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Online Channel Sales Premia in Times of COVID-19: First Evidence from Germany

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Abstract: A presence on the web tends to be important for firms. Empirical studies show that firms with a better performance across various dimensions, and firms that are more internationally active, tend to have a website. Furthermore, a website helped firms to survive during the COVID-19 pandemic. An open question that is not discussed in the literature is how the use of online channels for sales is related to various dimensions of firm performance. This study contributes to the literature by using a unique recently released set of firm level data from Germany to investigate for the first time the links between online channels sales and firm characteristics. In a robustness check, the empirical investigation was replicated using strictly comparable firm level data from nine European countries, namely Austria, Belgium, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands, and Sweden.

Keywords: online channels sales; firm performance; COVID-19; Germany 2021 Enterprise Survey Data Set

JEL Classification: D22; L25

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1. Motivation

A presence on the web is today considered as an important part of a firm's strategy to successfully make a living. This has tended to be even more important during the COVID-19 pandemic when quarantines and lockdowns have increased the costs of face-to-face contacts with (potential) buyers and sellers. Several recent empirical studies report findings that support this view:

Wagner (2022a) showed that in 2019, firms from 18 European countries that had a website were larger, older, more productive, and more often exporters, product innovators, process innovators, and (partly) foreign-owned firms compared to firms without a website. Good firms tend to have a website.

Wagner (2022b) used firm-level data from the Flash Eurobarometer 421 survey conducted in June 2015 in 34 European countries to investigate the link between having a website and international firm activities in small and medium sized enterprises (SMEs). He reports that firms that are present on the web more often export, import, and engage in research and development cooperation with international partners, work as subcontractors for firms from other countries, use firms in other countries as subcontractors, and perform foreign direct investments—both inside and outside the European Union. The estimated website premia are statistically highly significant after controlling for firm size, country, and sector of economic activity. Furthermore, the size of these premia can be considered to be large. Internationally active firms tend to have a website.

Using firm-level data from the World Bank Enterprise surveys conducted in 2019 and from the COVID-19 follow-up surveys conducted in 2020 in ten European countries, Wagner (2021) investigated the link between having a website before the pandemic and firm survival until 2020. The estimated positive effect of web presence was statistically

highly significant ceteris paribus after controlling for various firm characteristics that are known to be related to firm survival. Furthermore, the size of this estimated effect can be considered to be large on average. Similarly, Muzi et al. (2022) report based on firm-level data collected for 34 economies up to 18 months into the COVID-19 crisis that businesses that have a website are more likely to continue existing. A web site helps firms to survive.

An open question that is not discussed in the literature on web presence and firm performance is how the use of online channels for sales is related to various dimensions of firm performance. Do better (larger, more innovative, more exporting) firms sell more using the web? Obviously, having a website does not mean that the owner uses it to sell goods and services—just think of yourself and your homepage on the web. This note contributes to the literature by using a unique recently released set of firm-level data from Germany to investigate for the first time the links between online channels sales and firm characteristics.

To anticipate the most important results, for Germany, we find that firms that use online channels more intensively for their sales tend to be larger, younger, more active in exports, and more innovative, while there is no link between labor productivity and intensity of use of online channels for sales.

In a robustness check that used strictly comparable data for nine other European countries and identically specified empirical models, however, these results could not be replicated. The picture holds for Germany only, and it differs from country to country. Any discussion of the reason for these cross-country differences is, however, far beyond the scope of this paper.

The rest of the paper is organized as follows. Section 2 describes the data used and gives the definition of the variables in the empirical investigation. Section 3 reports results from the econometric investigation of the size of online channel sales premia in the firms. Section 4 replicates the investigation for Germany with strictly comparable recently released firm-level data from nine European countries, namely Austria, Belgium, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands, and Sweden. Section 5 concludes.

2. Data and Definition of Variables

The firm-level data used in this study are taken from the World Bank's "The Germany 2021 Enterprise Surveys Data Set". This survey was conducted between October 2020 and June 2022; data were released in July 2022.[1]

In the survey, firms were asked in question C22b, "At present time, does this establishment have its own website or social media page?" Firms that answered "yes" were classified as firm with a web presence; 91.3% of all German firms in the sample said that they did have a web presence—a much larger share than was reported for other countries in 2019 (see Wagner 2022a). This demonstrates that nearly all firms in Germany do have a website today, and that it does not make sense to look for any website premia here.

Furthermore, question EUD.1 asked for the percentage of the establishment's sales that was sold by using online channels (web-based platforms, social-media platforms, establishment's website, smartphone app): 72.5% of all firms in the sample reported zero online sales. This documents that by far not all of the 91.3% of firms with a website use it for online sales: a large fraction of firms with a website reported a share of online channels sales of zero percent. Table 1 documents in detail the reported percentage of the establishment's sales that was sold by using online channels.

Table 1. Share of establishment's sales made using online channels.

Percentage	Number of Firms
0	1.030 (72.54%)
1	19
2	13

Table 1. *Cont.*

Percentage	Number of Firms
3	9
4	5
5	47
6	1
7	1
8	4
9	1
10	68
12	2
13	1
14	2
15	14
17	1
19	2
20	30
24	1
25	15
30	24
34	2
35	4
40	11
45	5
47	1
50	28
55	4
60	15
52	1
70	13
75	3
80	11
84	1
85	2
90	5
93	1
95	2
96	1
98	1
100	19
	1.420

Source: The World Bank's "The Germany 2021 Enterprise Survey Data Set".

In the empirical investigation, the link between the percentage of sales of a firm using online channels and a number of firm characteristics was looked at. The selection of these characteristics was not based on a theoretical model—it was motivated by the results of empirical studies that looked at the difference in firm characteristics between firms with and without a website (summarized in the introductory section). The firm characteristics considered and the way they were measured here are listed below.

Firm size: Firm size was measured as the number of permanent, full-time individuals that worked in the establishment at the end of the last complete fiscal year at the time of the survey (see question I.1).

Firm age: Firm age was measured as follows. In question B.5 of the survey firms were asked, "In what year did this establishment begin operation?". Firm age is the difference between the year of the survey (reported in variable a15y) and the founding year.

Productivity: Productivity was measured as labor productivity, defined as the amount of total annual sales for all products and services (recorded in question d2) over the number of permanent, full-time individuals that worked in the establishment at the end of the last complete fiscal year at the time of the survey (see question I.1). Given that information on value added and on the capital stock used in a firm is missing in the data from the World Bank Enterprise Survey, more elaborate measures of productivity at the firm level, such as total factor productivity, cannot be used.

Exports: In the survey, the firms were asked for the percentage share of direct exports in total sales (see variable d3c). This variable was used as a measure for the export share in total sales.

Innovation: In the survey, firms were asked whether during the past three years this establishment had introduced new, improved products and services (see question H1). Firms that answered in the affirmative were considered as product innovators. Similarly, firms were asked whether during the past three years this establishment introduced any new or improved process, including methods of manufacturing products or offering services; logistics, delivery, or distribution methods for inputs, products or services; or supporting activities for processes (see question H5). Firms that answered in the affirmative were considered as process innovators.

Furthermore, firms were divided by broad sectors of activity (manufacturing, retail/wholesale, construction, hotel/restaurant, and services) based on their answer to the question for the establishment's main activity and product, measured by the largest proportion of annual sales (see question D1a1).

Descriptive statistics for all variables are reported for the whole sample used in the empirical investigation in Appendix A.

3. Testing for Online Channel Sales Premia in Firm Characteristics

To test for the link between firm characteristics listed in Section 2 and the intensity of the use of online channels for sales, an empirical approach was applied that modifies a standard approach used in hundreds of empirical investigations on the differences between exporters and non-exporters that has been introduced by Bernard and Jensen (1995, 1999). Studies of this type use data for firms to compute so-called exporter premia, defined as the ceteris paribus percentage difference of a firm characteristic—e.g., labor productivity—between exporters and non-exporters. These premia were computed from a regression of log labor productivity on the current export status dummy and a set of control variables:

$$\ln LP_i = a + ß\ Export_i + c\ Control_i + e_i \quad (1)$$

where i is the index of the firm, LP is labor productivity, Export is a dummy variable for current export status (1 if the firm exports, 0 else), Control is a vector of control variables, and e is an error term. The exporter premium, computed from the estimated coefficient ß as $100(\exp(ß) - 1)$, shows the average percentage difference between exporters and non-exporters controlling for the characteristics included in the vector Control (see Wagner (2007) for a more complete exposition of this method).

Here, we look at differences between firms with various intensities of use of online channels in sales (instead of differences between exporters and non-exporters) and are interested in the existence and size of online channel sales premia (instead of exporter premia). Therefore, (1) becomes (2)

$$\ln LP_i = a + ß\ Onlinesales_i + c\ Control_i + e_i \quad (2)$$

where i is the index of the firm, LP is labor productivity, Onlinesales is the percentage share of sales of the firm sold using online channels, Control is a vector of control variables (that consists of dummy variables for sectors of economic activity), and e is an error term. The online channels sales premium ß shows the difference between firms with different intensities of using online channels for firm sales controlling for the broad economic sector the firm is active in.

Here, ß is computed by OLS for firm characteristics that are measured by continuous variables (firm size, firm age, labor productivity, export intensity). Firm size, firm age, and labor productivity are measured in logs, while export intensity is measured as the percentage of exports in total sales.

For firm characteristics that are measured by dummy variables (product innovator, process innovator) the empirical models are estimated by Probit instead. Therefore, (2) becomes (3)

$$Indicator_i = a + ß\ Onlinesales_i + c\ Control_i + e_i \quad (3)$$

and the online channels sales premia are computed as the estimated average marginal effects of the percentage of online channels sales shares.

Standard errors are robust standard errors adjusted for clusters in the six broad sectors of economic activity of the firms.

The results are reported in Table 2. For firm size, firm age, productivity, and export share, the reported premium is the estimated percentage increase that is associated with an increase in the share of online channel sales of a firm in its total sales by one percentage point (controlling for the broad sector of economic activity of the firm). For product innovator and process innovator, the premium is the estimated average marginal effect of an increase in the share of online channel sales by one percentage point on the probability that the firm is an innovator (controlling for the broad sector of economic activity of the firm).

Table 2. Estimated online channel sales premia for firm characteristics.

Firm Characteristic	Premium	t-Value
Firm size (number of employees)	0.37	2.12
Firm age (years)	−0.41	−3.44
Productivity (total sales per employee)	0.032	0.29
Export share (percentage)	0.057	2.56
Product innovator (dummy; 1 = yes)	0.0010	1.63
Process innovator (dummy; 1 = yes)	0.0012	3.46

Source: Own calculations with data from the World Bank's "The Germany 2021 Enterprise Survey Data set". The premium is the estimated percentage increase in firm characteristic for an increase in the share of online channel sales in total sales of the firm (controlling for broad sector of economic activity of the firm); t-values are based on robust standard errors, adjusted for clusters in sectors. For details see text.

We find that firms that use online channels more intensively for their sales tend to be larger, younger, more active in exports, and more innovative, while there is no link between

labor productivity and intensity of use of online channels for sales. While some of these links can be considered to be quite strong—a 1% increase in the share of online channels sales in total sales is associated with an estimated increase in firm size by 0.37%, a decrease in firm age by 0.41%, and an increase in the export share by 0.057%—this is not the case for innovation activities. When averaged across firms, an increase in the share of online channel sales by one percentage point is associated with an estimated 0.001% increase in the probability of being a product innovator and a 0.0012% increase in the probability of being a process innovator.

4. Robustness Check: Strictly Comparable Evidence from Nine European Countries

Do the results reported for Germany here hold for other countries, too? To investigate this important question, all computations were replicated using strictly comparable firm-level data from the World Bank's Enterprise Surveys (that are available from the website mentioned in note 1) conducted recently in nine European countries, namely Austria, Belgium, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands, and Sweden.

To start with, the share of firms with a web presence, which was 91.3% in the sample for Germany, was of comparable size in the other countries looked at here: it was 92.2% in Austria, 88.8% in Belgium, 97.4% in Denmark, 96.7% in Finland, 84.4% in France, 93.6% in Ireland, 89.54% in Luxembourg, 95.6% in the Netherlands, and 4.8% in Sweden.

Similarly, the percentage of firms that reported a zero percentage share of online channel sales (which was 72.5% in the sample of German firms) tended to be similar across the other countries looked at here: it was 71.7% in Austria, 74.1% in Belgium, 64.7% in Denmark, 68.3% in Finland, 76.6% in France, 75.0% in Ireland, 73.5% in Luxembourg, 65.6% in the Netherlands, and 67.1% in Sweden.

This indicates that today, on the one hand, nearly all firms in the ten European countries looked at here are present on the web, but that, on the other hand, a very large share of these firms (that varies from country to country between about two-thirds and three-fourths of all firms in the sample) does not generate any turnover from online channel sales.

How is the intensity of the use of online channels for sales linked to firm characteristics? The test for online channels sales premia in firm characteristics for German firms described in detail in Section 3 above revealed that firms that use online channels more intensively for their sales tend to be larger, younger, more active in exports, and more innovative, while there is no link between labor productivity and intensity of use of online channels for sales. Do these results hold for the other European countries looked at here, too? To investigate this important question, the empirical investigation for Germany was replicated with the strictly comparable firm-level data for the other nine countries. The results are reported, country by country, in Table 3.

For Austria, none of the estimated premia for a more intensive use of online channels for sales by the firms in the sample was statistically significantly different from zero at an error level of 5%. This is a totally different picture compared to the results we find for Germany. Note, however, that the positive and marginally significant link between a higher share of online channel sales in total sales and both a higher share of exports in total sales, and a higher probability of being a process innovator, is in line with the results for Germany. The same holds for the missing link between online channel sales and productivity.

For firms from Belgium, we find the results showed a statistically significant positive link between the share of online channel sales and three firm characteristics, namely firm size, product innovator, and process innovator; these results, and the missing link with productivity, are in line with the results found for Germany.

For firms from Denmark, productivity is negatively related to online channels sales, which is in stark contrast to the results for Germany. The link between online channel sales and the probability of product and process innovation, however, is positive in accordance with Germany.

Table 3. Estimated online channel sales premia for firm characteristics in nine countries.

Firm Characteristic	Premium	t-Value
AUSTRIA	(N = 566 firm)	
Firm size (number of employees)	−0.068	−0.38
Firm age (years)	−0.36	−0.82
Productivity (total sales per employee)	0.017	0.09
Export share (percentage)	0.199	1.70
Product innovator (dummy; 1 = yes)	0.00038	0.34
Process innovator (dummy; 1 = yes)	0.0016	1.75
BELGIUM	(N = 559 firms)	
Firm size (number of employees)	0.84	2.73
Firm age (years)	−0.047	−0.19
Productivity (total sales per employee)	−0.080	−0.15
Export share (percentage)	−0.021	−0.20
Product innovator (dummy; 1 = yes)	0.0037	2.56
Process innovator (dummy; 1 = yes)	0.0030	3.06
DENMARK	(N = 914 firms)	
Firm size (number of employees)	−0.19	−0.55
Firm age (years)	0.10	1.03
Productivity (total sales per employee)	−0.21	−2.17
Export share (percentage)	0.041	0.46
Product innovator (dummy; 1 = yes)	0.0023	1.77
Process innovator (dummy; 1 = yes)	0.0045	7.83
FINLAND	(N = 720 firms)	
Firm size (number of employees)	0.20	1.37
Firm age (years)	−0.0071	−0.05
Productivity (total sales per employee)	−0.16	−1.16
Export share (percentage)	−0.090	−4.58
Product innovator (dummy; 1 = yes)	0.00059	0.69
Process innovator (dummy; 1 = yes)	0.00093	1.58
FRANCE	(N = 1310 firms)	
Firm size (number of employees)	0.099	0.76
Firm age (years)	−0.24	−1.25
Productivity (total sales per employee)	−0.094	−1.05
Export share (percentage)	0.043	0.86
Product innovator (dummy; 1 = yes)	0.0019	4.45
Process innovator (dummy; 1 = yes)	0.00022	0.24
IRELAND	(N = 565 firms)	
Firm size (number of employees)	0.75	1.76
Firm age (years)	0.19	1.51
Productivity (total sales per employee)	−0.023	−0.04
Export share (percentage)	0.025	0.29
Product innovator (dummy; 1 = yes)	0.0024	1.05
Process innovator (dummy; 1 = yes)	0.0035	3.97

Table 3. *Cont.*

Firm Characteristic	Premium	t-Value
LUXEMBOURG	(N = 151 firms)	
Firm size (number of employees)	0.076	0.12
Firm age (years)	−0.24	−0.45
Productivity (total sales per employee)	−0.60	−1.76
Export share (percentage)	0.44	4.21
Product innovator (dummy; 1 = yes)	0.0030	0.85
Process innovator (dummy; 1 = yes)	0.0049	2.02
THE NETHERLANDS	(N = 773 firms)	
Firm size (number of employees)	0.60	2.19
Firm age (years)	0.067	0.53
Productivity (total sales per employee)	−0.11	−1.43
Export share (percentage)	0.023	0.41
Product innovator (dummy; 1 = yes)	0.0017	2.67
Process innovator (dummy; 1 = yes)	0.0023	2.85
SWEDEN	(N = 510 firms)	
Firm size (number of employees)	0.73	5.87
Firm age (years)	−0.12	−0.96
Productivity (total sales per employee)	0.24	2.04
Export share (percentage)	0.059	1.06
Product innovator (dummy; 1 = yes)	0.00083	0.90
Process innovator (dummy; 1 = yes)	0.0027	5.20

Source: Own calculations with data from the World Bank's Enterprise Surveys. The premium is the estimated percentage increase in firm characteristic for an increase in the share of online channel sales in total sales of the firm (controlling for broad sector of economic activity of the firm); t-values are based on robust standard errors, adjusted for clusters in sectors. See text for details.

For Finland, the only statistically significant result found here is the negative link between a higher share of online channel sales and a larger export share of the firm—a result that is contrary to the one reported for Germany.

For France, there is no statistically significant relationship between the firm characteristics looked at and the share of online channel sales in total sales of the firms, but a positive link between online sales and product innovation. The big picture, therefore, is different from the one reported for Germany.

The picture found for France is similar to the one reported for Ireland, where the only significant link is the one between a larger share of online channel sales and a higher probability of being a process innovator.

The small sample of firms from Luxembourg points to positive online channel sales premia for the share of exports in total sales and process innovations. Both findings are in line with the results for Germany.

In the Netherlands, firms with a larger share of online channel sales in total sales tend to be larger and more innovative. These results match the results reported for Germany, while the results for firm age and export share do not.

For firms from Sweden, we find a positive and statistically significant online channel sales premium with regard to firm size, productivity, and process innovation. While results for firm size and process innovation match the findings for Germany, the positive link with productivity is found for firms from Sweden only.

If we look at the results for the nine European countries not country by country but firm characteristic by firm characteristic, we learn that we do not find evidence for a clear picture. To state it differently, the estimated online channel sales premia are never statically significantly different from zero at a 5% error level for one firm characteristic across all

countries looked at. Therefore, it does not make any sense to go one step further and try to compare the size of the estimated effects across countries.

Furthermore, the results reported for Germany are not matched by the results from a single other country. This illustrates again that it is important to replicate empirical results found in one data set for one country and one period of time with data from other samples (for other periods of time or other countries) using strictly comparable data and identically specified empirical models. Only results that stand this robustness test can be a sound basis for any further conclusions, and for evidence-based policy measures.

5. Concluding Remarks

This study reports for the first time estimated premia for important firm characteristics for a more intensive use of online channels for sales. For Germany, we find that firms that use online channels more intensively for their sales tend to be larger, younger, more active in exports, and more innovative, while there is no link between labor productivity and intensity of use of online channels for sales. While some of these links can be considered to be quite strong—a 1% increase in the share of online channel sales in total sales is associated with an estimated increase in firm size by 0.37%, a decrease in firm age by 0.41%, and an increase in the export share by 0.057%—this is not the case for innovation activities.

In a robustness check that used strictly comparable data from nine other European countries, namely Austria, Belgium, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands, and Sweden, and identically specified empirical models, however, these results could not be replicated. The picture holds for Germany only, and it differs from country to country.

Any discussion of the reason for these cross-country differences is, however, far beyond the scope of this paper. Given that the estimated online channels sales premia are never statically significantly different from zero at a 5% error level for one firm characteristic across all countries looked at, it does not make any sense to go one step further and try to compare the size of the estimated effects across countries.

Furthermore, it is an open question (that is investigated at length in the literature where exporter premia are discussed) whether the premia reported for German firms are due to self-selection of firms into online channel sales or whether they are the effect of using online channel sales more intensively. For example, do larger firms use online channels more intensively (because they can deals more easily with the fixed costs associated with setting up and maintaining an online shop) or does the use of online channels for sales help firms to grow and become larger firms? Or are both of these possible directions of the observed positive link between firm size and the intensity of the use of online channel sales important? This issue cannot be investigated with the cross section data at hand. To answer this important question, longitudinal data for firms are needed that cover several years and that include a sufficiently large number of firms with various intensities of the use of online channels for sales over time. To the best of my knowledge such data are not available as of today. Let us collect it!

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Data Availability Statement: Data are available from the web; see note for details.

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Descriptive statistics for sample (N = 1420) used in estimations.

Variable	Mean	Std. Dev.
Firm size (number of employees)	73.84	485.41
Firm age (years)	36.40	34.46
Productivity (total sales per employee)	289,617.8	776,437.1
Export share (percentage)	11.93	22.02
Product innovator (dummy; 1 = yes)	53.24	
Process innovator (dummy; 1 = yes)	38.17	
Manufacturing (dummy; 1 = yes)	40.07	
Retail/wholesale (dummy; 1 = yes)	18.73	
Construction (dummy; 1 = yes)	12.46	
Hotel/restaurant (dummy; 1 = yes)	10.92	
Services (dummy; 1 = yes)	17.82	

Source: Own calculations with data from The World Bank's "The Germany 2021 Enterprise Survey Data Set"; for details see text.

Note

[1] The data and the questionnaire used are available free of charge after registration from the website https://www.enterprisesurveys.org/portal/login.aspx (accessed on 2 November 2022).

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