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The Impact of the Russian-Ukrainian War on E-Sellers in North Macedonia: Exploring Challenges and Demographic Influences

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Nina Angelovska[*], Julijana Angelovska[**]

Abstract

This study explores the impact of the Russian-Ukrainian war through an existing comprehensive survey, delving into the challenges e-sellers face in North Macedonia. The research specifically investigates how demographic factors influence e-sellers challenges in maintaining prices and coping with decreased demand, attributed to factors like inflation and the Russian-Ukrainian war. The ANOVA test was employed to assess the impact of categorical independent variables, including sales channels, years of operation, number of employees, and online sales, on these challenges. Regression (linear and quantile) is performed to determine the relationship between the variables. The results indicate that e-sellers operating under the click-and-mortar model face more challenges in maintaining prices compared to those exclusively selling online. Notably, other demographic factors such as years of operation, number of employees, industry, and online sales do not show statistically significant mean differences, suggesting a universal challenge for e-sellers. E-sellers with fewer employees (1-9), limited operational experience, newly established businesses, and lower online sales face the challenge of decreased demand more prominent.

Keywords: e-commerce; inflation; demographics of E-sellers; ANOVA; regression;

JEL: M21

Introduction

The Russian-Ukrainian conflict is a significant human tragedy for the people, but its economic consequences have global ramifications. The war is unfolding during a challenging period for the global economy. The conflict in Russia-Ukraine has hindered the worldwide efforts to recover from the COVID-19 pandemic and address its associated health and economic issues. Before the invasion, the world was predominantly preoccupied with addressing the multifaceted challenges brought about by the global pandemic. Efforts were concentrated on mitigating the repercussions

[*] Faculty of Economy, University of Skopje, Skopje, North Macedonia
[**] Faculty of Economy, University of Skopje, Skopje, North Macedonia, Corresponding Author

of the pandemic, which encompassed endeavors to rebuild human capital and sustain economic activities amid the complexities of recovery. This involved tackling obstacles like disruptions in supply chains, a diminishing level of policy support, and the escalating spectre of inflation, with a particular emphasis on essential commodities such as food and energy. The invasion has introduced an unforeseen and profound layer of complexity to the existing global challenges, redirecting attention and resources toward managing the geopolitical and economic ramifications of the conflict. The disruptions in global trade and investment caused by COVID-19 impeded growth in developing nations and contributed to inflationary pressures, especially when governments resorted to trade restrictions to safeguard their economies (Jackson et al., 2020). The war has swiftly introduced a negative global impact, notably affecting commodity markets (Guenette, Kenworthy and Wheeler, 2022). As Russia's war in Ukraine exacerbated pressures on international food prices, inflation is on the rise in numerous countries, leading major economies to raise interest rates to mitigate it (Rother et al., 2022). The war has disrupted global supply chains and introduced uncertainties that are affecting various industries. Previous research suggests that geopolitical events, such as conflicts, can have profound impacts on businesses (Shenkar and Reuer, 2005).

In the context of the intricate relationship between geopolitics and the geo-economy, several studies highlight the potentially severe repercussions of geopolitical conflicts, including adverse impacts on social welfare, escalating commodity prices, and inflation (Dogan et al., 2021, Norouzia, 2019, Norouzi, 2021). G'Oes and Bekkers (2022) employed a regional general equilibrium model to assess the potential consequences of ongoing global geopolitical conflicts on trade, technological innovation, and economic growth, revealing significant harm to welfare. Utilizing the augmented group estimator (AMG), Husnain et al. (2022) investigated the environmental Kuznets curve (EKC) in E7 countries, examining the interplay between geopolitical risk and carbon emissions. Li et al. (2023) explored the impact of geopolitical risk shocks on commodity markets, concluding that such threats and behaviors could yield alternating positive and negative effects on these markets. Su et al. (2020) conducted an analysis focusing on Venezuela, establishing a connection between geopolitical risks, inflation, and oil prices, highlighting the pivotal role of geopolitical stability in fostering economic growth and maintaining low inflation. Conversely, some scholars argue that geopolitical crises serve as catalysts for energy security strategies aimed at reducing dependency, emphasizing Russia's motivation to expedite its energy transition (Jääskeläinen et al., 2018, Rasoulinezhad et al., 2020).

Although the literature on the demographic characteristics of e-sellers is relatively limited, there is a substantial body of research on the demographics of e-shoppers (Gong, Stump and Maddox, 2013; Alkan, Küçükoglu and Tutar, 2021). Many studies in e-commerce have focused on how factors such as education level (Ünver and Alkan, 2021), income, age, gender (Hernández, Jiménez and José Martín, 2011; Mishra, 2015; Alkan, Güney and Kılınç, 2023; Tutar et al., 2024), and region (Ünver, Aydemir and Alkan, 2023) significantly influence online shopping behavior, especially during the COVID-19 pandemic and across different regions. While previous research has explored diverse aspects of the economic and environmental repercussions of the conflict,

there is a limited availability of in-depth and organized evaluations regarding the effects on e-sellers, specifically in terms of quantifiable economic outcomes. This study investigates the contemporary challenges faced by e-sellers in North Macedonia, with a particular focus on the repercussions of the Russian-Ukrainian war and the associated energy crisis. Utilizing a quantitative approach, data was derived from a survey conducted by the Macedonian E-commerce Association, comprising responses from 80 e-sellers; it aims to answer these research questions:

RQ1: How do demographic factors of e-sellers: sales channels, years of operation, number of employees, and online sales affect the challenge of Maintaining prices at the same level as in previous years, and are there any significant differences in this impact among different categories within each variable? And

RQ2: How do demographic factors of e-sellers: sales channels, years of operation, number of employees, and online sales affect the challenge of Decreased demand (due to factors like inflation, the Russian-Ukrainian war, etc.), and are there any significant differences in this impact among different categories within each variable?

To address the research inquiries, we use existing survey data and employ statistical methodologies such as ANOVA and regression analyses.

To the best of our knowledge, there has been no research that specifically examines the combined effects of demographic factors and external crises, such as the Russian-Ukrainian war, on the challenges faced by e-sellers in North Macedonia. This study uniquely contributes to the existing literature by addressing this gap, providing insights into how factors like sales channels, operational years, employee numbers, and online sales interact with the economic and market disruptions caused by global conflicts and inflationary pressures.

This research holds significant importance due to its unique contribution to the existing literature and is particularly valuable as it adds a distinct perspective by examining the role of demographic characteristics in shaping the challenges e-sellers face during the Ukrainian war. By delving into these factors, the research seeks to offer a detailed understanding of how various demographic attributes influence the difficulties encountered by e-sellers in the context of this geopolitical crisis.

The remainder of the paper is organized as follows. Section 2 presents the literature review. Section 3 explains data collection and methodology. Section 4 provides empirical analyses. The last section offers concluding remarks, limitations of the study and recommendations for future research.

Literature Review

The COVID-19 pandemic has significantly impacted the global business landscape, particularly affecting e-traders who faced unprecedented challenges in adapting to the rapidly changing market conditions. Studies have highlighted the diverse and sometimes divergent responses of e-commerce businesses to the challenges posed by the pandemic (Angelovska, 2022). The pandemic prompted a swift and critical need for e-traders to reassess their business strategies, focusing on operational resilience, supply chain flexibility, and customer engagement (Tabuena et al., 2022). One of the major challenges e-traders encountered during the COVID-19

pandemic was the disruption in supply chains, leading to inventory shortages and delayed deliveries (Mehrotra et al., 2020). E-traders had to swiftly implement measures to address these logistical issues and meet the surge in online demand as consumers turned to digital platforms for their shopping needs. In addition to supply chain disruptions, the economic impact of the pandemic, coupled with inflationary pressures, presented challenges related to pricing and cost management for e-traders (Donthu and Gustafsson, 2020). The literature also emphasizes the role of technological advancements in helping e-traders overcome challenges. E-commerce platforms that leveraged advanced analytics, artificial intelligence, and automation were better equipped to respond to changing market dynamics and consumer behavior during the pandemic (Verhoef et al., 2021). Moreover, the dual challenge of adapting to COVID-19 restrictions and navigating the economic consequences of inflation prompted e-traders to reconsider their marketing strategies and explore innovative ways to reach and retain customers. Many e-commerce businesses turned to digital marketing, social media engagement, and personalized customer experiences to stay competitive in an evolving market (Tajvidi et al., 2021).

The Russian-Ukrainian war has emerged as a pivotal geopolitical conflict, drawing significant attention from academic circles. (Alam et al., 2023) contends that energy resources play a crucial role in economic development, emphasizing that geopolitical conflicts driven by energy considerations may yield lasting consequences. Boungou and Yatié (2022), in their analysis of the impact of the Russian-Ukrainian war on the stock markets of 94 countries, observe a negative influence, particularly on countries bordering Russia and Ukraine and those imposing severe sanctions on Russia. Liadze et al. (2023), utilizing the global econometric model (NiGEM), project multifaceted consequences of the Russian-Ukrainian war, anticipating turbulence in financial markets, soaring energy and food prices, a 1% decrease in global GDP, and a 1%–2% increase in inflation. Carriquiry et al. (2022) highlight potential ramifications on food insecurity and carbon emissions due to the Russian-Ukrainian war. In summary, the ongoing Russian-Ukrainian war, as a prominent geopolitical conflict post-pandemic, is poised to disrupt the global energy market, affecting supply chains, economic growth, and carbon emissions worldwide. This conflict reshapes energy trade networks, introducing complex and far-reaching effects on global political and economic landscapes. As the conflict's intensity increases, the imposition of enhanced energy sanctions by the US and EU on Russia leads to a swiftly spreading energy crisis, heightening global uncertainty (Cui et al., 2023).

This study offers a twofold contribution. First, it enriches the e-commerce literature by focusing on the often-overlooked challenges faced by e-sellers, particularly through an analysis of their demographic characteristics and adaptive capacities. Second, it examines these dynamics within the context of the Russian-Ukrainian war, a critical yet underexplored area. By investigating how different demographic profiles affect e-sellers' abilities to manage and adapt to the inflationary pressures and economic volatility induced by the conflict, this research bridges a significant gap in our understanding of the broader economic impact of the war, thereby providing new insights for both scholars and practitioners in the field.

Data and methodology

The research employs a quantitative approach and utilizes data from an existing survey. The survey, specifically designed for e-sellers, is conducted by the Macedonian E-commerce Association and is currently in its third iteration. The objective of the survey is to reveal the contemporary challenges and obstacles confronted by e-sellers. It is worth noting that the survey has been continually refined and adjusted to align with the ever-evolving and demanding economic climate conditions. The questionnaire designed for e-traders, conducted by the Macedonian E-Commerce Association for the third time, aims to uncover the current challenges and barriers faced by these individuals, addressing the ongoing economic challenges. Comprising 49 questions across five sections, the survey covers demographics, current challenges, collaboration with banks, delivery aspects for companies selling products, and questions related to promotion. Notably, the questionnaire tailors its content based on whether e-traders sell products or services and offer delivery, ensuring a customized approach. To boost response rates, three gifts in the form of free tickets for an e-commerce conference were offered. The sequence of questionnaire distribution involved strategic timing, reminders, and personalized emails, contributing to a comprehensive data collection process. Respondents had the opportunity to answer multiple-choice questions, questions with a matrix of answers, and ranking questions. To assess individual questions, a Likert scale ranging from 1 to 5 was used. The survey was conducted within the time frame of September 13th to October 20th, 2022. The Macedonian E-commerce Association distributed this questionnaire to the following groups of e-sellers: those who regularly receive the Association's weekly email newsletter; who are members of the Association; who established e-stores as part of the "e-commerce4all" initiative in 2020; agro-producers who began selling their products on local marketplace platforms; the database of verified e-sellers; the database of e-sellers who applied for the "Best E-seller" competition in 2021. Additionally, the questionnaire was forwarded by five banks that offer e-commerce services to all virtual sales platforms using their payment processors. Furthermore, the e-seller platform Grouper.mk (and Paopao.mk) sent personalized direct emails to e-sellers who offer their products for online sales through this marketing platform (Macedonian E-commerce Association, 2022).

The questionnaire was completed by 81 e-sellers. After filtering out duplicate responses from the same e-sellers, 80 valid responses were obtained. For this study, we focus on the initial two sections of the questionnaire out of the five available. The first segment gathers demographic information about the respondents, while the second addresses queries about current challenges. The remaining sections of the questionnaire are not relevant to the scope of this research. The companies that responded to the questionnaire belong to various industries, including beauty, wellness, and health products (18.8%), food products (restaurants, food delivery, supermarkets) (16.3%), household products (furniture, electronics) (12.5%), education (academies, training, books) (6.3%), Information and Communication Technology (ICT) (hosting, digital products, software, etc.) (6.3%), clothing, accessories, and footwear (sportswear, equipment, children's and adult clothing) (6.3%), tourism (tourist agencies, hotels, motels) (3.8%), and other categories (30%). The online stores that participated in the survey are primarily small. The majority,

about 85%, employ up to 50 workers, with 60% having 1 to 9 employees, and 25% having 10 to 50 employees. Approximately 6% of the online stores have a workforce of 51 to 100 employees, and 9% have more than 100 employees. Among the e-sellers who responded to the questionnaire, 22% commenced online sales before 2015, 39% started before 2020, 19% began in 2020, and 20% initiated their online selling activities after 2020. Among the e-sellers who participated in the survey, 65% exclusively offer online sales, while 35% provide both online and traditional sales in physical stores. Approximately 50% of the respondents generate 0 to 20% of their total sales online, 25% generate 21 to 60%, 4% generate 61 to 99%, and 21% exclusively rely on online sales for 100% of their revenue. The distribution of their participation is depicted in Table 1.

Table 1. Demographic profile of the e-sellers (N=80)

Variable	Code	Answers	Freq	%	Cum.%
Industry	1	Clothing, sports equipment and footwear	5	6.3	6.3
	2	Food products (restaurants, food delivery, supermarkets)	13	16.3	22.5
	3	Beauty, care, health and fashion accessories	15	18.8	41.3
	4	Household products (furniture, electronics)	10	12.5	53.8
	5	Tourism (travel agencies, hotels and motels)	3	3.8	57.5
	6	Education (academies, training, books)	5	6.3	63.7
	7	ICT (hosting, digital products, software, etc.)	5	6.3	70.0
	8	Other	24	30.0	100
Number of employees	1	1-9	48	60	60
	2	10-50	20	25	85
	3	51-110	5	6.3	91.3
	4	>100	6	8.8	100
Start selling online	1	Before 2015	18	22.5	22.5
	2	Before 2020	31	38.8	61.3
	3	2020	15	18.8	80
	4	After 2020	16	20	100
Selling channels	1	Pure-play	28	35.0	35.0
	2	Click and mortar	52	65.0	100
Online sales	1	0-20%	40	50	50
	2	21-40%	16	20	70
	3	41-60%	4	5	75
	4	61-80%	1	1.3	76.3
	5	81-99%	2	2.5	78.8
	6	100%	17	21.3	100.0

Source: Author's calculations

The ongoing events tied to the war in Ukraine and the resulting energy crisis, which has led to price hikes for all products and services, both locally in the Republic of North Macedonia and on a global scale, are also impacting e-commerce operations. In Table 2, the mean of responses to questions regarding current challenges are depicted on a scale ranging from 1 (indicating "not at all") to 5 (indicating "very much"). Among the e-sellers who participated in the survey, the most significant challenge is identified as maintaining prices at previous year levels, scoring an average of 3.8. The second most prominent challenge is the recruitment of appropriate staff, with an average score of 3.5, followed by issues related to unfair competition, which scores 3.4. Decreased demand (due to factors like inflation, the Russian-Ukrainian war, etc.) is found to be, as well challenge of interest as a result of the Russian-Ukrainian war, with a mean above score of 3. Challenges like recruitment of appropriate staff and unfair competition are persistent issues faced by e-sellers (Macedonian E-commerce Association, 2018; Macedonian E-commerce Association, 2020). However, the challenge of price maintenance and decreased demand are recent challenges imposed by the Russian-Ukrainian war. Other challenges score below 3 on average and encompass issues like capacity constraints, technical hurdles, product delivery, and managing user complaints.

Our objective is to examine challenges that have received scores exceeding 3 in our survey data and are connected to the consequences of the Russian-Ukrainian war concerning the demographic characteristics of the e-sellers. The challenges that were influenced by the Russian-Ukrainian war and are scored above 3 are: 1. Maintaining prices at the same level as in previous years and 2. Decreased demand (due to the factors like inflation, the Russian-Ukrainian war, etc.). Based on this we have two research questions:

RQ1: How do demographic factors of e-sellers: sales channels, years of operation, number of employees, and online sales affect the challenge of Maintaining prices at the same level as in previous years, and are there any significant differences in this impact

Table 2. Descriptive statistics of challenges of e-sellers (N=80)

Challenges	Mean	Std. dev.
Maintaining prices at the same level as in previous years.	3.78	1.20
Recruiting appropriate staff.	3.49	1.27
Dealing with unfair competition in the online market (grey economy).	3.43	1.49
Decreased demand (due to factors like, inflation, the Russian-Ukrainian war, etc.).	3.03	1.25
Insufficient capacity to monitor and respond to new trends	2.61	1.12
Technical issues and challenges	2.44	1.20
Managing product delivery.	2.36	1.30
Managing product delivery.	2.04	1.17

Note: 1= Not at all, 5=very much

Source: Author's calculation

among different categories within each variable? And

RQ2: How do demographic factors of e-sellers: sales channels, years of operation, number of employees, and online sales affect the challenge Decreased demand (due to factors like, inflation, the Russian-Ukrainian war, etc.), and are there any significant differences in this impact among different categories within each variable?

To answer the research questions we will employ techniques such as ANOVA and Multiple Linear Regression. Analysis of Variance (ANOVA) is a statistical method used to determine whether there are statistically significant differences between the means of three or more independent (unrelated) groups. It's a way to compare group means in a sample and test if they are different from one another. ANOVA is particularly useful to assess the impact of one or more categorical independent variables on a dependent variable. ANOVA calculates an F-statistic based on the variance between group means and the variance within the groups. The F-statistic is a ratio of these two variances. If there is a significant difference between group means, the F-statistic will be relatively large. The F-statistic is used to calculate a p-value, which tells the probability of observing such a difference in group means if the null hypothesis were true. A small p-value (typically less than 0.05) suggests that we can reject the null hypothesis and conclude that there is a significant difference between the group means. After exploring statistically significant differences between the groups, we perform linear and quantile regression to find out the relationship between the variables. Linear regression is a statistical method used to model the relationship between a dependent variable (response variable) and one or more independent variables (predictor variables). The goal is to find the best-fitting linear relationship that minimizes the difference between observed and predicted values. Key components include the dependent variable (Y) to be predicted or explained and independent variables (X) used for prediction. The linear equation, typically represented as:

$$Y=\beta_0+\beta_1 X+\varepsilon, \quad (1)$$

where β_0 is intercept, β_1 slope, and ε an error term accounting for unexplained variability. The objective is to estimate coefficients β_0 and β_1 that minimize the sum of squared differences between observed and predicted values. Linear regression is widely applied for prediction, understanding variable relationships, and making inferences in various fields, while quantile regression extends these capabilities by analyzing effects across different points in the conditional distribution.

Quantile regression, introduced by Koenker and Bassett (1978), estimates relationships between variables at different points in the distribution, overcoming the limits of classical linear regression. While classical regression minimizes the sum of squared residuals to estimate the average effect, quantile regression minimizes the cumulative absolute deviations to estimate the conditional median and other quantiles (Choi et al., 2012). The basic quantile regression model is typically expressed as:

$$Y=\beta\Theta_0+\beta\Theta_1 X+\varepsilon_{qi}, \quad (2)$$

with $\text{Quant}_{\Theta}(Y_i/X_i) = X_i\beta\Theta$ where Θ is regression quantile ($0<\Theta<1$)

Quantile regression is particularly useful if the impact of the demographic factors is not uniform; for instance, the effect of the number of employees or years of operation

might differ among e-sellers facing severe challenges compared to those facing moderate challenges. This method thus provides a more comprehensive view by capturing heterogeneity in the effect sizes across the distribution of the dependent variables. The regression model is estimated as the following based on markers of Θ quantile regression observation value.

$$\min_{\beta} \frac{1}{n} \sum_{i=1}^{n} \left(\Theta - \frac{1}{2} + \frac{1}{2} sgn\,(Yi - Xi)(Yi - Xi\,\beta) \right) \quad (3)$$

Dependent variables in our research are the challenges impacted by the Russian-Ukrainian war that we regress on demographic characteristics of the e-sellers as dependent variables: Type of channel, Number of employees, Years of operation, Industry and Percentage of online sales.

Results

In evaluating the impact of various demographic factors (Type of channel, Number of employees, Years of operation, Industry and Percentage of online sales) on challenges related to 1. Price maintenance level as in previous years and 2. Decreased demand (due to factors like inflation, the Russian-Ukrainian war, etc.) among e-sellers, an ANOVA test was conducted, treating demographic variables as categorical independent factors.

The outcomes of the ANOVA test, evaluating the challenge most encountered by e-sellers in maintaining prices at the previous year's level and its association with e-sellers' demographics, are summarized in Table 3. The evaluation of results was conducted based on the significance of the F statistic, and the ANOVA test revealed statistical significance for the variable "Type of Channel" (F=4.558, p=0.036). This suggests that e-sellers operating under the click-and-mortar model face more the challenge in maintaining prices, while those exclusively selling online demonstrate better proficiency in overcoming this specific challenge. The ANOVA test results indicate that other demographic characteristics such as years of operation, number of employees, industry, and online sales do not exhibit statistically significant differences in means. This implies that all e-sellers, irrespective of their size, years of operation, industry affiliation, or the proportion of online sales, face challenge in maintaining prices at the previous year's level equally.

The outcomes of the analysis, as presented in Table 4, shed light on the impact of demographic factors on the response to the challenge of decreased demand among e-sellers, attributed to factors like inflation and the Russian-Ukrainian war. Specifically, variables such as the Number of Employees (F=2.608, p=0.05), Years of Operation (F=4.16, p=0.009), and Online Sales (F=3.181, p=0.012) exhibit statistically significant differences in means across various categories. These results imply that e-sellers characterized by a lower number of employees (1-9), less operational experience or those representing newly established businesses (opened after 2020), as well as those with lower online sales (selling online below 60% of total sales), encounter the challenge of decreased demand (due to factors like, inflation, the Russian-Ukrainian war, etc.) more prominently.

Table 3. ANOVA test: Maintaining prices at the same level as in previous years and demographics of e-sellers (N=80)

Type of channel (F=4.558, p=0.036)								
	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval		Min.	Max.
					Lower Bound	Upper Bound		
1	28	3.3929	1.42307	0.26894	2.8410	3.9447	1.00	5.00
2	52	3.9808	1.01923	0.14134	3.6970	4.2645	1.00	5.00
Number of employees (F=0.284, p=0.837)								
1	48	3.7708	1.32472	0.19121	3.3862	4.1555	1.00	5.00
2	20	3.6500	1.08942	0.24360	3.1401	4.1599	1.00	5.00
3	5	3.8000	0.83666	0.37417	2.7611	4.8389	3.00	5.00
4	7	4.1429	0.89974	0.34007	3.3107	4.9750	3.00	5.00
Years of operation (F=1.685, p=0.177)								
1	18	3.6111	1.28973	0.30399	2.9697	4.2525	1.00	5.00
2	31	4.1290	1.05647	0.18975	3.7415	4.5165	1.00	5.00
3	15	3.6667	1.04654	0.27021	3.0871	4.2462	2.00	5.00
4	16	3.3750	1.40831	0.35208	2.6246	4.1254	1.00	5.00
Industry (F=1.168, p=0.332)								
1	5	4.0000	1.73205	0.77460	1.8494	6.1506	1.00	5.00
2	13	3.7692	1.42325	0.39474	2.9092	4.6293	1.00	5.00
3	15	3.8667	1.06010	0.27372	3.2796	4.4537	1.00	5.00
4	10	4.4000	0.69921	0.22111	3.8998	4.9002	3.00	5.00
5	3	4.3333	0.57735	0.33333	2.8991	5.7676	4.00	5.00
6	5	4.2000	0.83666	0.37417	3.1611	5.2389	3.00	5.00
7	5	3.2000	1.48324	0.66332	1.3583	5.0417	1.00	5.00
8	24	3.3750	1.20911	0.24681	2.8644	3.8856	1.00	5.00
Percentage of online sales (F=1.164, p=0.335)								
1	40	3.8250	1.10680	0.17500	3.4710	4.1790	1.00	5.00
2	16	3.6250	1.20416	0.30104	2.9833	4.2667	1.00	5.00
3	4	5.0000	0.00000	0.00000	5.0000	5.0000	5.00	5.00
4	1	4.0000					4.00	4.00
5	2	3.0000	2.82843	2.00000	-22.4124	28.412	1.00	5.00
6	17	3.5882	1.32565	0.32152	2.9066	4.2698	1.00	5.00

Source: Author's calculation

Table 4. ANOVA test: Decreased demand (due to factors like, inflation, the Russian-Ukrainian war, etc.) and demographics of e-sellers (N=80)

Type of channel (F=0.771, p=0.383)								
	N	Mean	Std. Dev	Std. Error	95% Confidence Interval		Min,	Max.
					Lower Bound	Upper Bound		
1	28	2.8571	1.23871	0.23409	2.3768	3.3375	1.00	5.00
2	52	3.1154	1.26264	0.17510	2.7639	3.4669	1.00	5.00
Number of employees (F=2.608, p=0.05)								
1	48	3.3333	1.35793	0.19600	2.9390	3.7276	1.00	5.00
2	20	2.6000	1.04630	0.23396	2.1103	3.0897	1.00	5.00
3	5	2.4000	0.54772	0.24495	1.7199	3.0801	2.00	3.00
4	7	2.5714	0.78680	0.29738	1.8438	3.2991	2.00	4.00
Years of operation (F=4.16, p=0.009)								
1	18	2.3889	1.03690	0.24440	1.8733	2.9045	1.00	5.00
2	31	3.2258	1.23044	0.22099	2.7745	3.6771	1.00	5.00
3	15	2.6667	1.11270	0.28730	2.0505	3.2829	1.00	5.00
4	16	3.6875	1.30224	0.32556	2.9936	4.3814	1.00	5.00
Industry (F=1.511, p=0.177)								
1	5	2.6000	1.51658	0.67823	0.7169	4.4831	1.00	5.00
2	13	3.3077	1.31559	0.36488	2.5127	4.1027	1.00	5.00
3	15	2.8000	1.20712	0.31168	2.1315	3.4685	1.00	5.00
4	10	2.4000	0.69921	0.22111	1.8998	2.9002	1.00	3.00
5	3	3.6667	1.15470	0.66667	0.7982	6.5351	3.00	5.00
6	5	4.0000	0.70711	0.31623	3.1220	4.8780	3.00	5.00
7	5	3.8000	1.30384	0.58310	2.1811	5.4189	2.00	5.00
8	24	2.9167	1.34864	0.27529	2.3472	3.4861	1.00	5.00
Percentage of online sales (F=3.181, p=0.012)								
1	40	2.8500	1.18862	0.18794	2.4699	3.2301	1.00	5.00
2	16	3.5625	1.26326	0.31582	2.8894	4.2356	1.00	5.00
3	4	4.7500	0.50000	0.25000	3.9544	5.5456	4.00	5.00
4	1	3.0000					3.00	3.00
5	2	3.0000	0.00000	0.00000	3.0000	3.0000	3.00	3.00
6	17	2.5294	1.17886	0.28592	1.9233	3.1355	1.00	5.00

Source: Author's calculation

While there exists a difference in means between pure-play and click-and-mortar e-sellers, signifying that click-and-mortar entities face greater challenges in terms of decreased demand, the industry categories: Food Products (including restaurants, food delivery, and supermarkets), Tourism (encompassing travel agencies, hotels, and motels), Education (covering academies, training, and books), and ICT (encompassing hosting, digital products, software, etc.) display means above 3, indicating heightened challenges with decreased demand. However, it's important to note that there is no statistically significant difference in their means.

In addition to the ANOVA analysis, we conducted a regression analysis to gain deeper insights into how the demographic factors of e-sellers contribute to the challenge of maintaining prices. Upon examining the impact of variables such as the number of employees, years of operation, industry type, online sales, and type of channel on this challenge, distinct patterns emerged in the results.

The variables encompassing the number of employees, years of operation, industry type, and online sales did not exhibit statistically significant effects on the ability of e-sellers to maintain prices at the previous year's level. This implies that, irrespective of a business's size, operational experience, industry affiliation, or the extent of online sales, e-sellers across diverse demographics encounter similar challenges in maintaining pricing stability caused by inflation and the energy crisis as a result of the Russian-Ukrainian war.

Only the type of channel proved to be a significant factor influencing the challenge of maintaining prices. E-sellers categorized as click-and-mortar, in contrast to those exclusively selling online, face a heightened level of difficulty in preserving pricing. The coefficient of 1.006 and a p-value of 0.023 indicate a statistically significant relationship. In the face of external challenges such as the Russian-Ukrainian war and inflation impacting input costs universally, e-sellers of all types—whether larger or smaller, in various industries, and regardless of their operational history—encounter a comparable challenge in maintaining prices at the previous year's level. The notable exception is the distinction between click-and-mortar and online-only e-sellers, with the former facing a more pronounced challenge in this context. Online-only e-sellers demonstrate better performance, possibly due to lower operational costs.

Quantile regression further refines these insights by examining effects at different points in the distribution. At the 25th percentile, the type of channel exhibited an even stronger impact (coefficient = 2.480, $p < 0.05$), though its influence diminished at the median and 75th percentiles, suggesting that pricing challenges vary across performance levels. Additionally, while industry type was not significant in the OLS model, it emerged as statistically significant across all quantiles (coefficients of −0.143, −0.171, and −0.063 for the 25th, 50th, and 75th percentiles, respectively). This indicates that the industry sector plays a more nuanced role in determining pricing stability at different levels of e-seller performance. Overall, these findings suggest that, apart from channel type, most factors do not consistently differentiate e-sellers' capacity to maintain pricing, underscoring a uniform challenge imposed by external economic pressures.

Table 5. Regression results: Maintaining prices at the same level as in previous years and demographics of e-sellers (N=80)

Variable	OLS	Quantile Regression Q25 Q50 Q75		
Number of employees	0.003	0.041	-0.214	-0.046
	(0.151)	(0.208)	(0.175)	(0.1358)
Years of operation	-0.065	0.061	-0.057	-0.076
	(0.36)	(0.072)	(0.157)	(0.1219)
Industry	-0.086	-0143*	-0.171**	-0.063*
	(0.052)	(0.072)	(0.0604)	(0.0469)
Type of channel	1.006*	2.480**	0.629	0.696
	(0.432)	(0.594)	(0.5004)	(0.388)
Percentage of online sales	0.146	0.337	0.029	0.696
	(0.103)	(1.416)	(0.1192)	(0.388)
C	2.315*	-1.439*	4.157**	3.857**
	(1.153)	(1.587)	(1.3367)	(1.036)
R^2	0.36	-	-	-
Pseudo R^2		0.086	0.021	0.037

Note: *p<0.01; **p<0.05; Standard errors are reported in the parentheses

Source: Authors' calculations

The regression analysis of decreased demand, considering factors such as inflation, the Russian-Ukrainian war, and demographic characteristics of e-sellers, revealed statistically significant results for the number of employees with a coefficient of -0.296 and a p-value of 0.061, as well as for years of operation with a coefficient of 0.267 and a p-value of 0.059. However, the industry type, type of channel, and online sales did not exhibit statistically significant impacts on decreased demand.

Interpreting these findings, it suggests that e-sellers with a lower number of employees and those that are newly opened or have less experience in operation are more susceptible to the challenge of decreased demand. The statistically significant coefficients for the number of employees and years of operation imply a meaningful relationship between these demographic factors and the impact of decreased demand on e-sellers caused by the consequences of the Russian-Ukrainian war. The difference in results between ANOVA (Analysis of Variance) and regression analysis regarding the significance of online sales as a predictor of decreased demand can be attributed to the distinct methodologies and objectives of these statistical techniques. ANOVA is designed to assess whether there are any statistically significant differences between the means of three or more independent groups. In this research, it appears that ANOVA found a significant difference in the means of online sales across different groups related to decreased demand. This means that, on the surface, there are variations

in the mean levels of online sales among these groups. On the other hand, regression analysis is primarily focused on examining the relationship between one dependent variable (in this case, decreased demand) and one or more independent variables (such as online sales). The goal is to understand how changes in the independent variable(s) relate to changes in the dependent variable. If regression analysis did not find online sales to be a statistically significant predictor of decreased demand, it suggests that, after accounting for other variables in the model, online sales may not have a significant linear relationship with decreased demand. Several factors could contribute to these differences. Other variables included in the regression model may be confounding the relationship between online sales and decreased demand.

Quantile regression further refines these insights by showing that the impact of these factors varies across the distribution. Notably, at the 75th quantile, the negative effect of the number of employees becomes more pronounced (coefficient = -0.377, $p < 0.05$), and the positive effect of years of operation also strengthens (coefficient = 0.377, $p < 0.05$). In contrast, industry type, type of channel, and the percentage of online sales did not exhibit statistically significant effects in either the OLS or quantile regression models.

These results indicate that while the external pressures stemming from the conflict affect all e-sellers, those with fewer resources and less experience face particularly pronounced challenges in maintaining demand.

Table 6. Regression results: Decreased demand (due to factors like, inflation, the Russian-Ukrainian war, etc.) and demographics of e-sellers (N=80)

Variable	OLS	Quantile Regression Q25 Q50 Q75		
Number of employees	-0.296***	-0.125	-0.174	-0.377**
	(0.156)	(0.3537)	(0.2582)	(0.177)
Years of operation	0.267***	0.25	0.354	0.377**
	(0.140)	(0.2537)	(0.2317)	(0.1588)
Industry	0.023	0.029	0.031	0.057
	(0.054)	(0.122)	(0.0891)	(0.0611)
Type of channel	0.354	-0.421	-0.446	0.491
	(0.445)	(0.594)	(0.7379)	(0.5057)
Percentage of online sales	-0.043	0.25	0.446	0.491
	(0.136)	(1.011)	(0.7379)	(0.5057)
C	2.290*	1.625	2.985**	2.811**
	(1.187)	(1.705)	(1.977)	(1.036)
R^2	0.38	-	-	-
Pseudo R^2		0.023	0.008	0.16

Note: *p<0.01; **p<0.05; *** p<0.10; Standard errors are reported in the parentheses

Source: Authors' calculations

Conclusion, limitations and future research directions

This study investigates the contemporary challenges faced by e-sellers in North Macedonia, with a particular focus on the repercussions of the Russian-Ukrainian war and the associated energy crisis. Utilizing a quantitative approach, data was used from a survey conducted by the Macedonian E-commerce Association, comprising responses from 80 e-sellers. The demographic profile of the participating e-sellers revealed a predominance of small-scale enterprises across diverse industries. The challenges of maintaining prices at previous levels and coping with decreased demand emerged as paramount, exacerbated by external factors such as the Russian-Ukrainian war and inflation. Statistical analyses, employing ANOVA and regression techniques, elucidated the nuanced relationship between demographic factors and the identified challenges. The type of channel significantly impacted the challenge of maintaining prices, with click-and-mortar e-sellers facing more difficulties than their online-only counterparts. This implies that e-sellers who operate under the click-and-mortar model, meaning they have both physical (mortar) and online (click) sales channels, encounter greater difficulties in managing and sustaining competitive prices. This is contrasted with businesses that exclusively sell their products or services online, which appear to exhibit greater skill in navigating and overcoming the specific challenge of maintaining competitive pricing. The rationale behind this observation can be explored further. Businesses with brick-and-mortar establishments incur additional operational costs such as rent, utilities, and maintenance for physical stores. These expenses contribute to a higher overall cost structure for click-and-mortar e-sellers. As a result, these sellers may find it more challenging to offer competitive prices compared to their online-only counterparts. On the other hand, e-sellers operating exclusively online often enjoy cost advantages as they are not burdened by the additional overhead associated with physical stores. This absence of brick-and-mortar-related expenses allows online-only businesses to potentially offer more competitive pricing, meeting the expectations of price-conscious consumers. In essence, this suggests that the business model, whether click-and-mortar or online-only, influences how effectively e-sellers can manage and sustain competitive prices, with online-only models demonstrating a comparative proficiency in this aspect due to their lower operational costs.

However, other demographic variables, including the number of employees, years of operation, industry type, and online sales, did not exhibit statistically significant effects on the ability to maintain prices.

For the challenge of decreased demand, significant impacts were identified based on the number of employees and years of operation. E-sellers with fewer employees and those in the early stages of operation were more susceptible to the challenges posed by decreased demand. In the context of smaller businesses, characterized by a limited workforce and potentially constrained resources, the implications of decreased demand become more pronounced. These enterprises often face challenges in adapting swiftly to market changes, optimizing their inventory management, and executing strategic adjustments due to their inherent scale and operational constraints. The decreased demand tends to be more acutely

felt, amplifying the operational hurdles faced by smaller e-sellers.

Likewise, newly established e-sellers, typically in the early stages of their business journey, encounter unique dynamics in the face of decreased demand. With limited brand recognition and a developing customer base, these businesses may find it challenging to weather fluctuations in demand. The absence of an established market presence can intensify the impact, as they contend with the dual challenge of building brand loyalty and navigating market shifts. In essence, the convergence of smaller business scales and the novelty of newly established e-sellers renders them more susceptible to the challenges posed by decreased demand. The intricate interplay of resource limitations, operational scale, and market positioning underscores the need for tailored strategies to fortify these businesses against the implications of fluctuating demand scenarios.

The theoretical and practical contributions of this research offer valuable insights into the intricacies of challenges faced by e-sellers in the context of the Russian-Ukrainian war's economic ramifications.

From a theoretical standpoint, this study contributes to the existing body of knowledge by providing nuanced insights into the challenges faced by e-sellers operating under different sales channels. The examination of the click-and-mortar model adds depth to the theoretical understanding of the complexities associated with hybrid retail approaches. Additionally, the identification of distinct impacts of decreased demand on newly established and smaller e-sellers during periods of crisis, enriches the theoretical framework by highlighting the intersection of business size, operational maturity, and market responsiveness.

On a practical level, the findings of this research furnish e-commerce practitioners, policymakers, and industry stakeholders with actionable intelligence. E-sellers, especially those employing a click-and-mortar strategy, can leverage the insights to refine their pricing strategies and operational models, promoting better adaptability to market conditions. For smaller and emerging businesses, the study offers practical guidance for formulating targeted responses to mitigate the challenges associated with decreased demand, fostering resilience and sustainability.

In summary, the theoretical contribution lies in advancing our understanding of e-commerce dynamics, while the practical contribution extends to offering tangible guidance for policymakers, industry stakeholders, and e-commerce practitioners to navigate challenges effectively. This dual contribution positions the research as a valuable resource for academics, practitioners, and policymakers seeking to comprehend and enhance the functioning of the e-commerce landscape.

This information can be instrumental in tailoring support, resources, and solutions to address the specific needs of e-sellers in different demographic categories, ultimately fostering the growth and success of the e-commerce sector. This study aims to fill existing knowledge gaps by providing timely and context-specific results, contributing valuable insights for decision-makers, policymakers, and stakeholders engaged in the growth of the e-commerce sector.

The current study has several limitations that should be acknowledged. Firstly, the findings are based on a specific demographic group of e-sellers, and caution should be exercised in generalizing the results to a broader population. Additionally, the accuracy

of demographic data is contingent upon the honesty and precision of respondents, introducing potential biases. The temporal scope of the research is confined to the challenges posed by the Ukrainian war, limiting the applicability of the findings to different geopolitical contexts or evolving economic conditions. Furthermore, the survey methodology employed may be susceptible to response bias, where participants may provide socially desirable responses rather than accurate information. Lastly, language barriers and cultural nuances could impact the interpretation of survey questions, potentially influencing the validity of the results.

Moving forward, future research endeavors could address these limitations and contribute to a more comprehensive understanding of the challenges faced by e-sellers. Longitudinal studies are recommended to track changes in these challenges over time, providing insights into their evolving nature beyond the immediate aftermath of the Ukrainian war. Comparative analyses of other geopolitical conflicts can uncover commonalities and distinctive factors influencing e-sellers' experiences. Qualitative research methods, such as interviews or case studies, may complement quantitative data, offering a deeper understanding of the strategies employed by e-sellers. Exploring the impact of government policies and support measures during times of geopolitical unrest can also be a fruitful avenue for investigation. Moreover, investigating how e-sellers leverage technological advancements and exploring the impact of geopolitical events on consumer behavior represent promising areas for future research within the dynamic landscape of e-commerce.

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