Analysis of Entrepreneurial Ecosystems in Munich, Basel and Cambridge Relating to Biopharma

Plain Summary

This study compares the biopharmaceutical entrepreneurial ecosystems of Munich, Basel, and Cambridge between 2000 and 2025. It applies the Stam framework, while adapting its indicators to the specific characteristics of the biopharmaceutical sector, including clinical trials, life-science venture capital, patents, clinical research infrastructure, and specialized support services. The findings show that all three regions represent highly developed ecosystems, but that they operate through distinct configurations. Munich is characterized by broad scientific capabilities and increasing translational activity. Basel stands out through its strong industrial concentration and close proximity to regulatory and pharmaceutical decision-making structures. Cambridge is distinguished by its university base, spinout dynamics, dense networks, and entrepreneurial culture. The data further indicate that high ecosystem quality does not translate immediately into new firm formation, as biopharmaceutical entrepreneurship is shaped by long development, regulatory, and financing cycles. The main contribution of this study lies in providing a more precise sector-specific operationalization of existing entrepreneurial ecosystem frameworks, thereby supporting comparative research, regional assessment, and future biopharmaceutical policy in knowledge-intensive, highly regulated, and capital-dependent innovation fields in Europe and beyond.

Abstract

This paper compares the Biopharma-related Entrepreneurial Ecosystems of Munich, Basel and Cambridge between 2000 and 2025. Building on the Stam framework(Stam 2015), the study retains the established ecosystem elements but adapts the indicators to the specific conditions of Biopharma: long development cycles, high capital intensity, clinical translation, regulatory dependence and specialized knowledge infrastructures. Methodologically, the study follows an exploratory, theory-guided embedded multiple-case design (Yin 2009). The analysis shows that all three regions are strong ecosystems, but their strengths are differently configured. Munich represents a broad and increasingly translational ecosystem, Basel a highly concentrated and industry-integrated ecosystem, and Cambridge a compact, science-driven and spinout-oriented ecosystem. The sector-specific adaptation adds analytical value because it makes visible differences in clinical trials, Biopharma VC, clinical infrastructure, specialized intermediaries and university–industry collaboration that a generic framework would only partially capture.

1. Introduction and Research Questions

Entrepreneurial Ecosystems have become an important framework for analysing how productive entrepreneurship emerges within specific territorial contexts (Stam 2015; Stam und van de Ven 2021; Wurth et al. 2022; Bell-Masterson und Stangler 2015; Leendertse et al. 2022). The concept is particularly useful because it does not explain entrepreneurship through single factors alone, but through the interaction of institutions, talent, knowledge, finance, networks, infrastructure, demand and support organizations. For Biopharma, however, generic EE frameworks require sectoral adaptation (Bader et al. 2025b). Biopharma ventures differ from many digital or service-based start-ups because they depend on clinical validation, regulatory approval, specialized capital, patentable knowledge, university–industry collaboration and long commercialization cycles (DiMasi et al. 2016; Seyhan 2019; Schuhmacher et al. 2025a; Park und Vonortas 2023)

This paper therefore asks four research questions:

RQ1: How do the Biopharma Entrepreneurial Ecosystems of Munich, Basel and Cambridge differ between 2000 and 2025?
RQ2: Which element-level strengths, weaknesses and development trajectories characterize each region?
RQ3: What additional interpretive value does a sector-specific adaptation of the Stam framework provide compared with a generic EE assessment?
RQ4: How can the sector-specific ecosystem profiles be interpreted in relation to entrepreneurial output?

The three cases are suitable for comparison because all are leading European Biopharma regions, but they differ structurally. Munich is large and diversified, Basel is pharmaceutically concentrated and industry-driven, while Cambridge is compact, university-centred and spinout-oriented.

2. Framework and Methodology

The study retains the core elements of the Stam framework (Stam 2015): Formal Institutions, Entrepreneurship Culture, Networks, Physical Infrastructure, Finance, Leadership, Talent, New Knowledge, Demand and Intermediate Services. The adaptation is carried out at the indicator level and draws on the findings of (Bader et al. 2025a)Bader and other relevant sources (Franco und Haefliger 2025; Calza et al. 2021) to capture the operationalization. For example, Finance is not only measured through general venture capital, but also through biopharma VC intensity (Park und Vonortas 2023); New Knowledge is not only captured by R&D expenditure, but also by biopharma patents and clinical trials(Schuhmacher et al. 2025b; Narin et al. 1997); Physical Infrastructure includes clinical research infrastructure (Bader et al. 2025b; Seyhan 2019; Calza et al. 2021); and Intermediate Services include incubators, accelerators and biopharma-specific support structures(Franco und Haefliger 2025).

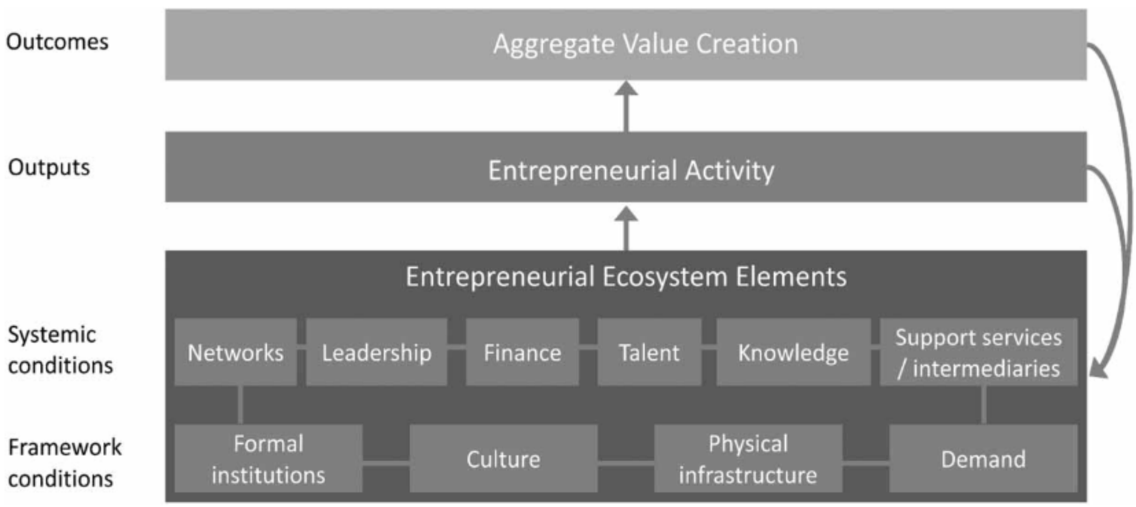

Figure 1(Stam 2015)

The research design follows an exploratory embedded multiple-case study logic (Yin 2009). Each region is analysed as a case, while the ecosystem elements function as embedded units of analysis (Figure 2). The period 2000–2025 is divided into five subperiods: 2000–2007, 2008–2012, 2013–2018, 2019–2022 and 2023–2025. This periodization is important because Biopharma ecosystems develop slowly and often show delayed relationships between structural strength and entrepreneurial output.

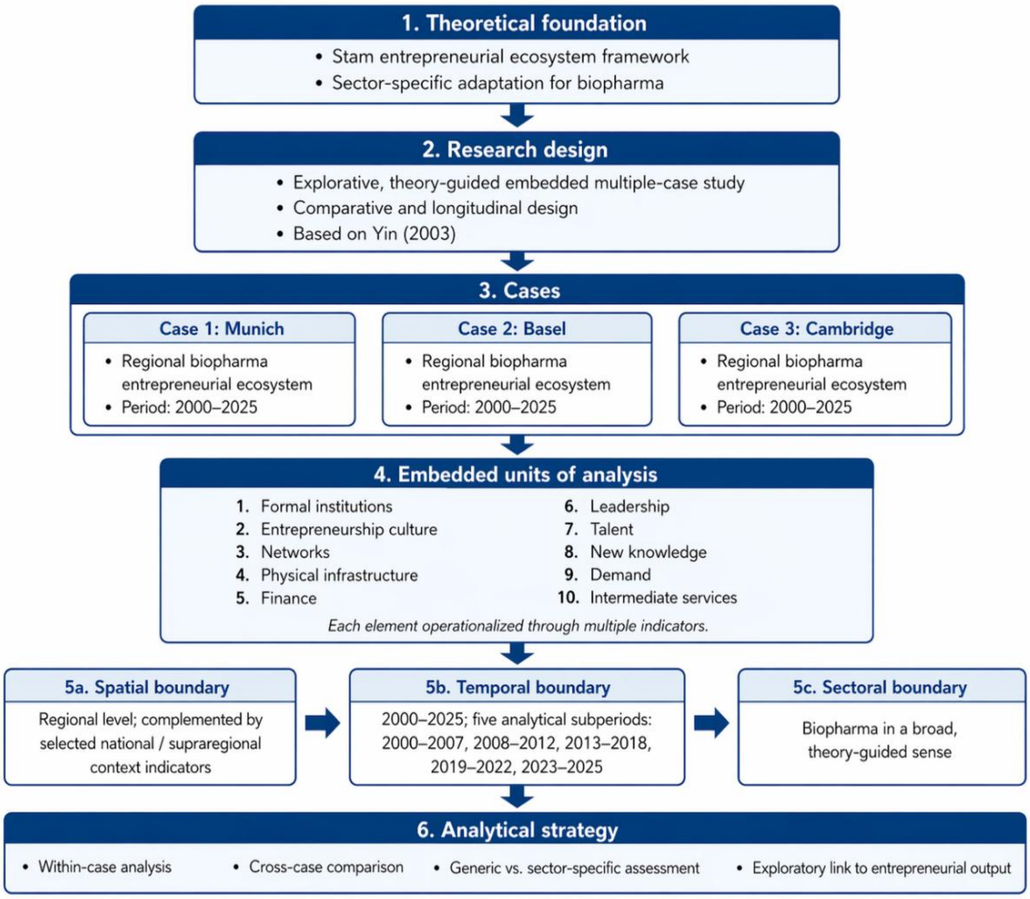

Figure 2

The empirical basis consists of indicators from the provided dataset, including active firms , Biopharma firm births, university–industry clinical collaborations, clinical infrastructure, biopharma VC, tertiary education, life-science students, R&D expenditure, Biopharma patents, clinical trials, GRP, health expenditure, knowledge-intensive services, incubators and start-up output. Higher values are interpreted as stronger ecosystem conditions, while negative indicators are treated cautiously or directionally adjusted (Table 1)

Element	Indicator	Description	Evidence from studies/papers	Source	Included in framework of Stam 2015
1. Formal institutions	Quality of governance (corruption, impartiality, quality & accountability)	Average z-score from three governance indicators (corruption, impartiality, quality & accountability), based on survey data	Stam, 2015	Quality of Government Index	Yes
1. Formal institutions	Ease of doing business index	Index based on several dimensions (business formation, permits, property, credit, investor protection, taxes, trade, contract enforcement, insolvency)	Stam, 2015	World Bank Doing Business Report	Yes
1. Formal institutions	Regulatory approval efficiency	Average duration of approval procedures (clinical trials, medical devices, pharmaceuticals)	Franco, 2025	EMA, MHRA, Swissmedic	No
1. Formal institutions	Regulatory approval	Number of approved pharmaceuticals	Schuhmacher, 2025	EMA, MHRA, Swissmedic	No
1. Formal institutions	Ethics & compliance capacity	Number of accredited ethics committees per region	Bader 2025, Seyhan 2019	National registers	No
2. Entrepreneurship culture	Active firms	Number of active firms	Stam, 2015	Crunchbase and national economic statistics (BFS,Genesis,ONS)	Yes
2. Entrepreneurship culture*	BT, LS, MT-based birth of new firms	Share of BT, MT, LS new firm formations	Bader 2025, Seyhan 2019	Crunchbase, Dealroom, Crunchbase and national economic statistics (BFS,Genesis,ONS) and position papers from cluster and industry contexts, as well as annual reports from the Innovation Hub Cluster	No
2. Entrepreneurship culture*	Death of firms	Number of corporate insolvency cases	Stam, 2015	national economic statistics (BFS,Genesis,ONS)	Yes
2. Entrepreneurship culture*	BT, LS, MT-based death of firms	Share of BT, MT, LS insolvency cases	Bader 2025, Seyhan 2019	Crunchbase, Dealroom, Crunchbase and national economic statistics (BFS,Genesis,ONS) and position papers from cluster and industry contexts, as well as annual reports from the Innovation Hub Cluster	No
3. Networks	Innovative SMEs collaborating with others	Share of innovative SMEs collaborating with others	Stam, 2015	RIS & EIS; DG Regio (RCI)	Yes
3. Networks	University–industry clinical collaborations	Number of joint publications / trials	Bader 2025, Seyhan 2019	Scopus, ClinicalTrials.gov, euclinicaltrials.eu	No
4. Physical infrastructure	Number of passenger flights	Number of passenger within a 60-minute radius	Stam, 2015	Eurostat, Eurogeographics, official statistics published by airport authorities	Yes
4. Physical infrastructure	Household access to internet	Share of households with internet access	Stam, 2015	Eurostat (RCI)	Yes
4. Physical infrastructure	Clinical research infrastructure	Number of study centers / beds	Bader 2025, Seyhan 2019	OECD Health, national health statistics (BFS,Genesis,ONS)	No
5. Finance	Venture capital	Average VC volume	Stam, 2015	The sources consulted include position papers from cluster and industry contexts, as well as annual reports from the Innovation Hub Cluster	Yes
5. Finance	Credit constrained SMEs	Share of SMEs with constrained access to credit	Stam, 2015	EIB Investment Survey	Yes
5. Finance	Life-science VC intensity	VC investments specifically in life sciences	Park, 2023	Invest Europe, Dealroom, position papers from cluster and industry contexts, as well as annual reports from the Innovation Hub Cluster	No
5. Finance	Public R&D funding for LS	Public life-science funding	Park, 2023	Horizon Europe, NIH	No
5. Finance	Non-dilutive funding access	Grants, milestone funding	Park, 2023	EU, national agencies	Yes
6. Leadership	Ecosystem leadership	Number of coordinators in Horizon 2020 innovation projects	Stam, 2015	CORDIS	Yes
7. Talent	Tertiary education	Share of population with tertiary education	Stam, 2015	Eurostat	Yes
7. Talent	Lifelong learning	Share of population aged 25–64 participating in education and training	Stam, 2015	Eurostat	Yes
7. Talent	Life-science PhDs per capita	PhD graduates in life-science fields	Hutchins et al. (2019), Weber (2013)	Higher education statistics, university reports, national education statistics	No
7. Talent	Life-science study capacity	Number of available study places per year in life sciences, biotechnology, and medtech-related degree programs (BA/MA/PhD)	specification of Stam (2015) Indiactor	Higher education statistics, university reports, national education statistics	No
7. Talent	Tertiary education in BT, LS, MT-based field	Share of population with tertiary education in LS, BT, MT-related fields	specification of Stam (2015) Indiactor	Higher education statistics, university reports, national education statistics	No
8. New knowledge	R&D expenditure	Intramural R&D expenditure as % of regional GDP	Stam, 2015	Eurostat	Yes
8. New knowledge	Life-science publications	Publications with clinical relevance	Hutchins et al. (2019), Weber (2013)	Scopus, Web of Science	No
8. New knowledge	Translational patents	Patents with clinical application	Narin, 1997	EPO	No
9. Demand	Disposable income per capita	Disposable household income (PPP)	Stam, 2015	Eurostat	Yes
9. Demand	Potential market size in GRP	Regional GDP (Index EU=100)	Stam, 2015	Eurostat	Yes
9. Demand	Potential market size in population	Population size (Index EU=100)	Stam, 2015	Eurostat	Yes
9. Demand	Health expenditure per capita	Health expenditure	specification of Stam (2015) Indiactor	OECD Health	No
9. Demand	Disease burden relevance	Prevalence of relevant indications	specification of Stam (2015) Indiactor	WHO	No
9. Demand	Public demand in health	Public demand for pharmaceutical products	specification of Stam (2015) Indiactor	OECD	No
a. Intermediate services	Knowledge-intensive services	Employment share in knowledge-intensive services	Stam, 2015	Eurostat	Yes
a. Intermediate services	Incubators	Share of incubators in the business population	Bader 2025, Seyhan 2019	EIT Health, Dealroom, Start-Up-Munich	Yes
a. Intermediate services	Life-science incubators & accelerators	Share of life-science incubators in accelerators and incubators in gernal	Bader 2025, Seyhan 2019	EIT Health, Dealroom	No
b. Productive	Innovative new firms	Number of new firms with patents	Stam, 2015	Crunchbase, Dealroom, Pitchbook	Yes
b. Productive	High-value new firms (unicorns)	Number of firms valued at over USD 1 billion	Stam, 2015	Crunchbase, Dealroom, Pitchbook	Yes
b. Productive	Strategic exits & partnerships	M&A, licensing, IPOs	Schuhmacher, 2025	Crunchbase, Dealroom, Pitchbook	No

Table 1

3. Within-Case Analysis

3.1 Munich: Broad, translational and increasingly finance-enabled

Munich shows the profile of a broad and gradually densifying Biopharma ecosystem. Its strength lies not in one dominant actor, but in the combination of scientific capacity, talent, clinical resources, networks and increasingly stronger finance. Munich's potential market size rose from €69.5 billion in 2000 to €138.5 billion in 2022. Tertiary education increased from 28.7% in 2000 to 42.3% in 2022, and the number of tertiary students in Biopharma-related fields grew from 24,185 in 2007 to 33,555 in 2022. This indicates a strong and reproducible talent base.

New Knowledge and Networks are also central. University–industry clinical collaborations increased from only 6 in 2000 to 727 in 2022, before falling to 466 in 2025. Clinical trials rose from 0 in 2000 to 131 in 2022. Finance becomes especially important in later phases: biopharma VC intensity increased from €94.4 million in 2000 to €487 million in 2022 and €534.4 million in 2025.

Entrepreneurial output also reflects this maturation. Munich recorded 57 biopharma start-ups in 2000–2007, 104 in 2013–2018 and 81 in 2019–2022. The 2023–2025 value of 18 start-ups should be interpreted cautiously because the period is shorter. At the same time, biopharma remains a relatively small but gradually increasing component of Munich's overall start-up activity, with its share rising from around 4% in 2000–2007 to about 7% in 2013–2018 and 10% in 2019–2022. Overall, Munich is best understood as a broad ecosystem that becomes increasingly translational and capital-enabled over time.

3.2 Basel: Concentrated, industry-integrated and demand-driven

Basel represents the most concentrated and industry-integrated model among the three cases. Its strength lies in the close coupling of pharmaceutical industry, demand, specialized services, knowledge, finance and institutional stability. The region is smaller than Munich, but more sharply focused. Active firms increased from 12.592 in 2007 to 17.177 in 2025, while the potential market size rose from €13.8 billion in 2000 to €41.0 billion in 2022. This indicates a strong economic and demand-side expansion.

Basel's sectoral profile becomes especially visible through Biopharma-specific indicators. University–industry clinical collaborations increased from 37 in 2000 to 1002 in 2022, before declining to 768 in 2025. Clinical trials increased from 2000 to 2018 up to 154 and remained high at 153 in 2022. Biopharma VC intensity increased from €2.8 million in 2000 to €118 million in 2022 and €701 million in 2025. This strong late-stage rise suggests that Basel's finance environment became increasingly capable of supporting capital-intensive Biopharma activity.

Basel also shows strong growth in specialized intermediaries. Life-science incubators and accelerators increased from 0 in 2000 to 9 in 2022 and remained at 9 in 2025. This is analytically important because it shows that Basel's strength is not only based on large pharmaceutical companies, but also on a growing support infrastructure around the sector. Basel's entrepreneurial output reflects its strong life-science specialization: biopharma start-ups increased from 32 in 2000–2007 to 72 in 2013–2018 and 56 in 2019–2022, while their share of total start-up activity rose from around 14% to 33% and 51%, respectively. Basel therefore appears as a highly integrated ecosystem, where industrial depth and specialized support compensate for lower openness compared with Cambridge.

3.3 Cambridge: Science-driven, spinout-oriented and network-intensive

Cambridge differs from Munich and Basel through its compact, science-based and entrepreneurial profile. Its strength lies in academic excellence, spinout culture, dense networks and specialized finance. Tertiary education increased from 25.9% in 2000 to 47.4% in 2022, the highest value among the three cases in that year. Biopharma-related students increased from 18.260 in 2000 to 26.215 in 2022. Cambridge therefore combines a strong knowledge base with a highly educated labour pool.

The network dimension is particularly strong. University–industry clinical collaborations rose from 23 in 2000 to 1.072 in 2022 and remained high at 924 in 2025. Clinical trials increased up to 109 in 2018 and 95 in 2022. Biopharma

VC intensity grew from €45.1 million in 2007 to €591.3 million in 2018, €422.5 million in 2022 and €688.8 million in 2025. This confirms the strong venture orientation of the Cambridge model.

At the same time, Cambridge appears more sensitive to financial cycles than Basel. Its strength depends heavily on the interaction of academic knowledge, networks, venture capital and entrepreneurial culture. Start-up output is high: Cambridge recorded 89 start-ups in 2000–2007, 124 in 2013–2018 and 85 in 2019–2022. The decline to 11 in 2023–2025 should not be read as structural collapse, but as a short-period and potentially post-boom effect. Overall, Cambridge is the clearest spinout-oriented ecosystem among the three cases.

4. Cross-Case Comparison

Across all three cases, Talent, New Knowledge and Networks are the common core strengths. However, these strengths take different forms. Munich is broad and institutionally diversified; Basel is specialized and industry-integrated; Cambridge is compact and university-driven. The same element can therefore perform different functions across ecosystems. Networks in Munich act as bridges across heterogeneous actors; in Basel they coordinate a dense industrial-pharmaceutical system; in Cambridge they enable rapid recombination between university research, investors and start-ups.

The strongest differences appear in Finance, Demand, Leadership, Entrepreneurship Culture and Intermediate Services. Basel is strongest where industrial demand, pharmaceutical depth and specialized services matter. Cambridge is strongest where science-based entrepreneurship, spinout legitimacy and venture dynamics matter. Munich is strongest where broad research capacity, talent reproduction and translational upgrading matter.

The sector-specific adaptation of the framework is therefore crucial. A generic framework would show that all three regions are strong. The adapted framework explains why they are strong in different ways. For example, clinical collaborations rose strongly in all three regions, but from different starting points and with different ecosystem meanings. Biopharma VC also reveals different profiles: Munich becomes increasingly finance-enabled, Basel shows strong late-stage sectoral finance growth, and Cambridge displays a persistent venture-oriented model.

5. Entrepreneurial Output and Interpretation

The output data show that ecosystem strength does not translate linearly into biopharma start-up formation rates across cities and periods. On an annualized basis, Cambridge increases from 11.1 start-ups per year in 2000–2007 (22% biopharma share) to 16.0 in 2008–2012 (22%), 20.7 in 2013–2018 (26%) and 21.3 in 2019–2022 (42%). Munich rises from 7.1 start-ups per year in 2000–2007 (4%) to 10.0 in 2008–2012 (5%), 17.3 in 2013–2018 (7%) and 20.3 in 2019–2022 (10%). Basel increases from 4.0 start-ups per year in 2000–2007 (14%) to 7.8 in 2008–2012 (27%), 12.0 in 2013–2018 (33%) and 14.0 in 2019–2022 (51%). The 2023–2025 rates remain more difficult to interpret due to the shorter observation window.

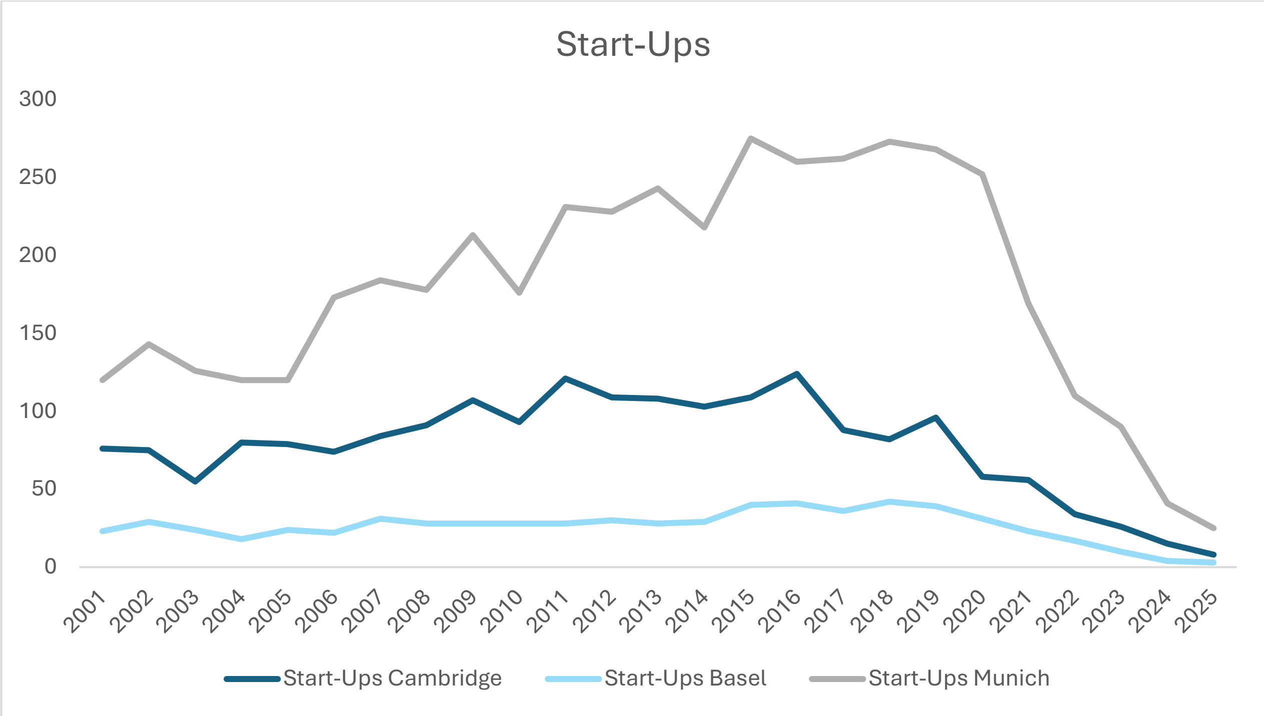

Figure 3

In Biopharma, output must be interpreted cautiously. A strong ecosystem may not immediately produce more start-ups because commercialization is delayed by research, regulation, clinical testing and financing requirements. Therefore, the output analysis should be read as exploratory rather than causal (Figure 4).

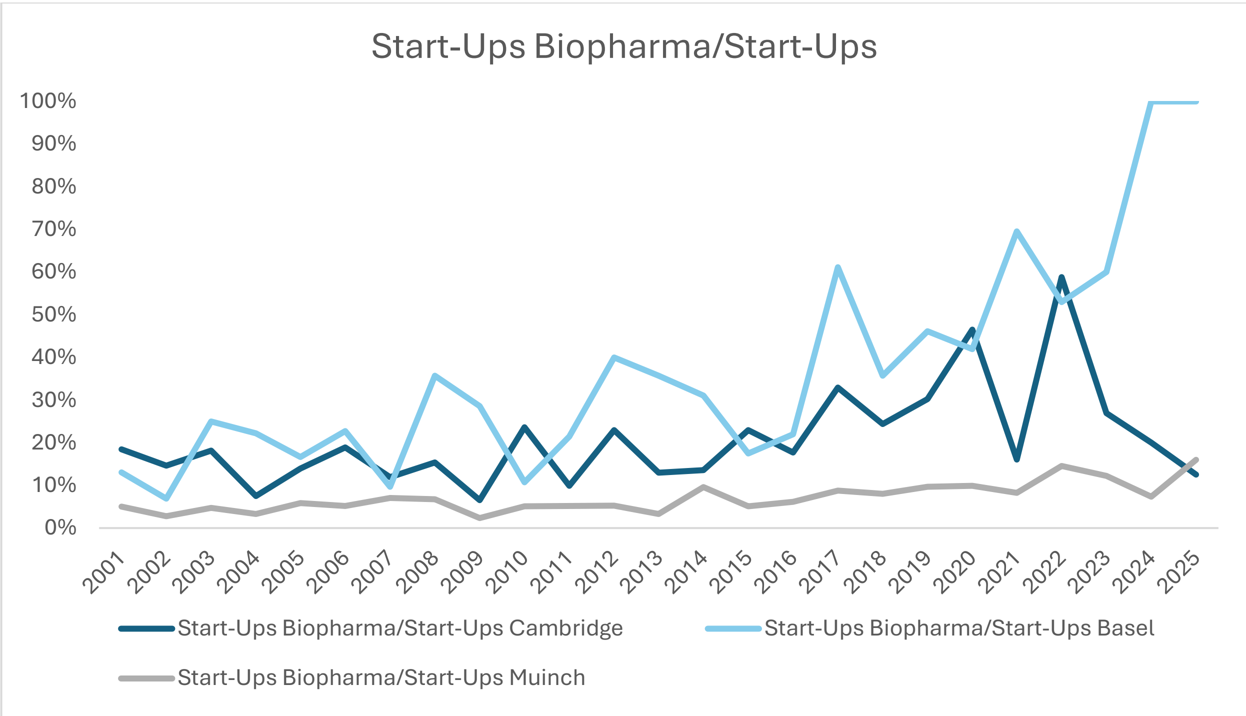

Figure 4

6. Conclusion

The comparison shows that Munich, Basel and Cambridge are all strong Biopharma ecosystems, but they are not strong in the same way. Munich is broad, increasingly translational and finance-enabled. Basel is concentrated, industry-integrated and institutionally embedded. Cambridge is compact, science-driven and spinout-oriented. The study therefore confirms that high-performing Biopharma ecosystems do not follow a single model.

The main contribution lies in the sector-specific adaptation of the Stam framework. The original element structure remains useful, but the indicators must be adapted to the sector. In Biopharma, clinical trials, biopharma VC, clinical infrastructure, specialized intermediaries and university–industry collaborations are not minor additions; they are central to understanding how ecosystems function. The study thus shows that the future of EE research in regulated, science-based sectors should not lie in replacing existing frameworks, but in operationalizing them more precisely.

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