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## **DIGITAL COMMUNICATION CHANNELS IN EXPORT TRANSACTIONS OF POLISH ENTERPRISES IN THE CONDITIONS OF THE COVID-19 PANDEMIC<sup>1</sup>**

### **Summary**

*Purpose* – The article aims to identify the relationship between the communication shock caused by the COVID-19 pandemic, the digitalization of communication channels in the transaction process, and the exports of Polish enterprises.

*Research method* – The following methods are used: descriptive statistics, correlation analysis, and non-parametric one-way analysis of variance (Kruskal-Wallis test) based on data from a diagnostic survey conducted on a representative sample of Polish exporters.

*Results* – The communication shock caused by the restriction of face-to-face meetings with foreign counterparties had, among many factors, the most negative impact on Polish enterprises' export transaction opportunities during the pandemic. However, hypotheses that there are relationships between export performance, export opportunities and the use of digital communication channels, and the digitalization of communication under pandemic conditions were rejected. The absence of such relationships refers to Solow's paradox of the lack of efficiency effects of digital technologies implementation.

*Originality/value/implications/recommendations* – Conclusions enhance knowledge of the digitalization of international economic transactions, and in particular, the efficiency of the utilization of digital communication channels in export transactions under pandemic conditions.

**Keywords:** international transactions, digitalization, communication channels, exports, COVID-19 pandemic, Polish enterprises.

**JEL classification:** F10, F23, O30

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## 1. Introduction

The outbreak of the COVID-19 pandemic took place in the conditions of high-degree globalization of the world economy and, at the same time, ongoing digital transformation. This had multidirectional consequences for the course of the pandemic and its effects. Social distancing and lockdowns have been implemented on a large scale in most developed countries as part of managing the health crisis. Consequently, enterprises suddenly faced the need to limit direct contact with contractors. Therefore, the pandemic would cause not only a demand and supply shock but also a communication shock, significantly affecting international trade. In these conditions, there is a sudden increase in the utilization of digital technologies (ICT). Their broad functionality and communication capabilities become particularly valuable. Thanks to the use of digital tools, it is possible, in many cases, to continue the business activity and reduce the adverse effects of the pandemic [Abidi et al., 2022]. This drives digitalization, although some factors also inhibit this process [Amankwah-Amoah et al., 2021].

Despite intense research on the consequences of the COVID-19 pandemic, the existence of the relationship between digitalization and concluding export transactions in the conditions of communication shock has not yet been verified. Analyzes of the impact of the pandemic on international trade focus on aggregated macroeconomic and sectoral results [*International trade...*, 2022; Aiyar et al., 2022; Jean, 2020; *Impact of...*, 2021]. Research on the use of selected digital tools in promotion and sales by Polish exporters during the pandemic was, to some extent, conducted by the Polish Economic Institute [Ambroziak et al., 2022, pp. 24–25].

The article aims to identify the relationship between the communication shock caused by the pandemic, the digitalization of communication channels in the transaction process, and the exports of Polish enterprises. This objective consists of three specific goals:

1. identifying the scale of the communication shock caused by the pandemic in export activity;
2. determining the correlation between export performance and opportunities during the pandemic and the use of digital communication channels in the transaction process;
3. determining the impact of the digitalization of communication channels caused by the pandemic on the export opportunities of enterprises.

The analysis is conducted based on the data from a direct survey of Polish exporters carried out on a representative sample in July 2021. The study used

a literature review, methods of descriptive statistics, correlation analysis, and non-parametric one-way analysis of variance (Kruskal-Wallis test). The following parts of the article contain a literature review and research hypotheses, a description of data and research methods, research results, and a summary in which conclusions are drawn, and a discussion is carried out.

## 2. Literature review and research hypotheses

The pandemic, in addition to the widely reported supply and demand shock [Cerdeiro, Komaromi, 2022; Espitia et al., 2021; Baldwin, Tomiura, 2020; Brinca et al., 2020; Sadler, 2022] also caused a communication shock. The latter is understood as a sudden disruption of direct social contact resulting from the restrictions introduced at the borders, the obligation to maintain social distance, wear masks and stop international transport connections. This limited the possibilities to travel, organize meetings and participate in business events. Therefore, the pandemic has significantly hindered, and in some periods even banned, face-to-face (F2F) interpersonal communication, which naturally takes place in conditions of the physical presence of the parties in one place and time [Mheidly, 2020]. However, unlike the demand and supply shock, the communication shock is rarely taken up in economic research.

The smallest element of economic activity is the transaction, which includes the exchange of products and all communication and interactions between the parties to the contract [Suematsu, 2014]. Social communication is therefore an essential component of the transaction process, but it also generates costs [Fink et al., 2005]. The theory of transaction costs states that they are ex-ante costs that arise while concluding a contract [Williamson, 2008].

The digital revolution has dramatically increased the possibilities and reduced communication costs. The primary digital communication channels currently include:

- telephone communication, which is also based on digital technologies that enrich connections with additional functions and, at the same time, reduce the costs of its use (e.g., VoIP telephony) [Jalendry, Verma, 2015];
- electronic mail (e-mail);
- instant messengers;
- interface communication systems, providing a brand new trade channel called e-commerce.

The most comprehensive and self-service digital tool used in concluding commercial transactions are e-commerce platforms. It is the software specially

dedicated to sales, consisting of a computer system automatically communicating with a person through an interface. Even in the early approaches to e-commerce, it was indicated that it is to provide access to information necessary to conclude a transaction, build and/or maintain business relationships and conclude the contract itself [Zwass, 1996].

However, digitalization, ongoing for many years, has been accompanied by a growing number of face-to-face international meetings [ICCA Statistics..., 2020], and interpersonal communication has dominated the activities of business entities. It was only the pandemic outbreak that changed the situation dramatically, affecting, among others, the increase in commercial costs [Benz et al., 2020]. According to the international research by Gartner [*Effective Meetings...*, 2021], the time-share spent by employees in face-to-face meetings dropped from 63% in 2019 to 33% in 2021 and, at the same time, the time-share spent on remote meetings, including audio (from 18% to 27%) and audio-video (from 19% to 41%), increased.

Furthermore, international transactions bear greater risk than domestic ones which is related to the possibility of using institutional mechanisms for enforcing contracts, and therefore reputation and trust are more important. From this point of view, effective communication is essential in the transaction process. Not only does it ensure a cheap flow of information but also builds trust and relationships.

Many researchers consider F2F interpersonal communication the primary, most natural, or even the only form of social communication [Fleischer, 2012; Laskowski, 2010]. Other indirect forms stem from it. Such an intermediary in communication can be a letter, telephone, or Internet. Concerning the social presence theory, F2F communication has the highest level of social presence and facilitates building trust [Kupritz, Cowell, 2011]. Similarly, from the media richness theory perspective, F2F communication is the best one [Trevino et al., 1987].

In this situation, the question arises about the importance and efficiency of digital-based communication forms in concluding export transactions and the willingness to adapt these forms in the communication shock conditions caused by the pandemic. Previous studies on the economic consequences of ICT use broadly confirm their positive impact on international trade development, including the participation of enterprises from developing countries [Maurseth, Medin, 2019; Wang, Choi, 2019]. Numerous studies also confirm the impact of ICT use on reducing the pandemic's adverse effects due to facilitating entities' functioning in conditions of limited direct contact [Pierri, Timmer, 2020; Katz et al., 2020].

Based on a review of studies, reflections on the specificity of Internet-based forms of communication by Coughlan et al. [2007] create a relatively positive

picture of their efficiency. However, certain conditions are also formulated to obtain proper effects of their use, e.g., the need to utilize these tools properly. In turn, the analysis by Kupritz and Cowell [2011] drew attention to the dependence of the efficiency of online communication forms on the nature or characteristics of the transmitted information, e.g., in the case of confidential, sensitive content, F2F communication is critical. This approach to the features of individual communication channels is also adopted by Standaert et al. [2021], pointing to the dependence of the efficiency of contact forms on the purposes for which they are to be used, and these are different and may include, for example, routine transfer of information or building relationships. In turn, Karl et al. [2022], examining the forms of communication between employees within the organization during the pandemic, presented conclusions about diverse perceptions and preferences in use of these forms by employees, but also, to a certain extent, their ignorance of these tools. There are also studies showing that digital technologies have failed to eliminate barriers to F2F communication [Tanaka, 2022]. It should be noted that the means of communicating and concluding transactions is only one of many factors determining the export opportunities of enterprises. The literature [Sousa et al., 2008] indicates at least 40 different determinants of export performance, of which 31 are internal (e.g., size of enterprise, experience in international operations, competence, operational flexibility), and the remaining nine are external factors (e.g., legal regulations, cultural similarity, access to a foreign market, administrative support). Internal factors are explained primarily on the ground of the resource-based view, and external factors are embedded in the contingency theory.

To sum up, the communication shock caused by the COVID-19 pandemic happened in the conditions of the ongoing digitalization process, although direct F2F communication still played a dominant role. Restrictions in interpersonal contacts increased transaction costs and the capabilities for concluding export transactions. In this situation, ICT use should be of great importance. Their primary functionality includes communication and access to information necessary for the transaction process. Thus, digital communication channels can solve the problems caused by the communication shock and mitigate the economic costs of the pandemic but their efficiency has not yet been clearly defined, particularly in concluding export transactions. This is a research gap to be bridged by this study.

Considering that the pandemic has caused a communication shock, the effects of which on export transactions may vary depending on the degree of digitalization of communication channels in individual enterprises, and depending on the commu-

nication adjustment measures implemented, the export opportunities of enterprises may also vary in these conditions, the following research hypotheses were posed:

H1. The pandemic-driven communication shock had a negative impact on the opportunities for concluding export transactions.

H2. The impact of the pandemic on the value of export transactions depends on the utilization degree of digital communication channels.

H3. Export opportunities during the pandemic depend on the utilization degree of digital communication channels.

H4. Export opportunities during the pandemic depend on the digitalization of communication channels expressed by the increased use of instant messengers.

### 3. Research data and methods

The hypotheses were verified based on data from the diagnostic poll. The survey was conducted using the CATI (computer-assisted telephone interview) with a standardized questionnaire. The target population consisted of Polish exporting enterprises, i.e., all entities selling goods and/or services to foreign markets, including the EU countries. The survey was conducted on a representative sample of 350 enterprises selected at stratified random. The stratifying variables are the size of entities measured by the number of employees and the main type of business activity determined based on the Polish Classification of Activities (PKD). The exact characteristics of the sample are presented in Table 1. The sample distribution was assessed based on two data sources, i.e., data from the Statistics Poland (GUS) (*Miesięczna informacja o podmiotach gospodarki narodowej w rejestrze REGON z kwietnia 2021r*) in terms of the number of enterprises meeting the indicated assumptions (PKD, size of entity), which was compared to the proportion of export enterprises, calculated as a percentage of enterprises determined based on the Polish Dun & Bradstreet (formerly Bisnode) Database.

The questions in the questionnaire had been constructed in a way that allowed the authors to obtain relevant information regardless of the nature of the business activity conducted by the enterprise. First, a pilot survey was carried out on a sample of 35 respondents. As a result, minor modifications were introduced to the questionnaire questions, and a few instructions were issued to interviewers. The proper survey was carried out in July 2021. The respondents had the most extensive knowledge about sales to foreign markets in a given company.

TABLE 1

**Distribution of the research sample of Polish exporters over stratification variables: size of enterprise (number of employees), the main type of economic activity (n = 350)**

Type of economic activity	Size of enterprise				Total
	0–9	10–49	50–249	250+	
Manufacturing (sections B-C of PKD)	50	42	39	15	146
Wholesale trade (section G, chapter 45–46)	79	24	7	2	112
Retail trade (section G, chapter 47)	16	3	1	1	21
Service activities (sections F, H, J, M, R, S)	31	7	32	1	71
Total	176	76	79	19	350

Source: author's own elaboration.

The following dependent variables were selected for the statistical verification of hypotheses H2–H4: changes in the value of export transactions caused by the pandemic (*export performance* variable) and export opportunities during the pandemic (*export opportunities* variable). Independent variables were determined by the importance of using the following channels of communication with a foreign contractor/customer in the process of concluding export transactions: direct meetings (in one place and time) (*F2F* variable); phone calls (*phone* variable); e-mail communication (*e-mail* variable); remote interactions via instant messengers, e.g., WhatsApp, WeChat, Skype (*chat* variable); e-commerce, i.e., the availability of an electronic form that allows users to place an order on their own (*e-commerce* variable) and digitalization of communication channels, which was expressed in the increase in the use of instant messengers (*digitalization* variable).

The analyzed variables are ordinal and measured on a Likert scale. Appropriate non-parametric methods were selected for their analysis. Descriptive statistics uses position measures. In the correlation analysis, Kendall's tau correlation coefficient was employed, which measures the strength and direction of the rank relationship, taking values in the range  $<-1, 1>$ . Compared to Spearman's rank correlation coefficient, it is characterized by more excellent resistance to tied ranks, often occurring with variables measured on the Likert scale. The hypotheses were also verified by

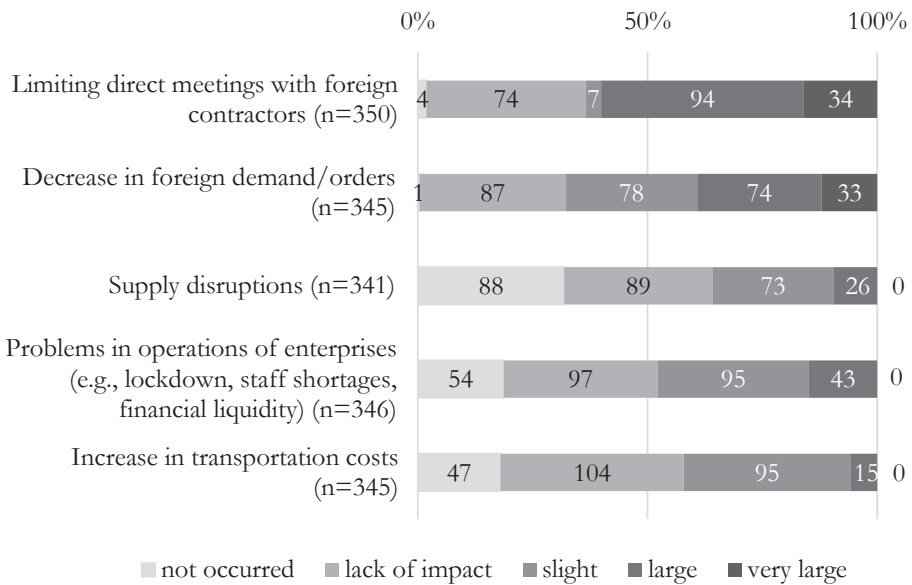
the Kruskal-Wallis test (one-way ANOVA on ranks). The analyzed variables come from independent samples for more than two groups and therefore meet all the assumptions of the Kruskal-Wallis statistical test of the significance of differences. Statistica, version 13.3, was used in the calculations.

#### 4. Results

Hypothesis H1 was verified by assessing the communication shock’s occurrence and impact on the opportunities of concluding export transactions by Polish enterprises. The communication shock is understood as limiting face-to-face meetings with foreign contractors resulting from the pandemic. The study also considered the demand shock (defined as a decrease in foreign demand/orders), the supply shock (procurement disruptions) as well as internal problems in the functioning of enterprises, and an increase in transport costs (Chart 1).

**CHART 1**

**The impact of the pandemic-related factors on reducing the opportunities of concluding export transactions by Polish enterprises**



Source: author’s own elaboration.

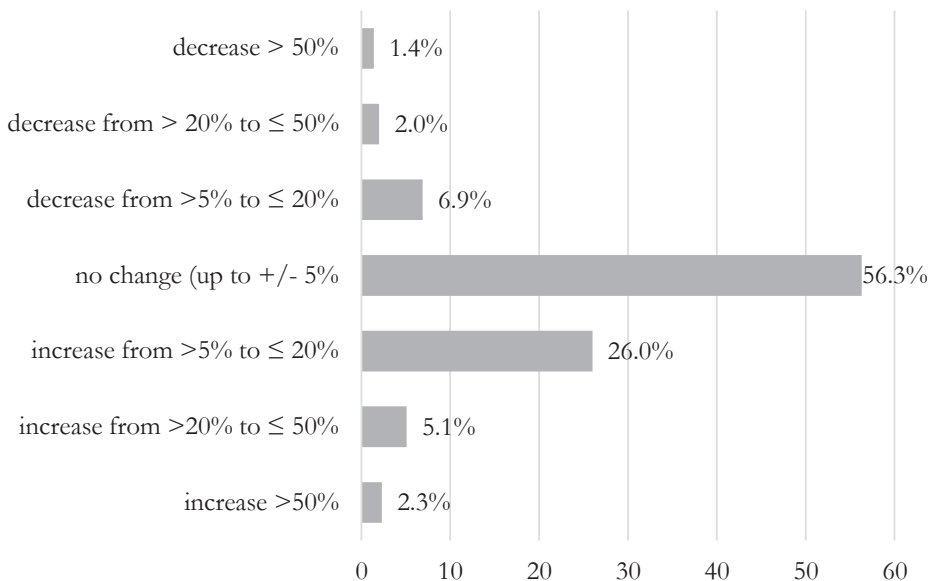


The data presented in Chart 1 do not include cases not affected by the given problem. The results indicate that the communication shock had the greatest negative impact on export opportunities during the pandemic. Its effect was very large and large in more than 35% of cases, and moderate in nearly 40% moderate. The communication shock is even more important than the demand shock, which was the second one that limited the export opportunities of Polish enterprises to the greatest extent.

The distribution of variables employed to verify hypotheses H2–H4 is shown in Charts 2–5.

**CHART 2**

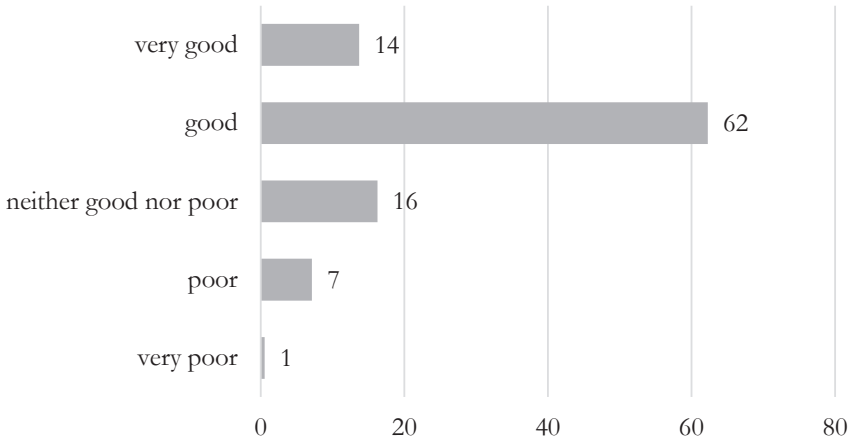
**Impact of the pandemic on the value of export transactions of Polish enterprises from the beginning of the pandemic to 07.2021 against market forecasts in the absence of a pandemic (n = 350) – *export performance* variable**



Source: author's own elaboration.

CHART 3

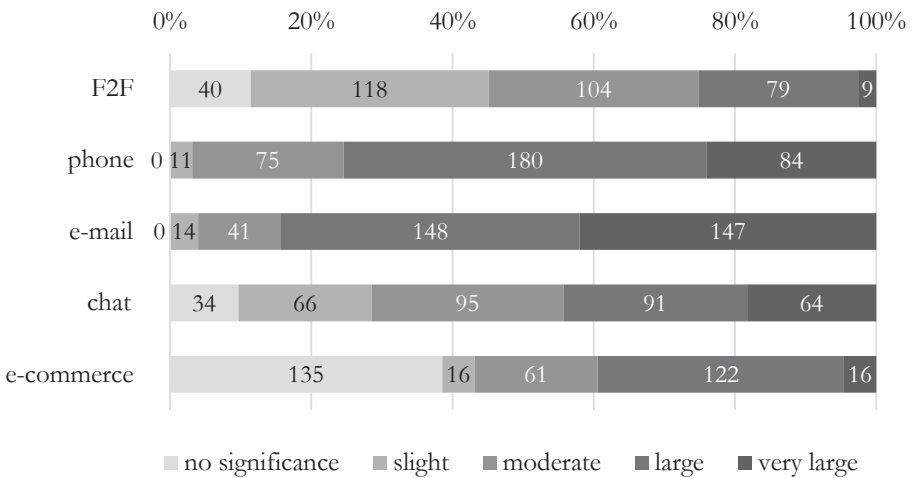
**Assessment of export opportunities in the conditions of the pandemic by Polish exporters (n = 350) – *export opportunities* variable**



Source: author's own elaboration.

CHART 4

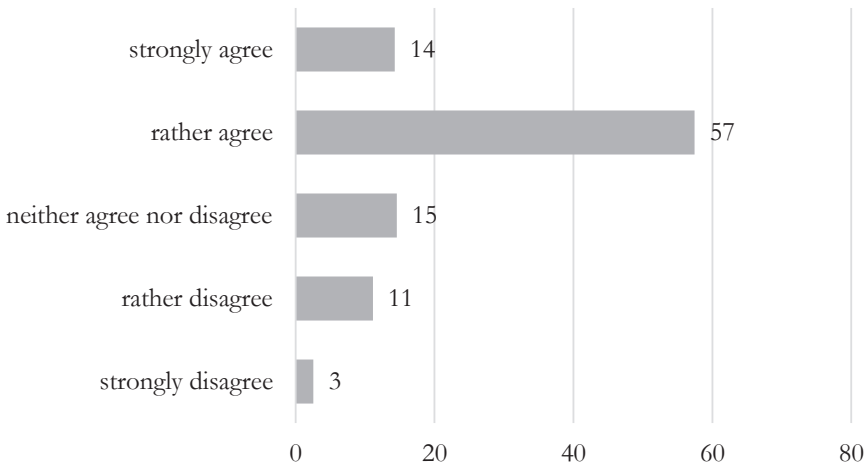
**The importance of different communication channels in concluding export transactions by Polish enterprises during the pandemic (n = 350)**



Source: author's own elaboration.

CHART 5

**Assessment of the impact of the pandemic on the increased use of instant messengers in concluding export transactions by Polish enterprises (n = 350) – digitalization variable**



Source: author's own elaboration.

The data presented in Chart 2 indicate that over 56% of the surveyed exporters did not experience a significant impact of the pandemic on the value of export transactions in the analyzed period. In about 10% of the cases, the pandemic positively impacted the value of foreign sales. However, nearly one-third of the entities recorded a decline in exports. Meanwhile, after more than a year of the pandemic, almost 80% of the surveyed exporters positively assess their foreign sales opportunities (Chart 3).

In the case of Polish exporters, neither digitalization nor the pandemic has eliminated or even marginalized F2F communication in international transactions. Only about 10% of the enterprises did not use this communication channel. However, electronic mail (*e-mail*) and telephone communication (*phone*) had a crucial share in the process of concluding export transactions during the pandemic (Chart 4). In the case of e-commerce, the rating distribution is the most diverse. This indicates a high specificity of this channel. During the pandemic, over 70% of exporters digitalized their communication channels by increasing the use of instant messengers, and only in about 15% of the cases such actions did not occur (Chart 5).

TABLE 2

## Descriptive statistics of independent variables

Variables	Median	Mode	Mode size	Min.	Max.	25th percentile	75th percentile	Interquartile range
<i>F2F</i>	3	2	118	1	5	2	4	2
<i>phone</i>	4	4	180	2	5	4	4	0
<i>e-mail</i>	4	4	148	2	5	4	5	1
<i>chat</i>	3	3	95	1	5	2	4	2
<i>e-commerce</i>	3	1	135	1	5	1	4	3
<i>digitalization</i>	4	4	201	1	5	3	4	1

Source: author's own elaboration.

The presented statistics (Table 2) indicate the highest median values for the *phone*, *e-mail*, and *digitalization* variables, with the last one characterized by a greater dispersion degree. The strongest value differentiation occurs in *e-commerce* use. In turn, *F2F* and *chat* variables have similar distributions.

The verification results of hypotheses H2–H4 based on Kendall's tau correlation analysis are presented in Table 3. Statistically significant coefficients at the level of  $\alpha = 0.05$  were marked.

The correlation results indicate a significant monotonic positive relationship of average strength (0.37) between the *e-mail* and *phone* variables and a weak (0.28) relationship between *e-mail* and *chat*. There is also a poor statistically significant relationship between *chat* and *F2F* and *phone*, which may indicate that these are complementary communication channels. There is also a low inverse relationship between *F2F* and *e-mail*, which, in turn, may suggest an alternative nature of these two communication channels. Moreover, there is a significant relationship of weak strength between *digitalization* and *e-commerce* (0.29) and *chat* (0.28). The combination of digitalization of communication with e-commerce confirms that the digitalization of business operations is comprehensive. However, no significant correlations were found between *export performance* and *opportunities* and the use of different communication channels, as well as *digitalization*.

TABLE 3

**Kendall's tau correlation matrix – correlations between export performance and opportunities and the use of digital communication channels and digitalization of communication during the pandemic (n = 350)**

Variable	export performance	export opportunities	F2F	phone	e-mail	chat	e-commerce	digitalization
<i>export performance</i>	–							
<i>export opportunities</i>	0.266*	–						
<i>F2F</i>	-0.034	-0.044	–					
<i>phone</i>	-0.037	0.047	-0.010	–				
<i>e-mail</i>	0.000	0.083*	-0.071*	0.369*	–			
<i>chat</i>	-0.094*	-0.023	0.135*	0.113*	0.279*	–		
<i>e-commerce</i>	-0.051	-0.035	0.012	0.069	0.064	0.153*	–	
<i>digitalization</i>	0.075*	0.000	0.063	0.155*	0.166*	0.280*	0.290*	–

\*  $p < 0.05$

Source: author's own elaboration.

The calculations of the Kruskal-Wallis homogeneity test for the analyzed variables showed no statistically significant difference between *export performance* and the use of digital communication channels (grouping variables: *phone*, *e-mail*, *chat*, *e-commerce*). Thus, hypothesis H2 was rejected.

The results of the Kruskal-Wallis test conducted to verify hypotheses H3 and H4 (dependent variables: *export opportunities* and grouping variables: *phone*, *e-mail*, *chat*, *e-commerce*, *digitalization*) allowed for the rejection of the null hypothesis (H0) ( $p < 0.05$ ), indicating the lack of differentiation between only two pairs of variables, i.e., for H3 between *export opportunities* and *e-mail* communication use (Kruskal-Wallis test:  $H(3, N = 350) = 13.06114$   $p = .0045$ ) and H4 between *export opportunities* and *digitalization* (Kruskal-Wallis

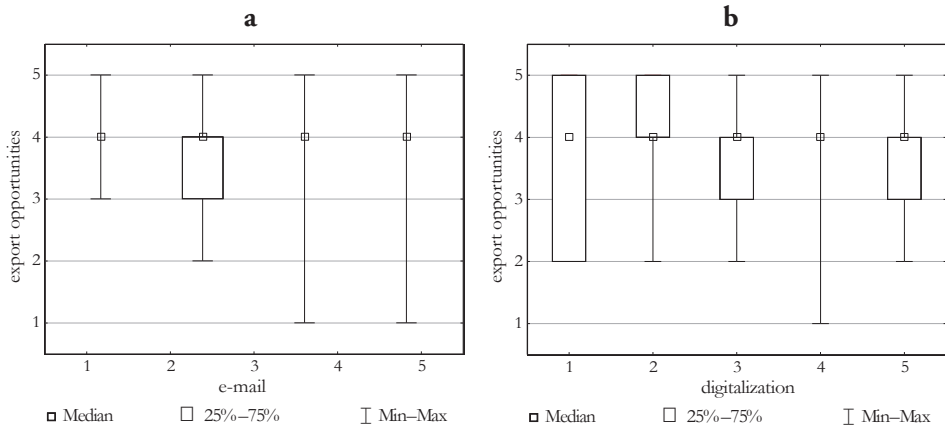
test:  $H(4, N = 350) = 17.05146$   $p = .0019$ ). Thus, it should be assumed that at least one group in each pair of variables differs from the others.

Post-hoc tests for multiple (two-tailed) comparisons of these variables at the significance level of 0.05 showed that statistically significant differences in *export opportunities* exist between the group using e-mail communication to a moderate extent (group 3) and the group using it to a greater extent (group 5). However, in the post-hoc analysis for the second pair of variables, statistically significant differences in *export opportunities* were identified only between the group that rather does not digitalize communication channels (group 2) and the group with a neutral activity in this respect (group 3). Based on the distribution of the results of the mentioned groups of variables presented in boxplots (Figure 6), it can be said that:

- the export opportunities of the group using e-mail communication (e-mail) to a large degree (group 5) are better compared to the group using this communication channel to a moderate degree (group 3), although there is a greater dispersion of its results due to the Min-Max range (Chart 6a),
- the group of cases which rather did not digitalize their communication channels during the pandemic (group 2) is characterized by a heavy concentration of better export opportunities (right-sided asymmetry) compared to the group with a neutral attitude to digitalization (group 3), in which there is a left-sided asymmetry (Chart 6b).

CHART 6

**Distribution of *export opportunities* for the grouping independent variable *e-mail* (a) and *digitalization* (b)**



Source: author's own elaboration.

#### 4. Conclusions

The COVID-19 pandemic caused a shock in virtually all areas of the functioning of enterprises, although not in all, and not everyone felt it in the same way. In the opinion of Polish exporters, the communication shock related to limiting face-to-face meetings with foreign contractors had the most negative impact on export transaction opportunities during the pandemic – greater than the demand and supply shock and other disturbances caused by the pandemic.

Despite the significant impact of the pandemic on the reduction in the value of export transactions in the first period of about a year, in July 2021 Polish exporters positively assessed their export opportunities. This may be due to the emergence of new opportunities during this time and/or their ability to adapt quickly to the conditions of the pandemic. The current research confirms that the negative impact of the pandemic on foreign exchange was significant only in the short term, in its first phase, and many enterprises were able to adapt to the new conditions relatively quickly [Hayakawa et al., 2021; Hu et al., 2022]. After the initial period of surprise with an unknown disease, according to research [Liu et al., 2022], the improvement of export conditions was influenced by demand factors, as the early decline in international trade and, in general, economic activity was, in fact, not caused by a reduction in demand, but by postponement of purchase decisions. In an unbalanced market, communication problems, although they hindered the conclusion of transactions, did not have to be a blocking factor. It can therefore be assumed that entities' behavioral determinants in the conditions of unprecedented disturbances may change, and the issues of costs and risks may have a different meaning than in stable conditions. The need to change the perspective in the “pandemic economy” is indicated, among others, by Kielczewski [2021], proposing the adoption of the complexity economics approach.

As a result of the statistical analysis, the hypotheses about the correlation between the results and export opportunities and the use of digital communication channels and digitalization of communication during the pandemic (H2–H4) were rejected. Therefore, the research did not confirm the existence of differences in the impact of the pandemic on exports and the degree of digital communication channel utilization. Therefore, the use of different communication tools in concluding export transactions did not differ significantly between companies that have experienced the impact of the pandemic on export results to varying degrees. However, a statistically significant, albeit weak, relationship was identified between e-mail, telephone, and instant messaging communication use. This may

indicate the complementary nature of these communication channels. It is also worth noting that neither digitalization nor the pandemic has eliminated F2F communication.

Despite the results of the homogeneity test of Kruskal-Wallis distributions, indicating statistically significant differences between export opportunities and the use of e-mail communication and the digitalization of communication implemented during the pandemic, hypotheses H3 and H4 were also rejected. It was concluded that the statistically significant differences identified for H3 in the distribution of only one pair of variables and between only two groups of the independent variable (post-hoc test results) are insufficient even for the partial acceptance of this hypothesis. A similar interpretation was applied to H4.

The research shows that although the pandemic has contributed to a large extent to the digitalization of communication channels, it did not affect export opportunities during the pandemic conditions. The lack of visible relationships between the results and export opportunities and the degree and increase in the use of digital communication tools can be explained by their lower efficiency compared to F2F communication, despite the existing limitations caused by the communication shock. Such properties of digital forms of communication are indicated by some of the studies cited in the literature review, e.g., Coughlan et al. [2007], Kupritz, Cowell [2011], Standaert et al. [2021]. However, the obtained results may also suggest a broader action range of the Solow productivity paradox, which asserts the lack of efficiency effects of ICT use [Acemoglu et al., 2015; Arendt, 2016]. One of the popular explanations for this phenomenon is too short a period of using the technology and the need to meet additional conditions to achieve the expected results. The most critical factor may therefore be the ineffective use of digital tools.

The added value of the analysis carried out in this article is the application of the Solow paradox in research on the digitalization of international economic transactions and the properties of new communication forms based on digital tools used in the transaction process.

Some limitations related to this study also affected the presented conclusions. The analyzed data come from the diagnostic survey and variables are of the ordinal type, reflecting the respondents' assessments and opinions. Applied adequately to such variables, the non-parametric Kruskal-Wallis test is characterized by relatively low interpretative power, forcing caution in formulating far-reaching conclusions. Therefore, a similar study using parametric methods, if possible, is recommended as the direction of further research. The study's limitations also include the relatively diverse nature of the activities of the surveyed enterprises. Narrowing down the



scope of the study might have yielded different results. Due to the large variety of currently available communication tools, a challenging path for further research may be the identification of substitutability and complementarity between various communication channels in the transaction process. It is also advisable to examine the degree of diversity in channels used to communicate and its impact on commercial results.

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