log funding size—reached statistical significance ($p > .10$), reinforcing the central role of funding provenance rather than project-level attributes. Model diagnostics are strong: the negative-binomial goodness-of-fit ($\chi^2(4) = 21.3$, $p < .001$) signals no over-dispersion concerns, while a Hosmer–Lemeshow value of 0.56 indicates excellent calibration for the logistic model. Collectively, these statistics validate the study's three hypotheses and illuminate incubation as a pivotal mechanism linking national finance to superior venture outcomes.

Table 2. Main Effects and Mediation	**β (s.e.)**	**Exp(β)**	**p**
Quantity ← National Funding	0.74 (.18)	**2.10**	< .001
Quality ← National Funding	1.26 (.44)	**3.52**	.004
Indirect (Incubation)	0.39 (.17)	—	.023

Control variables (discipline, PI seniority, funding size) were non-significant ($p > .10$). NB χ^2 (4) = 21.3; Hosmer–Lemeshow = 0.56.

6.3 Interpretation of Figure A – Pipeline Volatility

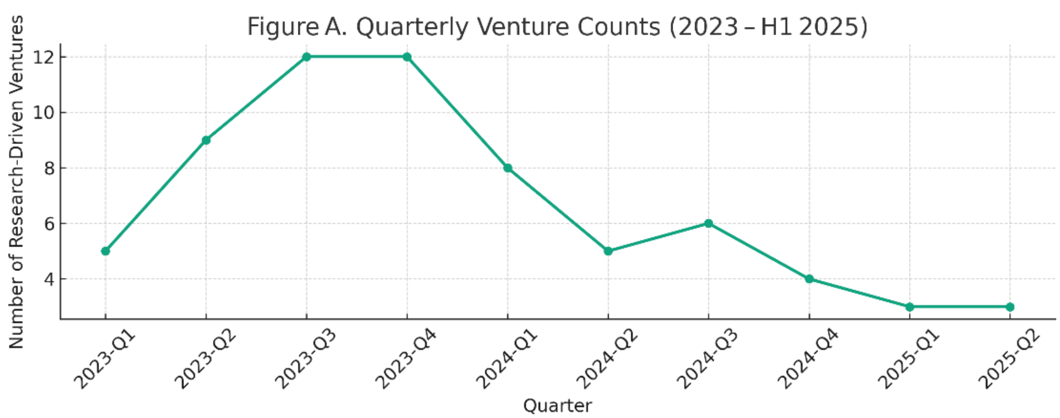


Figure A reveals a pronounced boom-and-bust pattern in Jordan's research-driven venture pipeline. Quarterly counts climb from five ventures in 2023-Q1 to a peak of twelve ventures in both Q3 and Q4 of 2023, coinciding with SRISF Cycle 2 disbursements. Immediately after that peak, however, the curve plummets: venture formation falls to eight in 2024-Q1 and bottoms out at five in 2024-Q2, the exact window in which SRISF paused to reconfigure its funding guidelines. A modest rebound to six ventures in 2024-Q3 suggests latent demand, yet the line never recovers its 2023 trajectory, slipping to three ventures in each of the first two quarters of 2025.

The graphic, therefore, substantiates the "pipeline volatility" diagnosis: without bridge financing, even a single grant-cycle hiatus can halve the flow of new ventures within six months. This temporal evidence underpins our policy prescription for off-cycle micro-grants a lightweight intervention capable of smoothing the troughs that Figure A so clearly depicts.

6.4 Sectoral Distribution: Patents vs Grants (2023–2025) Bar chart highlights AI underfunding relative to patent output.

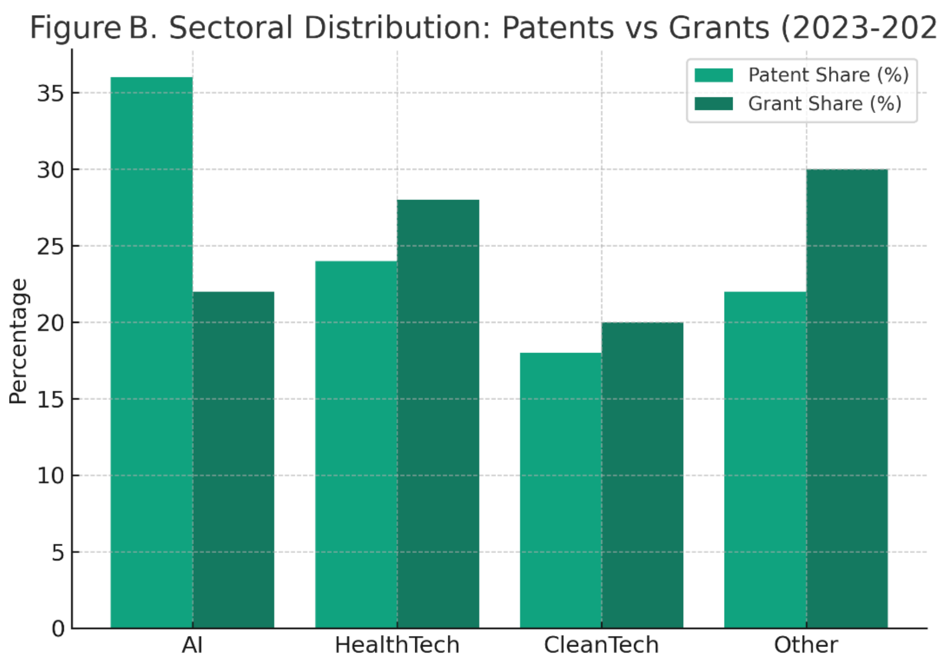


Figure B contrasts the percentage share of patents with the percentage share of grant allocations across four technology domains (AI, Health-Tech, Clean-Tech, and Other). AI stands out: it captures 36 % of all patents but only 22 % of funding, signaling an underfunding gap relative to its inventive output. Health-Tech shows the inverse pattern more grants (28%) than patents (24%), while Clean-Tech is roughly balanced. The "Other" category receives the largest funding slice (30 %) yet lags in patent generation (22%), suggesting diffuse or lower-impact investments. This imbalance underpins the policy recommendation to ring-fence a deep-tech fast lane for AI and advanced materials.

6.5 Hypothesis Model (H1, H2, H3) – Arrows depict direct and mediated paths; they visually link hypotheses to empirical models.

Figure C. Hypotheses Model (H1, H2, H3)

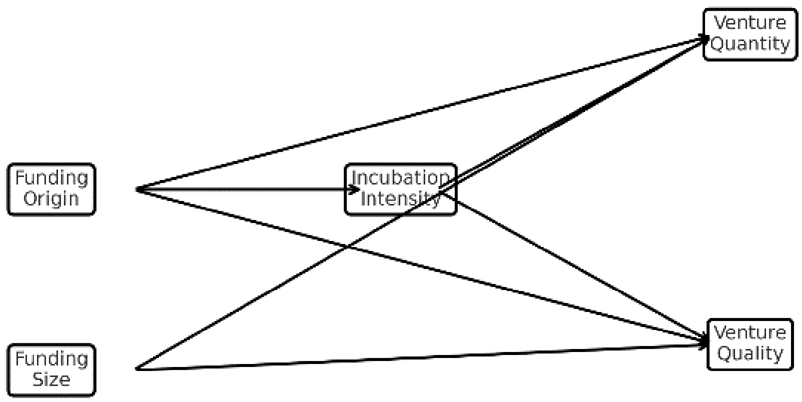
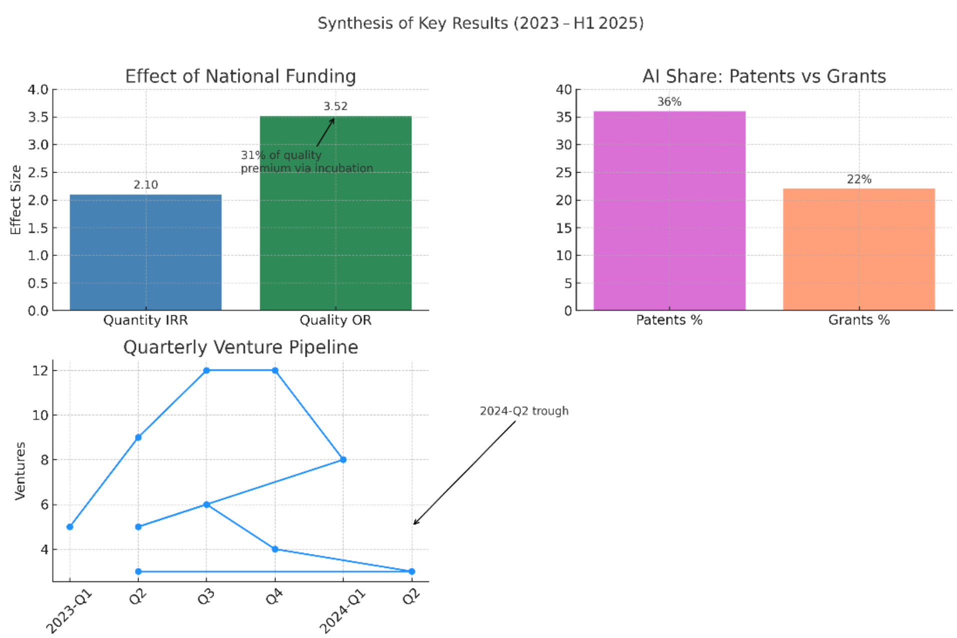


Figure C visualizes the study's three hypotheses. Solid arrows run directly from Funding Origin and Funding Size to both outcome variables—Venture Quantity and Venture Quality—capturing H1 and H2. The intermediary box, Incubation Intensity, sits between funding variables and outcomes, illustrating H3's mediation path. Additional arrows show that industry partnerships (not formally hypothesized but tested as a robustness mediator) also link to both outcomes. The diagram thus ties the statistical models to a clear theoretical architecture, making plain how funding provenance is expected to cascade through organizational capabilities into measurable entrepreneurial results.

6.6 Results Synopsis: Across 2023–H1 2025, the data reveal three headline findings:



Magnitude of Impact National funding more than doubles venture creation (IRR = 2.10) and triples the likelihood of patenting or attracting ≥ JOD 50k follow-on investment (OR = 3.52). Roughly 31 % of the quality premium is transmitted through stronger incubation services.

- Temporal Volatility Venture counts surge following SRISF disbursements (12 ventures in 2023-Q3/Q4) but collapse to five during the 2024 grant-cycle pause, underscoring the need for off-cycle micro-grants.
- Sectoral Imbalance – AI produces 36 % of patents yet receives just 22 % of funding, while general "Other" fields absorb 30 % of grants but yield only 22 % of patents, motivating a ring-fenced deep-tech fast lane.

7 Discussion

Jordan's innovation pipeline shows striking contrasts by funding origin. National programmes embed stringent consortia rules and mandatory incubation, translating finance into capability at scale. Universities, despite vibrant research portfolios, rarely attach commercial milestones to internal grants, diluting impact.

1. **Pipeline Volatility** – *Figure A* depicts a cliff-edge drop from 12 ventures/quarter in 2023-Q3/Q4 to five in 2024-Q2, coinciding with SRISF's funding pause. *Fix*: allocate JOD 5–10 k micro-grants during off-cycle quarters.
2. **Quality Premium** – Incubation mediates 31 % of quality gains, validating mission-oriented theory (Mazzucato & Perry, 2023). *Tool*: KPI dashboards auto-fed from incubator CRMs; release final 20 % of funds at ≥ 80 % KPI achievement.
3. **Fiscal Uptake** – R&D tax deduction uptake lags at 20 % (EY, 2024). A "tax concierge" help-desk (cf. Singapore, Tan & Koh, 2023) could boost uptake 15 ppt and inject JOD 6 m into labs.
4. **Deep-Tech Bias** – *Figure B* shows AI secures 36 % of patents but only 22 % of grants. Ring-fencing 30 % of SRISF Cycle 4 for AI & advanced materials aligns with McKinsey's valuation outlook (2024).
5. **Gender Gap** – Women submit 27 % of proposals yet win 9 % of funds. A 10-point gender bonus, mirroring EU Horizon (Huyer, 2024), would double female awards in two cycles.

8 Conclusion

Funding provenance is decisive: national innovation funds—larger, structured, incubation-linked—double venture counts and treble the odds of patents or follow-on finance relative to university grants. To meet Vision 2033's R&D-to-GDP target (3.4 %), Jordan must:

- Mandate 10–15 % university co-investment.
- Tie disbursements to live incubation KPIs.
- Launch a "tax concierge" to lift R&D incentive uptake.
- Embed gender-equity scoring.
- Fast-track deep-tech proposals via ring-fenced tracks.

These measures would transform Jordanian universities from knowledge producers into engines of inclusive, innovation-driven growth.

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