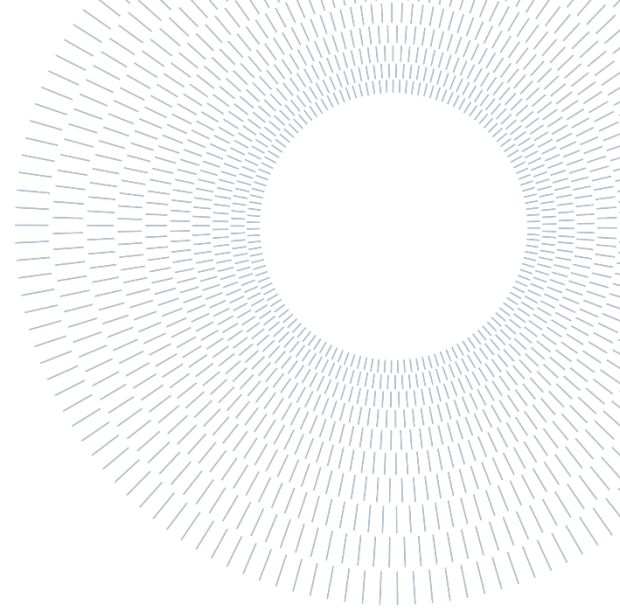




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EXECUTIVE SUMMARY OF THE THESIS

Regulatory Orchestration as a Driver of innovation and competition: a framework for regulators and firms in Open Finance ecosystems

TESI MAGISTRALE IN MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

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1. Introduction

Open banking and open finance have emerged as central policy instruments aimed at fostering innovation and competitiveness in data-driven financial ecosystems. While these frameworks promise to stimulate entry, experimentation, and data-driven business models through consent-based data portability, their impact varies significantly across jurisdictions. Differences in regulatory clarity, complexity, and fragmentation shape firms' strategic decisions, cross-border scalability, and the overall competitiveness of financial ecosystems. Against this backdrop, this thesis addresses the following research question:

How does open banking and open finance regulation clarity, complexity, and fragmentation affect innovation and competition across different regulatory frameworks?

To answer this question, the study develops a structured analytical framework that bridges regulatory design and ecosystem-level resource orchestration, explaining how regulatory

architectures influence innovation dynamics and competitive conditions.

2. Methodology

The study adopts a qualitative research design combining a systematic literature review with multiple illustrative case studies. The literature review was conducted following a structured and transparent protocol inspired by Tranfield et al. (2003). Two complementary Scopus queries, focused respectively on open banking/open finance and on fintech, innovation, and regulation, were used to map the broader conceptual foundations on which open finance builds, including regulatory governance, financial innovation, technological infrastructures and supervisory design. After a multi-stage screening process based on predefined inclusion and exclusion criteria, 34 academic articles were retained and complemented with 7 grey-literature sources, resulting in a final corpus of 41 documents. Each paper was systematically coded through a structured data-extraction matrix, enabling the identification of recurring themes related to regulatory clarity, complexity, fragmentation, governance coordination, and innovation dynamics.

To complement the literature review and further elaborate the emerging conceptual constructs, the study adopts a multiple illustrative case-study design aligned with the exploratory and theory-elaborating purposes of case-based inquiry (Eisenhardt, 1989).

Empirical evidence was collected through 11 semi-structured interviews (12 informants) involving regulators, policy advisors, financial institutions, fintech practitioners, and technology experts across different institutional contexts. Interviewees were selected through purposive and theoretical sampling to capture heterogeneous perspectives on regulatory implementation and data governance. Interviews were transcribed and analysed using an inductive coding process, moving from first-order concepts to second-order themes and aggregate dimensions. This iterative analysis enabled the identification of six aggregate dimensions that structure the findings and support the development of the Regulatory Resource Orchestration Framework.

Together, the systematic review and the case-based analysis ensure methodological rigor, conceptual coherence, and analytical triangulation, allowing the study to link regulatory design features with ecosystem-level innovation and competitiveness outcomes.

3. Literature review

The literature review establishes the analytical foundation for examining how regulatory design influences innovation and competitiveness in open banking and open finance. It is structured into the following sections.

3.1. Open banking and Open finance

Over the past decade, open banking and its extension into open finance have evolved from niche regulatory initiatives into globally diffused governance models shaping financial innovation. Originating as competition remedies aimed at reducing informational lock-in and fostering market entry, these frameworks institutionalise consent-based data portability through standardized APIs, embedding regulatory requirements directly into technological infrastructure. Open banking is widely understood as a regulatory construct grounded in consumer data sovereignty, where legal principles such as consent, authentication, and liability are

embedded directly into technological infrastructure (Odorovic, 2023). Open finance extends this architecture beyond payments into savings, investments, insurance, and pensions, transforming product-centric systems into data-centric ecosystems. Jurisdictions have implemented open banking and open finance through different governance models. Some rely on regulation-led frameworks that mandate participation and technical standards, while others adopt market-driven approaches based on voluntary coordination. This divergence has produced heterogeneous regulatory configurations across countries. The literature highlights that regulatory clarity, standardisation, and interoperability are closely linked to fintech innovation intensity and ecosystem development (Ran et al., 2025), yet cross-country divergences persist, particularly between advanced and emerging markets. At the same time, increased interoperability expands the perimeter of operational, cyber, and governance risks. Despite conceptual progress, significant empirical gaps remain, including limited causal evidence linking regulatory design to firm-level performance, insufficient comparative metrics of regulatory quality, and underdeveloped measurement of distributional and systemic effects. These gaps underscore the need for integrated frameworks connecting regulatory architecture, technological design, and observable innovation outcomes.

3.2. Innovation

The literature shows that open banking and open finance emerged as policy-driven responses to structural inefficiencies in traditional banking, aiming to stimulate innovation and competition through secure and standardised data-sharing frameworks. Innovation in this context is enabled by a layered technological architecture examined in detail across the sub-sections on platforms, Application Programming Interfaces (APIs), artificial intelligence, blockchain and distributed ledger technologies, cloud computing, and data governance. Platforms and APIs constitute the governance and interoperability layer of open finance, while AI, DLT, cloud infrastructures, and data analytics form the execution layer that enables programmable, scalable, and data-driven financial services. However, innovation does not diffuse automatically. Its impact depends critically on regulatory clarity, institutional capacity, and

infrastructural readiness. As demonstrated by Nalluri & Chen (2024), structural barriers such as trust deficits, regulatory gaps, and weak digital infrastructures can significantly hinder fintech adoption, particularly in emerging economies. Overall, the effectiveness of open finance innovation depends on the alignment between technological architectures and coherent regulatory design.

3.3. Risks

The literature highlights that innovation and risk in open finance are intrinsically intertwined. The same infrastructures that enable data portability, real-time services, and ecosystem collaboration also expand operational, compliance, market, systemic, and reputational vulnerabilities. Data-intensive profiling and AI-based decision-making introduce concerns related to fairness, opacity and accountability, particularly when explainability and auditability safeguards are insufficient (Ferretti, F., & Petkoff, P., 2022).

At the same time, cybersecurity exposure, cross-border inconsistencies, and unclear liability allocation increase compliance risk, while decentralised and tokenised architectures generate accounting uncertainty, valuation volatility, and governance challenges. The growing reliance on cloud providers and shared API infrastructures further concentrates systemic risk, potentially undermining resilience objectives. Overall, the literature suggests that open finance redistributes rather than eliminates risk, highlighting the need for governance frameworks that align technological innovation with accountability, resilience, and cross-jurisdictional coordination.

3.4. Regulation and innovation

The literature highlights that regulation plays a dual role in open banking and open finance: it acts both as an enabling architecture for innovation and as the governance mechanism that standardises data protection, interoperability, and multi-stakeholder coordination. The impact of regulation depends on its design quality along three core dimensions: clarity, complexity, and fragmentation. Regulatory clarity, through precise legal definitions, stable liability rules, and predictable technical standards, reduces uncertainty, supports market entry, and is associated with higher fintech creation and

innovation intensity. By contrast, excessive regulatory complexity, generated by overlapping legal layers and uncoordinated supervisory expectations, increases compliance burdens, slows implementation, and may dampen innovation, particularly for smaller actors. Fragmentation across jurisdictions, sectors, and technical standards represents a structural constraint, undermining interoperability, raising integration costs, and limiting cross-border scalability. Overall, the literature suggests that clarity accelerates innovation diffusion, complexity introduces friction, and fragmentation creates systemic bottlenecks, yet empirical evidence linking these regulatory features to firm-level innovation and competitive outcomes remains limited.

3.5. Theories

The literature review draws on multiple complementary theoretical frameworks to explain how regulation and technology jointly reshape financial ecosystems. Information economics frames open banking as a remedy to asymmetric information, reducing informational lock-in and increasing market contestability. Platform theory interprets banks and fintechs as actors in multi-sided markets, where APIs function as interfaces enabling network effects and modular innovation. Dynamic capabilities theory explains how firms must develop sensing, seizing, and reconfiguring capabilities to adapt to regulatory and technological change. Resource orchestration theory conceptualises open finance as an ecosystem in which banks, fintechs, and regulators coordinate complementary resources through standards, interoperability rules, and governance mechanisms. Innovation-diffusion and co-innovation theories highlight how openness supports both incremental and radical innovation, while regulators themselves evolve through iterative learning. Finally, institutional and network perspectives emphasise how decentralised and programmable infrastructures reshape coordination, trust, and risk propagation. Together, these theories provide a multidimensional lens for understanding how regulatory architecture influences innovation and competitiveness in open finance.

3.6. Future Research

Future research should develop systematic frameworks linking regulatory design and coordination mechanisms to innovation and competition outcomes, supported by comparative and empirical evidence across jurisdictions.

4. Findings

The empirical findings are organised around six aggregate dimensions that explain how regulatory design is experienced in practice and how it shapes innovation and competitiveness in open banking and open finance ecosystems.

First, Regulatory clarity and complexity capture how actors interpret the regulatory environment in operational terms. Clarity is associated with the absence of interpretative ambiguity and the possibility of translating legal provisions directly into technological and organisational solutions. When expectations are stable and enforcement predictable, firms can allocate resources to innovation and attract investment. By contrast, complexity emerges from the accumulation of overlapping rules, technical standards, exceptions, and continuous updates. This layered environment generates implementation frictions, increases compliance costs, and disproportionately affects smaller fintechs, contributing to asymmetric competitive conditions within the ecosystem.

Second, Regulatory implementation as a collaborative opportunity highlights the gap between formal regulatory design and practical application. Interviewees describe frequent divergences in national transposition and early-stage implementation challenges. However, these gaps are not framed purely as failures; rather, they create space for iterative adjustment through Q&A processes, guidelines, and structured dialogue. Firms adapt their strategies in response to evolving interpretations, while regulators refine requirements based on market feedback. Implementation thus becomes a dynamic learning process embedded in ongoing interaction.

Third, Regulatory fragmentation across countries reflects the practical consequences of divergent national interpretations, supervisory styles, and institutional overlaps. Even within harmonised frameworks, firms encounter inconsistent enforcement intensity, autonomous authorities, and heterogeneous compliance expectations. This

fragmentation translates into higher coordination costs, differentiated organisational structures across markets, selective market entry, and in some cases withdrawal from specific jurisdictions. Cross-border scalability is therefore constrained not only by formal legislation but by practical supervisory divergence.

Fourth, Regulation and innovation dynamics show that regulatory design directly shapes innovation pathways. Clarity enhances credibility in the eyes of investors and can “switch on” investment decisions, while uncertainty and frequent reinterpretation discourage experimentation and increase defensive compliance. Regulatory requirements influence whether firms develop capabilities in-house or through partnerships, how they structure business models, and how they allocate financial resources. Regulation thus affects both the pace and the organisational configuration of innovation.

Fifth, Governance and coordination mechanisms refer to the formal and informal structures that support regulatory alignment. Public consultations, direct dialogue, and ongoing interaction between firms and authorities help clarify expectations and reduce ambiguity. Experimental governance tools—such as regulatory sandboxes and controlled testing environments—enable supervised experimentation and gradual policy learning. Alternative governance models, including principle-based approaches and centralised coordination bodies, are perceived as mechanisms capable of reducing divergence and supporting more coherent implementation.

Sixth, Emerging challenges capture forward-looking pressures on current regulatory models. Interviewees identify artificial intelligence as a transformative force raising unresolved questions of responsibility and accountability. Data governance tensions persist around ownership, sharing, and operational resilience, while increasing technological interdependence intensifies security and infrastructure risks. At the global level, fragmented regulatory systems and geopolitical divergence limit the scalability of open-finance architectures.

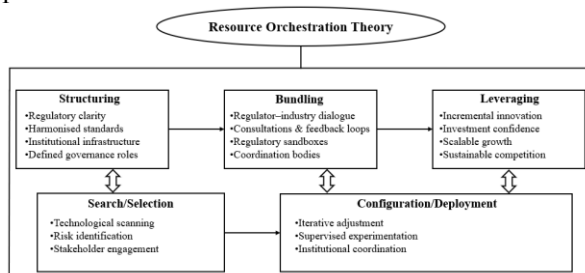
Taken together, these six dimensions demonstrate that regulation operates as an evolving architecture that structures interpretation, coordination, investment, and technological adaptation. Innovation outcomes are therefore shaped not only

by technological opportunities, but by how regulatory clarity, complexity, fragmentation, and governance mechanisms interact across jurisdictions and organisational contexts.

5. Discussion

The discussion integrates the empirical evidence with Resource Orchestration Theory to develop the Regulatory Resource Orchestration Framework, a conceptual model explaining how regulatory design shapes innovation and competitiveness in open banking and open finance ecosystems. Extending Sirmon et al.'s orchestration logic beyond the firm, the framework reconceptualises regulators as ecosystem-level orchestrators who structure, coordinate, and deploy regulatory and governance resources in ways that influence how firms innovate, invest, and scale.

The framework unfolds across five interconnected processes.



Structuring refers to the intentional design of clear, interpretable, and coordinated regulatory architectures. Drawing on the findings on clarity, complexity, and fragmentation, this phase emphasises the creation of simplified standards, harmonised interpretations, and stable governance roles that reduce uncertainty and lower compliance frictions. Effective structuring establishes a predictable institutional infrastructure that enables coordinated ecosystem development.

Bundling captures the integration of regulators and market actors through collaborative governance mechanisms. Building on evidence related to implementation gaps and iterative refinement, this phase highlights dialogue, consultations, Q&A processes, sandboxes, and coordination platforms as mechanisms that align regulatory intent with operational practice. Through structured interaction and mutual learning, bundling transforms fragmented elements into a coherent governance system and reduces interpretative divergence.

Leveraging represents the translation of orchestrated regulatory resources into ecosystem-level outcomes. When regulatory clarity and coordination are effectively structured and bundled, they generate investment confidence, credibility, and incremental innovation. In this phase, regulation acts as an enabling infrastructure that channels entrepreneurial activity toward scalable growth. Importantly, leveraging operates at the ecosystem level: jurisdictions with clearer and more coordinated regulatory environments enhance their overall competitiveness by attracting experimentation, capital, and innovative firms.

Search and selection concern the continuous identification of emerging technological and systemic challenges requiring regulatory attention. Grounded in findings on artificial intelligence, data governance tensions, and global fragmentation, this phase highlights proactive scanning, stakeholder engagement, and prioritisation mechanisms that allow regulators to anticipate risks and opportunities before they destabilise ecosystem dynamics.

Configuration and deployment refer to the practical operationalisation of regulatory strategies. Building on findings related to iterative adjustment and experimental governance, this phase emphasises adaptive implementation, feedback loops, and supervised experimentation. Regulatory effectiveness is sustained not through static rulemaking but through continuous alignment between policy objectives and evolving market realities.

Together, these five processes explain how regulatory design influences innovation trajectories, partnership formation, investment behaviour, and cross-border scalability. The framework reframes regulation from a passive constraint into an active design variable that structures ecosystem-level resource orchestration. By linking clarity, coordination, and adaptive governance to observable innovation outcomes, the discussion demonstrates that the competitiveness of open banking and open finance ecosystems depends on how effectively regulatory architectures are intentionally orchestrated over time.

This study contributes to the literature by addressing the limited empirical linkage between regulatory design and innovation outcomes in open banking and open finance. While prior research emphasises regulatory clarity,

complexity, and fragmentation, it rarely explains how these dimensions translate into firm-level innovation, partnership formation, and ecosystem competitiveness. By developing the Regulatory Resource Orchestration Framework, the thesis extends Resource Orchestration Theory to the ecosystem level, conceptualising regulators as orchestrators who structure, bundle, leverage, and adapt governance resources. In doing so, it bridges regulatory analysis and management theory, reframes regulation as an active design variable rather than a passive constraint, and provides a structured explanation for divergent innovation trajectories across jurisdictions.

For practitioners, both firms and regulators, the framework offers a strategic roadmap for fostering innovation and competitiveness. For firms, it highlights regulatory engagement as a strategic capability: active participation in consultations, sandboxes, and supervisory dialogue can reduce uncertainty, accelerate experimentation, and support scalable growth. For regulators, the framework underscores the importance of designing clear, harmonised, and coordinated regulatory architectures supported by adaptive and experimental governance mechanisms. Embedding feedback loops, supervised testing, and institutional coordination strengthens ecosystem-level innovation and cross-border scalability. Ultimately, sustainable open-finance development depends on a shared orchestration logic in which firms and regulators jointly align governance, technology, and market evolution.

6. Conclusions

This thesis demonstrates that innovation and ecosystem competitiveness in open banking and open finance are shaped not by regulation per se, but by how regulatory clarity, complexity, and fragmentation influence the orchestration of data, technologies, and governance mechanisms across jurisdictions. Drawing on Resource Orchestration Theory and qualitative evidence, the study shows that regulatory clarity enables effective structuring and leveraging of resources by reducing interpretative uncertainty and strengthening investment confidence; regulatory complexity acts as a friction that increases compliance burdens and disproportionately constrains smaller firms; and regulatory fragmentation limits cross-border

scalability but also creates spaces for collaborative alignment and institutional learning. The findings further reveal that regulatory implementation is iterative and adaptive, with dialogue, consultation, and sandbox mechanisms functioning as coordination tools that support incremental innovation. By conceptualising regulators as ecosystem-level orchestrators, the thesis reframes regulation as an enabling and strategically deployable resource that shapes managerial behaviour, innovation pathways, and jurisdictional competitiveness. Ultimately, the success of open banking and open finance depends on the capacity of firms and regulators to co-orchestrate clear, coordinated, and adaptive governance architectures capable of aligning technological evolution with sustainable and pro-competitive ecosystem development.

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