Assessing the Regulatory Impact of the Turkish Competition Authority on Market Dynamics: A Statistical Approach Using Kernel Estimation and its Simulation

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Abstract

Established in Turkey in 1994, the Competition Authority plays a key role in safeguarding and promoting competition in markets. Its main tasks include monitoring agreements, detecting collusive practices and preventing the formation of cartels, as well as conducting inspections to thwart monopolistic tendencies. It also ensures healthy competition by monitoring mergers and acquisitions. The Authority's decisions have a profound impact on the market for goods and services, promoting better opportunities for consumers. Its effective and independent functioning is essential for Turkey's sustainable economic growth and the functioning of the competitive market mechanism. Through statistical evaluations, this study aims to assess the impact of the authority in preventing imperfect competition in Turkey's goods and services markets. The analysis of the Competition Law and related legislation sheds light on the Authority's role and regulatory tools, while statistical trends reveal its proactive stance in regulating competition infringements and maintaining a fair market environment.

***Keywords:** Administrative fine, computation, statistics, Turkish competition authority, merger.*

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1. INTRODUCTION

Creating a competitive market environment is important for Turkey's economic growth and sustainable development. Competition plays a crucial role in the effective functioning of markets and in providing consumers with more choices. Therefore, the Competition Authority was established in Turkey to protect and promote competition. This institution has taken on the responsibility of monitoring and enhancing competition, which has a profound impact on Turkey's economic future. The history of the Competition Authority dates back to the 1980s, a period that marked the first steps of Turkey's transition to a free market economy. The promotion and protection of competition in the markets were particularly emphasised during this period. The "Competition Protection Law", adopted by the Turkish Grand National Assembly in 1994, officially established the Competition Authority and symbolised the moment when the Authority began to function as an independent regulatory body.

The main objective of the Competition Board is to protect and promote competition among businesses. This means not only giving consumers more choices, but also maintaining the vitality of competition among companies. The authority has a wide range of powers and responsibilities aimed at preserving and maintaining competition. One of the basic tasks of the Competition Authority is to prevent monopolistic situations in which one company could maintain a dominant position in a particular market. Preventing such situations is crucial to maintaining competition and ensuring that consumers have access to a range of options. The Competition Authority closely monitors such threats, carries out market analyses and, if necessary, implements regulations. Another important task of the authority is to prevent the formation of cartels, which involve secret agreements and price coordination among companies. These agreements restrict competition and harm consumers. The Competition Authority works effectively to detect these cartels and take action against such improper actions, thereby ensuring fair and unrestricted competition.

In addition, the Competition Authority effectively monitors agreements that may restrict competition between undertakings and identifies collusive practices. The detection of such agreements and actions is of immense importance for the healthy functioning of competition, and the Authority works diligently in this area. Monitoring collusion among companies not only ensures that competition is maintained but also prevents companies from gaining unfair advantages. The Authority also supervises mergers and acquisitions of companies. This supervision aims to ensure that mergers among companies do not restrict competition and maintain balance in the markets. Supervising these processes ensures that competition works well and that consumers continue to have access to a range of options. This supervision doesn't limit the growth or mergers of companies, but rather plays a balancing role for the healthy functioning of competition and the maintenance of market equilibrium.

This study examines the computational distribution of the number of competition law infringements and the fines imposed for these infringements between 2008 and 2022. These data and the artificially generated forms underline the crucial role of the authority in shaping the competitive

environment in Turkey. *In addition, merger statistics for the same period show the direction of mergers and acquisitions.* The competition authority plays a key role in protecting and promoting competition in Turkey when the artificially generated data represent a picture showing how the numbers of events behave such that a decrease or a fluctuation is observed. Its effectiveness supports the country's economic growth while offering consumers more choices. The work of the Competition Board is of great importance for Turkey's economic future and will continue to support the country's sustainable economic growth. Competition is the key to transform Turkey into a more competitive and sustainable economy in the global market.

2. LITERATURE REVIEW

Many studies in the literature highlight the importance of competition authority decisions and their significant impact on market dynamics. For example, Nilssen (1997) conducted a noteworthy study in the Norwegian insurance sector, claiming that the decisions of the Norwegian Competition Authority in the last two merger cases were inconsistent. The research suggested that these decisions were not primarily based on economic factors, but rather on political influences and inconsistent data. In Ireland, Massey (2010) looked at the Competition Authority's merger procedures, highlighting delays in decisions and problems with decision analysis, suggesting a need for a re-evaluation of the Authority's merger process. Massey (2011) focused on two merger decisions of the Canadian Competition Bureau, showing a preference for qualitative over quantitative evidence, resulting in inconsistent decisions due to inadequate economic analysis and a lack of econometric methods. Van der Burg and Van den Bulck (2015) conducted a study of eight merger cases in the media sector handled by the Belgian and Dutch competition authorities, emphasising the responsibility of the media sector to consider both the economic and non-economic interests of consumers and society.

Cunha and Vasconcelos (2018) analysed how the approval of mergers by competition authorities in Stackelberg markets affects the market. Their analysis included two types of decisions: one that did not consider subsequent outcomes due to initial decisions, and another that assumed that a merger decision would trigger further mergers, leading to predictions about the final state of the market. However, this approach has been criticised as short-sighted. Sushkevitch (2012) focused on the activities of the Russian competition authority and their impact in the period following a merger decision. Redkina, Molodchik, and Jardon (2021) examined the Russian Competition Authority's scrutiny of mergers of foreign firms, to identify whether the decisions reflected a nationalist or a stimulatory economy. Their discrete choice model, applied to merger data for selected years, highlighted the influence of political and policy conditions on merger decisions.

In another study focusing on EU countries, Mainenti (2019) discussed the transfer of powers in merger cases from local institutions to the Competition Authority, suggesting that the transfer of powers did not have a significant impact between 2004 and 2012 due to problems in the decision-making

mechanism, such as the entry of new EU members, firms with a negative impact on competition, and sensitive sectors. Saggers (2008) scrutinised the European Commission's vertical merger guidelines, while in Italy, Noce, Bolasco, Allegra, Ruocco and Capo (2006) used a textual analysis tool to test the consistency of the Competition Authority's decisions and construct a predictive model of the Authority's decision-making process. Karagök and Rutz (2014) examined the merger notification process of the Swiss Competition Authority, highlighting the growing literature on mergers but the lack of studies on notification thresholds.

Cardoso, Pitelli, and Figueiredo (20-21) examined the compliance of merger decisions by the Brazilian Competition Authority with the Merger Guidelines and found that despite compliance with the guidelines, there was a high number of challenges to decisions, suggesting that some decisions were made outside the guidelines. In Malaysia, the Uber-Grab merger was studied by Rahman, Khan, Azmi and Zakaria (2020), who found that the legal infrastructure of the Malaysian Competition Authority was inadequate. Their study concluded that the merger legislation was not comprehensive enough to adequately protect competition. This literature review highlights how merger decisions by competition authorities are influenced by economic, political and social factors and provides valuable insights into the consistency of these decisions.

3. METHOD AND OBJECTIVE

In Turkey, the Competition Authority is entrusted with the task of preventing unfair competition. It operates within the legal framework established by Law No. 4054 on the Protection of Competition. It has considerable powers to ensure the competitiveness of the goods and services markets. Using its legal powers, the Competition Authority can intervene in the activities of companies that violate fair competition and is also empowered to impose fines on these companies. This study aims to examine the impact of the Competition Authority's legal powers and sanctions in curbing unfair competition. The study aims to assess the effectiveness of the existing legislation. Law No. 4054 serves as the cornerstone of competition protection in Turkey. Secondary legislation consists of the detailed regulations issued under the umbrella of this law. These regulations, communiqués and guidelines provide the framework for the activities of the Competition Board. This secondary legislation sets out the procedures and processes governing the functions and implementation of the Authority. The primary objective of this study is to shed light on the specific legal powers and responsibilities vested in the Competition Authority. In order to achieve this objective, a document review technique was used. This method has been instrumental in conducting a thorough analysis of the legal infrastructure of the Competition Authority.

As a result, this study aims to provide a representation for the role and impact of the Competition Authority in preventing unfair competition and also provide the numbers for each case when the computational statistics are performed. In doing so, it can contribute to a deeper understanding and better

evaluation of the measures taken to safeguard competition in Turkey. The simulated data sets replicated 10,000 times give the numbers of events in the near future as well. In addition, this research has examined decision records and statistics available on the official website of the Turkish Competition Authority. It represents changes in merger and acquisition notifications between the years 2008 and 2022.

When some statistics such as first moment as a mean and scale estimate, we can have a chance to provide the confidence interval as well. Since the asymptotic theory trusts that the maximum likelihood estimators and their counterparts such as the mean from smooth function are asymptotically normal, the confidence interval for the estimated value $\hat{\theta}$ is given as below:

$$\hat{\theta} \pm z_{\frac{\alpha}{2}}\sqrt{Var(\hat{\theta})},$$

where $\hat{\theta}$ can represent the statistics such as mean, minimum, maximum values, etc. Note that these statistics are delivered by a data set with sample size n replicated at m times. For each replication, each statistic can be held to get a vector of values generated artificially when the smooth function used for modelling the real data set is used.

3.1. Statistical Method: Modelling Based on Kernel

As it is known, the statistical methods mainly depend on the assumptions. The necessary conditions for assumptions cannot be easy to satisfy if the parametric techniques are used. The nonparametric technique should be preferred especially when the sample size of the data set is low. In our case, the Smooth Kernel Distribution is preferred to overcome the disadvantages while applying some statistical methods. Kernel density estimation (KDE) is a non-parametric approach for estimating the probability density function of a random variable from a sample of data. Unlike parametric methods that assume a particular underlying distribution, Kernel density estimation is data-driven, relying on no pre-defined assumptions about the distribution of the data. This makes it a flexible and robust choice for modelling complex data sets where the underlying distribution is unknown or not well understood. In other words, the smoothing methods are capable of performing a data-adaptive approach while performing the modelling on the data. In the smoothing case, the chosen kernel function is a kind of function that can also be trying the best modelling on the data. Further, since in our motivation the artificial data are generated, the general results from the artificial data set will be around the real data set. Such a motivation is generally enough approach for modelling when the necessary statistics from the generated data are provided.

The smoothing technique based on kernel density is a method used for identifying the distributional structure of the data while performing a modelling. In the kernel method, a parametric model is not used. The kernel density is an empirical method and it is used when the finite points are data set. Especially, if the number of sample size is low, the kernel method as a non-parametric approach

should be preferred by the researcher. In the kernel density technique, a data-adaptive function is tried to be estimated instead of using directly a parametric model approach while modelling. The formula for the kernel density estimator is defined in the following form:

$$\hat{f}(x; h) = \frac{1}{nh} \sum_{i=1}^{n} \frac{K(x - X_i)}{h},$$

where K is the kernel function and it satisfies to be a probability density function if the equation $\int_{-\infty}^{\infty} K(x)dx - 1 = 0$ holds and h is called the smoothing parameter or bandwidth at histogram ($h > 0$). A kernel estimate can be obtained by centering a scaled kernel at X and averaging the n kernel ordinates there. The estimate becomes larger as the number of samples falling within a bandwidth increases, compared to regions containing fewer observations. This method is comparable to the histogram method in that instead of adding the number of observations in a bin, we add the kernel ordinates over the window width which is h.

The Gaussian distribution or standard normal is one frequent option for K:

$$\phi(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{x^2}{2\sigma^2}\right).$$

The random variable X is assumed to be normal and $X \sim N(0, \sigma^2)$ (Alain, 2024; Hastie, et al. 2009, Casella & Berger, 2021).

Techniques and consulting artificial data sets are considered as precautions to avoid the bad effects that may occur when the sample size is small. Note that for the smoothing technique, alternative smooth function can also be tried to perform a probable more precise modelling, however; since the replication number is increased to generate the artificial data, the numbers will be already around these results obtained. Additionally, the parametric model proposed by Vila et al., 2023 provides a comparison between the parametric function and the smooth function. The results of Vila et al., 2023 show that the smooth function is capable of performing a precise fitting when it is compared with the trimodal normal distribution as a parametric model. Note that when the numerical optimization and the generation procedures are taken into account, the numerical results can be values given in Figures 1-3. Thus, the simulated data are accepted to be reliable owing to the fact that the probable best fitting on the data have been accomplished.

Numerical optimization schema is in the following order:
1. Transfer to data set into the case where the unit interval is set
2. Model the unit interval data set
3. Generate an artificial data set with sample size n=15 which represents the years from 2008 to 2022 when the proposed smooth kernel function determined by SmoothKernelDistribution in Mathematica is used
4. Replicate the artificially generated data sets at 10 000 times and product by total number of event

5. Provide the statistics such as first moment, scale estimate, minimum, maximum, %25 and %75 from the artificially generated data sets.

The empirical first moment, i.e., $\text{Moment}[data, 1]$ and the scale estimate, i.e., $\text{Sqrt}[\text{Moment}[data, 2] - \text{Moment}[data, 1]\text{\^{}}2]$ are evaluated by functions in Mathematica 12.0. The corresponding statistics are computed when the smooth function is used. Thus, these statistics are more accurate due to precise fitting performed by smooth function. Since the artificial data set with sample size $n = 15$ is replicated; for each set, the minimum and maximum values are chosen. The same procedure is conducted for the data sets at the quantiles %25 and %75; thus, we can observe the behaviour of the data set at these quantiles as probability values which show what the generated values are around for these quantiles. In other words, the general appearance of the generated data for these quantiles can be pictured. Note that the computational schema is also used by references (Vila et al., 2023, Özen & Çankaya, 2023).

4. STATISTICAL RESULTS FOR SOME INDICATORS ON THE DECISIONS OF THE COMPETITION AUTHORITY

An in-depth evaluation was carried out by reviewing the activity reports and decision statistics available on the official website of the Turkish Competition Authority. The main objective was to assess the overall effectiveness and impact of the institution. The analysis included a thorough review of the distribution of decisions, the incidence of competition violations and the figures on mergers and acquisitions documented from 2008 to 2022. These extensive findings were methodically organised and presented in tabular form to allow for detailed and insightful analysis.

Examining the patterns of the distribution of decisions over this significant period provided valuable insights into the range and frequency of cases dealt with by the Turkish Competition Authority. This research shed light on the types of cases, the volume of investigations conducted and the outcomes or resolutions of these cases. It provided a detailed understanding of the types of issues addressed and the actions taken, demonstrating the institution's active role in ensuring fair competition practices and addressing market concerns. In addition, the analysis of competition infringements allowed a thorough examination of the prevalence and types of anti-competitive behaviour, thereby facilitating an assessment of the level of compliance with competition laws and regulations in the market over the years covered.

In addition, a careful examination of the data on mergers and acquisitions provided valuable insights into the landscape of corporate activity, highlighting the frequency and nature of significant corporate mergers and acquisitions during the period. This examination may have revealed trends in market concentration, potential problems of market dominance and the general health of competitive dynamics in different industries and sectors.

The presentation of this data in tabular form and the simulated data sets facilitated a comprehensive comparative analysis, allowing a detailed examination of the trends, shifts and tendencies observed in the decisions and activities of the Turkish Competition Authority during the period under review. This approach serves a comprehensive overview to assess the institution's role in ensuring fair market competition, monitoring market behaviour and promoting competitive market conditions in Turkey and we can examine the distributional behaviour of the real data set. The data set is transformed to the unit interval. Thus, the discrete data set is transferred to a continuous case. The unit interval case of the discrete data is evaluated by means of each year divided by total of years. The advantage of such approach to make a unitization is that the data set can be modelled numerically precisely. In other words, the potential bad convergence while performing optimization done by Mathematica can be avoided. After modelling the transferred data set is completed, the artificially generated data based on the unit interval are product by a total of years which are 2008-2022.

Table 1. Types and Distribution of Competition Authority Decisions

Year	Competition Violations	Mergers and Acquisitions	Privatisations	Negative Clearance-Exemption	Other	Decisions on Judicial Decisions	Total
2022	78	238	7	19	40	4	386
2021	74	302	7	22	46	9	460
2020	65	220	0	34	34	2	355
2019	69	207	1	35	27	2	341
2018	88	210	13	44	22	1	378
2017	80	179	5	32	22	2	320
2016	83	200	9	33	13	5	343
2015	89	151	8	35	16	6	305
2014	163	215	0	59	16	11	464
2013	191	194	19	58	23	7	492
2012	303	282	21	50	19	12	687
2011	283	239	14	54	15	12	617
2010	252	210	66	96	2	21	647
2009	178	144	2	46	3	25	398
2008	132	231	24	57	9	14	467

Source: https://www.rekabet.gov.tr/tr/Sayfa/Yayinlar/karar-istatistikleri

The statistics show that the number of competition infringement decisions varies from year to year. For example, a record number of competition infringement decisions were taken in 2012 and 2013, but in recent years this number has fallen to a lower level. This shows that the Competition Authority continues to monitor competition and fight infringements. The number of merger and acquisition decisions seems to have increased over the years. Since 2010, there has been a steady increase in such transactions. This may reflect the growth of the Turkish economy and changing market dynamics. Privatisation decisions seem to have followed a steady course. These decisions may indicate the withdrawal of the state from the economy or the results of privatisation policies. It can be observed that negative determination-exemption decisions vary over the years. These decisions are taken to regulate transactions that prevent or restrict competition. The other category of decisions may cover various

competition-related issues. Decisions in this category also vary from year to year. Decisions based on judicial decisions are an indicator of the application of the law. These decisions also vary from year to year.

Figure 1. Total numbers of competition authority decisions for years 2008-2022

Figure 1(a): Empirical first moment evaluated by smooth function
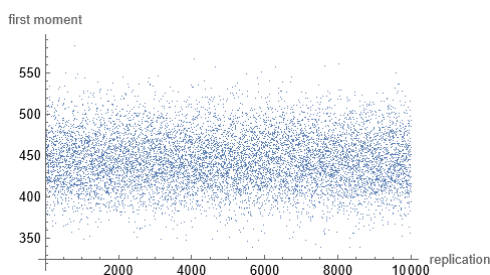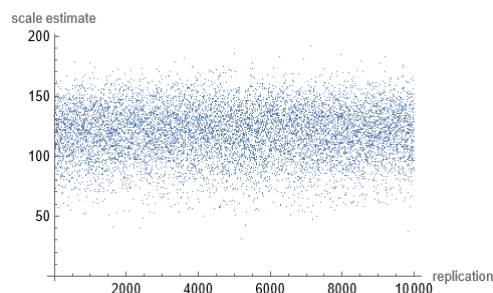
Figure 1(b): Scale estimate evaluated by smooth function
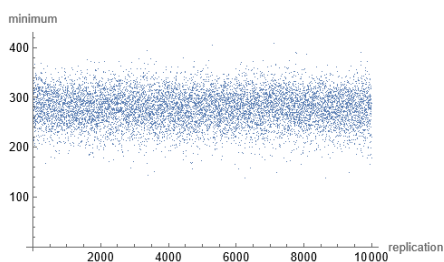

Figure 1(c): Minimum values of artificial data

Figure 1(d): Maximum values of artificial data
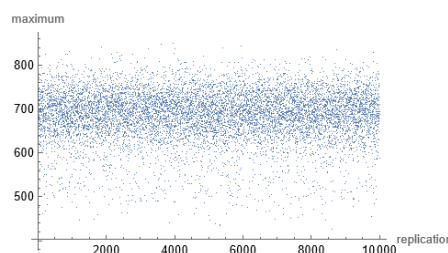
Figure 1(e): Quantile at %25 of artificial data
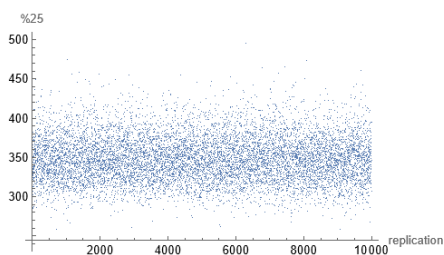
Figure 1(f): Quantile %75 of artificial data
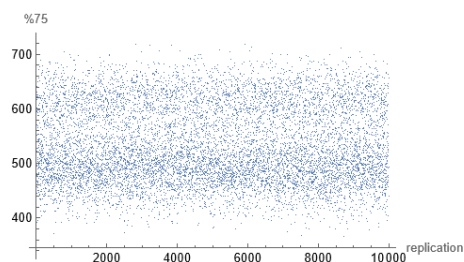
Overall, these statistics show that the competition authority is working dynamically and taking various measures to protect competition in Turkey. Further, the precautions can be taken according to the statistics provided. Particular attention is paid to antitrust violations and mergers and acquisitions, as these are factors that directly affect economic competition and market dynamics. The fair and impartial enforcement of the authority's decisions is crucial for the protection of the rule of law. In a general setting, the artificial data set shows that these numbers can also be observed in this way. When the minimum and scale estimates statistics are taken into account, it can be easily observed that the

numbers can get a decreasing trend, especially when the actions from law are applied. For Turkey to maintain its competitiveness in the national and international arena, the Competition Board must continue to play an active and effective role. This will help to support economic growth by promoting innovation, increasing efficiency and making long-term contributions to the national economy (see Figure 1).

Table 2. The Summarized Values of the Simulated Total Numbers of Competition Authority Decisions for Years 2008-2022

	Statistic	Standard deviation	Confidence interval
Empirical first moment	443.717	32.6008	[379.821, 507.614]
Scale estimate	119.180	21.4078	[77.222, 161.139]
Minimum	278.443	33.5332	[212.72, 344.167]
Maximum	685.353	56.3782	[574.854, 795.852]
%25 quantile	347.979	28.3829	[292.350, 403.608]
%75 quantile	532.868	69.8685	[395.928, 669.808]

Table 3. Distribution of Competition Violation Decisions

Year	Rejection Decision	Penalised	Opinion Expressed	Process Terminated Upon Commitment	Terminated by Settlement	Total
2022	28	9		7	34	78
2021	44	5		25	*	74
2020	46	16		-	3	65
2019	52	10		*	7	69
2018	66	11		*	11	88
2017	69	7		*	4	80
2016	65	9			9	83
2015	78	*		*	11	89
2014	130	11		*	22	163
2013	142	14	35	*	*	191
2012	273	9	21			303
2011	238	9	36			283
2010	239	9	4			252
2009	170	5	3			178
2008	129	3				132

Source: https://www.rekabet.gov.tr/tr/Sayfa/Yayinlar/karar-istatistikleri

Table 3 shows a fluctuating trend over the years in the number of rejection decisions, companies penalised, companies with observations, cases closed with commitments and settlements concluded by the Competition Authority. A rejection decision refers to cases examined by the Competition Authority that were rejected, i.e. no violation of competition rules was found. It's worth noting that the number of rejection decisions fluctuates over the years, with an increase between 2009 and 2013, followed by a decrease in the following years. Sanctioned companies represent the sanctions imposed on companies found to have infringed competition rules. In 2022, penalties were imposed on 9 companies. This

number was higher in 2014 and 2013. The fluctuation in the number of companies penalised reflects the approach of the Competition Authority in dealing with infringement cases.

Figure 2. Total numbers of competition violation decisions

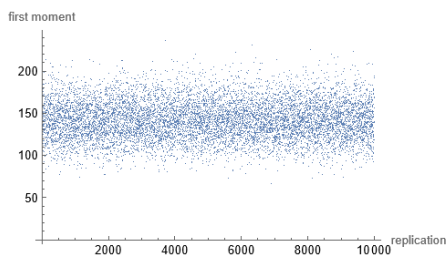**Figure 2(a):** Empirical first moment evaluated by smooth function

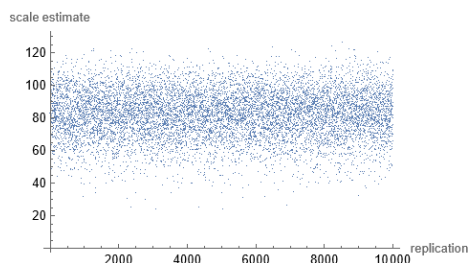**Figure 2(b):** Scale estimate evaluated by smooth function

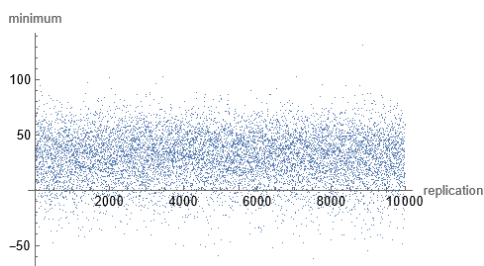**Figure 2(c):** Minimum values of artificial data
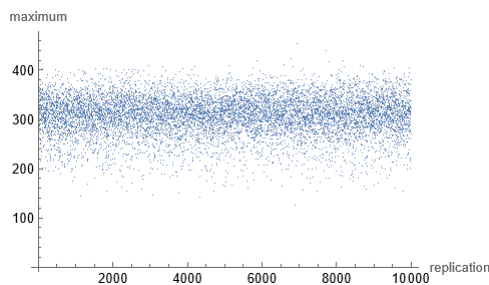
Figure 2(d): Maximum values of artificial data

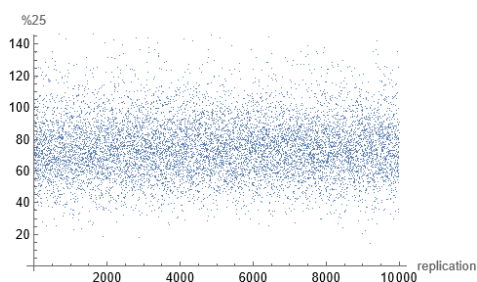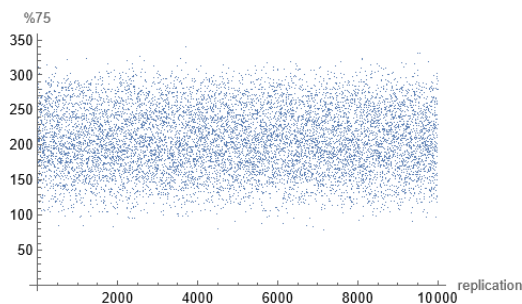**Figure 2(e):** Quantile at %25 of artificial data

Figure 2(f): Quantile %75 of artificial data

The number of companies with an opinion in 2022 was not specified. However, this number had increased in previous years. Undertakings with views are those which provide information and views during the course of an FCA investigation. Commitments refer to a mechanism that allows companies to close investigations by making specific commitments in relation to alleged infringements of competition law. In 2022, 7 companies closed cases with commitments, demonstrating their commitment to safeguarding competition. In 2022, 34 companies settled cases. Settlements allow companies to avoid sanctions by reaching a settlement to allegations of competition law infringements. Overall, these statistics show that the Competition Authority uses different mechanisms and sanctions to protect competition. The different results from year to year reflect the way in which competition and

business behaviour are shaped. It shows that the Competition Authority works effectively and uses a variety of tools to combat competition law infringements (see Figure 2).

Table 4. The Summarized Values of the Simulated Total Numbers of Competition Violation Decisions for Years 2008-2022

	Statistic	Standard deviation	Confidence interval
Empirical first moment	141.740	22.4712	[97.697, 185.7820]
Scale estimate	82.3144	14.3668	[54.156, 110.4730]
Minimum	29.8674	21.7481	[-12.7582, 72.4929]
Maximum	307.288	38.8864	[231.072, 383.5040]
%25 quantile	74.6379	18.3979	[38.5787, 110.697]
%75 quantile	206.301	45.8829	[116.372, 296.230]

When Tables 3 and 4 are examined, it is observed that there exists decreasing for the total values, which implies that the precautions taken affect the total results tending to be decreasing. Especially, in Table 4, the lower band of minimum statistic has been negative, which shows that the values go to zero and in the near future there is no potential problem occurred by competition violation decisions.

Table 5. Mergers/Acquisitions by Characteristics

Year	Acquisitions	Joint Ventures	Mergers	Transfers within the Scope of Privatisation	Total
2022	160	76	2	7	245
2021	214	83	5	7	309
2020	150	62	8	*	220
2019	140	66	1	1	208
2018	152	56	2	13	223
2017	141	32	6	5	184
2016	161	32	7	9	209
2015	125	25	1	8	159
2014	130	63	4	18	215
2013	125	68	1	19	213
2012	190	91	1	*	282
2011	168	68	3	*	239
2010	202	5	3		210
2009	128	12	4		144
2008	209	19	3		231

Source: https://www.rekabet.gov.tr/tr/Sayfa/Yayinlar/karar-istatistikleri

This table shows that the number of different types of transactions varies over the years. Acquisitions refer to an enterprise buying or gaining control of another enterprise. In 2022 there were 160 acquisition transactions. This number is lower than in previous years. The decrease in the number of acquisitions may reflect changes in companies' growth strategies or fluctuations in economic conditions. Joint ventures are collaborations between two or more enterprises to create a new enterprise or to jointly operate an existing one. There were 76 joint venture transactions in 2022. This may be an indicator of cooperation between enterprises. Mergers involve two or more enterprises joining together to form a new entity. In 2022, there were only 2 merger transactions. This suggests that mergers are rare.

Figure 3. Total numbers of mergers/acquisitions by characteristics

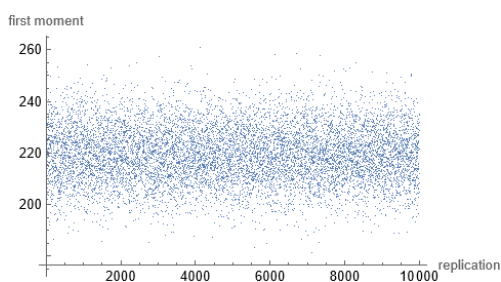**Figure 3(a):** Empirical first moment evaluated by smooth function

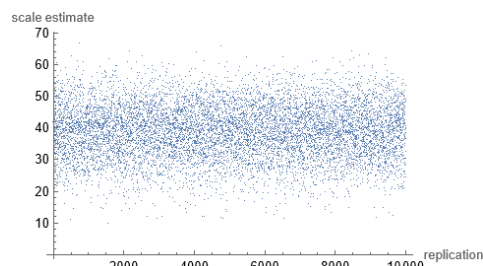**Figure 3(b):** Scale estimate evaluated by smooth function
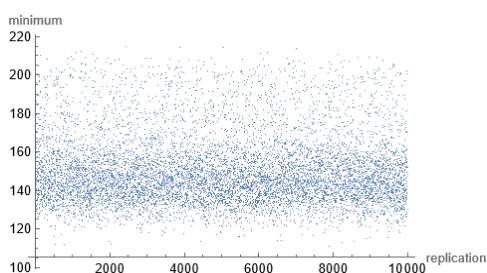
Figure 3(c): Minimum values of artificial data

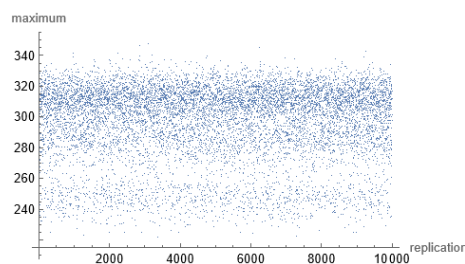**Figure 3(d):** Maximum values of artificial data

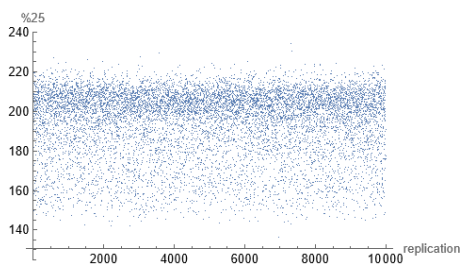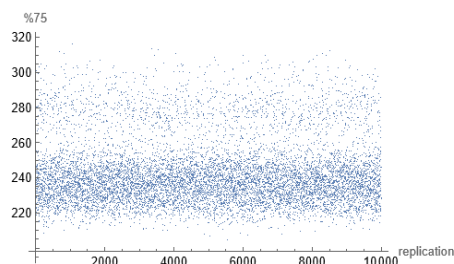**Figure 3(e):** Quantile at %25 of artificial data

Figure 3(f): Quantile %75 of artificial data

Transfers under privatisation refer to transactions carried out by the government to privatise public assets. In 2022 there were 7 transfers under privatisation. Overall, the total number of transactions varies from year to year. While the total number of transactions was 309 in 2021, it decreased to 245 in 2022. These changes could be influenced by various factors such as economic conditions, business strategies and government policies. In addition, there may be years with no privatisation transactions, while other years may see more transactions. In general, these data reflect how factors such as business growth strategies, collaborations and privatisation can show variability (see also Figure 3(b)). The dynamics of the business world can vary from year to year and the Competition Authority carefully

monitors these transactions (see Figure 3). Changes in these data over the years may be influenced by factors such as economic conditions, business dynamics and government policies.

Table 6. The Summarized Values of the Simulated Total Numbers of Mergers/Acquisitions by Characteristics for Years 2008-2022

	Statistic	Standard deviation	Confidence interval
Empirical first moment	219.314	10.6277	[198.484, 240.143]
Scale estimate	38.7903	8.22200	[22.6755, 54.9052]
Minimum	149.899	17.4077	[115.781, 184.018]
Maximum	297.513	23.6050	[251.248, 343.777]
%25 quantile	194.667	16.9094	[161.526, 227.809]
%75 quantile	242.166	18.3400	[206.22, 278.1120]

Each figure from 1-3(a)-(f) show the summarized statistics from the data set generated artificially for the sample size, $n = 15$ replicated 10,000 times. Figures 1-3(a) and 1-3(b) represent the empirical first moment as a mean from the central tendency measure and the scale estimate from the dispersion measure. Figures 1-3(c)-(d) represent the minimum and maximum values of the data with sample size, $n = 15$, respectively. Figures 1-3(e)-(f) represent the simulated data for $n = 15$ at the quantiles %25 and %75, respectively.

The statistic, standard deviation and confidence intervals of first moment, scale estimate, minimum, maximum, %25 and %75 quantiles obtained by the replicated form of the sample size n are given in Tables 2,4 and 6. Note that even though the mean is used as a summarizing statistic for each case of statistic, standard deviation, etc. from the replicated form of the artificial data set is used, the confidence interval is based on the standard deviation of the artificial data set for the sake of the larger form of the confidence band. In other words, we give a rough confidence interval for how far it can go down, if it can go down, and how far it can go up, if it can go up.

5. CONCLUSION AND DISCUSSION

In Turkey, the Competition Authority plays a crucial role in supporting economic growth and ensuring the effective functioning of the market mechanism. The main focus of the authority is to ensure economic balance by protecting and promoting competition between companies. The Competition Authority aims to prevent restrictions on competition, in particular by closely monitoring agreements between companies. Preventing the formation of cartels is of great importance in this respect. Cartels are organisations that distort competition and harm consumers. The Competition Authority identifies such organisations and imposes sanctions, thereby helping to transform markets into healthy competitive environments. In addition, the Authority issues regulations to prevent the creation of monopoly situations. Monopoly situations can lead to one or more players dominating the market, which can restrict competition. The Competition Authority's intervention ensures that markets remain balanced and that consumers have more choices. This encourages the provision of quality products and services.

The Competition Authority also closely monitors mergers and acquisitions. Such transactions can affect competition in the market and threaten the healthy continuation of competition. The Authority evaluates these transactions and, if necessary, imposes regulations to protect competition in the market. A strong legal infrastructure is necessary for the Competition Authority to operate effectively. The legal basis for its decisions protects its independence and impartiality. This ensures a fair competitive environment for companies and consumers. The role and functioning of the Competition Authority is crucial for Turkey to remain competitive in domestic and international markets. A more competitive market environment promotes innovation, increases efficiency and contributes to the national economy in the long term. Therefore, the efforts of the Competition Authority should be seen as an integral part of supporting Turkey's economic growth and sustainable competitive advantage.

This study examines the Competition Authority's decisions on competition violations between 2008 and 2022. After modelling the real data, the artificial data obtained show to what extent the decisions of the Competition Authority on competition violations will affect the goods and services market in the near future. The artificial data and its statistics clearly show that the decisions on competition violations and administrative fines have varied over the years. It may be useful to discuss some important points when the results of numerical simulation are taken into evaluation as well. It is worth noting that the number of infringement decisions issued by the Competition Board has fluctuated over the years. Although a record number of infringement decisions were taken in 2012 and 2013, this number has decreased in recent years. This may reflect the variability of the Competition Authority's monitoring and regulation. The increase or decrease in infringement decisions may be due to changes in the competition environment or developments in monitoring methods. Mergers and acquisitions seem to have increased over the years. In particular, there has been a steady increase in such transactions since 2010. This may be related to the growth of business in Turkey, new business opportunities and market changes. The Competition Authority plays a crucial role in ensuring the protection of competition by closely scrutinising such transactions.

Privatisation decisions seem to have followed a steady course over the years. This may reflect the withdrawal of the state from the economy or the results of the privatisation policy. Privatisation transactions can be the result of economic policies such as the privatisation of the public sector or the transfer of privatised assets. Administrative fines show significant fluctuations over the years. A high number of fines in 2021 stands out and may warrant special scrutiny. The variability of administrative fines may depend on government policies, economic conditions and the behaviour of companies.

Turkey's competition policy and the activities of the Competition Board are crucial for the healthy functioning of the economy and the competitiveness of the business community. Statistics show that the Competition Authority operates dynamically and makes decisions in a manner that is sensitive to economic variables. However, these data also show that competition policy requires careful monitoring and evaluation in order to maintain its stability and effectiveness. Administrative fines and

proceedings underline the need for companies to comply with competition rules and are an important tool for protecting economic competition. The promotion of competition and the protection of competitiveness are essential to support economic growth and to ensure that consumers have access to a variety of choices. The work of the Competition Authority plays a crucial role in achieving these objectives and is important for data-based policy formulation and improvement. In this framework, the statistical values computationally evaluated can be indicators for decision-makers how many the numbers of competition there should be necessary. The statistical trends in all three areas (total decisions, competition infringement decisions and mergers/acquisitions) indicate that the Competition Authority is playing a proactive and increasingly participatory role in the Turkish market. The increasing effectiveness of the authority in regulating competition infringements and controlling mergers and acquisitions indicates a strong commitment to maintaining a fair and competitive market environment. This trend may also indicate an increase in the enforcement and awareness of competition law in Turkey. Overall, the efforts of the Competition Authority during the period under report demonstrate its integral role in protecting competition and market integrity.

As a result, the economic competition environment in Turkey is a complex area where competition rules and regulations need to be constantly reviewed and updated. The work of the competition authority plays a crucial role for Turkey in maintaining its economic competitiveness and creating a fair business environment. These statistics can help policymakers, business leaders and consumers make more informed decisions to protect and promote competition. It underlines the importance of competition for economic growth, innovation and consumer welfare in the near future.

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