

## The impact of the COVID-19 pandemic on relations in B2C markets from the point of view of selected buyer characteristics

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### Abstract

The Covid-19 pandemic is a phenomenon affecting many socio-economic processes. It also affects the personal sphere of people, which often determines the change in behaviour, attitudes and the structure of values. Consequently, this has an impact on the exchange processes and relations among market players. The situation makes it possible to study and model these processes and react to similar shock phenomena in the future. The main research, carried out by the research team, was aimed at, e.g. creating and verifying descriptors describing the category of a pandemic as an exogenous shock and a multidimensional structural model allowing to study the relationship between an exogenous variable and endogenous variables, concerning both individual and relational factors. The article presents partial results of these studies which concern the assessment of the impact of the exogenous variable, which is the COVID-19 pandemic, on e-commerce relations, taking into account the mediating variables such as gender, age and education. It was hypothesised that the pandemic positively stimulates the development of e-commerce relations and that gender, age and education are the factors that differentiate the impact of COVID-19 on e-commerce relations. The article presents partial results regarding the relationship between consumers and e-commerce market players. For this purpose, the SEM path analysis methodology was applied.

**Keywords:** COVID-19 pandemic, path analysis, e-commerce, market segmentation

### Purpose

The recent pandemic caused by the Sars-Cov2 virus has been a phenomenon often referred to as a shock for most societies in the world, with largely very negative consequences. The scale, pace and effects of the spread of this type of phenomenon are characterised by exogenous shock. Its exogeneity is mainly due to the source of origin, i.e. the natural environment and the way the virus is transmitted from natural systems to social ones. Natural phenomena themselves often have an unexpected and negative impact on human life, e.g. weather phenomena, volcanic eruptions, etc., consequences in relations between entities both in the social and economic spheres. For this reason, among others, the pandemic was a pretext for the research team to address the subject of exogenous shocks holistically, as it is one of the first examples on a global scale of such a wide impact of biological factors on various spheres of life, not only social or political but also economic. Paradoxically, the pandemic positively stimulates the development of e-commerce on the Polish market. The article aims to present the results of quantitative research analysis of one of the aspects of the impact of the COVID-9 pandemic on B2C relationships. In addition, an attempt was made to verify the assumptions that gender, age and education are factors that differentiate the impact of COVID-19 on relationships in e-commerce.

### Introduction

The concept of an exogenous shock is at the heart of the presented research. The PWN dictionary of the Polish language defines the word shock as "a strong, usually negative market reaction to some phenomenon or event", while the word exogenous means "coming from outside the organism, caused by external causes, affecting the Earth's crust from the outside." The concept of an exogenous shock can therefore be defined as "a violent and severe reaction to a phenomenon caused by external factors beyond our control" (Doroszewski, 2011). The very term shock, therefore, refers to any phenomenon that occurs unpredictably and suddenly, and causes significant, above-average effects (positive or negative) in the form of physical, mental, structural and institutional changes in the environment and human life. The term external shock is sometimes used interchangeably (Abere & Akinbobola, 2020).

The concept of exogenous shock is best known in connection with economic phenomena of a supranational nature (Malova, 2020), which trigger crises (Tang, 2010). According to Taleb, Krugman and Dornbusch, an exogenous shock is understood as unexpected and large changes in external factors that affect and influence internal factors (Karpavičius, 2012, s. 86).

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Nevertheless, the issue of exogenous shock itself is analysed in the area of many other scientific disciplines. The issue of shock is most often discussed in psychology (Brooks et al., 2020; Fiorillo & Gorwood, 2020; Sasaki et al., 2020), in culture and sociology (Furnham, 2019; Ward et al., 2020), in politics (Marangos, 2002; Margalit, 2019) and economics (del Rio-Chanona et al., 2020; McKibbin & Fernando, 2021; Sabyasachi Kar & B B Bhattacharya, 2011). As a result, any shock affects the behaviour of individuals and is frequently the cause of changes in attitudes and the structure of values (Bonetto et al., 2021; Wolf et al., 2020). In each of the above-mentioned cases, a shock or a shock situation usually leads to a crisis at the level of individuals, entities and social structures understood as a state of imbalance, breakdown, fluctuations, disturbances, etc. Therefore, the issue of a shock is broader than just economic and requires a more holistic approach. Its global nature, unpredictability, rapid spread and reaction of the international community certainly have the hallmarks of an exogenous shock (Kohlscheen et al., 2020; McKibbin & Fernando, 2021; Noy & Nualsri, 2007). Such situations of biological shocks on a global scale do not happen often, hence their uniqueness. Exogenous shocks have both positive and negative effects on development. Undoubtedly, they enforce adaptive changes, e.g. technological or structural changes in value chains as well as in competitive and cooperative mechanisms. This also applies to shocks caused by deliberate economic and political actions necessitating adaptation by entire markets or sectors of the economy. (Corbo et al., 2018).

This multidimensional aspect of the problem of exogenous shocks indicates the need to study this type of phenomenon, taking into account both their causes, but above all their impact on the behaviour and decisions of entities participating in the processes of production, exchange or consumption. Undoubtedly, the Covid-19 pandemic and the crisis caused by it have primarily demand and supply sources. This is manifested by a drop in demand and serious difficulties in the operation of logistics chains (Hayakawa & Mukunoki, 2021; Shih, 2020). In each of these areas, we deal with decisions related to restrictions on the part of citizens who play the role of consumers, clients, employees or employers. They are representatives of primary demand. The connections of various groups of individual entities in the networks of dependencies with economic and public entities generate several relations with specific properties. The appearance of a sudden shock situation usually disrupts these relationships.

Institutional conditions, including behavioural ones, are of key importance for the magnitude of the impact of a shock. These include the shape of the institutional matrix built on the composition of institutions (formal and informal) as well as relational and symbolic connections between the participants of the processes of creating and exchanging values (Plichta, 2019). Research confirms the effect of Covid-19 on anxiety and its relationship with behaviour and the tendency to panic (Nicomedes & Avila, 2020). The pandemic is also the cause of unconventional and panic shopping behaviour (Laato et al., 2020). Among other things, due to the fear of being infected, many buyers have changed the form of shopping into the online mode, which has resulted in the dynamic development of e-commerce.

It should be noted that the Polish e-commerce market was one of the fastest-growing in the world before the pandemic (in 2019, as many as 62% of people using the Internet declared online shopping). The most important factor influencing the choice of this form of shopping is 24/7 availability, but also convenient delivery methods (e.g. courier deliveries to the indicated address, parcel lockers) and modern payment methods, including BLIK, fast transfers or deferred payments ("E-commerce in Poland 2019. Gemius for e-Commerce Polska"). According to the PMR report, e-commerce in Poland in 2019 was worth over PLN 61 billion and accounted for almost 11% of the entire retail market. It is forecasted to reach almost 20% in 2025. ("E-commerce in Poland 2020. Analysis and development forecast for the e-commerce market for 2020-2025"). Considering safety, e-consumers are reassured that they will receive the desired goods, a safe product (e.g. packed in sterile conditions), they can choose a safe form of payment and delivery, and the possible return of the product will also be safe ("E-commerce in times of crisis" 2020). According to the Shopper report "Trade vs coronavirus - how sales moved to the Internet", in Poland in the first quarter of 2020, 5% to 23% more stores started operating online (mainly grocery stores; 18%). According to the "e-Commerce during the crisis 2020" report, in the face of the pandemic threat as many as 37% of the Poles said that online shopping is a safer form than the traditional one and that is why they opt for it. As many as 38% of the surveyed consumers purchased food, hygiene products and chemicals online during the quarantine period. They were largely middle-aged (35-44 years old).

There are many indications that the pandemic situation will strengthen the development of e-commerce in Poland and will change the shopping habits of the Poles ("e-Commerce during the 2020 crisis"). The growth of the e-commerce market in the future is to be supported by digital wallets, as the world's most popular online payment method, and the development of mobile and augmented reality technologies (FedEx 2021 Trade Trends Report). The conclusions of the ECB research suggest, among others, that the current situation will result in higher turnover in e-commerce and a wider use of digital technologies, which will increase productivity, but at the cost of a decline in employment in the longer term (ECB Report 2021).

## Methodology and Approach

The analyses presented in the article concern the assessment of the impact of the exogenous variable, i.e. the COVID-19 pandemic, on e-commerce relations, taking into account the moderating variables such as gender, age and education levels. The results of the analyses are a part of the main research carried out by the research team, under which, among others, the

descriptors describing the category of the pandemic as an exogenous shock were verified and a multidimensional structural model was created to study the relationship between the exogenous variable and endogenous variables, concerning both individual and relational factors.

To assess the impact of the exogenous variable, the impact of the covid shock expressed by descriptors on B2C relationships was analysed. In the process of implemented activities, the hypotheses were assessed, in which it was assumed that the pandemic positively stimulates the development of e-commerce and that gender, age and education are factors differentiating the impact of COVID-19 on relations in e-commerce.

The analyses were carried out based on the quantitative data obtained during the survey research. The CAWI questionnaire containing twenty-two questions was used as a measurement tool in this study, nine of which were covered by the record. A seven-point Likert scale was used to reflect the respondents' opinions on the statements in the formulated survey questions. The research was carried out on a representative research sample N = 578, randomly selected respondents according to the amounts taking into account the structure of sex, age and education.

To verify the hypotheses adopted in this article, an analysis of the structure of answers to the questions concerning the B2C relation and the multigroup linear PLSc model with a path inner weighting scheme was used. Descriptions of COV variables (exogenous and BUY descriptors - e-commerce relationships used in the theoretical model) and mediating variables are presented below.

(1) Pandemic Covid-19 variable (research abbreviation; analyzes performed: COV):

- A) COVID-19 is primarily a social distance, which means acceptance of limiting contacts between people;
- B) COVID-19 is primarily objects (e.g. dishes, door handles, etc.) that may be infected with the virus and contribute to its transmission;
- C) COVID-19 is primarily a large-scale disease outbreak that spreads rapidly and affects many people at the same time;
- D) COVID-19 is primarily contact tracing, i.e. recognising and monitoring people who may have come into contact with an infected individual, to control the spread of an infectious disease;
- F) COVID-19 is, first of all, a special law applied by the Government and other State authorities in an emergency to maintain public safety;
- G) COVID-19 is primarily self-isolation, i.e. conscious refraining from any contact with other people for a certain period (e.g. two weeks) during an infectious disease, usually by staying at home and also limiting contacts with family members;
- H) COVID-19 is primarily a lockdown. The term is now most commonly understood as "restricting the activities or communication of persons or the transport of goods to prevent the spread of the virus";
- I) COVID-19 is primarily "patient zero", the first documented case of infectious disease, a genetically transmitted condition, or a mutation in a population, region or family;
- J) COVID-19 is first and foremost a "superspreader", meaning "a person who is highly contagious and capable of transmitting an infectious disease to an unusually large number of other uninfected people";
- K) COVID-19 is primarily contagious, understood as transmission of the virus through direct or indirect contact with an infected person and infectivity that causes or may cause infection;
- L) COVID-19 is primarily a virus that can grow and multiply only in living cells, causing various serious human diseases.

(2) Variable regarding the relationship between consumers and entities operating in e-commerce containing a list of statements concerning various opinions on making purchases and communicating remotely (on-line) during the COVID-19 pandemic, according to the adopted 7-point scale (designation in tests, conducted analyses: "BUY").

- A) During a pandemic, I shop online more than before;
- B) During a pandemic, I buy more online than I do traditionally;
- C) Thanks to the Internet, during a pandemic, I make purchases faster and more efficiently than in the traditional offline way;
- D) During a pandemic, I become more attached to companies (brands) and places (websites) and shopping online than before;
- E) During a pandemic, I have more time to obtain information about goods and services than before;
- F) During a pandemic, the Internet is a safer form of contact with sellers, suppliers of goods and services (e.g. text, voice, video communication) than in the case of traditional, direct forms of offline communication;
- G) During a pandemic, the Internet allows me to better adjust the time (time of the day, day of the week) in which I can make purchases than in the case of traditional, direct forms of offline communication and contact;
- H) During a pandemic, the Internet allows me to verify more information (including this about goods and services) compared to direct contact in an offline store;
- I) During the pandemic, the Internet and mobile phones are a better form of shopping than traditional offline shopping;
- J) In the future, I will use the Internet more often than before when shopping for goods and services.

Three moderating variables were used in the path model: gender (nominal scale) and age as well as education (ordinal scale); i.e.:

Moderating variable: gender: (1) female (2) male

Moderating variable: age levels: (a) 18-24 (b) 25-34 (c) 35-49 (d) 50-64 (e) 65 and more

Moderating variable: education levels: (a) primary (b) lower secondary (c) basic vocational (d) secondary (e) higher

## Findings

### *Evaluation of COVID and BUY measurement scales*

Because the proposed Author’s scale depicts the various aspects of the COV scale from a concept - by - postulation with formative rather than reflective indicators, the confirmatory component analysis was also used to verify that hypothesis concerning the formative nature of the COV items and reflective in the case of the BUY scale (Schubert et al 2018). Table 1 shows the indices of measurement quality (VIF) of the COV formative component.

**Table 1. Variance inflation factors of COV index**

Construct COV	A	B	C	D	E	F	G	H	I	K	L
VIF	2.25	2.11	2.62	1.99	1.80	2.47	2.22	2.32	2.67	2.90	2.21

Source: own elaboration

The collinearity of the formative component of COV is measured by a variance inflation factor (VIF). All of the items collinearity is low and below the threshold of 5, which indicates sufficient collinearity of the formative items. In the overall evaluation of latent variable BUY, a confirmatory composite factor model has been used. Factor loadings and goodness of fit indices of the unidimensional BUY scale is presented in Table 2.

**Table 2. Loadings of BUY scale**

Item	Loading
Buy 6A	0.912
Buy 6B	0.791
Buy 6C	0.799
Buy 6D	0.758

Source: own elaboration

For reflective construct BUY several reliability indices, like Cronbach’s alpha, congeneric weighted reliability (Dijkstra-Henseler’s Rho), congeneric reliability (RhoC) and tau-equivalent reliability (RhoT) are presented in Table 3. The average variance extracted (AVE) shows how much of the variation of its indicators is due to the assumed latent variable.

**Table 3. Reliability indicators of BUY scale**

Construct	AVE	Cronbach’s alpha	Dijkstra-Henseler’s Rho	RhoC	RhoT
BUY	0.668	0.888	0.893	0.888	0.888

Source: own elaboration

All scale reliability indices are acceptable given the threshold of acceptance to be 0.7. The overall goodness of fit of the confirmatory composite factor model is presented in Table 4.

**Table 4. Model goodness of fit**

Fit measure	Value	Critical value
Geodesic distance dG	0.090	0.07
Squared Euclidean distance dL	0.106	0.07
ML distance dML	0.475	0.39
Chi Square	273.955	-
DF	35	-
Chi Square/df	7.827	-
CFI	0.956	-
CN	105.892	-

GFI	0.906	-
IFI	0.956	-
NFI	0.950	-
NNFI	0.866	-
RMSEA	0.108	-
RMS theta	0.046	-
SRMR	0.030	0.02

Source: own elaboration

Based on the dG, dL and dML distance measures, the hypothesis that the model implied covariance matrix equals the population indicator covariance matrix should be rejected. Furthermore, RMSEA is far below acceptance (0.08 for approximate fit). On the other hand, the incremental fit indices show the acceptable fit of the model.

The analysis of relationships between COV and BUY involves gender, age and education as grouping/moderator variables. The impact of the covid shock on the strength of e-commerce relationships may be different within gender, age and education.

**Covid impact on e-commerce relationships among males and females.**

The disattenuated parameters of the multigroup linear PLSc model with path inner weighting scheme are presented in Table 5.

**Table 5. Parameters of the model with gender as a grouping variable**

Model: BUY is regressed on COVID	Parameter estimate	Standard deviation	Parameter bias	95% L C.I.	95% U C. I	R <sup>2</sup>	Cohen's f <sup>2</sup>
Females	0.454	0.051	0.045	0.264	0.465	0.168	0.202
Males	0.390	0.058	0.087	0.102	0.328	0.092	0.100

Source: own elaboration

Both among males and females, the relationships between the COVID shock and e-commerce relationships are significant, although slightly stronger relationships can be observed in the female group.

The assessment of multi-group composite measurement invariance was done without BUY6A item which standardized factor loading in the first group was inadmissible >1. Test for measurement invariance is based on Henseler (Henseler et al., 2016) three-step procedure to assess measurement invariance of composite models (MICOM test). The three-step procedure involves measurement of configural, composite invariance and mean-and-variances equality. The configural invariance was based on the identity of indicators per measurement model, data treatment and algorithm settings. The analysis of compositional invariance is related to equality of correlation between the composite scores using the weights as obtained from the first group and the composite scores using the weights as obtained from the second group:

$$c = cor(\xi^{(1)}, \xi^{(2)}) = cor(Xw^{(1)}, Xw^{(2)}). \tag{1}$$

The compositional measurement invariance of the constructs is tested under the null hypothesis that c=1. Test partial rather than full measurement invariance stems from the fact that under partial invariance the standardised path coefficients can be compared across groups.

The heterogeneity across groups was tested using Klesel's geodesic distance test (d<sub>G</sub> test) (Klesel et al., 2019). Klesel's test uses the distances between the indicator model-implied correlation matrices across groups. The geodesic distance between the group's model-implied correlation matrices is calculated as:

$$d_G = \frac{1}{2} \sum_{i=1}^K \ln(\phi_i)^2 \tag{2}$$

where  $\phi_i$  is the i-th eigenvalue of the matrix  $\Sigma(\theta_1)^{-1}\Sigma(\theta_2)$  and K is the number of rows of the matrix. When the two matrices are equal, the geodesic distance is zero because all eigenvalues of a unit matrix are one. To assess the heterogeneity across groups, the null hypothesis about equality of matrices and zero geodesic distance should be rejected.

The result of the partial measurement invariance check and multigroup heterogeneity test is shown in Table 6.

**Table 6. Partial invariance analysis – gender**

Compared groups: females to males	Test statistics	P-value
COVID	0.769	0.799
BUY	0.996	0.754
dG test for multigroup differences	0.236	0.186

Source: own elaboration

To summarise the results of the analysis, the positive relationships between COV and BUY can be observed, measurement invariance is held removing non-invariant item BUY6A from the scale. However, the groups appear to be homogeneous (insignificant dG test).

**Covid impact on e-commerce relationships among education classes.**

The disattenuated parameters of the multi-group linear PLSc model within education levels with path inner weighting scheme are presented in Table 7.

**Table 7. Parameters of the model with education as a grouping variable**

Model: BUY is regressed on COVID	Parameter estimate	Standard deviation	Parameter bias	95% L C.I.	95% U C. I	R <sup>2</sup>	Cohen's f <sup>2</sup>
Secondary education or lower	0.413	0.057	0.051	0.199	0.424	0.131	0.151
Higher education	0.421	0.055	0.065	0.183	0.398	0.126	0.145

Source: own elaboration

Both among the respondents with secondary or lower education level and higher education, the relationships between the COVID shock and e-commerce relationships are significant, although slightly stronger relationships are observed among respondents with higher education levels.

The assessment of multi-group composite measurement invariance in education classes is valid for complete sets of items. The result of the bootstrapped measurement invariance check and multi-group comparison is given in Table 8. Test for measurement invariance is based on Henseler (Henseler et al., 2016) that the null hypothesis that compositional measurement invariance of the constructs is valid.

**Table 8. Partial invariance analysis – education**

Compared groups: females to males	Test statistics	P-value
COVID	0.786	0.808
BUY	0.996	0.164
dG test for multigroup differences	0.248	0.098

Source: own elaboration

To summarise the results of the analysis, the positive relationships between COV and BUY is observed both in secondary and higher education class and tests of measurement invariance are valid across the compared group. The groups seem to be homogeneous (insignificant dG test).

**Covid impact on e-commerce relationships among age groups**

The disattenuated parameters of the multi-group linear PLSc model within age levels with path inner weighting scheme are presented in table 9.

**Table 9. Parameters of model with age as a grouping variable**

Model: BUY is regressed on COVID	Parameter estimate	Standard deviation	Parameter bias	95% L C.I.	95% U C. I	R <sup>2</sup>	Cohen's f <sup>2</sup>
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Age 18-24	0.239	0.556	-0.108	-0.634	1.546	0.121	0.137
Age 25-34	0.639	0.063	0.064	0.387	0.634	0.331	0.495
Age 35-44	0.531	0.073	0.074	0.239	0.526	0.209	0.264
Age 45-54	0.585	0.072	0.080	0.282	0.568	0.255	0.342
Age 55 and above	0.495	0.097	0.093	0.118	0.498	0.161	0.192

Source: own elaboration

The parameter estimates among age groups are relatively similar and reveal the strong and positive relationships between COVID and e-commerce relations. The path parameter is insignificant for the youngest age group (no relationship between covid and e-commerce relationship in age 18-24).

The assessment of multi-group composite measurement invariance in age classes is valid for complete sets of items except (removed) BUY6A item. The result of the bootstrapped measurement invariance check and multi-group comparison is presented in Table 10.

**Table 10. Partial invariance analysis - age**

Compared groups	Test statistics - c	P-value
Age0-Age1		
COVID	0.200	0.174
BUY	0.992	0.087
Age0-Age2		
COVID	0.403	0.482
BUY	0.996	0.294
Age0-Age3		
COVID	0.119	0.183
BUY	0.995	0.216
Age0-Age4		
COVID	0.468	0.651
BUY	0.995	0.238
Age1-Age2		
COVID	0.746	0.954
BUY	0.999	0.551
Age1-Age3		
COVID	0.453	0.509
BUY	0.999	0.661
Age1-Age4		
COVID	0.653	0.826
BUY	0.999	0.518
Age2-Age3		
COVID	0.221	0.142
BUY	0.999	0.945
Age2-Age4		
COVID	0.474	0.514
BUY	0.999	0.872
Age3-Age4		
COVID	0.161	0.160
BUY	0.999	0.927
dG test for multigroup differences	1.558	0.000

Source: own elaboration

To summarise the results of the analysis, the positive relationships between COV and BUY can be observed in all age groups. Geodesic distance tests reject the hypothesis of homogeneity of the age groups (age groups are heterogeneous).

## Discussion

The results and conclusions presented in the article as well as the verified research theses are an extension of the research and research problems recently published in many journals. The impact of the Covid-19 pandemic on the development of e-commerce and m-commerce is unambiguous and clear (Bhatti et al., 2020; Donthu & Gustafsson, 2020; Dumanska et al.,

2021) and is correlated with many economic and social phenomena (*E-Commerce in the Time of COVID-19 - OECD*, 2020; *Socio-Economic Impact of COVID-19 | United Nations Development Programme*, 2020; Tran et al., 2020). This also applies to the mental aspects of anxiety states, insecurity feelings and panic attacks, which in the short and long term will have an impact on changing not only behaviour but also the attitudes and structure of the value of entities (Ahn et al., 2020; Akhtar et al., 2020; Sasaki et al., 2020; Szymkowiak et al., 2021). The article presents only a part of a wider project in which attention was drawn to the direction of research on the causes of such behaviours as a response to exogenous shocks. A new and valuable aspect was the linking of descriptors describing the Covid-19 pandemic with the impact on the relationship between consumers and e-commerce entities. It allowed delving deeper into the ways of perceiving phenomena and the reactions they cause.

## Conclusion

The hypotheses presented in the article about the positive impact of the Covid-19 pandemic on B2C relationships and the differentiated impact of the pandemic on B2C relationships in terms of gender, age and education were mostly positively verified. The relationships between the COVID shock and e-commerce relationships, taking into account gender, are significant, although the slightly stronger relationships can be observed in the female group. Both among the respondents with secondary or lower education level as well as higher education, the relationships between the COVID shock and e-commerce relationships are significant, although a slightly stronger relationships can be observed among the respondents with higher education level. A positive relationships between COV and BUY is observed both in secondary and higher education class and tests of measurement invariance are valid across the compared group. The groups seem to be homogeneous. The parameter estimates among the age groups are relatively similar and reveal the strong and positive relationships between COVID and e-commerce relations. The path parameter is insignificant for the youngest age group (no relationship between covid and e-commerce relationship in age 18-24).

The obtained results indicate not only the positive impact of the exogenous shock of the Covid-19 pandemic on the development of e-commerce but also the diversified impact of various market segments on this process. The key result of the conducted research and analyses is the postulate of including the shock variable to the set of buyer segmentation criteria as an important criterion for their differentiation. This creates great opportunities for building a communication strategy and relationship management for companies from the e-commerce sector.

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## References

- Abere, S. S., & Akinbobola, T. O. (2020). 'External Shocks, Institutional Quality, and Macroeconomic Performance in Nigeria'. *SAGE Open*, 10(2), 2158244020919518. <https://doi.org/10.1177/2158244020919518>
- Ahn, M. H., Lee, J., Suh, S., Lee, S., Kim, H. J., Shin, Y.-W., & Chung, S. (2020). Application of the Stress and Anxiety to Viral Epidemics-6 (SAVE-6) and Coronavirus Anxiety Scale (CAS) to Measure Anxiety in Cancer Patient in Response to COVID-19. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.604441>
- Akhtar, N., Iqbal Siddiqi, U., Usman, M., & Ali, M. (2020). COVID-19 restrictions and consumers' psychological reactance toward offline shopping freedom restoration. *Service Industries Journal*, Accepted. <https://doi.org/10.1080/02642069.2020.1790535>
- Bhatti, A., Akram, H., Basit, H., Khan, A., Mahwish, S., Naqvi, R., & Bilal, M. (2020). E-commerce trends during COVID-19 Pandemic. *International Journal of Future Generation Communication and Networking*, 13.
- Bonetto, E., Dezechache, G., Nugier, A., Inigo, M., Mathias, J.-D., Huet, S., Pellerin, N., Corman, M., Bertrand, P., Raufaste, E., Streith, M., Guimond, S., Sablonnière, R. de la, & Dambrun, M. (2021). 'Basic human values during the COVID-19 outbreak, perceived threat and their relationships with compliance with movement restrictions and social distancing'. *PLOS ONE*, 16(6), e0253430. <https://doi.org/10.1371/journal.pone.0253430>
- Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). 'The psychological impact of quarantine and how to reduce it: Rapid review of the evidence'. *The Lancet*, 395(10227), 912–920. [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8)



- Corbo, L., Pirolo, L., & Rodrigues, V. (2018). 'Business model adaptation in response to an exogenous shock: An empirical analysis of the Portuguese footwear industry'. *International Journal of Engineering Business Management*, 10, 1847979018772742. <https://doi.org/10.1177/1847979018772742>
- Del Rio-Chanona, R. M., Mealy, P., Pichler, A., Lafond, F., & Farmer, J. D. (2020). 'Supply and demand shocks in the COVID-19 pandemic: An industry and occupation perspective'. *Oxford Review of Economic Policy*, 36(Supplement\_1), S94–S137. <https://doi.org/10.1093/oxrep/graa033>
- Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research*, 117, 284–289. <https://doi.org/10.1016/j.jbusres.2020.06.008>
- Doroszewski, W. (2011). *Słownik języka polskiego*. PWN.
- Dumanska, I., Hrytsyna, L., Kharun, O., & Matviiets, O. (2021). E-commerce and M-commerce as Global Trends of International Trade Caused by the Covid-19 Pandemic. *WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT*, 17, 386–397. <https://doi.org/10.37394/232015.2021.17.38>
- *E-commerce in the time of COVID-19—OECD*. (2020). <https://read.oecd-ilibrary.org>
- Fiorillo, A., & Gorwood, P. (2020). 'The consequences of the COVID-19 pandemic on mental health and implications for clinical practice'. *European Psychiatry*, 63(1), e32. <https://doi.org/10.1192/j.eurpsy.2020.35>
- Furnham, A. (2019). 'Culture Shock: A Review of the Literature for Practitioners'. *Psychology*, 10(13), 1832. <https://doi.org/10.4236/psych.2019.1013119>
- Hayakawa, K., & Mukunoki, H. (2021). 'Impacts of COVID-19 on Global Value Chains'. *The Developing Economies*, 59(2), 154–177. <https://doi.org/10.1111/deve.12275>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). 'Testing measurement invariance of composites using partial least squares'. *International Marketing Review*, 33(3), 405–431. <https://doi.org/10.1108/IMR-09-2014-0304>
- Klesel, M., Schubert, F., Henseler, J., & Niehaves, B. (2019). 'A test for multigroup comparison using partial least squares path modeling'. *Internet Research*, 29(3), 464–477. <https://doi.org/10.1108/IntR-11-2017-0418>
- Kohlscheen, E., Mojon, B., & Rees, D. (2020). 'The Macroeconomic Spillover Effects of the Pandemic on the Global Economy'. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3569554>
- Laato, S., Islam, A. N., Farooq, A., & Dhir, A. (2020). 'Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach'. *Journal of Retailing and Consumer Services*, 57, 102224.
- Malova, A. (2020). Climate Congress 2019: 'Global warming and the role of exogenous shocks in enhancing international cooperation: Are we there yet'. University of Glasgow, Scotland. *Journal of Coastal Zone Management*, 2.
- Marangos, J. (2002). 'The Political Economy of Shock Therapy'. *Journal of Economic Surveys*, 16(1), 41–76. <https://doi.org/10.1111/1467-6419.00159>
- Margalit, Y. (2019). 'Political Responses to Economic Shocks'. *Annual Review of Political Science*, 22(1), 277–295. <https://doi.org/10.1146/annurev-polisci-050517-110713>
- McKibbin, W., & Fernando, R. (2021). 'The Global Macroeconomic Impacts of COVID-19: Seven Scenarios'. 43.
- Nicomedes, C. J. C., & Avila, R. M. A. (2020). 'An analysis on the panic during COVID-19 pandemic through an online form'. *Journal of Affective Disorders*, 276, 14–22. <https://doi.org/10.1016/j.jad.2020.06.046>
- Noy, I., & Nualsri, A. (2007). *What do exogenous shocks tell us about growth theories?* (No. 07-16). Working Paper.
- Plichta, G. (2021). 'Trust as a Factor of E-Commerce Development and Building Relationship in the B2C Sector in the Situation of an Exogenous Shock' [in:] BUSINESS DEVELOPMENT IN DIGITAL ECONOMY AND COVID-19 CRISIS, red. J. Nesterak, B. Ziębicki, Warsaw, Institute of Economics Polish Academy of Science; 155-166

- Plichta, J. (2019). 'Koszty transakcyjne w procesach współtworzenia wartości przez konsumentów'. *Zeszyty Naukowe/Uniwersytet Ekonomiczny w Krakowie. Seria Specjalna, Monografie*, 264.
- Report from the research (2019). 'E-commerce w Polsce 2019. Gemius dla E-Commerce Polska'. Report from the research conducted by Gemius in cooperation with the Chamber of Digital Economy.
- Report from the research (2020). 'E-Commerce w czasie kryzysu 2020'. A report ordered by the Chamber of Digital Economy.
- Report from the research (2020). 'E-commerce w czasach kryzysu'. Iab Polska, Warszawa. Access 15 April 2021 from <https://www.iab.org.pl/baza-wiedzy/e-commerce-w-czasach-kryzysu>.
- Report from the research (2020). 'Handel vs koronawirus: Jak sprzedaż przeniosła się do Internetu' Access 18 April 2021r. from <https://www.shoper.pl/blog/handel-vs-koronawirus-jak-sprzedaz-przeniosla-sie-do-internetu>.
- Report from the research (2020). 'Handel internetowy w Polsce 2020. Analiza i prognoza rozwoju rynku e-commerce na lata 2020-2025'.PMR. Access 20 April 2021 from <https://mypmr.pro/products/handel-internetowy-w-polsce-2020>.
- Report from the research (2021). 'Raport EBC za rok 2020'. Access 20 April 2021 from <https://www.ecb.europa.eu/pub/annual/annual-accounts/html/ecb.annualaccounts2020~0508aea2f9.pl.html>.
- Report from the research (2021). 'FedEx 2021 Raport Trade Trends'. Access 20 April 2021 from [https://www.fedex.com/content/dam/fedex/eu-europe/campaigns/h1-2020/trends-report/fedex\\_trade\\_trends\\_report\\_pl-pl.pdf](https://www.fedex.com/content/dam/fedex/eu-europe/campaigns/h1-2020/trends-report/fedex_trade_trends_report_pl-pl.pdf)
- Sabyasachi Kar & B B Bhattacharya. (2011). 'Shocks, Economic Growth and the Indian Economy' (Issue id:4319). eSocialSciences. <https://ideas.repec.org/p/ess/wpaper/id4319.html>
- Sasaki, N., Kuroda, R., Tsuno, K., & Kawakami, N. (2020). 'Workplace responses to COVID-19 associated with mental health and work performance of employees in Japan'. *Journal of Occupational Health*, 62(1), e12134. <https://doi.org/10.1002/1348-9585.12134>
- *Socio-economic impact of COVID-19 | United Nations Development Programme*. (2020). UNDP. <https://www.undp.org/coronavirus/socio-economic-impact-covid-19>
- Shih, W. C. (2020, September 1). 'Global Supply Chains in a Post-Pandemic World'. *Harvard Business Review*. <https://hbr.org/2020/09/global-supply-chains-in-a-post-pandemic-world>
- Szymkowiak, A., Gaczek, P., Jeganathan, K., & Kulawik, P. (2021). The impact of emotions on shopping behavior during epidemic. What a business can do to protect customers. *Journal of Consumer Behaviour*, 20(1), 48–60.
- Tang, F.-F. (2010). Reinhard Selten Labs, Bounded Rationality and China. In *The Selten School of Behavioral Economics* (pp. 33–49). Springer Science  $\text{\$}\text{\$}$  Business Media. [http://dx.doi.org/10.1007/978-3-642-13983-3\\_5](http://dx.doi.org/10.1007/978-3-642-13983-3_5)
- Tran, B. X., Nguyen, H. T., Le, H. T., Latkin, C. A., Pham, H. Q., Vu, L. G., Le, X. T. T., Nguyen, T. T., Pham, Q. T., Ta, N. T. K., Nguyen, Q. T., Ho, C. S. H., & Ho, R. C. M. (2020). Impact of COVID-19 on Economic Well-Being and Quality of Life of the Vietnamese During the National Social Distancing. *Frontiers in Psychology*, 11, 2289. <https://doi.org/10.3389/fpsyg.2020.565153>
- Ward, C., Bochner, S., & Furnham, A. (2020). 'The Psychology of Culture Shock' (2nd ed.). Routledge. <https://doi.org/10.4324/9781003070696>
- Wolf, L. J., Haddock, G., Manstead, A. S. R., & Maio, G. R. (2020). 'The importance of (shared) human values for containing the COVID-19 pandemic'. *British Journal of Social Psychology*, 59(3), 618–627. <https://doi.org/10.1111/bjso.12401>