Profit Persistence in the Food Industry: Evidence from five European Countries

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1. Introduction

Under conditions of perfect competition firm profits that deviate from the average, can only be a transitory phenomena. However, it is commonly observed that actual profit rates differ heavily across firms contradicting the proposition of the competitive environment hypothesis. In industrial economics Bain's (1968) 'Structure-Conduct-Performance' paradigm and the more dynamic market-based view mainly focus on industry characteristics as a driver of such abnormal profits. The so called 'new learning' on the other hand attributes abnormal profits to internal firm specific resources. According to the resource-based view, valuable, rare and inimitable resources are the drivers of heterogeneity in firm profitability.

Starting with Mueller (1986) a series of contributions aiming to analyze the persistence of abnormal firm profitability has emerged. While most of these studies concentrate on entire manufacturing sectors, studies which only focus on the food industry have been sparse with the exception of Schumacher and Boland's (2005) study of profit persistence in the US food industry.

In order to fill this gap, this study aims to quantify profit persistence and its determinants for food processors in five European Union (EU) member countries: Belgium, France, Italy, Spain and the UK, for the period of 1996-2008.

The food industry[1] constitutes one of the largest economic sectors within total EU manufacturing[2] and is covering a wide range of different economical activities ranging from the processing of bakery products to the production of a very heterogeneous range of beverages. Food markets are characterized by strong competition, high market saturation and are confronted with high concentration in the retail sector. Due to these special characteristics a differentiated examination of the food industry appears useful and necessary.

Besides being the first analysis of profit persistence in the European food industry, this study contributes to the literature in three ways. First, contrary to most previous studies, which are either restricted to publicly quoted firms or to a minimum firm size criterion this study is based on data which has nearly no firm size restrictions making a more precise representation of the industry possible. This is an important advantage particularly for a study of the food industry since 96% of all EU food producers are small firms.[3] Furthermore small firms play an important role regarding competition within industries and therefore also for the examination of profit persistence. Second, by taking into account five EU member countries, which in 2007 account for 59% of the enterprises and 51% of turnover of the EU-27 food industry (Eurostat 2010) a large fraction of the sector is analyzed. Third, while the autoregressive model of order one AR(1) has become the econometric workhorse of the persistence of profits literature, this study estimates autoregressive models up to order 4 and then chooses 'the best lag model' for further analysis. This approach is crucial, since the dynamics of firm profits can be more complex than the simple AR(1) process could capture.

The paper is organized as follows. Section 2 describes the methodology while Section 3 gives a description of the Data. Section 4 presents the empirical results and section 5 concludes.

[1] Manufacture of food products and beverages excluding tobacco. Regarding to NACE Rev. 1.1 division DA15

[2] Contributing 11 % of total value added the food industry occupies the second place within EU-27 manufacturing following the engine building industry in 2007.

[3] According to the SME definition of the European Commission small firms are defined as having employed less than 50 persons and total assets of less than 10Mio €.

2. Methodology

The AR(1) persistence of profits model is a simple regression of the level of firm profits at a given point in time on the immediately previous level:

$$\pi_{i,t} = \alpha_i + \lambda_i \pi_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where $\varepsilon_{i,t}$ is a white noise error term with zero mean and constant variance. As in the previous literature, profitability of firm i at time t $(\pi_{i,t})$ is measured as the deviation of the firms return on assets (ROA) from the competitive norm which usually is approximated by the mean across the sample of firms. This normalization serves two ends. First, it removes the impact of macroeconomic cycles. Second, by taking the sample mean as a proxy for normal profit, we can interpret firm profitability as deviations from the competitive norm or as 'abnormal' profitability, with attendant welfare implications.

The coefficient on lagged profit $(\hat{\lambda}_i)$ reflects the 'stickiness' of profits from period to period, and can be interpreted as 'short-run persistence', and as a measure for the speed of adjustment to the long run level.

The long run average of the autoregressive process, on the other hand, yields the so-called 'long run projected profit rate' (LRPP). The LRPP, defined as $\hat{\rho}_i = \hat{\alpha}_i / (1 - \hat{\lambda}_i)$ is the steady-state equilibrium value to which, according to the model, the series is ultimately heading. $\hat{\rho}_i$ is a measure of 'permanent rents', which are not eroded by competitive forces and can therefore be interpreted as 'long run persistence'. Since $\hat{\rho}_i = 0$ implies a long run projected return on assets equal to the competitive norm, the percentage of $\hat{\rho}_i$'s significantly different from zero in a given sample is an indicator of the degree of profit persistence within it.

The present study extends the classical methodology by using the 'best lag model'. Autoregressive models up to order four have been estimated for each company and Schwarz Bayesian Information Criterion (SBC) has been employed in order to decide, which model best describes the adjustment path. After choosing the 'best lag model', the long-run projected profit rate becomes $\hat{\rho}_i = \hat{\alpha}_i / (1 - \sum \hat{\lambda}_{ij})$, where $j = \{1....L\}$ is the number of lags of the AR process and $\hat{\lambda}_i = \sum \hat{\lambda}_{ij}$ is the speed of adjustment parameter. This extension is important since the adjustment path of profitability might be more complex than a simple AR(1). The 'best lag model' allows for more general dynamics than the simple AR(1) and at the same time enables comparison with most of the previous literature.

Stability, and convergence upon a finite steady state, requires that the estimate of λ_i lies in the range between plus and minus one. Furthermore, the procedure is appropriate only for stationary AR processes, since $\hat{\alpha}_i / (1 - \hat{\lambda}_i)$, the measure for long-run persistence, is not defined for unit root processes, where $\hat{\lambda}_i = 1$. If $\hat{\lambda}_i \approx 1$, the long-run persistence measure is poorly defined because the denominator is close to zero. The practice of testing for non-stationarity has its roots in macroeconomics, where some macro economic variables can drift off endlessly. But non-stationarity seems far less likely to be a problem for profits time series because a continuous downward trend in profits must either drive a firm out of the market or has to cause correction policies to stop this downward trend. At the same time competition is expected to stop any continuous upward trend in profits. In order to test for stationarity a panel KPSS test was done for each country with the results presented in section 4.

Persistence analyses based on autoregressive models can serve as a practical, and potentially powerful, tool both in assessing the status of competition in quite large populations of firms, and also as a screening device for identifying particular cases for policy review.

3. Data

The firm data used for the present analysis stems from AMADEUS, a commercial pan-European balance sheet database compiled by Bureau van Dijk Electronic Publishing. The analysis is based on the period 1996 through 2008.[4] Following previous literature firm profitability in year t (π_{it}) is measured as the firms ROA in year t normalized by mean ROA of that year. ROA is calculated as a firm's profit/loss before taxation and interests divided by total assets.[5] The Data was screened by eliminating firms for which less than 13 years of ROA data were available. Additionally all firms not assigned to a 4-digit NACE industry, and firms active in the 'miscellaneous category' (NACE 1589: manufacture of other food products not elsewhere classified) were removed from the database. This was necessary since the second step of the estimation which aims at explaining profit persistence requires a clear allocation of firms to 4-digit NACE industries. Observations which lie in the top and bottom 5% of the distribution in each year were removed from the sample in order to prevent the results from being excessively influenced by outliers.[6]

Regarding firm size some previous studies have either used a minimum firm size criterion (see e.g. McGahan and Porter 1999) or are restricted to publicly quoted firms (see e.g. Schumacher and Boland 2005).[7] For the European food industry a minimum size criterion would lead to a tremendous loss of information, since small enterprises represent 96% of all food industry corporations. Even though the economic relevance of these firms is rather small since in 2007 they only accounted for 21% of industry turnover (Eurostat 2010) the large number of small firms is a characteristic of the industry that should not be neglected.[8]

The countries considered in this study were chosen by means of remaining sample sizes after screening. This resulted in a group of five countries: Belgium, France, Italy, Spain and the United Kingdom which make up 51% of total EU-27 food industry turnover in 2007. Germany as the European leader regarding food industry turnover is not comprised in the study since the remaining sample was too small. This is caused by the fact that during most of the period analyzed in this study the majority of German firms were not subject to a legal obligation to publish financial statements. Nonetheless the final sample comprises four of the top five countries regarding food industry turnover[9] with a total of 5494 firms active in 30 4-digit NACE Industries.

4. Empirical Results

This section first examines the existence of profit persistence per se by presenting results on the two persistence parameters $\hat{\lambda}_i$ and $\hat{\rho}_i$ which were estimated for each firm in the sample using equation 1. In order to assure convergence firms where $\left|\hat{\lambda}_i\right| > 1$ were dropped from the

[4] Most profit persistence studies are based on longer time spans of about 15-25 years. These studies however mainly analyze entire manufacturing sectors which makes data availability over long time spans easier. In the case of the present study the 13 year time span is the longest available for the European food industry.

[5] It is important to note, that interests are included in the numerator in order to make the profit measure independent of the source of funds used to create total assets.

[6] The elimination of a single profit rate observation means that there is less than 13 years of ROA data available for that firm which leads to its overall elimination from the sample.

[7] McGahan and Porter use 10 million US$ in total assets as a cut off value.

[8] Nonetheless a minimum size criterion could be justified by the fact that the estimation considers all firms in an equal way regardless of firm size, which causes the results being largely dependent on the huge number of small enterprises, whose economic relevance however is rather small.

[9] According to Eurostat (2010) Germany, France, UK, Spain and Italy are the European leaders regarding food industry turnover while Belgium takes eighths place. Data for 2007 except for Italy (2002) and France (2003).

analysis reducing the initial sample size to 4676 firms.[10] The remaining series were tested for stationarity using the KPSS Test which indicated that in each country around 90% of the series were stationary.[11] The second step of the analysis aims at explaining profit persistence by estimating the effect of several firm and industry characteristics upon the two persistence parameters.

4.1 Profit Persistence

The short run persistence parameter $\hat{\lambda}_i$ reflects the speed at which a firm's profit rate π_{it} converges to its long run level $\hat{\rho}_i$. Small values of $\hat{\lambda}_i$ which are close to zero indicate a low degree of persistence of past profits and a quick erosion of short-run rents. Small $\hat{\lambda}_i$ values can therefore also be seen as a sign of high competition.

Table 1: An overview of the persistence parameters

	Belgium	France	Italy	Spain	UK
# obs. $\left\|\hat{\lambda}_i\right\| < 1$	679	2394	548	867	188
Mean $\hat{\lambda}_i$	0.057	0.188	0.143	0.201	0.232
% of $\hat{\rho}_i$'s significantly different from 0[a]	38.0	39.0	38.3	42.0	40.4
% of $\hat{\rho}_i$'s significantly >0[a]	20.6	18.1	11.5	21.7	18.6
% of $\hat{\rho}_i$'s significantly <0[a]	17.4	20.9	26.8	20.3	21.8
% of $\hat{\lambda}_i$'s significantly different from 0[a]	12.4	23.4	6.0	23.5	29.8
% of equations with $R^2 > 0.1$	64.4	66.2	40.5	67.4	75.5

[a] significant at the 5% level or less

Rows one and two of table 1 show the number of firms with $\left\|\hat{\lambda}_i\right\| < 1$ and the mean $\hat{\lambda}_i$ values for each country. The highest mean value can be found for the UK (0.232) followed by Spain (0.201) and France (0.188) which indicates that the average speed of adjustment to the long run level is slower in these countries implying weaker competition. Italy (0.143) and Belgium (0.057) on the other hand exhibit lower average $\hat{\lambda}_i$ values indicating stronger competition in these countries. Overall mean $\hat{\lambda}_i$'s for the food industry turn out to be rather small compared to other studies based on entire manufacturing sectors. Most previous studies of entire manufacturing sectors yield average $\hat{\lambda}_i$ values above 0.4.[12] Competition among food producers therefore seems to be rather strong. These results are not too surprising since EU food markets are considered as being strongly saturated which in conjunction with a high level of price competition leads to strong competition among producers and therefore to relatively low average $\hat{\lambda}_i$ values. Furthermore while the importance of direct sales by producers has diminished the retail sector as the main link between the food industry and the consumers is characterized by a high and still increasing degree of concentration which leads

[10] Furthermore $\hat{\rho}_i$ values which lie in the top and bottom 2.5% of the distribution of each country sample were removed. This was necessary since for $\hat{\lambda}_i$ values close to one $\hat{\rho}_i$ is poorly defined leading to extremely high values of the latter.

[11] Exact fractions of stationary series are: Belgium: 95%, France: 88%, Italy: 96%, Spain: 87%, UK: 86%

[12] Goddard and Wilson (1999) give an overview of previous results for entire manufacturing sectors of seven countries during various time periods. All mean $\hat{\lambda}_i$ values except for the US exceed 0.4.

to strong bargaining power on part of the retailers putting producers under pressure. In most EU countries the top 5 supermarket chains have a market share of around 70 %. As regards the five countries analyzed in the present study Spain shows the highest 5-Firm concentration ratio (0.79) followed by Belgium (0.77), France (0.69), UK (0.54) and Italy (0.41).[13] For Belgium (lowest average $\hat{\lambda}_i$ and high concentration of the retail sector) and for the UK (highest average $\hat{\lambda}_i$ and relatively low concentration of the retail sector) results are consistent. The bargaining power of retailers is reinforced by the increasing importance of their private labels which in 2006 already achieved a market share of 27%.[14] Establishing private labels enables retailers to offer products that are of similar quality but usually 10 to 20% cheaper than brands meaning that in cases of low product differentiation, private labels can achieve high market shares. Producers therefore do not have the power to take decisions in the downstream of the value chain. They can only countervail by offering lower prices or better services and quality.

Table 1 also gives an overview of the fractions of significant profit-persistence parameters for all five countries. The percentage of $\hat{\rho}_i$'s significantly different from zero in row three reflects the fraction of firms within each country that do not converge to the average in the long run. It can therefore be seen as an indicator for the persistence within the food industries of the five countries. This percentage is around 40% for all countries. Rows four and five of the table reveal the fact that for Belgium, France, Spain and the UK the percentage of firms with a significant positive $\hat{\rho}_i$ value is similar to the percentage of firms with a significant negative $\hat{\rho}_i$ value. For Italy in contrast the percentage of firms showing significantly negative $\hat{\rho}_i$'s is much higher than the percentage of firms with significantly positive values. This suggests that within the Italian food industry competition forces are operating better for firms with profits above the norm than for firms with profits below the norm. Overall these results show that a significant fraction of firms tend to earn profits both above and below the norm that persist in the long run indicating that the process of convergence is far from completion. For firms with significantly positive $\hat{\rho}_i$'s some specific advantages or industry wide entry barriers must exist while for firms with significantly negative $\hat{\rho}_i$'s impediments to leave the market e.g. sunk costs or other forms of exit barriers must exist.

The percentage of $\hat{\lambda}_i$'s significantly different from zero which is found in row six can also be seen as an indicator for the magnitude of the competitive process. The higher this percentage, the higher the number of firms for which the forces of competition were not strong enough to erode profits within one to four years implying profit persistence. The percentage differs between the countries being the highest for the UK (29.8) followed by Spain (23.5) and France (23.4). Belgium (12.4) and especially Italy (6.0) show a much smaller percentage of significant $\hat{\lambda}_i$ values implying that competition in UK, France and Spain is weaker as in Italy and Belgium. These results coincide with the mean $\hat{\lambda}_i$ values. The last row of Table 1 shows the percentage of equations where more than 10% of the variation in profitability is explained by the autoregressive process. For each country except Italy this percentage seems to be larger as in previous studies, indicating that the best lag structure has higher explanatory power compared to the autoregressive processes of order one on which most previous studies are based.[15]

[13] 2004 values according to Wijnands et al. (2006), p.45 ff.
[14] Datamonitor (2006): Tomorrow's Private Label Consumers.
[15] For four of the seven countries analyzed in Mueller's (1990) study this percentage is smaller than 50%.

4.2 Explaining Profit Persistence

For both antitrust policy and firm stakeholders the determinants of profit persistence might be more interesting than the patterns of profit persistence per se. This section therefore analyzes the impact of firm and industry characteristics on the two persistence parameters $\hat{\lambda}_i$ and $\hat{\rho}_i$. Data on the following firm level characteristics could be deduced from AMADEUS:

Market Share (MS) measured as the ratio of firm's sales to industry sales is expected to be an important determinant of firm profitability. Several studies found a positive relationship between market share and profitability (see e.g. Szymanski et al. 1993). Nonetheless the impact of market share has not always been unambiguous. Gale (1972) one of the earliest efforts finds that the effect of market share on profitability is greater for larger firms in industries with high concentration and moderate growth. Gschwandtner (2010) argues that if market share is a measure for diversification a negative relationship can appear since most studies find a negative impact of diversification on profitability (see e.g. Berger and Ofek 1995).[16] Katchova (2005) finds a similar 'diversification discount' for US farming operations.

Firm age (Age) calculated by means of incorporation dates can account for lifecycle effects. One might expect that aging decreases costs due to learning effects within the firm and learning spillovers from other firms in the same or in other industries. Loderer and Waelchli (2010) however find a negative relationship between firm age and profitability. They argue that corporate aging is attended by organizational rigidities, slower growth and assets which become obsolete with time. Beyond that, as predicted by the 'rent seeking hypothesis' corporate governance is perishing and CEO pay is increasing as firms grow older.

The relationship between firm size (Ln TA) measured as the logarithm of total assets and firm profitability has not always been unambiguous. Due to the fact that price competition is the dominant competition strategy among food processors, achieving economies of scale through sufficient firm size is expected to be a very important matter. Ollinger et al. (2000) e.g. show, that US chicken slaughtering plants that were two times larger than the average-sized plant have 8% lower per unit costs. Furthermore it can be assumed that the complex set of EU legislations regarding food safety, animal welfare, additives and residues, packaging and labeling put relatively higher administrative burdens on smaller firms as on firms of larger scale. Especially pre-market approval for new additives, novel foods, genetically modified organisms (GMO's) and health claims are beyond the reach for the vast majority of small food processors in the EU.[17] In addition, being of larger size might certainly increase the ability to counter the bargaining power of retailers. However it has to be noted that there is as well evidence for the inefficiency of large firms in the case of diseconomies of scale. In a recent study e.g., Goddard et. al. (2005) find a negative impact of firm size on profitability.

The effect of firm growth (Gr. TA) measured as the growth rate of a company's assets is in general supposed to be positive. Yurtoglu (2004) e.g. finds a significantly positive impact of firm growth on long run persistence. However, Gschwandtner (2010) finds evidence for a negative relationship between firm growth and short run persistence during the period 1950-1966 while the effect becomes insignificant in later periods.

Two risk proxies, one for short run risk and one for long run risk could be derived. Short run risk (1/Curr) is measured by the ratio of current liabilities to current assets which is the reciprocal of a firm's current ratio. As a proxy for long run risk the firm's gearing ratio (Gear) has been used, which is defined as the ratio of non-current liabilities plus loans to shareholders funds. Firms with a high gearing ratio have a higher risk of being unable to fulfill interest and debt repayment obligations. According to risk theory firms with higher risk should on average have a higher profit level than companies with lower risk. Yurtoglu (2004)

[16] In the present study market share could very well be a proxy for diversification since AMADEUS data to some extent is based on consolidated financial statements.

[17] Wijnands et al. (2006)

using the standard deviation of profits as a measure for firm risk finds that firms with higher variability in profits also tend to have higher long run profits. However, the bigger part of previous studies finds a negative relationship between various risk measures and profitability (see e.g. Mueller (1986) and Gschwandtner (2005)).

Industry characteristics were obtained from Eurostat's annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing.[18]

Concentration measured by the four-firm concentration ratio (CR4) is the industry characteristic one would most likely expect to affect the level of profit persistence. Firms in industries characterized by collusive behavior as a result of high concentration might have the ability to prevent entry leading to a higher degree of profitability. Many studies report a positive relationship between concentration and profit persistence (see e.g. Yurtoglu 2004). However there is also the possibility that high concentration leads to very strong rivalry between firms within an industry resulting in a negative impact on profitability.

As regards industry size (NF) which is measured by the number of firms in an industry, one might expect that the higher the number of establishments in the industry the higher the volatility of profits, the stronger the competition and therefore a lower degree of profit persistence is to be found.

The growth rate of an industry measured by the growth rate of the number of firms in an industry (Gr.NF) may also be an important factor explaining profit persistence. Its net effect on profit persistence however is ambiguous at a theoretical level. On the one hand in industries with rapid growth the ability of incumbents to maintain their market shares might decrease leading to a reduction of oligopolistic discipline and subsequently to a decrease in profitability and its persistence. On the other hand in industries characterized by fast growing output firms are not under pressure to reduce prices in order to increase sales and therefore abnormal profits might be maintained over time.

Some of the differences in profit persistence may be explained by the degree of research and development. Permanent changes in consumer preferences related to issues of health, convenience, variety, ethics and safety as well as changes in technology make R&D an important issue in the food industry. It has to be recognized though that R&D in the food industry has a different character as e.g. in the electronic industry. Conventional foods and beverages have been in this world for a long time and the invention of completely new ones is rather unusual. New food products are therefore mainly variations of older ones, e.g. product extensions by the use of new additives, variations in taste and packages designed for different consumption moments.[19] In general one might expect that the intensity of R&D at the industry level is a basis for product differentiation and for the creation of entry barriers for new firms which enables incumbents to earn high profits that persist over time. Waring (1996) e.g. finds a positive impact of the industry-level R&D intensity on short run persistence. In the present study the 'share of expenditure for research and development in total industry sales' (R&D) serves as a measure for R&D.

The results of the regression analysis are presented in Table 2. The first equation always explores the impact of the industry and firm characteristics on the short run persistence rate $(\hat{\lambda}_i)$ while the second equation always explains the impact on the long run persistence parameter $(\hat{\rho}_i)$. Since both persistence measures are estimated parameters, the equations were weighted by the inverse of their standard errors according to Saxonhouse (1976). All explanatory variables except age are mean values over the time span analyzed.

As regards firm characteristics the impact of market share (MS) seems to be ambiguous as predicted. While the impact is significantly positive on short run persistence in Italy

[18] Available online at: http://epp.eurostat.ec.europa.eu

[19] According to Stewart-Knox and Mitchell (2003) only 7-25% of the food products launched can be considered as being truly novel.

Table 2: Regressors explaining the estimated parameters of Equation 1 (heteroskedasticity–consistent t-values)

	Cons.	CR4	NF	Gr. NF	R&D	MS	Age	Ln TA	Gr. TA	Gear	1/Curr	R^2	p
Belgium													
(1)	-0.572	0.442	0.000	2.583	-0.014	0.000	0.000	**0.088***	**0.185*****	0.000	0.004	0.021	0.039
	(-1.353)	(1.003)	(0.978)	(0.463)	(-0.878)	(0.234)	(-0.013)	**(1.958)**	**(15.883)**	(0.263)	(0.139)		
(2)	0.900	0.558	**0.000***	**36.610***	-0.049	0.000	**-0.022***	-0.037	**0.098*****	0.000	-0.128	0.037	0.003
	(0.756)	(0.477)	**(1.700)**	**(1.676)**	(-0.912)	(0.103)	**(-1.714)**	(-0.303)	**(2.826)**	(-0.407)	(-1.506)		
France													
(3)	-0.428	**0.625***	**0.000****	**5.191*****	-0.013	0.000	-0.001	**0.152*****	**0.096*****	0.000	0.023	0.025	0.000
	(-2.006)	**(1.957)**	**(2.552)**	**(3.581)**	(-0.337)	(-0.504)	(-0.557)	**(5.265)**	**(3.253)**	(-0.305)	(0.963)		
(4)	0.402	-0.396	-0.001	-3.209	0.182	0.000	-0.008	-0.025	0.057	**-0.001****	0.063	-0.001	0.579
	(0.588)	(-0.439)	(-1.061)	(-0.746)	(1.245)	(-0.386)	(-0.983)	(-0.246)	(0.969)	**(-2.450)**	(1.077)		
Italy													
(5)	0.846	-0.614	0.000	-1.134	0.126	**0.000****	0.001	-0.025	0.000	0.000	0.022	0.030	0.014
	(1.400)	(-1.123)	(-1.383)	(-1.059)	(1.254)	**(2.536)**	(0.469)	(-0.418)	(-0.721)	(-0.795)	(0.114)		
(6)	1.710	-0.378	0.000	**6.834****	**-1.162*****	**0.000*****	**-0.033*****	0.054	**-0.006****	0.000	-0.569	0.191	0.000
	(1.222)	(-0.314)	(-0.028)	**(2.412)**	**(-5.794)**	**(-2.785)**	**(-4.480)**	(0.386)	**(-2.254)**	(-0.098)	(-1.164)		
Spain													
(7)	0.252	0.587	0.000	-0.806	-0.075	-0.001	-0.008	**0.122*****	**0.983*****	0.000	-0.091	0.011	0.033
	(0.600)	(1.518)	(-0.704)	(-0.433)	(-0.761)	(-0.220)	(-1.295)	**(2.586)**	**(3.807)**	(-1.493)	(-1.638)		
(8)	-0.078	1.229	0.000	**-8.729***	-0.220	**0.030*****	**-0.031****	**0.255***	**1.966****	**-0.002*****	**-0.765****	0.032	0.000
	(-0.061)	(1.258)	(0.788)	**(-1.755)**	(-0.775)	**(2.860)**	**(-2.093)**	**(1.659)**	**(2.046)**	**(-3.259)**	**(-2.525)**		
UK													
(9)	-2.029	-0.375	0.000	-2.351	0.025	-0.010	0.004	**0.352****	**-4.065****	0.000	-0.159	0.007	0.378
	(-1.421)	(-0.344)	(0.049)	(-0.328)	(0.166)	(-1.629)	(0.723)	**(2.411)**	**(-2.113)**	(1.615)	(-0.429)		
(10)	-16.334	5.396	0.001	7.546	**-1.234***	**-0.049****	0.005	**1.399***	7.238	-0.002	2.229	0.011	0.337
	(-2.170)	(1.632)	(0.400)	(0.322)	**(-1.942)**	**(-2.285)**	(0.223)	**(1.820)**	(0.835)	(-0.905)	(0.988)		

Dependent variables: Equations 1,3,5,7,9: $\hat{\lambda}_i$; Equations 2,4,6,8,10: $\hat{\rho}_i$. Since the dependent variable is an estimated parameter, values are divided by their standard errors.

Industry variables: CR4 = 4 firm concentration ratio; NF= # of firms in Industry; Gr.NF = Growth rate of the number of firms in the industry; R&D = Share of R&D expenditure in industry value added.

Firm variables: MS = firm sales/industry sales; Age = firm age; Ln TA = natural logarithm of total assets; Gr.TA= growth rate of total assets; Gear = gearing ratio; 1/Curr = 1/current ratio.

All variables except age are averages over the sample period

Numbers in parentheses are white heteroskedasticity-consistent t-values. p refers to the p-value of the F-test.

and long run persistence in Spain it is significantly negative for long run persistence in Italy and the UK. While interpreting these results one has to keep in mind that market share might be a proxy for diversification. Dorsey and Boland (2009) e.g. find that diversification of US food producers into activities within the food economy[20] leads to premiums while diversification to unrelated activities outside the food economy does not lead to premiums which might in part be an explanation for the ambiguous results. As suggested by Gale (1972) the impact of market share on profitability can depend on the environment in which firms operate. The ambiguous results could therefore also be a consequence of the wide range of economical activities allocated on different countries with different environmental and industry structures that can be found within the European food industry.

Firm age has a significant negative impact on long run persistence in Belgium, Italy and Spain reinforcing for these countries the findings of Loderer and Waelchli (2010) that corporate aging is attended by organizational rigidities, slower growth and assets which become obsolete with time.

Firm size (Ln TA) has a significant positive impact on short run persistence in all countries except Italy. The impact on long run persistence in the UK and Spain is also significantly positive. These results emphasize the fact that being of sufficient scale is a very important matter in the food industry. Larger firms seem to be able to countervail the superiority of retailers, to offer lower prices and seem to be less affected by administrative burdens like pre-market approval or the handling of legislation.

The impact of firm growth (Gr. TA) is mainly positive. Belgium and Spain show significantly positive coefficients for both persistence measures. For France the impact on short run persistence is significantly positive. A negative coefficient can only be found for long run persistence in Italy and for short run persistence in the UK. If firms seek growth through diversification because they have exhausted growth in their primary field of action a negative relationship between growth and profitability may result as a consequence of a negative relationship between diversification and profitability in a similar way as it is suggested for market share.

In contradiction with risk theory the impact of firm risk appears to be negative. The gearing ratio has a significantly negative impact on long run persistence in France and Spain. The reciprocal of the current ratio has a significantly negative impact on the long run persistence measure in Spain. The negative relationship between risk and profitability which was already found in previous literature also seems to apply to the food industries of these countries: less risky firms are the ones that achieve higher profits that last over time.

The importance of Industry concentration (CR4) in order to explain profit persistence seems to be negligible. Only for France the coefficient has a positive impact on short run persistence merely significant at the 10% level indicating that some degree of collusion took place with attendant welfare implications for the firms.

Firms operating in large and fast growing industries in Belgium and France seem to obtain a higher degree of profit persistence. Both measures have a significantly positive impact on long run persistence in Belgium and on short run persistence in France. In addition industry growth has a positive impact on the long run persistence measure in Italy and a negative one in Spain which, however, is only slightly significant at the 10% level.

The relationship between R&D and profit persistence has to be interpreted on the basis of the special character of R&D in the food industry. The bulk of the coefficients are negative, however the influence is only significant for long run persistence in Italy and the UK. These results emphasize the fact that the vast majority of new food products (72-88%) fail.[21] Stewart-Knox and Mitchell (2003) state that original and truly new products are more likely

[20] Dorsey and Boland consider diversification within the food economy as integration while diversification refers to activities outside of the food economy.

[21] Stewart-Knox and Mitchell (2003)

to be successful than product extensions. This is further confirmed by the finding of Hoban (1998) who states that the failure rate of truly new products is only 25%.The fact that only 7-25% of launched food products can be considered as being truly novel might therefore explain to some degree the negative impact of R&D. Weiss and Wittkopp (2005) analyzing the impact of retailer concentration on product innovation in German food manufacturing find that as a result of retailers' upstream market power food processors achieve lower profits which reduces their incentive for cost-intensive product innovation. High retailer concentration might therefore intensify the fact that only a small amount of launched products is truly novel and based on cost-intensive R&D while the bulk of innovations are only variations or product extensions with lesser success. Overall the results indicate that the methodology for new food product development is in the urgent need of improvement.

Even though the bigger part of equations is overall statistically significant as shown by the p-values of the F-Test it has to be noted that the adjusted R^2 is in general relatively small. The main reason is that several other variables like import, export, advertising or merger activity have previously been found to be related to profit persistence. Unfortunately these variables could not be taken into consideration in the present analysis due to data limitation.

5. Conclusion

The preceding analysis of profit persistence in the European food industry indicates that the process of converge towards a competitive norm is far from completion since in each of the five countries analyzed a significant fraction of around 40% of the firms tends to earn profits above or below the competitive norm which persist even in the long run.

As indicated by the mean $\hat{\lambda}_i$ values profit persistence seems to be highest in the UK and lowest in Belgium and Italy. Furthermore for the UK the percentage of $\hat{\lambda}_i$'s significantly different from zero which represents the fraction of firms for which the forces of competition were not strong enough to erode profits within one to four years is highest in the UK. These fractions are lowest in Belgium and Italy reinforcing the finding that competitive forces work slower for UK firms and faster in Belgium and Italy.

However competitive forces do not seem to affect all firms equally. As the second step of the estimation shows some of the observed differences in the degree of profit persistence can be explained by specific firm and industry characteristics. As regards firm characteristics it was shown that especially young, large firms that are also characterized by fast growth are the ones earning high profits that persist. Regarding industry characteristics especially the size and the growth rate of the industry in which a firm operates seem to have a positive impact on its profit persistence. Additionally firm risk and the level of industry R&D expenditure have a negative impact on profit persistence in some countries.

Comparing the results with other studies analyzing mainly entire manufacturing sectors it has to be noted that the degree of persistence is lower in the food industry mainly due to a high degree of market saturation, strong price competition and a highly concentrated retailing sector. Another striking difference is the importance of firm size. While many previous studies find evidence for the inefficiency of large firms, being of sufficient scale seems to be a very important matter in the food industry. A final crucial difference is the special characteristic of R&D and its negative influence on profit persistence. Contrary to other sectors innovation for the most part seems to be unsuccessful.

From the researchers point of view an extension of the analysis on the retailing- and wholesaling sector and an analysis of individual 3-digit NACE industries within food manufacturing could be a starting point for further research. However, the purpose of the present study was to give a first impression of the profit persistence phenomena in the European food industry.

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