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EFFECTS OF E-COMMERCE ON PRICES AND BUSINESS COMPETITION

Aitor Lacuesta, Pau Roldan and Darío Serrano-Puente

ABSTRACT

This article describes the boom of recent years in e-commerce in Spain, which reached a 14% share of sales in 2016, similar to the euro area average. The COVID-19 pandemic may have accelerated this trend, with some authors indicating a 6 pp increase in the share of sales during March of this year to over 20%. This article reviews the academic literature analysing potential price differences for the same product depending on whether it is sold in a traditional establishment or through a digital platform. The papers assessed do not observe significant price differences between the two markets. They also show that online markets display some of the same characteristics that are observed in traditional markets, such as a low frequency of price changes and high price dispersion for the same product sold in different online points of sale. Lastly, it is estimated that the development of e-commerce has nurtured business competition in Spain, reducing mark-ups. However, there is no evidence that corporate profits have been affected, which may reflect lower fixed costs associated with the sourcing of certain inputs for digital channels.

Keywords: e-commerce, mark-ups, online markets, price dispersion.

JEL classification: E3, L11, L81.

The authors of this article are Aitor Lacuesta, Pau Roldan and Darío Serrano-Puente of the Directorate General Economics, Statistics and Research.

Introduction

In recent years, online sales platforms have accounted for a growing volume of sales in the retail sector (see Goolsbee and Klenow (2018)). In the euro area, according to Eurostat, the share of sales via digital platforms stood at over 14% in 2016, up by more than 4 pp since 2009 (see Chart 1.1). Although there are significant sector-level differences in how e-commerce has developed, such sales have become more prevalent across the board (see Chart 1.2). For instance, e-commerce sales have had a notably larger impact in the hospitality sector in this time horizon. Spain has not been immune to this trend. As Charts 1.1 and 1.3 show, in 2009 the share of online retail sales in Spain stood 2 pp below the euro area average and 5 pp below Germany, but by 2019 had reached a matching level (14%).

The recent COVID-19 pandemic and the measures applied by governments to curb infections have accelerated the e-commerce growth trend and prompted many consumers to shop online for the first time. Based on an analysis of 1.4 billion bank transactions in Spain since 2019, Carvalho et al. (2020) show that online purchases rose to 22% of the total from 15% prior to the lockdown. Although there is a great deal of uncertainty as to the persistence of these changes after the most stringent confinement measures were lifted, e-commerce can be expected to retain much of its buoyancy given the trend observed before the lockdown. In fact, in the months that followed the strictest confinement measures, in force between March and May 2020, online retail sales have declined from their peak in May but have held steadily above the levels observed prior to the crisis, at least through to the month of September.[1]

Against this background, this article aims to shed light on how prices have been affected by the boom in online purchases compared to those made in traditional establishments. To this end, the article first reviews the previous literature on potential price differences for the same product depending on whether it is sold in a traditional shop or through a digital platform. It should be noted that in addressing this question possible price changes for a product owing to supply and demand fluctuations are ignored. The aim is simply to assess whether at any given time the price of the same

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[1] See Eurostat's short-term business statistics. https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sts_trtu_m&lang=en.
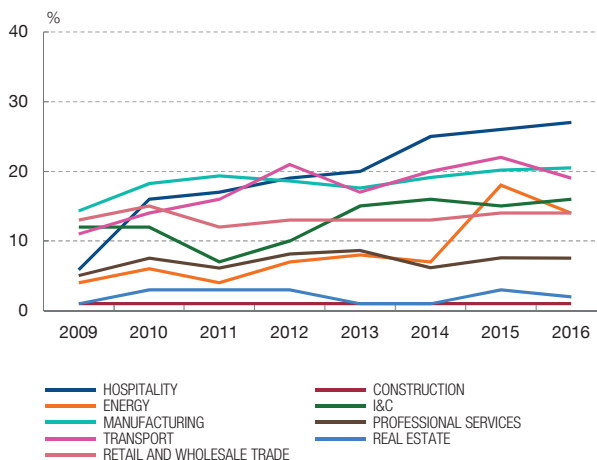
Chart 1
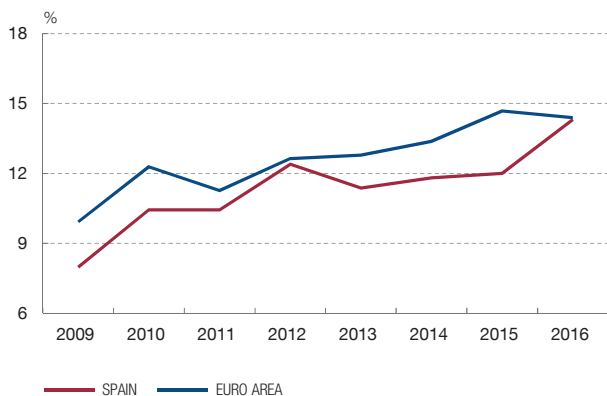**CHANGES IN THE PERCENTAGE OF ONLINE SALES** (a)

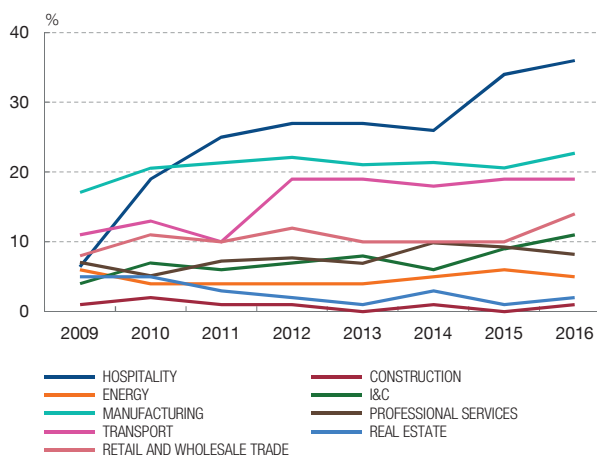1 PERCENTAGE OF ONLINE SALES IN GERMANY AND THE EURO AREA
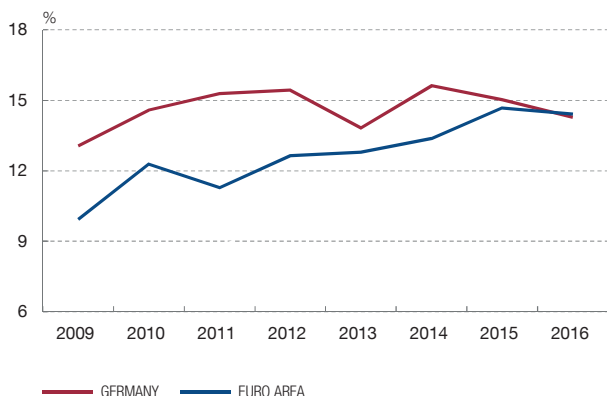
2 CHANGE IN THE PERCENTAGE OF ONLINE SALES IN THE EURO AREA,
  BY SECTOR

3 PERCENTAGE OF ONLINE SALES IN SPAIN AND THE EURO AREA

4 CHANGE IN THE PERCENTAGE OF ONLINE SALES IN SPAIN,
  BY SECTOR

SOURCE: Banco de España, based on Eurostat data (2020).

a Percentages calculated using the weighted average (by sales) of firms by region or by sector.

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product varies on the basis of the sales channel used. Second, the article estimates the extent to which the development of e-commerce fosters business competition or increases the market power of certain firms that may be better positioned.

Short-term differences between online and offline prices

The average price of the products sold by a firm may vary depending on how they are accessed by consumers (via a website or traditional establishments). There are at least two distinct factors behind this difference.

First, the composition and rotation of the products available to customers through each channel. If the basket of goods available in physical and online establishments differs, or if new products are introduced differently or asynchronously in the two types of point of sale, the average price of the respective catalogues could differ. This deviation has macroeconomic relevance, since it could affect the measurement of CPI owing to the sample of prices used to calculate the index including products available in physical establishments but not in online stores, or vice versa. More broadly, the CPI measurement could reflect certain biases insofar as it incorporates a basket of goods that does not accurately represent real household consumption patterns.[2] This, in turn, could lead to an inaccurate measurement of inflation indices.

Second, a firm's pricing policy may vary based on the sales channel used. Firms may have to bear different price adjustment costs depending on whether the products are available online or in physical establishments. Online prices can be modified at a low cost, thereby providing these firms with greater capacity and flexibility to respond immediately to high-frequency changes in supply and demand. For the consumer, transaction costs (e.g. transport costs) may also vary depending on whether a purchase is made online or at a physical establishment, and this may in turn be reflected in the firm's pricing strategy. Lastly, the competitive environment of firms selling the same product could differ between one type of market and the other, since the geographical dimension of the firms' pricing policy is, in most sectors, less relevant in the virtual market. The differences in terms of competitive structure between the two types of market could prompt firms to set different mark-ups in each market for the same products. According to this hypothesis, online markets would foster competition for two reasons: (i) lower entry costs for firms to sell their products, and (ii) easier dissemination of price information among competitors selling the same product, and between sellers and end-consumers. These circumstances would give rise to increased competition between firms and, consequently, downward pressure on product prices, along with a reduction of mark-ups. This latter hypothesis is explored in the next section.

Several studies have assessed whether e-commerce has generated such biases in consumer prices. As regards price levels, Cavallo (2017) uses individual price data for products sold by the same firm both in its physical establishments and digital platforms in ten different countries. The author concludes that, on average, the prices in the two channels are identical 72% of the time, although he notes considerable cross-country heterogeneity (e.g. 42% in Brazil and 92% in Canada and the United Kingdom). As for price growth, Goolsbee and Klenow (2018) find that the inflation indices calculated in the United States for products available online stand 1.3 pp lower than the CPI inflation figures for the same product categories. It is thought that

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2 Although this is a structural problem for statistical institutes, it was exacerbated during the confinement. The National Statistics Institute made technical and methodological changes to its CPI calculation to partially address these problems during the state of alert prompted by COVID-19. See https://www.ine.es/daco/daco42/daco421/nota_tecnica_ipc_covid.pdf.

part of the bias in CPI could owe to the index not accurately reflecting changes in offline-online consumption patterns in the products comprising the average shopping basket (since this is updated infrequently). If this were taken into account, real inflation figures could be somewhat lower than the estimated figures.

However, the fact that there are similarities between online and offline price levels does not imply that firms follow consistent pricing and price change strategies in both sales channels. For example, if firms' adjustment costs differ in each of these two markets, price changes could occur more frequently in one market than the other. In fact, several studies have found differences in terms of the frequency or size of price changes. Cavallo (2017) finds that price changes for products available both online and offline appear not to be synchronised in the two markets but have similar frequencies and average sizes. Meanwhile, Gorodnichenko and Talavera (2017) observe that online prices are somewhat more flexible, given that they allow greater pass-through of cost shocks (between 60% and 75%, compared with 20% and 40% for traditional establishments) and respond more swiftly to movements in nominal exchange rates (between the United States and Canada). According to these authors' calculations, price changes in online stores (averaging approximately 4% in absolute terms) are smaller than price changes in physical establishments (approximately 10%), while price changes are more frequent in online shops (around once every three weeks) than in conventional shops (once every four or five months). Despite price changes occurring more frequently than in traditional shops, the frequency of change is not very high. Gorodnichenko, Shreminov and Talavera (2018) present similar results for the United States and the United Kingdom. According to these authors, the average duration of price levels in online markets is relatively long (between seven and 20 weeks) and there is little synchronisation of price changes across goods for a single seller or across sellers for different goods. Further, although digital markets should support access to greater information on competitors' prices – which would help to design better pricing strategies –, price dispersion is high (for the same product sold in different online points of sale within the country); this observation is also highly prevalent in studies based on offline prices (see Kaplan and Menzio (2015)).

One important conclusion drawn from these studies is that despite lower adjustment costs for firms in online markets, which should allow them to respond more flexibly to unexpected variations in supply and demand, online price changes are not as frequent as might be expected. Indeed, these prices tend to remain constant for periods that can last several weeks. Further, price dispersion remains high for the same product sold online by different firms, despite the fact that in an online market the firms should have more information about their competitors' prices. These observations are perhaps a reflection of the market frictions typically associated with offline prices – such as those linked to the challenge of finding information on competitors or the difficulty of changing price or catalogue strategies – also pertaining, to some extent, to online markets.

The effects of e-commerce on competition and mark-ups

As described above, access to online markets could lower firms' pricing costs, such as the costs associated with accessing information on their competitors' prices. At the same time, it may reduce entry costs for new competitors, leading to increased competitor rotation. This, in turn, would benefit consumers, giving them access to a broader variety of products at a lower search effort. These effects have consequences not only for firms' pricing strategies but also in terms of the structure of the market in which they operate. Greater dissemination of information among firms and lower market entry costs would drive up competition between sellers of the same product and, therefore, reduce their mark-ups and market power.

Specifically, if consumers can more readily locate the sellers offering the lowest prices, those firms with the lowest costs (or those that can offer the best quality at the same cost) should be able to absorb a larger market share. This redistribution of customers towards more efficient firms may ultimately drive up their profits, despite their mark-ups being reduced on account of the heightened competition. For instance, Goldmanis, Hortaçsu, Syverson and Emre (2010) conclude that e-commerce has generated such effects in the travel agency, book shop and car dealership industries in the United States.

As a first pass at assessing the impact of the e-commerce boom on competition in Spain, this section examines the effects on mark-ups associated with the phenomenon. Two variables are used to approximate firm-level mark-ups: (i) the mark-up in the final price over the marginal cost,[3] based on the estimation of production functions, under which the mark-up is approximated as the ratio of the output elasticity of material inputs to the material share of sales; and (ii) the ratio of earnings before interest, taxes, depreciation and amortisation (EBITDA) to the firm's total sales. Both variables are obtained from the Integrated Central Balance Sheet Data Office Survey sample for the period 2009-2016. The independent variable of interest is the year-on-year change in the percentage of total industry sales made online. The regression is as follows:

$$\Delta\mu_{ijt} = \alpha_j + \delta_j + \beta\Delta EC_{it} + \tau X_{ijt} + u_{ijt}$$

In this equation, $\Delta\mu_{ijt}$ is the change in the mark-up (or EBITDA-to-sales ratio, depending on the specification) of firm i in industry j in year t; ΔEC_{it} is the annual change in online sales in the industry, and (α_j, δ_j) are industry and time fixed effects that absorb, respectively, within-industry variation across firms over time, and cross-firm and industry variation for each given year. Lastly, X_{ijt} includes one or more of the

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3 Mark-up approach based on J. Loecker and F. Warzynski (2012), drawing on highly disaggregated firm-level data and industry-level estimates of production functions. The authors theoretically demonstrate that a firm's mark-up can be estimated based on the ratio of the input materials' output elasticity to the percentage of sales represented by expenditure on materials at each firm.

ESTIMATED EFFECT OF AN INCREASE IN THE PERCENTAGE OF ONLINE SALES ON MARK-UPS, EARNINGS, LABOUR COSTS AND OTHER FIXED COSTS (a) (b)

Control included in the regression	Mark-up	Earnings / Sales	Labour costs / Sales	Fixed operating costs / Sales
Sectoral value added	-0.0048**	0.02055	-0.00008	-0.0413*
Financial costs / Sales	-0.0047**	0.01535	-0.00006	-0.0377*
Financial assets / Total assets	-0.0046**	0.01420	-0.00005	-0.0368*

SOURCES: Firm-level microdata from the Central Balance Sheet Data Office Survey, Banco de España (2020), and sector-level data as the percentage of sales made through e-commerce, Eurostat (2020).

a All the specifications are assessed in differences and include time fixed effects and industry fixed effects. Likewise, all are clustered at the industry level. * denotes statistical significance of the coefficient at the 90% confidence level. ** denotes statistical significance of the coefficient at the 95% confidence level.

b The number of firm-level observations for each of the specifications is 1,300,217. The period of analysis runs from 2009 to 2016.

following controls: value added at the industry level, and the ratio of financial costs to sales, the ratio of financial assets to total assets and the lagged value of the EBITDA-to-sales ratio at the firm level. These control variables aim to pick up the effect on changes in mark-ups by each firm's financing capacity (internal and external), which could play an important role in how e-commerce in the sector influences profitability and competition.

The results (see Table 1) indicate that an increase in the online share of sales prompts firms in the industry to significantly lower their mark-ups. The scale of the effect suggests that, on average across firms within an industry, an increase of 10 pp in the share of online sales would reduce the mark-up by 4 pp. The result is robust to the inclusion of one or more of the controls.

However, the profitability of firms, calculated as the EBITDA-to-sales ratio, is not significantly affected. To investigate this latter result and assess what factor might allow profitability to be maintained while mark-ups simultaneously decline, the above equation is estimated over two important costs for firms: (i) cost of supplies, which include rents, utilities and non-production related materials, and (ii) labour costs. The results indicate that an increase in the share of sales made online prompts firms in the industry to reduce their cost of supplies relative to sales, while labour costs appear unaffected.

The results for mark-ups therefore indicate that the growth of e-commerce may have increased competition among firms and reduced mark-ups, insofar as firms have adjusted their prices down to absorb growing demand. However, the lower mark-ups do not appear to translate into losses of profitability for firms. This may indicate a reduction of certain fixed costs such that total profits are not necessarily altered to a substantial degree.

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