

Building organizational resilience in public–private partnerships through adaptive risk sharing and governance under uncertainty

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Abstract

This paper examines the relationship between risk sharing and organizational resilience in public–private partnerships (PPPs). Long-term PPP arrangements operate under substantial financial, operational, regulatory, political and demand uncertainty, making the distribution and management of risks a central condition of partnership sustainability. The paper argues that resilience cannot be achieved through contractual risk transfer alone. Instead, it depends on the alignment between risk responsibilities and the actual capacities of public and private partners, as well as on their ability to adapt when project conditions change. The analysis is structured around three dimensions: contractual architecture and risk-sharing mechanisms, governance and relational arrangements, and organizational and institutional adaptive capacities. The findings indicate that resilient PPPs combine appropriate risk allocation with flexible contracts, effective coordination, trust, institutional support, operational preparedness and access to complementary resources. Excessive or poorly calibrated risk transfer may increase financial pressure, conflict and renegotiation, whereas capability-based and adaptive risk sharing can strengthen project continuity. The paper therefore proposes an integrated understanding of PPP resilience in which contractual, organizational, relational and institutional mechanisms interact to preserve service delivery and partnership stability under uncertainty.

Keywords: Public–private partnerships; risk sharing; organizational resilience; risk allocation; adaptive governance; contractual flexibility; relational governance.

JEL classification: H54; H57; L32; D81; G32; M10.

Introduction

Public–private partnerships (PPPs) occupy an increasingly important position in the provision of infrastructure and public services because they allow governments to combine public objectives with private financial resources, managerial expertise and operational capabilities. Their attractiveness is particularly strong in environments characterized by fiscal constraints, growing infrastructure needs and increasing expectations regarding service quality. Nevertheless, PPPs are also inherently exposed to uncertainty. Their long contractual duration means that

projects must operate through changing economic conditions, political and regulatory adjustments, technological transformations, demand fluctuations and, in some cases, major external shocks. These uncertainties can affect financing conditions, expected revenues, construction costs, service delivery and the relationship between public and private partners. Consequently, the sustainability of a PPP depends not only on its capacity to generate value under expected conditions, but also on its ability to withstand disturbances without experiencing persistent contractual instability, financial distress or interruption of essential services. This issue has become more visible following recent crises that have demonstrated the limitations of contractual arrangements designed primarily around predictable risks. PPP governance must therefore increasingly address not only efficiency and value for money, but also the capacity of partnerships to remain functional and adapt when the conditions underlying the initial agreement substantially change.

Within this context, the relationship between risk sharing and organizational resilience constitutes a particularly important research issue. Risk allocation has traditionally been treated as one of the foundations of PPP design, with responsibilities distributed between public and private actors according to their capacity to manage particular exposures. Yet the resilience of a partnership cannot be guaranteed by an initial allocation of risks alone. Unexpected events may modify the intensity, nature or interdependence of risks throughout the project life cycle, while organizational capacities themselves may evolve over time. The central question therefore becomes how PPP arrangements can combine contractual risk sharing with sufficient organizational and governance flexibility to absorb shocks, reorganize resources and preserve service continuity. This paper addresses this question by examining how contractual architecture, financial and operational risk-sharing mechanisms, relational governance, institutional conditions and adaptive organizational capabilities contribute jointly to PPP resilience. It argues that resilient partnerships depend on the interaction between well-calibrated contractual responsibilities and the capacity of participating organizations to anticipate, respond to and adapt to disruption. The paper is structured around three complementary dimensions: contractual architecture and risk sharing, governance mechanisms and partnership performance, and organizational resilience and adaptive capacity. This approach provides an integrated understanding of PPP resilience that extends beyond conventional assessments centred exclusively on cost efficiency, risk transfer or value for money.

1. Contractual architecture and risk sharing in public–private partnerships

1.1. Foundations and principles of PPP risk allocation

Chung and Hensher (2015) show that the economic rationale of PPP arrangements depends largely on assigning risks to the actors most capable of controlling or absorbing them. Their findings imply that efficient risk allocation cannot be reduced to transferring the maximum possible exposure to private partners, because such transfers may weaken project performance when responsibilities exceed managerial or financial capacities. Carpintero and Petersen (2016) provide empirical support for this principle by showing that inappropriate transfers of construction, demand and revenue risks can generate delays, financial pressure and contractual instability. Their contribution suggests that risk allocation creates value only when the receiving organization possesses the resources and operational capacity required to manage the exposure. Osei-Kyei and Chan (2015) broaden this reasoning by showing that appropriate risk sharing forms part of a wider set of conditions that includes private-sector capacity, political support, transparent procurement and a favorable legal framework. Chou and Pramudawardhani (2015) further demonstrate that these conditions vary across national and institutional envi-

ronments. Taken together, these contributions imply that PPP risk allocation must remain contextual and capability-based, with contractual responsibilities reflecting both the characteristics of individual projects and the institutional environment within which public and private partners cooperate over time.

Valipour et al. (2016) show that certain PPP risks are sufficiently interdependent to require shared management rather than a simple division between public and private responsibility. Their findings imply that project continuity may depend on coordinated responses when neither partner can manage a particular exposure independently. Li et al. (2017) complement this perspective by showing that risk allocation emerges through negotiation and is influenced by bargaining positions, preferences and risk-bearing capacities. This suggests that technically efficient allocations may not remain sustainable if one party considers the resulting distribution excessively burdensome or unacceptable. Chou and Pramudawardhani (2015) reinforce this implication by demonstrating that risk-sharing practices differ according to national, regulatory, political and market conditions, which influence both negotiating positions and feasible contractual arrangements. Osei-Kyei and Chan (2015) add that risk sharing contributes to partnership performance when it is supported by transparency, institutional stability and sufficient private-sector competence. The combined implication is that PPP risk allocation must integrate both technical and relational dimensions. Sustainable cooperation depends not only on determining who is best positioned to bear each risk, but also on designing arrangements that partners can jointly manage and continue to regard as acceptable throughout the contractual relationship.

Carpintero and Petersen (2016) demonstrate that poorly designed risk transfers can undermine PPP stability when actors are assigned exposures they cannot effectively control. Their findings imply that resilience requires a close correspondence between contractual responsibility and operational capacity. Valipour et al. (2016) extend this reasoning by identifying shared risks that require collaborative rather than unilateral management, indicating that some uncertainties cannot be isolated contractually without weakening collective response capacity. Li et al. (2017) add that the final allocation also depends on negotiation dynamics, meaning that perceptions of fairness and bargaining outcomes can influence whether cooperation remains sustainable after contracts are signed. Chung and Hensher (2015) reinforce the underlying principle by emphasizing that risk should be assigned according to the ability of each actor to control or absorb it throughout the project life cycle. These contributions imply that resilient PPP arrangements require more than formal risk transfer. They depend on distinguishing between risks that can be efficiently assigned to one party and those that require joint management, while also ensuring that negotiated arrangements remain economically manageable and institutionally acceptable. Risk allocation therefore becomes a mechanism linking contractual design, organizational capability and the long-term durability of public-private cooperation.

1.2. Revenue, demand, guarantees and incentive-based risk sharing

Liu et al. (2017) show that revenue-risk-sharing mechanisms can reduce the financial instability created by demand uncertainty without eliminating private-sector incentives. Their findings imply that revenue risk should not be transferred entirely to one party, since excessive private exposure can undermine project viability while excessive public protection can increase fiscal burdens and weaken performance incentives. Wang et al. (2018) reinforce this perspective by showing that minimum-revenue guarantees influence both risk sharing and private-sector effort. Their results suggest that guarantees should be designed not merely as financial protection but also as incentive mechanisms capable of limiting moral hazard. Ma et al. (2018) broaden this reasoning by demonstrating that risk allocation is connected with concession duration and

pricing because uncertainty over future cash flows affects the financial equilibrium of the project. Nguyen et al. (2018) add that these arrangements require contractual specificity if responsibilities are to remain clear when adverse events occur. Taken together, these contributions imply that resilient PPP design depends on contractual mechanisms that combine revenue protection, incentive preservation, pricing flexibility and clearly defined responsibilities, thereby allowing partnerships to absorb demand shocks without undermining either private performance incentives or public financial sustainability.

Shrestha et al. (2018) show that risk-allocation inefficiencies can emerge when contractual responsibilities are determined by bargaining practices or institutional conventions rather than by the actual capacity of each party to manage particular risks. Their findings imply that such mismatches can increase costs and weaken project performance when organizations are exposed to uncertainties they cannot effectively control. Shrestha et al. (2017) reinforce this principle by demonstrating that efficient risk transfer in wastewater PPPs depends on assigning each exposure to the actor with superior managerial or technical ability rather than maximizing private-sector responsibility. This suggests that capability-sensitive allocation can strengthen operational continuity while limiting unnecessary risk premiums and conflict. Liu et al. (2017) provide a related financial mechanism by showing that revenue-sharing arrangements can distribute uncertainty without imposing extreme outcomes on either partner. Nguyen et al. (2018) further emphasize that these allocations must be translated into sufficiently precise contractual provisions. The combined implication is that resilience depends on both the economic logic and the contractual implementation of risk sharing. Risks must be allocated according to management capacity, while responsibilities for financing and responding to disruptions must remain sufficiently explicit to prevent uncertainty from developing into disputes or performance deterioration.

Ma et al. (2018) demonstrate that concession periods and pricing arrangements should reflect uncertainty surrounding future project cash flows, implying that PPP contracts require a degree of flexibility when long-term conditions cannot be predicted accurately at the outset. This perspective is consistent with Wang et al. (2018), who show that differentiated minimum-revenue guarantees can absorb severe revenue shocks while maintaining incentives for private participants to exert effort. Their findings suggest that public support is most effective when it protects project continuity without removing the private partner's responsibility for operational performance. Shrestha et al. (2017) add that such arrangements remain dependent on assigning controllable risks to actors possessing the relevant technical and managerial capabilities. Shrestha et al. (2018) further show that departures from this principle can create inefficiencies when institutional or bargaining practices produce allocations that do not correspond to actual risk-management capacity. Together, these contributions imply that incentive-based risk sharing requires a balance between contractual protection and organizational responsibility. Revenue guarantees, concession design and flexible pricing can strengthen financial resilience, but their effectiveness depends on preserving performance incentives and maintaining a coherent relationship between risk exposure and each partner's capacity to manage uncertainty.

1.3. Financing, bankability, public support and value for money

Santandrea et al. (2016) show that financing structures and contractual rigidity can make PPP arrangements fragile when conditions deviate from initial expectations. Their findings imply that value for money should not be assessed only under normal operating conditions, since financial structures that appear efficient ex ante may prove vulnerable when projects face cost increases, revenue shocks or other adverse developments. Demirag et al. (2015) reinforce this perspective by demonstrating that financiers influence the way PPP risks are evaluated, priced

and allocated. Banks and investors therefore shape contractual requirements and affect the capacity of projects to withstand financial disturbances. Opara (2018) extends this reasoning by showing that value creation cannot be separated from the distribution of risks retained, transferred or shared between public and private partners. Apparent cost advantages may consequently be overstated when risk-transfer assumptions do not correspond to actual exposure. Wibowo and Sundermeier (2020) add that risk-mitigation capability is itself an important dimension of value for money because organizations facing similar exposures may possess different capacities to absorb their consequences. PPP financial resilience therefore depends on whether financing arrangements, contractual structures and organizational capabilities can sustain project performance under adverse conditions rather than merely satisfy expected efficiency criteria.

Vecchi et al. (2017) show that governments can improve PPP access to credit through guarantees and other credit-enhancement instruments, but these mechanisms simultaneously create contingent public liabilities. Their findings imply that public support should be understood as a form of risk sharing that can strengthen bankability while also transferring part of the downside exposure to the public sector. Pellegrino (2021) reinforces this interpretation by demonstrating that alternative revenue-support mechanisms generate different effects on project viability, private profitability and governmental exposure. This suggests that guarantees should be calibrated according to their capacity to absorb destabilizing shocks without eliminating incentives for effective private management. Demirag et al. (2015) add that financing conditions affect risk pricing and contractual structures, meaning that improvements in bankability can modify the broader distribution of responsibilities among PPP participants. Opara (2018) further indicates that value for money depends on whether this distribution reflects the real uncertainty borne by each partner. Public financial support can therefore strengthen PPP resilience when it alleviates financing constraints and limits extreme losses, while excessive protection may weaken market discipline and transfer disproportionate financial exposure to the public sector.

Wibowo and Sundermeier (2020) demonstrate that value-for-money assessment should incorporate the capacity of PPP participants to mitigate risks rather than focusing solely on the level of exposure. Their findings imply that resilience depends on organizational capability because similar financial or operational shocks may generate very different consequences according to the resources available to manage them. Santandrea et al. (2016) provide a complementary perspective by showing that contractual and financing arrangements can become fragile when they lack sufficient flexibility to adapt to changing circumstances. Vecchi et al. (2017) add that government guarantees can improve access to finance, although the resulting contingent liabilities require careful assessment of public-sector risk. Pellegrino (2021) further shows that different support mechanisms involve distinct trade-offs between private profitability, project viability and fiscal exposure. Bankability, value for money and resilience are therefore closely connected. A financially viable PPP must not only attract private capital but also possess sufficient capacity to absorb shocks without relying excessively on public protection. Sustainable project finance requires a balance between credit enhancement, contractual adaptability, risk-mitigation capability and incentives that encourage both partners to manage uncertainty effectively.

2. Governance mechanisms, relationships and PPP performance

2.1. Contract stability, renegotiation and adaptive risk governance

Soeipto and Verhoest (2018) show that governmental PPP support can reduce contractual instability by providing expertise, standardized procedures and institutional capabilities capable of addressing emerging difficulties before they develop into extensive renegotiation. Their findings imply that contract stability depends partly on capacities located beyond the individual

project agreement. Xiong et al. (2019) reinforce this perspective by showing that PPP governance involves contractual arrangements, institutional structures, accountability mechanisms, relationships and managerial processes that interact throughout project implementation. Long-term contracts cannot anticipate every future circumstance, making coordination and adjustment necessary when unexpected events occur. Tallaki and Bracci (2021) further distinguish risk allocation from subsequent risk management, showing that assigning responsibility contractually does not ensure that the designated actor will manage the exposure effectively over time. Rybníček et al. (2020) add that PPP risks extend across financial, political, regulatory, operational, construction and relational dimensions and require contractual, managerial and collaborative mitigation responses. Contract stability therefore depends on more than the precision of initial risk allocation. It also requires institutional support, continuing information exchange and managerial capabilities that allow partners to adjust responses when project conditions change without transforming every disturbance into conflict or renegotiation.

Fleta-Asín and Muñoz (2020) show that transferring greater levels of risk to private partners does not automatically improve PPP success in developing economies. Their findings indicate that the effects of risk transfer depend on the nature of the exposure and on the institutional environment surrounding the project. This implies that contractual stability may deteriorate when one partner receives risks that exceed its capacity to control or absorb. Rybníček et al. (2020) complement this argument by showing that mitigation strategies must evolve throughout the project life cycle because vulnerabilities can emerge from several interconnected sources. Tallaki and Bracci (2021) similarly emphasize that effective management requires continuing actor interaction after the initial contractual distribution has been established. Soeipto and Verhoest (2018) add that governmental support structures can help resolve emerging problems and thereby reduce the need for disruptive renegotiation. Adaptive risk governance consequently requires preserving sufficient risk-bearing capacity on both sides of the partnership while maintaining institutional mechanisms capable of responding to changing conditions. Stability does not depend on preventing all contractual adjustment, but on ensuring that adaptation occurs through organized governance processes that protect service continuity and maintain cooperation between public and private participants.

Osei-Kyei et al. (2023) show that PPP risk-management research has progressively moved toward more integrated approaches combining identification, assessment, allocation and mitigation with governance-oriented perspectives. This evolution indicates that risk management is increasingly treated as a dynamic process rather than as a static contractual exercise. Xiong et al. (2019) provide a governance foundation for this interpretation by showing that accountability, institutional arrangements and relational mechanisms interact with formal contracts throughout project implementation. Fleta-Asín and Muñoz (2020) add that the effectiveness of private risk transfer varies with institutional conditions, demonstrating why fixed allocation rules cannot be applied uniformly across projects or countries. Osei-Kyei et al. (2023) further highlight the growing attention given to interdependence and changing project conditions, while Tallaki and Bracci (2021) show that managerial capabilities remain necessary after contractual responsibility has been assigned. PPP resilience therefore rests on the capacity to revise responses as risks evolve while preserving a clear allocation of responsibilities. Adaptive governance allows partnerships to absorb uncertainty through coordinated mitigation, institutional learning and selective contractual adjustment rather than relying exclusively on ex ante provisions that may become inadequate over long project horizons.

2.2. Relational governance, trust, control and social value

Caldwell et al. (2017) show that public-private collaboration depends not only on formal contractual arrangements but also on relational coordination between organizations characterized

by different objectives and institutional logics. Their findings imply that communication, mutual adjustment and collaborative interaction can provide flexibility when disruptions cannot be fully anticipated in advance. Fernandez et al. (2018) complement this perspective by showing that contractual design must also address moral hazard when private actions are imperfectly observable by public authorities. Their contribution indicates that flexibility is sustainable only when incentives remain compatible and when one party cannot transfer costs or risks without corresponding accountability. Bracci et al. (2024) extend this reasoning by demonstrating that trust and formal management-control systems can coexist and evolve rather than functioning as simple substitutes. This suggests that resilient partnerships require both relational confidence and mechanisms capable of preserving accountability under changing conditions. Burke and Demirag (2019) further show that risk management takes place through networks of public and private actors within special-purpose vehicles rather than through the concession contract alone. PPP resilience therefore depends on coordinated organizational relationships, incentive-compatible contracts and adaptive combinations of trust and control that allow risks to be re-distributed without undermining cooperation.

Torchia et al. (2015) show that healthcare PPPs involve complex governance arrangements through which public and private organizations combine resources, responsibilities and objectives under substantial operational, financial and institutional uncertainty. Their findings imply that service continuity depends on governance structures capable of reconciling efficiency incentives with long-term public-service obligations. Hodge and Greve (2017) reinforce this interpretation by showing that PPP performance cannot be evaluated through a single efficiency measure because outcomes depend on institutional settings, contractual design, governance arrangements and evaluation methods. This broadens performance assessment toward continuity, adaptability and legitimacy when partnerships operate under changing conditions. Caldwell et al. (2017) add that relational coordination can support mutual adjustment across organizational boundaries when formal contracts provide insufficient guidance. Bracci et al. (2024) further demonstrate that formal control and trust can be recombined as partnership circumstances evolve. Organizational resilience in PPPs therefore requires performance systems capable of preserving service delivery while allowing relationships and control mechanisms to adapt. Financial efficiency remains relevant, but sustainable performance also depends on whether partners maintain sufficient coordination, accountability and institutional flexibility to reorganize activities when unexpected operational or governance pressures arise.

2.3. Context-sensitive risk allocation in emerging economies and infrastructure sectors

Mazher et al. (2019) show that PPP risk allocation becomes more sustainable when responsibilities are assigned according to the actual capacity of participants to manage specific exposures. Their capability-based framework implies that resilience depends less on transferring risks as widely as possible than on matching each uncertainty with the organization best positioned to anticipate, absorb and mitigate it. Mazher et al. (2018) reinforce this perspective by demonstrating that PPP risks frequently interact rather than operate independently. Financial, political, construction and operational problems can therefore combine and generate cascading effects that exceed the consequences of isolated exposures. Kukah et al. (2024) extend this logic to Ghanaian power projects by developing a quantitative framework that systematically matches a broad range of risks with suitable parties. Their findings suggest that structured allocation becomes particularly important in emerging economies where institutional and financial constraints can increase vulnerability. Kate and Patil (2020) similarly show that risk assessment and allocation in power-transmission PPPs must reflect the technical, financial and regu-

latory capacities of participating actors. Resilient infrastructure delivery therefore requires allocation models that account simultaneously for managerial capability and interdependence between risks, since poorly assigned or interacting exposures can undermine project continuity even when individual contractual responsibilities appear formally clear.

Rafaat et al. (2020) show that preferred risk allocation in Egyptian water PPPs depends strongly on local political, regulatory and operational conditions. Their findings imply that standardized allocation rules may weaken resilience when they ignore risks that private firms cannot effectively control, particularly those linked to public policy and essential-service obligations. Nur et al. (2023) reach a comparable conclusion in Indonesian geothermal projects, where exploration, resource, construction, policy and market uncertainties require differentiated allocation according to the comparative capacities of public and private participants. This suggests that project continuity depends on recognizing that some exposures are more efficiently retained publicly or shared rather than transferred entirely to private actors. Mazher et al. (2019) provide the capability-based foundation for this approach by showing that allocation quality improves when responsibility follows genuine mitigation capacity. Kukah et al. (2024) further demonstrate that systematic quantitative assessment can support such decisions before disruptions occur. Context-sensitive allocation therefore strengthens PPP resilience by protecting participants from risks outside their effective control while maintaining responsibility for exposures they can reasonably influence. The objective is not maximum private risk transfer, but a contractual distribution capable of preserving financial stability and infrastructure delivery under sector-specific and institutional uncertainty.

Nur et al. (2023) demonstrate that optimal risk allocation in geothermal PPPs requires distinguishing between exposures according to the comparative risk-bearing capacities of public and private actors. Their findings imply that sector-specific uncertainty must be incorporated directly into contractual design rather than treated as a generic infrastructure risk. Kate and Patil (2020) reinforce this interpretation in power-transmission projects by showing that allocation decisions need to reflect technical, financial and regulatory capabilities if operational continuity is to be preserved. Rafaat et al. (2020) add that local institutional conditions influence which party should bear particular risks, especially in water infrastructure where public-service obligations constrain the extent of efficient privatization. Mazher et al. (2018) broaden the perspective by showing that risk interactions can create cascading vulnerabilities, meaning that allocation decisions should also consider how one exposure may intensify another. PPP resilience therefore depends on a combination of sector knowledge, local institutional understanding and systematic assessment of interdependent risks. Allocation structures become more robust when they recognize both the comparative capacities of partners and the possibility that multiple uncertainties may reinforce one another, thereby reducing the likelihood that localized disruptions evolve into wider financial, contractual or operational instability.

3. Organizational resilience and adaptive capacity in PPP and cross-sector systems

3.1. Public-private collaboration as a resilience capability

Eyerkauf et al. (2016) show that public-private collaboration can strengthen disaster-risk management by combining governmental responsibilities with private-sector resources and operational capabilities. Their findings imply that resilience depends partly on the capacity to mobilize resources and coordinate action across institutional boundaries when ordinary organizational routines become insufficient. Gabler et al. (2017) reinforce this perspective by demonstrating that even short-term public-private collaboration can provide adaptive capacity during disruptive events through the rapid combination of complementary resources. This suggests

that resilience can emerge from relational and organizational arrangements that extend beyond conventional long-term concession contracts. Barasa et al. (2018) broaden this reasoning by showing that organizational resilience depends on resources, planning, information, leadership, collaboration and adaptive capacity rather than on a single protective mechanism. Linnenluecke (2017) further emphasizes that resilience involves the capacity to anticipate disruption, maintain essential functions and adapt after shocks. PPP resilience therefore cannot be reduced to contractual stability or formal risk allocation. It also depends on whether participating organizations possess sufficient resources, coordination mechanisms and adaptive capabilities to maintain important functions and reorganize activities when severe external events disrupt normal operating conditions.

Casady and Baxter (2020) show that pandemics and force-majeure events expose the limitations of long-term PPP contracts built around assumptions that future conditions can be specified sufficiently in advance. Their findings imply that resilience requires contractual provisions capable of accommodating extraordinary shocks that neither public nor private actors can reasonably control. Linnenluecke (2017) provides a broader theoretical basis for this interpretation by showing that organizational resilience involves more than resistance to disruption and includes adaptation and recovery after changing circumstances. Ghanem and Ghaley (2024) extend this logic directly to public-private partnerships by developing a resilience-based framework in which public and private stakeholders jointly contribute resources and capabilities to strengthen adaptation. Eyerkauf et al. (2016) similarly demonstrate that coordinated public-private action can improve disaster-risk management through resource mobilization and information exchange. Resilient PPPs therefore require both contractual flexibility and cooperative capacity. Force-majeure provisions and renegotiation mechanisms can create formal room for adjustment, but their effectiveness depends on whether partners can coordinate resources, exchange information and reorganize responsibilities when external shocks exceed the conditions anticipated in the original agreement.

Ghanem and Ghaley (2024) show that resilience can be incorporated directly into the logic of public-private partnership by emphasizing the joint contribution of stakeholder resources and capabilities to adaptation. Their framework shifts attention from risk transfer toward cooperative resilience building, implying that the ability to withstand disruption can itself become an objective of partnership design. Gabler et al. (2017) provide a complementary mechanism by showing that cross-sector relationships can operate as adaptive capacities when established channels permit rapid coordination during emergencies. Barasa et al. (2018) add that such coordination is effective only when organizations possess supporting resources, leadership, information and planning capabilities. Casady and Baxter (2020) further demonstrate that severe external shocks can require renegotiation and collaborative responses when contractual assumptions become inadequate. Organizational resilience in PPPs therefore emerges from the interaction between formal contractual flexibility and the adaptive capacities of participating organizations. Partnerships are more likely to maintain continuity when they can mobilize complementary resources, revise operating arrangements and coordinate responses without allowing extraordinary shocks to develop into lasting contractual failure or interruption of essential public services.

3.2. Operational, supply-chain and digital capabilities supporting resilience

Duchek (2020) conceptualizes organizational resilience through the interrelated capabilities of anticipation, coping and adaptation, implying that exposure to similar risks can produce different outcomes depending on the preparedness and adaptive resources available within organizations. This perspective is particularly relevant to PPP arrangements because contractual risk allocation alone cannot determine how effectively partners respond once disruption occurs.

Scala and Lindsay (2021) reinforce this reasoning by showing that healthcare supply-chain resilience depends on agility, collaboration, flexibility and redundancy, especially when extreme disruptions undermine efficiency-oriented operating models. Their findings suggest that public-private service systems require operational margins that permit rapid adjustment rather than relying exclusively on tightly optimized resources. Spieske et al. (2022) extend this perspective by demonstrating that resilience in healthcare supply networks depends on organizational and interorganizational mechanisms, indicating that the vulnerability of suppliers or institutional partners can affect the continuity of the entire service network. Mhelembe and Mafini (2019) similarly show that flexibility strengthens public-sector capacity to manage supply-chain uncertainty. PPP resilience therefore depends on capabilities distributed across organizational boundaries, including preparedness, alternative sourcing, interorganizational coordination and flexible decision-making. Strong contractual protections remain insufficient when operational networks lack the capacity to anticipate disruptions, reorganize resources and maintain essential services under changing conditions.

Ait Hbib et al. (2024) show that B2B FinTech-platform adoption can improve SMEs' access to financing, business relationships and organizational adaptation, providing an adjacent perspective on how digitalization may strengthen the resource-access capabilities of private organizations involved in collaborative arrangements. Duchek (2020) helps interpret this mechanism by showing that resilience depends on capabilities developed before, during and after disruption, particularly anticipation, coping and adaptation. Digital access to financial and interorganizational resources can therefore support resilience when it strengthens the capacity to prepare for uncertainty and adjust operating decisions. Spieske et al. (2022) add that resilience becomes a network property when service delivery depends on multiple interconnected organizations, meaning that digital capability within one organization cannot compensate fully for weaknesses among critical suppliers or institutional partners. Scala and Lindsay (2021) reinforce this conclusion by emphasizing collaboration, agility and flexibility as essential responses to severe supply and demand shocks. Digitalization can consequently contribute to PPP resilience when it improves access to resources, information and interorganizational coordination, but its effects remain dependent on broader organizational and network capabilities. Resilient partnerships require technological capacity to be combined with flexible operating structures, collaborative relationships and preparedness mechanisms capable of sustaining service delivery when disruptions propagate across organizational boundaries.

3.3. Institutional resilience and integrated governance of resilient PPPs

Torayashiki and Watanabe (2024) show that the effectiveness of public-private disaster partnerships depends on organizational experience, employee autonomy and internal orientations toward risk and crisis management. Their findings indicate that formal agreements alone are insufficient when participating organizations lack the internal capacity to translate contractual commitments into effective action during emergencies. El Hamidi and Karboub (2023) add a broader institutional perspective by showing that institutional quality influences Morocco's macroeconomic resilience to external shocks. Although their study is not centered on PPP contracts, its implications suggest that policy credibility, economic stability and institutional strength can provide an external environment that supports partnership continuity during systemic disturbances. Mazher (2025) complements this reasoning by demonstrating that inappropriate risk allocation can weaken value for money and partnership performance, which supports the need for capability-sensitive and adaptable risk-sharing arrangements. Jung and Song (2015) further show that disaster resilience depends on the structure of interorganizational networks, particularly the combination of strong internal relationships and bridging connections. PPP resilience therefore depends on organizational preparedness, institutional stability,

appropriate risk allocation and network structures capable of providing additional knowledge and resources when normal operating arrangements are disrupted.

Liu et al. (2025) demonstrate that PPP project resilience results from interrelationships among institutional, organizational, contractual and managerial governance factors. Their findings place flexible contracts, risk allocation, strategic alliances and long-term relationship management within the same governance system, showing that resilience cannot be generated through a single contractual mechanism. Jung and Song (2015) reinforce the relational dimension of this framework by showing that bridging relationships allow organizations to access additional resources and information during crises, while bonding relationships support internal coordination. Torayashiki and Watanabe (2024) provide an organizational complement by demonstrating that experience, employee autonomy and crisis-management orientation influence the practical effectiveness of public-private disaster arrangements. El Hamidi and Karboub (2023) add that these organizational and relational mechanisms operate within a wider institutional environment whose quality affects the ability to absorb external shocks. PPP resilience governance therefore requires interaction between internal organizational capabilities, interorganizational connections and supportive institutional conditions. Flexible contractual arrangements can facilitate adjustment, but their effectiveness depends on whether participating actors possess the autonomy, experience and external relationships necessary to coordinate responses when project conditions change unexpectedly.

Mazher (2025) shows that PPP risk-sharing research has progressively moved toward more dynamic and capability-sensitive approaches, indicating that long-term partnerships cannot rely exclusively on fixed allocations established at the beginning of a project. Risk responsibilities need to remain compatible with changing exposures and with the ability of participating organizations to manage them. Liu et al. (2025) extend this perspective by showing that resilience governance incorporates risk allocation alongside flexible contracts, strategic alliances and long-term relationship management. Their findings suggest that adaptation requires coordination between contractual and relational mechanisms rather than periodic modification of risk clauses alone. Jung and Song (2015) help explain the importance of these relational mechanisms by showing that network architecture affects the availability of information and resources during disruptive events. Torayashiki and Watanabe (2024) further demonstrate that such external support can only be converted into effective action when organizations possess sufficient experience, autonomy and crisis-management capacity. PPP resilience therefore emerges from the interaction between dynamic risk sharing, relational networks and internal organizational capabilities. Contracts provide the initial allocation of responsibilities, while adaptive governance allows partners to mobilize additional resources, revise responses and preserve service continuity as the nature and intensity of disruptions evolve.

4. Discussion

The literature reviewed in this paper indicates that the resilience of public-private partnerships is closely associated with the quality of risk allocation and with the capacity of partners to adjust contractual arrangements when project conditions change. The results suggest that transferring risks to the private partner does not automatically improve PPP performance. Instead, risks should be assigned to the party with the strongest managerial, technical, financial, or institutional capacity to control them. This interpretation is consistent with Chung and Hensher (2015), who emphasize capability-based allocation, and with Carpintero and Petersen (2016), who show that inappropriate transfers of construction, demand, and revenue risks may generate financial stress and contractual instability. Similar conclusions are reached by Shrestha et al. (2017, 2018), who underline the importance of aligning contractual responsibilities with actual risk-management capacities. The findings also support the argument of Valipour et al.

(2016) that some risks cannot be managed effectively by a single actor and therefore require shared responsibility. In this respect, resilience appears to depend less on maximizing private risk transfer than on establishing an allocation that remains economically manageable for both parties. Fleta-Asín and Muñoz (2020) similarly demonstrate that extensive private risk transfer does not necessarily increase PPP success, particularly when institutional conditions constrain the capacity of private actors to absorb uncertainty.

A second result emerging from the review is that organizational resilience cannot be generated through contractual provisions alone. PPPs operate over long periods during which economic, political, technological, and operational conditions may evolve substantially, making relational and adaptive governance necessary. This conclusion is consistent with Xiong et al. (2019), who conceptualize PPP governance as an interaction between contractual arrangements, institutional structures, accountability mechanisms, and relational processes. Tallaki and Bracci (2021) similarly distinguish initial risk allocation from subsequent risk management, demonstrating that assigning responsibility does not guarantee that the designated actor will successfully manage changing exposure. The importance of relational mechanisms is further supported by Caldwell et al. (2017), who show that communication and mutual adjustment can provide flexibility when contracts cannot anticipate all contingencies. Bracci et al. (2024) extend this reasoning by demonstrating that trust and formal control mechanisms can coexist and evolve throughout the partnership. These findings suggest that resilient PPP governance requires a combination of contractual discipline and relational flexibility. Soeipto and Verhoest (2018) also show that governmental support structures, institutional expertise, and standardized procedures can reduce instability and facilitate responses to emerging difficulties. Resilience therefore reflects the capacity of partners to adapt without allowing every unexpected event to develop into conflict, contractual failure, or disruptive renegotiation.

Finally, the review shows that PPP resilience should be understood as an organizational and institutional capability extending beyond conventional risk-management mechanisms. The capacity to anticipate disruptions, maintain essential services, mobilize additional resources, and reorganize activities appears particularly important when partnerships encounter severe external shocks. This interpretation corresponds closely to Duchek (2020), who conceptualizes organizational resilience through anticipation, coping, and adaptation, and to Linnenluecke (2017), who emphasizes continuity and adjustment following disruption. Barasa et al. (2018) similarly demonstrate that resilience depends on leadership, resources, information, planning, collaboration, and adaptive capacity. In a PPP context, these capabilities are distributed across several organizations, making interorganizational coordination particularly important. Eyerkauf et al. (2016) and Gabler et al. (2017) show that public-private collaboration can strengthen crisis responses by combining complementary public and private resources. More recent contributions reinforce this integrated perspective. Torayashiki and Watanabe (2024) highlight organizational experience, employee autonomy, and crisis-management orientation, whereas Liu et al. (2025) associate PPP resilience with flexible contracts, strategic alliances, risk allocation, and long-term relationship management. El Hamidi and Karboub (2023) additionally suggest that broader institutional quality can strengthen the environment in which organizations absorb systemic shocks. Consequently, resilient PPPs emerge from the interaction between appropriate risk sharing, adaptive organizational capacities, relational networks, and supportive institutional conditions.

Conclusion

This paper has shown that the resilience of public-private partnerships cannot be explained solely by the existence of formal contracts or by the transfer of risks from the public sector to private operators. Across the literature reviewed, a more consistent interpretation emerges in

which resilience depends on the alignment between risk exposure and the actual capacities of the partners responsible for managing it. Appropriate risk allocation, revenue-sharing mechanisms, guarantees, financing structures and concession arrangements can contribute to project continuity, but their effectiveness remains conditional on managerial competence, institutional support and the ability to adjust contractual responses when circumstances change. The analysis also indicates that excessive or poorly calibrated risk transfer may weaken rather than strengthen partnership performance by creating financial pressure, conflict and incentives for renegotiation. Consequently, resilient PPP design requires a balance between contractual clarity and flexibility, ensuring that responsibilities remain sufficiently precise while preserving room for adaptation. From this perspective, risk sharing should be understood as a dynamic governance mechanism rather than a one-time contractual decision. The long-term stability of PPPs therefore depends on the capacity of public and private actors to continuously reassess uncertainties, mobilize complementary resources and maintain cooperation when initial assumptions no longer reflect actual project conditions.

The broader contribution of the paper is to connect PPP risk governance with the literature on organizational resilience and adaptive capacity. The review suggests that resilient partnerships emerge from the interaction of contractual, organizational, relational and institutional mechanisms. Formal risk allocation remains necessary, but it must be complemented by trust, communication, coordination, institutional support, operational flexibility and the capacity to anticipate and absorb disruptions. This is particularly relevant in infrastructure and essential public services, where shocks may propagate across financial, operational and supply networks and where service interruption can generate substantial social costs. The reviewed studies further indicate that resilience is strengthened when organizations possess experience, autonomy, crisis-management capabilities and access to supportive interorganizational networks. These findings open several directions for future research. Empirical studies could test how particular combinations of risk-sharing arrangements, relational governance and adaptive capabilities affect PPP performance before, during and after major disruptions. Comparative research across sectors and institutional environments would also help determine whether resilient governance mechanisms operate differently in emerging and developed economies. Integrating organizational resilience more explicitly into PPP evaluation could therefore move research beyond traditional measures of efficiency and value for money toward a broader assessment of continuity, adaptability and long-term public-service sustainability.

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