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Risk Allocation in Unsolicited and Solicited Road Public-Private Partnerships: Sustainability and Management Implications

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Abstract: Risk allocation plays a crucial role in the successful development of public-private partnership (PPP) projects. However, despite being an important topic for scholars and practitioners, the existing literature does not provide sufficient evidence on how managing risks in solicited (SP) and unsolicited (USP) road PPP projects, and subsequently, on what the sustainability implications are for such managerial processes. This study aims to extend risk allocation studies by analyzing contracts in Chilean highway PPPs over the last decade based on a systematic content analysis framework and case study data. The framework was developed through line-by-line coding of contract provisions associated with risk-related issues, and data were collected from semi-structured interviews with Chilean PPP practitioners. Results show that, although the majority of risks are either shared or transferred to the private party in most contracts, there are important variations in the way allocation procedures are implemented for SPs and USPs. Contracts analyzed revealed that risk arrangement mechanisms have usually focused on the economic dimension of sustainability without fully incorporating social and environmental considerations, increasing protests in the long-term. Conclusions indicate that risk allocation procedures and sustainability considerations are highly dependent on project-specific features and contextual factors. Overall, the analysis uncovers that the level of autonomy given to the private sector in both SPs and USPs has contributed to properly manage technical and economic risks, but has failed to successfully allocate social and environmental concerns.

Keywords: risk allocation; public-private partnerships; PPP; unsolicited proposals; solicited proposals; sustainability

1. Introduction

Public-Private Partnerships (PPPs) have become useful instruments to improve the road infrastructure sector in multiple jurisdictions worldwide [1–3]. These initiatives involve long-term arrangements in which each risk is shared between private and public actors or shifted to the actor that can manage it best [4]. In a typical PPP road infrastructure project, the risk allocation process consists of multiple contractual transactions in which the private sector assumes specific project-related risks and agrees to design, build, finance, operate, and maintain the asset in exchange for adequate financial returns [5]. Consequently, PPPs can be beneficial to the public and private parties because they facilitate project delivery, provide long-term operation and maintenance services, and ensure suitable compensations throughout projects' lifecycle phases [6,7]. Moreover, PPP investments are crucial to empowering communities and achieving sustainable development, which is important because the

United Nations (UN) has identified the development of proper infrastructure as one of its Sustainable Development Goals (SDGs) [8].

Public agencies have traditionally procured and developed PPPs through solicited proposals (SPs) procedures, which often involves competitive tendering processes [9]. However, to manage the deficient ability of the public sector to formulate PPP initiatives, some jurisdictions employ unsolicited proposals (USPs) to develop PPP initiatives that are originated within the private sector [10]. In this context, the USP method is defined as a PPP approach in which a private investor identifies and proposes a public project to a public agency without any formal invitation [11]. For both initiation processes (i.e., SPs and USPs), researchers and practitioners highlight the benefits associated with the ability of public agencies to transfer risks to private partners, as well as the capacity of the private sector to deliver projects according to pre-established service-based performance outputs [10].

However, despite their potential benefits, several road PPP development processes worldwide (originated by either SP or USP) have been affected by multiple difficulties taking place across projects' lifecycle phases. Scholars argue that such difficulties are mainly because PPP transactions are affected by opportunism, uncertainty, and bounded rationality phenomena in the long-term [12–15]. The literature indicates that these challenges may be exacerbated within the transportation sector because, in this domain, public-private agreements usually involve a combination of autonomous private partners and high transaction and supervision costs from the public authorities [16–18]. Risk allocation and management processes, as a result, seemingly play a crucial role in overcoming development barriers and enhancing private sector's efficiencies, while reducing costs associated with safeguarding public interests. This is because implementing proper risk management mechanisms contributes to increase contractual transparency, improve communication between public and private counterparties, enhance problem-solving procedures, and facilitate conflict-resolution practices [19–23].

PPP scholars have conducted studies focused on getting a better understanding of how to improve risk management and allocation practices [23–29]. However, the literature on this subject remains fragmented and inconclusive. Researchers appear to adopt the perspectives of either public or private sectors when analyzing assessment frameworks, governance structures, and optimization models, among other risk-related topics [30,31]. There is little evidence of research examining how risk management is done in multiple real projects and how it should be done in practice. For instance, most papers use interviews or surveys and do not directly examine PPP contractual documents and legislation [23,30,32,33]. Furthermore, research in this domain does not seemingly differentiate among different project delivery methodologies (e.g., Build-Operate-Transfer, Design-Build-Operate-Maintain, Design-Build-Finance-Operate-Maintain) or initiation mechanisms (e.g., solicited and unsolicited proposals) [25,32,34]. It seems to mainly focus on delivery approaches employed in specific countries (e.g., Australia, China, and the UK) [23,33,35] or sectors (e.g., utilities and health care) [36–39]. Additionally, concerning sustainability, although scholars recognize it as an important topic for PPPs, there is scarce evidence of PPP research available on the relationship between sustainability and risk management for different PPP types [34,40].

In this context, risk is a topic that has been extensively studied from multiple perspectives, and it can be connected to the origin and resolution of multiple PPP difficulties within the road infrastructure sector [19,29,31]. Allocation and management procedures are essential to establish how each one of the risks associated with road PPPs is transferred, shared, and managed among public and private counterparties [29,41]. Taking into account that these procedures are specified in the contract agreement, this document becomes a key instrument to systematically study the way responsibilities are distributed between project participants and the mechanisms through which risk and incentives are assigned to PPP partners [26,29]. Consequently, to improve risk management and enhance PPP development, the PPP contract is a crucial tool to cohesively examine the relationship between project risks and management factors related to project delivery methodologies, initiation mechanisms, governance structures, and sustainability issues [19,31,41,42].

Building on literature related to road infrastructure, PPP governance, risk management, and sustainability, this study seeks to get a better understanding of the PPP risk management practices in the road infrastructure sector [2,12,14,28,29,32,43–48]. In order to do that, authors examine risk allocation processes from an integrated perspective by incorporating managerial (i.e., different project initiation approaches) and sustainability (i.e., economic, social, and environmental aspects) considerations into the analysis. To achieve this goal, this study assesses PPP contracts in the Chilean road infrastructure market and examines the perception of key PPP actors in Chile. With this in mind, the authors intend to address a current research gap in the extant literature: The study of PPP risks from an integrated perspective, based on data incorporated from multiple real cases, and by considering management and sustainability implications.

Consequently, this study leads to answer: (1) How do project initiation processes (i.e., solicited and unsolicited proposals) influence risk allocation mechanisms within the Chilean road PPP market? Furthermore, (2) what sustainable implications emerge from such risk allocation mechanisms? By answering these questions, this work seeks to gain insight into the differences between SPs and USPs and provide a comparative analysis of risk allocation schemes in conjunction with their sustainability-related implications. The authors seek to achieve this goal by conducting a comprehensive content analysis of contractual documents of all the Chilean road PPP projects since 2010. The content analysis is supported by semi-structured interviews with Chilean PPP experts and the development of a risk allocation matrix. This allows the authors to further compare and examine the PPP contracts at the light of experts' opinions and risk allocation procedures in multiple projects. In this sense, this study strengthens the PPP body of knowledge by exploring risk allocation practices and their sustainability implications across different initiation processes.

2. Background

2.1. PPP Development and Initiation Processes

PPPs integrate the complementary skills of private and public partners. The former contribute with innovative, technical, and managerial strengths; the latter provides a social- and local-based perspective, and accountability allowing an effective procurement method for diverse services and infrastructure types [36]. This integration occurs across multiple lifecycle phases includes long-term inter-organizational relationships between multiple participants, and is affected by uncertainty and bounded rationality [14,46,49,50]. Because of that, PPPs require governance structures capable of enabling both contractual and relational interactions between private and public counterparties [46,49,50].

Scholars characterize contractual and relational governance mechanisms as interrelated instruments required to improve PPP development [18,28,47,51]. The former refers to tools associated with reducing transactions costs and developing contracts capable of safeguarding the public and private parties from issues related to uncertainty and opportunism [1,13,49,51]. The latter encompasses instruments focused on building trust and generating shared beliefs and collaboration norms among PPP participants [1,12,18,47,51]. The implementation of both governance mechanisms is necessary to fully integrate public and private partners, increase project performance, and improve PPP outcomes [1,12,18,47,51].

In this context, while traditional project delivery methods (e.g., Design-Build and Design-Bid-Build) are mostly based on fixed-price agreements focused on processes required to reach the final product (i.e., project), PPPs employ performance-based contracts (PBC) as a way to provide infrastructure solutions through an integrated approach focused on achieving specific outcomes and performance levels throughout the project' lifecycle [50,52–54]. In the road infrastructure sector, performance-based contracts have proven useful to align public and private interests by establishing proper communication channels among project participants, incentivizing concessionaires' efficiency levels, promoting innovation, and providing clear service-based outputs [51,55]. In this sense, PBCs are useful to jointly

implement contractual and relational governance mechanisms. However, the implementation of these instruments has been challenging in multiple jurisdictions worldwide because it is not easy for public and private partners to mutually agree on how to create PPP value [14,52,53,55,56].

Based on studies developed by Kivleniece and Quelin [48], Caldwell et al. [57], and Hartmann et al. [14], it is clear that the implementation of PBCs and enabling governance structures relies on the concept of PPP value and that these structures are necessary to integrate public and private interests successfully. Accordingly, PPP value as a concept can be defined as the total aggregation of all the benefits generated by the public-private agreement [48]. Because benefits can be generated through public and private perspectives, researchers define social value as all the positive societal outcomes generated by PPP transactions and private value as the financial or monetary benefits obtained by private players [58].

Multiple researchers have studied PPP development mechanisms in conjunction with their governance structures and employed the concept of PPP value to understand better how to facilitate successful public-private transactions [20,59]. However, there is little evidence related to the way governments and private partners have implemented such studies within the road infrastructure sector. Furthermore, the literature does not provide sufficient empirical-based investigations focused on gaining insight into how public-private transactions incorporate concepts associated with the governance and PPP value [46,60,61]. One example of this research gap is the lack of differentiation between SPs and USPs in several scholarly publications.

A PPP project originates through SPs or USPs, based on the party that generates the initiative and begin the project [9]. The government develops SPs after an initiative is demanded following a national infrastructure development plan. That is, the public sector is the leader of the PPP implementation effort and is in charge of planning the initiative. Later, private firms provide resources, such as equity and debt, thus, reducing the government's financial constraints [10,62].

In contrast, private organizations procure the USPs looking for profitable investments [63]. USPs do not have to be contained in any national infrastructure development plan. However, USPs used to be allowed as a way to facilitate the private provision of infrastructure through the PPP scheme [10]. In this context, procurement processes play a crucial role in PPP development because it is essential for any government to choose an adequate partner that drives the USPs.

Tendering processes can be significantly different depending on whether projects are SPs or USPs. The differences between these tendering methodologies often lead to various levels of interaction between public and private parties [10,62,64]. In this sense, scholars have analyzed such differences by examining multiple case studies [65], management strategies [63], and organizational success factors [10]. However, despite the apparent differences between SPs and USPs procurement processes, the distinctions between these two PPP methodologies have not received sufficient scholarly attention so far.

Previous research focused on the difference between SPs and USPs has typically explored the motivations and pitfalls of these proposals in multiple regions worldwide. Scholars report that USPs have drawbacks related to reduced competition and lack of transparency, thus, disproportionally benefiting the private sector bidder [65,66]. To address these drawbacks, researchers have claimed that it is necessary to better structure USPs by increasing transparency and participation of all the stakeholders involved in such projects; thus, reducing corruption and biased judgment practices from the public and private parties [65]. Osei-Kyei et al. [63,67] investigated the reasons why public authorities of various countries have adopted USPs, and subsequently, studied strategies for improving the effectiveness of managing these initiatives. Yun et al. [10] explored how organizational aspects contributed to the improvement of PPP development processes by comparing public and private organizational performance on SPs and USPs in Korea. Hodges and Dellacha [68] investigated how governments enhanced competition and transparency on USPs by studying unsolicited transactions in countries, such as Australia, Chile, Canada, South Korea, the US, and many others. Abdel Aziz and Nabavi [69] explored how US transport sector companies perceived USPs in terms of their costs,

regulation, competition, and transaction times. Camacho et al. [70] compared the macroeconomic indicators and the procedures related to USPs in Chilean and Brazilian markets. Marques [65] compared effectiveness features and success factors related to USP experiences in the US, Korea, and Brazil.

2.2. Sustainability and PPPs

PPPs are closely related to SDGs, given that public-private agreements facilitate the supply of key services, such as transportation, education, water, healthcare, sewage, energy, and communication. In this context, Thacker et al. [71] identified the influence of infrastructure development across all the 17 SDGs. According to them, all of the sustainable targets related SDG3 (i.e., good health and well-being for people), SDG6 (i.e., clean water and sanitation), SDG7 (i.e., affordable and clean energy), SDG9 (i.e., industry, innovation, and infrastructure), and SDG11 (i.e., sustainable cities and communities) are affected by infrastructure projects [71]. In this sense, road PPPs play a crucial role in achieving high levels of sustainable development because of directly influencing processes associated with accomplishing SDG3, SDG9, and SDG11 [71].

The literature does not provide a unique definition of the concept of sustainability. Although the number of sustainability-related investigations linked to infrastructure development has increased in recent decades [40,61,72–79], researchers have not reached a consensus regarding a definition for such a concept [61,75,79,80]. However, most scholars agree that sustainability refers to all the efforts directed towards satisfying the present generation's requirements without undermining the capacity of future generations to satisfy their requirements [81]. This definition incorporates a three-dimensional approach that includes social, environmental, and economic perspectives. These dimensions, in turn, encompass multiple notions and goals related to "people", "planet", and "profit" [75,82].

The lack of consensus around the three-dimensional concept of sustainability makes it flexible and adaptable to several sets of circumstances. In the context of infrastructure development, the three dimensions are related to the impact generated by the design, construction, finance, operation, and maintenance of infrastructure initiatives [43,61,83,84]. In this paper, each perspective incorporates infrastructure-related concerns. Social sustainability refers to the influence of infrastructure development on aspects related to the accessibility and affordability of public services (e.g., water, electricity, telecommunications, transportation, health) [85]. Environmental sustainability focuses on the effects of infrastructure initiatives on the health and well-being of people and the built (e.g., air quality and traffic conditions in urban settlements) and natural environments (e.g., water pollution, deforestation, ecosystem services) [75]. Financial sustainability refers to the abilities of the parties to comply with the short- and long-term financial obligations associated with infrastructure investments [61].

Although PPPs and sustainability are intrinsically connected, their relationship is complex [75]. On one side, public-private initiatives are useful instruments to facilitate infrastructure provision by incorporating private capital into project delivery. PPPs contribute to incentivizing a lifecycle perspective in which public authorities, infrastructure developers, and equity investors work in conjunction to meet societies' needs [2,61]. Therefore, this vision requires that government agencies clearly define infrastructure project outcomes and that the private sector focuses not only on building infrastructure assets, but also on ensuring adequate service-based conditions. Because of that, multiple authors have argued that PPP development is a suitable means to improve infrastructure systems in any jurisdiction worldwide, and at the same time, accomplish economic, social, and environmental sustainability [2,40,61,75,77,78].

Despite their potential benefits, PPPs may also endanger sustainability. Researchers suggest that one of the main hurdles to achieve sustainability through PPPs is related to the lack of control over the role played by the private sector in these transactions [75]. If government agencies are not able to effectively oversee the private sector's actions, infrastructure projects delivered through PPP schemes may become legal monopolies in which investors and developers pursue their self-interest, rather than the general social welfare [2]. These opportunistic behaviors hinder the accomplishment of multiple

sustainability goals because private actors may behave opportunistically to improve their financial returns regardless of social, environmental, and economic necessities [61].

The concept of infrastructure development lies at the center of the relationship between PPPs and sustainability. Although public-private initiatives are a valid vehicle to enhance infrastructure systems, they may not necessarily do so by incorporating sustainability-related perspectives. Some scholars report how the implementation of PPPs has improved the provision of essential infrastructure-based public services at a global level. However, other researchers highlight multiple PPP-related controversies associated with a lack of socio-political legitimacy, negative environmental impacts in the long-term, and excessive economic returns given to the private sector [2,61,75]. In this sense, the evidence regarding how to successfully integrate the concepts of sustainability and PPPs remains inconclusive. As a result, there is a clear need to examine how to harmonize the implementation of these two concepts to improve infrastructure systems worldwide.

Multiple researchers have examined the relationship between PPPs and sustainability. Hueskes et al. [61] analyzed 25 Belgium PPP contracts, and found that PPP projects are developed neglecting social dimensions of sustainability because of the absence of sustainable performance indicators. Atmo and Duffield [86] evaluated various Asian PPP power projects and established that PPPs could be enhanced by including environmental sustainability, energy security, and value for money criteria. Kumaraswamy et al. [87] studied cases in Latin America and Africa from a perspective of contracting relationships to strengthen the sustainability and productivity of PPPs. Patil [88] established proposals for modifying the procurement in Indian PPP projects to integrate sustainability criteria and reduce pitfalls. Noble [89] discussed criteria and parameters for improving the Strategic Environmental Assessment in Canadian PPPs to achieve sustainable objectives.

2.3. Risk Management and Risk Allocation

Previous research has explored the relationship between risks and sustainability in non-PPP environments. De Luca et al. [90] revealed that risks related to intellectual capital are closely related to sustainable development. This relation intensifies as the size of the companies increases because of information asymmetries implications. Zimon and Madzík [91] exposed the influence of quality management systems on the reduction of risk in the supply chain, especially for big companies. Zimon et al. [92] presented and classified the requirements and obstacles to perform the SDGs in supply chains. Fedorova et al. [93] revealed that the social dimension of sustainability improves the management of conflicts related to the use of resources and social risks across the supply chain. Kovačević et al. [94] calculated the reliability of risks ranking in levees for controlling floods in a non-PPP Croatian case study to prioritize the investment.

Differing from small and medium-sized infrastructure projects in which routine construction management practices can be applied, road PPP projects involve multiple participants making several complex management-related decisions within a long-term, uncertain environment [95]. Based on that, risk management elements that are common in road PPP projects are associated with: Multi-layer relationships among project participants [96], project performance (i.e., cost, time, and safety) [1,97–100], procurement and contracts [95,101–104], environmental and social concerns [73,105], construction [106–109], and economic returns [95,110].

In this context, the concept of risk management plays a crucial role in terms of uncovering the differences between SPs and USPs [65]. Although appropriate risk management strategies are required to implement both SPs and USPs, no robust evidence exists to examine the differences between these two PPP procurement methodologies properly. Moreover, it remains unclear how the differences between SPs and USPs impact PPP performance.

Risk management is one of the most critical processes in delivering infrastructure through PPPs [2]. Due to the uncertainty and bounded rationality associated with PPP-related decisions across the project's lifecycle [111], proper risk management strategies are required to ensure adequate project performance [28]. However, no risk can be eradicated. Therefore, the only alternative is sharing,

distributing, or transferring risks in the contractual documents [27]. These processes are known as risk allocation.

Risks can be managed in different ways in PPPs. In this matter, Hartmann et al. [14] revealed that highway projects evolved from a method-based and asset-based to a serviced-based procuring method; this serviced-based procuring method includes PPPs analyzed in this study. This evolution increased risks transferring to the private partner in the Netherlands and the UK markets. Other authors have shown that Chinese and British governments, for example, usually bear most of the exogenous risks (i.e., the ones related to political and regulatory changes) [23,32,33]. In contrast, the US government seems to share such risks [29]. Otherwise, in most projects, the private traditionally assumes endogenous risks. For instance, in the UK and US, construction risks are typically allocated to the private party. However, this is not always the case, since, for example, the Chinese contracts usually have provisions for sharing these risks between public and private counterparties [23,29,32,33].

3. Materials and Methods

This study seeks to understand risk allocation mechanisms in road PPP development by examining managerial (i.e., project initiation processes, solicited and unsolicited proposals) and sustainability (i.e., economic, social, and environmental impacts) considerations. To do so, the authors employed elements from three knowledge domains: PPP development, sustainability, and risk allocation and management. Because these three fields are extensive and can be analyzed from several perspectives, this study uses PPP contracts as its main analytical instrument and as a common point to jointly explore these three topics. Contracts have been used for PPP investigations before because they are the representation of governance mechanisms, and as such, they are the result of public-private interactions and decision-making processes [19,31,41,42]. In this paper, as a result, contracts are employed as a means to explore decisions made concerning assigning and sharing project risks at the light of initiation processes and sustainability dynamics.

This work focuses on Design–Build–Finance–Operate–Maintain (DBFOM) transactions developed after 2010 within the road infrastructure sector in the Chilean PPP market. This is because several reasons: (1) Chile was chosen as a case of study given that this country has developed a consolidated highway concession system that includes 32 road PPP transactions since 1993, a number similar to the road PPP projects developed in countries, such as USA (32 initiatives) and Canada (30 initiatives) [112]; (2) the road infrastructure sector comprises the highest number of PPP transactions among all economic sectors in Chile (i.e., since 2010, the total number of PPP agreements in Chile includes ten roads, nine airports, three hospitals, two urban projects, and two hydropower projects) [113]; (3) the whole set of road projects developed under Law 24010 are toll road initiatives that comply with the characteristics of Design–Build–Finance–Operate–Maintain agreements as described in the PPP literature [15,112,114,115]; and (4) since 2010, Chile has conducted ten road concession initiatives thanks to the implementation of new PPP enabling legislation (i.e., Law 24010) directed to enhance PPP development in the road infrastructure sector [113]. Furthermore, since 2010 several developing and developed countries have increased their interest in developing PPP programs influenced by the 2008 global economic crisis [31,116,117].

The research methodology is organized as follows: Section 3.1 introduces the data sources used for the analysis (i.e., a literature review, the contract documents, and semi-structured interviews); Section 3.2 details the content analysis developed to identify risk allocation procedures; and Section 3.3 describes the procedure for conducting and analyzing the semi-structured interviews.

3.1. Data Sources

3.1.1. Literature Review

The first step towards analyzing PPP risks in SPs and USPs in this study was to identify the most important risks for public-private agreements and define them based on the PPP-related literature.

Building on the multiple PPP- and risk-related studies [2,23,29,33,42,118], the authors established a list of the most relevant risks for public-private initiatives. Tables 1–3 show the risk list developed, including their corresponding descriptions. Risk descriptions are based on multiple investigations in which the selected risks have been defined and analyzed. In line with that, Table 1 depicts the political and economic risks associated with PPPs. These concerns are usually examined across the initial or general phases of the PPP projects. Table 2 depicts risks related to the project site and construction activities within the construction phase. Finally, Table 3 describes the operation and termination risks.

Table 1. Political and economic risks.

Phase	Type	Risk [References]	Description
General	Political	Political opposition to project [2,21,29]	Opposition to the project by stakeholders, such as government agencies, the general public, and private-sector organizations.
		Change in law [2,21,29]	Any change in laws directly affecting public–private partnership (PPP) project development.
	Economic	Interest rates [2,21,29]	Any change in interest rates in long-term bank loans.
		Inflation [2,21,29]	High inflation effects over construction and operation.
		Financing [21,29]	Problems related to project finance.
		Foreign exchange [2,21]	Foreign-currency exchange-rate movements, e.g., in countries where the long-term debt is raised in a foreign currency

Table 2. Project site and construction risks.

Phase	Type	Risk [References]	Description
Construction Phase	Project site	Site acquisition [2,29]	Any difficulty in acquiring properties necessary for the project.
		Ground condition[2,29]	Difficulties with ground conditions because site geology maybe not as expected.
		Planning and permits [2,21,29]	Delays in getting planning and construction permits.
		Environmental impact and natural hazards [2,21,29]	The appearance of predictable or unpredictable environmental conditions (e.g., hazardous waste, pollution).
		Archeology and fossils [2,29]	Delays due to important archaeology discoveries or uncovering of fossils.
		Access, rights, and easements [2,29]	Difficulties during relocation and utility adjustments, or permitting across the site.
		Connections to the site [2,21]	Problems with the coordination with any third party related to the provision of connections or relocation of utilities.
		Protesters [2,21,29]	Delays due to opposition to the project by citizens.
		Disposal of surplus land [2,29]	Difficulties in selling old facilities as planned.
	Construction	Construction subcontract and subcontractor [2,23,29,34]	Risks related to the construction subcontract types and construction subcontractor (i.e., technical competence, credit risk, or limited involvement in the construction subcontract).
		Price adjustments [2,29]	Claims from subcontractors, due to changes in the project schedule, owner's risks, unforeseen events, or latent defects.
		Revenue during construction [2,29]	Revenues from tolls or a contracting authority not received as expected during construction.
		Delay by construction subcontractor [2,29]	Delays due to the construction subcontractor's fault.
		Performance [2,29]	The project fails to meet output specifications (e.g., equipment problems or inadequate technology).
		Construction subcontractor's risks [2,29,34]	The risk that payments by the concessionaire to the construction subcontractor failed.
		Contracting authority's risks [2,29,119]	The risk that contracting authority gives additional supports to the private partner to mitigate construction risks.
		Design [2,21,29]	Difficulties associated with faults within the design process
		Insurable risks [2,35]	Additional insurances to the contract requirements that could ask lenders for the construction phase.

Table 3. Operation and termination risks.

Phase	Type	Risk [References]	Description
Operation Phase	Operation	Demand risk [2,21,29]	Lower demand because of optimism bias (e.g., difficulty of valuing time saved, lower usage by heavy-goods vehicles, slower ramp-up, or problems to finance in expected connecting roads).
		Network [2,29]	Local policy changes by the government (e.g., changes in road networks, traffic management, changes in tolls, or other road-usage fees, competing roads).
		Revenue payment [2,29]	The government fails in paying according to the dates established in the contract.
		Availability and service [2,29]	The facility fails to meet specified availability or service standards/measures.
		Maintenance [2,29]	Higher maintenance costs than expected or unscheduled maintenance that impairs availability.
		Other operating costs risks [2,29]	Other operating-cost overruns (e.g., utilities costs per unit, higher demand, insurance premiums, Special Purpose Vehicle´s direct costs).
		Transfer [2,29]	Modifications in the structure of the SPV of parties linked to the contract (e.g., shareholder structure changes).
		Interface risks [2]	Risk related to the interaction between two parties, such as subcontractors.
	Termination	Project-company default [2,29]	Early termination due to project company default.
		Termination by the contracting authority [2,21,29]	Early termination caused by decision or default of the contracting authority.
		Permanent *force majeure* [2,29]	Events unlikely in nature that entails permanent failure.
		Hand back and residual value [2,29]	The facility site does not have the specified residual value or requirements once the contract has ended.

3.1.2. Contract Documents

The goal of this study was to examine risk allocation procedures in Chilean SPs and USPs within the road infrastructure sector. This analysis was done to gain insight into different risk management mechanisms and analyze their sustainability implications. This analysis was conducted by exploring the most recent DBFOM highway contracts with financial closure (i.e., road PPP contracts with financial closure as established in Law 20410) from 2013 to 2019. As shown in Table 4, ten projects met these parameters, accounting for a total of 369 km roadway and an initial total investment of USD 3348 million. This set of initiatives differ in scope, duration, and other project parameters. These projects were selected given that those variations allow a suitable comparative and longitudinal analysis through the total sample of the highway DBFOM that reached financial close within the current PPP legal framework. Specifically, all PPP road contracts in Chile are fully integrated DBFOM contracts that imply project finance schemes with user charges, in this case, toll collection.

The authors analyzed both the request-for-proposal documents and the PPP contracts with their corresponding addenda. This information was obtained from the official online platform of the Chilean government for PPP procurement processes [113]. Each project included multiple documents that comprised around 400–500 pages in total.

Table 4. PPP highway projects in Chile granted after Act 20410. SP, solicited; USP, unsolicited.

Project	Length (km Roadway)	Initial Investment (Millions of US)	ID	Urban-Interurban
Segunda Concesion Túnel el Melon	5	147	SP1	Interurban
Segunda Concesión Camino Nogales-Puchuncavi	27	215	SP2	Interurban
Segunda Concesión Rutas del Loa	136	300	SP3	Interurban
Ruta 43, de la Región de Coquimbo	86	209	SP4	Interurban
Mejoramiento Ruta Nahuelbuta	55	251	USP1	Interurban
Mejoramiento Ruta G-21	31	94	USP2	Interurban
Nuevo Puente sobre Río Bio Bio	6	181	SP5	Urban
Américo Vespucio Oriente Tramo El Salto-Príncipe de Gales	9	896	SP6	Urban
Américo Vespucio Oriente Príncipe de Gales-Los Presidentes	5	805	SP7	Urban
Conexión Vial Ruta 78 hasta Ruta 68	9	250	USP3	Urban
TOTAL	**369**	**3348**		

3.1.3. Semi-Structured Interviews

Apart from contractual documents, data collection efforts also included ten face-to-face semi-structured interviews with PPP experts. These interviews were conducted to improve research validity by improving external trustworthiness. As shown in Table 5, all of the interviewees possessed eminent practical experience in Chilean PPP projects. For this research, each one of the interviewees was chosen because of his/her experience and role according to the field of experience (i.e., academic, project manager, contract manager, consultant, government official, or O&M contractor). In this regard, the authors searched for professionals with more than 5 years of experience in road PPP projects. The group of experts included multiple backgrounds within the public and private sectors: Consultants, contract managers, academics, project managers, O&M contractors, and government officials. All interviews lasted between 60 and 100 min and were recorded to facilitate analysis and to ensure accuracy.

Table 5. Profile of interviewees.

ID	Sector	Years of Experience	Role
R1	Academia	More than 10	Professor
R2	Public	More than 10	Project manager
R3	Public	More than 10	Contract manager
R4	Public	More than 10	Contract manager
R5	Private	Between 5 and 10	O&M contractor
R6	Public	More than 10	Project manager
R7	Public	More than 10	Consultant
R8	Public	More than 10	Government official
R9	Private	More than 10	O&M contractor
R10	Private	More than 10	O&M contractor

The authors developed a questionnaire protocol that every experienced professional received and approved. The questions were designed in order to find implications and insights instead of quantities and numeric indicators. The questionnaire elaboration process was based on a comprehensive literature review to implement bias-reduction mechanisms employed in other studies [29,95,117,120–127]. The questions were focused on the most critical risks, due to their impact, risks that have arisen more disputes and renegotiations, changes and flexibility in risk allocation, and issues related to sustainability and risks. Consequently, ten face-to-face interviewees were developed.

3.2. Content Analysis

Based on the contract documentation and PPP-related Acts collected, this study used content analysis to identify risk allocation procedures. This methodology was chosen because makes replicable inferences by interpreting and coding text [128]. Moreover, it is an effective observational research method to systematically evaluate the content of documents, analyze recorded communications [129], and characterize extensive datasets [130]. It can be applied through qualitative or quantitative perspectives and inductive or deductive approaches [131]. Consequently, for this study and considering the collected information, the authors implemented an inductive and qualitative technique to improve the comprehension of risk management in SPs and USPs.

Following the analytical framework proposed by Nguyen et al. [29], a three-stage approach was implemented to ensure replicability and reliability [132]. First, a conceptual risk matrix was developed. Building one PPP-related literature and Chilean institutional documents focused on PPP development and risk management [2,29,32,112,133,134], a total of 36 risks were identified as necessary for studying the Chilean context. Second, based on the risk matrix, the analysis rubric was designed to examine contracts and tender documents. Third, the rubric was filled using data related to contracts and tender documents. This information was subsequently organized and qualitatively examined to identify both relevant contractual provisions and the way each one of the 36 risks identified from the literature was allocated in each PPP project under analysis.

3.3. Analysis of Semi-Structured Interviews

The aim of conducting these interviews was to examine qualitatively risk perceptions about what the respondents considered the most critical risks. In this sense, the interviews contributed to examine further the risk allocation mechanisms identified from the PPP-related literature and Chilean PPP documents. They also helped to confirm the findings obtained from the content analysis of contracts and tender documents. Moreover, because experts were asked to suggest additional risk allocation criteria, interviews complemented the information collected during the content analysis stage. Overall, the semi-structured interviews were analyzed to determine risk allocation critical factors associated with risk impacts, contractual disputes, and changes in risk allocation and risk management practices.

4. Results

Tables 6 and 7 show the risk allocation results for the ten Chilean road PPP contracts under study. In total, 36 risks were identified and organized based on their allocation patterns. Table 6 shows risks homogenously assigned across SPs and USPs projects, respectively. Table 7, on the other hand, depicts the risks that exhibit differences in their allocation processes. Overall, 75% of risks were equally allocated for the ten contracts under examination; the remaining 25% were allocated in different ways across the projects.

4.1. Risks Homogenously Allocated Across the Projects

According to Table 6, most of the risks homogenously allocated across the ten contracts correspond to risks mainly allocated to the private party. These mainly refer to categories, such as finance (*financing)*, project site (*planning and permits; archeology and fossils; access, rights, and easements*); construction (*construction subcontract and subcontractor; contracting authority's risks; design; insurable risks);* operation (*availability and service; maintenance; other operating costs risks*; *transfer; interface risks*); and termination (*project-company default;* and *hand back and residual value*). This allocation pattern confirms that, as reported by multiple researchers [33,42,118], and respondents (R1–R4, R6–R7, and R9–R10), private parties are in a better position than the public sector to manage most of the risks associated with PPP projects.

Apart from risks borne by the private sector, Table 6 also shows that there are some risks consistently shared between public and private parties. They are related to general issues (*inflation*

and *permanent force majeure*), and activities within the construction phase (*site acquisition, connections to the site, price adjustments* and *construction subcontractor's risks).* Based on the collected information, these risks have been mitigated through compensation events or delay events (event mechanisms). For instance, *site acquisition* risk is treated as a delay event. This is illustrated in the SP6 contract (Section 1.8.8.3) that stated: " . . . in [the] case that the MOP does not meet the deadlines previously established for the delivery of the land, it will compensate the Concessionaire, granting it an increase in the time allocated for construction activities [. . .], equal to the time of effective delay".

Finally, three risks have not been allocated in any contract (*protesters, foreign exchange rate, and interest rates).* In addition, another three risks that have been consistently assigned to the public sector (*political opposition to project, disposal of surplus land*, and *termination by the contracting authority).* This allocation pattern seems to reflect that the Chilean government was not concerned about public demonstrations against PPP agreements or the fluctuations of financial and economical rates. In the same way, such allocation decisions follow the PPP literature [23,33,42,118] governments are responsible for protecting the projects from political opponents, facilitating the provision of land, and ensuring termination mechanisms.

Table 6. Risk homogenously allocated across SP and USP projects.

Phase	Type	Risk	Allocation in SPs	Allocation in USPs
General	Political	Political opposition to project	Public	Public
		Change in law	*	Public
	Economic	Interest rates	NA	NA
		Inflation	Shared	Shared
		Financing	Private	Private
		Foreign exchange rate	NA	NA
Construction Phase	Project site	Site acquisition	Shared	Shared
		Ground condition	*	Private
		Planning and permits	Private	Private
		Archeology and fossils	Private	Private
		Access, rights, and easements	Private	Private
		Connections to the site	Shared	Shared
		Protesters	NA	NA
		Disposal of surplus land	Public	Public
	Construction	Construction subcontract and subcontractor	Private	Private
		Price adjustments	Shared	Shared
		Delay by construction subcontractor	*	Private
		Performance	*	Private
		Construction subcontractor's risks	Shared	Shared
		Contracting authority's risks	Private	Private
		Design	Private	Private
		Insurable risks	Private	Private
Operation Phase	Operation	Demand risk	*	Public
		Availability and service	Private	Private
		Maintenance	Private	Private
		Other operating costs risks	Private	Private
		Transfer	Private	Private
		Interface risks	Private	Private
	Termination	Project-company default	Private	Private
		Termination by the contracting authority	Public	Public
		Permanent force majeure	Shared	Shared
		Hand back and residual value	Private	Private

* = Heterogeneously allocated.

Table 7. Risk heterogeneously allocated across the projects.

Phase	Type	Risk	Solicited Proposals							Unsolicited Proposals		
			SP1	SP2	SP3	SP4	SP5	SP6	SP7	UP1	UP2	UP3
General	Political	Change in law	Pu	Pu	Pu	S	Pu	Pu	Pu	Public		
Construction Phase	Project site	Ground condition	Pr	Pr	Pr	Pr	S	Pr	Pr	Private		
		Environmental impact and natural hazards	Pr	Pr	S	S	S	S	S	Pr	S	S
	Construction	Revenue during construction	Pr	S	Pr	S	S	S	S	S	S	Pr
		Delay by construction subcontractor	Pr	Pr	Pr	S	Pr	Pr	Pr	Private		
		Performance	Pr	Pr	NA	Pr	Pr	Pr	Pr	Private		
Operation Phase	Operation	Demand risk	Pr	Pu	Pu	Pr	Pu	Pu	Pu	Public		
		Network	Pu	Pu	Pu	Pu	Pu	Pu	S	Pu	Pu	S
		Revenue payment	Pr	Pu	Pr	Pu	Pu	Pu	Pu	Pu	Pu	Pr

Pu, public; Pr, private; S, shared; NA, not addressed.

4.2. Risks Heterogeneously Allocated across the Projects

According to Table 7, nine of the risks that were heterogeneously allocated across the projects were focused on project tasks, such as political changes (*change in law*); project site (*ground condition* and *environmental impact and natural hazards*); construction (*revenue during construction, delay by construction subcontractor* and *performance*); and operation (*demand risk, network*, and *revenue payment*).

According to the literature [23,33,42], and multiple respondents (R1–R4, and R6–R7), *change in law* is one of the most critical PPP-related risks and does not have a uniform way to be allocated. For Chilean PPPs, depending on the level of definition of this risk, for instance, private parties should bear it until they finish the design and start the construction phase (R1–R4). In this regard, one public contract manager emphasized that "*(the public authority) should define that the change in law must be allocated to the private sector if this (change) occurs before the completion of the design and the beginning of the construction phase, otherwise this (risk) must be assumed by the private sector*". Also, this risk can be either borne by the government agency in charge of the PPP agreement or shared between private and public parties. In some other countries, besides being allocated to the public and shared, this risk can also be allocated to the private party in some contracts [23,33].

On the other hand, according to multiple researchers [23,29,33], most of the risks related to project site and construction concerns are commonly allocated in different ways. Allocation processes usually classify such risks are either shared or borne by the private sector. This allocation pattern means that the way such concerns are managed depends on specific characteristics that may vary from project to project. According to various respondents (R1, R2, R3, R6, and R7), in Chile, *ground condition* and *environmental impacts and natural hazards* are heterogeneously allocated, due to their criticality, and to some extent, due to their unpredictability in some specific projects.

Finally, *demand* and *network risks* have been recognized for some respondents as some of the most critical hazards (R1, R4, R6, and R9). Moreover, these two risks have been widely recognized as some of the most critical PPP-related risks by multiple researchers worldwide [23,29,33,42,118]. In Chile, such concerns have usually been borne by the public sector through the use of the minimum income guarantee (MIG) (SP1 and SP4 are exceptions in this regard). On the other hand, *revenue payment* has been homogenously shared by public and private parties in Chile. This allocation pattern seems to suggest that Chilean authorities tend to guarantee the payment of revenues to offer stability to the private party and improve project attractiveness.

4.3. Risk Perceptions of the Interviewees

The interviewees were asked about their opinions regarding the most critical risks. The most mentioned risks included: Design; environmental impact and risks; archeology and fossils; connections to the site; demand; network; price adjustments; protesters; planning and permits; ground condition; change of law; maintenance; and contracting authority's risks. Table 8 depicts sample responses that point out significant problems related to the most critical risks.

Table 8. Most critical risk insights matrix.

Risk	Public Sector's Responses	Private Sector's Responses	Academic Responses
Environmental impact and natural hazards	"Although they are apparently assigned to the private sector, they are shared with the public when there are overlaps or cost overruns." **Public Project Manager**	"Environmental risks usually involve other risks such as acts of God or change in the law." **Consultant**	"This risk should not be allocated exclusively to the private partner. This risk should be shared, given the fact that the public sector influences environmental agencies." **Academic.**
Archeology and fossils	"This risk could be mitigated before its occurrence if there is good communication with the public institutions in the planning phase." **Public Project Manager**	"There was a PPP project where thousands of indigenous bones were found. After two years, the archeologists had not recovered even 10% of the bones; consequently, the project was early terminated" **Consultant**	"There have been extreme cases where this risk has appeared. This risk should be shared, given the fact that the public sector influences archaeological entities." **Academic**
Connections to the site	"If (the connections to the site) cost exceeds a certain amount, the public sector partially supports these costs (through the prorated method)." **Project Manager**	"Public services companies do not have incentives to make detours and connections (to the site) quickly and are used to charge excessively." **Consultant**	"The public sector should be more involved in how and when public services companies make detours and when connections are required." **Academic**
Protesters	"Communities often do not value the relevance of the infrastructure investment, and certain opportunistic behaviors appear to increase the demands of the project because they perceive the private company as a very profitable partner. Communities should be involved in the planning phase (of the PPP projects)." **Public Contract Manager**	"There are usually more renegotiations in the construction phase due to community demands for new accesses, bridges, and bus stops." **O&M contractor**	"Sometimes (the public sector) has to make changes to the project that will imply cost overruns due to opposition from communities." **Academic**
Price adjustments	"Some bidders win bids because of their aggressive economic proposals to enter a new market or just win the bid. These concessionaires will seek to renegotiate later to compensate for this artificial lower proposal." **Government Official**	"Although companies develop quality PPP projects, they have a high rate of litigation due to price renegotiation compared to other concessionaires." **Consultant**	"When there are (price) renegotiations, some concessionaires threaten the public sector. They know that the government is not willing to revoke the concession." **Academic**

Table 8. *Cont.*

Risk	Public Sector's Responses	Private Sector's Responses	Academic Responses
Design	"Although design risk is apparently allocated to the private sector, this risk is shared with the public partner because they make the conceptual design. Design risk increases when the path for the road has not been fully defined." **Public Project Manager**	"There are several public agencies involved in the approval of design changes that do not have incentives to make decisions quickly, affecting the whole design process." **Consultant**	"The public sector should share this risk with the private partner since the basic design did not meet the standards." **Academic**
Demand risk	"The government assumes it (at least partially) even when this risk is allocated to the private partner to achieve credibility to the PPP program." **Public Project Manager**	"The Net Present Value of Incomes may have a negative consequence given the fact that a bigger number of users than expected will result in an early end of the concession and, consequently, the service levels will be lowered." **Consultant**	"The government assumes it when there is no Guaranteed Minimum Income, especially when there is a fixed term." **Academic**
Network	"Although there is no guarantee that there will be no future competing roads, there have been competing roads-related claims given that the private assume this as an unfair act." **Public Project Manager**	"In one road PPP project, there was a change in the lighting regulation for the roads on the area where are located observatories, which generated cost overruns, and consequently, private partner's complaints." **Consultant**	"The Public Authority established reduced maximum toll waiting times that were very difficult to meet." **Academic**

5. Discussion

5.1. Similarities in Risk Allocation between SPs and USPs

The findings indicate that most of the risks were homogeneously allocated across the studied projects regardless of their initiation processes. These were mostly assigned to private developers and grouped in categories, such as financing, project site, construction, and operation. According to Kivleniece and Quelin [48], these allocation patterns are consistent with risk allocation criteria for PPPs, as discussed in the PPP literature [23,33,135]. Moreover, this high proportion of risk allocated to private partners was expected given that road PPPs are autonomous structures. This means that, for the Chilean road infrastructure sector, risk allocation processes encourage private partners to assume an important number of risks, motivating them to look for private efficiencies and profit incentives. In other words, although private partners are required to deal with a high number of PPP-related limitations and uncertainties within the Chilean market, they seemingly seek to implement efficient and effective procedures across projects' lifecycles in order to obtain their corresponding economic and financial returns. As a result, based on these allocation practices, Chilean contracting authorities are mainly focused on verifying and monitoring contractual compliance.

In line with that, the findings also suggest that Chilean authorities have made important efforts focused on developing well-designed PPP contracts for both SPs and USPs. According to the studied PPP reports and semi-structured interviews, most procurement documents and contractual provisions have been drafted with the intention of implementing transparent PPP development processes,

which have been beneficial in terms of attracting PPP investors. Although such efforts indicate an inclination towards properly implementing contractual governance instruments, they have faced multiple challenges across several lifecycle phases in some projects. Most of these challenges can be associated with not implementing suitable relational mechanisms, as one of the respondents (i.e., project manager from the public sector) claimed: *"[C]oncessionaires from certain countries have less interest in entering this market, (for example) French (companies) considered the (Chilean PPP) contracts very complicated because French people are more used to build trust by (orally) discussing and negotiating PPPs"*.

Most of the respondents (R1–R4, and R6–R7) considered as highly critical all the risks assumed by private partners within the studied initiatives. They argued, for instance, that allocating the *design risk* is problematic in Chile. According to the interviewees, it opens the door to claim for renegotiations, given that, for SPs, projects' conceptual designs are developed by the contracting authority without private partners' participation. On the other hand, various respondents (R1, R2, R3, R6, and R7) considered *archeology and fossils* as one of the most critical risks because it can severely delay the construction phase. A private consultant highlighted the criticality of this risk: *"[T]here was a PPP project where thousands of indigenous bones were found; after two years, the archeologists had not recovered even 10% of the bones; consequently, the project was early terminated"*. Accordingly, respondents added that this risk could be mitigated in projects' early stages by improving communication between public and private organizations.

On this matter, it is essential to consider that some allocation patterns offer opposite perspectives as compared to what the international literature reports for similar risk management practices in other jurisdictions [23,33,42,118]. In the UK and China, for example, Chan et al. [33] and Bing et al. [23] found that the private partner borne the *inflation* risk. Moreover, in Australia, the UK, China, and India, the private party usually assumes *price adjustment* risks [23,33,42,118]. These cases differ from the Chilean experience, because Chilean PPPs allow for more protection to the private partner in some cost-related risks (e.g., *inflation, price adjustments, revenue during construction*, and *revenue payment*). Interviewees highlighted this higher protection to the private sector. For instance, one private consultant exposed that: *"[R]isk distribution . . . was extremely favorable for the private sector . . . , not only in terms of prices and profits but also in terms of the arbitration mechanism that is especially favorable for concessionaires"*.

On the other hand, while in Australia, the UK, and India *site acquisition* is traditionally allocated to the public sector [23,118], in Chile, such risks are shared. This indicates that Chilean PPPs allow for private partners to facilitate land acquisition procedures by reducing transaction and supervision efforts of public authorities. Furthermore, various respondents (R1, R2, R3, and R7) argued that *connections to the site* were one of the most critical risks, and more public involvement is required to create incentives for the public services companies to facilitate procedures and reduce utility charges. Interviewees highlighted the criticality of this risk as one private consultant indicated that this risk affects the budget and the schedule of the projects given that *"public companies do not have incentives to expedite and reduce the costs associated with utility works"*.

Finally, it is worth noting that the public party uniformly bore three main risks. In respect to *political opposition to the project*, this includes factors considering how local governments, pressure groups, users, and residents may offer resistance to PPP development. According to the literature, as in the Chilean case, the public sector usually assumes this risk given that private investors perceive political risks as a critical aspect that may influence the decision to participate or not in PPP projects [56,79,136,137]. On the other hand, regarding risks related to *disposal of surplus land* and *termination by the contracting authority*, the literature and interviews provide scarce evidence of allocation and management practices. This suggests that allocation procedures for such concerns have not traditionally been studied, and further research is required for both risks.

5.2. Differences in Risk Allocation between SPs and USPs

The findings confirm that, despite the similarities in risk-related procedures, the studied contracts exhibit significant differences concerning allocation patterns between USPs and SPs. In general, risks

were allocated more uniformly in USPs (i.e., 32 risks) than SPs (i.e., 27 risks), which implies that the government prefers to reduce variations in risk allocation procedures for USPs. This pattern suggests that Chilean authorities seem to prioritize standardization in USPs in order to safeguard competition conditions [138]. In doing so, Chilean authorities seem to prefer contractual over relational governance mechanisms.

Higher standardization in USPs aims to minimize conflicts and avoid litigation, due to the higher risk-exposure of such projects. This is because USPs are first-structured by private partners who are interested in winning the future project bid. However, this may also indicate that, for USPs, the contracting authority has a limited amount of time and resources to discuss and negotiate contractual and procurement documents properly [71]. In other words, this may suggest that Chilean contracting authorities do not have enough capacity to facilitate the implementation of efficient relational mechanisms and are mostly focused on delivering road PPP projects through applying contractual instruments. Interviewees highlighted this issue, as one public project manager commented that *"the government has an incentive to award as many contracts as possible, which is against good planning (and control) practices since this means low-supervision efforts across projects' phases"*.

The allocation patterns for *performance, delay by construction subcontractor*, and *ground condition* clearly show that risk management practices may have significant variations between USPs and SPs. Regarding this, for example, Hodges [66], explored the problems associated with unsolicited proposals, including Chile, with a particular focus on risks associated with contract transparency and competition conditions. According to this author, in order to cope with transparency issues in unsolicited initiatives, governments usually allocate some of the most significant risks to private partners (i.e., *ground condition, delay by construction subcontract*, and *performance*). Along with that, Yun et al. [10] and Marques [65] concluded that such allocation practices mean that the private sector needs to excel in managing USPs to develop these types of projects successfully.

The findings also confirm that contextual factors play an important role in terms of developing SP initiatives. Chilean authorities seem to prefer mechanisms directed towards incorporating projects' unique features into the risk allocation processes of SPs. This facilitates contractual and financial closure procedures because it contributes to clarifying the risk exposure of PPP investors [79]. As shown in Table 7, for instance, while *change in law* was allocated to the public sector in all USPs, it was shared in SP4. The way such risk is partially transferred to private partners is described in one of the contract provisions for SP4: *"In the event of regulatory changes related to the Environment Impact Assessment System (EIAS) taking place between the contract award ceremony and the beginning of the construction phase [. . .] It will be the total responsibility of the concessionaire to obtain the corresponding Environmental Qualification Permits"*.

Similarly, while the public party bore *demand risk* for every USP, this was transferred to the private partner in SP1 and SP4. For these two initiatives, it is clear that this allocation procedure was implemented because the uncertainty associated with traffic counts was low. SP4, for instance, is the only interurban project connecting La Serena (i.e., one of the main capital cities in Chile) with the national network. SP1, on the other hand, is a 5 km toll road (i.e., the shortest interurban project in Chile) that has been developed as a way to extend the period of an already-finished concession. In both projects, as a result, the *demand risk* was not significant and, consequently, government agencies did not need to ensure a minimum fixed level of revenues in case of the traffic volumes being lower than expected.

5.3. Analysis of Risk Allocation and Sustainability

Based on the studied PPP contracts and responses from the interviewees, there are two main risks related to the three-dimensional concept of sustainable development: *[E]nvironmental impact and natural hazards* and *protesters*. These two concerns are mostly linked to environmental and social sustainability issues. Both risks were considered as some of the most critical ones by most of the interviewees (R1–R4, and R6–R7). This criticality highlights the relevance of sustainability in PPP risk allocation processes.

In this regard, one private consultant emphasized that *"environmental risks usually involve other risks such as acts of God or change in the law"*. Also, a public project manager expressed that the protest-related risk *"has never really been addressed"*, and a public contract manager added that *"communities often do not value the relevance of the infrastructure investment, and certain opportunistic behaviors appear to increase the demands of the project because they perceive the private company as a very profitable partner; communities should be involved in the planning phase (of the PPP projects)"*.

Although public and private PPP experts recognize the importance of sustainability-related concepts for PPPs, highway PPP projects in Chile have been developed without fully considering the environmental and social dimensions of sustainability. This is in part because public hearings with communities affected by PPP projects are not legally required in this country [8]. Although environmental impact assessments (EIAs) have been implemented in some Chilean initiatives (as an optional pre-construction process), they seemingly do not facilitate the analysis of the relationships between *environmental impact and natural hazards* and project construction and operation performance. In this matter, a public project manager exposed that *"although they [environmental-related risks] are apparently assigned to the private sector they are shared to the public when there are overlaps or cost overruns"*. Considering the above, homogenizing the allocation of this risk to share it between the parties may be a solution; consequently, an academic proposed that *"these risks should not be allocated exclusively to the private partner. These risks should be shared due to the influence of the general public over environmental agencies"*.

Given the limitations associated with EIAs and social consultation processes, communities are seemingly not included in the governance scheme of PPPs (at least in the procurement phase). This is in part because the inclusion of communities requires the implementation of good communication channels between the general public and public and private partners. However, Chilean government agencies have proven unable to implement relational mechanisms focused on building trust and collaboration patterns among all stakeholders. Therefore, Chilean PPPs have created value on a limited basis, given that most road concessions seem to focus on generating economic value, without comprehensively incorporating strong social value-creation mechanisms. This seeming preference for economic value has created a reinforcing cycle in which total value (i.e., the sum of economic and social value) continually diminishes project after project. Consequently, for the Chilean case, neglecting social participation reinforces social disapproval for the PPP program, which in turn reinforces protests and affects private value capture mechanisms.

The literature supports this finding. For instance, Kivleniece and Quelin [48] argue that this pattern of behavior is more frequent in road PPPs because such initiatives tend to have autonomous governance structures. This makes communities likely to feel excluded and judge the participation of private companies in PPPs as contrary to their social norms and values. As a result, projects are perceived as illegitimate what encourages distrust among public authorities, private partners, and communities, motivating an increase in protests and complaints.

Additionally, Caldwell et al. [57] suggest that mutual understanding must be achieved to improve the social environment. Based on that, the collected evidence suggests that the Chilean government must improve the inclusion of environmental entities and community-based organizations within the PPP planning phase to enhance the application of relational mechanisms, increase PPP value, and improve legitimacy, thus, reducing the likelihood of protests against PPP projects. In line with that, the private sector must also contribute by building trust with communities. This contribution can help to reduce negative perceptions about public-private agreements and enhance the receptiveness of local communities towards PPPs [136]. Doing so may also reduce the impact of protests on the monetary value of the projects, improve the ways public sector authorities recognize their political accountabilities and social responsibilities [139], and expand the protection of social welfare in the long-term.

Apart from the literature, interviewees highlighted the fact that *protests*, which is currently one of the most critical risks for Chilean PPPs, had not been allocated in any of the contract documents of the projects under study. Respondents argued that before the 2019 protests in Chile, the government did

not consider this concern as a likely risk because they thought that the communities across the country widely supported the national PPP program. However, during the October 2019 protests, some of the movements that obtained more support were the ones focused on *"no more electronic toll collection"* or *"no more toll roads"*. Between October and December 2019, protestors damaged more than 50 toll facilities, and the central government reduced the toll fees of several PPP highways nationwide [140]. The public authority must pay all the costs associated with the reconstruction of such facilities and the reduction of users' fees, due to the absence of proper allocation procedures. This situation is an example that no matter how unlikely a risk may seem, it must be thoroughly analyzed and accordingly allocated.

6. Validation

Overall, data were collected longitudinally, involving all the authors and multiple PPP experts. This was done to obtain reliable evidence to identify risks, allocation patterns, and management and sustainability implications. In this context, triangulation was employed to conduct reliable data collection procedures and implement a consistent case study methodological approach [141,142]. In this way, this study was strengthen based on three different sources: Contractual documents for each project (i.e., PPP concessionaire agreement and addenda, request for proposals, and operation reports), interviews with ten Chilean PPP experts (i.e., informants had knowledge about at least one PPP project under study), and PPP-enabling legislation (i.e., Act 20410, Act 20123, and Decree 900).

The validation process involved the following objectives: (1) Ensure the inclusion of all significant risks within the analysis procedure; (2) verify the identification of risk allocation procedures in the contractual documents; (3) achieve a reliable interview process; and (4) guarantee data reliability for the case study analysis. The first objective was accomplished through conducting a broad literature review to identify the key risks to be allocated in PPP projects (i.e., political, economic, project site, construction, operation, and termination risks). The second goal was accomplished by following the analytical framework developed by Nguyen et al. [29]. This framework consisted of building a risk analysis rubric to examine the contractual documents. For this process, the authors assigned roles, two analysts and two supervisors. In this regard, the roles of supervisors were assigned to the most experienced researchers (i.e., the second and third authors). The analysts (i.e., the first and fourth authors) first reviewed the contracts and interview transcripts, took notes, copied the relevant text segments related to each risk, and established risk allocation of every risk in each one of the projects. In case of discrepancies, both analysts discussed their disagreements. If there was no agreement for any risk allocation procedure after two rounds of discussion, the four participants (including the two supervisors) reviewed and discussed all remaining discrepancies until achieving a consensus. At the end of the process, the analysis rubric and the allocation processes were independently reviewed by the second and third authors.

The third objective was achieved by developing a selection criteria process for the interviewees. Such a process sought to select experts with ample experience in diverse roles within the public and private domains. Moreover, a questionnaire was designed based on a comprehensive literature review to obtain key insights associated with the management and sustainability implications of risk allocation procedures. Finally, to accomplish the fourth objective, triangulation procedures were employed to examine data collected from three different sources: Contractual documents (i.e., PPP concessionaire agreement and addenda, request for proposals, and operation reports), interviews with ten Chilean PPP experts (i.e., informants had knowledge about at least one PPP project under study), and PPP-enabling legislation (i.e., Act 20410, Act 20123, and Decree 900). This study used triangulation to compare risk allocation procedures identified in contractual documents with Chilean PPP-enabling legislation and interviews. This comparison allows for increasing the reliability of the findings through a cross-checking process. This process increases the convergence of results, and allows for obtaining a further understanding of the underlying motives of risk allocation procedures.

7. Conclusions

The PPP-related literature offers multiple examples of studies focused on risk management, risk allocation practices, experiences, and pitfalls of USPs among countries. However, scholars have not thoroughly neither examined the differences between SPs and USPs concerning risk allocation processes nor their sustainable implications. Based on such a research gap, this study employed content analysis of documental evidence and semi-structured interviews of PPP experts to examine how risks are assigned in solicited and unsolicited public-private agreements. The authors focused on Chile, one of the most stable PPP markets worldwide. The analysis uncovered sustainable insights and relationships among multiple risks within different types of projects. A deeper understanding of managerial implications associated with PPPs can be attributed to these findings.

In contrast to previous PPP risk allocation studies, this paper focused on SPs, USPs, and their sustainability implications. A risk content analysis procedure was conducted to examine how risks were allocated in seven SPs and three USPs in road PPP projects in Chile. Results indicate that most of the risks were allocated homogeneously for all projects through the implementation of efficient contractual governance mechanisms. However, this also suggests that, in terms of risk management practices, Chilean authorities have not thoroughly implemented relational instruments as complements of such contractual tools. A comparative analysis of the ten projects analyzed in this study uncovered some interesting practices that reveal the differences in risk allocation procedures between SPs and USPs, in conjunction with their sustainability-related implications.

First, most of the risks were homogenously allocated across all projects and were assigned to the private sector. These risks are related to contextual factors (e.g., political and economic) and project concerns (e.g., financing, project site, construction, and operation). This high exposure for the private partners incentivizes not only private players' autonomy, but also their need to implement efficient management procedures across all projects' lifecycle phases. Based on that, public authorities are mainly focused on implementing contractual compliance and accountability processes.

Second, although most risks are transferred to private partners, some significant risks are mutually shared between public and private counterparties. These mostly refer to construction costs and revenue-related risks. This allocation pattern is different from the standard practice in countries, such as the UK and Australia, and means that Chilean officials have sought to improve the attractiveness of their PPP initiatives, and enhance their contractual instruments by offering protection to the private sector's interests.

Third, the findings confirm that there are significant variances between risk allocation patterns in different project initiation processes. For USPs, the Chilean government has sought to standardize contractual and procurement mechanisms in order to attract investors, safeguard competition conditions, and thus, reducing transaction and supervision costs. This reduces the likelihood of having conflicts and litigation, given the higher risk exposure of these projects. In contrast, for SPs, contracting authorities seem to incorporate contextual factors into their managerial procedures, thus, implementing risk allocation procedures by considering projects' unique features. This allocation pattern seems to suggest that Chilean authorities prefer to be flexible in terms of adjusting some risks based on the unique features of each project. Hence, the public sector seeks to reduce the tension between the long-term nature of PPP contracts and the need for flexibility in low-risk projects.

Fourth, most of the interviewees considered sustainability-related risks (i.e., *environmental impact and natural hazards* and *protests*) as some of the most critical concerns for both SPs and USPs. However, PPP development efforts in Chile have not fully incorporated the environmental and social dimensions of sustainability into their procurement and management procedures. The exclusion of such dimensions in the PPP governance structure has triggered value-creation mechanisms mainly focused on the private sector. This, in turn, has reduced the amount of total value in road PPPs because of the increasing social disapproval of the PPP program. Consequently, the Chilean government must improve relational mechanisms associated with community consultation processes in order to enhance citizen engagement and PPP legitimacy. Given the increasing influence of community organizations, this analysis suggests

that Chilean agencies should enhance stakeholder analyses to understand their dependencies, concerns, perceptions, interests, responsibilities, and roles in order to develop a sustainable PPP program.

This research contributes in several ways to multiple bodies of knowledge. First, although scholars have extensively discussed PPP governance mechanisms [51,55,61], and examined multiple PPP risk management procedures [24,124,135] in various infrastructure domains, this paper goes beyond previous research by examining the influence of managerial considerations (i.e., different project initiation mechanisms in DBFOM projects) into risk allocation mechanisms from an integrated perspective. Second, while PPP risk allocation procedures have been widely studied before [24,29,143], few studies have analyzed PPP risks from a sustainability-related perspective. In this regard, this work uncovered the environmental and social implications of PPP risk allocation procedures within the road infrastructure sector. Third, researchers in engineering and managerial fields have focused on improving their understanding of how to improve risk management and allocation practices by developing mathematical models [24,144–146], analyzing surveys [23–29], or evaluating interview-related data [16,31,111,147]. However, this study examined real PPP contractual documents (i.e., PPP agreements, procurement documents, and PPP-enabling legislation) to gain insight into the relationship among PPP initiation processes, sustainability, and risk management. Fourth, this research provides evidence on how Latin American countries deal with PPP contracts and risk management practices. This is important because, in comparison to other jurisdictions [23,32,33,35,118,148], there is little scholarly evidence on how PPPs have been implemented in this region for more than two decades. Fifth, although researchers have widely studied governance mechanisms and their relationships with community consultation and value creation processes [48], this study goes beyond by examining the link between risk allocation procedures, contractual instruments, and relational governance mechanisms. This has allowed the authors to examine how neglecting sustainability-related risks (e.g., protests) in the PPP planning phase may contribute to diminish PPP value, thus, decreasing the overall PPP program legitimacy and increasing protests in the long-term.

Despite the multiple contributions of this study, future research could explore five main research avenues. First, researchers can conduct risk allocation studies focused on Chilean non-highway PPP projects, such as urban infrastructure, airports, hydropower infrastructure, jails, seaports, healthcare infrastructure, and other public facilities. Second, future research can explore the influence of relational governance mechanisms on risk management through the PPP project's lifecycle. Third, a comparative study of risk allocation patterns can be conducted between Latin American countries or between developing and developed countries to understand similarities and differences among jurisdictions and explore the motivations underlying these procedures. Fourth, future research could also explore further implications of relational governance mechanisms, such as information sharing, commitment, communication strategies, trust, coordination mechanisms, collaboration, and dispute resolution on risk management practices in road PPP projects. Fifth, researchers can conduct studies focused on the relationship between complexity and performance in PPPs based on procurement complex performance (PCP) issues.

Overall, the findings of this study challenge the traditional approach for understanding risk allocation patterns across PPPs in the road infrastructure sector. USPs have been traditionally understood in the literature as a mechanism used by governments to expedite PPP procurement processes by allowing private counterparties to materialize ideas for public-private initiatives. Nevertheless, this study shows that, in terms of risk management practices, the influence of private partners in USPs may cover not only the procurement phase, but also all the other stages of the projects' lifecycle. The manner in which risks tend to be homogenously allocated in unsolicited initiatives within the Chilean market demonstrates this influence. This allocation strategy seeks to reduce the time and resources required to assess not only procurement documents in unsolicited transactions, but also conflicts and litigations across the construction, operation, and termination phases.

On the other hand, in terms of SPs, the analysis indicates that the Chilean government has tried to balance public and private interests by considering how each project's specific characteristics

influence the way risks are managed. This approach intends to improve projects' attractiveness among private investors. However, for both USPs and SPs, the way in which the Chilean government handles risk allocation procedures may endanger public interests if risks are not adequately identified and allocated. In this regard, this study shows that sustainability-related risks play a crucial role in achieving successful allocation processes. Consequently, not promoting governance structures focused on deeply involving community consultation processes can significantly reduce public support and social legitimacy towards PPP program—thus, increasing protests in the long-term.

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References

1. Guevara, J.; Garvin, M.J.; Ghaffarzadegan, N. The forest and the trees: A systems map of governance interdependencies in the shaping phase of road public-private partnerships. *J. Manag. Eng.* **2020**, *36*, 04019031. [CrossRef]
2. Yescombe, E.R.; Farquharson, E. *Public-Private Partnerships for Infrastructure: Principles of Policy and Finance*, 2nd ed.; Butterworth-Heinemann: Oxford, UK, 2018; ISBN 9780081007662.
3. Hodge, G.A.; Greve, C. Public-private partnerships: An international performance review. *Public Adm. Rev.* **2007**, *67*, 545–558. [CrossRef]
4. Groton, J.; Smith, J.R. *Realistic Risk Allocation: Allocating Each Risk to the Party Best Able to Handle the Risk*; International Institude for Conflict Prevention & Resolution: New York, NY, USA, 2010.
5. Alcaraz, V.; De Albornoz, C.; Millán, J.M.; Soliño, A.S. Managing a portfolio of public—private partnerships: Concessionaire perspective. *J. Manag. Eng.* **2018**, *34*, 04018044.
6. De Schepper, S.; Dooms, M.; Haezendonck, E. Stakeholder dynamics and responsibilities in Public—Private Partnerships: A mixed experience. *JPMA* **2014**, *32*, 1210–1222. [CrossRef]
7. Guevara, J.; Garvin, M.J.; Ghaffarzadegan, N. Capability Trap of the U. S. Highway System: Policy and Management Implications. *J. Manag. Eng.* **2017**, *33*, 1–14. [CrossRef]
8. The Economist. *Evaluating the Environment for Partnerships in Latin America and the Caribbean*; The Economist: London, UK, 2017.
9. World Bank. Guidelines for the Development of a Policy for Managing Unsolicited Proposals in Infrastructure Projects. 2017. Available online: https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/UnsolicitedProposals_Volume2_Guidelines_WEB%20%281%29.pdf (accessed on 20 January 2020).
10. Yun, S.; Jung, W.; Heon Han, S.; Park, H. Critical Organizational success factors for public private partnership projects—A comparison of solicited and unsolicited proposals. *J. Civ. Eng. Manag.* **2015**, *21*, 131–143. [CrossRef]
11. World Bank. Review of Experiences with Unsolicited Proposals in Infrastructure Projects. 2017. Available online: https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/UnsolicitedProposals_Volume3_Review_WEB%20%281%29.pdf (accessed on 20 January 2020).
12. Guevara, J.; Garvin, M.; Ghaffarzadegan, N. A Systems Analysis of Governance in Transportation Public-Private Partnerships: Exploring Major Feedback Mechanisms. In Proceedings of the Engineering Project Organization Conference, Cle Elum, WA, USA, 30 June 2016; p. 17.
13. Ho, S.P.; Asce, A.M.; Levitt, R.; Asce, D.M.; Tsui, C.; Hsu, Y. Opportunism-focused transaction cost analysis of public-private partnerships. *J. Manag. Eng.* **2015**, *31*, 04015007.

14. Hartmann, A.; Roehrich, J.K.; Frederiksen, L.; Davies, A. Procuring complex performance: The transition process in public infrastructure. *Int. J. Oper. Prod. Manag.* **2014**, *32*, 174–194. [CrossRef]
15. Antillon, E.I.; Garvin, M.J.; Molenaar, K.R.; Javernick-will, A. Influence of interorganizational coordination on lifecycle design decision making: Comparative case study of public-private partnership highway projects. *J. Manag. Eng.* **2018**, *34*, 05018007. [CrossRef]
16. Ameyaw, E.E.; Chan, A.P.C. Risk ranking and analysis in PPP water supply infrastructure projects. *Facilities* **2015**, *33*, 428–453. [CrossRef]
17. Reeves, E. The not so good, the bad and the ugly: Over twelve years of PPP in Ireland. *Public Priv. Partnersh. Infrastruct. Transp. Local Serv.* **2013**, *39*, 375–395. [CrossRef]
18. Benítez-Ávila, C.; Hartmann, A.; Dewulf, G. Contractual and relational governance as positioned-practices in ongoing public—Private partnership projects. *Proj. Manag. J.* **2019**, *50*, 716–733. [CrossRef]
19. Chou, J.; Pramudawardhani, D. Cross-country comparisons of key drivers, critical success factors and risk allocation for public-private partnership projects. *JPMA* **2015**, *33*, 1136–1150. [CrossRef]
20. Zhang, X. Critical success factors for public-private partnerships in infrastructure development. *J. Constr. Eng. Manag.* **2005**, *131*, 3–14. [CrossRef]
21. Osei-kyei, R.; Chan, A.P.C. Review of studies on the critical success factors for Public-Private Partnership (PPP) projects from 1990 to 2013. *JPMA* **2015**, *33*, 1335–1346. [CrossRef]
22. Liu, T.; Wang, Y.; Wilkinson, S. Identifying critical factors affecting the effectiveness and ef fi ciency of tendering processes in Public-Private Partnerships (PPPs): A comparative analysis of Australia and China. *JPMA* **2016**, *34*, 701–716.
23. Bing, L.; Akintoye, A.; Edwards, P.J.; Hardcastle, C. The allocation of risk in PPP/PFI construction projects in the UK. *Int. J. Proj. Manag.* **2005**, *23*, 25–35. [CrossRef]
24. Lam, K.C.; Wang, D.; Lee, P.T.K.; Tsang, Y.T. Modelling risk allocation decision in construction contracts. *Int. J. Proj. Manag.* **2007**, *25*, 485–493. [CrossRef]
25. Chang, C.-Y. A Principal-agent model of risk allocation in construction contracts and its critique. *Acad. Manag. Proc.* **2015**, *2013*, 12523. [CrossRef]
26. Nguyen, D.; Garvin, M.J. Risk allocation and management practices in highway PPP contracts: Pilot study of Virginia. *Constr. Res. Congr.* **2016**, *2016*, 2861–2871.
27. Andi. The importance and allocation of risks in Indonesian construction projects. *Constr. Manag. Econ.* **2006**, *24*, 69–80. [CrossRef]
28. Zhang, S.; Zhang, S.; Gao, Y.; Ding, X. Contractual governance: Effects of risk allocation on contractors' cooperative behavior in construction projects. *J. Constr. Eng. Manag.* **2016**, *142*, 4016005. [CrossRef]
29. Nguyen, D.A.; Garvin, M.J.; Gonzalez, E.E. Risk allocation in U.S. public-private partnership highway project contracts. *J. Constr. Eng. Manag.* **2018**, *144*, 4018017. [CrossRef]
30. Loosemore, M.; McCarthy, C.S. Perceptions of contractual risk allocation in construction supply chains. *J. Prof. Issues Eng. Educ. Pract.* **2008**, *134*, 95–105. [CrossRef]
31. Jiang, X.; Lu, K.; Xia, B.; Liu, Y.; Cui, C. Identifying significant risks and analyzing risk relationship for construction PPP projects in China using integrated FISM-MICMAC Approach. *Sustainability* **2019**, *11*, 5206. [CrossRef]
32. Ke, Y.; Wang, S.; Chan, A.P.C. Risk Allocation in public-private partnership infrastructure projects: Comparative study. *J. Infrastruct. Syst.* **2010**, *16*, 343–351. [CrossRef]
33. Chan, A.P.C.; Yeung, J.F.Y.; Yu, C.C.P.; Wang, S.Q.; Ke, Y. Empirical study of risk assessment and allocation of public-private partnership projects in China. *J. Manag. Eng.* **2010**, *27*, 136–148. [CrossRef]
34. Siraj, N.B.; Fayek, A.R. Risk identification and common risks in construction: Literature review and content analysis. *J. Constr. Eng. Manag.* **2019**, *145*, 03119004. [CrossRef]
35. Chung, D.; Hensher, D.A.; Rose, J.M. Toward the betterment of risk allocation: Investigating risk perceptions of Australian stakeholder groups to public e private-partnership tollroad projects. *Res. Transp. Econ.* **2010**, *30*, 43–58. [CrossRef]
36. Roehrich, J.K.; Lewis, M.A.; George, G. Are public-private partnerships a healthy option? A systematic literature review. *Soc. Sci. Med.* **2014**, *113*, 110–119. [CrossRef]
37. Torchia, M.; Calabrò, A.; Morner, M. Public–private partnerships in the health care sector: A systematic review of the literature. *Public Manag. Rev.* **2015**, *17*, 236–261. [CrossRef]

38. Acerete, B.; Gasca, M.; Stafford, A.; Stapleton, P. A Comparative policy analysis of healthcare ppps: Examining evidence from two spanish regions from an international perspective. *J. Comp. Policy Anal. Res. Pract.* **2015**, *17*, 1–17. [CrossRef]
39. Barlow, J.; Roehrich, J.; Wright, S. Europe sees mixed results from public-private partnerships for building and managing health care facilities and services. *Health Aff.* **2013**, *32*, 146–154. [CrossRef]
40. Marx, A. Public-private partnerships for sustainable development: Exploring their design and its impact on effectiveness. *Sustainability* **2019**, *11*, 1087. [CrossRef]
41. Shrestha, A.; Tamošaitienė, J.; Martek, I.; Hosseini, M.R.; Edwards, D.J. A Principal-Agent Theory Perspective on PPP Risk Allocation. *Sustainability* **2019**, *11*, 6455. [CrossRef]
42. Hodge, G.A. The risky business of public—Private partnerships. *Aust. J. Public Adm.* **2004**, *63*, 37–49. [CrossRef]
43. Ruiz, A.; Guevara, J. Environmental and economic impacts of road infrastructure development: Dynamic considerations and policies. *J. Manag. Eng.* **2020**, *36*, 4020006. [CrossRef]
44. Akbiyikli, R.; Eaton, D.; Dikmen, S.U. Achieving sustainable construction within private finance initiative (PFI) road projects in the UK. *Technol. Econ. Dev. Econ.* **2012**, *18*, 207–229. [CrossRef]
45. Alasad, R.; Motawa, I. Dynamic demand risk assessment for toll road projects. *Constr. Manag. Econ.* **2016**, *33*, 839–857. [CrossRef]
46. Levitt, R.E.; Henisz, W.; Scott, W.R.; Settel, D. Governance challenges of infrastructure delivery: The case for socio-economic governance approaches. *Constr. Res. Congr.* **2010**, 757–767. [CrossRef]
47. Benítez-ávila, C.; Hartmann, A.; Dewulf, G.; Henseler, J. Interplay of relational and contractual governance in public-private partnerships: The mediating role of relational norms, trust and partners â€™ contribution. *Int. J. Proj. Manag.* **2018**, *36*, 429–443. [CrossRef]
48. Kivleniece, I.; Quelin, B.V. Creating and capturing value in public-private ties: A private actor's perspective. *Acad. Manag. Rev.* **2012**, *37*, 272–299. [CrossRef]
49. Nguyen, D.A. Improving Public-Private Partnership Contracts through Risk Characterization, Contract Mechanisms, and Flexibility. Ph.D. Thesis, Virginia Tech, Blacksburg, VA, USA, 2017.
50. Roehrich, J.K.; Caldwell, N.D. Delivering integrated solutions in the public sector: The unbundling paradox. *Ind. Mark. Manag.* **2012**, *41*, 995–1007. [CrossRef]
51. Zheng, J.; Roehrich, J.K.; Lewis, M.A. The dynamics of contractual and relational governance: Evidence from long-term public–private procurement arrangements. *J. Purch. Supply Manag.* **2008**, *14*, 43–54. [CrossRef]
52. Wright, S.; Barlow, J.; Roehrich, J.K. Public-Private Partnerships for Health Services: Construction, Protection and Rehabilitation of Critical Healthcare Infrastructure in Europe. In *Public-Private Partnerships: Construction, Protection, and Rehabilitation of Critical Infrastructure*; Clark, R.M., Hakim, S., Eds.; Springer: Berlin/Heidelberg, Germany, 2019; ISBN 9783030245993.
53. Essig, M.; Glas, A.H.; Selviaridis, K.; Roehrich, J.K. Performance-based contracting in business markets. *Ind. Mark. Manag.* **2016**, *59*, 5–11. [CrossRef]
54. Ozbek, M.E.; De La Garza, J.M.; Piñero, J.C. Implementation of level-of-service component for performance-based road maintenance contracts. *Transp. Res. Rec.* **2010**, *2150*, 1–9. [CrossRef]
55. Gajurel, A. *Performance-Based Contracts for Road Projects: Comparative Analysis of Different Types*; Springer: Berlin/Heidelberg, Germany, 2014; ISBN 9788132213017.
56. Priemus, H.; Flyvbjerg, B.; van Wee, B. *Decision-Making on Mega-Projects: Cost-Benefit Analysis, Planning and Innovation*; Priemus, H., Flyvbjerg, B., van Wee, B., Eds.; Edward Elgar Publishing Limited: Cheltenham, UK, 2008.
57. Caldwell, N.D.; Roehrich, J.K.; George, G. Social value creation and relational coordination in public-private collaborations. *J. Manag. Stud.* **2017**, *54*, 906–928. [CrossRef]
58. Benítez-Ávila, C.A. *Governig and (Re)producing Project Governance: Public-Private Partnerships at Their Exploitation Phase*; University of Twente: Enschede, The Netherlands, 2019.
59. Liu, T.; Bennon, M.; Garvin, M.J.; Wang, S. Sharing the big risk: Assessment framework for revenue risk sharing mechanisms in transportation public-private partnerships. *J. Constr. Eng. Manag.* **2017**, *143*, 1–12. [CrossRef]
60. Fliervoet, J.M.; Geerling, G.W.; Mostert, E.; Smits, A.J.M. Analyzing collaborative governance through social network analysis: A case study of river management along the waal river in The Netherlands. *Environ. Manag.* **2016**, *57*, 355–367. [CrossRef]

61. Hueskes, M.; Verhoest, K.; Block, T. Governing public-private partnerships for sustainability. An analysis of procurement and governance practices of PPP infrastructure projects. *Int. J. Proj. Manag.* **2017**, *35*, 1184–1195. [CrossRef]
62. World Bank. User Guidebook on Implementing Public-Private Partnerships for Transportation Infrastructure Projects in the United States. 2007. Available online: https://ppp.worldbank.org/public-private-partnership/library/user-guidebook-implementing-public-private-partnerships-transportation-infrastructure-projects-united-states (accessed on 20 January 2020).
63. Osei-Kyei, R.; Chan, A.P.C.; Dansoh, A.; Ofori-Kuragu, J.K.; Oppong, G.D. Strategies for effective management of unsolicited public-private partnership proposals. *J. Manag. Eng.* **2018**, *34*, 4018006. [CrossRef]
64. Kwak, Y.H.; Chih, Y.; Ibbs, C.W. Towards a comprehensive understanding of public private partnerships for infrastructure development. *Calif. Manag. Rev.* **2009**, *51*, 51–78. [CrossRef]
65. Marques, R.C. Empirical evidence of unsolicited proposals in PPP arrangements: A comparison of Brazil, Korea and the USA. *J. Comp. Policy Anal. Res. Pract.* **2018**, *20*, 435–450. [CrossRef]
66. World Bank. Unsolicited Proposals: Competitive Solutions for Private Infrastructure. 2003. Available online: https://openknowledge.worldbank.org/handle/10986/11357?show=full (accessed on 20 January 2020).
67. Osei-kyei, R.; Chan, A.P.C. Motivations for adopting unsolicited proposals for public-private partnership project implementation A survey of international experts. *J. Financ. Manag. Prop. Constr.* **2017**, *23*, 221–238. [CrossRef]
68. Hodges, J.T.; Dellacha, G. Unsolicited Infrastructure Proposals. How some Countries Introduce Competition and Transparency. 2007. Available online: https://ppiaf.org/documents/3094/download (accessed on 20 January 2020).
69. Aziz, A.A.; Nabavi, H. Unsolicited Proposals for PPP Projects: Private Sector Perceptions in the USA. In Proceedings of the Construccion Research Congress, Atlanta, GA, USA, 21 May 2014; pp. 1349–1358.
70. Camacho, F.T.; Rodrigues, B.C.L.; Vieira, H.M.M. Unsolicited proposals in infrastructure—Lessons from Brazil and Chile. In *The Emerald Handbook of Public-Private Partnerships in Developing and Emerging Economies*; Emerald: Bingley, UK, 2017.
71. Thacker, S.; Adshead, D.; Fay, M.; Hallegatte, S.; Harvey, M.; Meller, H.; O'Regan, N.; Rozenberg, J.; Watkins, G.; Hall, J.W. Infrastructure for sustainable development. *Nat. Sustain.* **2019**, *2*, 324–331. [CrossRef]
72. Ruiz, A.; Guevara, J. Sustainable decision-making in road development: Analysis of road preservation policies. *Sustainability* **2020**, *12*, 872. [CrossRef]
73. Vazquez, E.; Rola, S.; Martins, D.; Alves, L.; Freitas, M.; Rosa, L.P. Sustainability in civil construction: Application of an environmental certification process (leed) during the construction phase of a hospital enterprise-rio de janeiro/Brazil. *Int. J. Sustain. Dev. Plan.* **2013**, *8*, 1–19. [CrossRef]
74. Wang, H.; Zhang, X.; Lu, W. Improving social sustainability in construction: Conceptual framework based on social network analysis. *J. Manag. Eng.* **2018**, *34*, 1–9. [CrossRef]
75. Koppenjan, J.F.M.; Enserink, B. Public-private partnerships in urban infrastructures: Reconciling private sector participation and sustainability. *Public Adm. Rev.* **2009**, *69*, 284–296. [CrossRef]
76. Mohammadifardi, H.; Knight, M.A.; Unger, A.A.J. Sustainability assessment of asset management decisions for wastewater infrastructure systems—Implementation of a system dynamics model. *Systems* **2019**, *7*, 34. [CrossRef]
77. Berrone, P.; Ricart, J.E.; Duch, A.I.; Bernardo, V.; Salvador, J.; Peña, J.P.; Planas, M.R. EASIER: An evaluation model for public-private partnerships contributing to the sustainable development goals. *Sustainability* **2019**, *11*, 2339. [CrossRef]
78. Wojewnik-Filipkowska, A.; Węgrzyn, J. Understanding of public-private partnership stakeholders as a condition of sustainable development. *Sustainability* **2019**, *11*, 1194. [CrossRef]
79. Koppenjan, J.F.M. Public-Private Partnerships for green infrastructures. Tensions and challenges. *Curr. Opin. Environ. Sustain.* **2015**, *12*, 30–34. [CrossRef]
80. Moser, S.C. Adaptation, mitigation, and their disharmonious discontents: An essay. *Clim. Chang.* **2012**, *111*, 165–175. [CrossRef]
81. WCED (World Commision on Environment and Development). *Our Common Future*; Oxford University Press: Oxford, UK, 1987.
82. UNEP. *Protecting Our Planet Securing Our Future*; The World Bank: New York, NY, USA, 1998.
83. OECD. *Report on the Implementation of the OECD Strategy on Development*; OECD: Paris, France, 2014.

84. OECD. *3rd OECD Forum on Governance of Infrastructure. In the Public Interest—Delivery of Sustainable, Transparent and Inclusive Infrastructure*; OECD: Paris, France, 2018.
85. Roseland, M. *Toward Sustainable Communities: Resources for Citizens and Their Communities*; New Society Publishers: Gabriola, BC, Canada, 2005; ISBN 0865715351.
86. Atmo, G.; Duffield, C. Improving investment sustainability for PPP power projects in emerging economies: Value for money framework. *Built Environ. Proj. Asset Manag.* **2014**, *4*, 335–351. [CrossRef]
87. Kumaraswamy, M.; Anvuur, A.; Rahman, M. Balancing contractual and relational approaches for PPP success and sustainability. In Proceedings of the Public Private Partnerships—Opportunities and Challenges, Hong Kong, China, 22 February 2005; pp. 104–114.
88. Patil, N.A.; Laishram, B.S. Sustainability of Indian PPP procurement process. *Built Environ. Proj. Asset Manag.* **2016**, *6*, 491–507. [CrossRef]
89. Noble, B.F. The Canadian experience with SEA and sustainability. *Environ. Impact Assess. Rev.* **2002**, *22*, 3–16. [CrossRef]
90. De Luca, F.; Cardoni, A.; Phan, H.; Kiseleva, E. Does Structural Capital affect SDGs Risk-related Disclosure Quality? An empirical investigation of Italian large listed companies. *Sustainability* **2020**, *12*, 1776. [CrossRef]
91. Zimon, D.; Madzík, P. Standardized management systems and risk management in the supply chain. *Int. J. Qual. Reliab. Manag.* **2020**, *37*, 305–327. [CrossRef]
92. Zimon, D.; Tyan, J.; Sroufe, R. Drivers of sustainable supply chain management: Practices to alignement with un sustainable development goals. *Int. J. Qual. Res.* **2020**, *14*, 219–236. [CrossRef]
93. Fedorova, E.; Aaltonen, K.; Pongr, E. Social sustainability dilemma: Escape or communicate? Managing social risks upstream of the bionergy supply chain. *Resources* **2020**, *9*, 7. [CrossRef]
94. Kovačević, M.S.; Librić, L.; Ivoš, G.; Cerić, A. Application of reliability analysis for risk ranking in a levee reconstruction project. *Sustainability* **2020**, *12*, 1404. [CrossRef]
95. Shiferaw, A.T.; Klakegg, O.J.; Haavaldsen, T. Governance of public investment projects in Ethiopia. *Proj. Manag. J.* **2012**, *7*, 47–67. [CrossRef]
96. Turner, J.R.; Müller, R. Communication and co-operation on projects between the project owner as principal and the project manager as agent. *Eur. Manag. J.* **2004**, *22*, 327–336. [CrossRef]
97. Kean, J.R. Improving project predictability with the application of critical project governance structures. *AACE Int. Trans.* **2011**, *2*, 1023–1035.
98. Sha, K. Vertical governance of construction projects: An information cost perspective. *Constr. Manag. Econ.* **2011**, *29*, 1137–1147. [CrossRef]
99. Toor, S.U.R.; Ogunlana, S.O. Beyond the "iron triangle": Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *Int. J. Proj. Manag.* **2010**, *28*, 228–236. [CrossRef]
100. Guo, H.L.; Li, H.; Li, V. VP-based safety management in large-scale construction projects: A conceptual framework. *Autom. Constr.* **2013**, *34*, 16–24. [CrossRef]
101. Aliza, A.H.; Stephen, K.; Bambang, T. The importance of project governance framework in project procurement planning. *Procedia Eng.* **2011**, *14*, 1929–1937. [CrossRef]
102. Osipova, E.; Eriksson, P.E. How procurement options influence risk management in construction projects. *Constr. Manag. Econ.* **2011**, *29*, 1149–1158. [CrossRef]
103. Collyer, S.; Warren, C.M.J. Project management approaches for dynamic environments. *Int. J. Proj. Manag.* **2009**, *27*, 355–364. [CrossRef]
104. Meng, X. The effect of relationship management on project performance in construction. *Int. J. Proj. Manag.* **2012**, *30*, 188–198. [CrossRef]
105. Martin, J.C.; Point, P. Road project opportunity costs subject to a regional constraint on greenhouse gas emissions. *J. Environ. Manag.* **2012**, *112*, 292–303. [CrossRef]
106. Harty, C. Implementing innovation in construction: Contexts, relative boundedness and actor-network theory. *Constr. Manag. Econ.* **2008**, *26*, 1029–1041. [CrossRef]
107. Harty, C. Innovation in construction: A sociology of technology approach. *Build. Res. Inf.* **2005**, *33*, 512–522. [CrossRef]
108. Tombesi, P. Good thinking and poor value: On the socialization of knowledge in construction. *Build. Res. Inf.* **2006**, *34*, 272–286. [CrossRef]
109. Murphy, M.; Heaney, G.; Perera, S. A methodology for evaluating construction innovation constraints through project stakeholder competencies and FMEA. *Constr. Innov.* **2011**, *11*, 416–440. [CrossRef]

110. Tsamboulas, D.; Verma, A.; Moraiti, P. Transport infrastructure provision and operations: Why should governments choose private-public partnership? *Res. Transp. Econ.* **2013**, *38*, 122–127. [CrossRef]
111. Guo, F.; Chang-Richards, Y.; Wilkinson, S.; Li, T.C. Effects of project governance structures on the management of risks in major infrastructure projects: A comparative analysis. *Int. J. Proj. Manag.* **2014**, *32*, 815–826. [CrossRef]
112. MOP. *Concesiones de Obras Públicas en Chile 20 Años*; Ministerio de Obras Públicas: Santiago, Chile, 2016; ISBN 9789567970315.
113. MOP. Concesiones.cl. Available online: http://www.concesiones.cl/proyectos/Paginas/default.aspx (accessed on 20 January 2020).
114. World Bank. World Bank Colombia—4th Generation Toll Road Program. 2016. Available online: http://documents.worldbank.org/curated/en/570111468186858634/Colombia-4th-generation-toll-road-program (accessed on 20 January 2020).
115. Albornoz, C. *Diagnóstico de las Concesiones de Carreteras Urbanas en Chile*; Universitat Politecnica de Valencia: Valencia, Spain, 2019.
116. Garvin, M.J. Enabling development of the transportation public-private partnership market in the united states. *J. Constr. Eng. Manag.* **2010**, *136*, 402–411. [CrossRef]
117. Jooste, S.F.; Scott, W.R. The public-private partnership enabling field: Evidence from three cases. *Adm. Soc.* **2011**, *44*, 149–182. [CrossRef]
118. Kalidindi, S.N.; Thomas, A. V Private sector participation road projects in India: Assesment and allocation of critical risks. In *Public-Private Partnerships*; Akintoye, A., Beck, M., Hardcastle, C., Eds.; Blackwell Publishing: Malden, MA, USA, 2002; pp. 317–350.
119. Wang, J.; Yuan, H. System Dynamics Approach for Investigating the Risk Effects on Schedule Delay in Infrastructure Projects. *J. Manag. Eng.* **2017**, *33*, 1–13. [CrossRef]
120. Antillon, E.I. *An Exploration of the Influence of Public-Private Partnerships on the Life Cycle Design Decision-Making Process of Highway Projects*; University of Colorado Boulder: Boulder, CO, USA, 2016.
121. Askar, M.M.; Gab-Allah, A.A. Problems facing parties involved in build, operate, and transport projects in Egypt. *J. Manag. Eng.* **2002**, *18*, 173–178. [CrossRef]
122. European PPP Expertise Centre. A Guide to the Qualitative and Quantitative Assessment of Value for Money in PPPs: Public-Private Partnerships in the Western Balkans. 2018. Available online: https://www.wbif.eu/storage/app/media/Library/8.%20Public%20Private%20Partnership/2.%202-Value-for-Money-Assessment-Guide-FINAL-310818.pdf (accessed on 20 January 2020).
123. Mostaan, K.; Asce, S.M.; Ashuri, B.; Asce, A.M. Challenges and enablers for private sector involvement in delivery of highway public-private partnerships in the United States. *J. Manag. Eng.* **2014**, *33*, 1–15. [CrossRef]
124. Wang, Y. Evolution of public-private partnership models in American toll road development: Learning based on pubic institutions risk management. *Int. J. Project Manage.* **2015**, *33*, 684–696. [CrossRef]
125. Algarni, A.M.; Arditi, D.; Polat, G. Build-operate-transfer in infrastructure projects in the United States. *J. Constr. Eng. Manag.* **2007**, *133*, 728–735. [CrossRef]
126. Oppenheim, A.N. *Questionnaire Design, Interviewing and Attitude Measurement*; CONTINUUM: London, UK; New York, NY, USA, 1992.
127. Skinner, J. *The Interview: An Ethnographic Approach*; BERG: London, UK; New York, NY, USA, 2012.
128. Luna-reyes, L.F.; Andersen, D.L. Collecting and analyzing qualitative data for system dynamics: Methods and models. *Syst. Dyn. Rev.* **2003**, *19*, 271–296. [CrossRef]
129. Kolbe, R.H.; Burnett, M.S. Content analysis research: An examination of applications with directives for improving research reliability and objectivity. *J. Consum. Res.* **1991**, *18*, 243–250. [CrossRef]
130. Fellows, R.F.; Liu, A.M.M. *Research Methods for Construction*; Wiley-Blackwell: Oxford, UK, 2008.
131. Elo, S.; Kyngäs, H. The qualitative content analysis process. *J. Adv. Nurs.* **2007**, *62*, 107–115. [CrossRef]
132. Tranfield, D.; Denyer, D.; Smart, P. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *Br. J. Manag.* **2003**, *14*, 207–222. [CrossRef]
133. De Solminihac, H.; Dagá, J.; Echaveguren, T. Priorización de Riesgos en Proyectos de Concesiones Viales en Chile. 2019. Available online: https://clapesuc.cl/assets/uploads/2019/06/informe-priorizacin-riesgos-concesiones-v11.pdf (accessed on 20 January 2020).

134. Engel, E.; Fischer, R.; Galetovic, A.; Hermosilla, M. Renegociación de concesiones en chile. *Estud. Públicos* **2009**, *113*, 151–205.
135. Albalate, D.; Bel, G.; Bel-piñana, P.; Richard, R. Risk mitigation and sharing in motorway ppps: A comparative policy analysis of alternative approaches. *J. Comp. Policy Anal. Res. Pract.* **2015**, *17*, 37–41. [CrossRef]
136. Hodge, G.A.; Greve, C.; Boardman, A.E. *International Handbook on Public-Private Partnerships*; Edward Elgar Publishing Limited: Cheltenham, UK, 2010; ISBN 9781848443563.
137. Reside, R.E. *Global Determinants of Stress and Risk in Public-Private Partnerships (PPP) in Infrastructure*; Asian Development Bank Institute: Tokyo, Japan, 2009.
138. Coordinación de Concesiones. *Desarrollo de Infraestructura y Participación Público Privada*; Ministerio de Obras Públicas: Santiago de Chile, Chile, 2015.
139. Andon, P. Accounting-related research in PPPs/PFIs: Present contributions and future opportunities. *Account. Audit. Account. J.* **2012**, *25*, 876–924. [CrossRef]
140. Cabello, C. Autopistas Reportan Daños al MOP: Más de 50 Plazas de Peaje han Sido Objeto de Violencia. Available online: https://www.latercera.com/pulso/noticia/autopistas-reportan-danos-al-mop-mas-50-plazas-peaje-objeto-violencia/919499/ (accessed on 20 January 2020).
141. Yin, P.K. *Case Study Research and Applications*, 6th ed.; SAGE Publications Ltd.: Singopore, 2018; ISBN 9781506336169.
142. Taylor, J.E.; Dossick, C.S.; Garvin, M. Meeting the burden of proof with case-study research. *J. Constr. Eng. Manag.* **2011**, *137*, 303–311. [CrossRef]
143. Jin, X.H.; Doloi, H. Interpreting Risk Allocation Mechanism in Public-Private Partnership Projects: An Empirical Study in a Transaction Cost Economics Perspective. *Constr. Manage.Econ.* **2008**, *26*, 707–721. [CrossRef]
144. Zayed, T.M.; Chang, L.M. Prototype model for build-operate-transfer risk assessment. *J. Manag. Eng.* **2002**, *18*, 7–16. [CrossRef]
145. Nasirzadeh, F.; Khanzadi, M.; Rezaie, M. Dynamic modeling of the quantitative risk allocation in construction projects. *Int. J. Proj. Manag.* **2014**, *32*, 442–451. [CrossRef]
146. Xu, Y.; Chan, A.P.C.; Yeung, J.F.Y. Developing a fuzzy risk allocation model for PPP projects in China. *J. Constr. Eng. Manag.* **2010**, *136*, 894–903. [CrossRef]
147. Helliar, C.; Lonie, A.; Power, D.; Sinclair, D. Attitudes of UK managers to risk and uncertainty. *Balance Sheet* **2001**, *9*, 7–10. [CrossRef]
148. Ng, A.; Loosemore, M. Project Risk allocation in the private provision of public infrastructure. *Int. J. Proj. Manag.* **2007**, *25*, 66–76. [CrossRef]