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RESEARCH ARTICLE

Profitability and profit persistence in EU food retailing: Differences between top competitors and fringe firms

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Abstract

We investigate the drivers and persistence of profits in EU food retailing by focusing on differences between "top competitors" and fringe food retailers using a sample of 12,786 firms from France, Spain, and Sweden between 2006 and 2014. We detect a high degree of profit persistence in food retailing, presumably caused by strong bargaining power towards processors. Moreover, we find that profit persistence is higher for "top competitors" such as members of Top-5 chains regarding sales and that independent/specialized supermarkets generate lower profitability. The results provide insights regarding power imbalances in food retailing and thus support the development of managerial strategies as well as measures to enhance market efficiency.

KEYWORDS

food retailing, GMM dynamic panel model, profit persistence, profitability drivers

JEL CLASSIFICATION

C23; L13; L22; L25; L81

1 | INTRODUCTION

An understanding of the mechanisms governing the relationship of firm profits, company characteristics and the external business environment (e.g., the structure of the industry in which it operates) is essential for firms'

strategic orientation in dynamic market environments such as the EU food retail sector (Berner, 2002). The food retailing sector is of key relevance because it is the connecting element between the food-processing industry and the end consumer and represents the final phase for products on their way to the consumer (Richards & Pofahl, 2010; Sheldon, 2017). In the food retailing sector, the market structure is generally associated with competitive advantages of dominant supermarket chains in comparison to smaller, independent fringe groceries (e.g., Inderst & Valletti, 2011). This has consequences for entire agri-food systems.

In this paper, we, therefore, provide new insights on the persistence and drivers of profits in EU food retailing. More specifically, we investigate differences between "top competitors" and fringe retailers using empirical case studies on retail firms in France, Spain, and Sweden during the period 2006–2014.

There is evidence that food retailing remains highly competitive due to fierce price and nonprice competition and low margins (e.g., Dobson, Clarke, Davies, & Waterson, 2001; Richards & Hamilton, 2006; Richards, Hamilton, & Yonezawa, 2018). However, increasing consolidation through mergers and acquisitions and the presence of dominant oligopolies can be observed in several EU countries (McCorriston, 2002, 2014). For example, Sheldon (2017) indicates that in comparison to the US food supply chain where the focus has mainly been on high seller concentration in food processing, EU antitrust authorities are particularly focusing on concentration in food retailing. In fact, food retail market structure is characterized by five firm concentration ratios that well exceed 70% in most member states (Dobson et al., 2001; McCorriston, 2014; Muehlfeld, Weitzel, & van Witteloostuijn, 2011; Wijnands, der Meulen, & Poppe, 2007). These developments can create challenges resulting from power imbalances across the food supply chain (e.g., Aalto-Setälä, 2002; Cotterill, 1986; McCorriston, 2014; Viaene & Gellynck, 1995).[1] The market structure affects the dynamic deviations of firm profit from the competitive norm – a phenomenon known as profit persistence (e.g., Geroski & Jacquemin, 1988; Goddard, Tavakoli, & Wilson, 2005; Pattitoni, Petracci, & Spisni, 2014). Profit persistence relates to the degree of competition within an industry by indicating the speed at which competitive forces erode above- or below-average profits and it can also be an indication of firms' competitive advantages by revealing the degree to which firms can resist the forces of competition for example, through their ability to prevent imitation or block entry (e.g., Goddard & Wilson, 1996; McMillan & Wohar, 2011).

Extensive research into the industrial organization, strategic management, and finance has aimed at identifying the drivers of firm profitability (e.g., Bain, 1956; Porter, 1980; Rumelt, 1991) and determining the degree of profit persistence (e.g., Geroski & Jacquemin, 1988; Goddard et al., 2005; Pattitoni et al., 2014).[2] Previous studies analyzing profit persistence in the food sector have revealed that firms operating in the EU food processing sector are characterized by a low degree of profit persistence compared to other industrial sectors due to a highly competitive market structure and strong downstream (i.e., retail sector) concentration (Gschwandtner & Hirsch, 2018; Hirsch & Gschwandtner, 2013; Schumacher & Boland, 2005). Moreover, Hovhannisyan and Bozic (2016) indicate that retailer bargaining power also has implications for horizontal competition as it creates challenges for a large number of smaller, individual retailers and influences the efficiency of the sector which constitutes the basis for the diversity, quality and safety of food available to consumers (Muehlfeld et al., 2011; Sexton & Xia, 2018; Wijnands et al., 2007).

Despite the importance of the EU food retailing sector for overall value chain efficiency, it has not been analyzed with respect to the drivers of firm profitability and the degree of profit persistence (Competition Commission, 2008).[3] Our article is prompted by this lack of evidence combined with the high social and economic relevance of food retailing in the EU. In 2011, a total of 910,000 EU food retailers[4] generated a turnover of €1.130 bn., accounting for approximately 42% of the total EU retail trade turnover and making food retailing the largest retailing sector (Eurostat, 2017a). However, these firms are highly heterogeneous with respect to size and

[1]Accordingly, EU food retailing is closely monitored by governmental competition authorities which investigated 45 antitrust cases between 2004 and 2011 (European Competition Network, 2012).

[2]We refer to Hirsch (2018) for a comprehensive review of the empirical profit persistence literature.

[3]Earlier studies (e.g., Corstjens & Steele, 2008) only focus on the level of retailing firms' profitability or report profit persistence values for entire retailing sectors (e.g., Goddard et al., 2005).

[4]The EU food retail sector is defined as NACE classes G47.11 and G47.21 – G47.29.

organizational structure, such as store types operated, or non-price competition strategies implemented (e.g., Richards & Hamilton, 2006; USDA, 2018).

The purpose of this article is to help close that gap and derive evidence for the degree of accounting profit persistence in EU food retailing. To the best of our knowledge, the food retailing sector has not been investigated in that respect. In contrast to earlier work on profit persistence in the EU food processing industry (Gschwandtner & Hirsch, 2018; Hirsch & Gschwandtner, 2013) a particular emphasis is thereby on differences between "top competitors" (i.e., larger firms and members of Top-5 chains regarding sales) and fringe groceries. Moreover, we assess the impact of firm and industry characteristics on the level of profitability, whereby particular attention is paid to those factors which are relevant for the generation of competitive advantages in food retailing, such as store types operated and membership of a Top-5 retailing group.

Our analysis is based on a dynamic panel model applied to a sample of 12,786 food retailers operating in three EU member states—France, Spain, and Sweden—over the period 2006–2014. These countries account for 29% of the EU food retailing turnover and reflect heterogeneous regions of the EU regarding the level of concentration and the composition of prevailing store types (Eurostat, 2017a; USDA, 2012, 2018, 2019). For example, the five-firm concentration ratio is around 50% in Spain while it exceeds 95% in Sweden (European Commission, 2014; Nicholson & Young, 2012). In the case of store types, there is a stronger presence of convenience stores and superettes in France (USDA, 2018).

Our results point towards a high degree of profit persistence in food retailing and reveal that it is greater for "top competitors". Moreover, we find that independent/specialized retailers generate lower levels of profitability than non-specialized hypermarkets/supermarkets. The findings contribute to understanding the dynamics of profitability in EU food retailing and may reveal power imbalances between "top competitors" and individual fringe retailers. The results may be of particular importance for the group of fringe firms where insights into the persistence and drivers of profitability are relevant when developing strategies to generate competitive advantages that enable a company to resist competitive pressure by large, dominant firms (Samuel, Vigneron, & Sinha, 2012).

The article is organized as follows. We first describe the theoretical background and econometric framework. The next section presents the data followed by a discussion of the results. Finally, a number of conclusions are drawn from our findings.

2 | THEORETICAL BACKGROUND

The static approaches of the classical industrial organization theory and the structure-conduct-performance paradigm (e.g., Bain, 1968) assume that structural industry characteristics such as industry concentration, and industry growth constitute crucial determinants of the degree to which a firm's profits can persistently outperform the market (Carlton & Perloff, 2005; Porter, 1980). On the other hand, strategic management literature and, in particular, the resource-based view supposes that firms' strategic decisions, knowledge, and idiosyncratic resources are the main determinants for the level and persistence of profitability (e.g., Barney, 1991). In empirical applications, these resources have been operationalized by variables related to the market position (firm size and market share), experience (firm age), and financial capabilities (debt ratios) of firms (e.g., Gschwandtner, 2012).

Mueller's (1986) Persistence of Profits hypothesis, deviates from static industrial organization and resource-based literature by relating competition and profitability based on a dynamic approach (Goddard & Wilson, 1996). The Persistence of Profits hypothesis suggests that some firms possess competitive advantages in the form of superior technical knowledge or better access to inputs and finance. These advantages enable them to prevent imitation and entry, leading to excess profits that persist over time. In empirical applications, the degree of the first-order autocorrelation in excess firm profitability is frequently used as an indicator of profit persistence (Goddard et al., 2005).

Before the emergence of the New Empirical Industrial Organization literature (e.g., Bresnahan, 1981), which has emerged as a critique of the simple one-way causal relationship underlying the structure-conduct-performance paradigm (Sheldon, 2017), the above theories were generally tested empirically using reduced form approaches. New Empirical Industrial Organization assesses the strategic actions of firms using game theory and structural approaches accounting for demand, local competition, costs, collusive behavior as well as potential feedback loops between variables (Evans, Froeb, & Werden, 1993). This permits a more detailed depiction of industry and firm specific factors than reduced-form modeling based on the structure-conduct-performance paradigm or resource-based view. Nevertheless, while New Empirical Industrial Organization is particularly suitable for modelling case studies of regionally delimited subindustries with a focus on local competition (Kadiyali, Sudhir, & Vithala, 2001) it has been criticized for for example, the lack of a dynamic oligopoly framework and the ex-ante choices of functional forms for demand and supply functions and the industry technology (Sheldon, 2017).

We aim to generate holistic insights into profitability and profit persistence in EU food retailing focusing on power imbalances between large and fringe retailers. To this end, our analysis is based on the theoretical concepts that have been developed to describe differences in competitive advantages between dominant retailers and individual fringe supermarkets (e.g., Ellickson, 2006, 2007) or, more specifically, those frameworks that model retailing sectors as markets characterized by a dominant oligopoly of large supermarket chains facing a competitive fringe of small firms (e.g., Ellickson, 2006, 2007; Rhoades, 1985).[5] Based on Sutton's (1991) framework of sunk costs and market structure Ellickson (2006) explains the structure of retail markets by presenting an endogenous fixed cost model of vertical product differentiation with two submarkets (large supermarket chains and small grocery stores). Supermarkets compete for a consumer segment that values variety leading to escalating investments in vertical distribution channels and a natural oligopoly of large supermarket chains. Since large supermarkets incur high endogenous fixed costs to prevail in competition and to maintain a variety of products, further entry into this market segment is discouraged. The expansion of retailing firms is therefore limited to a fringe submarket of small grocery stores and specialized retailers that do not invest in vertical distribution but focus on a narrower product assortment targeted at consumers that mainly value price. This leads to an industry structure where the majority of sales are captured by an oligopoly of 3–6 dominant supermarket chains and a fragmented fringe of specialized grocery stores (Ellickson, 2006). Similarly, Inderst and Valletti (2011) show that asymmetric buyer power can lead to a "waterbed effect" where advantageous terms of trade for larger, more powerful buyers lead to less favorable terms of smaller, less powerful rivals. In general, while the dominant oligopoly can exert bargaining power, fringe firms—usually specialized retailers or independent groceries—are price takers that can survive in the market due to a greater merchandising flexibility that allows adaption to particular niche markets (Ellickson, 2006; Handy & Padberg, 1971; Litz & Stewart, 2000).

In the EU food retailing sector, this implies that an advantageous bargaining position, economies of scale and scope, well-coordinated sales and distribution channels, lower administrative burdens regarding EU legislation, combined with better access to capital markets can lead to competitive advantages, less vigorous competition and a higher degree and persistence of profitability for larger dominant firms (Inderst & Valletti, 2011; Shukla, Bhattacharyya, & Narayanan, 2016; Wijnands et al., 2007). On the other hand, although there is a large number of smaller fringe firms, they are less successful due to for example, a less efficient operating cost base, lower investment capital, supply problems (e.g., due to a lack of economies of scale), as well as limited management skills (McEachern & Waranby, 2019).

Nevertheless, small firms can survive in the market by judicious use of non-price strategies that increase their competitive advantages in local markets. These include co-operations, strong customer orientation, creation of a distinct identity through special in-store environments, as well as their role as a center of social activity for local

[5]A recent strand of literature estimates markups and the state of competition in international markets using an extended version of the production function approach by Hall (1988) (e.g. De Loecker, Eeckhout, & Unger, 2020).

inhabitants (Ahlert, Blut, & Evanschitzky, 2010; Baron, Harris, Leaver, & Oldfield, 2001; Doyle & Broadbridge, 1999; Masurel & Janszen, 1998; McEachern & Waranby, 2019; Tajeddini, Elg, & Trueman, 2013).

Accordingly, we assess disparities in competitive advantages between "top competitors" (i.e. larger firms and members of Top-5 chains regarding sales) and small, fringe supermarkets by estimating differences in profit persistence between these two groups. We control for the effect of different retailing formats (store types and legal forms) as well as factors that constitute relevant profitability drivers as defined by industrial organization and strategic management theory.

3 | ECONOMETRIC FRAMEWORK

Our empirical analysis is based on the autoregressive model of order one (AR(1)) previously used for the empirical analysis of profit persistence (e.g., Goddard et al., 2005; Hirsch & Gschwandtner, 2013):

$$\pi_{i,t} = \alpha + \lambda\pi_{i,t-1} + \sum_k \alpha_k X_{k,i,t} + \varepsilon_{i,t} \tag{1}$$

Equation (1) represents a dynamic panel model where the AR(1) coefficient $\hat{\lambda}$ quantifies the average degree of profit persistence across firms in the sample and can be interpreted as a measure for the functioning of competition.[6] and the presence of competitive advantages in an industry (Geroski & Jacquemin, 1988; Goddard & Wilson, 1996; McMillan & Wohar, 2011). Theoretically, the persistence estimate $\hat{\lambda}$ is expected to lie within the range of [−1,1] as values outside this range would indicate an exploding pattern of profits over time which is implausible for competitive markets (Hirsch & Hartmann, 2014; Yurtoglu, 2004). A value of zero indicates an erosion of profits within one period and an absence of firms' competitive advantages. In contrast, a value of + 1 implies a perfect resistance against competitive forces (Khemani & Shapiro, 1990; Mueller, 1990). If the value lies within the range, it can be concluded that there is a partial reduction in the magnitude of profits (either positive or negative) due to competitive effects. Finally, a negative persistence estimate, that is $-1 < \hat{\lambda} < 0$, suggests an oscillating erosion of profits over time. For example, this kind of decline may arise due to a strong dependence on climatic factors or is a typical phenomenon for firms that are on the verge of exiting the market due to bankruptcy (Gschwandtner, 2005; McMillan & Wohar, 2011). Note that $0 < \hat{\lambda} < 1$ can also reflect persistence of losses. However, negative profits should not persist if exit barriers are non-existent as firms will cease operation or take immediate action to enhance profitability. Accordingly, McMillan and Wohar (2011) and Gschwandtner (2005) find that the presence of exit barriers and the degree of profit persistence is particularly low for firms that operate below the competitive profit-level. However, exceptions might occur in the presence of significant sunk commitments that impede the redeployment of resources (McGahan & Porter, 1999). Therefore, we perform sensitivity analyses with respect to the profit persistence of firms that consecutively generate profits below the norm.[7]

In addition to measuring profit persistence and thereby quantifying competitive advantages, Equation (1) also captures the influence on retailers' profitability of firm size, the type of retail format (hypermarket/supermarket; individual/specialized supermarket; Top-5 group member; discounter; convenience store/superrette), legal form and the number of stores operated. Moreover, we control for industry and firm specific factors that (a) reflect the degree of market imperfections according to the IO-theory and (b) represent a firm's resource endowment according to strategic-management literature. Those variables are reflected by X_k and the coefficient vector $\hat{\boldsymbol{\alpha}}_{\mathbf{k}}$ reflects their impact on profitability. Note that the reduced-form model described by (1) does not allow a full understanding of the mechanisms of how firm profits are related to company characteristics and the external

[6]Note that while our article applies the profit persistence measure to evaluate power imbalances in retailing the measure has till late 199s also been used by cartel authorities to evaluate the functioning of competition in specific industries (e.g. Geroski, 2006; Mueller, 1983).

[7]Sensitivity analysis is performed by i) estimating $\hat{\lambda}$ only for below-norm performers and ii) excluding below-norm performers from the estimation.

business environment. However, we aim to mitigate some of the drawbacks of earlier reduced-form IO studies by focusing on a delimited industry, employing a dynamic approach and considering the endogeneity of variables that logically arises through feedback loops between variables by using an IV model (Bonanno, Russo, & Menapace, 2018; Evans et al., 1993; Sheldon, 2017). Note that in our interpretations we do not conclude any direction of causality between profitability and the firm and industry-specific factors but focus on associations.

We use two complementary approaches for a broader assessment of the importance of firm size as a strategic asset and to determine differences in competitive advantages between "top competitors" and individual fringe supermarkets. First, we use sample splits to determine whether $\hat{\lambda}$ differs between "top competitors" and fringe firms. In accordance with Ellickson (2006), we (a) identify "top competitors" and fringe firms based on their membership in a Top-5 retailing group regarding sales, and (b) use the EU size classification which defines small entities as firms with less than €6 million (European Commission, 2013b). Secondly, we consider firm size as a continuous variable and determine marginal effects of $\pi_{i,t-1}$ on $\pi_{i,t}$ – that is profit persistence—across firm size by estimating:

$$\pi_{i,t} = \alpha + \lambda\pi_{i,t-1} + \beta_1 s\pi_{i,t-1} + \beta_2 s^2 + \beta_3 s^2\pi_{i,t-1} + \sum_k \alpha_k X_{k,i,t} + \varepsilon_{i,t} \quad (2)$$

where s indicates firm size measured by total assets. Marginal impacts can then be derived as a function of s using: $(s) = \partial\pi_{i,t}/\partial\pi_{i,t-1}$.

When performing the estimation, it must be borne in mind that dynamic relationships as specified by equations (1) and (2) are affected by an endogeneity bias when estimated with ordinary least squares (OLS). The error term $\varepsilon_{i,t}$ which captures unobserved company characteristics, such as management quality and location is assumed to be composed of a time-invariant fixed effect τ_i and an observation-specific effect $v_{i,t}$ so that $\varepsilon_{i,t} = \tau_i + v_{i,t}$. This implies that $\varepsilon_{i,t}$ is correlated with $\pi_{i,t-1}$, leading to an inconsistent and upward biased estimate of $\hat{\lambda}$ if (a) and (b) are estimated with OLS (Baltagi, 2013; Gschwandtner & Hirsch, 2018).[8] As opposed to OLS, Arellano and Bond's (1991) GMM estimator produces consistent and unbiased estimates of the AR-coefficient ($\hat{\lambda}$) (Andres et al., 2009; Baltagi, 2013). Note that we use the GMM-system estimator which outperforms the related GMM-difference estimator when applied to samples with a relatively short time series dimension (Arellano & Bover, 1995; Blundell & Bond, 1998).[9]

While most of the literature to date has treated the set of industry and firm-specific drivers of profitability (X_k) as exogeneous (e.g., Goddard et al., 2005; Hirsch & Gschwandtner, 2013), we adopt an IV strategy to account for potential endogeneity of firm size and growth, gearing, market share as well as concentration and industry growth. We employ lagged values as instruments and assess their validity and strength using relevant test statistics.

4 | DATA

We use the commercial balance sheet database AMADEUS provided by Bureau van Dijk, which contains financial information on around 21 million European companies. This is the most representative firm-level data source for EU food retailing. As there is no minimum-size criterion for the inclusion of firms in the database, AMADEUS provides solid coverage of the large share of small-sized food retailers. This share is well over 95% in most EU countries (Eurostat, 2017a). Our analysis focuses on the three EU countries France, Spain, and Sweden which together account for 29% of total EU-27 food retailing turnover (Eurostat, 2017a). We use data for the period 2006–2014, whereby AMADEUS provides harmonized data at company level (Bureau van Dijk, 2007). This means

[8]More precisely, endogeneity is caused by $Cov(\pi_{i,t-1}; \tau_i) \neq 0$. The use of fixed or random effects estimation similarly leads to biased $\hat{\lambda}$ values (Andres, Betzer, Goergen, & Renneboog, 2009; Baltagi, 2013).

[9]We refer to Baltagi (2013) for a detailed description of the GMM estimators.

that reports are available at the legal-entity-level, that is for each (private and public) company which operates one or several retail stores. In addition, the reports in our sample are not group-level observations but consist of unconsolidated financial statements. Consequently, distinct data is available for different chains that operate under one holding company. In addition, for chains that are operated as cooperatives or franchisors this implies that data is provided at the level of cooperative members or franchisees. Indeed, a significant number of retail chains in the analyzed countries is organized as cooperatives (e.g., French E.Leclerc) or franchisors (e.g., Spanish DIA or French Spar owned by Casino). As a result, the average number of individual retail outlets a company (legal entity) in our data set runs is with 1.4 (France) to 4.1 (Spain) comparatively small (cf. Table 2).

In accordance with previous profit persistence literature, return on assets, defined as the quotient of earnings before interest and taxes and total assets, is used as the measure for a firm's profitability (Goddard et al., 2005; Hirsch, 2018).[10] We thereby comply with Freeman (1987) and Murphy, Trailer, and Hill (1996) who indicate the need to control for firm size and age when analyzing accounting profits.

Note that accounting values might be biased by profit-smoothing and cross-subsidization (e.g., Barlev & Levy, 1979), as well as different depreciation methods that can lead to systematic errors (Fisher & McGowan, 1983; Perloff, Karp, & Golan, 2007; Salomon, 1989).[11] On the other hand, Long and Ravenscraft (1984) do not find evidence for large deviations between accounting and economic profits and argue that significant differences only arise if depreciation plays a major role in the calculation of profitability. Along these lines, Jacobson (1987) detects a significant relationship between return on investment and stock returns.[12] In addition, Kay and Mayer (1986) find that persistently higher accounting profits are associated with persistently higher economic profits, implying that our measure of profit persistence is not necessarily affected by the above drawbacks. Furthermore, Danielson and Press (2003) detect that harmonized accounting standards such as Generally-Accepted-Accounting-Principles (US-GAAP) constrain the accounting/economic profit relation making accounting profits a suitable proxy. We believe that this also applies to the accounting data in our study to a certain extent, given that listed EU companies must file their reports based on International Financial Reporting Standards. Moreover, harmonization of AMADEUS data is based on International Accounting Standards and the EU directives that companies must adhere to when preparing accounts (Bureau van Dijk, 2007; European Commission, 2013a, 2019a). Finally, Schmalensee (1985) points towards problems of business unit accounting data arising from an arbitrary allocation of assets across different stores. However, this type of profit smoothing does not apply to our company-level data.[13]

To compile the samples, we first selected all those firms from the three countries included which operate in the four-digit NACE classes[14] that define EU food retailing and its subsectors: G47.11 and G47.21 – G47.29. We then added variables related to the retail format such as legal form (limited private, limited public, partnership/cooperative), number of stores a company operates, and the type of stores a company runs. *Hypermarket/supermarkets* are thereby defined as firms operating in NACE code G47.11 (retail sale in nonspecialized stores with food, beverages or tobacco predominating) while *independent/specialized supermarkets* such as small groceries (neighborhood stores) including greengrocers as well as bakeries and butchers are defined as operating in NACE code G47.2 (retail sale of food, beverages, and tobacco in specialized stores).[15] Moreover, by using the information on ultimate company owners and secondary firm names from AMADEUS as well as

[10]Market values, such as Tobin's Q or value added, have only been used in a negligible number of profit persistence studies (Hirsch, 2018).

[11]Moreover, biases can occur through unadjusted equity values (Barlev & Levy, 1979), improper consideration of the effects of advertising and R&D (Hirschey & Wichern, 1984; Perloff et al., 2007) and neglecting to account for cost of capital and accounting policies (Lin, Chen, & Lo, 2014).

[12]Note that the broader literature on firm performance has also applied measures such as return on equity, net income, or an efficiency ratio calculated as quotient of operational expenses and gross profit to proxy firms' financial efficiency (e.g., Halkos & Salamouris, 2004).

[13]Furthermore, alternative measures of performance, such as economic value added developed by Stern Steward & Co, which measures the economic returns generated for shareholders by performing over 100 adjustments related to the treatment of advertising, R&D, and inventory, also have their disadvantages (Holian & Reza, 2011, Weaver, 2001). For example, Biddle, Bowen, and Wallace (1997) show that economic value added is outperformed by earnings as an economic profitability measure.

[14]NACE is the statistical classification of economic activities in the European Community.

industry reports (USDA, 2012, 2018, 2019), we identify those companies (i.e., chains) belonging to a *Top-5* retailing group regarding sales for each country. According to Ellickson (2006) "dominant" retail groups can be precisely identified by financial characteristics such as sales. We, therefore, follow Ellickson (2006) and focus on the five leading retailing groups regarding sales[16] as a distinct bound on the sales generated by these groups which contribute up to 90% to total industry sales (in France and Sweden)[17] can be observed (OECD, 2014; USDA, 2012). In addition, a leap in sales from lower ranked groups to the fifth largest group in each country affirms that non-Top 5 companies are regarded as fringe firms (USDA, 2012, 2018, 2019). Finally, we identify *discounter* chains and *convenience stores* that is small supermarkets (superettes) carrying a limited variety of basic products and that are usually open every day (USDA, 2018; Cai et al., 2018; Rudawska & Bilinska-Reformat, 2018) amongst the *Top-5* groups in each country.[18]

Based on strategic management literature, we then selected firm-specific explanatory variables reflecting firms' resources endowment as control variables (Barney & Arikan, 2001; Goddard et al., 2005; Hirsch, Mishra, Möhring, & Finger, 2020; Pattitoni et al., 2014). *Firm size* and *firm growth* measured by a firm's total assets as well as *market share*, that is the proportion of a firm's sales to total sales of the four-digit NACE class in which it operates are included (e.g. Hirsch & Gschwandtner, 2013; Szymanski, Bharadwaj, & Varadarajan, 1993) to account for competitive advantages of larger and growing firms. We also explore possible nonlinearity in the relationship between size and profits by including a squared term of the size variable (Porter, 1985). *Firm age*, measured in years since incorporation, can account for learning effects (Barney & Arikan, 2001). Finally, we include the *gearing ratio* defined as the quotient of noncurrent liabilities plus loans and shareholder funds (e.g., Linsley & Shrives, 2006) to assess the role of firms` financial capabilities and risk exposure.

As outlined by industrial organization theory, we also control for factors that determine the degree of market imperfections of the industry in which firms compete (e.g., Bain, 1968; Carlton & Perloff, 2005; Porter, 1980). We define industries as four-digit NACE classes within EU food retailing (e.g., Goddard et al., 2005). Subsequently, yearly data related to the concentration measured by the Herfindahl-Hirschman-Index (HHI) as well as size and growth of these NACE subsectors are added from Eurostat (Eurostat, 2017a, 2017b). Note that while endogeneity of most firm-specific variables is intuitive, classical industrial organization literature has, in particular, pointed towards potential endogeneity of industry concentration due to reverse causality between firm performance and industry structure as well as omitted variables (e.g., Evans et al., 1993; Froeb & Werden, 1991). Our IV strategy is therefore in line with recent literature in which estimation biases are mitigated by either constructing instruments or employing lagged values of concentration as instrumental variable (Hovhannisyan, Cho, & Bozic, 2019).

The samples were finalized by performing multivariate outlier screening using the blocked adaptive computationally efficient outlier nominators (BACON) algorithm (Billor, Hadi, & Velleman, 2000). Outliers in accounting data can consist either of erroneous observations such as negative assets or of implausible values –that is observations that systematically deviate in a multivariate manner from the remainder of the sample. The BACON algorithm allows the identification of multivariate outliers on the basis of Mahalanobis distances (Weber, 2010). Observations with distances deviating from a variable's median within a threshold defined by

[15]We do not further delimit the G47.2 category for example, by excluding bakeries as our theoretical framework emphasizes the role of specialized fringe firms (Ellickson, 2006). There is also evidence for inter-store type competition where consumers are diversifying their purchases through several stores including supermarkets and specialized retailers (González-Benito, Muñoz-Gallego, & Kopalle, 2005; USDA, 2018).

[16]Ellickson (2006) uses Top-6 groups and additionally identifies dominant and fringe firms based on their degree of vertical integration and a stochastic growth model. However, this is not possible with the present data. Moreover, Ellickson (2006) finds robustness in-store characteristics between the dominant Top-6 firms and the dominant firms identified via the alternative methods.

[17]Five-firm concentration is with around 60% lower in Spain (European Commission, 2014).

[18]Note that any Top-5 retailing group can operate several chains with distinct store formats. Moreover, while the majority of Top-5 group members are hypermarkets/supermarkets (NACE 47.11), some specialized and convenience store chains that belong to a Top-5 group (e.g., French biocoop) operate as specialized supermarkets (NACE G47.2). Data on the geographical focus (national/international) was highly correlated with the Top-5 variable and therefore not considered in the analysis.

TABLE 1 Representativeness of the samples

	France	Spain	Sweden
# firm in sample	7,485	3,432	1,869
# firms in population[a]	69,240	130,678	9,639
% shares by size class[b] in 2014			
Large firms			
Sample	1.24	1.78	0.45
Population	0.21	0.07	0.24
Medium firms			
Sample	5.66	1.71	3.32
Population	1.64	0.12	2.21
Small firms			
Sample	93.10	96.52	96.23
Population	98.15	99.81	97.55

Note: Shares for the population are derived from Eurostat (2017b).
[a]Population refers to all firms operating in NACE G 47.11 and G 47.2.
[b]Size classification based on the threshold of the European Commission (2013b): small: <50 employees and total assets <EUR 6 million; medium: <250 employees and total assets <EUR 20 million. Due to data availability, firms in the population are size-classified according to the number of employees while firms in the sample are classified by total assets.

the 1-α percentile of the χ^2 distribution remain in the sample while observations exceeding this threshold are rejected (Billor et al., 2000). The following number of firm/year observations (out of 90,022 observations) were identified as multivariate outliers and removed from the samples: France (419), Spain (265), and Sweden (138).[19]

Table 1 shows the distribution of the sample of 12,786 food retailing firms over the three countries and across size classes. Despite solid representation of small firms skewness towards large firms in the samples for France and Spain prevails. Note that while all limited liability and listed EU companies are obliged to file financial statements which are then included in AMADEUS (Bureau van Dijk, 2007), the EU rules on financial information disclosure are relatively lenient for micro-size companies with less than 10 employees (European Commission, 2013a). These firms are allowed to publish abridged balance sheets and profit and loss accounts potentially leading to their exclusion from the sample and potential sample selection bias (European Commission, 2019b). However, the firms included generate a total of 51.61% of the overall food retail turnover in the three countries selected and hence adequately represent the population of firms.

Descriptive statistics for all variables are reported in Table 2. In European retail as a whole, firms achieve an average return on assets of approximately 4.5% (Quesada, De Orta, Mendes, Ponkratova, & Andrade, 2015). Using this as a reference, the mean values in Table 2 ranging from 2.5% to 9.9% reveal that, with the exception of Spain, firms in our sample generate a relatively high return on assets. This may be due to the underrepresentation of less profitable micro-sized firms.

Moreover, it can be observed that firms in Spain are considerably larger, but are characterized by lower growth, compared to the remaining countries and, in addition, they operate a significantly larger number of stores. This is due to a lower number of chains based on a franchise concept compared to for example, in France, several of these chains exist (e.g., Spar and Franprix). Furthermore, a significantly larger share of independent/specialized

[19]Descriptive statistics for the identified outliers (cf., Appendix A2) reveal that these observations are, on average, characterized by an implausible combination of extremely high leverage, large firm size, and growth as well as extreme ROAs.

TABLE 2 Summary statistics of firm and industry specific variables (2006–2014)

	France	Spain	Sweden
Return on assets (Profit or Loss)/TA)	0.091 (0.131)	0.025 (0.127)	0.099 (0.170)
Top-5	0.021 (0.142)	0.005 (0.071)	0.016 (0.124)
Discounter	0.001 (0.026)	0.001 (0.028)	0.002 (0.042)
Supermarket/hypermarket	0.516 (0.500)	0.296 (0.457)	0.754 (0.431)
Independent/specialized	0.484 (0.500)	0.704 (0.457)	0.246 (0.431)
Convenience/neighborhood	0.010 (0.098)	0.001 (0.024)	0.007 (0.084)
Number of stores	1.359 (2.563)	4.131 (40.137)	1.446 (7.907)
Private limited	0.649 (0.477)	0.915 (0.279)	1.000 (0.000)
Public limited	0.343 (0.475)	0.084 (0.278)	-
Partnership/cooperative	0.007 (0.086)	0.001 (0.031)	–
Firm size (TA m. €)	1.641 (4.113)	7.748 (142.010)	1.609 (16.173)
Firm growth (growth factor)	1.060 (0.301)	1.045 (0.298)	1.065 (0.326)
Market share (%)	0.020 (0.046)	0.088 (1.258)	0.111 (0.492)
Firm age (years)	16.861 (10.632)	15.522 (8.090)	17.874 (13.292)
Gearing ratio	0.891 (1.470)	0.962 (1.679)	0.696 (1.441)
Concentration (HHI)	74.302 (61.072)	1,159.674 (1,694.111)	209.545 (90.303)
Industry growth (growth factor)	1.021 (0.104)	0.984 (0.060)	1.030 (0.068)
No. of obs.	54,125	23,610	12,287

Note: Values in parentheses are standard deviations.

retailers operates in Spain compared to France and Sweden, where around 50% of the firms operate hyper-/supermarkets (Table 2). It can also be observed that the share of convenience stores is highest in France. Table 2 shows that the majority of retailers operate as private limited companies. Finally, it can be observed that, contrary to the conventional precept of extremely high concentration, firms in our sample operate on average in moderately

concentrated industries.[20] This is due to the fact that we measure concentration at the 4-digit NACE level and not for food retailing as a whole. Tests of country differences between all mean values are reported in Tables A1 and A2.

5 | RESULTS AND DISCUSSION

5.1 | Profit persistence

Table 3 presents the estimation results of the dynamic panel model specified by Equation (1). The findings reveal a statistically significant profit persistence estimate $\hat{\lambda}$ for the three countries investigated indicating successful resistance against competitive forces. In particular, a high degree of profit persistence is achieved in France (0.610) and Sweden (0.636), while persistence is somewhat lower in Spain (0.451). However, this difference is not statistically significant (cf., Table A3). While the entry of a leading international discounter at the beginning of the 2000 s has led to increased dynamics of competition in Swedish food retailing, the high level of profit persistence in this sector may be due to the extremely high five-firm concentration ratio that exceeds 95% associated with high entry barriers (USDA, 2012). In turn, Spanish retailing is characterized by marked diversity with competitive friction between different store formats and a relatively low concentration of around 50%. This probably leads to lower profit persistence (European Commission, 2014; Nicholson & Young, 2012).

The degree of profit persistence identified in our study is (except for Spain) higher than the results obtained by Goddard et al. (2005) for the EU retail sector as a whole and generally exceeds the findings of Hirsch and Gschwandtner (2013) for the EU food processing industry.[21] Hence, competitive advantages and bargaining power towards upstream sectors (i.e., food processors) tend to be higher in EU food retailing than in other retailing sectors (e.g., Wijnands et al., 2007).

We estimated $\hat{\lambda}$-values (a) under exclusion of firms that consistently perform below the norm and (b) for models that only consider below-norm performers to account for possible upward biases in $\hat{\lambda}$ due to the persistence of negative profits. Table A4 shows that only between 2.3% (Sweden) and 3.2% (Spain) of the firms included consistently report negative profits. We find that $\hat{\lambda}$-values for the models excluding below-norm performers do not differ significantly[22] from those in the full model. Moreover, when only focusing on below-norm performers, these firms are characterized by $\hat{\lambda}$-coefficients that are either equal to (France) or lower than (significant only for Sweden) those obtained for the remaining firms. This indicates that profit persistence is not upward biased through the persistence of below-norm profits, since these profits either do not tend to persist or do not exceed persistence of above-norm performers.

5.2 | Differences between SMEs and large firms and Top-5 and fringe firms

The differences in competitive advantages between "top competitors" and independent fringe supermarkets (e.g., Ellickson, 2006) are assessed by estimating separate models for large/small as well as Top-5/non-Top-5 retailers. Table 3 shows that in each country λ-values of SMEs with less than €6 million in total assets are significantly below

[20]Three market types can be distinguished based on the HHI; moderately concentrated (0 < HHI < 1,500); reasonably concentrated (1,500 < HHI < 2,500); and highly concentrated (2,500 < HHI < 10,000; USDoJ, 2010).

[21]Goddard et al. (2005) detect persistence measures $\hat{\lambda}$ of 0.411, 0.329, and 0.443, for the entire retail trade sectors of Belgium, France, and the UK, respectively. Hirsch and Gschwandtner (2013) detect persistence values between 0.110 (Belgium) and 0.304 (UK) for the EU food industry. Note that both studies are based on the same data source and estimator used in our analysis.

[22]Based on a z-test for the difference between regression slopes.

TABLE 3 Dynamic panel model estimation results

	All firms			Large firms			Small firms		
Variable	France	Spain	Sweden	France	Spain	Sweden	France	Spain	Sweden
$\pi_{i,t-1}$	0.610*	0.451**	0.636***	0.990***	0.782***	0.878***	0.332	0.289	0.370*
	(0.330)	(0.224)	(0.166)	(0.207)	(0.086)	(0.096)	(0.328)	(0.194)	(0.225)
Firm level explanatory variables									
Top-5	0.026**	0.052	0.020	−0.008	0.012	0.060*	0.013	–	−0.110
	(0.011)	(0.071)	(0.038)	(0.018)	(0.014)	(0.031)	(0.022)		(0.098)
Discounter	−0.021	−0.012	0.094*	0.018	−0.011	−0.129	1.31e-4	–	0.153
	(0.020)	(0.028)	(0.049)	(0.026)	(0.019)	(0.118)	(0.022)		(0.146)
Independent/	−0.019*	−0.009***	−0.025*	−0.179	−0.003	−3.10e-4	−0.019	0.007	0.044
specialized	(0.011)	(0.003)	(0.014)	(0.145)	(0.006)	(0.059)	(0.031)	(0.010)	(0.037)
Convenience/	0.016	−0.122	−0.009	–	0.035	–	0.068*	4.440	0.112
neighborhood	(0.037)	(0.213)	(0.039)		(0.030)		(0.039)	(2.781)	(0.097)
Number of stores	−2.16e-4	1.64e-4	−0.001	−4.44e-4	1.42e-5	0.001	−0.010*	−0.004	0.003
	(0.001)	(2.88e-4)	(0.001)	(4.96e-4)	(4.22e-5)	(0.001)	(0.005)	(0.003)	(0.003)
Private limited	−0.013*	−0.001	–	0.012	0.003	–	−0.011	0.023**	-
	(0.007)	(0.004)		(0.020)	(0.008)		(0.036)	(0.010)	
Partnership/	0.002	0.001	–	−0.007	−0.011	–	0.018	0.015	-
cooperative	(0.020)	(0.023)		(0.018)	(0.011)		(0.028)	(0.015)	
Firm size	−0.005**	−5.64e-5	2.08e-4	0.002	−1.65e-5	−0.001	−0.014	0.144*	0.098*
	(0.003)	(1.06e-4)	(5.63e-4)	(0.003)	(1.91e-5)	(4.95e-4)	(0.047)	(0.080)	(0.059)
Firm size^2	6.85e-5*	1.17e-9	−6.66e-7	−1.80e-5	1.62e-9	9.32e-7	0.001	−0.028	−0.017
	(3.95e-5)	(7.59e-9)	(8.09e-7)	(3.30e-5)	(1.70e-9)	(5.82e-7)	(0.003)	(0.022)	(0.013)
Firm growth	−0.037	0.210***	0.254**	0.018	0.110**	0.023	−0.056	0.127**	0.161**
	(0.069)	(0.068)	(0.099)	(0.048)	(0.050)	(0.107)	(0.140)	(0.057)	(0.073)
Market share	0.378**	−0.001	0.020	0.624	8.82e-5	−0.011	0.760	−0.071	−0.133
	(0.191)	(0.002)	(0.017)	(0.428)	(3.02e-4)	(0.017)	(0.654)	(0.069)	(0.107)
Firm age	−1.92e-4	4.96e-4	2.32e-4	−8.95e-5	0.003	−0.001	−3.25e-4	−0.002**	−0.001
	(3.14e-4)	(8.93e-4)	(4.10e-4)	(0.001)	(0.002)	(0.002)	(8.23e-4)	(0.001)	(0.001)

TABLE 3 (Continued)

	All firms			Large firms			Small firms		
Variable	**France**	**Spain**	**Sweden**	**France**	**Spain**	**Sweden**	**France**	**Spain**	**Sweden**
Firm age^2	3.96e-6	−1.80e-6	−3.34e-6	2.45e-6	−2.90e-5	−4.98e-6	7.11e-6	2.11e-5**	1.02e-5
	(4.99e-6)	(9.40e-6)	(5.07e-6)	(9.86e-6)	(2.20e-5)	(4.11e-5)	(1.15e-5)	(9.70e-6)	(8.44e-6)
Gearing ratio	1.93e-4**	1.53e-4	−4.84e-4**	−2.61e-5	1.62e-4	2.91e-4	4.69e-4	9.11e-5	−4.05e-4**
	(7.73e-5)	(1.04e-4)	(2.22e-4)	(9.34e-5)	(1.14e-4)	(4.10e-4)	(3.37e-4)	(1.08e-4)	(1.91e-4)
Industry level explanatory variables									
HHI NACE	−1.169	0.021**	0.045	2.735	−0.007	1.499	−0.905	0.010	0.733
	(0.805)	(0.010)	(1.311)	(2.660)	(0.027)	(2.941)	(1.229)	(0.013)	(0.852)
Industry growth	0.024	0.013	−0.433***	−0.623	0.057	−0.169**	0.063	0.013	−0.164*
	(0.024)	(0.024)	(0.114)	(0.433)	(0.053)	(0.084)	(0.060)	(0.023)	(0.099)
Intercept	0.056	−0.240***	0.248***	0.556	−0.218***	0.168*	0.050	−0.187**	0.034
	(0.050)	(0.089)	(0.069)	(0.397)	(0.070)	(0.093)	(0.127)	(0.080)	(0.052)
Model diagnostics									
Wald χ^2	742.20	152.66	570.92	243.64	851,457.46	5,080.56	277.13	1191.33	970.71
p	.000	.000	.000	.000	.000	.000	.000	.000	.000
AR(2) z	1.10	1.56	1.92	0.29	−0.19	0.71	0.29	1.04	1.08
p	.270	.118	.055	.773	.847	.479	.770	.297	.278
Hansen/Sargan χ^2	8.26	14.39	19.42	2.50	33.54	25.67	10.06	22.57	24.12
p	.310	.852	.366	.927	.789	.219	.074	.367	.192
obs.	45,903	15,645	9,420	2,766	496	235	43,137	15,149	9,185
firms	7,313	2,620	1,843	545	87	68	7,000	2,545	1,817

	Top-5			Non-Top-5		
Variable	**France**	**Spain**	**Sweden**	**France**	**Spain**	**Sweden**
$\pi_{i,t-1}$	0.733***	0.668***	0.584***	0.353**	0.284	0.395***
	(0.264)	(0.086)	(0.237)	(0.175)	(0.380)	(0.108)
$\pi_{i,t-2}$a	−0.088					
	(0.266)					

(Continues)

TABLE 3 (Continued)

	Top-5			Non-Top-5		
Variable	**France**	**Spain**	**Sweden**	**France**	**Spain**	**Sweden**
Firm level explanatory variables						
Top-5	–	–	–	–	–	–
Discounter	−0.026	0.016*	0.074	–	–	–
	(0.026)	(0.009)	(0.063)			
Independent/ specialized	−0.189	0.002	–	0.001	−0.011*	0.004
	(0.128)	(0.021)		(0.009)	(0.006)	(0.024)
Convenience/ neighborhood	0.020	–	0.018	–	−0.104	–
	(0.031)		(0.049)		(0.496)	
Number of stores	−0.006	1.16e-5	−4.10e-4	2.70e-4	5.94e-5	−0.004*
	(0.008)	(1.03e-5)	(0.002)	(0.001)	(4.50e-4)	(0.002)
Private limited	0.018	0.027*	–	−0.015	0.004	–
	(0.023)	(0.015)		(0.011)	(0.005)	
Partnership/ cooperative	0.083	0.011	–	0.006	0.017	–
	(0.039)	(0.009)		(0.015)	(0.031)	
Firm size	−4.8e-4	1.76e-7	0.003	−0.002	0.001	0.014***
	(0.002)	(9.80e-6)	(0.003)	(0.004)	(0.001)	(0.005)
Firm size^2	−1.04e-5	2.29e-10	−3.58e-6	−3.29e-5	−1.59e-6	−4.46e-5***
	(1.35e-5)	(1.02e-9)	(3.27e-6)	(6.98e-5)	(1.80e-6)	(1.40e-5)
Firm growth	0.047	0.028	0.483**	−0.005	0.134**	0.262***
	(0.080)	(0.039)	(0.216)	(0.061)	(0.068)	(0.087)
Market share	1.448	−2.04e-4	−0.043	0.237**	0.040	−0.091
	(1.518)	(4.85e-4)	(0.070)	(0.113)	(0.059)	(0.061)
Firm age	0.001	0.004	0.001	−4.12e-4	−4.86	−1.54e-4
	(0.002)	(0.003)	(0.004)	(3.37e-4)	(0.001)	(4.41e-4)
Firm age^2	−5.33e-6	−4.91e-5	1.30e-5	6.70e-6	8.34e-6	1.76e-6
	(4.91e-5)	(3.77e-5)	(6.64e-5)	(5.32e-6)	(1.12e-5)	(6.04e-6)
Gearing ratio	−1.36e-4	3.11e-5	−3.56e-4	2.75e-4***	1.20e-4	−0.001**

TABLE 3 (Continued)

Variable	Top-5			Non-Top-5		
	France	Spain	Sweden	France	Spain	Sweden
	(9.47e-5)	(4.44e-5)	(2.96e-4)	(9.32e-5)	(1.50e-4)	(3.06e-4)
Industry level explanatory variables						
HHI NACE	1.131	0.064	−6.165	−0.488	0.009	−0.132
	(2.303)	(0.046)	(7.867)	(0.443)	(0.014)	(1.080)
Industry growth	−0.189	0.072*	−0.465	0.014	−0.011	−0.302***
	(0.128)	(0.037)	(0.321)	(0.037)	(0.037)	(0.111)
Intercept	0.156	−0.176**	0.145	0.039	−0.123	0.141***
	(0.158)	(0.071)	(0.216)	(0.047)	(0.086)	(0.047)
Model diagnostics						
Wald χ^2	632.97	10,421.42	274.15	352.40	170.99	519.40
p	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) z	1.17	0.91	−1.36	0.65	0.59	1.11
p	.244	.364	.175	.515	.555	.267
Hansen/Sargan χ^2	17.60	51.70	31.60	12.26	10.16	42.30
p	.128	.525	.720	.056	.254	.185
obs.	782	100	146	44,958	15,545	9,274
firms	150	17	30	7,160	2,603	1,814

Note: $\pi_{i,t-1}$ and $\pi_{i,t-2}$ are lagged profits; figures in parenthesis are heteroscedasticity robust standard errors.

*, **, and ***significant at 10%, 5%, and 1% level, respectively.

Small firms are defined as having less than €6 million (European Commission, 2013b).

[a]Several specifications for the French Top-5 model have led to second-order autocorrelation in the residuals, which is undesirable in dynamic panel models. In such cases, Goddard et al. (2005) propose the addition of higher-order lags of the dependent variable to the right-hand side of the model. Moreover, Callen and Morel (2001) show that profit dynamics can be characterized by an AR(2)-process. Therefore, the Top-5 model for France was estimated by including an additional second-order lag as an independent variable. The results indicate that the additional lag removes second-order autocorrelation without having a statistically significant impact or altering the remaining coefficient estimates.

those of large companies (cf., Table A3 for statistical tests of these differences). We also find a similar pattern when splitting the sample into Top-5 group members and fringe firms, although differences are not significant in this case.

While the sample split approach constitutes an ad hoc splitting into "top competitors" and fringe firms, equation (2) allows information to be derived on the behavior of λ across the entire size class range. Table A5 [23] shows that marginal effects (i.e., profit persistence) increase continuously with firm size in all countries, thus resembling the results of Table 3.

To summarize, our findings support previous evidence on the presence of a group of "top competitors" and a fringe of firms with lower competitive advantages in EU retailing (e.g., Draganska, Klapper, & Villas-Boas, 2010; Ellickson, 2006; Inderst & Valletti, 2011). Hence, larger EU food retailers tend to benefit from competitive advantages when compared to fringe supermarkets due to their advantageous bargaining position, economies of scale and scope, more efficient sales and distribution channels, as well as lower administrative burdens (e.g., Wijnands et al., 2007).

5.3 | Profitability, and associations with firm-, and industry-specific variables

Equation (2) also controls for the relevance of firm and industry-specific variables on the level of profitability.[24] We calculated variance inflation factors and correlations coefficients to avoid multicollinearity among these variables and found that severe multicollinearity is not present.

Regarding store types, Table 3 reveals that independent/specialized retailers are characterized by significantly lower profitability compared to the base group of hypermarkets/supermarkets in all countries. This confirms the fact that this store format has come under pressure due to current trends of consolidation and concentration plus a growing share of discounters that operate with extremely low margins. This has led to increased competition and declining market shares of independent/specialized retailers (Ahlert et al., 2010; Hardaker, 2018). Membership of a Top-5 group is associated with higher profitability in France and amongst the set of larger firms in Sweden where the market is dominated by three large chains. This indicates the advantages of Top-5 retailers w.r.t. bargaining power and well-coordinated sales and distribution channels. It can also be observed that operating as a discounter is associated with higher profitability in Sweden and Spain. This confirms that the recent entry of international discounter chains into the Swedish retailing sector has changed the dynamics in this market. Moreover, in many EU countries increasing price competition has led to a more price-oriented strategy of dominant incumbent chains and a competitive environment favoring discounters (Ahlert et al., 2010; USDA, 2012). We also detect that convenience stores generate higher profitability, particularly amongst smaller French retailers. This can be attributed to the popularity of this store type in France (in the EU, only the UK has a higher number of convenience stores than the French retailing sector), higher prices and margins as well as longer opening hours (Rudawska & Bilinska-Reformat, 2018; USDA, 2018). Finally, it can be observed, that operating a larger number of stores reduces the profitability of fringe firms in France and Sweden. This result is in line with Martinez-Giralt and Neven (1988) who find that establishing multiple stores can accelerate local price competition that outweighs potential advantages of market segmentation and reduces profitability.

The firm and industry-specific control variables in Table 3 reveal a U-shaped relationship between size and profitability in France suggesting that larger firms generate higher profitability and that gains in profitability rise as size increases. It can also be observed that *firm size* is positively related to the level of profitability, particularly within the set of small and non-Top-5 firms in Spain and Sweden. Therefore, in line with strategic management literature, size tends to constitute a relevant strategic resource for the generation of profits, especially in the fringe of smaller food retailers

[23]Results for the underlying regression models are reported in Table A6

[24]Note that the joint presence of variables containing very large numbers (e.g., firm size measured in mio. €) and small numbers, such as percentages (e.g., gearing ratio) can cause computational errors in regression analysis, above all when variables are stored as less precise floating-point numbers (Hayashi, 2000). Roodman (2009) also indicates that the Stata command xtabond2, which is applied to generate the results in Table 3, can be sensitive to the finite precision of floating-point values. Therefore, we imported all values in the more precise "double" format. Moreover, we performed sensitivity analysis by rescaling variables which did not alter estimated coefficients.

(Amato & Amato, 2004; Lee, 2009). We detect that *firm growth* is consistently positively related to profitability indicating potential benefits of growth strategies (Varaiya, Kerin, & Weeks, 1987). Moreover, as advanced by Amato and Amato (2004) and Goddard et al. (2005), Table 3 reveals a positive relationship of *market share* and profitability in France. This suggests related strategic advantages and product differentiation benefits.

Regarding *firm age*, we detect a U-shaped relationship with profitability amongst smaller firms in Spain. This is potentially due to learning effects acquired with increasing age that with time overcome initial inefficiencies (Deeds & Rothaermel, 2003).

Higher financial risk and leverage is generally perceived as being associated with higher returns (e.g., Barney & Arikan, 2001) and we do in fact detect a positive relationship of the *gearing ratio* and profitability in France. In contrast, the negative relationship between gearing and profitability in Sweden indicates that leveraged firms suffer from the pressure of servicing their debt (Amato & Amato, 2004; Goddard et al., 2005). This result is also in line with prospect theory (e.g., Shimizu, 2007) and the "risk-return paradox." This is based on the observation that risk and returns are often negatively related because firms suffering from economic depression tend to make riskier choices (Bowman, 1980).

In the case of industry-specific variables, the *HHI* can be considered as an indirect measure for barriers to market entry, implying that firms in highly concentrated industries benefit from greater profits (Hou & Robinson, 2006). Furthermore, high concentration can be the result of efficiency increases and a source of strong bargaining power towards the food processing industry (e.g., Wijnands et al., 2007). Accordingly, our results reveal a positive relationship of the *HHI* and profitability in the Spanish food retailing sector.

Finally, *industry growth* tends to have a significant negative relationship with profits in Sweden. This suggests that rapid industry growth can increase non-price competition, such as advertising as well as differentiation strategies in the form of in-store services that curb profitability. In contrast, profitability reacts positively to industry growth amongst Top-5 retailers in Spain. This effect may be explained by growth that is induced by increasing demand thus leading to less aggressive pricing strategies (Gschwandtner & Hirsch, 2018; Porter, 1980).

With regard to model diagnostics, Wald tests indicate overall significance for all models (Arellano & Bond, 1991; Roodman, 2009). In addition, the Hansen test of over-identifying restrictions provides insights with respect to the correct implementation of instruments. As described in Section 3, Equations (1) and (2) are estimated using lagged values as instruments for the endogenous independent variable $\pi_{i,t-1}$ as well as for all time-variant firm and industry-specific variables. The Hansen test is based on the null hypothesis that instruments are orthogonal to the errors (Arellano & Bond, 1991), which is not rejected on the 5% level or lower in any of the cases. This indicates that lagged values constitute valid instruments (Wooldridge, 2006). Finally, in the case of the GMM estimator, it is important to assess the presence of second-order autocorrelation in the residuals as this would imply that the moment conditions used in the estimation are invalid (Baltagi, 2013). The AR(2) test statistic confirms that the models are not affected as the null hypothesis of no second-order autocorrelation is not rejected on the 5% level or lower in any of the cases. This confirms the appropriateness of the selected instruments (Baltagi, 2013).

6 | IMPLICATIONS AND CONCLUSIONS

In the present article, we analyzed the degree of persistence and the drivers of profitability for 12,786 firms operating in EU food retailing. Overall, our findings reveal a resistance against competitive forces in the form of firm profits that persist from 1 year to the next in the three countries studied. A comparison with previous results for the whole EU retail sector and the food processing sector shows that food retailers are characterized by higher profit persistence which suggests that they benefit from stronger competitive advantages and bargaining power towards upstream sectors (i.e., food processors) than other retailing sectors (e.g., Wijnands et al., 2007).

However, our results reveal differences between "top competitors" independent, fringe supermarkets. More precisely, we find that profit persistence is higher for larger retailers and members of a Top-5 group than for fringe

supermarkets and that independent/specialized supermarkets generate lower levels of profitability. These findings indicate power imbalances in retailing that can potentially affect the efficiency at successive interrelated stages of the food supply chain (McCorriston, 2002; Sexton, 2000; Sheldon, 2017). Along these lines, Hovhannisyan and Bozic (2016) argue that retailer bargaining power can have implications, not only for horizontal competition but also for vertical relationships along the supply chain. These include adverse effects for small food processors and farmers, decreased consumer welfare and higher prices as well as lower productivity growth (Griffith & Harmgart, 2012; Hovhannisyan et al., 2019; Sexton & Xia, 2018). For example, Carstensen (2000) shows that strategic behavior by dominant retailers can reduce the ability of agricultural producers to act as independent entrepreneurs. According to Richards, Bjørkhaug, Lawrence, and Hickman (2013), dominant retailers can impose regulatory burdens in the form of compliance with specific food safety standards leading to high costs that drive small farmers out of the market. Moreover, EU retailers are able to dominate negotiations with the processing industry using strategies such as delisting threats, listing charges, shelf space fees (slotting allowances) or take-back-agreements constraining processors' individual decision-making and willingness to innovate (Dobson et al., 2001; Dobson, Waterson, & Davies, 2003; Hamilton, 2003; McCorriston, 2002; Weiss & Wittkopp, 2005). Bargaining power is further enhanced by the increasing share of private labels which could progressively force small-sized processors' brands out of the market (Frank & Lademann,, 2012; Hirsch & Hartmann, 2014; McCorriston, 2014). Nevertheless, despite potential adverse effects of retailer bargaining power, Brester, Marsh, and Atwood (2009) believe that the marketing system via retailers is still the more profitable option for farmers than selling directly to consumers. Finally, Lloyd et al. (2015) indicate that imperfect competition at successive stages of the supply chain can affect the transmission of price changes from the agricultural sector to the consumer. However, there is also evidence that consumers can benefit from the dominant position held by retailers due to the development of one-stop shopping offers, larger variety, and lower prices resulting from cost savings from enhanced efficiency (Dobson et al., 2003).

From the firms' perspective, the high degree of profit persistence indicates that larger EU food retailers and/or those belonging to a Top-5 chain operate in a favorable competitive environment. Furthermore, the results related to the impact of firm and industry-specific explanatory variables on profitability can be important when developing management practices in particular for the large number of small and medium-sized firms in this sector. Our findings reveal that decision-making processes should focus on growth so that a firm can reach a size that enables it to leverage economies of scale. Larger size also means that firms are in a better position to deal with administrative burdens or meet stringent quality standards. However, since smaller enterprises operating in the EU food retailing sector find themselves in an unfavorable competitive position and have limited access to capital markets, they are likely to be restricted in their pursuit of growth strategies. From a policy point of view, focus could be placed on improvements in EU food legislation leading to a reduction in the legislative burdens which confront the large number of SMEs (Altenburg, 2006; Hirsch & Hartmann, 2014).

The here presented study is not without limitations. First, it was not possible to consider several variables that relate to strategies of non-price competition such as advertising, or in-store characteristics that can be crucial factors for the economic survival of SMEs. Moreover, variables capturing M&A activity, buying group membership—which generally adds about 10 percentage points to industry concentration (London Economics, 2004)—and local competition were not available. For example, a critical level of competition in food retailing may occur at the regional level within and between different store formats (González-Benito et al., 2005; Hallsworth & Worthington, 2000). A second potential shortcoming is that the data only comprises firms that stay in business over the greater part of the period being studied. The consideration of firm exit can lower the estimated profit persistence coefficients (Hirsch, 2014). Moreover, technological advances may modify the traditional food supply chain and new business models and distribution channels, such as online grocery shopping, could emerge to challenge traditional supermarkets (e.g., Aspray, Royer, & Ocepek, 2013; Lu & Reardon, 2018). Thus, future work should focus on an expansion of this analysis to account for the impact of these developments on profit persistence in food retailing.

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APPENDIX A

TABLE A1 Differences in means of firm and industry specific variables (2006–2014)

	Differences[a]		
	Fr. vs Sp.	Fr. vs. Sw.	Sp. vs Sw.
ROA % (Profit or Loss)/TA)	0.067*** (0.001)	−0.008*** (0.002)	−0.074*** (0.002)
Top-5	0.016*** (0.001)	0.005*** (0.001)	−0.011*** (0.001)
Discounter	−9.73e-5 (2.11e-4)	−0.001** (3.97e-4)	−0.001** (4.22e-4)
Supermarket/hypermarket	0.220*** (0.004)	−0.237*** (0.004)	−0.457*** (0.005)
Independent/specialized	−0.220*** (0.004)	0.237*** (0.004)	0.457*** (0.005)
Convenience/neighborhood	0.009*** (4.49e-4)	0.003*** (0.001)	−0.007*** (0.001)
Number of stores	−2.771*** (0.293)	−0.086 (0.072)	2.685*** (0.302)
Private limited	−0.265*** (0.003)	−0.351*** (0.002)	−0.085*** (0.002)
Public limited	0.259*** (0.003)	–	–
Partnership/cooperatives	0.006*** (4.22e-4)	–	–
Firm size (TA m. €)	−6.106*** (0.924)	0.032 (0.147)	6.138*** (0.936)
Firm growth (growth factor)	0.015*** (0.002)	−0.005 (0.003)	−0.020*** (0.004)
Market share (%)	−0.068*** (0.008)	−0.091*** (0.004)	−0.023** (0.009)
Firm age (years)	1.339*** (0.070)	−1.013*** (0.128)	−2.353*** (0.131)
Gearing ratio	−0.071*** (0.013)	0.194*** (0.014)	0.266*** (0.017)
Concentration (HHI)	−1,085.372*** (11.029)	−135.243 (0.856)	950.129*** (11.055)
Industry growth (growth factor)	0.037*** (5.92e-4)	−0.009*** (0.001)	−0.046*** (0.001)

Note: Values in parentheses are standard errors. *, **, and *** significant at 10%, 5%, and 1% level, respectively.
[a]Based on *t* test.

TABLE A2 Means and standard deviations of firm and industry specific variables for outlier observations (2006–2014)

	France	Spain	Sweden
ROA % (Profit or Loss)/TA)	−1.982 (73.110)	−2.812 (42.002)	9.020 (44.376)
Top-5	0.151 (0.359)	0	0
Discounter	0.020 (0.141)	0	0
Supermarket/hypermarket	0.484 (0.500)	0.317 (0.466)	0.448 (0.499)
Independent/specialized	0.516 (0.500)	0.683 (0.466)	0.470 (0.501)
Convenience/neighborhood	0.003 (0.050)	0	0
Number of stores	108.083 (326.522)	33.216 (55.454)	36.590 (106.890)
Private limited	0.335 (0.473)	0.675 (0.469)	1.000 (0.000)
Public limited	0.652 (0.477)	0.325 (0.469)	–
Partnership/cooperatives	0.013 (0.112)	0	–
Firm size (TA m. €)	348.744 (1239.870)	82.129 (189.677)	49.775 (132.062)
Firm growth (growth factor)	7.592 (60.933)	3.404 (19.334)	9.866 (42.005)
Market share (%)	0.890 (1.768)	1.623 (2.143)	9.392 (21.099)
Firm age (years)	20.748 (18.642)	20.732 (11.027)	16.045 (13.536)
Gearing ratio	1.081 (1.814)	1.064 (1.573)	1.283 (2.020)
Concentration (HHI)	75.004 (64.368)	1,582.166 (1,897.956)	716.536 (1,878.577)
Industry growth (growth factor)	1.012 (0.134)	0.977 (0.078)	1.037 (0.078)

Note: Standard deviations in parentheses.

TABLE A3 Differences in profit persistence ($\hat{\lambda}$) between large and small firms and across countries

	Differences in $\hat{\lambda}$ between large and small firms			Differences in $\hat{\lambda}$ between Top-5 and fringe firms			Differences in $\hat{\lambda}$ across countries		
	France	**Spain**	**Sweden**	**France**	**Spain**	**Sweden**		**France**	**Spain**
$\hat{\lambda}$ **large/Top-5** $\hat{\lambda}$ **small**	0.990*** (0.207) 0.332 (0.328)	0.782*** (0.086) 0.289 (0.194)	0.878*** (0.096) 0.370* (0.225)	0.733*** (0.264) 0.353** (0.175)	0.668*** (0.086) 0.284 (0.380)	0.584*** (0.237) 0.395*** (0.108)	**Spain** ***z*** ***p*** **Sweden**	0.159 (0.399) .399 0.690	
Difference	0.658* (0.388)	0.493** (0.212)	0.508** (0.245)	0.380 (0.317)	0.384 (0.390)	0.189 (0.260)	***z***	0.026 (0.369) 0.070	0.185 (0.279) 0.664
z ***p***	1.697 .090	2.323 .020	2.077 .038	1.200 .230	0.986 .324	0.726 .468	***p***	.944	.507

Note: Calculated using $z = (\hat{\lambda}_m\text{-}\hat{\lambda}_n)/\left[s^2(\hat{\lambda}_m) + s^2(\hat{\lambda}_n)\right]^{1/2}$ where m and n are either the two countries to be compared or small and large firms, respectively. The standard error of the difference (denominator) is calculated as the square root of the sum of the two individual squared standard errors and reported in parentheses. We assume that in each case models are fit on independent samples which implies that the estimators are stochastically independent and that their covariance can be ignored (Clogg, Petkova, & Haritou, 1995; StataCorp, 2017).*, **, and *** significant at 10%, 5%, and 1% level, respectively.

TABLE A4 Sensitivity analysis regarding below-norm profitability

Variable	France	Spain	Sweden
No. of below-norm firms	183	111	43
No. of below-norm obs.	601	399	191
		$\hat{\lambda}$-values	
Excluding below-norm performers	0.660** (0.319)	0.542** (0.242)	0.551*** (0.158)
Only below-norm performers	0.634*** (0.221)	0.209 (0.156)	0.260**, + (0.122)

Note: Results of the full models available upon request.
***, **, and * indicate significance at the 1,5,10% level. Values in parentheses are robust standard errors.
+indicates significant difference at the 10% level to $\hat{\lambda}$ of the full model reported in Table 3.

TABLE A5 Profit persistence across firm size: Marginal effects

France			Spain			Sweden		
Size[a]	ME	SE	Size	ME	SE	Size	ME	SE
500	0.435	0.610	500	0.450**	0.225	500	0.200	0.373*
1,000	0.446	0.596	1,000	0.450**	0.225	1,000	0.376*	0.199
2,000	0.467	0.570	2,000	0.451**	0.224	2,000	0.381*	0.197
3,000	0.488	0.545	3,000	0.452**	0.223	3,000	0.386**	0.194
4,000	0.508	0.522	4,000	0.452**	0.223	4,000	0.391**	0.192
5,000	0.529	0.499	5,000	0.453**	0.222	5,000	0.396**	0.190
6,000	0.549	0.478	6,000	0.454**	0.222	6,000	0.401**	0.188
7,000	0.569	0.457	7,000	0.455**	0.221	7,000	0.406**	0.186
8,000	0.589	0.439	8,000	0.456**	0.221	8,000	0.411**	0.184
9,000	0.609	0.421	9,000	0.456**	0.220	9,000	0.416**	0.182
10,000	0.628	0.406	10,000	0.457**	0.220	10,000	0.421**	0.180
12,000	0.666*	0.379	20,000	0.465**	0.215	20,000	0.470***	0.161
14,000	0.703*	0.361	40,000	0.481**	0.206	30,000	0.517***	0.146
16,000	0.740**	0.350	60,000	0.496**	0.198	40,000	0.563***	0.134
18,000	0.775**	0.348	80,000	0.511***	0.192	50,000	0.607***	0.127
20,000	0.810**	0.354	100,000	0.526***	0.186	60,000	0.650***	0.124
21,000	0.827**	0.360	200,000	0.599***	0.184	70,000	0.691***	0.126
22,000	0.844**	0.368	300,000	0.667***	0.212	80,000	0.730***	0.132
23,000	0.860**	0.377	400,000	0.732***	0.258	90.000	0.768***	0.140
24,000	0.877**	0.388	500,000	0.793**	0.310	100,000	0.805***	0.152
25,000	0.893**	0.400	600,000	0.849**	0.363	110,000	0.840***	0.165
26,000	0.909**	0.414	700,000	0.901**	0.414	120,000	0.873***	0.178
27,000	0.925**	0.428	800,000	0.950**	0.462	130,000	0.905***	0.192

[a]Size measured in TA th. €. Size classes chosen to best reflect size class distributions of firms (see marginsplots above). Figures in parenthesis refer to standard errors derived with delta method.

*, **, and *** significant at 10%, 5%, and 1% level, respectively.

TABLE A6 Profit persistence across firm size: Models for the estimation of marginal effects

Variable	France	Spain	Sweden
$\pi_{i,t-1}$	0.425	0.449**	0.370
$\pi_{i,t-2}$	(0.623)	(0.225)	(0.201)*
	0.107	–	–
	(0.205)		
Firm level explanatory variables			
Top-5	0.023	0.012	−0.033
	(0.020)	(0.015)	(0.059)
Discounter	−0.028	−0.012	0.050
	(0.026)	(0.020)	(0.075)
Independent/specialized	−0.010	−0.009***	−0.030**
	(0.011)	(0.003)	(0.014)
Convenience/neighborhood	0.024	0.057	0.036
	(0.034)	(0.064)	(0.056)
Number of stores	1.61e-4	−6.44e-5	−0.002*
	(7.40e-4)	(7.04e-5)	(0.001)
Private limited	−0.019	−6.50e-5	–
	(0.020)	(0.004)	
Partnership/cooperative	0.006	−0.001	–
	(0.016)	(0.021)	
Firm size	−6.31e-6	−4.12e-8	1.03e-6
	(9.04e-6)	(5.93e-8)	(7.87e-7)
Firm size^2	6.84e-11	1.72e-14	−1.56e-12
	(1.06e-10)	(2.36e-14)	(1.03e-12)
Firm size*$\pi_{i,t-1}$	2.14e-5	7.88e-7	5.12e-6*
	(3.64e-5)	(8.97e-7)	(2.86e-6)
Firm size^2*$\pi_{i,t-1}$	−1.06e-10	−2.03e-13	−7.76e-12*
	(4.18e-10)	(2.62e-13)	(4.08e-12)
Firm growth	−0.037	0.205***	0.252***
	(0.072)	(0.067)	(0.082)
Market share	0.288	3.12e-4	0.009
	(0.227)	(4.55e-4)	(0.014)
Firm age	−2.67e-4	4.45e-4	−1.78e-4
	(3.66e-4)	(8.96e-4)	(4.70e-4)
Firm age^2	4.13e-6	−3.74e-7	1.05e-6
	(6.29e-6)	(9.45e-6)	(5.56e-6)
Gearing ratio	1.24e-4	1.53e-4	−4.38e-4**
	(7.64e-5)	(1.03e-4)	(1.92e-4)
Industry level explanatory variables			
HHI NACE	−0.641	0.021**	0.251
	(0.613)	(0.010)	(1.206)
Industry growth	0.019	0.012	−0.387***
	(0.028)	(0.024)	(0.096)
Intercept	0.070	−0.233***	0.227***
	(0.046)	(0.088)	(0.059)

TABLE A6 (Continued)

Variable	France	Spain	Sweden
Model diagnostics			
Wald χ^2	672.00***	316.91***	221.62***
p	.000	.000	.000
AR(2) z	−0.05	1.55	0.95
p	.959	.122	.343
Hansen/Sargan χ^2	11.58	20.03	29.49
p	.072	.640	.079
obs.	38,288	15,645	9,420
firms	7,105	2,620	1,843

Note: $\pi_{i,t-1}$ and $\pi_{i,t-2}$ are lagged profits. Figures in parenthesis refer to robust standard errors.
*, **, and *** significant at 10%, 5%, and 1% level, respectively.