

Forum: Practical Perspectives

The new Brazilian public procurement law as promoter of the winner's curse

Regis Signor ¹

Fernanda Fernandes Marchiori ²

Alexandre Bacellar Raupp ¹

Rafael Rubin Magro ³

Alan de Oliveira Lopes ³

¹ Polícia Federal / Setor Técnico-Científico, Florianópolis / SC – Brazil

² Universidade Federal de Santa Catarina / Departamento de Engenharia Civil, Florianópolis / SC – Brazil

³ Polícia Federal / Serviço de Perícias de Engenharia, Brasília / DF – Brazil

Avoiding overpricing and irresponsible pricing are two central objectives of the recently enacted Law 14133/2021. This article shows that when trying to achieve the first objective, the new Brazilian public procurement law promotes the second, since a specific command reduces maximum prices until they freeze to the lowest possible values, leading the contractors to the winner's curse. Public officials are warned that maintaining this command will lead to widespread breaches of contracts and eventual bankruptcy of contractors. The Monte Carlo method is adopted to show that a comprehensive price database will avoid the problem and guarantee the effect intended by the law.

Keywords: law 14133/2021; public procurement; winner's curse; overpricing; irresponsible pricing.

A nova lei de licitações como promotora da maldição do vencedor

Evitar sobrepreços e preços manifestamente inexequíveis são dois objetivos principais da recém-promulgada Lei nº 14.133, de 1º de abril de 2021. O presente artigo demonstra que, ao tentar alcançar o primeiro objetivo, a nova lei de licitações promove o segundo, pois um comando específico tende a reduzir os preços até congelá-los nos menores valores possíveis, conduzindo os contratados à maldição do vencedor. Alerta-se os agentes públicos sobre o fato de que a manutenção desse comando levará a descumprimentos generalizados de contratos e a uma eventual falência de competidores. O método Monte Carlo é utilizado para demonstrar que um mecanismo abrangente de pesquisa de preços evitará o problema e garantirá o efeito pretendido pela lei.

Palavras-chave: lei nº 14.133/2021; licitação; maldição do vencedor; sobrepreço; preço inexequível.

La nueva ley de licitaciones como promotora de la maldición del ganador


Evitar los sobreprecios y los precios manifestamente inviables son dos de los principales objetivos de la recién promulgada Ley 14.133/2021 de Brasil. Este artículo demuestra que, al intentar lograr el primer objetivo, la nueva ley de licitaciones promueve el segundo, ya que un comando específico tiende a reducir los precios hasta congelarlos a los valores más bajos practicables, llevando a los contratados a la maldición del ganador. Se advierte a los funcionarios públicos que mantener este comando conducirá a incumplimientos generalizados de contratos y eventual quiebra de los competidores. Se utiliza el método Monte Carlo para demostrar que un mecanismo integral de investigación de precios evitará el problema y garantizará el efecto buscado por la ley.

Palabras clave: ley 14.133/2021; licitación; maldición del ganador; sobreprecio; precio inviable.

DOI: <http://dx.doi.org/10.1590/0034-761220210133>

Article received on April 10, 2021 and accepted December 21, 2021.

[Translated version] Note: All quotes in English translated by this article's translator.

ISSN: 1982-3134 

ACKNOWLEDGEMENTS

The authors acknowledge the Brazilian Federal Police, the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for supporting this article.

1. INTRODUCTION

In April 2021, the Brazilian Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) was enacted. It summarizes and reformulates regulations for procuring public contracts in Brazil, which were previously established in Laws 8,666 (Lei nº 8.666, de 21 de junho de 1993); 10,520 (Lei nº 10.520, de 17 de julho de 2002); and 12,462 (Lei nº 12.462, de 04 de agosto de 2011). An important innovation expressed by art. 11 of the new law is the definition of general objectives for auctioning. These comply with the basic principles recommended by the Organization for Economic Cooperation and Development (OECD, 2009, 2020) and by the United Nations (UN, 2020). However, some provisions of the new law can lead to undesirable results, especially something that the law aims to avoid: the irresponsible pricing (meaning unfeasible, unreasonably low pricing), and, consequently, ineffective contracts. This is because specific guidance in the law, which is detailed below, will inevitably lead contractors to the winner's curse.

Capen, Clapp, and Campbell (1971) coined the term 'winner's curse' and the topic was further developed by one of the latest Nobel Prize winners in Economic Sciences, Paul Milgrom (1989). In a description adjusted for the purposes of this article, the phenomenon occurs when a competitor wins a contract through an auction process for a nearly irresponsible price and is forced to deliver without profit or, what is worse, at a loss. On the other hand, the State tends to experience several associated problems, such as delay and abandonment of contracts. As an example, a recent audit by the Federal Court of Accounts (TCU) showed that abandoned public infrastructure projects cause billions in losses and damage to growth, job creation and services in Brazil (Tribunal de Contas da União [TCU], 2019).

Deepening the study of public social infrastructure projects, Signor, Love, Marchiori, and Felisberto (2020) statistically showed that low contract prices can be an important factor in these abandonments, stimulated by the price caps imposed by the auction rules. In other words, the winner's curse arises because the government entities pressure contractors to offer prices below the minimum viable limit.

Similarly, this article shows that a specific order of Law 14,133 (Lei nº 14.133, de 1º de abril de 2021, art. 23, § 1, I), which aims to avoid overpricing in the acquisition of goods and contracting of services in general, actually institutionalizes the winner's curse by limiting the prices of new auctions to the median prices of past auctions. Section 3 presents the theoretical basis and a practical example of the malfunction of this command, which leads to unfeasible prices and thus cannot be used. Possible solutions to the problem are presented in section 4, which recommends that the price cap should be based on the other parameters described in the same article 23 (in particular section V) and that different judgment criteria be adopted when possible. In addition, this work alerts to the urgent need for new regulations that systematize extensive market research to avoid the above-mentioned problem.

2. BIBLIOGRAPHIC REVIEW

According to the OECD, public procurement accounts for, on average, 12% of GDP in OECD countries and 20-30% of GDP in developing economies (OECD, 2020). Naturally, the importance of this volume of resources has attracted the attention of several researchers, notably Paul R. Milgrom and Robert B. Wilson, winners of the Nobel Prize in Economics in 2020. Of fundamental importance with regard to this article is the fact that the Nobel prize was about avoiding the winner's curse (The Nobel Prize, 2021).

2.1. Avoiding the winner's curse

A detailed examination of the numerous studies on the different types of auctions, their characteristics and other aspects is beyond the scope of this article. However, it is important to highlight the seminal work of Capen et al. (1971). These US researchers observed that winners of auctions for contracts to explore oil fields did not obtain the expected profits because, in short, an excess of competitiveness drove prices into an unrealistic range. Thus, winning an auction was more likely seen as a curse rather than a blessing. Prominent researchers later confirmed the occurrence of this phenomenon in different areas, including Public-Private Partnerships for transport concessions, outsourcing in the billion-dollar Information Technology industry; and even for the rights to broadcast football matches (Bazerman & Samuelson, 1983; Kagel & Levin, 1986; Milgrom & Weber, 1982).

As the curse sets in when someone wins an auction for an irresponsible price (being forced to work without profit or at a loss), to avoid the problem the bold competitor must carefully estimate his bid so as not to stray too far from the real value of the auctioned object. In the words of Milgrom (1989, p. 6), "the payoff to careful cost estimation in competitive bidding is great, because it allows you to bid aggressively without great risk".

2.2. What leads to the winner's curse

The primary cause for the winner's curse is the inexistence or asymmetry of information, which prevents or makes it difficult for competitors to specify the value of the auctioned object, as highlighted by Capen et al. (1971) and later by other authors. The phenomenon is enhanced by other factors, such as: the degree of competitiveness, usually expressed by the number of competitors and the associated trend of irresponsible bids (Bazerman & Samuelson, 1983); the winner's inexperience, which can lead them to present an unrealistic bid (Milgrom, 1989); the inherent incompleteness of the contracts, which cannot cover all situations likely to occur during their execution, can lead to imbalances between the parties (especially for long-term contracts) and shade performances or other changes that counteract this imbalance (Hart & Moore, 2008); government opportunism, in which the government uses legal tools at its disposal to seize the gains of private contractors, and also the opportunism in the private sector, where asymmetric or biased information to unbalance contracts (Spiller, 2013); and lack of expertise compromising the ability of public institutions to design and supervise, and of private agents to execute, which makes it difficult for contracts to produce the desired outcomes (Cabral, 2017; Quelin, Cabral, Lazzarini, & Kivleniece, 2019), in addition to other factors such as irrational behavior and poor judgment (Bazerman & Samuelson, 1983).

2.3. The Brazilian case

Focusing on Brazilian auctions, it can be observed that when the winner selection criterion is the lowest price, although there is usually the possibility of rejecting irresponsible bids, in practice, this rarely occurs, leading to the winner's curse being a prominent feature (Signor et al., 2020). Dias (2021) analyzed the methods and theories employed by previous authors to identify the winner's curse early in the bidding phase. The author concluded that neither the methods nor the requirements of Law 8,666 (Lei nº 8.666, de 21 de junho de 1993) or the new Brazilian public procurement law project (the former Projeto de Lei nº 4.253, de 2020) manage to foresee the problematic contracts in public auctions for a public university infrastructure projects.

Despite the global recommendation that public procurement should be aimed at the best value for money (OECD, 2009), and although Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) allows different judgment criteria, it seems to be generally accepted in Brazil that the contracting party (the government for the purpose of this article) will gain an advantage over the contracted party by always aiming at the lowest price. Moreover, the government must save taxpayers' money and given the importance of public expenditure in national economies (OECD, 2020), it is undeniable that by reducing the prices of its purchases the administration will be acting to contain inflation. However, in the long term this situation becomes unsustainable and ends up adversely affecting the system, since bankrupt companies do not generate any advantage to the government (or the public) and frozen prices do not usually produce good results (Barrionuevo, 2015; Conceição & Monteiro, 2021; Schuettinger & Butler, 1979).

In addition, it is important to consider the possibility of what is known in Brazil as an *apagão das canetas* (a lack of signatories) (Mundim, 2020; Sundfeld & Marques, 2013), that is, the expected rational behavior of public officials in charge of procurement will be to avoid individual liability. Thus, these public servants tend to blindly apply the law even when inflation or some temporary fluctuations lead to an increase in market prices and thus irresponsible prices will be adopted as price caps even if deserted auctions become frequent.

The ideal situation is that of the economic-financial balance of contracts, in which the obligations assumed by the winning bidder are equivalent to their corresponding economic compensation, where both overpricing, and the winner's curse are mostly avoided by national legislation. In a brief historical review of Brazilian regulations, it was observed that back in 1993, Law 8,666 (Lei nº 8.666, de 21 de junho de 1993) established the need for extensive market research and the disqualification of excessively high or irresponsible bids, although there was no explicit mention of the source of the upper or lower limits for prices in the first years of the law.

Later, upper limits were firstly established, encompassing public infrastructure projects and engineering services. Following a link to numerous scandals in recent decades, several researchers, including Lopes (2011); Pereira (2002); Signor, Love, Vallim, Raupp, and Olatunji (2019); and Vallim (2018), analyzed the overpricing of public infrastructure projects. Progressively, from 2003, the outcry from society regarding overpricing motivated the forecasting of maximum prices for the contracting of public infrastructure projects and engineering services, based on the National System of Survey of Costs and Indexes of Civil Construction (Sinapi) and on the Referential Construction Costs System (Sicro). However, there were no clear limits set for irresponsible bids or maximum prices for general goods and services.

It is worth noting that a common characteristic of Sicro and Sinapi is that the main information in these systems is the costs of composition of services, assessed as the result of a combination of

quantities and unit prices of supplies. Since both of these result from extensive market research and involve information outside the public procurement environment, the resultant median prices for the compositions are safe to use, as demonstrated by Signor, Love, Olatunji, Marchiori, and Gripp (2016). The cited authors focused primarily on the Sinapi database, but their conclusions can be easily extended to Sicro.

Despite the research and advances regarding the acquisition of contracts for public infrastructure projects and engineering services, the lack of legal price caps for the acquisition of goods and contracting of services in general remained until the enactment of Law 14,133 (Lei nº 14.133, de 1º de abril de 2021). Initially, it can be noted that the new law has novel additions, since it specifies the objectives of the auctions, among which the main ones related to the subject addressed herein are transcribed (and translated) as follows:

Art. 11. The procurement process aims to:

[...]

I - ensure the selection of the proposal capable of generating the most advantageous contracting result for the Public Administration, including with regard to the object's life cycle;

[...]

III - avoid overpriced contracts or contracting at clearly irresponsible prices, and overpricing in the execution of contracts;

[...]

(Lei nº 14.133, de 1º de abril de 2021).

Specifically addressing avoiding overpricing, Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) establishes that:

Art. 23. The pre-tender estimated value of the contract must be compatible with the market values, considering the prices contained in public databases and the quantities involved, taking into account the potential economies of scale and the particularities of the place of execution of the object.

§ 1 In the procurement process for the **acquisition of goods and contracting of services in general**, according to the regulation, the pre-tender estimated value will be defined based on the best price measured through the use of the following parameters, **adopted in a combined way or not**:

I - composition of unit costs **less than or equal to the median of the corresponding item in the price consultation panel** or in the health services price database available on the National Public Contracting Portal (PNCP);

[...]

V - research in the national electronic invoice database, as regulated.

[...]

(Lei nº 14.133, de 1º de abril de 2021, emphasis added).

The next section will show that the median taken from the price consultation panel set by the new law tends to lead to an unwanted imbalance when purchasing goods and contracting services in general. It will be demonstrated that when only previous government contracts are used to establish

the maximum price limit, the undesired effect of reducing the prices to the minimum viable will emerge, institutionalizing the winner’s curse.

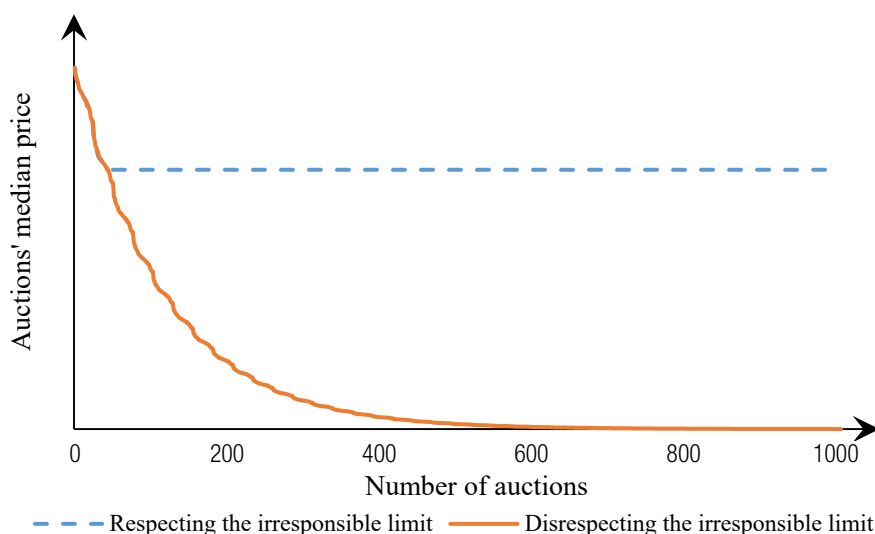
3. EFFECT OF USING THE MEDIAN OF THE PRICE CONSULTATION PANEL

As anticipated, Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) determines that the prices of goods and services in general must be estimated by the median of the corresponding item in the price consultation panel or in the health price database available on the National Public Contracting Portal (PNCP). The price panel aims to assist public managers in making decisions about purchasing processes, provide transparency to the prices paid by the government and encourage social control. Aiming to avoid personal liability for possible overpricing, the rational behavior expected from public officials responsible for procurement will be to use this median as maximum price cap.

However, unlike Sicro and Sinapi, (successfully used as references for public infrastructure projects and engineering services), the price consultation panel does not take into account the results of extensive market research carried out by public and private agencies, but only the records of auctions previously promoted by government agencies, as reported in the system manual (Rogério, 2018).

Thus, the aim of this paper is to demonstrate that when maximum prices are restricted to the medians of previous public purchases, future winner bids tend to be reduced to the minimum viable prices or, if an irresponsible limit is not set, to zero. This is because the continuous insertion of values equal to or lower than the median in a sample necessarily entails the maintenance or reduction of the median of the new sample, as illustrated in Graph 1. In practice, the price will be frozen at its *minimum minimorum* and from a given time there will be no room for the reduction of values in new auctions, except in special cases, such as an oversupply of a certain product or if a particular supplier, for a particular reason, offers the product at a price lower than its cost, subjecting itself to the winner’s curse.

GRAPH 1 BEHAVIOR OF THE PRICE CAP FOR FUTURE AUCTIONS IF ART. 23, § 1, I IS APPLIED



Source: Elaborated by the authors.

The authors performed several tests to verify the behavior illustrated in Graph 1. It is easy to foresee that from a certain point onward the price reduction will make it difficult (or will prevent) to purchase products subject to possible peaks or seasonality of costs. However, the worst effects of freezing the prices to the *minimum minimorum* are related to the hiring of labor. This is because it can be demonstrated that the strict adoption of section I of § 1 of article 23 of Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) will condemn all workers hired through outsourcing companies to receive the minimum wage stipulated in their respective labor agreements or regulations.

A series of fictitious auctions for contracts for the “Provision of Catering Services” (Catser Code 14397) can be used to demonstrate this phenomenon (in this case “catering service” means an outsourced company that provides a person to serve coffee, for example, to the workers in a place such as an office). A search of the price consultation panel¹, carried out on 04/04/2021, returned, for the Brazilian Midwest region, 78 records with prices ranging between R\$ 102.00 and R\$ 3,678,365.29 (1 US\$ ≈ 0.18 R\$ in April 2021). In a detailed analysis, it was found that the lowest price refers to the daily rate paid to a professional, and the value of R\$ 3,678,365.29 refers to the annual amount paid by a public agency for a group of employees (coffee maker, waiters, and overseers). In an attempt to mimic the procedure to be followed by the public official responsible for the auction, the extreme values were excluded, leaving 31 records priced between R\$ 1,998.00 and R\$ 4,453.96, which share the same object and are expected to express the monthly unit value for hiring these workers. All prices in the cleaned sample were ordered, as seen in Table 1, and the result was a median of R\$ 2,909.59.

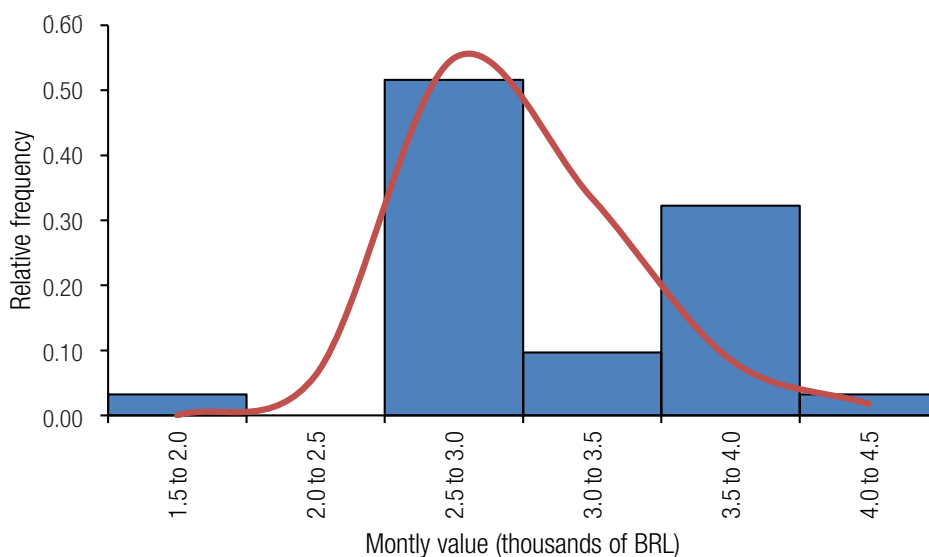
TABLE 1 CLEANED AND ORDERED SAMPLE OF CATERING SERVICES IN THE BRAZILIAN MIDWEST REGION (PRICES IN R\$, N = 31)

1,998.00	2,673.55	2,723.83	2,755.00	2,755.97	2,772.01	2,775.41	2,775.78
2,779.94	2,783.33	2,845.00	2,850.38	2,854.54	2,878.56	2,899.98	2,909.59
3,000.00	3,011.26	3,100.77	3,462.72	3,503.79	3,503.79	3,518.55	3,541.98
3,581.00	3,581.00	3,581.00	3,585.68	3,606.46	3,606.46	4,353.96	

Source: Elaborated by the authors from the Price Consultation Panel data.

Graph 2 shows the histogram of these prices and superimposes a 3P Lognormal distribution ($\sigma=0.34$; $\mu=6.99$; $\gamma=1,998.00$) that is considered adequate to describe the prices (Hajargasht & Griffiths, 2013) and cannot be rejected according to the Kolmogorov-Smirnov test ($\alpha=5\%$). It should be noted that whatever the histograms and distributions, after some auctions where the prices are limited by the median of previous auctions, there will be a flattening of wages and subsequent freezing at the minimum wage for these professionals. For this example, it is assumed that the worker’s earnings, together with taxes and the outsourced company’s profit cannot be lower than the lowest price observed, that is, R\$ 1,998.00 (the Brazilian minimum wage in 2020 was R\$ 1,045.00).

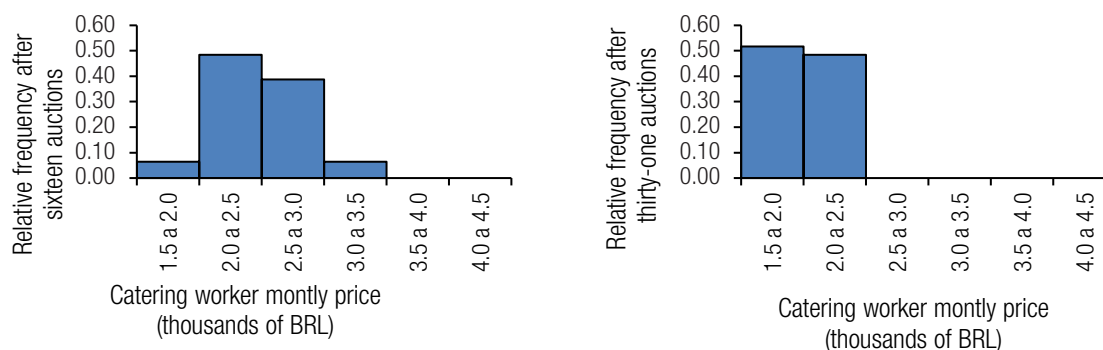
¹ Retrieved from <https://paineldepocos.planejamento.gov.br/>

GRAPH 2 PRICE HISTOGRAM AND THE PROBABILITY DISTRIBUTION ADOPTED TO REPRESENT IT

Source: Elaborated by the authors.

To continue with the example, the authors assume that the winners of each future auction will offer a price 20% lower than the price cap set in the respective auction notice. Although reductions tend to vary according to several factors described in a wide bibliography (Kagel & Levin, 1986; Pereira, 2002; Signor et al., 2019), the results would be the same for any percentage. Aiming to simulate the functioning of the price consultation panel, as new prices were entered in the database the oldest prices were excluded (assuming that the annual regime is approximately constant). Graph 3 shows the distribution of prices after sixteen auctions (when the winner value would be obligatorily reduced to the minimum viable) and after 31 auctions (when the median would reach R\$ 1,998.00 and freeze the workers' earnings at the minimum wage).

GRAPH 3 PRICE HISTOGRAMS FOR WINNER DISCOUNTS OF 20% ON THE MEDIAN AFTER 16 AUCTIONS (LEFT) AND AFTER 31 AUCTIONS (RIGHT)



Source: Elaborated by the authors.

The speed of price flattening and freezing will be dependent on the number of samples and their dispersion in the original dataset, and the winner discounts observed at each auction (fixed here at 20%, as an example). However, the result will always be the same, with prices freezing at the minimum viable, which is a highly undesirable outcome.

4. SUGGESTIONS TO SOLVE THE PROBLEM

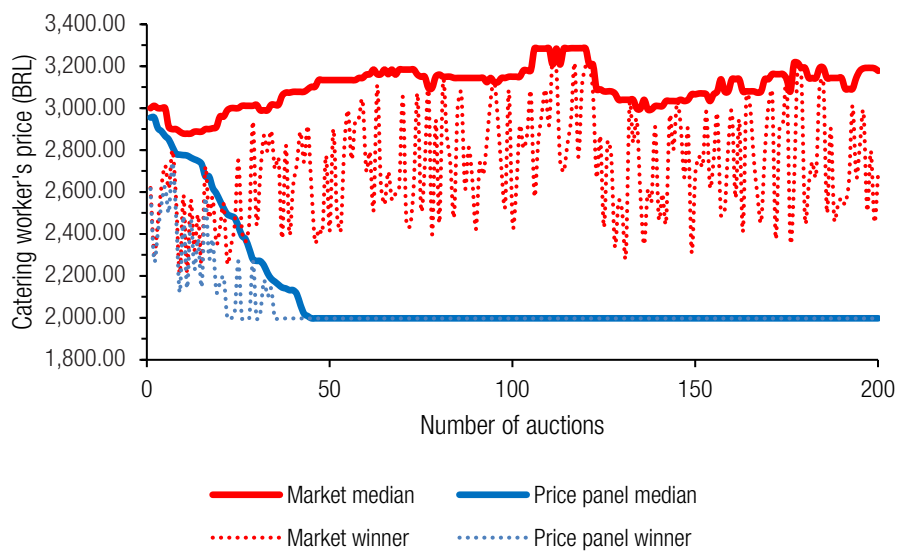
Considering the implications of the problem at hand, it is understood that, without disregarding the potential of other alternatives that may prove to be better, a possible solution is the application of another guideline of the Law 14,133 (Lei nº 14.133, de 1º de abril de 2021). Article 23, paragraph 1, section V, recommends that the price caps for new auctions may also be derived from research on a national basis of electronic invoices, according to a specific regulation. It is understood that this price research on market transactions is necessary to avoid feedback that degenerates the model and ends up freezing prices. It should be noted that this procedure is similar to the methodologies of Sicro and Sinapi, where the price surveys are not limited to government contracts.

As an example, the authors simulated auctions following both the regulations of sections I and V of paragraph 1, in Article 23 of the Law 14,133/2021. In the first case, using the data from the price consultation panel described in Table 1 as seeds, the Monte Carlo method was used to simulate thousands of situations, adopting as the winner prices the median values of each previous set reduced by random percentages following a Uniform distribution ($a = 0$; $b = 0.25$). With this procedure, even before 100 auctions the prices are already limited to the minimum viable values.

In contrast, when following the guidance of section V, using the same data from Table 1 as seeds (considering these data as representative of the market), but now entering, for each new auction, one price from a broad market survey (randomly generated by the Monte Carlo method according to the Lognormal distribution previously described), the authors observed that there is no degeneration of the model.

Graph 4 illustrates the behavior of medians and winner prices for simulated auctions for catering services when the price caps are set by searching only in the price consultation panel and when extensive market research is adopted. It can be observed that all previous predictions are confirmed by the simulations.

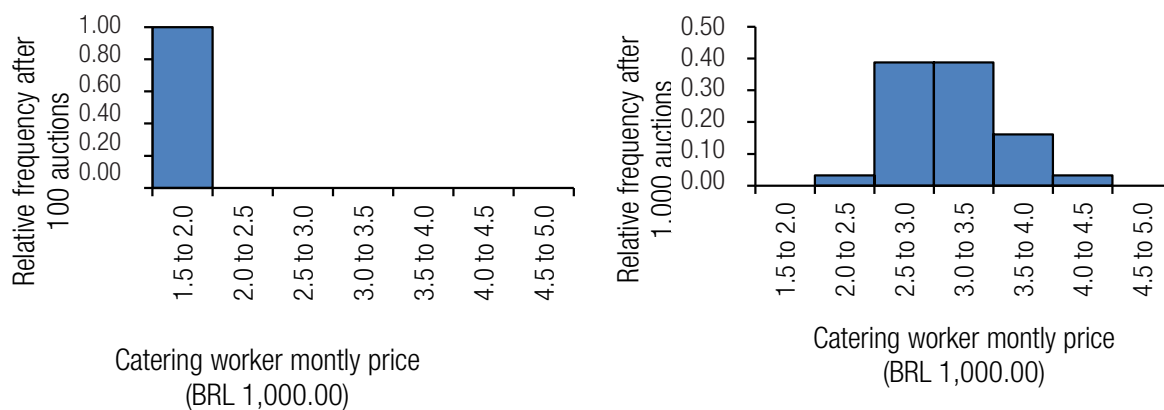
GRAPH 4 BEHAVIOR OF MEDIANS AND WINNER PRICES WHEN THE PRICE CAP SURVEYS ARE RESTRICTED TO THE PRICE CONSULTATION PANEL OR PERFORMED CONSIDERING MARKET-WIDE RESEARCH



Source: Elaborated by the authors.

Lastly, Graph 5 compares the histograms of prices observed after 100 auctions when adopting only the price consultation panel (degenerated model) and also after 1,000 auctions when using extensive market research (model still intact). As expected, the winner prices are frozen at the minimum viable in the first case and vary in the second case, reaching average prices of around R\$ 2,700.00.

GRAPH 5 EXPECTED HISTOGRAMS FOR CATERING SERVICE PRICES FOR RANDOM REDUCTIONS (BETWEEN 0 AND 25%) IN THE WINNER BID, WHEN THE PRICE CAP IS CALCULATED FROM PREVIOUS AUCTIONS (LEFT) AND BASED ON EXTENSIVE MARKET RESEARCH (RIGHT)



Source: Elaborated by the authors.

Despite the indisputable utility of first-price auctions for the acquisition of standardized goods and services, for other cases, prioritizing criteria that assess not only costs, but also benefits, is a more comprehensive strategy to avoid the winner’s curse and, simultaneously, achieve the best value for money for the public administration (article 11, Lei nº 14.133, de 1º de abril de 2021). To this end, the first-price criterion may be replaced by the best technique, technique and price or the highest economic return, when applicable.

It is possible to foresee, however, that the public servants in charge of auctions will face initial difficulties in this important procedural and cultural change. There are two fundamental limiting factors in the pursuance of these more effective solutions: the lack of specialization of the auctioning committees (which are still customarily formed by provisionally appointed public servants); and these public servants’ fear of personal liability imputed by the control agencies (which impels them to walk the safest and most known path of the lowest price criterion). It is expected that these obstacles will be removed in the future by closer action by the control agencies that, as determined by Law 14,133/2021 (article 173, Lei nº 14.133, de 1º de abril de 2021), became responsible for training the public servants who will perform this important task.

5. CONCLUSIONS

This article demonstrates that the specific novelty associated with section I, paragraph 1 of Article 23 of Brazilian Law 14,133 (Lei nº 14.133, de 1º de abril de 2021), which limits the maximum price of future auctions to the median of the winner prices of past auctions, tends to give a result that is the opposite to that intended. The practice of sampling data using a feedback-based approach tends to degenerate the model, freezing contract prices to the minimum viable values and, ultimately, institutionalizing the phenomenon known as the winner’s curse. In the long run the government, and Brazilian society as a whole, will be harmed if there is no change of course in this regard.

The analysis presented herein verifies this undesirable trend. Without ruling out different alternatives that may prove to be more appropriate, the need for extensive market research to set price caps for new auctions aimed at the acquisition of goods and contracting of services in general is highlighted as a solution to the problem. In this regard, it is suggested that the regulation requiring surveys based on the national database of electronic invoices should be implemented as soon as possible, allowing the price caps to be based on section V, paragraph 1 of Article 23.

Also, to fully meet the objectives of Law 14,133 (Lei nº 14.133, de 1º de abril de 2021) and for the government to ensure the selection of the proposal that results in the best value for money, it is necessary to consider a gradual change in the selection criteria, replacing the lowest price with the best technique or technique and price, or the greatest economic return whenever possible, along with the continuous training of public servants responsible for public procurement.

REFERENCES

- Barrionuevo, A. (2015). A formação distorcida de preços administrados na experiência brasileira recente. *Revista de Economia Política*, 35(3), 475-491.
- Bazerman, M. H., & Samuelson, W. F. (1983). I won the auction but don't want the prize. *Journal of Conflict Resolution*, 27(4), 618-634.
- Cabral, S. (2017). Reconciling conflicting policy objectives in public contracting: the enabling role of capabilities. *Journal of Management Studies*, 54(6), 823-853.
- Capen, E. C., Clapp, R. V., & Campbell, W. M. (1971). Competitive bidding in high-risk situations. *Journal of Petroleum Technology*, 23(6), 641-653.
- Conceição, C., & Monteiro, S. (2021, February 24). "Voltar com mecanismo de controle de preços seria um tiro no pé por parte do governo e da Petrobras". *Blog da Conjuntura Econômica* Retrieved from <https://ibre.fgv.br/blog-da-conjuntura-economica/artigos/voltar-com-mecanismo-de-controle-de-precos-seria-um-tiro-no-pe>
- Dias, S. F. (2021). *Critérios para seleção de licitantes de obras públicas evitando contratações a preços inexequíveis* (Master Thesis). Universidade Federal de Santa Catarina, Florianópolis, SC.
- Hajargasht, G., & Griffiths, W. E. (2013, July). Pareto-lognormal distributions: inequality, poverty, and estimation from grouped income data. *Economic Modelling*, 33, 593-604.
- Hart, O., & Moore, J. (2008). Contracts as reference points. *Quarterly Journal of Economics*, 123(1), 1-48.
- Kagel, J. H., & Levin, D. (1986). The winner's curse and public information in common value auctions. *American Economic Review*, 76(5), 894-920.
- Lei nº 8.666, de 21 de junho de 1993. (1993). Regulamenta o art. 37, inciso XXI, da Constituição Federal, institui normas para licitações e contratos da administração pública e dá outras providências. Brasília, DF. Retrieved from http://www.planalto.gov.br/ccivil_03/leis/l8666cons.htm
- Lei nº 10.520, de 17 de julho de 2002. (2002). Institui, no âmbito da União, Estados, Distrito Federal e Municípios, nos termos do art. 37, inciso XXI, da Constituição Federal, modalidade de licitação denominada pregão, para aquisição de bens e serviços comuns, e dá outras providências. Brasília, DF. Retrieved from http://www.planalto.gov.br/ccivil_03/leis/2002/l10520.htm
- Lei nº 12.462, de 04 de agosto de 2011. (2011). Institui o Regime Diferenciado de Contratações Públicas - RDC; altera a Lei nº 10.683, de 28 de maio de 2003, que dispõe sobre a organização da Presidência da República e dos Ministérios, a legislação da Agência Nacional de Aviação Civil (Anac) e a legislação da Empresa Brasileira de Infraestrutura Aeroportuária (Infraero); cria a Secretaria de Aviação Civil, cargos de Ministro de Estado, cargos em comissão e cargos de Controlador de Tráfego Aéreo; autoriza a contratação de controladores de tráfego aéreo temporários; altera as Leis nºs 11.182, de 27 de setembro de 2005, 5.862, de 12 de dezembro de 1972, 8.399, de 7 de janeiro de 1992, 11.526, de 4 de outubro de 2007, 11.458, de 19 de março de 2007, e 12.350, de 20 de dezembro de 2010, e a Medida Provisória nº 2.185-35, de 24 de agosto de 2001; e revoga dispositivos da Lei nº 9.649, de 27 de maio de 1998. Brasília, DF. Retrieved from http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/lei/l12462.htm
- Lei nº 14.133, de 1º de abril de 2021. (2021). Lei de Licitações e Contratos Administrativos. Brasília, DF. Retrieved from http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/L14133.htm
- Lopes, A. O. (2011). *Superfaturamento de obras públicas*. São Paulo, SP: LivroPronto.
- Milgrom, P. (1989). Auctions and bidding: a primer. *Journal of Economic Perspectives*, 3(3), 3-22.
- Milgrom, P., & Weber, R. J. (1982). A theory of auctions and competitive bidding. *Econometrica*, 50(5), 1089-1122.
- Mundim, G. A. (2020). *"Apagão das canetas": gestor público, controle e mídia* (Master Thesis). Fundação Getúlio Vargas, São Paulo, SP.
- Organization for Economic Cooperation and Development. (2009). *OECD Principles for integrity in public procurement*. Paris, France: Author.
- Organization for Economic Cooperation and Development. (2020). *Integrating responsible business conduct in public procurement*. Paris, France: Author.
- Pereira, G. P. C. (2002). *O mercado da construção civil para obras públicas como instrumento de auditoria: uma abordagem probabilística* (Master Thesis). Universidade Federal de Pernambuco, Recife, PE.

- Projeto de Lei nº 4253, de 2020.* (2020). Estabelece normas gerais de licitações e contratos administrativos para a União, Estados e Municípios, e suas autarquias e fundações. Disciplina prerrogativas, alocação de riscos, arbitragem, impugnações, recursos, fiscalização e prevê crimes. Cria o Portal Nacional de Contratações Públicas (PNCP) e centrais de compras. Brasília, DF. Retrieved from <https://www25.senado.leg.br/web/atividade/materias/-/materia/145636>
- Quelin, B. V., Cabral, S., Lazzarini, S., & Kivleniece, I. (2019) The private scope in public-private collaborations: an institutional and capability-based perspective. *Organization Science*, 30(4), 831-846.
- Rogério, D. M. P. (2018). *Manual do painel de preços*. Brasília, DF: Ministério de Planejamento, Desenvolvimento e Gestão. Retrieved from <https://paineldeprecos.planejamento.gov.br/storage/26aef97365b8eb36c361c4b104c44bb8.pdf>
- Schuettinger, R. L., & Butler, E. (1979). *Forty centuries of wage and price controls: how not to fight inflation*. Washington, DC: Heritage Foundation.
- Signor, R., Love, P. E. D., Marchiori, F. F., & Felisberto, A. D. (2020). Underpricing in social infrastructure projects: combating the institutionalization of the winner's curse. *Journal of Construction Engineering and Management*, 146(12), 05020018.
- Signor, R., Love, P. E. D., Olatunji, O., Marchiori, F. F., & Gripp, W. G. (2016). A probabilistic method for forensic cost estimating of infrastructure projects. *Applied Mathematical Modelling*, 40(21-22), 9197-9211.
- Signor, R., Love, P. E. D., Olatunji, O., Vallim, J. J. C. B., & Raupp, A. B. (2019). It is not collusion unless you get caught: the case of "Operation Car Wash" and unearthing of a Cartel. *Journal of Antitrust Enforcement*, 7(2), 177-202.
- Spiller, P. T. (2013, May). Transaction cost regulation. *Journal of Economic Behavior & Organization*, 89, 232-242.
- Sundfeld, C. A., & Marques, F. P. A., Neto. (2019). Decisões públicas e seu controle. In C. A. Sundfeld (Org.). *Contratações públicas e seu controle*. São Paulo, SP: Malheiros.
- Tribunal de Contas da União. (2019). *Acórdão 1079/2019-Plenário*. Retrieved from https://pesquisa.apps.tcu.gov.br/#/documento/acordao-completo/*/NUMACORDAO%253A1079%2520ANOACORDAO%253A2019%2520COPIATIPO%253A%2522AC%25C3%2593RD%25C3%2583O%2522/DTRELEVANCIA%20desc,%20NUMACORDAOINT%20desc/0/%20?uuid=141b9070-8541-11e9-a9c7-6f8552b77235
- The Nobel Prize. (2021). *Prize announcement*. Retrieved from <https://www.nobelprize.org/prizes/economic-sciences/2020/prize-announcement/>
- Vallim, J. J. C. B. (2018). *Engenharia forense: metodologias aplicadas na Operação Lava-Jato*. Curitiba, PR: Juruá.
- United Nations. (2020). *UN Procurement Practitioner's Handbook*. Copenhagen, Denmark: United Nations High-Level Committee on Management.

Regis Signor



<https://orcid.org/0000-0002-5813-7128>

Ph.D. in Production Engineering from the Federal University of Santa Catarina (UFSC); Forensic Expert of the Brazilian Federal Police (PF). E-mail: regis.rs@pf.gov.br

Fernanda Fernandes Marchiori



<https://orcid.org/0000-0001-9182-2541>

Ph.D. in Civil and Urban Construction Engineering from the University of São Paulo (USP); Associate Professor at the Civil Engineering Department at the Federal University of Santa Catarina (UFSC).
E-mail: fernanda.marchiori@ufsc.br

Alexandre Bacellar Raupp



<https://orcid.org/0000-0001-7859-8223>

Master's in Animal Science from the Federal University of Rio Grande do Sul (UFRGS); Master's in Environmental Forensics from the Federal University of Santa Catarina (UFSC); Forensic Expert of the Brazilian Federal Police (PF). E-mail: raupp.abr@pf.gov.br

Rafael Rubin Magro



<https://orcid.org/0000-0002-5734-8847>

Specialist in Project Management from Fundação Getulio Vargas (FGV); Specialist in State Law and Public Policy from the Federal University of Acre (UFAC); Forensic Expert of the Brazilian Federal Police (PF).
E-mail: magro.rrm@pf.gov.br

Alan de Oliveira Lopes



<https://orcid.org/0000-0002-2990-3241>

Master's in Transport from the University of Brasilia (UnB); Forensic Expert of the Brazilian Federal Police (PF). E-mail: alan.aol@pf.gov.br