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The impact of e-procurement on competition in public procurement: Insights from Morocco.

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Abstract

This paper examines the impact of electronic public procurement implementation on competition, with a particular focus on the recent public procurement reform introduced in Morocco in 2023, requiring the digitization of tenders' management, and generalizing electronic submissions. To measure competition, our study used the number of submissions per tender to analyze the differences between participation before the 2023 reform and the period after it. To conduct our analysis, we selected a random sample of 200 tenders initiated in the city of Rabat in Morocco, in the category of services, our sample included 100 tenders that were processed before the implementation of the reform, and 100 tenders after the reform took effect. Our results revealed that although participation to tenders increased after the implementation of the reform, the observed positive trends were not statistically significant. Which raises questions about the factors limiting the effectiveness of electronic public procurement in promoting competition. Possible reasons may be a low level in digital literacy for some bidders or the non-access to adequate technology to adapt to the reform and benefit from it. It remains important to address the reasons behind the non-significance of this increase in participation, to optimize the benefits that e-procurement can offer through a beneficially competitive environment. These findings offer policymakers important insights for advancing e-procurement systems in the public sector and make sure the reform reaches its intended goals.

Keywords: Public Procurement; Public E-Procurement; Competition; Electronic submissions; Moroccan Public Procurement Reform.

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Introduction

Public procurement, which represents 17% of Morocco's GDP, plays a crucial role in the country's economy by fostering its growth. However, some factors may hinder economic growth, like corruption and the lack of transparency and accountability. To address these transparency problems, governments worldwide advanced their electronic public procurement systems, increasing productivity and simplifying procedures. For instance, Morocco first adopted electronic public procurement in 2007 and continuously worked on improving its systems and legal framework through the years. However, for e-procurement to be efficient, its implementation must be successful and well-adopted by public authorities. Therefore, governments need to constantly improve and adapt their measures to overcome obstacles and issues faced in public e-procurement adoption, to optimize its benefits.

Many studies have been conducted highlighting the benefits of e-procurement, and outlining its impact on efficiency, transparency, and competition. Although the implementation of public e-procurement has received a lot of academic attention, empirical studies examining the impact of e-procurement on competition have mostly been conducted in countries foreign to Morocco. This leaves our paper with a research gap to address out of many. Our paper examines the impact of electronic public procurement on competition, within Morocco's public procurement system. In this regard, the main objective of our research is to assess how the implementation of public e-procurement influences competition, specifically by examining the number of bidders participating in public tenders. Our study is set out to answer one main question:

To what extent does e-procurement impact competition in public procurement?

To address this question, we evaluated the impact of the 2023 Moroccan public procurement reform, which mandated the full implementation of e-procurement by dematerializing tender management and making electronic submissions obligatory for all bidders, on competition, measured by the number of submissions received per tender. Our sample consists of 200 tenders, in the category of services, initiated in Rabat city, we evaluated 100 tenders before the reform and 100 after the reform.

Furthermore, our study enriches the literature on the impact of public e-procurement on competition in Morocco, by contributing to the growing body of literature on public procurement reform and offering insights for policymakers seeking to improve governance by optimizing e-procurement systems.

This paper is structured as follows: it begins with a literature review on e-procurement and competition, highlighting their benefits, implementation, and implications. Subsequently, we

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present our research methodology, detailing the epistemological positioning of our research, the data collection and analysis process, followed by our key findings and discussion of these results. Finally, we conclude with limitations of our study and recommendations for future research aimed at facing e-procurement implementations' obstacles and enhance its benefits.

1. Literature review

In this section, we will delve into the theoretical aspects of our research study, which will help us contextualize our research and guide our analysis. This literature review is structured in three subsections: a discussion on electronic public procurement implementation, an analysis of the benefits of enhanced competition in public procurement, and finally, an analysis of the impact of e-procurement on competition within public procurement.

1.1 Electronic public procurement

This subsection is divided into two segments. The first one aims to explore the conceptual framework of public e-procurement, examining its benefits and effective implementation requirements. The second segment focuses on public e-procurement implementation in Morocco, highlighting the country's historical evolution in this regard.

1.1.1 Conceptual framework of public e-procurement

Dematerialization reduces reliance on physical paper by transforming public procurement processes into digital flows (Thibous, 2019), whereas digitalization implies the larger incorporation of digital tools into company procedures (Gobble, 2018). Electronic procurement, or e-procurement, has evolved from simple dematerialization to digitalization, fundamentally improving procurement through digital innovation (Ilhan & Rahim, 2020).

Correct e-procurement implementation can lead to enhanced efficiency, optimized costs, and more transparency in public procurement procedures (Prasetyo, 2019). To successfully implement e-procurement, studies argue that government regulations, top management support, and employee competency are all necessary (Choga, 2017). Indeed, for this implementation to be successful, legal and regulatory frameworks need to be adapted to these technological advancements (Kramer, 2017). It is also argued that technological concerns, such as system security, IT infrastructure, and compatibility with existing systems, are also crucial for e-procurement implementation success (Prasetyo, 2019).

It has been shown that adopting e-procurement positively impacts the efficiency, effectiveness, competitiveness, and transparency of public procurement processes (Gardenal, 2013). Admittedly, it has been proven that by prioritizing e-procurement, society reduces corruption and bureaucracy, and ends up optimizing the use of public resources and therefore achieves

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enhanced efficiency, and transparency in governance (Synyutka & al., 2019). It has been found by an OECD investigation conducted in 30 countries, that the frequently mentioned method implemented to enhance small and medium-sized businesses (SMEs) accessibility to public procurement was dematerialized processes (Morand, 2022).

Although electronic public procurement has many advantages, it still faces some implementation challenges such as knowledge gaps, particularly in developing countries (Salifu & al., 2023). A report published by OECD indicated that to manage supply constraints and address information deficits, governments had to innovate quickly, after the Covid 19 crisis, and include business intelligence in their e-procurement functions, as it was lacking in 59% of OECD countries before the crisis (OECD, 2021). That being said, electronic procurement systems keep improving, and administrations must provide regular training for employees to prepare them for e-procurement adoption and advancements (Salifu & al., 2023). Now that the conceptual framework of e-procurement has been discussed, we will examine how it has been implemented in Morocco's public procurement system in the following segment.

1.1.2 Electronic public procurement in Morocco

E-procurement has gained significant attention in Morocco, where it's seen as a key anti-corruption measure, promoting competition and simplifying procedures (Amry, 2018). The dematerialization of public procurement in Morocco began in 2007, with the launch of the public procurement portal, enabling the exchange of information between the contracting authority and competitors by electronic means. Thus, Public purchasers were required to publish tender documents on the public procurement portal, and bidders could submit applications and bids for public procurement tenders electronically. (Al Khazina, 2012). As part of the ongoing modernization and improvement of public administration, public procurement has undergone several reforms worldwide. The Moroccan public sector, particularly since the reforms introduced in 2015 with the entry into force of decree no. 20-14 of September 4, 2014, has been at the heart of the national digital transition aimed at modernizing public administration (Khourchi, H. & al., 2024).

Even though Morocco was one of the first countries in the Middle East and North Africa (MENA) region to set up an electronic public procurement system, a survey carried out on behalf of the Transparency Maroc Association in 2017, involving a sample of 400 companies, reveals that only 10% of these companies take part in public tender procedures regularly, and almost 60% consider the procedures to be complicated, costly and tainted by corruption (Ed-Daou, 2022). Indeed, even though the dematerialization of public orders had been planned since

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the reforms of 2015, the tools required for its application were not available until September 2023, following the latest public procurement reform (Khourchi, H. & al., 2024). As indicated in a report published by the general treasury of Morocco, this last reform was prompted by the health crisis and its economic repercussions (Trésorerie Générale du Royaume, 2023). Lebied (2021) discusses that in times of crisis, public procurement is both a victim and an instrument of economic recovery.

Although the implementation of e-procurement faces many challenges, the significant updates introduced by Morocco to its legislation in 2023, stand ready to enhance transparency and accessibility, fight corruption, and ensure that e-procurement delivers what is due. In this next subsection, we aim to explore the dynamics of competition in public procurement, examining its benefits and ways to enhance it.

1.2 Competition in public procurement

In public procurement, competition is essential for economic growth and efficiency (Bhagat, 2017). This subsection will first explore the benefits and positive impacts of competition on public procurement, to then discuss the different approaches that could help promote competition and optimize its benefits.

1.2.1 Benefits of competition in public procurement

Various studies show competition is crucial for public procurement, fostering value for money and efficiency (Graells, 2010). Indeed, research has proven a positive correlation between competition and public procurement efficiency (Bhagat, 2017). A study based in Turkey analyzed the competitive environment in government procurement auctions using a comprehensive and extensive dataset and found that a more competitive environment considerably improves the outcome of government procurement auctions by significantly decreasing procurement costs (Onur & al., 2011).

Other studies argue that open competition shouldn’t only be seen as a tool to achieve efficiency and value for money, but also as a way to ensure accountability of public buyers by limiting their discretion in allocating public funds (Hanak & Serrat, 2018). Noting that one of the main purposes of public procurement in the market economy should be preventing favoritism or discrimination of participators in public tenders (Borowiec, 2017), it is important to make sure no bidder has any unfair advantage over the other (Atkinson, 2019).

It is also argued that competition can boost economic growth by creating a dynamic business environment that pushes firms to improve their offerings and expand their operations (Falvey & al., 2008). Public procurement represents an effective opportunity for development for small

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and medium-sized businesses (SMEs), enabling them to increase further their chances of economic growth (Akessou & Bekbachi, 2021). While the numerous benefits of competition in public procurement can't be denied, to fully and constantly accomplish them, it is necessary to overcome potential barriers and foster stronger competition. The following segment will explore strategies and approaches that could improve and promote competition in public procurement.

1.2.2 Enhancing competition in public procurement

Although competition and efficiency in public procurement are positively correlated, some studies argue that higher levels of participation do not always lead to better value for money and that increasing the number of bidders won't guarantee competitive prices or quality from the additional participants because of the heterogeneity of participants in terms of size, capabilities, and productivity (Albano, 2019). However, other studies argue that increased participation not leading to efficient public procurement can be avoided by designing tender documents with clear and well-defined specifications and requirements to reduce the risk of misunderstandings to guarantee quality and competitive prices (Dhall, 2020).

In terms of enabling the inclusion of SMEs in public procurement, an OECD report from 2013 has shown that specific legislative provisions and policies were put in place by a third of OECD member countries, to encourage the participation of SMEs in public procurement (OECD, 2013). For instance, implementing an allotment strategy is one of the actions that can be used to give SMEs easier access to public procurement contracts (Akessou & Bekbachi, 2021).

In addition to that, it is also argued that simplifying procedures helps attract more suppliers, especially small and medium-sized businesses (SMEs), making public procurement more open (Fiorentino, 2006). The literature also points to the importance of implementing e-procurement systems to make the procurement process more efficient and accessible, and therefore more open and more competitive (Falvey, 2008). In fact, simplifying procedures relies strongly on e-procurement, it is argued that the dematerialization of public procurement strengthens competition by consolidating mechanisms for equal access and preventing illicit practices by reducing human intervention in the procurement process (Daif & Er-Radi, 2021).

However, some studies argue that although e-procurement aims to foster competition, it can also result in competitive distortions, such as unequal access to technology or disparities in suppliers' digital literacy, that can hurt some bidders, especially small and medium-sized businesses (SMEs) (Graells, 2013). The following subsection explores the impact of implementing electronic public procurement on competition.

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1.3 Impact of public e-procurement on competition

E-procurement has an undeniable impact on competition in public procurement. To effectively discuss its impact on competition, this subsection is going to be divided into two segments. In the first segment, we're going to discuss how e-procurement impacts competition, and in the second one, we're going to explore the challenges and limitations faced in e-procurement implementation that may hinder its positive impact on competition.

1.3.1 Mechanisms through which public e-procurement influences competition

Various studies highlight the significant impact of electronic public procurement (e-procurement) on fostering competition within public procurement processes. Some studies argue that electronic public procurement promotes competition by enabling more companies to participate and facilitating access for small and medium-sized enterprises to participate in calls for tender (Thibous, 2019). Thus, beyond being a technical tool, e-procurement represents a solution to modernize procurement systems and processes in the public sector and foster mutually beneficial collaborations between businesses and public authorities, ultimately enhancing larger-scale competitiveness (Fiorentino, 2006).

E-procurement's potential to improve transparency is often emphasized as a key instrument for reducing information asymmetry and limiting favoritism, which in turn fosters a fair environment and encourages a greater range of suppliers to participate (Gurakar & Tas, 2015). Moreover, e-procurement is associated with better economic outcomes, such as lower contract prices and reduced administrative costs, providing benefits for both procuring entities and suppliers. These advantages further lead to increased participation from a diverse range of suppliers, boosting competition (Gurakar & Tas, 2015).

Additionally, public e-procurement is viewed as a crucial tool to increase international competition. Removing conventional paper-based procurement procedures, enables greater participation from foreign businesses, promoting fair competition and potentially contributing to optimized prices and better service options (Mavidis & Folinas, 2022).

While some studies have shown that implementing public e-procurement enhances competition by widening access to tender calls, through different ways. Other studies have noted that public e-procurement ability to foster and enhance competition is influenced by several factors such as technological infrastructure, regulatory framework strength and the level of user adoption (Mohungoo & al, 2020). In the following segment, we're going to explore the various challenges faced in e-procurement implementation that may hinder its effectiveness in promoting competition.

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1.3.2 Public e-procurement implementation challenges

While public e-procurement is considered important to enhance competition, it is important to examine the challenges public administration is confronted with in the implementation of e-procurement that could disrupt its effectiveness in boosting competition in public procurement. One could argue that the effective implementation of e-procurement systems depends widely on strong technological infrastructure. This is important because the seamless function of e-procurement platforms can be hindered by unreliable internet services and inadequate IT infrastructure, this problem occurs mainly in developing countries. Moreover, concerns about system reliability and data security are discouraging to suppliers which may reduce participation and impact competition negatively (Mohungoo & al, 2020). In this regard, research has concluded that public administrations should focus more on IT support and equipment preparation before implementing e-procurement (Ngatman & al, 2020).

Other studies argue that the smooth adoption of e-procurement in the public sector is negatively impacted by a lack of employee competency due to lack of training (Scovia & Jonath, 2024). For example, in Ghana, even though the majority of administrations were committed to improving e-procurement skills, training initiatives have not been fully implemented, which may have influenced e-procurement adoption and implementation (Azanlerigu & Akay, 2015). It is also argued that an undeveloped legal framework is part of the obstacles that may block the effective implementation of e-procurement (Scovia & Jonath, 2024).

To overcome these challenges and support e-procurement implementation, researchers recommend making infrastructure investments, developing thorough training programs (Scovia & Jonath, 2024), and implementing a more adequate legal framework in public procurement (Oketch, 2016).

Based on the findings of this literature review, we hypothesize that:

H1: *Competition in public procurement (measured by the number of bidders) increases due to public e-procurement implementation.*

A comprehensive research methodology will be used to examine the hypothesis presented above and explore our research question. The following section will detail the research design and describe the methods used for data gathering and analysis.

2. Research methodology

The epistemological positioning of our research aligns with a positivist stance, that focuses on objective measurement and the analysis of observable and quantifiable phenomena. Employing

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a deductive approach, our study starts with a theory-driven hypothesis and applies statistical methods to its validity and significance using the collected data.

Indeed, to test our hypothesis, we intend to draw on the data published on the Moroccan Public Procurement Portal, to examine the impact of the reform, that made electronic submissions compulsory for all bidders and dematerialized tenders managements starting September 2023, on the number of bidders for tenders.

Firstly, we conducted a descriptive analysis that helped us measure the central tendency and the variability of our data, and check our data distribution visually, which then helped us choose the statistical test to conduct our statistical analysis. Secondly, we applied the selected statistical test to examine our hypotheses and draw conclusions from the data.

2.1. Descriptive analysis

The data we analyzed was collected from the summaries of bid opening reports (Extraits de PV) published on the portal. We limit our research to open tenders in the services category, initiated in the city of Rabat. Our research sample consists of 100 pre-reform (before September 2023) and 100 post-reform (starting September 2023) tenders, randomly selected from 2022 to 2024.

Our descriptive analysis consists of calculating the mean, the median, the standard deviation, the variance, and the coefficient of variation, using Google Sheets. This will give us a first overview of our dataset, helping us highlight trends and compare key characteristics of bids before and after the reform. Below, is a table showing the results found for each period.

Table 1: The central tendency and variability of our dataset

Statistic	**Pre-reform (100 tenders)**	**Post-reform (100 tenders)**
Mean	5,37	7,42
Median	3	5
Standard deviation	6,83	8,79
Variance	46,70	77,31
Coefficient of variation	127,25 %	118,50 %
Minimum (number of bidders)	1	1
Maximum (number of bidders)	43	55

Source: Calculated with Google Sheets

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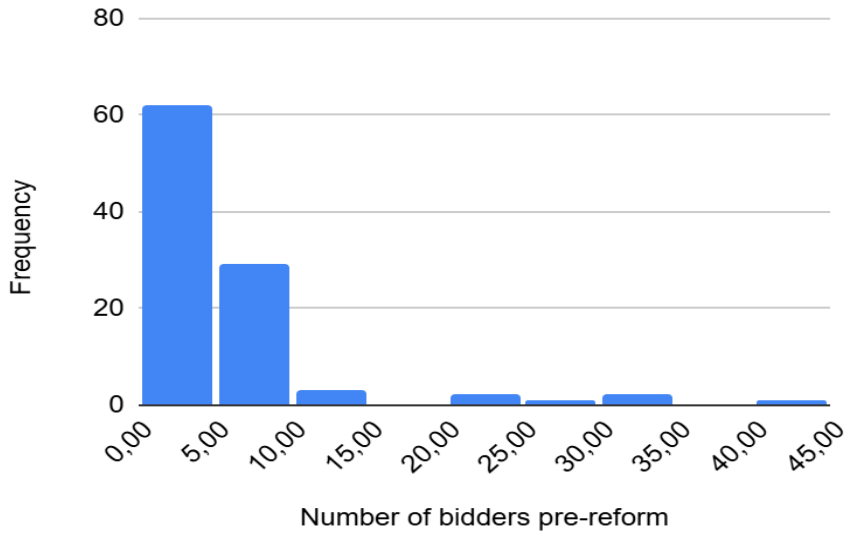
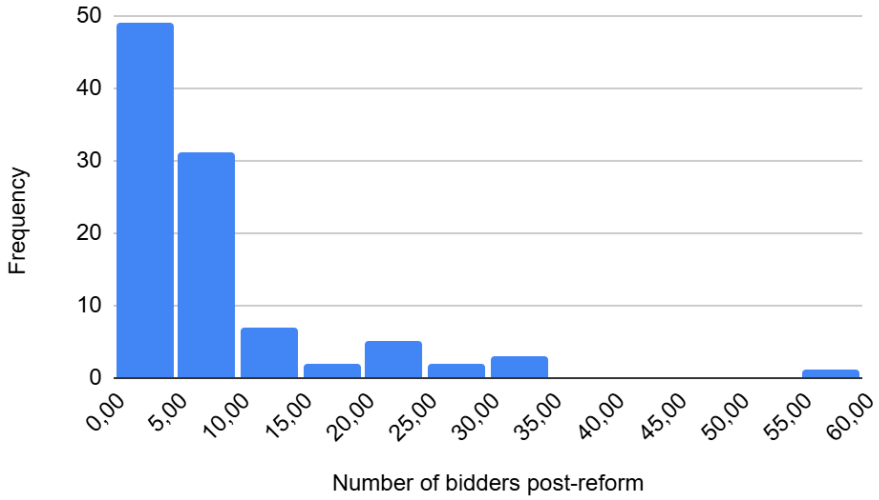
From the findings presented in Table 1, we can conclude that the increase shown in the mean and median indicates a positive impact of the reform (e-procurement) on competition. On another hand, the post-reform period and a coefficient of variation over a hundred percent show a higher variability. The figures below show us the dispersion of the data collected pre-reform (figure 1) and post-reform (figure 2).

Figure 1: The dispersion of the number of bidders pre-reform



Source: Generated by Google Sheets

Figure 2: The dispersion of the number of bidders post-reform



Source: Generated by Google Sheets

Both figures show a skewed distribution indicating a non-normality. A statistical test is now required to confirm whether the results found by the descriptive analysis are significant or not.

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2.2. Statistical analysis

After the descriptive analysis has shown that there's a positive impact of e-procurement on the number of participants in public procurement, we now need to conduct a statistical analysis to confirm the significance of these results.

Since the figure 1 and figure 2 show a non-normal dispersion of the data for both periods, the appropriate test to use for our statistical analysis is the Mann-Whitney U test. This non-parametric test provides a robust method to compare two groups when the data dispersion is non-normal (McKnight & Najab, 2010).

Our test hypotheses are:

H0: *The public e-procurement reform didn't increase significantly the number of bidders*

H1: *The public e-procurement reform increased significantly the number of bidders*

Noting that n1 (size of the pre-reform sample) and n2 (size of the post-reform sample) both equal 100, here are the key characteristics we found using the Mann-Whitney U test:

- U1 = 6938
- U2 = 5109

We use the smaller of the two values to calculate the p-value to determine whether the observed difference between the two groups is statistically significant.

To calculate the p-value, we followed these steps:

- **Step 1: we calculated the mean (μU) and standard deviation (σU):**
- $\mu U = (n1 * n2)/2$
- $\sigma U = \sqrt{((n1 * n2 * (n1 + n2 + 1))/12)}$
- **Step 2: we calculated the z-Score:**
- $z = (U - \mu U)/\sigma U$
- **Step 3: we calculated the one-tailed p-value using the Google Sheets formula below**
- $= 1 - NORM.DIST(z; 0; 1; TRUE)$

Here are the results we obtained for each characteristic:

U	5109
n1	100
n2	100
μU	5000
σU	409,27
z	0,27
One-tailed p-value	***0,3949***

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With a significant level of (0,05), we observe that our p-value (0,3949) is higher than our significant level, which means that we fail to reject our null hypothesis (*H0*). This shows that there is no statistically significant evidence to conclude that the public e-procurement reform, that took effect in 2023 in Morocco, had no significant effect on the number of bidders.

3. Key findings and discussion

The purpose of this study was to evaluate the impact of the Moroccan public e-procurement reform that dematerialized tenders' management and made the electronic submission of offers compulsory for all bidders. To conduct this study, we examined a sample of 200 tenders (100 tenders before the reform and 100 tenders after it), which helped us identify noteworthy trends but also revealed limitations in the significance of the results.

The descriptive analysis showed that the mean number of bidders per tender had a 38.18% increase (from 5,37 pre-reform to 7,42 post-reform), similarly, the median had a 66.67% increase (from 3 to 5). This indicates a general increase in the number of bidders participating in tenders after the reform. This analysis also showed a higher variability after the reform, reflected in the standard deviation (28.67% increase) and the variance (65.56% increase), which indicates that although some tenders had a notable increase in participation, other tenders didn't show a significant change.

While our descriptive analysis showed promising trends, our statistical analysis using the Mann-Whitney U test, showed no statistically significant change in the number of bidders between the two periods. We failed to reject the null hypothesis, due to a p-value (0,3949) exceeding the significance level (0,05), suggesting, contrary to initial expectation, that e-procurement reform did not significantly increase participation in public procurement.

This lack of statistical significance implies that the trends shown in the descriptive analysis could be a result of chance or other factors not taken into consideration in this study. However, other reasons could explain these findings. On one hand, the observed period (2022-2024), may be too short to reflect the full effect of the reform, and such reforms need a longer time to materialize. On another hand, the availability of digital tools for some bidders and their level of digital literacy may have made it more difficult for them to adapt to the new e-procurement reform.

4. Limitations and future research

Several limitations of this study should be addressed in future research. First, the sample was restricted to tenders from Rabat, which does not reflect the nationwide situation, future studies should widen the geographical scope for a more complete view of the impact of the Moroccan

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e-procurement reform on competition. Furthermore, future research may address other categories than the category of services that may have had a stronger impact. Finally, future studies can also explore the reasons for the higher variability observed in the number of bidders after the reform to provide insights into the challenges and opportunities presented by the public e-procurement system.

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Conclusion

While many governments worldwide are adopting e-procurement, Morocco still has some ameliorations to make to optimize the impact e-procurement has on competition. By comparing the number of bidders before the 2023 public e-procurement reform and after it, our descriptive analysis presented noteworthy trends, showing a notable increase in the mean number of bidders after the reform. However, our statistical analysis confirmed a non-significant impact of the e-procurement reform on the number of participants. This suggests that while the number of bidders has increased after the reform, it is important to address the reasons that may explain the non-significance of this increase: A low level of digital literacy and the non-availability of adequate electronic resources may make it harder for some bidders to adapt to the public e-procurement reform. Future research should address the challenges presented by e-procurement implementation to examine the factors hindering its potential positive impact, similarly, policymakers may want to implement complementary measures to enhance the inclusivity of the e-procurement system.

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