Unsolicited versus solicited public partnership proposals: is there a trade-off between innovation and competition?

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Abstract

Unsolicited proposals (UPs) are a modality of public private partnership (PPP) that is increasingly being used to attract private investors and operators to provide innovative solutions to public projects, notably in infrastructure. In most countries that expressly regulate UPs, the PPP tenders establish asymmetric conditions that favour UP proponents over other potential participants, with the aim of incentivising the presentation of innovative project solutions. The present study formally evaluates the conditions under which a competition/innovation trade-off may arise. We find that UPs can offer welfare-improving solutions compared with solicited proposals (SPs) only in exceptional circumstances. In addition, we find no robust evidence to either confirm the trade-off between innovation and competition in PPP tenders, or to indicate that UPs lead to welfare-enhancing solutions that could not be achieved under conventional SPs.

Keywords: unsolicited proposals, public-private partnerships, innovation, competition

1 INTRODUCTION

Public private partnership (PPP) contracts encompass a broad scope of arrangements between private and public sector aimed at delivering public services and infrastructure. Depending on the characteristics of the projects, the informational restrictions faced by the public sector, and the need to attract innovative solutions in project design, PPP schemes can consider different levels of private party involvement in the project (Bhattacharya, Openheim and Stern, 2016; Ahmad, Vinella and Xiao, 2017).

Under a solicited proposal (SP), a government agency invites private investors to submit proposals to execute a PPP. Under an unsolicited proposal (UP), a private company (the proponent) typically submits on its own initiative a project proposal to a government agency. In recent decades, a growing number of countries have considered UPs to attract private investors and operators to provide innovative solutions for public sector projects, including in public infrastructure. In a sample of 140 countries, more than 60% have adopted an explicit regulatory framework for UPs, and 9% have allowed privately originated PPPs even if not institutionally formalised (World Bank, 2020).

The rationale behind UPs relies, among other notions, on the idea that this mechanism may attract certain private sector skills and experience to the design and development of public projects that are unavailable in government organisations (Bederman and Trebilcock, 1994). Yet scholars have pointed out a possible tension between that objective and the need to ensure a reasonable degree of competition in procurement, given that preparing proposals on own initiative is costly and risky when there are many potential bidders (Hodges and Delacha, 2007: 14). One could also distinguish between proposals that involve the use of new concepts or technologies to address a given project specification, and those that

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address public sector needs not yet identified by the contracting authority. The case for UPs could be stronger for the latter type of project (UNCITRAL, 2001). Some countries therefore admit as UPs only "truly innovative" or "unique proposals" that receive exceptional treatment, including through direct negotiation (World Bank, 2017a: 63).

The widespread use of UPs despite these concerns raises the question of the nature and extent of the trade-off between innovation and competition in attracting public project proposals, and whether UPs are welfare-enhancing compared with conventional, government-solicited proposals. The trade-off between innovation and competition is not new in the industrial organisation literature (see, for instance, Gilbert, 2006; or Aghion et al., 2005). However, attempts to explore the scope and relevance of this trade-off for different modalities of PPPs are still scarce.

In this study, we formally examine the conditions under which UPs can offer welfare-improving solutions for government projects compared with SPs. We find that any welfare superiority of UPs can only be observed in exceptional circumstances of asymmetric information on potential project solutions between the government and the project proponent. That superiority depends on the relative effects of reduced competition versus the quality of the technical solution provided by the UP.

To formalise these arguments, we build a model in which the UP proponent acts as the principal and the government acts as the agent, thus inverting the traditional view adopted in the literature (Tirole and Laffont, 1993; Baron and Myerson, 1982). We derive conditions under which unsolicited proposals can be welfare-improving compared with solicited proposals. A striking result is that no welfare-improving solution can be obtained from UPs when the project is awarded through direct negotiation. We also provide empirical insights on recent international experience with UPs.

Section 2 reviews the literature on UP processes. Section 3 formally describes UP and SP problems using the principal-agent model and derives conditions under which the former can be welfare-improving. Section 4 discusses the results, contrasting them with findings in the literature and the World Bank's PPI database.[1] Section 5 concludes.

2 UNSOLICITED PROPOSALS, INNOVATION AND COMPETITION

In recent years several countries have begun to consider privately originated PPPs to attract private investment in the provision of public services and infrastructure, with UPs being one of the most frequently used modalities. According to the World Bank (2017a: 9-10), the motivations for considering UPs include the wish to make up for the lack of governmental technical and financial capacity to identify, develop and implement projects; the wish to harness private sector innovation

[1] See https://ppi.worldbank.org/en/ppi.

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and creativity; and, to a lesser extent, the desire to reduce the length of the project-awarding process and to increase the possibility of access to private sector finance.[2]

UP processes typically comprise five stages. In the inception phase the proponent identifies a project and provides a preliminary proposal to the government. Governments can set minimum requirements regarding studies and information for the admission of proposals. In the second phase, the government assesses the proposals, including their match with public policy objectives and their potential for obtaining value for money. The third phase consists of project development, including the financial structure, engineering studies, risk allocation analysis, and contract drafting. The fourth phase includes the process of awarding the project, which could be competitive or negotiated depending on the regulatory framework. As described below, even in the context of competitive procurement, UP tenders generally tend to establish asymmetric conditions that favour the proponents. Finally, once the PPP contract is signed, the project execution is initiated.

The rationale behind the use of UPs is closely related to failures in government procurement procedures. Bederman and Trebilcock (1994) note that conventional procurement practices fail to exploit the potential efficiencies that could be achieved in contracting with private parties. This failure may result from government's informational restrictions, search costs, and the failure to provide effective incentives. The authors argue that opening the possibility for private companies to submit unsolicited proposals to government can serve as a mechanism that allows the exploration of opportunities for overcoming these failures. In this context, the private sector would be better suited not only to identify but also to develop and implement such projects. Hodges and Dellacha (2007) and Osei-Kyei et al. (2018a) also argue that UPs can help to remedy the government's low technical and financial capacity through competitive and transparent bidding processes.

On the other hand, UPs have been criticised for lack of competition and transparency compared with SP award processes (World Bank, 2014; Zawawi, Kulatunga and Tayapharan, 2016; Takano, 2021; Marques, 2018; Camacho, Rodriguez and Vieira, 2017). The main concern relates to the advantages provided to those submitting UPs during the tendering stage. For example, some countries do not organise an open tender and negotiate directly with the UP proponent (see, for instance, Yun et al., 2015). Others organise a competitive tender, but provide certain advantages to UP proponents, such as a bonus system, the right to match the better bid (also referred to as a Swiss challenge), and allowing multistage offers (Osei-Kyei et al., 2018b).

The evidence from country case studies suggests that standards of competition applied to UP tenders are lower than those applied to SP tenders (table 1). Most studies (Zawawi, Kulatunga and Tayapharan, 2016; Takano, 2021; Marques,

[2] According to the World Bank (2017a), the evidence on reducing award times is inconclusive because transaction costs of UP processes were previously higher than those of SPs.

2018; and Camacho, Rodriguez and Vieira, 2017) emphasise the obstacles that UPs create to competitive tenders. Even when tenders are allowed, the limited time provided to potential competitors for submitting their bids implies an asymmetric treatment in favour of UP proponents. The World Bank (2017a: 45) found that UPs generally provided too short periods for competing bidders to submit bids, offering a significant strategic advantage to UP proponents. A key side-effect of the lack of competition and transparency in tenders, as highlighted by Bullock (2019), is that such processes are vulnerable to corruption risks.

Table 1

Country case studies on unsolicited proposals

Author	Country	Findings
Zawawi, Kulatunga and Tayapharan (2016)	Malaysia	**Lack of competition** in UP processes.
Mallisetti, Dolla and Laishram (2021)	India	Several flaws in their policies regarding implementation features across the stages of UPs, such as defined objectives, absence of fees and review timeframes in the submission, time frame and guidance on benchmarking and market testing in the evaluation and development stages, and the **time frame for bidding and access to information in the procurement stages**.
Takano (2021)	Peru	**Lack of competition** in UP processes particularly at the subnational government level.
Marques (2018)	Brazil, USA, Korea	Success factors for UP programs: commitment and mutual help are central to the process, robust and well-developed UP frameworks, **competitive tenders**, sound governance practices and leadership of PPP units.
Camacho, Rodriguez and Vieira (2017)	Brazil, Chile	**Difficulties in fostering competition** (very few winners that are not proponents).

Expert surveys on the effectiveness of UPs agree on the importance of promoting competition in UP tenders. In a survey of academics and practitioners, Osei-Kyei et al. (2018a) found that the strategies contributing to successful development and implementation of UPs were thorough assessment of the value for money; of the innovativeness, cost, and risks of proposals; as well as a competitive, fair, and transparent tendering process.

Recognising the tension between the objectives of innovation and competition, UNCITRAL's Legislative Guide for Privately Financed Infrastructure Projects distinguishes the cases in which proposals involve or do not involve novel concepts or technologies to address government infrastructure needs, justifying in the former case the establishment of exceptional negotiated selection procedures:

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> *"(...) a somewhat different situation may arise if the uniqueness of the proposal or its innovative aspects are such that it would not be possible to implement the project without using a process, design, methodology or engineering concept for which the proponent or its partners possess exclusive rights, either worldwide or regionally (...) In such a case, it would be appropriate to authorize the contracting authority to negotiate the execution of the project directly with the proponent of the unsolicited proposal."* (UNCITRAL, 2001: 93).

Intellectual property rights of proponents may clearly pose a serious obstacle to a fair tender for UP projects. Victoria Partnership (2001) suggests that in such cases the government could negotiate with the proponent on aspects of the proposal that could be considered confidential. The government could acquire the rights on information that could be considered crucial for the project, and then procure it on a competitive basis while not disclosing sensitive information. However, even in that case competition conditions may be asymmetric.

Hodges and Delacha (2007) noted that it is difficult to find a fair balance between private incentives to submit proposals and providing a reasonable likelihood of success to other parties challenging the unsolicited proposal. Increasing the challenger's probability of winning would discourage the participation of potential UP proponents, while providing incentives for UP proponents would introduce some type of asymmetric treatment that would place other competitors at a disadvantage. They argued that the Swiss challenge and bonus systems provided challengers a reasonable probability of winning such bids.

A relatively new mechanism used by governments to overcome the failures of traditional public works and PPP procurement mechanisms is the competitive dialogue. These procedures seek to allow more communication between the bidders and the contracting authority in the context of complex and innovative projects (see Buccino et al., 2019; Hoezen, Voordijk and Dewulf, 2012). Competitive dialogues are not yet widely used, however, and will not be analysed in this study.

3 FORMALISATION OF ARGUMENTS

The interaction between regulators and private concessionaires in the context of government-initiated PPPs (or solicited proposals, SPs) has been traditionally characterised with the use of the principal-agent (P-A) paradigm (classic references of that approach are Baron and Myerson, 1982; and Tirole and Laffont, 1993). Under this model, the regulator offers a "regulatory" contract to a prospective concessionaire whose decision must satisfy some participation and incentive compatibility conditions. Accordingly, regulatory contracts are designed to ensure that the private company's incentives are aligned with the regulator's public policy objectives. Under this approach, the regulator enjoys a "first mover advantage" (see Sappington, 1991) whenever they have the capacity to anticipate the agent's possible decisions. This capacity can in turn be used by the principal not only for achieving a more efficient allocation of resources but also for maximising their participation in the results of the exchange.

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Public projects are generally conceived as a manner of providing a solution to a public policy problem or an infrastructure need. There can be different technical options or potential solutions oriented to resolving a public policy problem. For example, a public policy problem can be defined as the absence of connection between a rural town and the rest of a country. One alternative for dealing with that public problem can be to build a road between the town and the country's road network. Other possible solutions could consist of the use of alternative technologies, such as trolley cars or railways, to connect the town with other transport networks. Some solutions can be technically more efficient than others, which can be analysed on a case-by-case basis. The superiority of some solutions versus others, could be based not only on the design or construction dimension of the project but also on their operational quality or maintenance requirements.

Let us assume that there exist n possible solutions for solving a public problem P that can be described by the vector $S = (s_1,s_2,..., s_n)$. For notational convenience, we will consider that S components are ordered downwards from high to low technically efficient solutions. Thus, a low level of s_i indicates that the solution proposed for P has a high degree of "innovativeness" or technical efficiency.

Typically, under the P-A model, the regulator seeks to maximise a welfare function. Let us denotate this welfare function as W. Following Tirole and Laffont (1993), we consider a situation in which the government uses a cost-reimbursement rule to compensate the private concessionaire in exchange for the service provided. Thus, welfare will depend negatively on a net transfer (t) collected by the government from users (given that this reduces the consumer surplus) and on the cost of the service (C) (because of the effect on productive efficiency).[3]

Costs and net transfers would in turn depend additionally on the level of competition faced by the concessionaire during the award process. Depending on the institutional arrangement, an SP or UP can attract more or fewer bidders to a tender process. We will consider a parameter r that denotates the level of "rivalry" or "competitive intensity" faced by bidders during the tender process, where a larger r implies a higher number of competitors.

Using the above-defined parameters, we can express the welfare function as follows:

$$W = W\,(t(r),\, c(s,r)), \tag{1}$$

where $W_t < 0$, $W_c < 0$. Additionally, $t_r < 0$, given that competition during the tender obligates bidders to offer reduced levels of t. Finally, costs relate positively with s as solutions become technically less efficient ($c_s < 0$) while they will tend to decrease as competition grows ($c_r < 0$). We assume that W (...) is first degree homogeneous in s and r.

[3] For simplicity, we will base our analysis in cost reimbursement rules rather in the regulated firm model developed by Tirole and Laffont (1993) chapter 2.

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Assuming that welfare achievable under a traditional public work contract is $W(t(r^{PW}), c(s^{PW}, r^{PW}))$, where r^{PW} and s^{PW} are competition and innovation levels that can be reached by this project implementation model; an SP or UP will only be justified when the level of welfare achieved satisfies $W(t(r), c(s, r)) \geq W(t(r^{PW}), c(s^{PW}, r^{PW}))$. The eligibility criteria and value for money assessment made by the government must ensure that the SP or UP provides a welfare-improving solution compared to the public works model of implementation.

Similarly, the benefit of the private company (B) can also be described as a function of the net transfer and costs of the project, as follows:

$$B = B(t(r), c(s, r)), \tag{2}$$

where (B) will depend positively on net transfers, $B_t > 0$. Given that, under a cost reimbursement scheme, lower costs are typically associated with the company's benefit, B will depend positively on their declared costs (c) (Tirole and Laffont, 1993), $B_c > 0$.

In the absence of informational asymmetries between regulator and concessionaire, the contractual design of a SP would be oriented to maximise (1) subject to a participation condition $B(t(r), c(s, r)) \geq B_0$, where B_0 is the reserve benefit of the private concessionaire.

The solution of this problem is composed of an allocative efficiency condition, as follows:

$$\left.\frac{W_t}{W_c}\right|_{SP} = \left.\frac{B_t}{B_c}\right|_{SP}, \tag{3}$$

and by the following participation condition, which sets the distribution of the results of the exchange:

$$B(t(r^{SP}), c(s^{SP}, r^{SP})) \geq B_0 \tag{4}$$

where r^{SP} and s^{SP} are the optimal levels of competitive intensity and innovativeness, respectively, under the SP problem. Condition (3) means that in the optimum allocation, both the regulator and concessionaire rates of substitution between net transfers and cost are equal.

Condition (4) ensures that society's welfare under SP (W^{SP}) is the maximum attainable provided that the regulated company is remunerated by their opportunity cost. This distribution of the results of the exchange, by construction, is a consequence of the regulator's "first mover advantage". It is important to note, however, that under conditions of informational asymmetry regarding the cost or technology of the concessionaire, only second-best solutions could be achieved

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considering an informational rent (*IR*) as a necessary condition for complying with the participation condition, as follows:

$$B(t(r^{SP}), c(s^{SP}, r^{SP})) - IR \geq B_0 \quad (4')$$

Conversely, a UP can be conceived as a game where the private proponent plays first, submitting to the government a technical solution for a public problem.[4] Assume that in the context of the *P-A* model, regulator-concessionaire roles are inverted. The latter will now enjoy a "first mover advantage" when seeking to maximise their private benefit (Equation (2)) subject to the government's participation condition of $W(t(r), c(s, r)) \geq W_0$. This participation condition could be more complex than the private concessionaire's participation condition. As mentioned above, the eligible solutions for public problems must satisfy not only minimum thresholds of social profitability but also some criteria for risk allocation and value for money. These eligibility criteria, in contrast with the preferences or benefits of the private concessionaire, are generally made public through guidelines or regulations.

The solution of the UP problem can be characterised by its corresponding efficiency condition, as follows:

$$\left.\frac{W_t}{W_c}\right|_{UP} = \left.\frac{B_t}{B_c}\right|_{UP} \quad (5)$$

Equation (5) shows optimality conditions valuated at s^{UP} and r^{UP}.

With respect to the participation condition, international experience shows that the approval of an UP could take time and may involve a complex process of interaction (or negotiation) between the government and the proponent. The participation condition under the UP problem will be as follows:

$$W(t(r^{UP}), c(s^{UP}, r^{UP})) \geq W_0 \quad (6)$$

Given the structure of the P-A optimisation problems described above, it seems unlikely that welfare obtained under the UP problem ($W(t(r^{UP}), c(s^{UP}, r^{UP})) = W_0$) will be superior to the welfare resulting from optimised welfare under an SP procedure ($W(t(r^{SP}), c(s^{SP}, r^{SP}))$). In the first case, the proponent's first mover advantage limits the government welfare at reservation levels, while in the second, in contrast, concessionaire benefits are bounded, and welfare is maximised. In this context, what would be the conditions under which an UP could be preferable to an SP from a welfare perspective?

[4] An exception to this rule could be the case of countries like Brazil (see Fernandez Moreira and Sombra, 2019), that among the modalities of UP, considers the possibility that once the government identifies a public problem, it can publicly request proposals for elaborating feasibility or engineering studies.

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To answer this question, we will consider two groups of scenarios:

1) Let us assume that the government can either possess complete or incomplete[5] information on the set S of possible solutions for P. In the first case, the government knows the n solutions available for solving the public problem, while in the second, the government only knows a subset $k < n$ of the total solutions. At the limit, the government could not have identified any solution for a public policy problem ($k = 0$).
2) Let us distinguish those SP processes where concessionaires have some freedom to participate in the design of the project from those in which design risk is retained by the government. In the first case, the government can incorporate into the project technical elements that can be welfare-improving, while in the second, it cannot.

Taking into account the different scenarios that arise from (1) and (2), we derive some results regarding the conditions under which a UP may allow superior levels of welfare compared to an SP.

Let us first consider the situation where the set of S solutions for P is known by the government. In this case, condition (6) of participation for the government under the UP problem will consider as the reservation level of welfare the result expected from public works ($W_0 = W(t(r^{PW}), c(s^{PW}, r^{PW}))$), as follows:

$$W(t(r^{UP}), c(s^{UP}, r^{UP})) = W(t(r^{PW}), c(s^{PW}, r^{PW})) \quad (6')$$

In this case, the authority has the capacity to assess the value for money and other characteristics of the proposal.

However, compared to the solution that could be obtained from an SP procedure (i.e., $W(t(r^{SP}), c(s^{SP}, r^{SP}))$), as mentioned above, under the government's perfect information regarding potential technical solutions S to P, it is not possible that the welfare obtained from this optimisation process to be lower than reservation welfare levels.[6]

3.1 INCOMPLETE INFORMATION WITH RESPECT TO TECHNICAL SOLUTIONS *S* TO *P*

Under the scenario where the government possesses incomplete information regarding the n technical S solutions available for P, it is possible that a proponent of a UP can submit a novel and innovative proposal to the government.

[5] Harsanyi (1995: 293) defines games with incomplete information generically as those in which "*(...) the players, or at least some of them, lack full information about the basic mathematical structure of the game as defined by its normal form (or by its extensive form)*."

[6] Eventually, additional efficiencies could be captured by an SP if competition levels are superior to those achieved under PW processes; however, there is no reason *a priori* for assuming such a situation.

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Considering first the extreme case in which the government has no information on possible solutions to P, the only reference available for the government to compare the optimal welfare obtained under SP ($W(t(r^{UP}), c(s^{UP}, r^{UP}))$) is the level of welfare without a project (let us denote it as $\underline{W}$). Given that the government's information is incomplete, under this scenario, the proponent can enjoy informational rents (Baron and Myerson, 1982; and Tirole and Laffont, 1993). Cova and Salle (2011) detail the ways through which proponents can make use of their private information to shape projects without revealing all the relevant data and the background of the project. In the context of an UP, the proponent can offer a solution with respect to the status quo if $W(t(r^{UP}), c(s^{UP}, r^{UP})) \geq \underline{W}$. This case corresponds to the scenario described by UNCITRAL (2001), where the proponent submits a novel and unique solution that is unknown to the government. However, to the extent that the proponent enjoys a "first player" advantage and information on their own costs is not known to the government, improvements in welfare derived from a low s^{UP}, in the context of a directly negotiated process can be easily offset by an increase in net transfers, keeping this participation condition as an equality. This result can be different, as explained below, when competition is allowed as a part of the UP process and the proponent has no control over r^{UP}.

In an intermediate case, we can express $S = (s_1, s_2, ..., s_k, ..., s_{n-1}, s_n)$, where the government only knows a subset $S_k = (s_k, ..., s_{n-1}, s_n)$, and only the proponent possesses information on the more efficient potential solutions to P. In this context, government observes a subset $k < n$ of the S solutions, and welfare levels under a UP can be compared with solutions provided by an SP, taking into account the different technical solutions provided by both systems (s^{UP} and s^{SP}).

Prior to continuing with the analysis, it is important to determine the conditions under which optimal SP levels of welfare ($W(t(r^{SP}), c(s^{SP}, r^{SP}))$) could be lower than those achieved under a UP. Considering (6), given that the government only possesses knowledge on a subset of S, its participation condition is $W(t(r^{UP}), c(s^{UP}, r^{UP})) \geq W(t(r^{PW}), c(s^{PW}, r^{PW}))$, i.e., welfare under a UP must be superior to or equal to that under public works (where the technical solution known by the government is s^{PW}). To ensure that the optimal welfare solution under a SP is lower than the welfare under an UP, the participation condition for this last problem should hold as a strict inequality ($W^{UP} > W^{PW}$).

Why may this condition hold as a strict inequality? A plausible answer to this question relates to the discontinuous character of technical solutions S to public problems P. Technological change typically tends to be discontinuous and indivisible (see, for instance, Romer, 1990; or Lissoni, 2005). Thus, in the case of the introduction of a disruptive technology as a part of a solution to P in an UP procedure, the difference between s^{UP} and s^{PW} could cause the reservation condition to convert into a nonbinding restriction. Similarly, provided that s^{P} is higher than s^{UP}, *ceteris paribus*, W^{UP} can also be superior to W^{SP}.

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It is important to stress that this result is conditional on the assumption that the proponent does not have control over the parameter r (competition intensity) and therefore cannot offset the welfare-increasing effect of a disruptive level of s^{UP} with a higher transfer derived from a lower competition intensity. This could be achieved when the proponent faces some degree of competition. Otherwise, i.e., in a direct negotiation scenario, the welfare gained by society derived from a higher s^{UP} could be totally offset by an increase in the net transfer collected from users ($t(r^{SP})$). In other words, directly negotiated awards in UP processes will never lead to welfare allocations that are superior to those in SP processes.

To determine the conditions under which the welfare achieved under a UP can be superior to the welfare obtained in an SP, we can totally differentiate W^{SP} and W^{UP}, which reflect the welfare changes of SP and UP, respectively, when r and s change. Using the property of first-degree homogeneity in s and r of W and rearranging both expressions, we find that the condition needed for a UP to produce a higher welfare than SP ($\Delta W^{SP} < \Delta W^{UP}$) is as follows (for simplicity we assume that $\Delta IR = 0$):

$$r^{SP} - r^{UP} < \frac{W_c c_s}{\left(W_t t_r + W_c c_r\right)}\left[s^{UP} - s^{SP}\right] \tag{7}$$

It is expected that the left-hand side of (7) will be non-negative whenever, as mentioned, according to the literature and the experience reviewed above, the competition intensity under SP processes would be generally higher than in the case of UP processes, so $r^{SP} > r^{UP}$. In this context, when the government possesses complete information on the universe of possible solutions, the UP cannot provide a novel or innovative alternative (i.e., $s^{UP} = s^{SP}$) and (7) does not hold.

In the presence of incomplete government information, there exists the possibility that the solution provided by the UP will be superior to the SP solution ($s^{UP} < s^{SP}$). The more significant the innovations provided by the UP are, the higher the difference between ($s^{UP} - s^{SP}$) (given that $s^{UP} < s^{SP}$ and $\frac{W_c c_s}{\left(W_t t_r + W_c c_r\right)} < 0$, and the product of both is positive) and the greater the probability that (7) holds. The satisfaction of (7), however, must be subject to some additional conditions. First, the differences in the degree of competitive intensity between the SP and UP must not be significant. The poorer the competition conditions offered by UP tenders are, the higher the degree of innovativeness needed by the private proposals to achieve higher welfare results compared to the SP. In addition, as the marginal effects of costs on welfare relative to the effects of competition (i.e., the multiplier $\frac{W_c c_s}{\left(W_t t_r + W_c c_r\right)}$) grow, a lower level of innovativeness is needed to satisfy (7).

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3.2 SOLICITED PROPOSALS THAT ALLOW BIDDERS TO PARTICIPATE IN THE DESIGN OF PROJECTS

In some SP projects, governments allow private concessionaires to incorporate design efficiencies into the project; a notable example is the case of beauty contests (see Janssen, 2002). In these cases, when the design risks are partially transferred to concessionaires, the difference between the degree of innovativeness between a UP and an SP will tend to be minor. Given that the difference between s^{UP} and s^{SP} would decrease in absolute terms compared to situations where SP projects do not transfer design risks, it would be least likely that the UP welfare is higher than the SP welfare.

Table 2 sketches the different scenarios that may arise under the different assumptions made regarding the SP and UP processes. The scenarios are divided according to whether the government possesses complete or incomplete information. With respect to SP processes, for simplicity, we assume that as a general rule, all processes are competitively tendered, but in some cases, the design risk can be transferred to the concessionaires. In the case of UP processes, we assume that tenders could be either competitive or directly negotiated.

In the scenario in which the government has complete information regarding all the technical solutions to P, no efficiency can arise from the risk of design transference, and the only source of efficiency could be competition during the tender. Thus, the UP can only produce an efficient result when the project is allocated competitively. However, as demonstrated above, in this case, a UP cannot provide any advantage over an SP.

In the context in which the government has incomplete information, the SP process can capture efficiencies both from competitive tenders and from the transfer of design risks to private concessionaires. Similarly, in UP processes, society can benefit from competitive tenders (if implemented) and innovative proposals. It is interesting to observe that innovations attracted through directly negotiated UPs could also be incentivised, at least partially, through an SP, where design risks are transferred to the private concessionaire. Nevertheless, UPs may exhibit a higher potential for attracting innovative proposals than SPs ($s^{UP} < s^{SP}$) whenever, under a competitive tender, private competitors do not have all the incentives to reveal their private information regarding potential improvements to projects.

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TABLE 2

Results under solicited and unsolicited proposal processes with transfer design risk and competitive and non-competitive tenders

Government's knowledge of *S* (all technical solutions)	Modality of the PPP	Scenarios	Results
Complete information	SP	Transfer design risk	No new technical solution can be offered by the proponent. Unique source of efficiency is competition.
		No transfer design risk	No new technical solution can be offered by the proponent. Unique source of efficiency is competition.
	UP	Competitive tender	No new technical solution can be offered by the proponent. Unique source of efficiency is competition.
		Directly negotiated	Null increase in welfare.
Incomplete information	SP	Transfer design risk	Both competition and a technical solution can be a source of efficiency.
		No transfer design risk	Unique source of efficiency is competition.
	UP	Competitive tender	Both competition and a technical solution can be a source of efficiency.
		Directly negotiated	Welfare enhancing effect of technical solutions is offset with higher tariffs applied by the proponent.

4 DISCUSSION

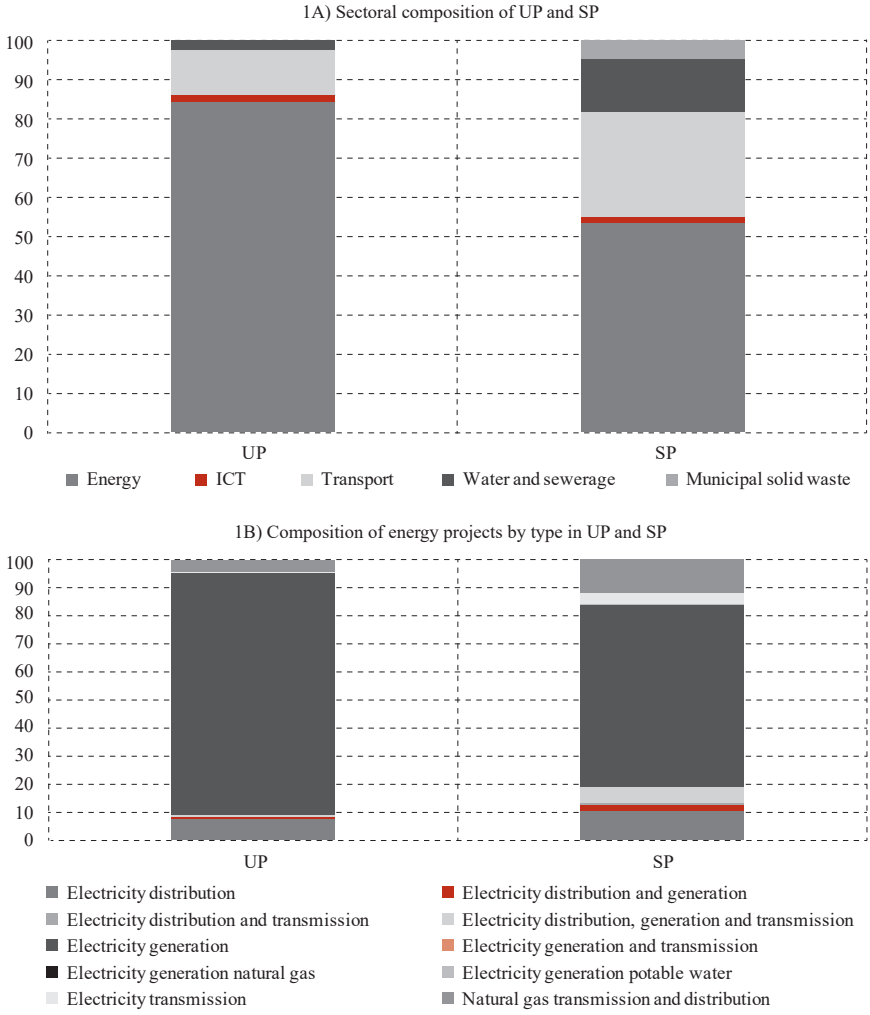
Because of the lack of detailed data on individual UP projects, their characteristics and impact, the empirical literature on PPPs is mostly based on case studies rather than cross-section or panel analysis. In particular, there are no official statistics on the number of UPs and the amount of investment involved in these projects worldwide. Estimates taken from the PPI database, which covers only low- and middle-income countries, show that in 2022, from a total of 9,093 PPP projects, 262 (2.9%) were UPs, 71% of which were initiated since 2010.[7] We can use this information to obtain some insights on the type of projects awarded under UPs and their degree of innovativeness.

Graph 1 shows similarities in the sectoral composition of SPs and UPs. Both SPs and UPs concentrate on energy and transport, followed by water and sewerage and information and communications technology (ICT). A higher proportion of UPs compared with SPs focus on energy projects, notably electricity generation followed by electricity distribution.

[7] At: https://ppi.worldbank.org/en/ppi (accessed in August 2022).

Graph 1

UP and SP distribution by sector (in %)



Source: PPI Database.

Among UPs, a much greater share can be found for renewable than conventional energy projects (graph 2A). However, most renewable energy projects were implemented through SPs, notably in the late 1990s and the second half of the 2000s (graph 2B). Figure A4 in the appendix shows a sharp increase in the number of patents related to non-renewable technologies since 2005, which suggests that this sector is relatively intensive in innovation. However, there has been no corresponding increase in UPs in this sector.

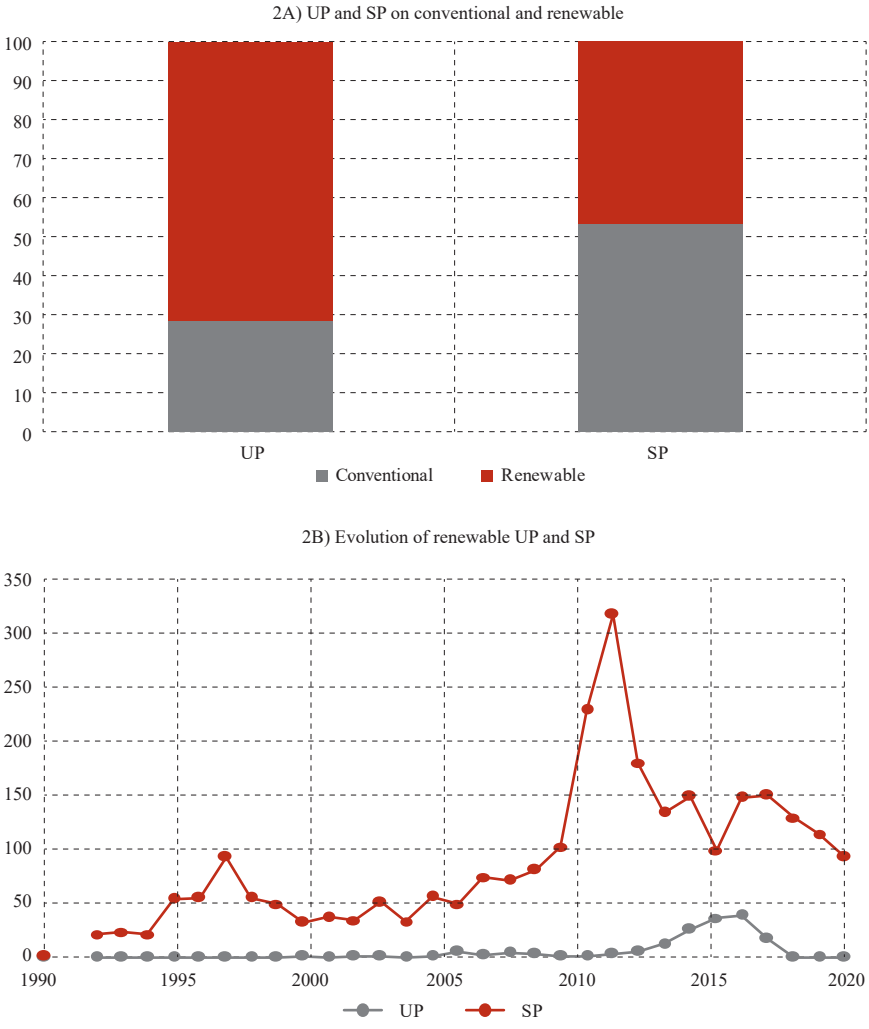
Latin America has been at the forefront of promoting UPs, with Brazil on the top (40%) followed by Colombia (5%), Peru (4%) and Mexico (3%). Other countries

with somewhat higher shares of UPs are India (6%), Turkey (3%), Jordan and Indonesia (3% each) (see table A1 in appendix).

In a case study of Brazil and Chile, Camacho, Rodriguez and Vieira (2017) conclude that UPs "work better in sectors where the government has developed in-house expertise and in projects that were previously evaluated." This suggests that institutional or technical difficulties related to low skills and lack of expert knowledge in public organisations may indeed present an obstacle to governments interested in developing novel and innovative projects.

Graph 2

UPs and SPs on renewable energy projects (in %)



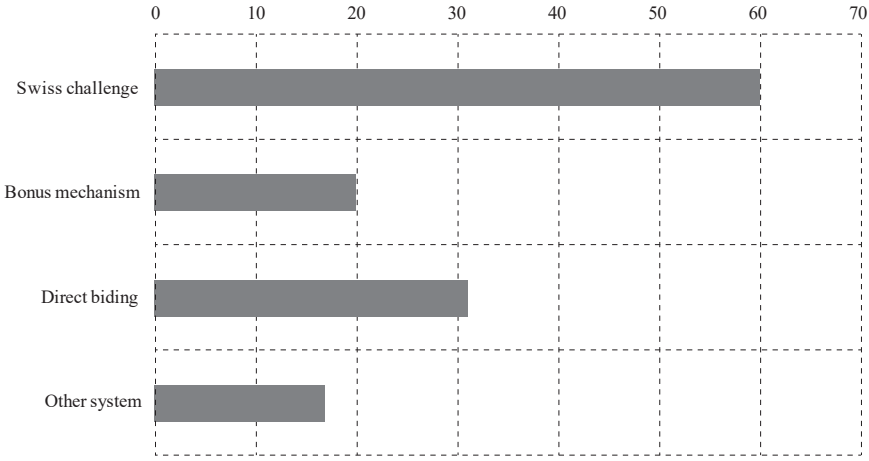
Source: PPI Database.

A benchmark study on competition in PPP projects for a sample of 97 countries found that 22% had not established explicit requirements for awarding UPs through competitive tender (World Bank, 2020). Among countries with regulations that expressly referred to competitive award processes, 22% did not grant potential bidders a minimum time to prepare and present their proposals, 61% provided the same time to UP and SP bidders, 14% provided more time to UP bidders, and only 3% provided more time to SP bidders. Details on the modality of tenders implemented under UP processes were not provided.

In another study for a sample of 17 countries, World Bank (2014) found that tenders in general established asymmetric rules favouring UP proponents through modalities such as the Swiss challenge, bonuses or multistage offers (graph 3). These findings support the case studies referred to earlier that identified the lack of competitive tenders as one of the main weaknesses of UP processes.

GRAPH 3

Main mechanisms for awarding unsolicited proposals (in %)



Source: World Bank (2014).

In sum, the available information on the degree of novelty and innovativeness in projects awarded through UPs is unconvincing. There is no systematic difference between the sectoral and other characteristics of projects awarded through UPs and SPs. In recent years, UPs could be found in the same sectors and types of projects as SPs. Even in those sectors where the importance of innovative projects *ex ante* was clear, such as renewable energy generation, fewer projects were awarded through UPs compared to SPs. This suggests that, compounding the distortions associated with restrictions on competition, there is no clear evidence that UP tenders have attracted novel and innovative project proposals.

5 CONCLUDING REMARKS

This study formalises the essential characteristics of SPs and UPs, assessing for the first time the common assertion in the literature that UPs have the advantage of attracting innovative and novel projects and providing a welfare-enhancing alternative to conventional methods of tendering. Our analysis concludes that there are no convincing welfare-founded arguments for preferring UP over SP processes, except in very exceptional circumstances. There is no clear evidence, either, that restrictions to competitive tenders through UPs incentivised the submission of innovative and novel project solutions.

Although UPs can in theory produce welfare-superior results, the available empirical evidence cannot confirm such cases or demonstrate that conventional solicited proposals could not achieve the same results. Under asymmetric information, welfare-improving results could be achieved only in the context of competitive tenders: directly negotiated proposals could never lead to superior welfare outcomes compared with solicited proposals. This suggests that UPs can only be advocated when competitive tenders are part of the procurement process.

Another result of our study is that technical upgrades to public projects could be achieved by transferring parts of design risk. Mechanisms such as competitive dialogue (World Bank, 2017b; EPEC, 2011) are promising avenues for seeking innovative projects without restricting the benefits of competition. Analysis of the effectiveness of these mechanisms, together with the collection of more systematic data on unsolicited and solicited proposals, is part of the current research agenda.

Disclosure statement

The author has no potential conflict of interest to report.

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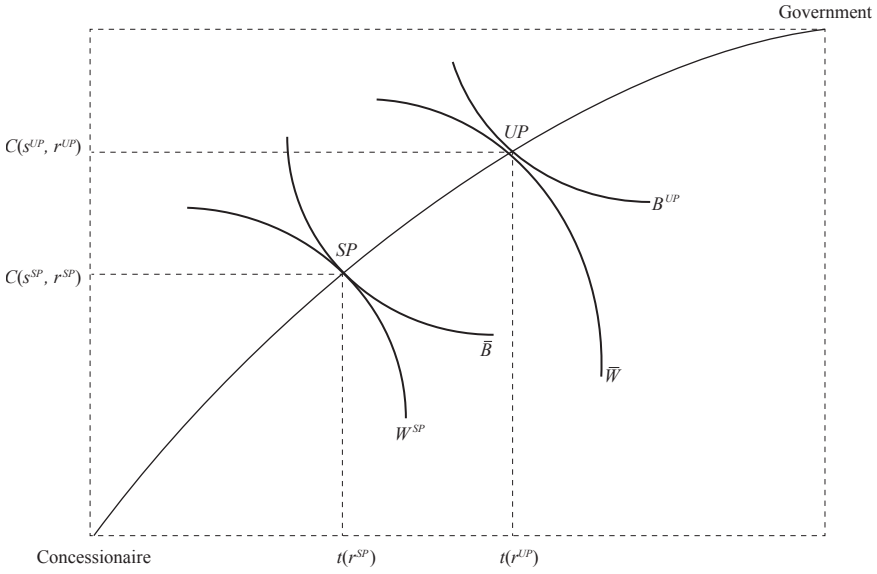
APPENDIX

Figure A1 uses an Edgeworth box to show the interchange relationship between government and concessionaire. In the horizontal axis the net transfer t is measured while the vertical depicts the concessionaire cost function. As can be seen, proponent's utility B depends positively on both t and c while the inverse occurs with welfare function W. With perfect information of government regarding the potential solutions S to P, SP equilibrium is reached in the allocation $(t(r^{SP}), c(s^{SP}, r^{SP}))$ which maximises welfare subject to a reservation utility for the proponent of $\bar{B}$.

Equilibrium under UP is depicted with higher levels of t and c, in the point $(t(r^{UP}), c(r^{UP}, s^{UP}))$. UP allocation represents the proponent maximisation of B subject to welfare reservation levels $\bar{W}$.

FIGURE A1

SP and UP equilibrium with government's perfect information on S



This figure illustrates clearly that if government possess perfect information on the S potential solutions to P, the UP solution will never be superior to SP. The opposite would imply that government maximises W in a point below their reservation levels which would be an irrational behavior or contrary to non-satiation traditional axioms. It is important to notice $r^{SP} > r^{UP}$ which is consistent with the evidence that competition under UP is lower compared to SP. As well, $s^{SP} > s^{UP}$, implies that solution provided by the UP is more efficient than that obtained through SP.

Figure A2 shows the equilibrium under informational asymmetry. Under SP equilibrium where concessionaire enjoys an informational rent (IR). Compared to the equilibrium with perfect information (SP), SP' locates under higher levels of t and c: $t(r_{II}^{SP})$ and $c\left(s_{II}^{SP}, r_{II}^{SP}\right)$. In this figure A2, also is shown $c(sk, r^{UP})$ in the vertical

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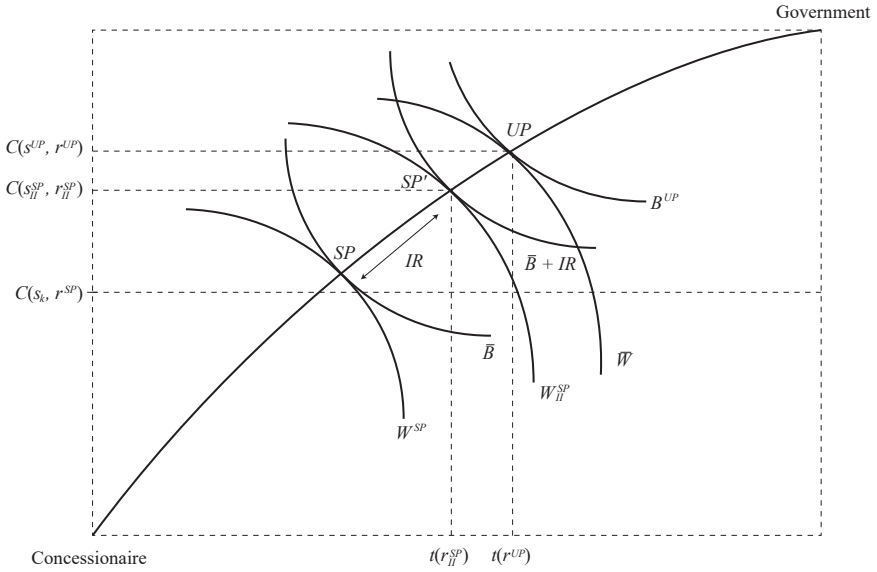
axis, as the lower limit level where SP solutions can fall, given the incomplete information of government on S solutions to P.

FIGURE A2

SP and UP equilibrium under informational asymmetry



Finally, figure A3 depicts the effect of a reduction in s from s^{UP} to s_{II}^{UP}. Cost reduction from $c(s^{UP}, r^{UP})$ to $c(s_{II}^{UP}, r^{UP})$ which allow an increase in welfare from $\bar{W}$ to W_{II}^{UP}, moving UP equilibrium from UP to UP'. Is important to notice this solution assumes that the level of competition r^{UP} keeps constant. The assumption that the proponent has no control on the level of competition faced under the tender, is critical for achieving the result where UP is a welfare superior solution with compared to SP. Otherwise, the proponent will increase their private rent increasing the net transfer from $t(s_{II}^{UP})$ to $t(s_{II}^{DN})$ (direct negotiated tender); which would lead again to a welfare inferior solution UP''.

Is important to stress that equilibrium UP' falls in a point located below $c(s_K^{UP}, r^{UP})$, a level unattainable for government because it possesses incomplete information on S.

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FIGURE A3

The effect of an increase on s, from s^{UP} to s_{II}^{UP}

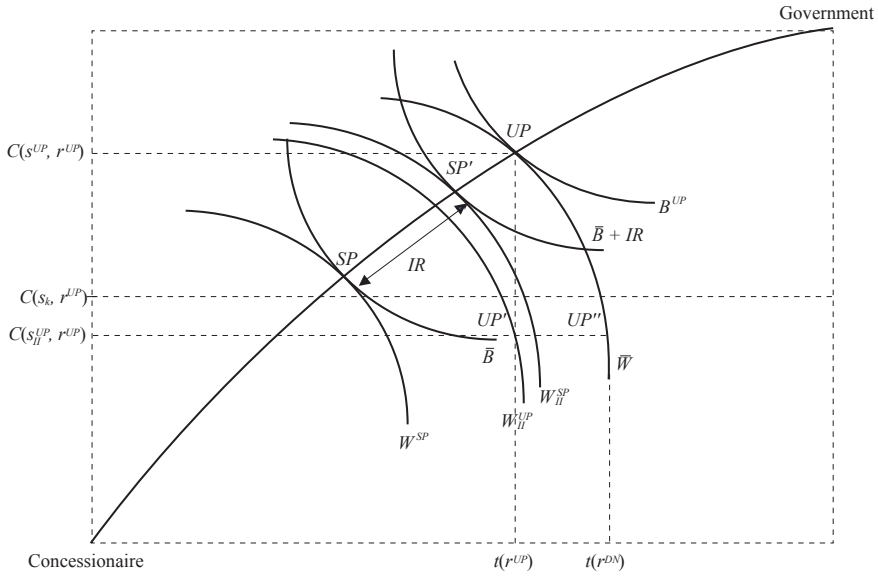
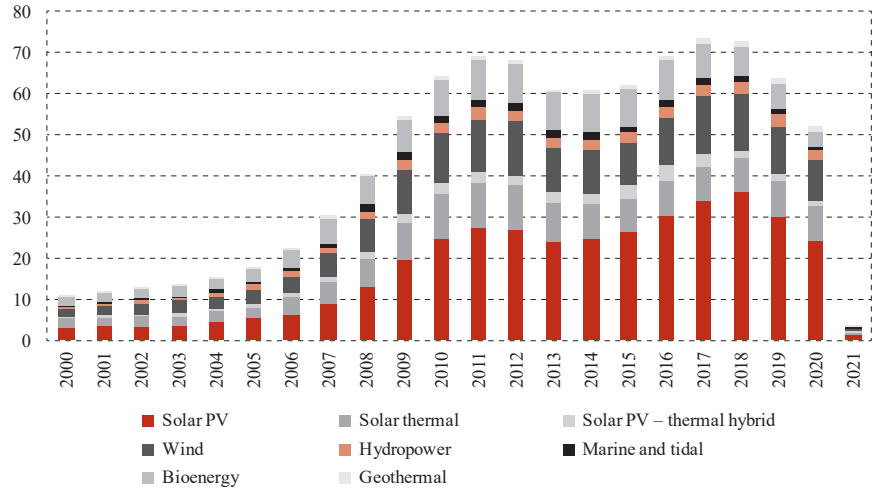


FIGURE A4

Number of patents filed globally for renewable energy technologies (in millions)



Source: International Renewable Energy Agency (IRENA).

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Table A1
UPs awarded by country

Country	Number of unsolicited proposals	Percentage
Brazil	105	40.1
India	17	6.5
Colombia	13	5.0
Peru	10	3.8
Turkey	9	3.4
Mexico	8	3.1
Indonesia	7	2.7
Jordan	7	2.7
Honduras	6	2.3
Philippines	5	1.9
Russian Federation	5	1.9
Bangladesh	4	1.5
Dominican Republic	4	1.5
Malaysia	4	1.5
Pakistan	4	1.5
Others	54	20.6
Total	**262**	**100.0**

Source: PPI World Bank.