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Kurzfassung: Abnormale Gewinne und deren Persistenz: Eine Analyse der europäischen Lebensmittelindustrie

Die vorliegende Dissertation untersucht die europäische Lebensmittelindustrie im Hinblick auf Unternehmensgewinne, welche von der Wettbewerbsnorm abweichen. Hierbei wird im Rahmen dreier wissenschaftlicher Papiere sowohl das Auftreten solcher ‚abnormalen' Gewinne zu einem bestimmten Zeitpunkt als auch deren Persistenz über längere Zeitperioden analysiert. Da es sich um eine der ersten Studien dieser Art handelt, welche sich ausschließlich mit Firmen der europäischen Lebensmittelindustrie befasst, liefert diese Dissertation einen wichtigen Beitrag zur Literatur.

Im Anschluss an eine ausführliche Einleitung wird im ersten Papier der Einfluss von Firmen-, Industrie-, Jahres- und Ländereffekten auf das Ausmaß der abnormalen Gewinne analysiert. Die Schätzung der Effektklassen erfolgt hierbei sowohl auf Basis konventioneller Methoden wie ANOVA oder Varianzkomponentenanalyse als auch durch ein hierarchisches, lineares Modell (HLM). Der HLM-Ansatz bietet darüber hinaus die Möglichkeit den Einfluss struktureller Firmen- und Industrievariablen auf das Ausmaß der abnormalen Gewinne zu schätzen. Die drei Methoden führen zu dem gemeinsamen Ergebnis, dass Firmeneffekte der wichtigste Einflussfaktor sind wohingegen Industrieeffekte eine vernachlässigbare Rolle spielen. Unter den strukturellen Firmen- und Industrievariablen stellt sich die Firmengröße als positiver Einflussfaktor heraus, während Firmenrisiko, das Alter der Firmen und die Wachstumsrate der Industrie einen negativen Einfluss auf die Höhe der abnormalen Gewinne haben.

Während im ersten Papier das Auftreten abnormaler Gewinne zu einem bestimmten Zeitpunkt analysiert wird, befasst sich das zweite Papier mit der Persistenz abnormaler Gewinne über längere Zeitperioden. Diese Analyse basiert sowohl auf autoregressiven Modellen (AR) sowie einem dynamischen Panelmodell. Beide Ansätze ermöglichen es zusätzlich den Einfluss struktureller Firmen- und Industrievariablen auf die Höhe der Profitpersistenz zu bestimmen. Die Analyse führt zu dem Ergebnis, dass eine hohe Anzahl an Firmen langfristig abnormale Gewinne erwirtschaftet. Jedoch führen starker Wettbewerb und eine hohe Konzentration im Lebensmitteleinzelhandel dazu, dass das Ausmaß der Persistenz geringer ausfällt als in anderen Industriesektoren. Des Weiteren stellen sich das Firmenrisiko, Firmenalter sowie der F&E Aufwand der Industrie als negative Einflussgrößen heraus. Die Firmengröße hingegen hat einen positiven Einfluss auf das Ausmaß der Persistenz.

Die ersten beiden Papiere basieren auf einer Stichprobe von 5.494 Lebensmittelproduzenten aus den fünf Ländern Belgien, Frankreich, Italien, Spanien und Großbritannien. Im dritten Papier wird hingegen eine Stichprobe von 590 Firmen des Milchsektors im Hinblick auf Profitpersistenz analysiert. Der Milchsektor wurde hierbei zum einen aufgrund seiner hohen wirtschaftlichen Relevanz im Ernährungsgewerbe als auch aufgrund seiner speziellen strukturellen Charakteristika ausgewählt. Zu diesen zählen u.a. eine hohe Anzahl an Genossenschaften sowie eine starke Regulierung durch die Gemeinsame Agrarpolitik (GAP) der EU. Die AR Modelle führen zu dem Ergebnis, dass Genossenschaften, welche in etwa einen Anteil von 20 % der Firmen im Sektor ausmachen, nicht in erster Linie gewinnorientiert sind. Analog zur gesamten Lebensmittelindustrie deuten die Ergebnisse auf eine hohe Wettbewerbsintensität, da das Ausmaß der Persistenz auch nach einem Ausschluss der Genossenschaften aus der Analyse gering ausfällt. Auch im Milchsektor stellt sich Firmengröße als positiver Einflussfaktor heraus, wohingegen Firmenrisiko, -alter sowie das Wachstum und die F&E Aufwendungen des Sektors einen negativen Einfluss haben. Gleiches gilt für die Konzentration im Lebensmitteleinzelhandel, welche als Indikator für dessen Verhandlungsmacht gesehen werden kann.

Abstract: Abnormal profits and profit persistence: evidence from the European food industry

This thesis comprises three papers that aim to analyze the phenomenon of firm profits in the European food industry that differ from the competitive norm either at a specific point in time or over longer time periods. The thesis adds to existing literature as it is one of the first studies of this type that directly focuses on the European food industry. Following an extended introduction, the first paper estimates the relative importance of firm, industry, country and year effects as drivers for profit deviations from the competitive norm at a specific point in time which are also commonly named ‘abnormal profits’. Besides conventional approaches such as ANOVA or components of variance, a hierarchical linear model (HLM) is implemented. The HLM approach additionally provides the possibility to estimate the impact of structural firm and industry variables on the degree of abnormal profits. All three approaches lead to the result that firm effects are the most important driver for abnormal profits while industry effects only play a minor role. Among the structural firm and industry variables it is in particular the size of firms’ that positively influences the degree of abnormal profits. On the other hand, firm risk and age as well as the growth rate of the industry in which firms operate have a negative impact.

While the first paper focuses on abnormal profits at a specific point in time, the second paper analyzes the persistence of abnormal firm profits over longer time periods. This analysis is based on autoregressive models (AR) as well as Arellano-Bond dynamic panel estimation. Both approaches additionally allow for the identification of the firm and industry characteristics that determine the degree of profit persistence. The estimation reveals that a significant number of firms generate abnormal profits that persist in the long run. However, as competition among food industry firms is strong and concentration in the downstream market is high, persistence in abnormal profits in the food industry tends to be lower in comparison to other manufacturing sectors. Further characteristics that have a negative influence on the degree of persistence are firm age and risk as well as the industries R&D intensity. Similar to the occurrence of abnormal profits at a specific point in time, firm size is estimated to have a positive impact on the persistence of such profits.

The first two papers of the thesis are based on a sample of 5,494 food processors from the five countries: Belgium, France, Italy, Spain and the United Kingdom. The third paper also uses AR models and dynamic panel estimation to analyze a sample of 590 dairy processors from the same five countries. Here the dairy industry was chosen not only because of its economic importance within the food industry but also due to its special structural features such as a high number of cooperatives and a strong regulation of economic activity by the Common Agricultural Policy (CAP). The AR models reveal that cooperatives, which account for approximately 20 % of all firms in the sector, are not predominantly profit oriented. Similar to the entire food industry the results indicate strong competition as the degree of persistence remains low even when cooperatives are removed from the sample. Again firm size turns out to be an important driver for persistence. Firm age and risk as well as growth and R&D investment of the sector have a negative impact. The same holds for the level of concentration in the retail sector which is an indicator of the retailers' bargaining power.

Abbreviations

AMADEUS	Analyse MAjor Databases from EUropean Sources
ANOVA	Analysis of variance
AR	Autoregressive
Be	Belgium
bn.	Billion
CAP	Common Agricultural Policy
cf.	Compare
Coop.	Cooperatives
COV	Components of variance
CR5	Five-firm concentration ratio
Cur. /Curr.	Current ratio
e.g.	For example
et al.	et alii
EU	European Union
EVA	Economic value added© by Stern Steward and Co.
F&E	Forschung und Entwicklung
FGrw.	Firm growth
FMCG	Fast moving consumer goods
Fr	France
FSize	Firm size
FV	Firm-view
GAP	Gemeinsame Agrarpolitik
Gear	Gearing ratio
GLS	Generalized least squares
GMM	Generalized method of moments
GMO	Genetically modified organism
Gr.	Growth
Herf.	Herfindahl-Hirschman Index
HHI	Herfindahl-Hirschman Index
HLM	Hierarchical linear modeling
ICT	Information and communication technologies
IGrw.	Industry growth
IO	Industrial organization
ISize	Industry size
It	Italy
IV	Industry-view
KBV	Knowledge-based view
m.	Million

Manuf.	Manufacturing / Manufacture
MS	Market share
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NF	Number of firms
N.a.	Not available
No.	Number
Oper.	Operation
OLS	Ordinary least squares
PCM	Polynomial convergence model
Pop.	Population
Pres.	Preserving
Proc.	Processing
Prod.	Production
Pro.	Products
RBV	Resource-based view
R&D	Research and development
REML	Restricted maximum likelihood
RFID	Radio Frequency Identification
ROA	Return on assets
R&D	Research and development
SBC	Schwarz-Bayesian Information Criterion
SCP	Structure-Conduct-Performance
SIC	Standard Industrial Classification
SME	Small and medium-sized enterprises
Sp	Spain
STSA	Structural time series analysis
TA	Total assets
TPM	Transition probability model
UK	United Kingdom
VA	Value added

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Chapter 1: Extended introduction

1. Motivation and relevance

The examination of firm profits that deviate from the competitive norm is one of the fundamental fields of study within economics. From a theoretical perspective the analysis of such deviations, which are often also referred to as 'abnormal profits', has its origin in industrial organization (e.g. Bain, 1956, 1968) and strategic management research (e.g. Porter, 1980; Barney, 1991). Starting with the contributions of Schmalensee (1985) and Rumelt (1991) a considerable number of studies empirically analyzing the occurrence of abnormal firm profits at a certain point in time has emerged. A complementary field of research focuses on the examination of persistence in abnormal profits over longer time periods. Mueller (1986, 1990) is considered as the initiator of this continuously growing research area and an extensive literature focusing on the persistence of abnormal profits has evolved following his groundbreaking contributions.

Besides its high relevance within academics, the investigation of persistence in abnormal firm profits is most likely of great interest for firms and stakeholders (Ruiz, 2003). Particularly throughout the last two decades firms have had to face economic conditions which are heavily influenced by intensified globalization. For the European continent this is reflected by the continuous expansion of the European Union (EU) and the formation of a single market for goods and services. Due to the concomitant reductions in entry barriers these developments provide the possibility for firms to operate in previously hardly accessible foreign markets. However, the deregulation of international trade has also led to a significant intensification of competition (Goddard et al., 2005). Therefore, the examination of profit persistence and the resultant entrepreneurial strategies, which are necessary to successfully participate in markets characterized by strong competition, are expected to take on even greater significance in the future. In addition, while firms and stakeholders are primarily interested in the drivers of persisting abnormal profits as a basis for entrepreneurial success, for governmental competition authorities the degree of persistence in abnormal firm profits can be used as an index for assessing the need of anti-trust measures in specific sectors.

Although there is already a considerable number of studies focusing on many different aspects of firm profits in various economic sectors, literature that solely concentrates on firm profits in the European food industry and its subsectors is still scarce. Only a few studies exist, concentrating on various issues of firm profits in the European food industry (e.g.

Sutton, 1991; Sexton, 2000; Weiss and Wittkopp, 2005; Szymański et al., 2007; Dorsey and Boland, 2009). However, previous studies that analyze the occurrence and persistence of abnormal firm profits almost exclusively focus on whole economies or entire manufacturing sectors of specific countries. A single exception is the study of Schiefer and Hartmann (2009) who analyze the occurrence of abnormal profits in the EU food industry.[1]

Thus, alongside the food industries important economic position within the European economy - which is highlighted below - the incentive for the present thesis is based on an apparent lack of research concentrating on firm profits in the European food industry. This thesis is therefore one of the few studying the occurrence of abnormal firm profits at a specific point in time and the first to analyze the persistence in abnormal firm profits in the EU[2] food industry. Additional objectives of this study are to identify the structural firm and industry characteristics that are responsible for the occurrence and the degree of persistence in abnormal profits as well as to apply improved econometric methodologies in comparison to the previous literature.

The present thesis consists of an introductory paragraph followed by three papers focusing on the occurrence and persistence of abnormal profits in the EU food industry. The first paper, which concentrates on the food industries of the five EU member countries Belgium, France, Italy, Spain and the United Kingdom (UK), analyzes the factors responsible for the occurrence of abnormal profits at a specific point in time. Paper number two determines the magnitude and the structural drivers of persistence in abnormal profits within the food industries of the five countries under investigation for the period of 1996 to 2008. The third paper focuses on profit persistence in the dairy industries of the five countries and can be viewed as complementary to the second paper. Here, the dairy industry was chosen due to its high economic importance within the EU food industry[3] and its special structural characteristics. Economic activity in this industry is still regulated by the Common Agricultural Policy (CAP) comprising a quota system that will remain effective until 2015. Furthermore, a high number of cooperatives are operating in the dairy industry and it can be expected that the specifics of this legal form will have a significant impact on the results.

As mentioned above, the three papers concentrate on five countries: Belgium, France, Spain and the UK. These countries were chosen due to economic relevance and data

[1] For the U.S. food economy literature focusing on the occurrence and persistence of abnormal firm profits is also scarce. Here, Schumacher and Boland (2005 and 2005a) are the solitary exceptions.
[2] As only EU member countries are analyzed in this thesis the term EU food industry is used instead of European food industry from now on.
[3] The dairy industry is the third largest sector within the EU food industry following the meat and the beverage sector, contributing 14 % of total food industry turnover in 2010 (Eurostat, 2012).

availability. In addition, the country selection represents the contrast of more formally oriented northern countries and more informally oriented southern countries where informal contracts are of greater importance (Poppe et al., 2009) as well as the contrast between continental and Anglo-Saxon countries.

All three papers are based on a similar theoretical framework, similar methodologies and on the same data source. In order to get a better overview and to facilitate reading of individual parts of this thesis, a description of these issues as well as detailed information on the EU food industry is provided in the remainder of this introductory chapter. The following subchapter therefore defines important terms that are used throughout the thesis. Subchapter 3 specifies the theoretical bases regarding abnormal profits while subchapter 4 gives a description of the econometric models on which the empirical analyses are based. Subchapter 5 provides a description of the EU food economy, highlighting its structural characteristics and economic relevance within EU manufacturing as well as recent developments. A description of the data used is provided in subchapter 6 while subchapter 7 reviews the literature. Chapters 2 through 4 comprise the three papers.

2. Definitions of abnormal profits and profit persistence

The term ‘abnormal profit‘ refers to the difference between a firm’s profit rate and the competitive norm in a specific period. Microeconomic theory generally states that the competitive norm of a market or industry equals zero. The majority of studies analyzing the occurrence of abnormal profits at specific points in time, and thus also the analysis in chapter 2 of the present thesis, follow this procedure. However, most of the previous studies analyzing the persistence of abnormal profits use the mean profit rate across all analyzed firms as a more realistic proxy for the competitive norm (e.g. McGahan and Porter, 2003; Schumacher and Boland, 2005a). The estimation of persistence in chapters 3 and 4 is therefore also based on this procedure. It should be pointed out that - according to the above definition - the term ‘abnormal profits’ can either refer to profits in excess of the competitive norm or to profits below this norm and that a firm with negative abnormal profits does not necessarily incur financial losses whenever the competitive norm exceeds zero.

In general the term ‘persistence’ can be interpreted as ‘the continuance of an effect after the cause is removed’ (Yourdictionary, 2012). In regards to ‘persistence in abnormal firm profits’, the literature provides several definitions. Barney (1991) gives a broader definition that neglects the use of calendar time as a reference, by stating that profit persistence constitutes profits above the competitive norm that continue to exist even after efforts to copy the advantages that lead to these profits have been implemented. While this definition is theoretically precise, it is hard to quantitatively operationalize it in a reasonable way. Schumacher and Boland (2005a) define profit persistence as the percentage of a firm's profit in one year that remains in the following year. According to Geroski and Jacquemin (1988) a persistently successful firm is one for which the fact that profits in period t-1 are above (below) the competitive norm increases the likelihood that profits are above (below) the norm in period t as well. While the definitions mentioned so far focus on persistence from period to period and thus on the short run, Wiggins and Ruefli (2002) define profit persistence based on longer-term considerations by specifying that abnormal profits persist if they are sustained over a long-term period. In this context, however, a vast discussion has emerged regarding the question on how long this time span must be. While Wiggins and Ruefli define 'long' as ten years or more, other authors argue that one has to look at time spans of up to 50 years[4] in order to get a correct picture of the degree of profit persistence. Therefore, according to the above definitions two persistence measures - one for short-run and one for long-run persistence - will be derived in the econometric models used to estimate profit persistence in the present thesis.

It must be noted, that the phenomenon of persistence is naturally not restricted to microeconomic factors such as firm profits but can as well play an important role in the analysis of macroeconomic factors such as inflation or unemployment (e.g. Barro, 1988). Persistence in unemployment or inflation, for example, refers to the adhesion of the unemployment or inflation rate at a given level (Blanchard, 2009). Furthermore, the phenomenon of persistence is also an established field of research in scientific areas outside economics such as in biology or chemistry. Here the term persistence is, for example, used '[…] to describe the continuing existence of certain insecticides […]' or other organic chemicals with biological activity (Greenhalgh, 1980: 2565). An example is the examination of chemicals with a long residence time, such as some pesticides, which may accumulate in the food chain (FAO, 2011).

In contrast to persistence of abnormal firm profits, the 'occurrence' of abnormal profits refers to the deviation of firm profits from the competitive norm only at a specific point in time i.e. in a single year. However, as will be shown below, most empirical studies which actually focus on the occurrence of abnormal profits at a specific point in time are

[4] See, e.g., Gschwandtner (2012) who analyzes profit persistence in U.S. manufacturing over the period 1950-99.

nevertheless based on profit time series of 3 to 5 years for each firm in order to increase the reliability of the results.

3. Theoretical bases for the occurrence and persistence of abnormal profits

Since the middle of the 20th century, the analysis of abnormal firm profits from a theoretical point of view has established as one of the pivotal fields of economic research. As neoclassical economic theory, and in particular the model of perfect competition, does not allow for abnormal profits due to the assumption of perfectly functioning markets[5], industrial organization theory, initiated by the contributions of Bain (1956; 1968), provides the first concepts aiming to explain the phenomenon of abnormal firm profits. While concepts from industrial organization focus on structural characteristics of the industries as the driver for firm's abnormal profits, during the 1980s the focus shifted to the firm itself (e.g. Porter, 1980). Within this so-called strategic management research, a variety of concepts have emerged that concentrate on specific firm-internal characteristics as the main determinants for abnormal profits. For instance, according to the 'resource based view' (e.g. Barney, 1991), firms endowed with specific valuable, rare and inimitable resources are more competitive, enabling these firms to generate profits above the competitive norm.

The remainder of this chapter illustrates the most important theoretical concepts in greater detail starting with the neoclassical model of perfect competition. Subsequently, theoretical concepts from industrial organization that focus on industry characteristics as determinants for abnormal profits will be depicted. Thereafter, approaches of strategic management, that focus more on the firm itself, such as the 'market-based view', the 'resource-based view' or the 'knowledge-based view' will be presented. In addition to the textbook versions of these approaches amendments from up to date research are presented for individual approaches.

It must be pointed out, that the neoclassical model of perfect competition as well as the models of industrial organization and strategic management mentioned so far solely focus on the long-run equilibrium value of abnormal profits. Hence, these models are of static nature and do not account for the dynamics of abnormal profits over time. These approaches can therefore only be used to model the occurrence of abnormal profits at a specific point in time[6]

[5] Within the neoclassical framework abnormal profits can only occur in the short run as it is assumed that entry of new firms immediately drives profits back to the competitive norm.

[6] In order to describe the occurrence of abnormal profits at a specific point in time it has to be assumed that the analyzed industry is in a long-run equilibrium at the analyzed moment (Schwalbach et al., 1989).

or the persistence of abnormal profits in a long-run equilibrium (Geroski, 1990). However, as will become apparent, for the analysis of persistence in abnormal profits, the process of adjustment of abnormal profits to the long-run level plays an important role as well. The final subsection of this chapter therefore gives an insight into the theoretical approaches of dynamic competition.

3.1. Model of perfect competition

In real markets the occurrence of abnormal profits at a specific point in time as well as the persistence of such profits is seemingly the general case while perfect competition as described by the model in this chapter is rarely observed. However, the model of perfect competition as one of the cornerstones of neoclassical economic theory provides the foundation for further theoretical concepts as well as a helpful benchmark for the empirical assessment of real markets. Thus, the following paragraph is dedicated to the conditions necessary for perfect competition within an industry. The model is based on the following assumptions (Carlton and Perloff, 2005: 56 ff; Herdzina and Seiter, 2009: 153 ff):

1. Perfect market transparency: Consumers and firms have complete information regarding the structure of the market. For consumers this implies perfect information regarding firms, the quality of goods as well as the price. For firms this implies perfect information regarding the market structure, production conditions and costs.
2. Homogeneity of goods: Firms produce and sell an identical good which implies that consumers are indifferent between products of different firms.
3. Perfect divisibility of products: Firms can produce and consumers can buy marginal amounts of the good and demand/supply therefore continuously varies with the price.
4. Absence of transaction costs: Neither consumers nor firms incur costs from participating in the market.[7]
5. Large number of firms and consumers: A large number of firms and consumers are active in the market with the consequence that firms and consumers are price takers.
6. Profit maximization: Each firm’s objective is to maximize its profits.
7. Absence of externalities: Firms have to carry the entire costs that arise during production. This means that they cannot pass on externalities such as pollution to other market participants.

[7] With exception of the costs of production and the purchase price.

8. Free entry and exit: There are no barriers to entry or exit meaning that firms can at any time enter or exit the market at no costs.

If assumptions 1 through 8 hold, it follows - according to Jevon's law of indifference - that there only exists one single price within the market (Herdzina and Seiter, 2009). If individual firms would raise the price above the given market level they would lose all their customers. Similarly, due to the assumption of profit maximization, no firm will be willing to sell at a price below the given market level (Carlton and Perloff, 2005). Therefore, firms do not have an incentive to deviate from the given competitive market price. In addition, if it is assumed that all firms in the market produce at identical costs, they will produce an equal amount of the good[8] and thus will generate identical profits (Pindyck and Rubinfeld, 2009).

Due to the assumption of free entry and exit the phenomenon of perfect competition can easily be applied to an entire economy with many markets/industries. If in some market prices and thus profits are above the competitive norm of the economy[9] firms will immediately move their capital to this more profitable market and offer the same product at a lower price. This process continues as long as profits in this market exceed the competitive level. Similarly, profits below the competitive level encourage firms to move their capital to more profitable markets (Schohl, 1990). Consequently, a general competitive equilibrium across all markets in the economy results. This equilibrium implies that differences in the profit level can neither occur within single industries nor between firms in different industries and that each firm's profits must be equal to the competitive norm in the long run.[10]

3.2. Concepts of industrial organization

The central idea of industrial organization theory is that structural industry characteristics are the main driver of firm performance. In contrast to the model of perfect competition, industrial organization theory allows for imperfect market structures that are determined by

[8] In perfect competition it follows that firms produce an output which ensures that its marginal costs are equal to the given market price (i.e. its marginal revenue).
[9] Within the theoretical frameworks described in this chapter as well as in the literature analyzing the occurrence of abnormal profits at a specific point in time, the competitive norm in general refers to zero profits. This implies that the term abnormal profit simply refers to profits or losses in these cases. However, the empirical estimation of persistence in abnormal profits generally uses average profitability of firms as a measure for the competitive norm.
[10] Within this framework, abnormal profits can theoretically occur in the short-run since it can be assumed that firms cannot easily build up new plants and enter an industry in the short run (Carlton and Perloff, 2005). However, if it is assumed that entry can occur indefinitely fast, which implies that abnormal profits are immediately driven back to the competitive norm, deviations from the competitive norm cannot occur in the short run either.

barriers to entry or exit as well as other factors that can be related to the magnitude of competition in the industry such as the degree of concentration or vertical integration of firms (Carlton and Perloff, 2005).[11] Firms operating in industries characterized by imperfect market structures can generate abnormal profits in the long run. However, this approach does not account for differences in the magnitude of abnormal profits among firms within the same industry.[12]

As industrial organization focuses on the structural characteristics of the industry as the main driver of abnormal profits, this branch of research is often referred to as the industry-view (IV).

3.2.1. The industry structure as a driver for abnormal profits

Within microeconomic theory the structure of an industry is generally defined according to the number of operating firms and the extent of entry and exit barriers. In what follows, the most common market structures are described together with the respective implications for abnormal profits.

As illustrated above, a structure characterized by perfect competition occurs in markets with a large number of firms and consumers as well as an absence of barriers to entry and exit. In industries characterized by full competition, firms produce an amount of output that ensures marginal costs are equal to the given market price (i.e. its marginal revenue) and due to the absence of entry barriers generate profits equal to the competitive norm in the long run.[13]

In contrast, a monopolistic structure is characterized by a single firm - the monopolist - that operates in a market characterized by barriers to entry and a large number of consumers. As opposed to price-taking firms operating in industries with perfect competition, the monopolist does not have to fear an undercut by competitors and can therefore directly influence the price through its output decision. He therefore faces a declining demand curve. Similar to perfect competition, the monopolist produces a level of output which ensures that marginal revenues equal marginal costs in order to maximize profits. As opposed to perfect

[11] Other factors that can determine the industry structure are e.g. the available technology, the availability of raw materials, the elasticity of demand, or government regulations that affect the degree of competition in the industry such as antitrust measures or specific taxes and subsidies (Carlton and Perloff, 2005).

[12] An exception is the Stackelberg model which is described below. Here firms can achieve higher abnormal profits compared to other firms in the same industry through the creation of first mover advantages.

[13] In the short run it is possible that the price exceeds average costs, which implies that firms make abnormal profits. However, new entry is induced by abnormal profits, which leads to an outward shift of the industry supply curve and a price that is equal to the minimum level of average costs.

competition the resulting amount of output is lower while the price exceeds marginal as well as average costs. This implies that the monopolist, due to the existence of barriers to entry, generates profits above the competitive norm of the economy in the long-run equilibrium. The level of abnormal profits thereby depends on the price-elasticity of demand (Carlton and Perloff, 2005; Pindyck and Rubinfeld, 2009).[14]

An industry structure of monopolistic competition is characterized by an absence of entry barriers and a large number of firms. However, unlike in perfect competition the products of individual firms are differentiated and therefore imperfect substitutes. Consequently, similar to a monopoly, firms that operate in monopolistic competition have a certain degree of market power and are facing a downward sloping demand curve. In the short run the price exceeds marginal costs as well as average costs meaning that firms generate abnormal profits. Nonetheless, due to the absence of entry barriers, abnormal profits will induce entry of new firms and as a consequence decreasing market shares that are reflected in a downward shift of each firm’s demand curve. This process continues to the point until the demand curve is tangent to the average cost curve and thus the price equals the average costs. The result is that firms operating in monopolistic competition are unable to generate abnormal profits in the long-run equilibrium. However, as the products of firms remain differentiated even in the long run, firms always face a declining demand curve and have a certain degree of market power. The price therefore exceeds marginal costs even in the long-run equilibrium where all firms achieve profits equal to the competitive norm (Pindyck and Rubinfeld, 2009).

Oligopolistic structures occur when a small number of firms operate in an industry protected by entry barriers. In general this market form can be divided into cooperative and non-cooperative oligopolies. In cooperative oligopolies or cartels, a small number of firms arrange their actions in a way that maximizes joint profits. In the ‘ideal’ case, where all firms join the cartel, the result will be that of a monopolist where the joint profit is divided among the cartel members. As the number of cartel members decreases, due to the fact that some firms decide to violate the cartel agreement by raising the amount of output above the optimal cartel level, overall industry profits decrease. The overall profit level and its pattern of division on firms in the industry depend on the allocation of cartel members and non-cartel firms as well as on the overall number of firms in the industry. However, as only a limited number of firms operate in the oligopolistic industry, and new entry is restricted, firms are

[14] The degree of monopoly power - i.e. the ability to profitably set the price above marginal costs - increases as demand becomes less elastic. This relationship can easily be derived by rearranging the condition for profit maximization (e.g. Carlton and Perloff, 2005: 91ff).

always able to achieve profits above the competitive norm of the economy in the long-run equilibrium (Carlton and Perloff, 2005).

Non-cooperative oligopolies are similarly characterized by a small number of firms operating in an industry that is protected by entry barriers. However, in contrast to cooperation, in non-cooperative oligopolies firms operate independently and have to consider the behavior of competing firms when making their own decisions. Non-cooperative oligopolies are usually described by game-theoretical models which differ in the decisions that firms can make (e.g., setting either the price or the level of output), the order in which firms make their decisions (e.g., which firm can set the price first) or the duration of the game (one period vs. many periods). The degree of abnormal profits that individual firms can achieve in non-cooperative oligopolies depends on these issues. For simplicity it is usually assumed that firms produce an identical good and can solely decide on the price or the level of output (Carlton and Perloff, 2005). In what follows, the three most important models of non-cooperative oligopolies are summarized.

The Cournot-model assumes that firms simultaneously set the production quantity whilst taking into account possible reactions of their competitors. The profit maximizing level of production of each firm decreases as the expected quantity produced by other firms increases. This relationship can be described by means of a best-response function that, for each firm, specifies the profit maximizing production level as a function of the other firm's production quantity. In the Cournot equilibrium each firm's expectation of its competitors' output decisions proves to be true and all firms produce the amount of output that maximizes their own profits, given its correct expectation of the other firms' output decision.[15] The degree to which firms can set the price above marginal costs and generate abnormal profits depends on the number of firms operating in the industry. In an industry with only one firm the Cournot-model describes the monopoly situation. As the number of firms increases the Cournot equilibrium converges to the competitive equilibrium where price equals marginal costs. Thus, the Cournot-model allows for any degree of abnormal profits between zero (competitive level) and the monopoly level (Pindyck and Rubinfeld, 2009).

The Bertrand-model operates on the assumption that all firms simultaneously decide on the price. As each firm produces an identical product, consumers will always buy from the firm with the lowest price. Thus, firms will undercut each other until each firm's price equals marginal costs (competitive level). In this situation no firm has an incentive to deviate from the competitive price since any increase leads to a loss of all its customers. As a consequence,

[15] The Cournot equilibrium can mathematically be derived by the point of intersection of individual response functions.

the Bertrand equilibrium is equal to the competitive equilibrium which implies that no firm is able to generate abnormal profits (Pindyck and Rubinfeld, 2009).[16] The Bertrand-model can be extended by the assumption that firms have limited production capacities.[17] To illustrate this issue it is assumed that two firms operate in the market and both firms are limited to produce half the amount of output which is demanded in the competitive situation where price equals marginal costs.[18] In this situation the Bertrand equilibrium where the price equals marginal costs would be a feasible result as the combined output of both firms would meet the market demand at this price level. Nevertheless, if capacity constraints are present, this solution is not an equilibrium. If firm one raises its price above marginal costs all consumers want to buy from the second firm. However, the second firm can only serve half the market due to its limited capacity. Firm one thus faces a positive residual demand and maximizes its profits with respect to this residual demand similar to a monopolist, charging a price above the competitive level. By acting like a monopolist firm one now makes positive profits without exploiting its entire capacities. The second firm, however, can now charge a price marginally below the monopoly price of firm one and still attract all the consumers in the market. While firm one - which acts like a monopolist - does not exhaust its entire capacities, the second firm can now sell its entire capacities at a price that is only marginally below the monopolistic price of firm one. This implies that the second firm now makes higher profit than firm one. However, by similar argumentation, firm one could now set a price slightly below the price set by the second firm in order to increase its profits. This underbidding continues until a price level[19] is reached where it is not worthwhile anymore for a firm to further underbid the price but rather more profitable to set the monopolistic price which was initially set by firm one. Therefore, in the presence of capacity constraints there is no static equilibrium with a single price. The result is rather a sequence also referred to as an Edgeworth cycle where prices first rise, then fall, and afterwards rise again (Carlton and Perloff, 2005).

The Stackelberg leader-follower model is based on the assumption that firms set the production quantity, however, one firm (the leader) is able to set its quantity before the other firms (the followers) can decide. The followers have to take the leader's decision as given and therefore maximize profits based on their Cournot best-response functions. When making its decision, the leader is aware of the fact that the followers decide based on their Cournot best-

[16] However, if the products of individual firms are to some degree differentiated, abnormal profits are possible. In this case firms maximize their profits based on the other firms' price decision.
[17] With this additional assumption the model is usually referred to as the Edgeworth-model.
[18] For a numerical example of the Edgeworth Model see Carlton and Perloff (2005: 174 f).
[19] This price is between the competitive price level and the monopolistic one initially set by firm one.

response functions. He can therefore determine the total level of industry production and sets the quantity which maximizes his own profit. In the Stackelberg equilibrium, the leader as well as the followers achieve abnormal profits. As the algebraic depiction of the leader's (π_L) and followers' (π_F) equilibrium profits in equations (1) and (2) shows, the degree of abnormal profits depends on the total number of firms that operate in the industry (*n*).[20] As soon as there is at least one follower operating in the industry, the profits of the leader fall below the monopolistic level (π_M).

(1) $\pi_L = \pi_M / n$

(2) $\pi_F = \pi_M (n-1)/n^2$

It can also be seen that the leader generally achieves higher abnormal profits than the following firms. The Stackelberg-model therefore postulates that firms should create first mover advantages in order to achieve higher degrees of abnormal profits (Carlton and Perloff, 2005).

The preceding section has indicated that a long-run equilibrium with firms generating abnormal profits can emerge whenever a small number of firms are operating in an industry protected by entry barriers. In particular, this was shown for a monopolistic industry structure as well as oligopolistic structures in which the core of firms' strategy consists of setting the profit maximizing level of output (Cournot- and Stackelberg-model).

Based on the textbook theory on oligopolies a variety of studies exist that provide theoretical extensions. Ghosh and Mitra (2010) illustrate, for example, how the outcomes of the Bertrand- and Cournot-model change if it is assumed that a profit-maximizing private firm competes with public firms. While the standard theory supposes that prices and profits are lower and quantities and welfare are higher in the Bertrand- compared to the Cournot-model Ghosh and Mitra (2010) show that these outcome rankings can be reversed in mixed markets with private and public firms. Another strand of studies empirically analyzes the presence of cooperative and non-cooperative oligopolies in several sectors. As regards the food sector Severová et al. (2011) analyze whether the Czech food retail industry is characterized by an oligopolistic structure where a dominant firm competes with several fringe firms. However, they do not find evidence for the presence of a dominant firm but rather for strong competition among a few firms that operate in this sector.

[20] See Carlton and Perloff (2005: 161 ff.) for the algebraic derivation of the Stackelberg equilibrium.

3.2.2. The Structure-Conduct-Performance paradigm

The 'Structure-Conduct-Performance' (SCP) paradigm was initially developed by Mason (1939, 1949) and later empirically assessed by Bain (1956, 1968). It can be seen as the core of classical industrial organization (Welge and Al-Laham, 2008). This classical SCP paradigm assumes a close relationship between the structure of an industry, the conduct of firms operating in the industry and the resulting performance. As Figure 1 indicates, the industry structure is assumed to influence the joint conduct or strategy of firms within this industry while the strategy in turn determines the collective performance of firms (Porter, 1981).

Figure 1: **Classical Structure-Conduct-Performance paradigm**

Source: Porter (1981: 611)

The structure encompasses the stable industry factors that determine the degree of competition within the industry. Among these factors are: the number and size distribution of firms (i.e. concentration), the degree of product differentiation and vertical integration as well as the existence of entry barriers (Porter, 1981; Carlton and Perloff, 2005). However, as Bain (1971) shows, there is a strong interaction between these factors as entry barriers are amongst others determined by the degree of product differentiation and vertical integration. As a consequence, Bain mainly focuses on the existence of entry barriers as the factor that determines the industry structure.[21] According to Bain (1971), entry barriers refer to the extent to which established firms can persistently raise the price above the competitive level of minimum average costs and thus generate abnormal profits. The existence of such barriers thereby depends on the following three factors:

[21] Although Bain (1971) assumes that entry barriers are the most important structural characteristic he shows that industry concentration can as well be an important structural issue as it has an influence on the effectiveness of entry barriers. In industries characterized by collusion due to strong concentration firms will collectively set a price that most effectively deters entry subject to the given entry barriers. In less concentrated industries firms most likely do not collude and individually set a price. This price, however, might be set in a way that makes new entry worthwhile. Thus, in industries with strong concentration barriers to entry are assumed to be more effective.

1. Absolute cost advantages of incumbent firms: Such advantages arise if established firms are equipped with superior production techniques, rare resources or better access to factor markets[22], and can thus produce at lower costs. New firms anticipate the need to cover higher production costs when entering the market and can thus be deterred from entry even if the price within the market exceeds the competitive level (Bain ,1971; Carlton and Perloff, 2005).

2. Product differentiation advantages: If there are significant differences in consumers' preferences between established and new products, established firms may have the ability to sell a similar product at higher prices without losing all customers. Thus, new firms would have to bear marketing costs in order to entice customers away from the established firms. These costs can deter new firms from entering the market despite a price above the competitive level (Bain, 1971; Carlton and Perloff, 2005).

3. Economies of scale: If economies of large scale are present in the industry and a new firm enters the market at sufficient scale this will either lead to a decrease in price or to a decrease in the market share of all firms in the industry. In both cases new entry would lead to a decrease in profits. Even if the price exceeds the competitive level, a potential entrant anticipates the effects of its entry and may be deterred from entering whenever he assumes that it does not pay off (Bain, 1971).[23]

The conduct refers to the strategic options of a firm, that are feasible within the given industry structure, such as the firms' pricing behavior, the production level and quality as well as the degree of advertising or research and development expenditure (Porter, 1981; Carlton and Perloff, 2005). However, the general perception of classical SCP research by Bain/Mason is that the conduct section can be classified as negligible and that a direct connection of the industry structure and its performance can be assumed (Porter, 1981).[24]

[22] The access to factor markets or to rare resources among others depends on the degree of vertical integration in the industry.
[23] It has to be noted that exit barriers, e.g., sunk costs in the form of specialized production technique which is needed in order to operate in the industry but hard to resell, can also deter firms from entering the market in the first place (Carlton and Perloff, 2005).
[24] Most empirical SCP research also focuses on a direct relationship between structural characteristics such as concentration ratios and performance.

Performance within the SCP paradigm is defined rather broadly and can be comprised of measures such as profitability, technical efficiency (i.e. the ability to minimize costs) or innovativeness (Porter, 1981).

Due to the direct influence of structure on performance and a focus on entry barriers as the main determinant of industry structure, it can be concluded that it is the presence of such entry barriers that leads to abnormal profits within an industry as it enables firms to set prices above the competitive level without inducing new entry. Consequently, firms are able to generate abnormal profits whenever they operate in industries that are either characterized by absolute cost advantages, product differentiation or economies of large scale.

The classical SCP paradigm provides a very general approach to organize the field of industrial organization and can therefore be thought of as a summary of the standard microeconomic approaches presented in the previous subchapter (Carlton and Perloff, 2005).[25] However, the classical SCP paradigm mainly ignores the conduct component and thus the strategic actions of individual firms. Abnormal profits are therefore solely explained by means of a firm's industry membership. As a consequence, the degree of abnormal profits generated in industries protected by entry barriers is the same for all firms operating in such industries. The classical SCP paradigm therefore does not provide an explanatory approach for differences in the degree of abnormal profits between individual firms within the same industry.[26]

Starting with Bain (1951) many studies have empirically analyzed the relationship between profits, concentration and a variety of variables measuring entry barriers.[27] Bain (1951) finds that the rate of return is higher in industries characterized by stronger concentration. In a subsequent study Bain (1956) provides evidence that profits are higher in industries with strong concentration and high entry barriers. Weiss (1974) provides a survey of empirical SCP studies and concludes that there is a significant impact of concentration and entry barriers on profit rates. Nevertheless, later studies (e.g. Salinger, 1984) find only weak or no evidence for the hypothesis that concentration and entry barriers are related to profitability (Carlton and Perloff, 2005).[28] As Carlton and Perloff (2005) point out most of the mentioned studies either suffer from biases in the measures for concentration and profitability

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[25] As the previous subchapter has shown, within standard microeconomic theory, the structure and thus the degree of abnormal profits in a long-run equilibrium is as well determined by the existence of entry barriers and by the number and size distribution of firms in an industry (i.e. concentration).

[26] However, as was shown in the framework of the Stackelberg-model, firms can create first mover advantages in order to achieve higher degrees of abnormal profits than other firms in the same industry (Carlton and Perloff, 2005).

[27] Commonly used measures for barriers to entry are: minimum efficient firm size or advertising and capital intensity (Carlton and Perloff, 2005).

[28] See e.g. Viaene and Gellynck (1995) for an empirical SCP study of the European food industry.

or are conceptually flawed as it is generally assumed that concentration is an exogenous variable.[29] This would imply that concentration affects profitability and not vice versa. However, it might very well be possible, that the more profitable firms are the ones that expand and make the industry more concentrated. For this reason subsequent research has focused on more dynamic extensions of the classical SCP approach. Some of these approaches are presented below.

3.3. Concepts of strategic management

At the beginning of the 1980's a branch of research referred to as strategic management has evolved within business economics. Strategic management research focuses on management decisions that are aimed at best utilizing a firm's resources in accordance with its external environment. The external environment comprises all economical, social, political and technological issues that are relevant to the establishment of the firm's strategies and to its performance. However, it is usually the industry in which a firm operates that is considered as the most relevant external factor (Grant and Nippa, 2006).

Approaches of strategic management thus focus on industry characteristics and on the firm's strategies in successfully operating in these industries as drivers for abnormal profits. It will therefore become apparent that the firm with its strategic decisions and resources becomes the focus of attention of research.

3.3.1. Porter's 'five-forces' framework / Market-based view

Porter (1980) provides a framework that relates the level of firm profits to the state of competition in the industry where the firm operates. He claims that the degree of competition in an industry is determined by the following five forces of competition (cf. Figure 2):

1. Threat of potential entrants: If new firms enter the industry, prices and as a consequence profits decrease. The magnitude of new entry depends on the existence and effectiveness of entry barriers.
2. Competition among existing firms: Rivalry among incumbents occurs if some of the existing firms take measures to improve their position within the industry. However, such competitive actions by one firm have an influence on the behavior of its

[29] This is usually referred to as a simultaneity bias.

competitors and may initiate a series of reactions. This can lead to a decrease in profits of all firms in the industry.

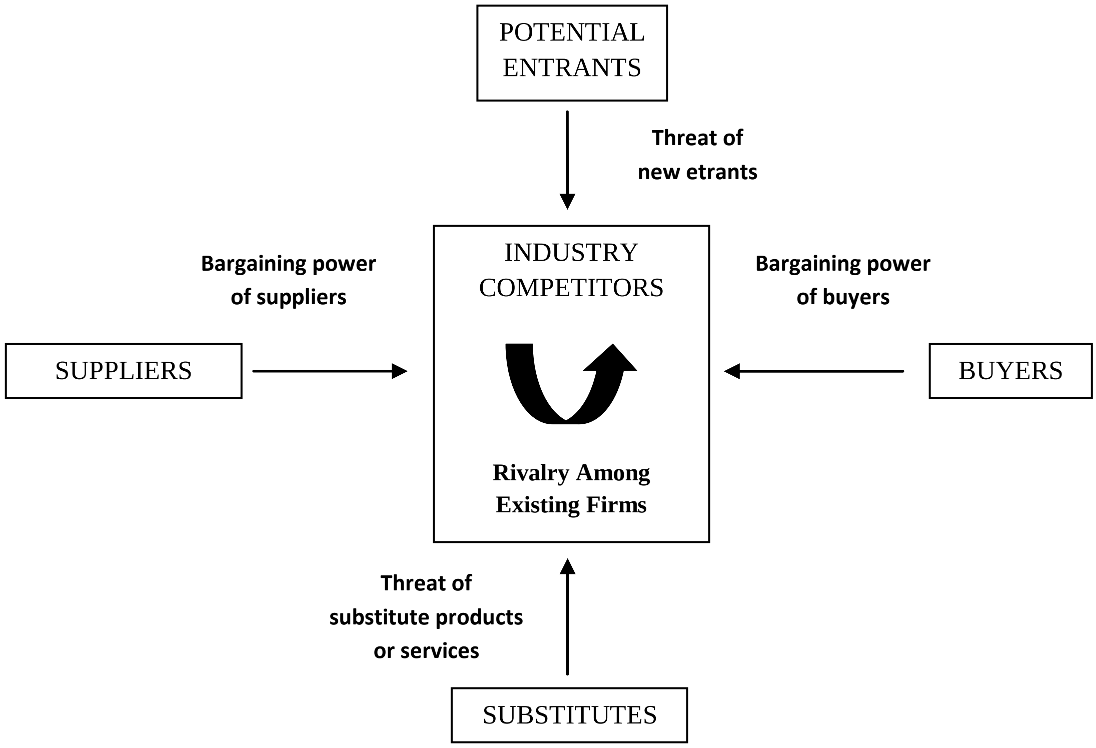
3. Threat of substitutes: All firms in an industry compete with other industries that produce substitute products. These substitutes can lower the profit level within the industry if they are offered at more attractive prices.
4. Bargaining power of suppliers: Strong bargaining power of suppliers results if concentration among suppliers is stronger than concentration in the considered industry. As a consequence suppliers can raise prices or reduce the quality of provided goods. This can lead to a decrease in profits of firms in the industry if these firms are restricted in raising their own prices.[30]
5. Bargaining power of buyers: If the downstream sector is characterized by strong bargaining power firms in this sector can force down prices and thus also profits of firms in the considered industry. Similar to suppliers, bargaining power of the downstream sector increases with the degree of concentration.

As Figure 2 shows it is the collective effect of these five forces that finally determines the degree of competition and thus the attractiveness of an industry. Within the ‘five-forces’ framework, firms can achieve abnormal profits if they either manage to position themselves in industries with favorable forces of competition or if they are able to find a position within the industry that enables them to effectively defend themselves against the collective strength of the five forces of competition (Porter, 1980). Thus, although the competitive forces of the industry are the crucial factor that determines the level of firm profits within this framework, it is also the firms themselves that can influence their profit level through individual strategic behavior (Porter, 1980; Grant and Nippa, 2006). Therefore, contrary to the classical SCP paradigm, the conduct component and hence the strategic behavior of the firm is of crucial importance within this approach.

The ‘five-forces‘ framework therefore not only provides an explanatory basis for inter-industry differences in profit levels but can also serve to explain differences in the profit levels of firms that operate in the same industry.

[30] For example, strong competition among existing firms within the considered industry or high bargaining power of the downstream industry can restrict firms in the industry in increasing their own prices.

Figure 2: Porter's 'five-forces' framework



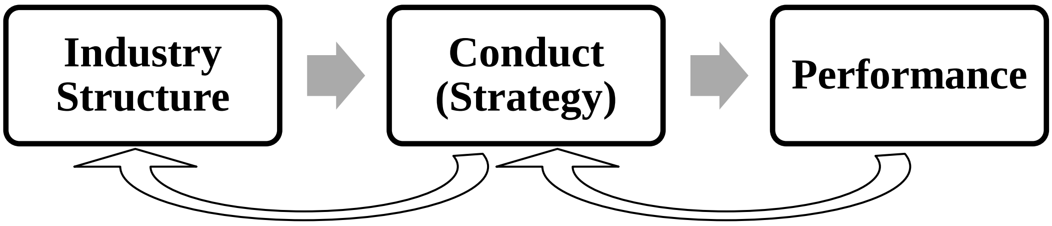
Source: Porter (1980: 4, Figure 1-1)

As the 'five-forces' framework primarily focuses on the market and the strategic positioning of firms within this market as the main driver for abnormal profits, it is usually also summarized as the market-based view (MBV) (Welge and Al-Laham, 2008). Figure 3 indicates that the MBV can in general be seen as a dynamic extension of the classical SCP paradigm. Firms can favorably influence the structural characteristics of the industry and thus the forces of competition through strategic behavior. Examples are the positioning in industries with a favorable structure or strategies of vertical integration such as the acquisition of (or collusion with) suppliers and buyers which leads to a decrease in pressure from the upstream or downstream markets. Through collusion with other participants in the industry firms can influence the concentration ratio and thus the degree of competitive rivalry within the industry. Via innovation or product differentiation strategies firms can reduce the threat of new entrants or substitute products (Porter, 1980; 1981).

In addition, the performance of firms is assumed to have an impact on their strategic behavior as firms adapt their strategies subject to their achieved performance (Welge and Al-Laham, 2008).

Regarding empirical evidence on the MBV Setiawan et al. (2012) analyze the Indonesian food and beverage industry and extent the classical SCP approach by challenging the single-direction-of-causality assumption running from structure to performance. They find evidence for a positive bi-directional relationship between structure measured by concentration and performance.

Figure 3: Market-based view



Source: Porter (1981: 616)

3.3.2. The resource-based view

During the 1990's the focus of strategic management research has further shifted from external industry specific sources of firm profitability to sources that can be found within the firm itself. The 'resource-based view' (RBV) summarizes those concepts of strategic management which focus on firm's idiosyncratic resource endowments as the main driver of persisting abnormal profits (Welge and Al-Laham, 2008). Therefore, a major contribution of the RBV is the fact that it provides a basis to explain long-lasting abnormal profits that cannot be attributed to specific industry characteristics (Peteraf, 1993).

The RBV (Barney, 1991; Peteraf, 1993) states that differences in firm profitability within the same industry are the consequence of firms' heterogeneous resource endowments. Each firm can in general be considered as a portfolio of unique and strategically important resources that enable it to implement strategies that generate persistent abnormal profits (Barney, 1991; Welge and Al-Laham, 2008). According to Barney (1991) these resources can be classified into three categories:[31]

1. Physical capital resources: The physical technology used by a firm such as the firm's buildings and machinery, its geographic location or its access to raw material markets.
2. Human capital resources: These include the experience, intelligence and skills of a firm's managers and workers.

[31] See also Welge and Al-Laham (2008: 88) for a description of these categories.

3. Organizational capital resources: These are a firm's planning, controlling and incentive systems, information- and communication systems as well as its organizational- and management structure.

Barney (1991) shows that such resources can serve as a driver of persisting abnormal profits if they are heterogeneously distributed and imperfectly mobile[32] between competing firms in an industry. Barney assumes that the following four resource characteristics determine the degree of resource heterogeneity and immobility:

1. Valuable: Resources are valuable if they provide a firm with the possibility to implement strategies that enhance the firm's efficiency and effectiveness.
2. Rare: A resource is rare if it is not possessed by a large number of competing firms. A valuable resource that is possessed by many firms would provide each of these firms with the possibility of implementing efficient strategies thus giving no firm a competitive advantage that leads to abnormal profits.
3. Imperfectly imitable: Valuable and rare resources can only be a driver of abnormal firm profits if other firms that do not possess these resources cannot copy them.
4. Not substitutable: There are no strategically equivalent resources which are valuable but either not rare or imitable. If there were strategically equivalent resources that are either not rare or imitable many other firms could implement the same efficient strategy thus leaving none of the firms with the possibility of generating abnormal profits.

Opposed to the industry-view or the classical SCP paradigm, the resource-based view drops the assumption that firms within an industry are identical regarding their resources and strategies. Individual firms within industries can implement strategies on the basis of valuable, rare, inimitable and non substitutable resources that lead to persisting abnormal profits. Thus, contrary to the industry-view or the classical SCP paradigm, the RBV has the advantage that it allows for persisting differences in abnormal profits across firms in the same industry. Due to its focus on firm characteristics the RBV is often also referred to as the firm-view. However, despite providing new theoretical insights regarding firm profitability the RBV has the disadvantage that - compared to the SCP paradigm or the MBV - it completely

[32] According to Peteraf (1993) imperfectly mobile resources can be traded between firms but are more valuable to a specific firm.

neglects the impact of external sources of firm profits and therefore does not account, e.g., for influences of the industry structure on firm profits.

In the course of its development the RBV has been intensively criticized amongst others due to the lack of a temporal component (Priem and Butler, 2001). Armstrong and Shimizu (2007), based on a review of the empirical RBV literature, propose that in order to further develop the resource-based theory issues such as industry conditions and development over time need to be incorporated. Kraaijenbrink et al. (2010) suggest that future research on the RBV should aim at merging this theory with the inherently dynamic framework of Austrian economics[33].

3.3.3. The knowledge-based view

The term 'knowledge-based view' (KBV) summarizes a category of concepts that focus on the firms' idiosyncratic knowledge as the driving resource for abnormal profits. At this it is distinguished between explicit and tacit knowledge. Explicit knowledge mainly comprises facts and theories that can easily be documented. It is therefore reproducible at low costs and without high effort can be transferred between individuals or firms. Tacit knowledge on the other hand is defined as knowledge that can only be acquired through time-consuming learning processes and is thus not easily transferrable between individuals or firms (Grant and Nippa, 2006; Welge and Al-Laham, 2008). It is therefore hard to imitate by competitors and is hence the kind of knowledge that is of high strategic relevance for firms in order to generate abnormal profits (Welge and Al-Laham, 2008).

Knowledge-based concepts can be seen as extensions of the classical RBV as they provide a clear substantiation of the resource-term. In addition, it is assumed that the firms' ability to extend its knowledge, through learning processes, significantly contributes to the firms' ability of generating abnormal profits (Welge and Al-Laham, 2008). Hence in contrast to the classical RBV, the KBV also incorporates dynamic processes that focus on the creation, extension and accumulation of knowledge. It is therefore also referred to as 'dynamic-resource approach' (Welge and Al-Laham, 2008). An additional approach within the knowledge-based theory is the so called 'core-competency approach' by Prahalad and Hamel (1990). This approach is based on the hypothesis that abnormal profits are a result of a firm's unique competencies and capabilities that enable the firm to use its resources in a way that leads to competitive advantages. It is therefore not the firm's resource endowment itself,

[33] Austrian economics summarizes a field of research initiated by Schumpeter (1934, 1950) which focuses on dynamic competition.

but rather its knowledge and competence in efficiently using its resources that enables a firm to achieve competitive advantages and generate abnormal profits (Welge and Al-Laham, 2008).

Similar to the RBV, approaches of the KBV can serve as an explanatory basis for abnormal profits of individual firms within the same industry. Nevertheless, in accordance with the RBV the KBV neglects the impact of external sources such as industry structure on firm profits. However, in comparison to the RBV, a clear improvement of the KBV is its dynamic perspective. As the following subchapter shows, dynamic processes are of crucial importance when analyzing the development and persistence of abnormal profits over time.

3.4. A dynamic view of competition

The theoretical approaches presented so far are mainly of static nature as they focus on the long-run equilibrium state of abnormal profits. These models can thus either serve to model the occurrence of abnormal profits at a specific point in time[34] or to explain the persistence of abnormal profits in a long-run equilibrium. However, it is also the development of abnormal profits from period to period which - besides the value of abnormal profits in the long-run equilibrium - serves as an important indicator for persistence in abnormal profits.[35] It is therefore also important to gain insight into the dynamics of competition over time from a theoretical point of view.

The theoretical perspective that focuses on dynamic competition is referred to as Schumpeter's (1934, 1950) theory of competition.[36] Schumpeter describes competition as a dynamic process where firms introduce innovations that are subsequently imitated by innovations of other firms. In the extreme case, the initial innovating firm has a monopoly position where it can generate a respective degree of abnormal profits. This, however, attracts other firms to copy the initial innovation, initiating a process of imitation that leads to an erosion of the initial abnormal profits. Thus, a cross-section of firms at any point in time consists of both innovating as well as imitating firms. It can therefore be assumed that firm profits within an industry deviate from each other at each point in time. It could indeed very well be expected that the process of innovation and imitation, which is also referred to as 'creative destruction', drives the profits of all firms towards the competitive norm in the long

[34] Under the assumption that the analyzed industry is in the long-run equilibrium at that specific point in time.
[35] The value of abnormal profits in the long-run equilibrium is referred to as long-run persistence while the continuance of abnormal profits between periods is referred to as short-run persistence.
[36] This approach is also known as 'Austrian economics' (see: e.g. Baaij et al., 2007; Geroski, 1990; Mueller, 1990a).

run (Cable and Mueller, 2008). However, within this framework it is instead assumed that a stringing together of first mover advantages that arise from initial innovations deter at least some of the firms from ever arriving at the competitive norm (Baaij et al., 2007; Cable and Mueller, 2008). Therefore, a continuous disequilibrium can occur where some firms generate persistent abnormal profits (Wiggins and Ruefli, 2005).

Hence the focus of the Schumpeterian perspective is on the properties of the process of abnormal profits over time and not on the characteristics of the long-run state (Geroski, 1990). In general, the sequences of innovation and imitation can lead to complex time paths of profits with phases of persistent divergence from the competitive norm, periods with convergence to the norm or intervals where profits persist at a level close or even equal to the competitive norm (Cable and Mueller, 2008).

According to the two views of competition described in this subchapter, the following section will present econometric models that incorporate both a long- as well as a short-run measure for persistence that accounts for the dynamics of abnormal profits between periods.

4. Econometric models

In order to estimate the factors that determine the magnitude of abnormal profits at a specific point in time the majority of previous studies (e.g. Schmalensee, 1985; Rumelt, 1991) either use analysis of variance (ANOVA) or the components of variance (COV) method. Therefore, the first paper of the present thesis (chapter 2) also implements ANOVA and COV in order to provide a basis for comparison to previous research. However, the emphasis of the first paper is put on a hierarchical linear model (HLM). Addressing some of the econometric drawbacks of classical ANOVA and COV, HLM is a rather new and more sophisticated econometric method to determine the drivers of abnormal firm profits at a specific point in time. Additionally, while ANOVA and COV only enable the estimation of entire effect classes (e.g., firm or industry effects), the HLM method allows for estimating the impact of structural firm and industry characteristics on the degree of abnormal profits (Hough, 2006; Misangyi et al., 2006). A detailed description of ANOVA, COV and HLM is given when these approaches are implemented in the first paper (chapter 2). Thus, in order to avoid repetitions, ANOVA, COV and HLM are not presented again at this point.

In the profit persistence literature a two-step methodology has become the standard method for the estimation of the degree of persistence and its drivers. In the first step the degree of profit persistence is estimated using simple autoregressive models. The second step is aimed at estimating the drivers of profit persistence by regressing structural firm and industry characteristics on the persistence parameters derived in the first estimation step (e.g. Mueller, 1990; Yurtoglu, 2004; Gschwandtner, 2005). This thesis additionally implements a dynamic panel model in order to overcome some of the econometrical shortcomings of the two-step standard approach. As will become apparent below, the dynamic panel model is a more sophisticated approach for the estimation of profit persistence and therefore serves as an improvement of the methodology used in the literature so far. Both models are explained in greater detail when implemented in papers two and three of the present thesis. However, as these approaches are not as straightforward this subchapter provides additional information in particular regarding the interpretation of the estimation results.

4.1. The autoregressive model

Starting with Mueller (1986, 1990)[37] a simple autoregressive model of order one (AR(1)) has become the standard econometric approach for the estimation of profit persistence:

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

where π_{it} is firm i's profit at time t and $\varepsilon_{i,t}$ is an error term with zero mean and constant variance.

In this thesis, profitability of firm i at time t ($\pi_{i,t}$) is measured as the deviation of a firm's return on assets (ROA) from the competitive norm which is approximated by mean sample ROA in t:[38]

(4) $$\pi_{i,t} = ROA_{i,t} - \frac{1}{n}\sum_{i=1}^{n} ROA_{i,t}$$

where n is the number of firms in the analyzed sample. As $\pi_{i,t}$ measures the deviation of firm i's profits from the competitive norm it can be interpreted as abnormal profits.[39] For example, a firm with abnormal profits of $\pi_{i,t} = 0.11$ is generating ROA's that exceed the competitive norm by 11 percentage points in period t.

[37] A detailed description of the autoregressive model is also given in Geroski (1990).
[38] This method of normalization corresponds to the standard expression of firm profits in the profit persistence literature.
[39] An additional advantage of this normalization is that the impact of macroeconomic cycles on firm profits is removed.

The estimation of equation (3) leads to two persistence measures for each firm i. The first one is $\hat{\lambda}_i$, which in the literature is often referred to as short-run persistence. The value of $\hat{\lambda}_i$, is a proxy for the speed at which the forces of competition drive abnormal profits to the long-run value of the AR process.[40] In addition, the smaller $\hat{\lambda}_i$ the less past abnormal profits are related to today's abnormal profits and the higher the fluctuations of abnormal profits between periods. Thus, as $\hat{\lambda}_i$ captures the dynamics of abnormal profits between periods it can be interpreted as a measure for competition in the Schumpeterian sense (Geroski, 1990; Yurtoglu, 2004). Most previous profit persistence studies use the mean value of $\hat{\lambda}_i$ across all firms in an analyzed sample as an indicator for the degree of short-run persistence within it.

The second persistence measure is the long-run value to which, according to the model, a firm's time series of abnormal profits is approaching when $t \rightarrow \infty$. This long-run persistence value which can be interpreted as a measure of permanent rents that are not eroded by the competitive process is defined by the limit of equation (3):

(5) $$\hat{p}_i = \hat{\alpha}_i / (1 - \hat{\lambda}_i)$$

The value of $\hat{p}_i$ can therefore be easily derived from the estimates of equation (3) $\hat{\alpha}_i$ and $\hat{\lambda}_i$.[41] As $\hat{p}_i$ indicates the value of firm *i*'s abnormal profits when $t \rightarrow \infty$ it can be seen as a proxy for the long-run equilibrium value of abnormal profits. For example, according to the neoclassical model of perfect competition, $\hat{p}_i$ should be equal to zero for all firms as this model does not allow for abnormal profits in the long-run equilibrium. Therefore, significantly positive or negative values of $\hat{p}_i$ can be seen as an indicator of abnormal profits in the static neoclassical sense (Geroski, 1990; Yurtoglu, 2004).

In the literature it is usually the fraction of $\hat{p}_i$'s significantly different from zero in a given sample of firms which is used as the indicator of the degree of long-run profit persistence within this sample.

Gschwandtner (2005) introduces an extension of the classical methodology. This so-called 'best lag model' extends the simple autoregressive process of order one by estimating

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[40] Convergence upon the long-run value requires that $-1 < \lambda_i < 1$ holds. Values of $|\hat{\lambda}_i|>1$ are therefore removed during the estimation as they do not make sense in a Schumpeterian way of competition.

[41] In the long-run it can be assumed that: $\pi_{i,t} = \pi_{i,t-1} = p_i$. This implies that for $t = \infty$ the estimated AR process becomes: $p_i = \hat{\alpha}_i + \hat{\lambda}_i p_i$. Rearranging leads to the long-run persistence value $\hat{p}_i = \hat{\alpha}_i / (1 - \hat{\lambda}_i)$.

autoregressive models up to fourth order and afterwards choosing the 'best lag' for each firm by means of the Schwarz Bayesian Information Criterion (SBC).[42] With this extension equation (3) becomes:

(6) $$\pi_{i,t} = \alpha_i + \sum_{j=1}^{L} \lambda_{ij} \pi_{i,t-j} + \varepsilon_{i,t}$$

where L is the number of lags of the 'best' autoregressive process.

Short-run persistence is now measured by the sum of the individual regression coefficients $\hat{\lambda}_i = \sum_{j=1}^{L} \hat{\lambda}_{ij}$ while the long-run persistence measure becomes: $\hat{p}_i = \hat{\alpha}_i \Big/ (1 - \sum_{j=1}^{L} \hat{\lambda}_{ij})$.

The 'best lag model' is an important extension of the standard methodology as several studies have shown that the adjustment path of profits might be more complex than a simple AR(1) can capture (Gschwandtner, 2012). For example, Glen et al. (2001) show that AR(2) is a more sophisticated method to model profitability over time. Cable and Jackson (2008) use structural time series analysis on a sample of 53 UK companies and find evidence for cyclical behavior which might not be adequately captured by a simple AR(1) process.

In summary, the 'best lag model' is better suited to adequately capture the dynamics in profit time series than a simple AR(1). At the same time this extension still allows comparability with most of the previous literature based on the standard AR(1) model.

4.2. Interpreting the two persistence measures $\hat{\lambda}_i$ and $\hat{p}_i$

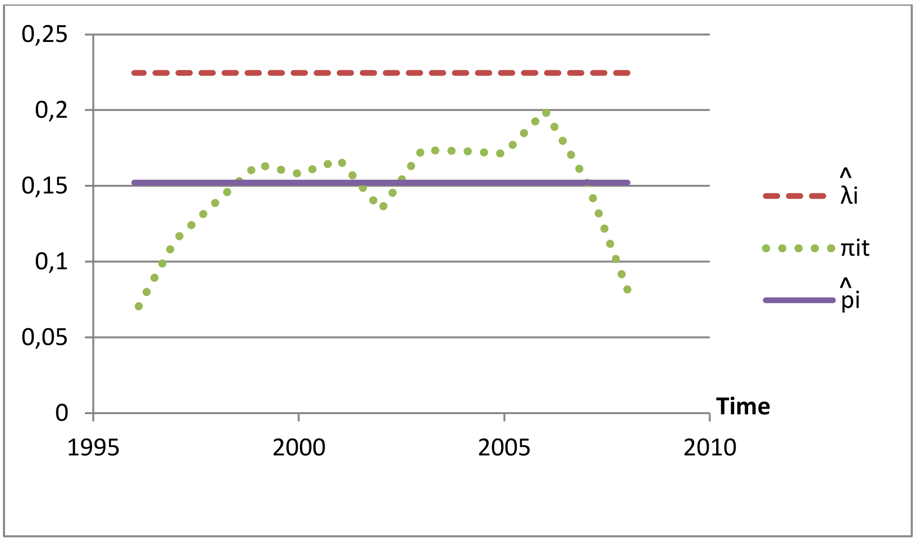
While $\hat{\lambda}_i$ is consistent with the general interpretation of the term 'persistence' in time series analysis (e.g. Baltagi and Griffin, 2006), Mueller (1986) was the first to emphasize the importance of $\hat{p}_i$ as an additional measure for profit persistence. Gschwandtner (2012) stresses, that it is important to consider both persistence measures jointly. She emphasizes that there might be firms whose profits converge very slowly to a low long-run value. This would imply a high short-run persistence value ($\hat{\lambda}_i$) while long-run persistence as measured by $\hat{p}_i$ is rather low. Vice versa firms might exist that are characterized by fast convergence of abnormal profits on a high long-run value implying a low $\hat{\lambda}_i$ and a high value of $\hat{p}_i$.

[42] For each firm the model with the lowest value of SBC is judged to be the best and therefore chosen for further analysis. A notion on why it might be improper to choose the best model by means of highest R^2 or highest adjusted R^2 can be found in Greene (1993: 244).

Therefore, in order to correctly assess a firm's competitive position and its degree of profit persistence it seems reasonable to consider a combination of the two persistence measures.

The following examples shall serve to illustrate the interpretation of the two persistence measures. Figure 4 provides an example of the application of the 'best lag model' to a Belgian dairy.[43] For this firm's profit time series, the autoregressive process of order two resulted in the 'best' model based on the SBC. The estimation yields a long-run persistence value of 0.152. Therefore, according to the model, this firm is earning long-run profits 15.2 percentage points above the competitive norm. The short-run persistence value ($\hat{\lambda}_i$) turns out to be 0.224. As the decay of abnormal profits that occur in the initial period takes place according to $\hat{\lambda}_i$, $\hat{\lambda}_i^{\,2}$, $\hat{\lambda}_i^{\,3}$,…,$\hat{\lambda}_i^{\,T}$ over periods, a $\hat{\lambda}_i$ value of 0.224 implies that around 5 % of abnormal profits initially generated remain after two periods. By and large this firm can be considered as a rather persistent firm especially regarding long-run persistence.

Figure 4: Application of the 'best lag model' to a firm with high $\hat{p}_i$



Data source: Own calculations based on AMADEUS (2010) database.

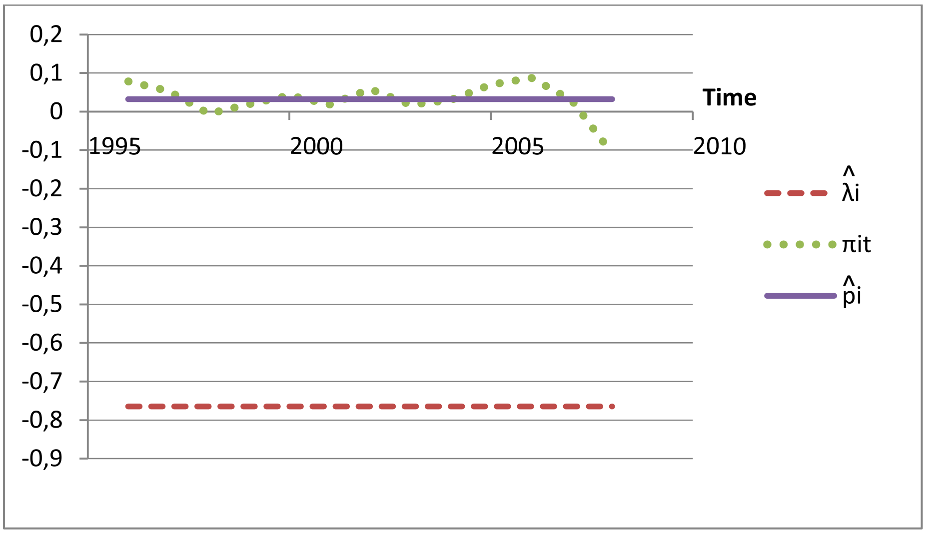
Notes: $\hat{\lambda}_i$ = short-run persistence; $\hat{p}_i$ = long-run persistence; $\pi_{i,t}$ = time series of abnormal profits

Figure 5 illustrates the application of the 'best lag model' to a small French company with around 20 employees active in NACE 1581 'Manufacture of bread; manufacture of fresh pastry goods and cakes' (AMADEUS, 2010). For this firm the AR process of order one turned out to be the 'best' model. This firm's long-run value of $\hat{p}_i = 0.032$ indicates that the firm is estimated to earn long-run profits of only around 3 percentage points above the competitive

[43] Due to unclear legal regulations the names of the firms illustrated in this chapter cannot be stated.

norm. As the long-run persistence value is close to zero this firm seems to be characterized by strong competition in the static neoclassical sense. For this firm abnormal profits fluctuate heavily around the long-run value which is reflected by a large negative $\hat{\lambda}_i$ value of -0.765.[44] Given these facts, this company can be considered as an example for a firm characterized by low profit persistence.

Figure 5: Application of the 'best lag model' to a firm with negative $\hat{\lambda}_i$



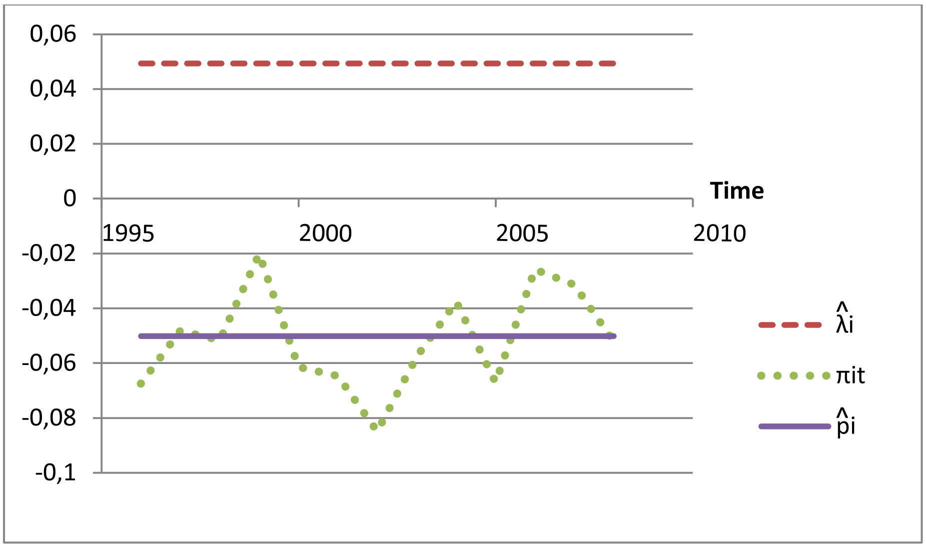
Data source: Own calculations based on AMADEUS (2010) database.

Notes: $\hat{\lambda}_i$ = short-run persistence; $\hat{p}_i$ = long-run persistence; $\pi_{i,t}$ = time series of abnormal profits

Figure 6 shows the application of the AR(1) model to a French wine processor. This firm can also be considered as less persistent with a $\hat{\lambda}_i$ value of 0.049 and a $\hat{p}_i$ value of -0.05. The short-run value indicates that only 4.9 % of abnormal profits initially generated remain one period later and that initial profits are almost completely eroded two periods later with only 0.24 % of the initial value remaining. The $\hat{p}_i$ value indicates that this firm is generating profits 5 percentage points below the competitive norm in the long run. At this point it must be noted that negative abnormal profits, even when persisting in the long run, do not necessarily have to drive a firm out of the market as the competitive norm can be larger than zero which implies that the firm may still generate positive profits.

[44] As will be illustrated below, negative $\hat{\lambda}_i$ values of are commonly observed for smaller firms.

Figure 6: Application of the 'best lag model' to a firm with negative $\hat{p}_i$

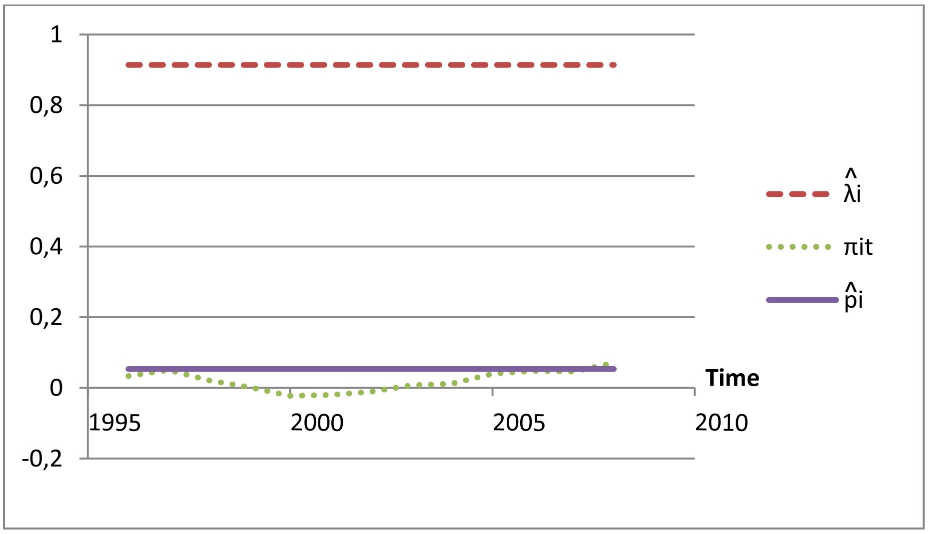


Data source: Own calculations based on AMADEUS (2010) database.

Notes: $\hat{\lambda}_i$ = short-run persistence; $\hat{p}_i$ = long-run persistence; $\pi_{i,t}$ = time series of abnormal profits

The French chocolate manufacturer which is presented in Figure 7 can be considered as a firm characterized by strong profit persistence especially regarding the short-run value which is estimated as $\hat{\lambda}_i = 0.91$. The exceptionally high value indicates that even after ten years 38.9 % of initial abnormal profits remain. Thus, this firm seems to realize permanent advantages in the Schumpeterian way of competition. In addition long-run persistence is estimated as $\hat{p}_i = 0.053$ indicating that this firm generates profit 5.3 percentage points above the norm in the long run.

Figure 7: Application of the 'best lag model' to a firm with high $\hat{\lambda}_i$



Data source: Own calculations based on AMADEUS (2010) database.

Notes: $\hat{\lambda}_i$ = short-run persistence; $\hat{p}_i$ = long-run persistence; $\pi_{i,t}$ = time series of abnormal profits

4.3. Estimation of the drivers of profit persistence

While in the first step of the standard-method the magnitude of profit persistence is examined, the second step of the estimation is aimed at explaining the drivers of $\hat{\lambda}_i$ and $\hat{p}_i$. Specific variables that are either related to the firms themselves or to the industries in which the firms operate are regressed on the two persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$:

(7) $$\hat{\lambda}_i = c + \sum_{j=1}^{k} \beta_j X_{j,i} + \varepsilon_i \quad \text{and} \quad \hat{p}_i = c + \sum_{j=1}^{k} \beta_j X_{j,i} + \varepsilon_i$$

where the X_j 's are k industry and firm variables and ε_i is an error term with zero mean and constant variance. Hence the impact of the X_j 's on the profit persistence measures can be quantified by the $\hat{\beta}_j$'s.

Additionally, in order to improve the standard two-step methodology, a dynamic panel model based on Arellano and Bond's (1991) GMM estimator is implemented. The dynamic panel model is a rather new approach in the profit persistence literature and has so far only been implemented in a few studies (e.g. Goddard et al., 2005; Gschwandtner, 2012). The improvements along with the shortcomings of this method in comparison to the standard two-step approach are described in detail when implemented in chapters 3 and 4. In what follows, a brief description of the approach is given. The dynamic panel model is based on the following equation:

(8) $$\pi_{i,t} = \sum_j \alpha_j (X_{j,i,t}) + \lambda \pi_{i,t-1} + \sum_j \lambda_j (X_{j,i,t}) \pi_{i,t-1} + \varepsilon_{i,t}$$

Equation (8) estimates a short-run persistence measure ($\hat{\lambda}$) as well as the impact of the structural variables X_j on this short-run measure (by means of the $\hat{\lambda}_j$'s) in one estimation step. Contrary to the standard two-step approach which yields short-run persistence measures for each individual firm and then takes the mean across the sample as a measure for short-run persistence, the dynamic panel approach yields a single short-run persistence measure ($\hat{\lambda}$) that applies for all firms in the analyzed sample. The short-run persistence measures $\hat{\lambda}$ and the mean $\hat{\lambda}_i$ of the standard AR approach are, however, not directly comparable due to methodological differences in the methods.

The dynamic panel approach does not yield a long-run persistence measure comparable to the $\hat{p}_i$ of the standard approach. However, as $\hat{\alpha}_j$ reflects the impact of X_j on abnormal profits over the entire time period analyzed, it can be assumed that the direction of this impact prevails in the long run. It is therefore possible to assess the direction of change in long-run profit persistence for a given change in the variables X_j by means of the algebraic signs of the $\hat{\alpha}_j$'s.

5. The EU food economy

5.1. Relevance of the EU food industry

The food industry[45] is one of the most important sectors within EU manufacturing. 287,230 firms were active in the food industry in 2010 creating a turnover of €954 billion and providing employment for 4.3 million people (Eurostat, 2012). A large variety of economical activities are covered by the food industry, ranging from the processing of bakery products to a diverse meat sector to the production of a very heterogeneous range of beverages. This implies that the industry is the basis for the daily diet of consumers across the EU. Furthermore, despite a continuous decline in the share of EU exports in world markets within recent years (24.6 % in 1998 to 17.5 % in 2008), the EU is still the world's leading exporter of food and beverages followed by the U.S., Brazil, China and Canada (CIAA, 2010).

Table 1: **Shares of food industry[a] in total manufacturing[b] (2010)**

Turnover	14.88 %
Value added	12.82 %
Employment	15.07 %
Enterprises	13.48 %

Data source: Own calculations based on Eurostat (2012)
[a] Manufacture of food products and beverages excluding tobacco according to NACE Rev. 1.1 division DA15
[b] Total manufacturing according to NACE Rev 1.1 Section D

[45] Manufacture of food products and beverages excluding tobacco in the EU-27. According to NACE Rev. 1.1 division DA15 or NACE Rev. 2.0 divisions C10 and C11. NACE (Nomenclature generale des activites economiques dans les commumautes Europeeanes) is the statistical classification of economic activities in the European Community.

As indicated by Table 1 the food industry constitutes one of the largest economic sectors within the European economy contributing around 15 % to total manufacturing turnover and around 13 % to total manufacturing value added in 2010. The 2010 shares of food industry employment and enterprises in total manufacturing are around 15 and 13 %, respectively.

The economic importance of the food industry becomes even more apparent when it is compared to other important manufacturing sectors. As Table 2 shows, the food industry contributes the largest share to total manufacturing turnover followed by the manufacture of motor vehicles, the manufacture of machinery and the manufacture of coke and petroleum. Regarding the shares in total manufacturing value added and employment the food industry takes first place as well followed by the manufacture of machinery. The last column of Table 2 indicates that the food industry also has the largest share with regard to the number of enterprises. The issue of firm size is very important in the food industry and will be described in more detail below.

Table 2: The food industry[a] in comparison with other manufacturing sectors. Shares of leading industries in total manufacturing[b] (2010)

Subsector[c]	Turnover	Value added	Employment	Enterprises
Manuf.[d] of food and bev.	14.88%	12.82%	15.07%	13.48%
Manuf. of motor vehicles	11.55%	8.87%	7.64%	0.96%
Manuf. of machinery	8.52%	10.86%	9.78%	4.60%
Manuf. of coke & petroleum	7.80%	1.48%	0.45%	0.05%

Data source: Own calculations based on Eurostat (2012)
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15
[b] Total manufacturing according to NACE Rev 1.1 Section D
[c] Abbreviated industry description. For a detailed industry description see Table 31 & Table 32 in the appendix.
[d] Manuf. = Manufacture

Table 3 depicts the economic contributions of the EU member countries to the food industry by listing each country’s share of food industry turnover in total EU food industry turnover. As mentioned above, the five countries analyzed in the present thesis were - along with general availability of data - chosen based on their economic relevance measured by these shares. Germany is the European leader regarding food industry turnover with a contribution of 18.6 % followed by France (18.4 %), the UK (11.4 %), Spain (10.3 %) and Italy (10.1 %). However, for German firms data availability during the analyzed period is sparse due to a lack of legal requirements to publish balance sheet data.[46] Nevertheless, with France, the UK, Spain and Italy four of the top five countries regarding turnover are included in the analysis. Belgium, the fifth country included, takes eighth place with a share of 3.7 % in total EU food industry turnover. Thus, the five countries included in the sample together contribute around 54 % to total EU food industry turnover. This implies that a large fraction of the EU food industry is covered by the analysis.

Table 3: Contributions of countries to the EU food industry[a] (2007)

Country	% share of country in total EU food industry turnover	Country	% share of country in total EU food industry turnover
Belgium	**3.72**	Lithuania	0.32
Bulgaria	0.42	Luxembourg	n.a.
Czech Republic	0.97	Hungary	1.21
Denmark	2.12	Malta	n.a.
Germany	**18.55**	Netherlands	5.48
Estonia	0.15	Austria	1.93
Ireland	2.57	Poland	4.67
Greece	1.33	Portugal	1.44
Spain	**10.30**	Romania	1.08
France	**18.44**	Slovenia	0.23
Italy	**10.14**	Slovakia	0.28
Cyprus	0.15	Finland	0.95
Latvia	0.19	Sweden	1.76
		United Kingdom	**11.39**

Data source: Own calculations based on Eurostat (2010)
Note: This table is based on 2007 data as this is the last year for which sufficient data for all countries is available. Data for Czech Republic from 2001, for Denmark, Finland, Italy and Slovakia from 2002.
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15

Table 4 lists the shares of food industry turnover in total manufacturing turnover per country. As the table shows, the food industry is of major economic importance in Cyprus, Denmark, Latvia, Lithuania, Greece and Ireland, where the share of food industry turnover in total manufacturing turnover exceeds 20 %. Additionally, the food industry tends to play an important role in those countries which more recently joined the EU in 2004[47] and 2007[48]. Here, in seven of those ten countries for which data is available the share is larger than 15 %. On the contrary, the food industry is of less economic importance in Austria, Germany and Finland where its contribution to total manufacturing turnover is less than 10 %. Regarding

[46] For Germany the obligation for non-publicly quoted firms to publish financial statements is only effective since 2007 (due to §325 HGB. Available e.g. at: http://www.buzer.de/gesetz/3486/a48769.htm, accessed last: 16. Oct. 2012).
[47] Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovenia, Slovakia, Hungary, Malta and Cyprus.
[48] Romania and Bulgaria.

the five countries analyzed in the present thesis, the food industry contributes between 11.5 % (Italy) and 17.0 % (Spain) to total manufacturing turnover.

Table 4: Shares of food industry turnover in total manufacturing[a] turnover per country (2007)

Country	% share of food industry[b] turnover within country	Country	% share of food industry[b] turnover within country
Belgium	13.48	**Lithuania**	**21.37**
Bulgaria	16.34	Luxembourg	n.a.
Czech Republic	n.a.	Hungary	12.60
Denmark	**25.70**	Malta	n.a.
Germany	8.69	Netherlands	18.01
Estonia	15.97	Austria	9.85
Ireland	**20.86**	Poland	18.81
Greece	**20.93**	Portugal	16.20
Spain	17.04	Romania	16.79
France	14.56	Slovenia	8.22
Italy	11.51	Slovakia	13.34
Cyprus	**36.85**	Finland	8.38
Latvia	**24.01**	Sweden	n.a.
		United Kingdom	14.44

Data source: Own calculations based on Eurostat (2010)
Note: This table is based on 2007 data as this is the last year for which sufficient data for all countries is available. Data for Czech Republic from 2001, for Denmark, Finland, Italy and Slovakia from 2002.
[a] Total manufacturing according to NACE Rev 1.1 Section D
[b] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15

5.2. Structure and developments of the EU food industry

As mentioned above, the food industry is the sector that has by far the largest share in total manufacturing regarding the number of enterprises (13.5 %, cf. Table 2). This is mainly due to the industries firm size structure with the majority of enterprises being micro and small sized. Table 5 shows the allocation of firms within food manufacturing with regard to size classes. As can be seen, micro and small sized firms make up 95 % of all food industry enterprises in the EU. However, the economic relevance of these firms is rather small as they only account for 22 % of total food industry turnover while the bigger part of turnover (51 %) is generated by a small number of large firms (Eurostat, 2011a).[49] Among these firms a considerable number of large world leading enterprises can be found.

[49] Although the fact that the majority of enterprises are micro and small sized is a frequently mentioned characteristic of the food industry a similar firm size structure can also be found in many other manufacturing industries. Within the entire manufacturing sector 96 % of the firms are micro and small sized with fewer than 50 employees while only 0.8 % are large enterprises with more than 250 employees. 60 % of the total

Table 5: Firm size distribution in the EU food industry[a] (2009)

Size class[b]	No. of firms	%	Turnover (bn. €)	%
Micro	216,196	78.83	65.110	7.05
Small	44,740	16.31	137.705	14.91
Medium	10,780	3.93	248.988	26.95
Large	2,550	0.93	471.921	51.09
Total	**274,266**	**100.00**	**923.724**	**100.00**

Data source: Own calculations based on Eurostat (2011a)
Note: 2009 is the last year for which data per size classes is available on Eurostat.
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] Size classes according to the SME definition of the European Commission (2005): Micro: <10 employees and total assets <EUR 2 million; Small: <50 employees and total assets <EUR 10 million; Medium: <250 employees and total assets <EUR 43 million. Due to data availability firms are only size-classified by the number of employees.

Regarding structural differences between the food industry and the entire manufacturing sector, it can be observed that profit margins calculated as the ratio of gross operating surplus to turnover are lower in the food industry (9.1 %) as compared to the entire manufacturing sector (9.6 %) (Eurostat, 2010). This is most likely due to a lower processing depth in the food industry in comparison to the entire manufacturing sector (Schiefer, 2011). Furthermore, average capital intensity per firm measured by the ratio of fixed assets and employees is with €145,875 higher in the food industry in comparison to the entire manufacturing sector where average capital intensity per firm is only €105,317.[50] Another difference regards personnel costs such as wages and employers' social security costs which are lower in the food industry in relation to the entire manufacturing sector. While annual personnel costs per employee in the entire manufacturing sector amount to €34,406 the respective value for the food industry is only €26,121 (Eurostat, 2010). Concerning wages, the average employee in the food industry obtains €20,267 annually as compared to €26,567 in the entire manufacturing sector (Eurostat, 2010).[51] This is indicative of a higher share of low-qualified workers in the food industry as compared to the entire manufacturing sector (Schiefer, 2011).

As mentioned above a considerable number of large world leading enterprises operates in the EU food industry. To provide an overview of these firms, Table 6 lists the leading EU food producers ranked by total assets based on data from AMADEUS, a commercial trans-European database of financial information, and the Forbes 'Global 2000 Leading

manufacturing turnover is generated by these large firms while micro and small firms only contribute 19 % (Eurostat, 2011a; data for 2010).
[50] Values are for 2008 and refer to the five countries Be, Fr, It, Sp and UK as the respective balance sheet items are only sufficiently available for these countries. Values were constructed from AMADEUS (2010).
[51] Values for personnel costs and wages for 2007.

Companies' list[52]. The largest corporation regarding total assets, turnover and number of employees is the Dutch food processor Unilever followed by Danone (France). Together with the U.S. firms 'Kraft Foods' and 'Archer Daniels Midland' as well as the Swiss food

Table 6: The largest firms in the EU food industry[a] (2008/2009)

Firm	Country	Industry	Total assets (bn. €)	Turnover (bn. €)	Number of employees
Unilever	NL	Diverse	36.14	40.52	175,000
Danone	FR	Diverse	26.87	15.20	100,995
Pernod Ricard	FR	Manuf. of alcoholic beverages	24.88	7.20	17,926
SABmiller	UK	Manuf. of beer	23.79	11.36	68,635
Heineken	NL	Manuf. of beer	20.56	14.35	54,004
Diageo	UK	Manuf. of alcoholic beverages	20.19	10.22	24,373
Carlsberg	DK	Manuf. of beer	19.48	8.15	45,505
Anyslam	UK	Prod. of alcohol	11.78	n.a.	n.a.
Associated British Foods Plc	UK	Diverse	10.26	10.38	95,816
Cadbury	UK	Manuf. of cocoa	9.30	5.64	46,517
Allied Domecq	UK	Manuf. of wine	8.19	n.a.	n.a.
Südzucker	DE	Manuf. of sugar	7.71	5.83	17,939
Inbev Belgium	BE	Manuf. of beer	7.65	1.15	2,715
Parmalat Spa	IT	Oper. of dairies & cheese making	4.37	4.63	14,444
Arla Foods Amba	DK	Oper. of dairies & cheese making	3.98	6.73	15,927

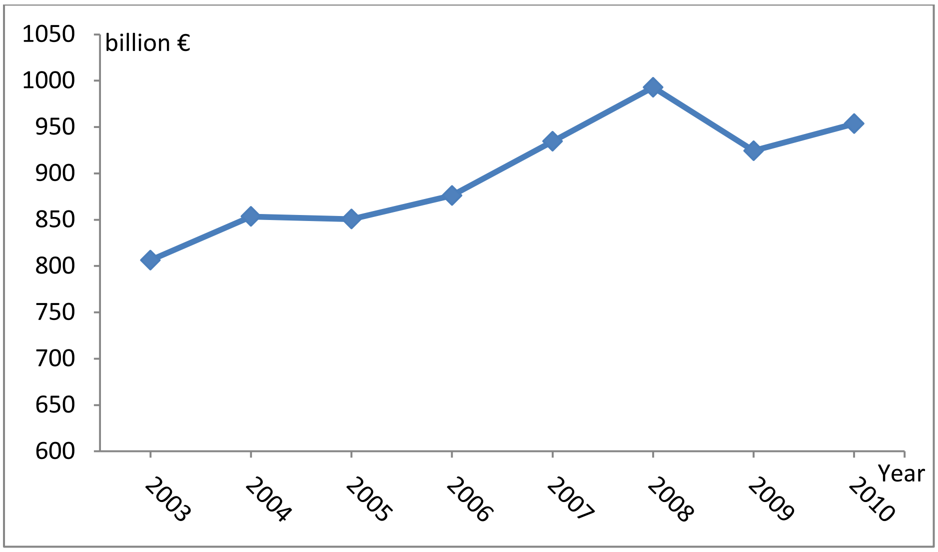
Data source: Own research based on the AMADEUS database and Forbes 'Global 2000 Leading Companies'.
Notes: Manuf. = Manufacturing; Prod. = Production; Oper. = Operation
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.

processor Nestlé[53] these two firms are the largest food processors globally. While the top two firms are active in a variety of food industry subsectors and/or in 'fast moving consumer goods (FMCG)' industries a significant number of firms active in the manufacturing of beer,

[52]Available online at: http://www.forbes.com/global2000/, accessed last: 12. Sep. 2012
[53] Nestlé is a Swiss corporation and thus - according to the above definition based on EU NACE codes - not active in the EU food industry.

wine or distilled potable alcoholic beverages from the UK (Sabmiller, Diageo, Anyslam and Allied Domecq), the Netherlands (Heineken), France (Pernod Ricard), Denmark (Carlsberg) and Belgium (Inbev) can be found among the largest firms in the EU food industry. Additionally, two enterprises operating in the 'operation of dairies and cheese making' (Parmalat and Arla Foods), the German sugar processor Südzucker and the UK cocoa processor Cadbury are among the largest firms.[54]

Figure 8: Development of EU food industry[a] turnover (2003-2010)



Data source: Own calculations based on Eurostat (2010, 2012).
[a] Manufacture of food products and beverages excluding tobacco according to NACE Rev. 1.1 division DA15

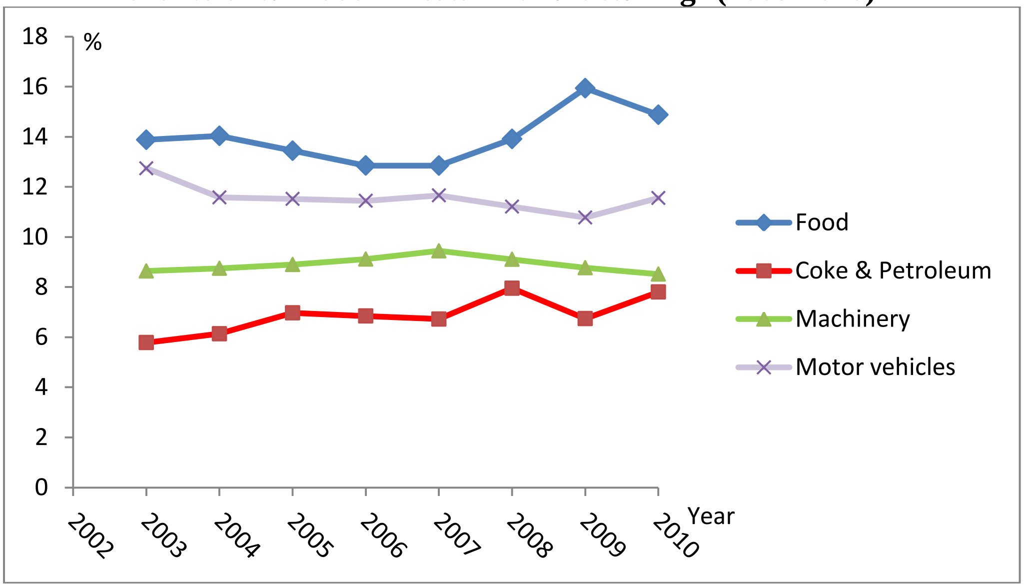
The food industry has, especially as a consequence of the 2008 global financial crisis, experienced a downward trend in the number of firms.[55] While in 2003 313,522 firms were operating in the industry this number has declined to 287,230 in 2010 (Eurostat, 2010; 2012). However, Figure 8, which illustrates the development of food industry turnover for the period 2003 to 2010, shows that the industry has overall experienced fairly stable economic development in recent years with average annual turnover growth rates of 4.3 % between 2003 and 2008.[56] However, in between 2008 and 2009 the global financial crisis led to a decrease in turnover of almost 7 % (Eurostat, 2012). Nonetheless, the impact of the financial

[54] It has to be noted, that for some firms AMADEUS only provides primary 4-digit NACE codes while no information on the diversification of those firms in further economic sectors is provided by the database. This implies that some of the firms listed in Table 6 are most likely active in further 4-digit NACE industries.
[55] According to Eurostat (2012) 16,291 firms have left the market between 2008 and 2009. This value only refers to NACE Rev. 2.0 division C10 (Manufacture of food products) as the respective values for C11 (Manufacture of beverages) are not available.
[56] Nevertheless, as BVE (2009) illustrates for Germany, the bigger part of growth in turnover has - besides growing export trade - to be ascribed to consumer price increases as a result of increasing commodity prices.

crisis on the food industry was essentially lower than its impact on the entire manufacturing sector which experienced a decrease in turnover of almost 19 % between 2008 and 2009 (Eurostat, 2012). Thus, the food industry tends to be a rather crisis-proof sector which is less affected by the business cycle, a fact that can be mainly attributed to a more or less static demand for food products (Lienhardt, 2004).

Figure 9 shows the development of the food industry's share as well as the shares of other leading manufacturing industries in total EU manufacturing turnover for the period 2003 to 2010. From this it can be observed that - despite the growing nominal level of turnover in the pre-crisis period - the relative importance of the food industry measured by turnover has declined between 2004 and 2007.[57] A similar development can be found for the motor vehicle sector while the machinery sector's share of turnover has increased between 2003 and 2007. The development of the coke and petroleum sector in the pre-crisis period is characterized by an increase in the turnover share between 2003 and 2005 followed by a decline that lasted until 2007. However, of even greater interest is the development following the global financial crisis. As Figure 9 indicates the food industry's share in manufacturing turnover increased from around 14 % in 2008 to almost 16 % in 2009 while the shares of the three other sectors considered were declining in the same period. This reinforces the assertion that the food sector is more crisis proof than other manufacturing sectors.

Figure 9: Development of the food industry's[a] and other leading industries' shares of turnover in total manufacturing[b] (2003-2010)



Data source: Own calculations based on Eurostat (2010; 2012)
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] Total manufacturing according to NACE Rev 1.1 Section D.

[57] This is likely due to the fact that the EU food industry is a highly saturated market.

The economic development of the food industry is also heavily dependent on the up- and downstream sectors. As will be described in subsection 5.5, the retail sector as the main distribution channel for the food industry is characterized by a high level of concentration and a high share of private labels leading to strong bargaining power vis-à-vis the industry. As the distribution channels - and in particular the retail sector - determine the business environment for the food industry developments within the retail sector will be crucial for the overall functioning of the food chain (Wijnands et al., 2007).

However, the input markets that provide raw materials for the food industry have also been subject to important developments in recent years. Since mid-2007 volatility of agricultural commodity prices in the EU has increased significantly and recently peaked at a new record level (European Commission, 2012). Driving forces of the rise of input costs are an increase in the demand for agricultural commodities due to a growing and increasingly wealthier population and a rising utilization of agricultural commodities for the production of biofuel. While there is increasing demand for agricultural commodities, supply is on the contrary generally characterized by inelasticity. The result is an overall increase in prices for agricultural commodities (European Competition Network, 2012). Nevertheless, due to the high bargaining power of retailers the industry is not in the position to pass on such price increases to the retailers and final consumers hence implying further pressure on the profit margins of producers (BVE, 2009).

As regards technological developments in the food industry, special focus is placed on genetically modified organisms (GMO's), information and communication technologies (ICTs) as well as on processing issues (Wijnands et al., 2007). In recent years, an intensive debate regarding the use of GMO's has emerged. While more than 70 % of the food products offered in U.S. supermarkets contain genetically modified ingredients, the ethical acceptance among consumers and politicians is considerably lower in the EU (Wijnands et al., 2007). As Wijnands et al. (2007) show, the low acceptance of GMO's is along with the extensive regulatory issues regarding the market approval of novel foods[58] the main impediment to innovation among firms in the EU food industry.

Recent examples of ICT developments are the replacement of traditional barcodes by wireless sensors such as Radio Frequency Identification tags (RFID)[59]. RFID tags lead to a higher efficiency of traceability systems as compared to classical barcodes (Wijnands et al.,

[58] Novel foods are defined as food products that were up to the introduction of the novel food regulation in 1997 not used for human consumption to a large extent within the EU (Wijnands et al., 2007).
[59] RFID is a system based on radio-frequency electromagnetic fields, which is used to transfer information from a chip that is affixed to products, in order to simplify traceability.

2007). Another development regarding ICT's is the direct delivery of food products to the consumer through internet mail-order trade. According to Kolbrück (2012) it can be expected that online food trade will achieve a market share of up to 2 % in the next 4 years. Current developments in the field of processing include improvements in food separation and fragmentation processes that allow a more efficient use of natural resources. Furthermore, there is a development from thermal-based processes to more energy efficient non-thermal processing and preservation methods[60] (Wijnands et al., 2007; Tiwari et al., 2009).

Although a continuously stable demand for food products provides a rather favorable basis for the economic development of the EU food industry, industry development in the coming years will depend on the developments of input markets and the retail sector. Furthermore, changes in the legal and political framework will play an important role in shaping the industry in the future. Especially micro and small sized firms in the food industry are strongly affected by legal burdens. For instance, pre-market approval regulations for new additives, novel foods or GMOs are out of reach for the majority of small food processors in the EU (Wijnands et al., 2007). Moreover, demographic changes will have an influence on the shape of the food industry. Although population growth in the EU-27 is lower as compared to its main competitors (U.S., Brazil, Australia and Canada)[61], suggesting a more favorable future demand situation in these countries, it is estimated that the number of consumers in the EU will be rather stable in future years (Eurostat, 2012b).[62] However, the population in the EU is becoming increasingly older[63] (Eurostat, 2012b), a fact that will most likely lead to changes in consumer preferences. It can be expected that older people will have a stronger interest in healthier foods ranging from functional foods[64], allergen-free food or special hospital diets. In addition, the share of one-person households is increasing and the time spent for the preparation of meals is declining inducing a further increase in the demand for convenience food and food service (Wijnands et al., 2007).

[60] Recent developments in food processing and preservation technologies include the application of pulsed electric fields (PEF) as well as procedures that are based on high-pressure or ultrasound (Tiwari et al., 2009).
[61] While the EU-27 has experienced an average annual population growth rate of only 0.4 % between 2003 and 2007 (Eurostat, 2012a), the respective growth rate exceeds 1 % in other leading food producing countries such as the U.S., Brazil, Australia and Canada (World Bank, 2012).
[62] According to Eurostat (2012b) population in the EU-27 will continue to grow from 501 million in 2010 to 524 million in 2050. For the period after 2050 a decline in the population is estimated.
[63] See Figure 11 in the appendix.
[64] Foods with an additional function regarding health promotion.

5.3. Food industry subsectors

Based on the 3-digit NACE industry classification system ten different subsectors can be identified within the EU food industry. Table 7 specifies these subsectors by turnover, value added and the number of firms. It can be seen, that the bigger part of turnover is created by the meat production (NACE 151), the manufacture of other food products (NACE 158), the manufacture of beverages (NACE 159) and the dairy sector (NACE 155). Together, these four sectors account for 65 % of total food industry turnover. However, it should be noted that the 'manufacture of other food products' (NACE 158) takes second place only due to its broad definition including a variety of large subsectors such as the 'manufacture of cocoa; chocolate and sugar confectionary' and the 'processing of tea and coffee'. The four largest sectors in terms of turnover are also among the largest sectors regarding value added. However, with almost 20 % the 'manufacture of bakery products' has the highest share in total food industry value added. The last column of Table 7 shows the shares in the total number of food industry firms of each subsector. Regarding the top five sectors, this ranking corresponds with the turnover ranking, with the exception of a switch between the 'manufacture of bakery products' and the dairy sector.

Table 7: Importance of subsectors in the EU food industry[a] (2010)

Subsector (NACE Rev. 1.1)	Share in total EU-27 food industry turnover (%)	Share in total EU-27 food industry value added (%)	Share in total EU-27 food industry no. of firms (%)
Production, proc. & pres. of meat & meat pro. (151)	20.03	15.30	13.93
Manuf. of other food pro. (158)	16.46	19.03	8.46
Manuf. of beverages (159)	14.68	18.15	8.04
Manuf. of dairy pro. (155)	13.63	8.83	4.09
Manuf. of bakery & farinaceous pro. (1581 & 1582)[b]	11.40	19.95	5.37
Manuf. of prepared animal feeds (157)	6.89	4.51	1.79
Proc. & pres. of fruit & vegetables (153)	6.08	6.18	3.58
Manuf. of vegetable & animal oils & fats (154)	4.31	2.12	3.01
Manuf. of grain mill pro., starches & starch pro. (156)	4.11	3.60	2.18
Proc. & pres. of fish & fish pro. (152)	2.39	1.93	1.25

Data source: Own calculations based on Eurostat (2012)
Notes: Proc. & pres. = processing and preserving; Manuf. = manufacture; Pro. = products
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] While NACE Rev. 1.1 lists the bakery sector as two subsectors (1581 and 1582) that are reported under the miscellaneous category 'Manufacture of other food products' it is reported as a separate single sector in the new classification NACE Rev. 2. For this reason NACE 1581 and 1582 are also reported as a separate single sector here.

As Table 8 indicates there are also significant differences in the capital intensity of the food industry subsectors. Capital intensity per firm measured by the ratio of fixed assets and the number of employees is in 2008 with €429,927 on average highest in the 'Manufacture of beverages' followed by the 'Manufacture of oils and fats' (€312,455). Less capital intensive subsectors are the 'Production of meat' and the 'Manufacture of other food products' where the values are with €100,381 and €92,717 below the average value for the entire food industry (€145,875).

Table 8: Capital intensity of subsectors in the food industry[a] (selected countries: Be, Fr, It, Sp and UK) (2008)

Subsector (NACE Rev. 1.1)	Average capital intensity per firm (€) (fixed assets / employees)
Manufacture of beverages (159)	429,927
Manufacture of vegetable & animal oils & fats (154)	312,455
Manufacture of grain mill products, starches & starch products (156)	204,526
Processing & preserving of fruit & vegetables (153)	188,077
Manufacture of prepared animal feeds (157)	156,954
Manufacture of dairy products (155)	131,817
Processing & preserving of fish & fish products (152)	110,280
Production, processing & preserving of meat & meat products (151)	100,381
Manufacture of other food products (158)	92,717
Total food industry (DA 15)	**145,875**

Data source: Own calculations based on AMADEUS (2010)
Notes: This table refers to the five analyzed countries (Be, Fr, It, Sp and the UK) and not to the entire EU-27 food industry as data availability of the required balance sheet items in AMADEUS is only sufficient for these countries.
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.

The dairy sector is not only of high economic importance within the food industry but also a food industry subsector highly influenced by interventions regulated by the 'Common Agricultural Policy' (CAP). Additionally, a high number of cooperatives operate in the industry, a fact which will most likely influence the occurrence and persistence of abnormal firm profits in the sector. The dairy sector therefore constitutes an interesting case for analysis within the EU food industry, not only because of its economic importance but also due to its structural features and dynamic developments (Drescher and Maurer, 1999). Thus, following a detailed analysis of the entire food industry in the first two papers (chapters 2 and 3), paper number three (chapter 4) focuses explicitly on the dairy sector in order to determine which influence the special characteristics of this sector have on the persistence of abnormal firm profits. For a basis, a description of the dairy industry, highlighting its economic characteristics, is given in the following section.

5.4. The dairy industry

Following the meat and the beverage sector, the dairy industry is the third largest sector within the EU-27 food industry[65] with a contribution of around 14 % to total food industry turnover in 2010 (cf. Table 7). The dairy industry has experienced a continuous decline in the number of firms in recent years (Eurostat, 2010, 2012) due to a wave of mergers and acquisitions.[66] A famous example is the merger of the German firms Humana and Nordmilch bringing about the sixth largest European dairy producer (N-tv, 2011). The decrease in the number of firms has been intensified by the global financial crisis in 2008 which has forced many firms into bankruptcy. In addition, the dairy sector has lately been heavily affected by the so-called 'milk crisis'. Due to increasing demand in recent years, prices for dairy commodities on the world market[67] have experienced a significant increase with a peak in 2007 (Milchindustrie, 2012). This price increase was reinforced by a drop in the production of important dairy exporters such as Australia and New Zealand due to drought and other climate change issues (Kershaw and Gaffel, 2008; Milchindustrie, 2012). The increase in prices in turn has led to a decrease in demand and thus an oversupply of milk products. The consequence was a dramatic decline in prices in early 2008 (Milchindustrie, 2012) while at the same time input costs, especially for feed and energy, significantly increased (European Competition Network, 2012).[68]

In 2008 around 134 million tons of cows' milk were processed into a variety of products in the EU-27 (Eurostat, 2011). The main products manufactured by the dairy industry are fresh milk, cheese, yoghurt, butter, milk powder, condensed milk as well as industrial raw materials for further reprocessing (Tacken, 2009). Due to their relative short shelf life products such as fresh milk or yoghurt are particularly produced for local markets (Poppe et al., 2009). Furthermore, the majority of trade with dairy products is taking place

[65] After exclusion of the miscellaneous sector NACE 158 'Manufacture of other food products'.
[66] The number of firms active in the dairy industry has decreased at an average rate of 1.7 % annually between 2003 and 2010. While 13,296 firms were active in the industry in 2003, only 11,755 are reported for 2010 (Eurostat, 2010, 2012).
[67] While the increase in demand, which can mainly be attributed to a growing and increasingly richer population, could initially be absorbed through the reduction of inventories, after mid 2007 processing firms had to purchase dairy commodities on the world market, which has induced the increase in prices (Milchindustrie, 2012).
[68] However, the effect of the 'milk crisis' on the occurrence and persistence of abnormal profits cannot be assessed by the present thesis since data is only available for the pre-crisis period.

within the EU. In 2010 EU-internal exports of dairy products accounted for $32.6 billion[69] (FAOSTAT, 2011). However, there is still a great amount of extra-EU trade taking place with the EU-27 being the world's leading exporter of dairy products (Tacken, 2009). In 2010 the EU-27 exported $9.7 billion (FAOSTAT, 2011) in form of dairy products with long shelf lives such as cheese, butter or milk powder to countries outside the EU-27 (Tacken, 2009).

Since the end of the 1960's, the EU dairy market is regulated by the CAP with the objective to support the raw milk price, and hence the incomes of dairy farmers (OECD, 2011). In order to achieve this objective, the CAP includes a variety of elements such as intervention prices, import tariffs and export subsidies as well as a quota system which was introduced in 1984 (European Commission, 2006). The quota system has put an efficient limit on the quantity of milk that dairy farmers in EU countries produce each year.[70] Within the framework of the quota system, dairy farmers are financially penalized through so-called 'superlevys' if the amount of milk delivered in a specific year exceeds the year's quota rights. At this, the levy is set at a rate that renders the delivery of amounts above the quota financially inefficient (European Commission, 2006). However, as Drescher and Maurer (1999) show, the quota can impede necessary structural adjustments at the farm level which in turn may lead to inefficiencies in the supply of raw inputs for the dairy industry. Wijnands et al. (2007) note that such inefficiencies in the supply of raw production materials can have a significant impact on the international competitiveness of the industry. Since its introduction in 1984, the quota system has been adjusted several times by EU agrarian reforms. The CAP reform in 2003 included a 25 % reduction in intervention prices over four years starting in 2004. At the same time direct payments to farmers have been introduced in order to compensate for these reductions (European Commission, 2000; OECD, 2011). Furthermore, in 2008 the CAP 'health check' decisions of the European Commission resulted in a yearly increase of the quota by 1 % for the period of transition up to its final abolition in 2015 (European Commission, 2009). These reforms imply that the dairy sector is set on a more market-oriented course and that competitive market forces are becoming an increasingly important driver in the sector (European Commission, 2006). As a consequence, milk prices have become more aligned with world market prices and volatility in the milk price has increased (Keane and Connor, 2009).

[69] Based on FAOSTAT data available on: http://faostat.fao.org/. Calculated as the difference between total dairy exports of all EU-27 countries ($42.3 billion) and extra EU-27 trade ($9.7 billion).

[70] In 2005 total milk quotas accounted for 137 million tons in the EU-25 (European Commission, 2006). See European Commission (2006: 13) for an overview of the 2005 milk quotas per EU-25 member states.

The processing and distribution of milk in the EU is in many cases organized in the form of farmer-owned cooperatives (European Commission, 2006). According to AMADEUS the share of cooperatives operating in the EU-27 dairy industry is 11 % and thus higher than in other subsectors of the food industry.[71] The respective share in the dairy industries of the five countries under consideration in the present thesis is with 19 % above the respective EU average. Cooperatives usually pay out part of their profit to farmers, through the price of raw milk. This fact will most likely influence the results on profit persistence in the dairy sector (Tacken, 2009).

Another feature of the dairy industry is its high quantity of innovations which lead to new product placements. As Tacken (2009) shows, between 2003 and 2008 the EU-27 accounts for 61 % of all dairy innovations worldwide. However, similar to other sectors of the food industry, innovation is mainly limited to the introduction of product extensions such as the use of new additives or new flavors as well as packaging innovation, while the launch of entirely new products is rather uncommon (Poppe et al., 2009).

As pointed out above the food retail sector is of significant importance for the business environment in the food industry and the overall functioning of the food chain. The following subsection therefore highlights the structural characteristics and the developments of this sector.

5.5. The food retailing sector

While the importance of direct sales by producers has considerably decreased since the 1970's, the food retail sector is the main link between the food industry and the final consumer today (Wijnands et al., 2007). The EU food retail sector is composed of non-specialized stores in the form of supermarkets as well as specialized stores such as greengroceries, specialized retail sale of meat and beverage retailers. Table 9 depicts the structure of the retail sector for the EU-27 and the five countries covered by the present thesis based on turnover and the number of enterprises. With around €900 billion about 87 % of turnover is generated by supermarkets in the EU while specialized stores only account for around 13 % of total food retail sector turnover (€135 billion). Both at the EU-27 as well as at the country level (with exception of the UK), the number of non-specialized firms is lower compared to specialized stores. Therefore, for non-specialized retailers, the ratio of turnover to the number of firms is on average much higher than for specialized retailers.

[71] In other sectors the share of cooperatives is only around 1 %. For example, in the meat sector the share of cooperatives at the EU-27 level is 1.4 %.

Table 9: Structure of the EU-27 food retail sector[a] (2009)

Subsector	Turnover (bn. €)	# of firms	Average turnover per firm (1000 €)
Retail sale in non-specialised stores with food, beverages or tobacco predominating (NACE 47.11)			
EU-27	900.00	426,102	2112.17
Belgium	29.09	6,689	4348.93
France	175.85	22,586	7785.80
Italy	100.79	52,982	1800.40
Spain	69.62	37,289	1867.04
UK	148.79	28,695	5185.22
Retail sale of food, beverages and tobacco in specialized stores (NACE 47.2)			
EU-27	134.73	476,457	282.77
Belgium	4.47	10,591	422.06
France	18.28	51,129	357.53
Italy	17.39	106.405	163.43
Spain	23.94	108,346	220.96
UK	13.17	26,543	496.18

Data source: Eurostat (2010) 'Annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing'.
[a] Retail sale of food products and beverages including tobacco. According to NACE Rev. 2 group G 47.2 and class G 47.11.

The relevance of specialized retail stores has declined compared to non-specialized supermarkets in recent years. Table 10 illustrates this development based on turnover for both subsectors for the period 2003 to 2009. While turnover for non-specialized stores increased by 21 % between 2003 and 2009, the respective growth rate for specialized retailers was only around 11 %.

Table 10: Turnover of specialized and non-specialized retailers[a] in the EU-27 (2003 and 2009)

Subsector	Turnover (bn. €)	
	2003	**2009**
Non-specialized retailers (NACE 47.11)	743.53	900.00
Specialized retailers (NACE 47.2)	120.48	134.73

Data source: Eurostat (2010) 'Annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing'.
[a] Retail sale of food products and beverages including tobacco. According to NACE Rev. 2 group G 47.2 and class G 47.11.

The majority of EU-27 food retailers (99 %) are micro and small sized firms with fewer than 50 employees while only 0.14 % are large firms with more than 250 employees. However, an important structural characteristic of the sector is that the majority of turnover (61 %) is generated by this small number of large firms. The same holds for the five analyzed countries where 0.12 % are large firms which generate 64 % of turnover (Eurostat, 2010).[72] Table 11 presents the five-firm concentration ratios for the food retailing sectors of the five analyzed countries. From this it can be ascertained that concentration among retailers has increased during the analyzed time span and - with the exception of Italy - stagnates around 70 % in the five countries considered.[73] This indicates high bargaining power of the retail sector vis-à-vis the industry. According to Wijnands et al. (2007) it can be expected that concentration in the retail sector will continue to increase and that 10 to 15 retail chains will dominate the EU market in the near future.

Table 11: Food retail[a] sector concentration ratios (CR5 in %) in selected EU countries

Country	1996	2000	2004	2006
Belgium	62	66	77	77
France	51	61	69	70
Italy	12	25	41	35
Spain	32	50	79	65
UK	73	80	54	63

Data source: Wijnands et al. (2007, Table 2.13, p.46), Vander Stichele and Young (2009) based on Planetretail Global retail concentration 2006 data and
[a] Retail sale of food products and beverages including tobacco. According to NACE Rev. 2 group G 47.2 and class G 47.11.

In addition to the high degree of concentration, another phenomenon that has recently gained attention of antitrust authorities is the increasing market share of retailer's private labels. Private labels which are often also referred to as house brands or own labels enable retailers to replace suppliers' branded products. This further contributes to retailer dominance vis-à-vis the producers (Vander Stichele and Young, 2009; Wijnands et al., 2007). The market share of private labels already exceeds 25 % in many EU countries. Regarding the five

[72] Data for 2009.
[73] Wijnands et al. (2007: 46, Table 2.13) show that in all EU-15 countries except Greece, Italy and the UK retailer concentration is around 70 % or higher in 2004.

countries analyzed in the present thesis the share is highest in Spain (30.9 %) followed by the UK (30.5 %) and France (26.1 %). With only 12.2 % the lowest share can be found for Italy[74] (Vander Stichele and Young, 2009). In recent years the image of private labels has developed from low quality to high quality products which can compete with global supplier brands. In many cases private labels are ‘copy cats’ of brands whose labeling and packaging resembles the one of branded products. This means that development- and advertising costs for private labels are significantly lower compared to brands. Therefore, the key benefit of private labels lies in the fact that net margins are in general higher in comparison to branded products (Vander Stichele and Young, 2009; Wijnands et al., 2007). This implies a higher profitability of private labels and thus further power imbalance between retailers and producers.

The developments in the retail sector have, however, not gone unnoticed by the respective authorities. Thus, as a consequence of its dominance vis-à-vis the food industry, the retail sector has recently caught the attention of national cartel offices and the European Commission (European Competition Network, 2012). Furthermore, the increasing share of retailer’s private labels has opened an additional discussion concentrating on the effect that a high and ever increasing market share of private labels has on the functioning of competition in the food chain (e.g. Frank and Lademann, 2012).

6. Data

Two data sources have been used in the present thesis in order to empirically estimate the occurrence and persistence of abnormal profits as well as the respective drivers. First, firm-level data was derived from the commercial balance sheet database AMADEUS. Most commercial balance sheet databases are either restricted to publicly quoted firms (e.g., Standard and Poor’s Compustat databases only contain data for publicly quoted U.S. firms.[75]) or are limited to a specific geographic area (e.g., Hoppenstedt’s firm database, which is limited to German firms). Furthermore, most databases imply minimum firm size criteria which are either determined by a minimum value of a specific balance sheet item (e.g., total assets or sales) or by the fact that only publicly quoted firms, which are usually larger, are contained in the database. The presence of a minimum firm size criterion was a very important factor when choosing the appropriate database for this thesis because, as mentioned

[74] Data for 2007. The market share for Belgium is not available.

[75] Most studies analyzing profit persistence in the U.S. use Compustat as their data source. Examples are: McGahan and Porter (1999, 2003); Schumacher and Boland (2005a); Gschwandtner (2005, 2012); Mueller (1977, 1986).

above, most EU food processors (95 %) are micro and small sized firms with total assets of less than €10 million. Choosing a size restricted database would therefore lead to a sample that significantly under-represents the population of EU food processors.

An additional challenge was to find a database from which a sample with both a sufficient cross section dimension and a sufficient time series dimension could be derived. The former difficulty is a consequence of the fact that this thesis solely focuses on the food industry which makes data availability much more complicated in comparison to the vast majority of other studies on profit persistence which mainly analyze entire manufacturing sectors. A sufficient time series dimension is particularly important for the estimations of profit persistence in Chapters 3 and 4 of this thesis, as these studies must be based on long time periods.[76]

In consideration of the described difficulties, AMADEUS[77] a commercial, pan-European balance sheet database compiled by Bureau van Dijk Electronic Publishing was chosen as the best available source for firm-level data. AMADEUS contains information on over 13 million public and private companies in 41 countries. For each firm 25 balance sheet items, 25 profit and loss account items and 26 ratios are recorded in AMADEUS. Furthermore, descriptive information including activity codes (for example, NACE 1.1 or U.S. SIC[78]), ownership information, trade descriptions or security and price information are provided for each firm (BvDEP, 2007). The particular feature of AMADEUS is that it has nearly no limitations regarding the inclusion of firms in the database. This made it possible to derive a sample with an adequate cross section dimension. However, as AMADEUS was launched in 1996, the longest time series dimension that could be obtained is 13 years (1996-2008)[79], a value that lies at the lower end of the time spans of previous studies depicted in Table 30 of the following chapter. Overall this data source appeared to be the best available option to adequately reflect the EU food industry.

Table 12 compares the total data comprised by AMADEUS with the values for the population, which are provided by Eurostat, for the five analyzed countries in 2007. It can be observed that between 56 % (Italy) and 79 % (Belgium) of total food industry sales are included in AMADEUS, respectively.[80] This highlights the fact that AMADEUS provides a respectable basis for an analysis of the EU food industry. However, regarding the number of

[76] As will be shown in the following chapter (cf. Table 30), most previous persistence studies analyze periods of around 20 years.
[77] AMADEUS is the acronym for Analyse MAjor Databases from EUropean Sources
[78] Standard Industrial Classification
[79] Data availability for 2009 and 2010 was sparse making it impossible to include these years in the analysis.
[80] This comparison had to be based on sales as other values such as total assets are not available on Eurostat.

firms, only around 18 % of the whole population of firms is included in AMADEUS. This is due to an underrepresentation of micro-sized firms as indicated by Table 13, which provides a comparison of the data comprised in AMADEUS with the population by size class for the five analyzed countries.

Table 12: Food industry sales and no. of firms in AMADEUS compared with Eurostat sales and no. of firms (2007)

Country	Sales of all food industry[a] firms in AMADEUS (bn. €)	Total food industry[a] sales according to Eurostat (bn. €)	% cov. of sales by AMADEUS	Total no. of food industry[a] firms in AMADEUS	Total no. of food industry[a] firms according to Eurostat	% cov. of no. of firms by AMADEUS
Belgium	27.40	34.81	78.71	3,113	7,511	41.45
France	94.79	142.79	66.38	13,195	70,823	18.63
Italy	52.96	94.72	55.91	4,297	72,691	5.91
Spain	59.32	96.30	61.60	8,975	28,657	31.32
UK	n.a.	106.43	n.a.	3,820	7,027	54.36
5 countries	[b]	[b]	[b]	**33,400**	**186,709**	**17.89**

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
Note: Data on the number of enterprises for Italy refers to 2003. Data on turnover for Italy refers to 2002 and for France to 2003.
Cov. = Coverage
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] Not reported as AMADEUS data on sales is not available for the UK.

Table 13: Comparison of AMADEUS data[a] with the population[b] by size class[c] shares in % (2007)

	Shares (%) in AMADEUS	Shares for population (%) according to Eurostat
Large	3.2	0.6
Medium	8.0	2.1
Small	20.4	11.5
Micro	68.4	85.9

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010).
[a] All food industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK.
[b] Population refers to Eurostat data for food industry firms in Belgium, France, Italy, Spain and the UK.
[c] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

Prior to the estimation the sample had to be screened by, amongst others, dropping all firms for which fewer than 13 years of ROA observations are available. The screening process is explicitly described in the individual papers and thus not reported again in this subchapter. Table 14 indicates that overall only 16 % of the firms recorded in AMADEUS remain in the final sample. Nevertheless, the final sample contains 5,494 firms and thus is one of the largest samples analyzed in the respective literature so far (cf. Table 30).

Table 14: Overall no. of firms in AMADEUS compared with final samples by country (2007)

Country	Total no. of food industry[a] firms in AMADEUS	Number of firms in final samples
Belgium	3,113	841
France	13,195	2,786
Italy	4,297	596
Spain	8,975	1,043
UK	3,820	228
Total	**33,400**	**5,494**

Data source: Own calculations based on AMADEUS (2010)
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.

Table 15 gives a comparison of the screened country samples with the population by size classes. As can be seen micro sized firms are underrepresented, especially for Italy, the UK and Spain while large firms are significantly overrepresented in the UK sample.

Table 15: Comparison of the sample[a] with the population[b] by size class[c] and country regarding shares of number of firms in % (2007)

	Belgium	France	Italy	Spain	UK	All
Large	4.7 (0.8)	3.6 (0.5)	5.5 (0.2)	5.2 (0.8)	30.7 (5.0)	5.4 (0.6)
Medium	6.5 (3.1)	5.8 (1.5)	35.4 (1.1)	14.9 (3.4)	30.7 (11.4)	11.9 (2.1)
Small	18.9 (15.8)	16.7 (8.7)	51.5 (9.3)	37.0 (18.4)	32.0 (28.0)	25.3 (11.5)
Micro	69.8 (80.4)	73.9 (89.3)	7.6 (89.4)	42.9 (77.4)	6.6 (55.6)	57.4 (85.9)

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010).
Note: Shares for the population in parentheses are derived from Eurostat (2010).
[a] All firms in the final AMADEUS samples for the countries Belgium, France, Italy, Spain and the UK.
[b] Population refers to Eurostat data for food industry firms in Belgium, France, Italy, Spain and the UK.
[c] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

A comparison of the sample with the population of all firms by industries is presented in Table 16. It can be detected that ‘Manufacture of other food products’ (NACE 158) is the largest sector regarding the number of firms in the population and in the sample. However, this sector is underrepresented in the sample while the meat industry (NACE 151) and the beverage sector (NACE 159) are overrepresented.

Table 16: Comparison of the final sample[a] and population[b] by industry (2007)

Industry (NACE)[c]	Sample		Population	
	No. of firms	%	No. of firms	%
151 (Meat)	1,324	24.1	20,320	11.0
152 (Fish)	141	2.6	1,693	0.9
153 (Fruit & veg.)	241	4.4	5,385	2.9
154 (Oils & fats)	31	0.6	5,580	3.0
155 (Dairy)	401	7.3	8,157	4.4
156 (Starch)	314	5.7	2,963	1.6
157 (Animal feeds)	260	4.7	2,606	1.4
158 (Other)	2,045	37.2	126,705	68.4
159 (Beverages)	737	13.4	11,803	6.4

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
[a] All firms in the final AMADEUS samples for the countries Belgium, France, Italy, Spain and the UK.
[b] Population refers to Eurostat data for food industry firms in Belgium, France, Italy, Spain and the UK.
[c] Industries defined by 3 digit NACE Rev. 1.1 groups. See the appendix for a detailed industry description according to NACE Rev. 1.1

With respect to the dairy industry, Table 17 reveals that overall 27 % of the firms operating in the dairy sectors of the five analyzed countries are recorded in AMADEUS. After deleting firms with missing ROA observations in at least one year of the analyzed period (1996-2008), the final sample, which is analyzed in chapter 4, comprises 590 dairy firms.[81] This represents a 27 % share of all firms listed in AMADEUS and a 7 % share of all dairy firms operating in the five countries analyzed.

[81] Due to the fact that additional data was available at the time the dairy industry sample was constructed this number is larger than the number of dairy firms reported for the total sample according to Table 16.

Table 17: Dairy industry[a] firms in AMADEUS compared with Eurostat dairy industry data (2007)

Total no. of dairy industry firms operating in Be, Fr, It, Sp and the UK according to Eurostat	8157
Total no. of dairy industry firms recorded in AMADEUS for Be, Fr, It, Sp and the UK	2179
Number of dairy industry firms in final sample (sample also refers to Be, Fr, It, Sp and the UK)	590

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
Note: Values for sales not reported as data for the UK is not available.
[a] Manufacture of dairy products. According to NACE Rev. 1.1 group DA155.

The second data source used is Eurostat's (2010) 'Annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing'. The Eurostat database is freely available via the webpage of the European Commission and provides detailed quantitative information on structural industry-level characteristics.

The remainder of this chapter provides information and descriptive statistics on the firm and industry variables used in this thesis. It must be noted that this chapter is solely descriptive while the impact that each firm- and industry variable has on the occurrence and persistence of abnormal profits is discussed when these variables are implemented in chapters 2 through 4.

6.1. Information and descriptive statistics on ROA

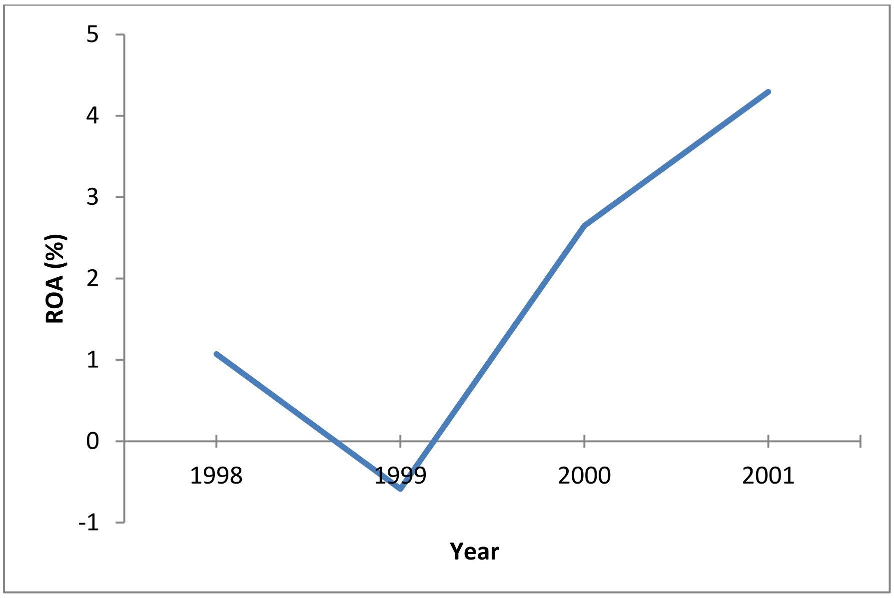
Similar to most previous studies, return on assets (ROA), calculated by a firm's profit/loss before taxation and interest divided by its total assets, is used as the measure for firm profitability (e.g. Goddard et al., 2005; Crespo Cuaresma and Gschwandtner, 2008). It must be pointed out, however, that balance sheet profit measures can be error-prone due to profit smoothing and cross subsidization and therefore do not necessarily reflect real economic performance of firms in an adequate way. This could be a problem especially for large multinational firms which cross subsidize less successful subsidiaries.[82] As an alternative to accounting profit data, economic value added (EVA) developed by Stern Steward and Co., which measures the economic returns generated for shareholders, might be used as a measure for firm performance. However, as Biddle et al. (1997) point out, EVA is also not without

[82] See Fisher and McGowan (1983) as well as Long and Ravenscraft (1984) for a detailed discussion on the usefulness of balance sheet profits as a measure for real economic performance.

disadvantages. They show, for example, that EVA is outperformed by earnings as a measure for firm performance as earnings are found to be more highly correlated with returns and firm values than EVA. Thus, in order to assure comparability to previous literature and due to better data availability, ROA was used as a measure for firm performance in the present thesis. Furthermore, results using the value added (VA) measure reported in AMADEUS[83] as a proxy for firm performance, are not expected to differ significantly from the results based on ROA as the correlation coefficients between ROA and VA exceed 0.8 and are statistically significant at the 1 % level for each year and country.

The quality of ROA in reflecting economic performance of large multinational firms can additionally be supported by looking at the impact of food scandals on the subsequent development of ROA. Figure 10, for example, depicts the ROA of Coca Cola Belgium which was affected by a major scandal regarding contaminated carbon dioxide in 1999. The decline in Coca Cola Belgium's ROA in 1999 indicates that this scandal and its consequences for firm performance are very well reflected apart from possible cross subsidizations or profit smoothing.

Figure 10: ROA of Coca Cola Belgium before and after carbon dioxide scandal



Data source: Own calculations based on AMADEUS (2010)

Table 18 provides a comparison between the sample used in this thesis and the population regarding the mean and standard deviations of ROA for the five analyzed countries

[83] This is the value in AMADEUS that appears most similar to EVA.

over the period of 1996-2008. As the Eurostat database does not provide ROA measures per industry, the values for the population had to be constructed from the AMADEUS database.[84] For this, all observations recorded in AMADEUS for the years 1996-2008 were considered.[85] Table 18 indicates that the country ranking regarding ROA is mostly identical for the sample and the population with French firms generating on average the highest ROA's (sample: 7.12 %; population: 6.51 %) and Italian firms generating the lowest ROA's (sample: 3.76 %; population: 3.46 %). For all countries, ROA in the sample exceeds ROA of the population and is characterized by lower volatility. This is partly due to the fact that only firms with at least 13 ROA observations are included in the sample thus removing less successful firms with lower and more volatile[86] ROA's that, e.g., went bankrupt during the analyzed period and are therefore not recorded over the entire 13 year time span. Furthermore, the lower volatility of ROA in the samples can be explained by an underrepresentation of micro-sized firms (cf. Table 15) which are characterized by higher volatility in ROA (cf. Table 19).[87]

Table 18: Mean[a] ROA and standard deviations for food industry[b] firms in AMADEUS: sample vs. population (1996-2008)

Country	Mean ROA sample[c] (%)	Standard deviation (%)	n	Mean ROA population[d] (%)	Standard deviation (%)	n
Belgium	4.47	6.4	841	3.81	13.9	3,113
France	7.12	7.4	2,786	6.51	14.0	13,195
Italy	3.76	3.3	596	3.46	8.9	4,297
Spain	5.04	4.2	1,043	3.73	10.7	8,975
UK	6.76	5.7	228	5.39	15.9	3,820
All countries	**5.93**	**6.5**	**5,494**	**4.98**	**12.7**	**33,400**

Data source: Own calculations based on AMADEUS (2010)
[a] Mean over the years 1996-2008.
[b] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[c] Sample refers to the screened data set covering the countries Belgium, France, Italy, Spain and the UK.
[d] Population refers to all food industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK. For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.

[84] As it is especially micro-sized firms with lower profits (cf. Table 19) that are not recorded in AMADEUS these proxies for the population might be somewhat overestimated.
[85] For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.
[86] Gschwandtner (2005) shows that firms which are on the verge of exiting the market are usually characterized by strong profit fluctuations.
[87] For the U.S. food industry Gschwandtner (2005) also shows that volatility in ROA is commonly larger for smaller firms.

As Table 19 reveals, average profitability in the population increases with firm size. This also holds for the country level with the exception of France, where micro-sized firms generate the highest returns, and Belgium, where medium-size firms are most profitable. It can also be observed that volatility in ROA decreases with firm size in all countries but Spain.

Table 19: Mean[a] ROA (%) and standard deviations for food industry[b] firms in the population[c] by size class (2004-2008)

Country	Firm size[d]			
	micro	**small**	**medium**	**large**
Belgium	3.3 (15.6)	5.5 (10.0)	5.9 (9.0)	5.6 (6.5)
France	5.8 (15.1)	5.5 (9.5)	5.3 (8.9)	5.7 (7.8)
Italy	1.2 (13.1)	3.4 (7.8)	3.9 (6.4)	4.6 (5.8)
Spain	2.6 (11.4)	4.2 (7.5)	5.0 (7.2)	6.3 (8.4)
UK	2.8 (22.9)	4.6 (13.3)	5.6 (11.4)	6.0 (9.8)
All countries	**4.3 (14.5)**	**4.4 (8.8)**	**4.8 (8.1)**	**5.7 (8.1)**

Data source: Own calculations based on AMADEUS (2010)
Note: Standard deviations in parentheses.
[a] Mean over the years 2004-2008.
[b] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[c] Population refers to all food industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK. For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.
[d] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

Table 20 provides identical information for the sample. Again, large firms tend to generate on average the highest ROA's while volatility in ROA is highest for micro firms. At the country-level mean ROA is also highest for large firms while volatility is only highest for micro firms in Belgium, France and Italy. Spain and the UK show a reverse pattern for volatility in ROA as the standard deviations are highest for large firms in these countries. Overall, both ROA and its standard deviation are much more equalized across size classes in the sample as compared to the population.

Table 20: Mean[a] ROA (%) and standard deviations for food industry[b] firms in the sample[c] by size class (2004-2008)

Country	Firm size[d]			
	micro	small	medium	large
Belgium	4.3 (6.8)	4.0 (6.0)	4.1 (5.5)	4.9 (5.3)
France	5.7 (7.6)	5.9 (6.3)	5.3 (5.9)	5.9 (5.8)
Italy	3.0 (3.4)	3.2 (3.1)	3.1 (2.9)	3.6 (2.6)
Spain	3.7 (3.7)	4.0 (3.6)	4.1 (3.8)	4.9 (4.0)
UK	3.8 (5.3)	4.4 (5.2)	5.8 (5.2)	6.5 (5.6)
All countries	**5.1 (7.0)**	**4.5 (5.1)**	**4.3 (4.6)**	**5.5 (5.2)**

Data source: Own calculations based on AMADEUS (2010)
Note: Standard deviations in parentheses.
[a] Mean over the years 2004-2008.
[b] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[c] Sample refers to the screened data set covering the countries Belgium, France, Italy, Spain and the UK.
[d] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

Table 21 shows the development of mean ROA over time. For both the sample and the population, the values reveal a clear downward trend over time that is likely due to the continuous formation of a single European market along with increased competition. The decline in 2008 can be attributed to the global financial crisis. While volatility in the sample is rather constant, due to the fact that the identical sample of firms is considered over the years, volatility in the population has increased from 11.2 % in 1996 to 14.3 % in 2008.

Table 21: Mean ROA (%) and standard deviations for food industry[a] firms in AMADEUS over time. Sample[b] vs. population[c] (1996-2008)

	Year												
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Sample	7.0 (7.0)	6.9 (6.6)	6.9 (6.5)	6.8 (6.5)	6.4 (6.3)	6.6 (6.3)	6.5 (6.4)	5.9 (6.2)	5.7 (6.2)	5.1 (6.1)	4.6 (6.0)	4.9 (6.1)	4.0 (6.7)
Pop.	6.2 (11.2)	6.2 (11.2)	6.2 (11.7)	6.0 (12.3)	5.4 (5.4)	5.5 (12.8)	5.8 (12.5)	5.3 (12.3)	5.3 (12.3)	4.3 (12.6)	3.6 (13.2)	3.9 (13.3)	2.9 (14.3)

Data source: Own calculations based on AMADEUS (2010)
Note: Standard deviations in parentheses; Pop. = Population
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] Sample refers to the screened data set covering the countries Belgium, France, Italy, Spain and the UK.
[c] Population refers to all food industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK. For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.

Mean ROA's per 3-digit NACE industries are reported in Table 22. For both the sample and the population, the 'Manufacture of other food products' (NACE 158) and the meat sector (NACE 151) turn out to have the highest mean values, respectively. On the other hand, the beverage sector (NACE 159), the dairy sector (NACE 155) as well as the 'Manufacture of vegetable and animal oils and fats' (NACE 154) show the lowest mean ROA's over time in both the sample and in the population.

Table 22: Mean ROA (%) and standard deviations for food industry[a] firms in AMADEUS by industry. Sample[b] vs. population[c] (1996-2008)

	Industry (NACE)[d]								
	151 (Meat)	**152 (Fish)**	**153 (Fruit & vegetables)**	**154 (Oils & fats)**	**155 (Dairy)**	**156 (Starch)**	**157 (Animal feeds)**	**158 (Other)**	**159 (Beverages)**
Sample	6.3 (6.6)	5.2 (5.2)	5.3 (4.9)	3.3 (5.8)	4.2 (5.4)	5.9 (6.0)	5.9 (5.5)	6.6 (7.2)	4.9 (5.4)
Pop.	5.4 (12.1)	4.1 (11.9)	4.0 (11.6)	3.5 (11.6)	3.1 (10.3)	4.6 (10.1)	4.5 (10.6)	5.8 (14.1)	3.3 (11.0)

Data source: Own calculations based on AMADEUS (2010)
Note: Standard deviations in parentheses; Pop. = Population
[a] Manufacture of food products and beverages excluding tobacco. According to NACE Rev. 1.1 division DA15.
[b] Sample refers to the screened data set covering the countries Belgium, France, Italy, Spain and the UK.
[c] Population refers to all food industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK. For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.
[d] Industries defined by 3 digit NACE Rev. 1.1 groups. See the appendix for a detailed industry description according to NACE Rev. 1.1

For the dairy industry, which is explicitly analyzed in chapter 4, Table 23 indicates a similar downward trend in ROA over time as for the entire food industry (cf. Table 21). Table 23 also highlights the finding that the dairy industry is a less profitable sector, as for all years of the analyzed time period mean ROA falls below mean ROA of the entire food industry. This holds for the sample as well as for the population.

Table 23: Mean ROA (%) and standard deviations for dairy industry[a] firms in AMADEUS over time. Sample[b] vs. population[c] (1996-2008)

	Year												
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Sample	4.9 (6.2)	4.8 (6.0)	4.3 (5.1)	4.3 (4.9)	3.8 (4.9)	4.1 (5.2)	4.5 (5.6)	4.5 (5.4)	4.0 (5.6)	3.5 (5.0)	4.0 (5.2)	4.1 (5.1)	3.3 (5.5)
Pop.	4.1 (10.1)	4.1 (10.1)	3.4 (9.6)	3.6 (10.2)	3.3 (10.3)	3.0 (10.3)	3.7 (9.4)	3.8 (10.0)	2.9 (9.4)	2.4 (10.5)	3.0 (9.8)	2.6 (10.7)	2.1 (13.1)

Data source: Own calculations based on AMADEUS (2010)
Note: Standard deviations in parentheses; Pop. = Population
[a] Manufacture of dairy products. According to NACE Rev. 1.1 group DA155.
[b] Sample refers to the screened dairy industry data set covering the countries Belgium, France, Italy, Spain and the UK.
[c] Population refers to all dairy industry firms recorded in AMADEUS for the countries Belgium, France, Italy, Spain and the UK. For each year the upper and lower 1 % of the observations was removed in order to prevent biases due to outliers.

6.2. Information and descriptive statistics on explanatory firm characteristics

In order to explain the occurrence of abnormal profits at a specific point in time as well as the persistence of such profits over longer time periods, for each firm in the sample the following firm-level variables were constructed from AMADEUS and Eurostat for each year between 1996 and 2008: Market share, firm size, firm growth, two measures for firm risk as well as firm age. Descriptive statistics for these variables are provided in Table 24 through 26.

Market share is calculated by the ratio of firm *i*'s sales according to AMADEUS and total sales[88] of the 4-digit NACE industry in which the firm operates. Table 24 shows that mean market share over all countries and years is 2.61 %, where firms in the Belgian sample have on average the highest market share over the analyzed time span (4.90 %) and firms in the UK sample have the lowest mean market share (1.88 %).

Firm size is measured by a firm's total assets[89] and firm growth by the growth rate of total assets from year to year. As Table 24 reveals, average firm size over all years and countries is €1.27 million. The mean per country is highest for the UK (€15.6 m.) followed by Italy (€6.42 m.). This is likely due to an underrepresentation of micro-sized firms in these countries (cf. Table 15). As micro-sized firms are represented adequately in the French sample (cf. Table 15), the respective mean turns out to be lowest among the five countries (€0.68 m.). The average firm-growth rate over all years and countries is 8.36 %. Spanish firms

[88] Total sales are provided by Eurostat and refer to the sales of the 4-digit NACE industry in which the firm operates in the respective country.
[89] The empirical analysis in chapters 2 through 4 is based on the logarithm of total assets. However, for reasons of comprehensibility, the descriptive statistic is based on total assets.

thereby exhibit on average the highest growth rate per year (13.21 %) while the smallest average growth rate per year is found for Belgium (6.11 %).

Two risk proxies were constructed from AMADEUS. The first one is the gearing ratio that is defined as the ratio of firms' non-current liabilities (long-term debt) plus loans and shareholder funds. The higher a firm's gearing ratio and thus its degree of leverage, the more the company is considered as risky. This is due to the fact that firms with higher leverage are more vulnerable to declines in the business cycle as firms must continue to pay off debts regardless of low profits (Investopedia, 2012). Gearing ratios in excess of two are indicative of a high level of leverage and therefore high risk (Hoen, 2010). As the gearing ratio is based on long-term characteristics, it is used as an indicator for long-run firm risk. The mean gearing ratio over all years and countries is 1.79 with Italian firms exhibiting on average the highest long-term risk (3.23) followed by Belgium (2.41). Spanish firms in turn show the lowest mean value for this characteristic (1.26).

The second risk measure was constructed by means of the firms' current ratio. This ratio is the quotient of current assets and current liabilities (short-term loans and other current liabilities). However, as the current ratio decreases when liabilities and thus risk increases, the reciprocal was taken in order to simplify interpretation. As this measure is based on short-term characteristics, it is used as an indicator for short-run risk. Table 24 reveals that short-run risk is on average highest for Belgian firms (1.51) and lowest for Italian and Spanish firms (0.91 and 0.92, respectively).

In 2002, the year in the middle of the analyzed time period, the average firm in the sample is 30.6 years old. With a mean value of 51 years, UK food processors are on average the oldest companies in the sample while Spanish firms are youngest with an average age of 27 years.

Table 24: Means[a] of firm characteristics in the sample[b] by country (1996-2008)

Country	Market share	Firm size	Firm growth	Risk		Age
				Gearing	1/current	
Belgium	4.90 %	0.89 m. €	6.11 %	2.41	1.51	30.67
France	2.21 %	0.68 m. €	7.96 %	1.51	1.43	28.96
Italy	3.37 %	6.42 m. €	8.00 %	3.23	0.91	37.37
Spain	3.69 %	2.08 m. €	13.21 %	1.26	0.92	27.11
UK	1.88 %	15.60 m. €	7.81 %	1.54	0.98	51.16
All countries	**2.61 %**	**1.27 m. €**	**8.36 %**	**1.79**	**1.27**	**30.64**

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
Note: Gearing = gearing ratio; 1/current = Reciprocal of the current ratio
[a] Means over the years 1996 to 2008. For age the mean was calculated for 2002.
[b] Sample refers to the screened data set. I.e. all firms for which complete ROA data for the time period 1996 to 2008 is available.

Table 25 depicts the development of the firm characteristics over time. It can be detected that average market share and size across the firms in the sample has increased over time. However, the average rate of firm growth shows a declining trend. Similarly, both risk measures show a downward trend over time.

Table 25: Means[a] of firm characteristics in the sample[b] over time (1996-2008)

	Year												
Var.	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Ms (%)	0.38	1.03	0.98	0.45	0.47	0.57	0.91	3.40	4.67	1.90	2.02	1.99	1.99
FSize (m. €)	0.92	0.98	1.04	1.11	1.18	1.26	1.30	1.35	1.41	1.46	1.52	1.59	1.65
FGrw. (%)	-	9.10	9.10	10.33	9.67	9.07	5.63	5.63	5.97	5.86	6.21	6.20	5.17
Gear (%)	2.43	2.41	2.11	1.91	1.75	1.86	1.70	1.63	1.53	1.51	1.53	1.50	1.42
1/Cur	1.32	1.33	1.37	1.34	1.30	1.27	1.25	1.25	1.19	1.18	1.20	1.28	1.21

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
Note: Ms = Market share; FSize = Firm size; FGrw. = Firm growth; Gear = gearing ratio; 1/Cur = reciprocal of current ratio
[a] Means over the five countries Belgium, France, Italy, Spain and the UK.
[b] Sample refers to the screened data set. I.e. all firms for which complete ROA data for the time period 1996 to 2008 is available.

Means for the firm characteristics by industry are reported in Table 26. Average market share is highest for firms in the dairy (3.49 %) and in the beverage sector (2.40 %). In contrast, firms in the meat sector have the lowest mean market share (0.24 %). On average the largest firms operate in the beverages industry (€4.59 m.) while the ‘Manufacture of other food products’ comprises on average the smallest firms (€0.51 m.). Mean firm growth is between 6 % and 10 % for most sectors with the exception of the dairy sector where firms on average only grow by 1.24 % per year. Long-term risk tends on average to be highest in the dairy sector (2.52) and lowest in the ‘Manufacture of grain mill products, starches and starch products’ (1.29). Regarding short-term risk, the highest mean value is found for the ‘Manufacture of other food products’ (1.77) while the ‘Manufacture of grain mill products’ also exhibits the lowest mean value in this case (0.79). With an average age of 41 years, firms in the beverage sector are eldest while the ‘Manufacture of other food products’ is on average the youngest sector (26 years).

Table 26: Means[a] of firm characteristics in the sample[b] by industry (1996-2008)

	Industry (NACE)[c]								
Variable	**151 (Meat)**	**152 (Fish)**	**153 (Fruit & vegetables)**	**154 (Oils & fats)**	**155 (Dairy)**	**156 (Starch)**	**157 (Animal feeds)**	**158 (Other)**	**159 (Beverages)**
Ms (%)	0.24	1.23	0.82	1.80	3.49	0.79	2.09	0.31	2.40
FSize (m. €)	1.08	3.02	3.66	2.51	3.50	2.01	2.45	0.51	4.59
FGrw. (%)	7.00	9.58	9.94	5.66	1.24	6.93	5.85	8.22	8.54
Gear	1.45	1.53	1.54	1.91	2.52	1.29	1.44	2.09	1.62
1/Cur	1.10	0.96	0.90	0.82	1.08	0.79	0.80	1.77	0.87
Age	27.6	29.7	31.1	39.4	37.4	37.7	33.0	26.0	41.1

Data source: Own calculations based on AMADEUS (2010) and Eurostat (2010)
Note: Ms = Market share; FSize = Firm size; FGrw. = Firm growth; Gear = gearing ratio; 1/Cur = reciprocal of current ratio
[a] Means per 3-digit NACE industry over the five countries Belgium, France, Italy, Spain and the UK for the period 1996-2008.
[b] Sample refers to the screened data set. I.e. all firms for which complete ROA data for the time period 1996 to 2008 is available.
[c] Industries defined by 3 digit NACE Rev. 1.1 groups. See the appendix for a detailed industry description according to NACE Rev. 1.1

6.3. Information and descriptive statistics on explanatory industry characteristics

Besides firm characteristics the following industry characteristics were employed as explanatory variables for the occurrence and persistence of abnormal profits: Industry concentration, industry size and growth as well as industry expenditure for research and development (R&D). Additionally, the concentration of the retail sector in each of the five analyzed countries serves as an explanatory variable. These variables were constructed for each 4-digit NACE industry within the ‘manufacture of food products and beverages’ and each year between 1996-2008 using Eurostat (2010) and the AMADEUS database. While the descriptive statistics in this chapter are based on the 3-digit NACE classification for reasons of clarity and comprehensibility, the explanatory industry variables are calculated according to the 4-digit classification, as the analyses in chapters 2 to 4 are based on this level. Table 27 to 29 present descriptive statistics for the explanatory industry variables.

Concentration is measured by the Herfindahl-Hirschman Index (HHI). For each 4-digit NACE industry, the HHI is calculated by the sum of the squared market shares of the 50 largest firms that operate in this industry.[90] HHI values in excess of 0.25 indicate that an industry is highly concentrated while the maximum value of 1 is indicative of a monopoly (U.S. Department of Justice, 2010). As Table 27 reveals, concentration is on average highest in Belgium (0.143) and the UK (0.107) and lowest in Spain (0.054) and Italy (0.033).

Industry size is measured by the number of firms operating in each 4-digit NACE industry, and industry growth is measured by the respective growth rate from year to year. The grand mean of the number of firms across all 4-digit NACE industries in all countries and years is 1302 firms. As the number of total food industry firms is largest for Italy and France (72,691 and 70,823, respectively; cf. Table 12), the average size of each 4-digit NACE industry is also largest in these countries (2195 and 2171 firms, respectively). In contrast, the number of total food industry firms is smallest in Belgium and the UK (7511 and 7027, respectively; cf. Table 12). Hence the average number of firms per 4-digit NACE industry is also smallest in these countries (306 firms in Belgium and 250 firms in the UK). With respect to the number of firms, the average 4-digit NACE industry across the five countries grows by 4.17 % per year. Here Italian 4-digit NACE industries are characterized by the highest mean growth rate (8.03 % per year) while French 4-digit NACE industries show on average a more or less stagnating development (0.56 % per year).

The research and development (R&D) intensity is measured for each 4-digit NACE industry by the ratio of total industry R&D expenditure and total industry value added. Table 27 shows that this value is on average around 1 % over all countries as well as for individual countries and years with the exception of Italy where the average share of R&D expenditure in total industry value added is only 0.5 %.

Concentration of the food retail sector in each country was included as an additional explanatory variable. Here concentration is measured by the five-firm concentration ratio as the Herfindahl index is not available for this sector. As Table 27 shows, average food retailer concentration over all years and countries is 0.57. This implies that the 5 largest firms in the retail sector on average generate 57 % of total retail sales. Regarding individual countries, Belgium shows the highest average retailer concentration (0.71) while mean concentration in Italy is moderate (0.28)

[90] As concentration measures are not provided by Eurostat, this variable had to be calculated manually by means of sales of the 50 largest firms in each 4-digit industry reported by AMADEUS and total industry sales given by Eurostat.

Table 27: Means[a] of industry characteristics by country (1996-2008)

Country	Concentration[b]	Industry size	Industry growth	R&D	Retail concentration[c]
Belgium	0.143	306.2	2.37 %	0.70 %	0.71
France	0.074	2170.5	0.56 %	1.08 %	0.63
Italy	0.033	2195.3	8.03 %	0.53 %	0.28
Spain	0.054	970.9	7.35 %	0.90 %	0.54
UK	0.107	250.2	1.19 %	0.85 %	0.68
All countries	**0.080**	**1301.9**	**4.17 %**	**0.80 %**	**0.57**

Data source: Own calculations based on Eurostat (2010) and AMADEUS (2010)
Note: R&D = Research and development
[a] Means over the years 1996 to 2008 except for retail concentration were data is only available for 1996, 2000, 2004 and 2006.
[b] Measured by the Herfindahl index.
[c] Measured by the five-firm concentration ratio.

Table 28 depicts the development of the industry characteristics over time with mean food industry concentration measured by the HHI showing an upward trend during the analyzed period. While average industry size narrowed by the number of firms decreases over time, mean growth fluctuates heavily over years with a minimum average value of -1.97 % in 2002 and a maximum value of 16.39 % in 1999. These values appear puzzling at first sight as periods with strong average growth per industry are accompanied by a decrease in the average number of firms per industry. However, these somewhat contradicting values are due to the fact that the mean growth rates are calculated over industries with significantly different number of firms ranging from only 2 firms in the Belgian production of ethyl alcohol (NACE 1592) up to 49,173 firms in the French manufacture of bread (NACE 1581).[91] In smaller sectors, growth or shrinkage by a few firms has a large impact on the growth rate while changes in large sectors, even if many firms enter or exit the market, do not necessarily have a significant impact on the growth rate. Thus, if small sectors grow by a few firms, while large sectors shrink by a significant extent, however, with a small impact on the growth rate, the given results arise.[92] Mean R&D intensity fluctuates over time around its grand mean of 0.8 % with a minimum value of 0.3 % in 1996 and a maximum value of 1.3 % in 2000. Average concentration of the retail sector has increased between 1996 and 2006 from 46 % to 61 %.

[91] Values for the years 2007 and 2001, respectively.
[92] For example, entry of two firms in the Belgian case (NACE 1592) would imply a growth rate of 100 % while exit of 1000 firms in the French example (NACE 1581) would only imply a decline of around 2 %.

Table 28: Means[a] of industry characteristics over time (1996-2008)

	Year												
Var.	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Herf.	n.a.	0.066	0.064	0.083	0.072	0.080	0.063	0.088	0.088	0.086	0.085	0.087	0.094
ISize	1485	1386	1410	1281	1216	1191	1459	1280	1302	1289	1272	1293	1162
IGrw. (%)	-	1.68	14.34	16.39	2.23	0.18	-1.97	7.50	0.86	1.68	4.55	5.22	-0.15
R&D (%)	0.3	0.8	0.8	0.6	1.3	0.8	0.5	0.6	0.6	0.8	1.0	0.9	n.a.
CR5	46.0	n.a.	n.a	n.a	56.4	n.a	n.a	n.a	64.0	n.a	61.3	n.a	n.a

Data source: Own calculations based on Eurostat (2010) and AMADEUS (2010)
Notes: Herf. = Herfindahl Index; ISize = Industry size; IGrw. = Industry growth; R&D = Research and development; CR5 = 5-firm concentration ratio of the food retail sector
[a] Means over the five countries Belgium, France, Italy, Spain and the UK.

The mean values for the industry characteristics per 3-digit NACE industry are presented in Table 29. Concentration turns out to have the highest average values in the beverage sector (0.123) and in the 'Manufacture of other food products' (0.118) and the lowest mean values in the fish industry (0.014) and in the 'Manufacture of vegetable and animal oils and fats' (0.011). As described above, the 'Manufacture of other food products' and the meat sector are the largest industries regarding number of firms in 2007 (cf. Table 16). The same holds for the mean size of these sectors over time. On average the smallest industries are the 'Processing and preserving of fruit and vegetables' (351 firms) and the 'Manufacture of prepared animal feeds' (287 firms). The beverage sector shows the highest mean growth rate with 6.28 % per year while growth is on average smallest in the fish industry with an average increase in the number of firms of only 1.12 % per year. Mean R&D intensity is highest in the 'Manufacture of grain mill products, starches and starch products' where on average 2.50 % of the total value added is spend on R&D and in the beverage sector where the respective fraction is 1.53 %. Less R&D intensive sectors are the oil and fat industry as well as the 'Manufacture of prepared animal feeds' with fractions of 0.14 % and 0.20 %, respectively.

Table 29: Means[a] of industry characteristics by industry (1996-2008)

Variable	151 (Meat)	152 (Fish)	153 (Fruit & vegetables)	154 (Oils & fats)	155 (Dairy)	156 (Starch)	157 (Animal feeds)	158 (Other)	159 (Beverages)
	Industry (NACE)[b]								
Herf.	0.028	0.014	0.045	0.011	0.070	0.060	0.051	0.118	0.123
ISize	1536	429	351	523	894	415	287	3241	360
IGrw. (%)	1.59	1.12	2.43	4.50	1.42	2.01	3.46	5.50	6.28
R&D (%)	0.55	0.85	1.22	0.14	0.56	2.50	0.20	0.83	1.53

Data source: Own calculations based on Eurostat (2010) and AMADEUS (2010)
Notes: Industries defined by 3 digit NACE Rev. 1.1 groups.
Herf. = Herfindahl Index; ISize = Industry size; IGrw. = Industry growth; R&D = Research and development; CR5 = 5-firm concentration ratio of the food retail sector
[a] Means per 3-digit NACE industry over the five countries Belgium, France, Italy, Spain and the UK for the period 1996-2008.
[b] see the appendix for a detailed industry description according to NACE Rev. 1.1

A number of additional firm and industry characteristics were used as explanatory variables by previous studies (e.g. Kambhampati, 1995; Yurtoglu, 2004; Gschwandtner, 2012). Unfortunately data on these characteristics are not available. In what follows, some of these variables are specified. Export and imports either at the firm or industry level have often been found to have an impact on the degree and the persistence of abnormal profits. Firms that are export orientated operate in international markets where the forces of competition might be stronger than in domestic markets. For example, Yurtoglu (2004) shows that the impact of firms' export intensity on long-run persistence is negative. Regarding imports, a negative impact can be expected as imports are the most direct new entry into the domestic market. For example, Gschwandtner (2012) detects a negative impact of imports at the industry level on long-run persistence. Advertising can serve as a basis for product differentiation and for the creation of entry barriers and should therefore have a positive impact on abnormal profits and profit persistence. Kambhampati (1995), for example, finds a positive impact of advertising expenditure on short-run persistence. Finally, data regarding mergers and acquisitions or variables related to ownership and control are often used to explain abnormal profits or profit persistence. Yurtoglu (2004), for example, analyzes the impact of business group affiliation and of ownership concentration on profit persistence and shows that the former has a positive impact on long-run persistence.

7. A review of the empirical literature on profit persistence

Paper number one (chapter 2) which focuses on the occurrence of abnormal profits at a specific point in time already comprises a detailed review on the respective literature. Paper number two (chapter 3) which focuses on profit persistence in the EU food industry also contains a review of the available literature within this strand of research. This review, however, is rather concise. The current chapter therefore provides a complementary review on the profit persistence literature.

While the studies analyzing the occurrence of abnormal profits at a specific point in time are either based on cross sectional data or on data with a rather short time series dimension with a maximum of 5 observations[93], profit persistence studies are in general based on panel data with a time series dimension of around 20 years. Table 30 provides a chronological overview of the profit persistence literature. As can be seen from the table, the majority of the contributions are based on AR models and analyze panel data comprising on average 23 annual profit observations on each firm.[94]

Mueller (1977) was the seminal study in profit persistence research. However, his study is based on a predecessor model of the AR approach referred to as the 'polynomial convergence model' (PCM).[95] The AR(1) methodology was first introduced to the profit persistence literature in Mueller's 1986 book. Following Mueller (1986), a series of contributions based on AR models has emerged analyzing profit persistence in various economic sectors. To mention just a few of these studies: Odagiri and Yamawaki (1986), Geroski and Jacquemin (1988), Cubbin and Geroski (1990), Mueller (1990a), Kambhampati (1995), Waring (1996), Goddard and Wilson (1999), Maruyama and Odagiri (2002), Yurtoglu (2004), Gschwandtner (2005; 2012). Gschwandtner (2005) was the first study improving the AR(1) methodology by using a 'best-lag' approach with AR processes up to order four. Table 30 also provides the mean $\hat{\lambda}_i$ values of the studies based on AR models. While this value is approximately between 0.4 and 0.5 for the majority of analyzed countries, Glen et al. (2001) show that firms in developing countries have on average lower degrees of profit persistence. The mean values for developing countries in their study range between 0.01 in Brazil and 0.42 in Zimbabwe. Most of the studies based on AR models also implement a second estimation step in order to determine the drivers of the short- and long-run persistence values $\hat{\lambda}_i$ and $\hat{p}_i$.

[93] Schmalensee's (1985) analysis is based on a single year, Rumelt's (1991) on a four-year series, and Schiefer and Hartmann's (2009) study on a five-year series for each firm.
[94] This mean holds for studies that are based on autoregressive models.
[95] This approach is described in the appendix.

Many of these studies find a positive impact of market share (e.g. Szymanski et al., 1993; Yurtoglu, 2004), firm size (e.g. Cubbin and Geroski, 1990; Gschwandtner, 2005) and industry concentration (e.g. Kessides 1990; Yurtoglu 2004) on profit persistence and a negative influence of risk (e.g. Schwalbach and Mahmood, 1990; Gschwandtner, 2005) and industry growth (e.g. Odagiri and Yamawaki, 1990; Gschwandtner, 2012).[96]

Goddard et al. (2005) are the first to use the Arellano and Bond (1991) dynamic panel approach to estimate profit persistence. Besides a significant degree of profit persistence they find evidence for a negative relationship between firm size and long-run profits, and a positive impact of market share. They also show that the relationship between firms' gearing ratio as a measure for risk and long-run profit is negative, whilst firms with higher liquidity are estimated to be more profitable in the long run. Furthermore, Goddard et al.'s (2005) study is the only other analysis based on AMADEUS, the database that is used in the present thesis. Gschwandtner (2012) stresses that the results of her dynamic panel model are in general a more robust reflection of the results obtained by the AR 'best-lag' approach.

A minority of studies are based on modifications of the standard approach by, e.g., estimating the AR model by means of generalized least squares (GLS) instead of OLS (e.g. Kessides, 1990) or by implementing an approach that proportions the persistence in abnormal profits into a firm and industry component by means of sequential weighted-least-squares technique (e.g. McGahan and Porter, 1999, 2003; Schumacher and Boland, 2005a). A few studies are also based on structural time series analysis (STSA) (e.g. Cable and Gschwandtner, 2008; Cable and Jackson, 2008; Cable and Mueller, 2008). STSA studies usually analyze a limited number of firms over long time spans of up to 50 years.[97] At this a long-run trend of the time series of abnormal profits, that can be compared to the long-run value ($\hat{p}_i$) of the AR model, is generated for each firm by means of maximum likelihood estimation (Cable and Jackson, 2008). According to Cable and Gschwandtner (2008), STSA appears to offer advantages compared to the AR model in cases with complex dynamics in the profit times series. The disadvantage of STSA, however, consists in the rather long computation time, thus limiting such analyses to small samples or case studies.

[96] Within this thesis many other factors are estimated to have an impact on profit persistence. These are described in the data section and discussed together with the respective results of papers two and three.
[97] E.g. Cable and Mueller (2008) analyze 4 U.S. firms and 4 UK firms over the periods 1950-99 and 1968-99, respectively.

Table 30: Chronological overview of empirical studies of profit persistence

Authors	Countries	Time span	Industry	No. of firms	Method	Mean $\hat{\lambda}_i$ [a]
Mueller (1977)	U.S.	1949-72	unknown	472	PCM & TPM	n.a.
Mueller (1986)	U.S.	1950-72	Manufacturing	1000	PCM & AR1	0.43 – 0.55[c]
Odagiri & Yamawaki (1986)	Japan	1964-80	Manufacturing	294	PMC & AR1	0.47
Cubbin & Geroski (1987)	U.K.	1951-77	48 industries[b]	217	AR1	n.a.
Geroski & Jacquemin (1988)	U.K. France Germany	1949-77 1965-82 1961-81	8 Manufacturing sectors	51 55 28	AR3	UK: 0.49 France:0.41 Germany: 0.41
Schwalbach et. al (1989)	Germany	1961-82	Manufacturing	299	AR1	0.49
Cubbin & Geroski (1990)	U.K.	1948-77	48 industries[b]	243	AR1	0.48
Jenny & Weber (1990)	France	1965-82	Manufacturing	450	AR1	0.36
Kessides (1990)	U.S.	1967-82	Manufacturing	n.a. analysis at industry level with 344 industries	GLS AR1	0.43
Khemani & Shapiro (1990)	Canada	1964-82 1968-82	Manufacturing and mining	161	AR1	0.43
Mueller (1990a)	U.S.	1950-72	Manufacturing	551	AR1	0.18
Odagiri & Yamawaki (1990)	Japan	1964-82	Manufacturing	376	AR1	n.a.
Schwalbach & Mahmood (1990)	Germany	1961-82	Manufacturing	299	AR1	0.27 – 0.67[d]
Schohl (1990)	Germany	1961-84	Manufacturing	283	PCM & AR1	0.51
Droucopoulos & Lianos (1993)	Greece	1963-88	Manufacturing	500	AR1	0.69 – 0.90[c]
Kambhampati (1995)	India	1970-85	42 Industries[b]	n.a. analysis at industry level	AR1-2	n.a.
Waring (1996)	U.S.	1970-89	68 industries[b]	12,986	AR1	0.66
Goddard & Wilson (1999)	U.K.	1972-91	Manufacturing	796	AR1	0.45
McGahan & Porter (1999)	U.S.	1981-94	All but financial and government	7,005	Sequential weighted-least-squares technique	n.a.
Glen et al. (2001)	Brazil India Jordan Korea Malaysia Mexico Zimbabwe	1985-95 1982-92 1980-94 1980-94 1983-94 1984-94 1980-94	Manufacturing	56 40 17 82 62 39 40	AR2	0.01 0.23 0.35 0.32 0.35 0.22 0.42

Table 30 (continued): Chronological overview of empirical studies of profit persistence

Authors	Countries	Time span	Industry	No. of firms	Method	Mean $\hat{\lambda}_i$ [a]
Maruyama & Odagiri (2002)	Japan	1964-97	Manufacturing	357	AR1	0.54
Wiggins & Ruefli (2002)	U.S.	1972-97	40 Industries[b] (Not restricted to manufacturing)	6,772	Event History Analysis and Ordinal Time Series Analysis	n.a
McGahan & Porter (2003)	U.S.	1981-94	All but financial and government	7,005	Sequential weighted-least-squares technique	n.a.
Yurtoglu (2004)	Turkey	1985-98	13 industries[b]	172	AR1	0.38
Goddard et al. (2005)	Belgium France Italy Spain UK	1993-2001	NACE[e] 15-36 and NACE 50-74	1,348 4,620 2,173 2,030 1,511	Dynamic panel	n.a.
Gschwandtner (2005)	U.S.	1950-99	Manufacturing	85 survivors 72 exitors	AR 'best lag'	Exitors: 0.23 Survivors: 0.34
Schumacher & Bohland (2005a)	U.S.	1980-2001	Food Industry	465	Sequential weighted-least-squares technique	n.a.
Cable & Gschwandtner (2008)	U.S.	1950-99	Manufacturing	156	AR1 and STSA	n.a
Cable & Jackson (2008)	U.K.	1968-99	Manufacturing and service	53	STSA	n.a.
Cable & Mueller (2008)	U.K. U.S.	U.S.: 1950-99 UK: 1968-99	Manufacturing	4 4	AR1-2, STSA and case histories	n.a.
Crespo Cuaresma & Gschwandtner (2008)	U.S.	1950-99	Manufacturing	156	AR1	0.47
Gschwandtner (2012)	U.S.	1950-66 1967-83 1984-99	Manufacturing	567 980 1099	AR 'best lag' and dynamic panel	0.49 0.42 0.36

Source: Own literature research based on Wiggins & Ruefli (2005), Table 1, p. 890 ff. and Gschwandtner (2012), Table 1, p. 180

[a] For studies based on AR models.

[b] Not described more precisely.

[c] Depending on the analyzed subsample / industry.

[d] Depending on the profit measure used.

[e] NACE (Nomenclature generale des activites economiques dans les commumautes Europeeanes) is the statistical classification of economic activities in the European Community.

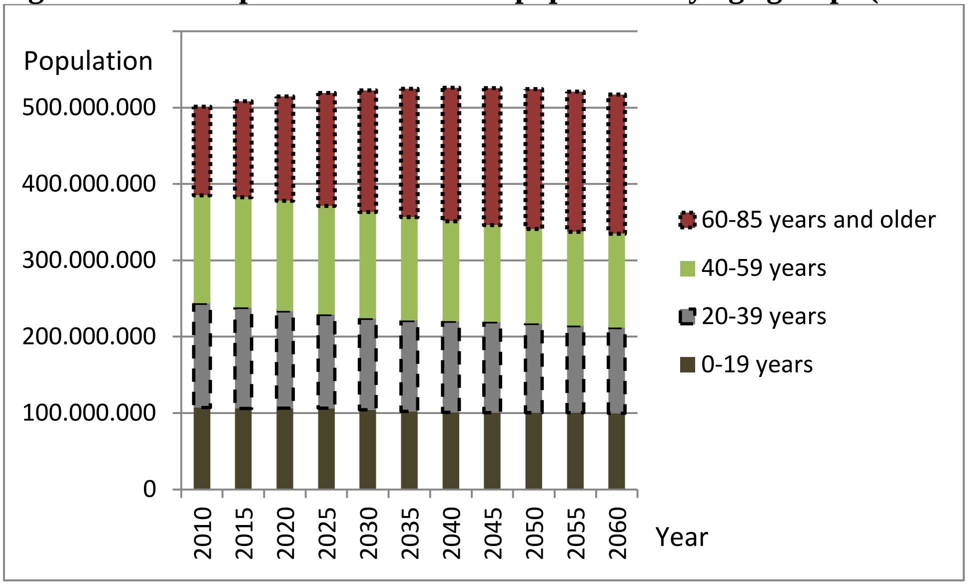
Notes: ROA=Return on assets; ROC=Return on capital; ROEC=Return on equity capital; ROS=Return on sales; AR(ρ)=Autoregressive model of order ρ; TAR=Threshold autoregressive; GLS= Generalized least squares; OLS=Ordinary least squares; PCM=polynomial convergence model; STSA=Case studies based on structural time series analysis; TPM=transition probability model

Table 30 also reveals that the majority of profit persistence studies focus on entire manufacturing sectors. Evidence regarding profit persistence in the food and agribusiness sector is therefore scarce, with the exception of Schumacher and Boland's (2005a) study for the U.S. food economy. Nevertheless, as indicated above, their study is based on a different estimation technique which does not quantify the structural firm and industry characteristics that determine profit persistence. However, their results reveal that industry effects are more important for profit persistence than corporate effects. Some of the studies focusing on entire manufacturing sectors also present separate results on the long-run value ($\hat{p}_i$) for individual subsectors. These results are summarized in Odagiri and Yamawaki (1990a: 183, Table 10.6). However, food industry firms only make up a small fraction of the analyzed firms in most of these studies (between 20 in Canada and 61 for the U.S.). The respective results therefore do not appear reliable and are not reported here.

The present thesis aims at contributing to this literature not only by providing evidence for profit persistence and its determinants in the EU food industry based on a large sample of firms, but also by improving the standard estimation technique.

Appendix

Figure 11: Development of the EU-27 population by age groups (2010-2060)



Data source: Own calculations based on Eurostat (2012b)

Table 31: NACE Rev. 1.1 section D-Manufacturing

D - Manufacturing
DA15 - Manufacture of food products and beverages
DA16 - Manufacture of tobacco products
DB17 - Manufacture of textiles
DB18 - Manufacture of wearing apparel; dressing; dyeing of fur
DC19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
DD20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
DE21 - Manufacture of pulp, paper and paper products
DE22 - Publishing, printing and reproduction of recorded media
DF23 - Manufacture of coke, refined petroleum products and nuclear fuel
DG24 - Manufacture of chemicals and chemical products
DH25 - Manufacture of rubber and plastic products
DI26 - Manufacture of other non-metallic mineral products
DJ27 - Manufacture of basic metals
DJ28 - Manufacture of fabricated metal products, except machinery and equipment
DK29 - Manufacture of machinery and equipment n.e.c.
DL30 - Manufacture of office machinery and computers
DL31 - Manufacture of electrical machinery and apparatus n.e.c.
DL32 - Manufacture of radio, television and communication equipment and apparatus
DL33 - Manufacture of medical, precision and optical instruments, watches and clocks
DM34 - Manufacture of motor vehicles, trailers and semi-trailers
DM35 - Manufacture of other transport equipment
DN36 - Manufacture of furniture; manufacturing n.e.c.
DN37 - Recycling

Source: Eurostat (2009)

Table 32: NACE Rev. 1.1 division DA-15 Manufacture of food products and beverages

DA15	**Manufacture of food products and beverages**
15.1	Production, processing and preserving of meat and meat products
15.11	Production and preserving of meat
15.12	Production and preserving of poultrymeat
15.13	Production of meat and poultrymeat products
15.2	Processing and preserving of fish and fish products
15.20	Processing and preserving of fish and fish products
15.3	Processing and preserving of fruit and vegetables
15.31	Processing and preserving of potatoes
15.32	Manufacture of fruit and vegetable juice
15.33	Processing and preserving of fruit and vegetables n.e.c.
15.4	Manufacture of vegetable and animal oils and fats
15.41	Manufacture of crude oils and fats
15.42	Manufacture of refined oils and fats
15.43	Manufacture of margarine and similar edible fats
15.5	Manufacture of dairy products
15.51	Operation of dairies and cheese making
15.52	Manufacture of ice cream
15.6	Manufacture of grain mill products, starches and starch products
15.61	Manufacture of grain mill products
15.62	Manufacture of starches and starch products
15.7	Manufacture of prepared animal feeds
15.71	Manufacture of prepared feeds for farm animals
15.72	Manufacture of prepared pet foods
15.8	Manufacture of other food products
15.81	Manufacture of bread; manufacture of fresh pastry goods and cakes
15.82	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
15.83	Manufacture of sugar
15.84	Manufacture of cocoa; chocolate and sugar confectionery
15.85	Manufacture of macaroni, noodles, couscous and similar farinaceous products
15.86	Processing of tea and coffee
15.87	Manufacture of condiments and seasonings
15.88	Manufacture of homogenized food preparations and dietetic food
15.89	Manufacture of other food products n.e.c.
15.9	Manufacture of beverages
15.91	Manufacture of distilled potable alcoholic beverages
15.92	Production of ethyl alcohol from fermented materials
15.93	Manufacture of wines
15.94	Manufacture of cider and other fruit wines
15.95	Manufacture of other non-distilled fermented beverages
15.96	Manufacture of beer
15.97	Manufacture of malt
15.98	Production of mineral waters and soft drinks

Source: Eurostat (2009)

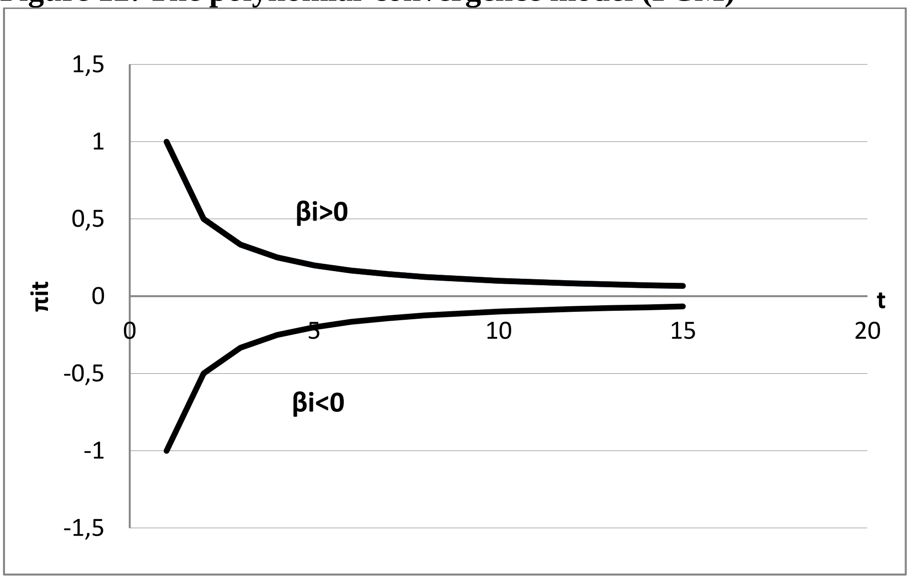
Polynomial-convergence model (PCM)

Some of the earlier studies of profit persistence (e.g. Mueller, 1977; Schohl, 1990; Kambhampati, 1995) model the adjustment process by regressing abnormal profits on the inverse of time:

(9) $$\pi_{it} = \alpha_i + \beta_i \frac{1}{t} + \varepsilon_{it} ,$$

where ε_{it} is an error term with zero mean and constant variance. Equation (9) is usually denoted as the 'polynomial convergence model' (PCM). Starting in $t=1$ with $\pi_{i1}=\alpha_i+\beta_i$ abnormal profits converge to α_i as $t\rightarrow\infty$. The constant $\hat{\alpha}_i$ therefore indicates long-run profit persistence. If $\hat{\alpha}_i$ is positive, the respective firm is estimated to earn abnormal profits above the competitive norm that persist in the long run. The absolute value of β_i reflects the rate at which convergence of abnormal profits on the long-run level takes place. The higher this value, the slower the convergence to the long-run level α_i, and the higher short-run persistence. Figure 12 depicts the possible profit paths for the simple case where $\alpha_i=0$. As can be seen, the form of the profit path is determined by the algebraic sign of β_i. If $\beta_i>0$ the initial value of abnormal profits exceeds the long-run value α_i while $\beta_i<0$ indicates that the initial value is below the long-run value (Schohl, 1990).

Figure 12: The polynomial-convergence model (PCM)



Source: Own illustration based on Mueller (1986, Figure 2.1, p.11).

According to Odagiri and Yamawaki (1986) the most obvious shortcoming of the standard model is that a monotonic convergence of π_{it} to α_i is assumed. In order to better capture the fluctuations of abnormal profits over time equation (9) can be generalized as follows:

(10) $$\pi_{it}=\alpha_i+\sum_{j=1}^{n}\beta_{ij}\frac{1}{t^j}+\varepsilon_{it},$$

where j is the number of polynomials added to the equation. Most of the studies that implement the PCM estimate equations with up to third order polynomials and then, similar to the 'best lag model', choose the 'best fit equation' for each firm based on the adjusted R^2.

Another deficit of this model is the fact that the estimates will depend heavily on the chosen time unit. Thus, for example, depending on whether time is introduced as $t = 1990, 1991, ..., 2008$ or as $t = 1, 2, ..., 19$ the results will significantly differ.[98]

Due to these disadvantages the PCM did not establish in the profit persistence literature while the autoregressive model of order one and its extensions in form of the 'best lag' framework have become the main econometric method to estimate profit persistence.

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[98] See Odagiri and Yamawaki (1986: 6 f) for a detailed description of the disadvantages of the PCM.

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Chapter 2: The determinants of firm profitability differences in EU food processing[99]

Abstract: This paper decomposes the variance in food industry return on assets into year, country, industry, and firm effects. In addition to estimating conventional approaches such as ANOVA and components of variance a multilevel approach is implemented which apart from its methodological improvements offers the possibility to estimate the impact of several covariates within each effect level. The results show that firm characteristics are far more important than industry structure in determining food industry profitability. In particular, firm size and industry concentration are drivers of profitability while firm risk and age as well as the industry growth rate have a negative influence.

Key words: ROA, food industry, variance decomposition, hierarchical linear model.
JEL Classification: L12, L66, M21

1. Introduction

In a perfectly competitive market, firm performance that deviates from the average should not exist in the long run. However, such deviations are not an exemption to the rule but the normal case. While classical industrial organization (IO) theory (e.g. Bain, 1956) and the 'market-based view' (Porter, 1980) mainly attribute such 'abnormal' profits to industry characteristics, proponents of the 'resource-based view' (Barney, 1991) assume that performance differentials can be better explained by firm properties. In order to resolve this debate, a series of contributions following Schmalensee's (1985) seminal paper, has used components of variance analysis (COV) and analysis of variance (ANOVA) to decompose the variation in firm profitability into firm and industry effects (McGahan and Porter, 2002; McNamara et al., 2005). Subsequent papers have also looked at the impact of year and, more recently, of country effects on firm profitability (e.g. Goddard et al., 2009) as the increasing relevance of integrated economic areas, such as the EU or NAFTA, provides an interesting, but yet neglected opportunity to disentangle the profitability effects of country versus area-wide economic fluctuation. Nevertheless, inconsistencies in the results of studies based on ANOVA and COV lead to the consensus that these methods are unreliable (Misangyi et al.,

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2006). A new strand of research addresses the disadvantages of classical COV and ANOVA and uses the multilevel approach of hierarchical linear modelling (HLM) in order to decompose the variance in profitability (Hough, 2006; Misangyi et al., 2006; Short et al., 2006; Chaddad and Mondelli, 2012). Additionally, while ANOVA and COV are only descriptive approaches, a crucial advantage of the HLM method is that, besides the magnitude of effects, the influence of specific structural covariates can be determined.

The present study contributes in the following ways. First, in order to address the methodological shortcomings of previous studies, in addition to COV and ANOVA, we implement the more sophisticated HLM approach. Second, evidence for the food sector is as yet sparse since past research has focused on other manufacturing sectors or entire economies. Few exceptions are Schumacher and Boland (2005) and Chaddad and Mondelli (2012). However, these studies focus on the U.S. sector. In order to fill these gaps, this study aims to provide evidence for the determinants of corporate profitability in the EU food industry.

The food industry is the largest sector within EU manufacturing, contributing 15 % to turnover in 2010 (Eurostat, 2012). Nevertheless, food processors are confronted with increasing price volatility in their input markets and high concentration in the downstream sector (Wijnands et al., 2007). Here pressure on the industry is further reinforced by increasing importance of retailer's private labels, which achieve a market share of 27 %[100] (Datamonitor, 2006). Thus, due to its high economic importance and its special structural characteristics the EU food industry deserves further investigation regarding the drivers of firm profitability.

The paper is structured as follows. After providing an overview of the theoretical and empirical background, we introduce the data used. In the methodology section we first identify and replicate best-practices applied in previous papers (ANOVA and COV) in order to assure comparability to earlier work. The focus, however, is put on the HLM approach. This is followed by the presentation of our results and a comparison to earlier work. In the final section, we discuss our findings and conclude.

2. Background

The conventional model of perfect competition states that profits that diverge from the competitive norm can only occur in the short run. Since this neo-classical standard model offers no explanations for the phenomenon of abnormal profits, numerous other models have

[100] Data for 2006

been developed to deal with this issue. Within industrial organization (IO) the focus is put on the characteristics of industries as the main determinants of performance differentials. This perspective is summarized in the structure-conduct-performance model. In this paradigm, it is assumed that performance mainly depends on the conduct of suppliers (e.g., their inclination to invest, to innovate, and to collude) which in turn is determined by industry structure (e.g., concentration, product differentiation, and vertical integration). Structure, conduct and performance, in addition, are influenced by a set of basic industry conditions including demand elasticity and technological features such as economies of scale. Since performance in this model ultimately depends on industry-level characteristics, IO theory generally asserts a deterministic link between industry membership and economic return.

During the 1980s, the so called ‘market-based view’ (MBV) has been developed within the realm of strategic management. According to Porter (1980), firms can achieve abnormal profits if they manage to position themselves in an attractive industry. While this assumption is consistent with the IV, Porter (1980) also assumes that the choice of strategy within a given market has a strong influence on corporate performance by creating cost and/or differentiation advantages.[101] Therefore, although industry attractiveness is perceived as an important driver of performance, the MBV also recognizes the importance of strategic positioning within the market as a cause of abnormal profits.

In the 1990s, the attention turned to a competing school of thought known as the ‘resource-based view’ (RBV). Proponents of this viewpoint expect industry membership to have little explanatory value since the factors responsible for superior profits are believed to be connected to the firm and its resources. Based on the assumption of heterogeneity in resource endowment, superior profits are assumed to result from the utilization of tangible and intangible resources that are rare and costly to copy or imitate (Day and Wensley, 1988; Barney, 1991; Hunt and Morgan, 1995). Due to the difficulty to copy such advantages, the RBV primarily predicts firm-specific deviations from the general level of industry economic return.[102]

The disagreement between the aforementioned theories is mainly on inter vs. intra-industrial variation in profits while justification for systematic differences in profitability between countries is not provided. Trade theory suggests that if capital can move freely, the

[101] Similar to the notion of entry barriers in IO, strategy-related advantages that lead to superior profitability are assumed to persist due to mobility barriers, which make the switch from one strategic group to another costly (Tremblay, 1985).

[102] Drawing on similar ideas, Prahalad and Hamel (1990) introduced the term ‘capabilities’, which are defined as complex combinations of resources. Since, due to complexity, such capabilities are difficult to imitate, abnormal profits are believed to persist in the long run.

rate of return will be equal between countries, as capital will flow to where its return is greatest. As the elimination of barriers to free trade is the main motive of the formation of the EU single market it might be argued, that within the EU, the influence of country-specific determinants on profitability should be small (Goddard et al., 2009). However, Chen (2002) shows that national borders strongly restrict trade within the EU and that intra-national trade exceeds international trade by an average factor of 4.3. In addition, savings and investments at the national level are strongly correlated which implies that the bigger part of capital does not cross national borders in pursuit of the greatest return (Goddard et al., 2009). Several other country-specific aspects such as resource endowments, financial infrastructures, technical sophistication or institutional and legal issues (e.g., common law tradition in the UK vs. civil law in many continental EU countries) can be expected to be important drivers of country specific differences in profitability (e.g. Wan and Hoskisson, 2003; Goddard et al., 2009).

According to trade theory, differences in national profitability levels can also be industry specific. Such industry-specific country effects can arise as a consequence of the formation of the EU single market which is expected to lead to stronger specialization of firms. As a result cross-border industry clusters will develop, within which firms are characterized by horizontal or vertical integration. These integration processes enable firms to achieve absolute cost advantages and external economies of scale (Porter, 1990; Goddard et al., 2009).

Besides variation across countries, profitability can also vary systematically over time. Numerous earlier papers have incorporated a general ‘year’ effect and referred to it as a component capturing the macroeconomic cycle (McGahan and Porter, 1997; Makino et al., 2004). While economic fluctuation may equally affect all actors in an economy, it may also be limited to subsets of firms active in certain geographical locations or in specific industries. Such asymmetric shocks or cycles (Buti and Sapir, 1998) are usually the result of abrupt changes in aggregated supply or demand, e.g., due to the imposition of a consumption tax in a certain region or industry or an unexpected shortage in the supply of a crucial input. Country-specific shocks have been addressed by a stream of research dealing with the synchronization of business cycles in economic unions (Clark and Wincoop, 2001; Ramos et al., 2003; Artis et al., 2004).

In the following, we will give an overview of the studies decomposing corporate profitability (cf. Table 33) and summarize, in how far the theoretical perspectives have received support in past empirical research. Initiated by Schmalensee (1985) a whole range of studies has emerged estimating the relevance of different effects as drivers for firm performance. Schmalensee (1985) was the first to apply ANOVA and COV to U.S. business-unit profits. He finds evidence for the importance of industry effects which account for 20 % of the variance in business-unit profits while firm effects turn out to be negligible. Schmalensee's results therefore support the IV. Rumelt (1991), however, finds significant business-unit[103] effects that strongly outperform industry and corporate effects and thus confirm the RBV. The predominance of firm effects relative to industry effects prevails in the subsequent literature (Roquebert et al., 1996; McGahan and Porter, 1997, 2002; Goddard et al., 2009). This also holds for more recent studies based on the HLM method (Hough, 2006; Misangyi et al., 2006; Chaddad and Mondelli, 2012).

While the debate has mainly focused on firm and industry effects most studies have also integrated year effects. The impact, however, seems to be negligible as this effect class only accounts for around 1 % in most studies (e.g. McNamara et al., 2005). A few studies additionally consider interaction effects between year and industry (e.g. Schumacher and Boland, 2005; Goddard et al., 2009). This effect class is in general stronger as the single year effect, indicating that economic fluctuations are stronger for subgroups of firms operating in specific industries. As the majority of studies focus on the U.S. country effects cannot be estimated. Goddard et al. (2009), however, analyze the EU manufacturing sector and find, that country affiliation is only responsible for 1 % of the variance in profitability. Previous studies therefore provide no evidence for the importance of macroeconomic and trade theory in explaining firm profits.

Regarding firm performance in the agribusiness sector, Schumacher and Boland (2005) analyzing the U.S. food economy also find evidence for the superiority of firm effects which contribute 49 % to variance in profitability. However, within their COV framework, industry effects, which contribute 20 %, also have a crucial impact. Chaddad and Mondelli (2012) are the first to implement HLM to firm profitability in the agribusiness sector. Their results indicate that business-unit and corporate effects are more important than industry effects. Furthermore, several structural characteristics such as firm size, industry capital intensity or corporate R&D intensity have a significant impact on profitability.

[103] Most of the studies analyzing the U.S. market are based on the Compustat database which provides data on each business unit. In those studies the firm effect consists of a business-unit and a corporate effect. The present study, however, is based on the corporate level.

Table 33: Previous studies decomposing firm profits based on ANOVA, COV and HLM

			Effect class (%)				
Authors	**Country**	**Method**	**Firm[a]**	**Industry**	**Year**	**Ind.*Year**	**Country**
Schmalensee (1985)[1]	U.S.	COV	0.6	19.5	n.a.	n.a.	n.a.
Rumelt (1991)[2]	U.S.	ANOVA COV	34.0 – 41.4 44.2 – 46.4	9.8 – 17.9 4.0 – 8.3	0.0 – 0.1 n.a.	6.8 – 9.8 5.4 – 7.8	n.a.
Roquebert et al. (1996)[3]	U.S.	COV	37.1	10.1	0.4	2.3	n.a.
McGahan & Porter (1997)[4]	U.S.	ANOVA COV	35.1 31.7	9.4 18.7	0.3 2.4	n.a.	n.a.
McGahan & Porter (2002)[5]	U.S.	Simultaneous ANOVA	36.0	10.3	0.4	n.a.	n.a.
Hawawini et al. (2003)[6]	U.S.	COV	35.8	8.1	1.0	3.1	n.a
Ruefli and Wiggins (2003)[7]	U.S.	Ordinal regression	12.3	0.1	0.01	n.a.	n.a.
Hawawini et al. (2004)[8]	U.S., UK, De, Benelux	COV	23.8	0.2	0.4	0.1	0.2
Makino et al. (2004)[9]	Japan	COV	28.2 – 31.4	5.0 – 6.9	0.1	n.a.	4.3 – 5.5
McNamara et al. (2005)[10]	U.S.	COV	43.8	9.1	1.0	4.0	n.a.
Schumacher & Boland (2005)[11]	U.S. food economy	ANOVA COV	48.7 49.3	3.1 19.9	0.8 1.0	5.8 2.0	n.a.
Hough (2006)[12]	U.S.	HLM	40.1	5.3	< 1.0	n.a.	n.a.
Misangyi et al. (2006)[13]	U.S.	HLM	36.6	7.6	0.8	n.a.	n.a.
Short et al. (2006) [14]	U.S.	HLM	45.0	8.3	n.a.	n.a.	n.a.
Goddard et al. (2009)[15]	Europe	ANOVA	9.3 – 32.2	2.4 – 5.7	0.3 – 0.7	2.4 – 11.9	0.8 – 1.0
Chaddad and Mondelli (2012)[16]	U.S. food economy / processing	HLM	Economy: 36.1 Processing: 36.7	7.0 7.5	0.5 1.0	n.a.	n.a.

Source: Own literature review

[a] In the U.S. studies (with the exception of Short et al., 2006) the firm effect is split into a business-unit and a corporate effect whereat the business unit effects are reported as firm effects.

[1] Table 1, p. 348

[2] Tables 2 and 3, p. 177 f. depending on the sequence of effect introduction and on samples (A and B)

[3] average values over different samples. Table 3, p. 660

[4] Tables 4 and 5, p 27f. Industry introduced before business unit effect

[5] Table 4, p. 845

[6] Table 5, p. 11

[7] Table 7, p. 874

[8] Table 8, p. 132

[9] Table 2, p. 1036

[10] Table 1, p. 1078

[11] Table 2 and 3 p. 104 f.

[12] Table 2, p. 55

[13] Table 3, p. 579

[14] Table 2, p. 273

[15] Table 5, p. 503

[16] Table 4, p. 13

3. Data

AMADEUS, a commercial pan European balance sheet database, is used as the data source. We employ return on assets (ROA), which is defined as a firm's profit/loss before taxation and interest[104] divided by total assets.[105] The industry classification systems used by most preceding papers were 4-digit SIC (Schumacher and Boland, 2005; Chaddad and Mondelli, 2012) while a few are based on 3-digit SIC (Hawawini et al., 2004) and 3-digit NACE (Szymański et al., 2007). As AMADEUS provides information at the NACE-4 level, we define industry membership along this level of aggregation, which is between 3 and 4-digit SIC. This is a limitation of our study compared to studies based on 4-digit SIC as data with finer classification allows to subdivide firm effects into business-unit and corporate effects while our data only enables us to estimate firm effects at the corporate level. The sample was constructed by including all firms listed in any NACE-4 food processing industry (32 categories between NACE-1511 and NACE-1599) from the five countries Belgium, France, Italy, Spain and the UK for which complete ROA data (Makino et al., 2004: 1033) for the period 2004 to 2008 were available. The countries were chosen due to their contribution to total EU-27 food industry turnover and overall data availability.[106]

Firms assigned to the 'miscellaneous industry' - NACE 1589: 'manufacture of other food products not elsewhere classified' - were deleted from the sample as enterprises in this category may be active in very different industries. Since AMADEUS does not provide data at the level of individual business units but on corporations as a whole, we also removed firms active in more than one NACE-4 industry from the database. This was necessary, because we use corporate ROA to estimate industry effects and therefore secondary activities would bias the estimation results of this effect class. Additionally, observations in the top and bottom 5 %

[104] To make ROA independent of the source of funds used, interest has to be included in the numerator.

[105] There has been an extensive debate regarding the suitability of ROA as a measure of economic profit since accounting profit data can be biased by profit-smoothing and cross-subsidization, and therefore do not necessarily reflect real economic profit (Fisher and McGowan, 1983; Long and Ravenscraft, 1984). Additionally, in an international context, differences in the national reporting regulations and practices can bias the estimation of country effects. For instance, firms in market-oriented financial systems (e.g., the United Kingdom), as opposed to banking-oriented economies (such as France) tend to more positively appraise performance, which may lead to an overestimation of profitability in those countries. An alternative indicator of economic performance recently used in the literature is economic value added (EVA), a measure of economic returns generated for shareholders, developed by Stern Steward & Co. However, EVA has drawbacks as well. As Biddle et al. (1997) show, EVA is outperformed by earnings as a performance measure. The variable provided by AMADEUS which appears most similar to EVA is value added (VA). However, data availability on VA is poor and the results are not expected to differ significantly since correlation between ROA and VA turned out to be strongly significant. For this reason and to assure comparability with the previous literature, ROA was chosen as the best available measure for firm performance.

[106] The five countries studied account for 56 % of the enterprises and 54 % of turnover of the EU-27 food industry in 2010 (Eurostat, 2012) meaning that a high share of the industry is covered by the analysis.

of the distribution in each year were deleted from the sample in order to avoid biases in the results due to outliers.

AMADEUS has the advantage that it only has marginal restrictions regarding firm size. This is an important issue in the EU food industry since 96 % of the firms are small and micro sized (Eurostat, 2012). Thus, while most previous studies use databases which are restricted to publicly quoted firms (Cubbin and Geroski, 1990; Schumacher and Boland, 2005) or use minimum firm size criteria based on specific balance sheet items (Schmalensee, 1985; McGahan and Porter 1997; Brito and Vasconcelos, 2006), the present study incorporates micro and small sized firms.[107]

The final sample comprises 5,494 enterprises. The average firm in the sample has a ROA of 4.9 %. On average the highest ROA is generated by large firms (5.5 %) followed by micro firms (5.1 %) while small and medium firms show lower mean values (4.3 % and 4.5 %).[108]

To assess whether the sample adequately represents the population of EU food processing firms, Table 34 presents the allocation of firms to the five countries indicating that Italian firms are underrepresented. In addition, Table 34 provides a comparison by size class which shows that micro sized firms are underrepresented, especially for Italy, the UK and Spain.

Table 34: Comparison of the sample with the population by country and size class

	Belgium	France	Italy	Spain	UK
# obs. in the sample in 2008	841	2,786	596	1,043	228
# obs. in the population in 2008	7,834	70,823	72,691	28,632	7,439
Size class[a] shares in % (2007)					
Large	4.7 (0.8)	3.6 (0.5)	5.5 (0.2)	5.2 (0.8)	30.7 (5.0)
Medium	6.5 (3.1)	5.8 (1.5)	35.4 (1.1)	14.9 (3.4)	30.7 (11.4)
Small	18.9 (15.8)	16.7 (8.7)	51.5 (9.3)	37.0 (18.4)	32.0 (28.0)
Micro	69.8 (80.4)	73.9 (89.3)	7.6 (89.4)	42.9 (77.4)	6.6 (55.6)

Source: Own calculations based on AMADEUS and Eurostat (2012).
Note: Shares for the population in parentheses are derived from Eurostat (2012).
[a] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

[107] Although micro and small-sized firms only account for 21 % of the EU-27 food industry turnover (Eurostat, 2012), which might justify a minimum size criterion, since the estimation considers all firms equally regardless of economic relevance, the large number of small firms is a characteristic of the industry that should be taken into consideration appropriately.
[108] The entire descriptive statistics on ROA can be found in the appendix (Table 40).

With regard to shares of observations by industry, Table 35 reveals that enterprises active in NACE 158 (manufacture of 'other' food products) are underrepresented in the sample, while the opposite holds for most other industries.

Table 35: Comparison of the sample and the population by industry

	Shares in sample and population in % (2008)	
(NACE Code), industry description[a]	Sample (N= 5,494)	Population (N = 177,575)
(158) Manuf. of other food pro.	37.2	68.4
(151) Production, proc. & pres. of meat & meat pro.	24.1	11.0
(159) Manuf. of beverages	13.4	6.4
(155) Manuf. of dairy pro.	7.3	4.4
(156) Manuf. of grain mill pro., starches & starch pro.	5.7	1.5
(157) Manuf. of prepared animal feeds	4.7	1.4
(153) Proc. & pres. of fruit & vegetables	4.4	2.9
(152) Proc. & pres. of fish & fish pro.	2.6	0.9
(154) Manuf. of vegetable & animal oils & fats	0.6	3.1

Source: Own calculations based on AMADEUS and Eurostat (2012).
Note: 'Population' refers to all firms active in the manufacturing of food products and beverages in the five countries Be, Fr, It, Sp and UK (according to Eurostat, 2012).
Proc. & pres. = processing and preserving; Manuf. = manufacturing; Pro. = products
[a] For the purpose of clarity, population and sample shares are compared at NACE-3, instead of NACE-4 level (ANOVA,COV and HLM rely on NACE-4 classifications).

4. Estimating effect magnitude using ANOVA and COV

4.1. Methodology

Most preceding studies are based either on nested ANOVA or on COV. As regards ANOVA, the order in which the effects are introduced has a significant influence on the estimates. Another disadvantage of ANOVA is the assumption that each effect class contains a certain amount of effect levels, which are all present in the data. COV assumes that the effect levels of each effect class in the data set are randomly drawn from a finite population of effect levels. Due to this random-effects assumption, COV results allow for a generalization of the results to a larger group of effects, not necessarily present in the data (Searle et al., 2006). Therefore, in the given case, COV is superior since we aim to infer from firm effects in a sample of firms to the size of firm effects in general, from a selection of accounting periods to all year effects, from a subset of industries to every industry within food processing, and from an incomplete list of member states to the EU as a whole. However, the COV technique can result in negative variance components or in unreliable estimates which underestimate the real magnitude of effects (Hough, 2006; Misangyi et al., 2006). Moreover, COV does not provide a reliable test for effect significance. In addition, both ANOVA and COV are based on the assumption that correlation between effects is not present (Misangyi et al., 2006).

As a basis for comparison with the previous literature, this study first employs ANOVA and COV and extends the methodological framework by estimating a hierarchical linear model, which addresses the drawbacks of both COV and ANOVA.

The ANOVA is based on the following descriptive model:

$$(1) \qquad r_{tkic} = \gamma + \varpi_t + \alpha_k + \mu_i + \chi_c + \varphi_{it} + \eta_{ct} + \phi_{ic} + \varepsilon_{tkic},$$

where r_{tkic} is year t ROA of firm k which is active in industry i of country c. In (1) γ is the grand mean across all ROA observations in the sample while ϖ_t, α_k, μ_i and χ_c are year, firm, industry and country effects, respectively. Besides the four main effects, similar to Goddard et al. (2009), two-way interactions of year, industry and country effects are introduced, whereat φ_{it} and η_{ct} are transient industry and country effects, respectively. The industry*country interaction is captured by ϕ_{ic}. The term ε_{tkic} represents the residual variation in ROA.

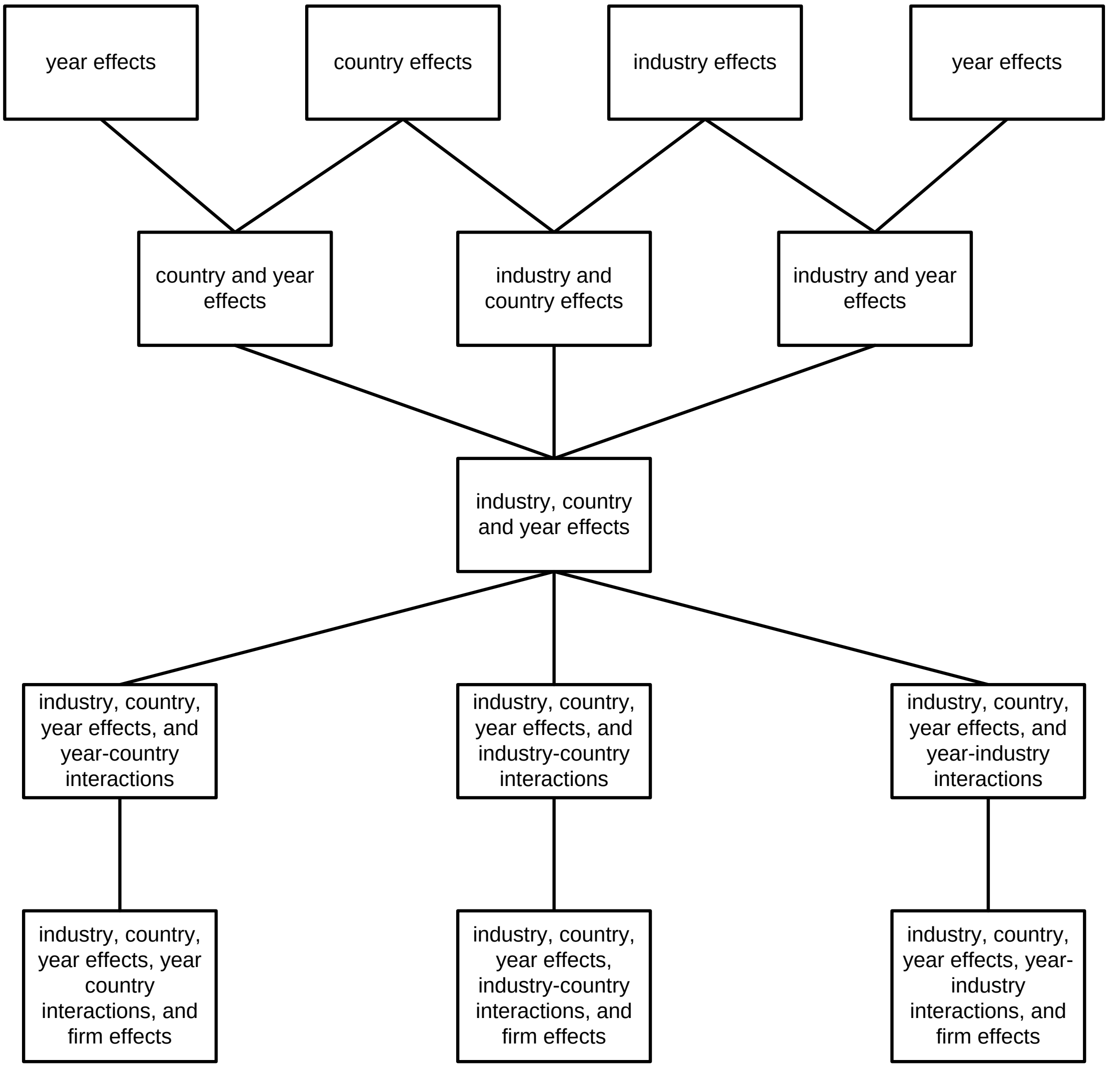
As the nested ANOVA results can strongly depend on the order of effect introduction, based on Schmalensee (1985), we design a rotation scheme for all effect classes contained in the model. The result is an effect-introduction pattern (Figure 13) which includes all reasonable combinations[109] of effect class introduction.

In accordance with Hough (2006) in the first step of the nested ANOVA a 'null model' is estimated with ROA as a dependent variable and the grand mean as explanatory variable. In the next step the 'null model' residuals are regressed on a first main effect (i.e. year, country or industry). Gradually, effects are introduced by regressing the latest residuals on a new effect until all effects have been added to the model according to Figure 13. In each estimation step the F-Test indicates if the latest effect has a significant impact. The contribution of the introduced effect to the model's explanatory power can be measured by the increment to R^2. Therefore, the average increment to R^2 over all steps in which a specific

[109] Although the rotation design leaves some room for maneuver, it is subject to some logical constraints. For example, two-way interactions cannot be considered before the introduction of their respective main effects. The following example serves to illustrate this: if one first introduces industry*country interactions and stores the residuals, these correspond to differences from average ROA in each industry-country combination. Since the mean of all residuals in such a combination is zero, the mean residuals for each industry (and country) will also be zero. For this reason, industry (and country) effects cannot be significantly different from zero after the introduction of their interactions.

effect significantly increases explanatory power can serve as an indicator of its overall magnitude.

Figure 13: Nested ANOVA effect-introduction pattern



For the COV approach, it is assumed that the effects are random variables with expected values of 0 and constant variances. Residuals are assumed to be uncorrelated, with expected values of 0 and constant variances. We decompose the total variance in ROA using restricted maximum likelihood (REML)[110] techniques (Norusis, 2008):

(2) $$\sigma_r^2 = \sigma_\omega^2 + \sigma_\alpha^2 + \sigma_\mu^2 + \sigma_\chi^2 + \sigma_\varphi^2 + \sigma_\eta^2 + \sigma_\phi^2 + \sigma_\varepsilon^2 .$$

[110] The standard maximum likelihood estimator does not adjust for the degrees of freedom which may result in a downward bias. We therefore employ the REML estimator as it corrects for this bias and is therefore generally considered as superior (Liao and Lipsitz, 2002). See, e.g., Rao (1997) and Searle et al. (2006) for in-depth explanations of COV and its estimation methods.

4.2. ANOVA and COV estimation results

The ANOVA results are reported in Table 36. First, the contribution of each effect when introduced as a single effect class is presented. As regards the main effects, the year only accounts for a negligible proportion (0.7 %) of the variance in profitability. Similarly, the contributions of industry (1.0 %) and country effects (2.3 %) as well as the interaction terms (2.6 % to 3.5 %) are rather small. Firm effects are the strongest effect class explaining 54 % of the variation in profitability. According to the F-Tests all effects have a significant impact when introduced as a single effect. Table 36 also shows the mean increments to R^2 of each effect arising from the combinations of effect introduction as depicted in Figure 13. The results show that when controlling for other effects the firm remains the strongest effect class contributing on average 53.1 % to the variation in profitability. The average impact of year, country and industry effects remains negligible. However, the average contribution of the interaction terms is considerably smaller in comparison with the introduction in the first step due to the fact that the corresponding main effects have been introduced previously. The impact of all effects remains significant, independent of the step of their introduction. The final models (with all effects introduced) on average explain around 59 % of the variance in profitability.

Table 36: ANOVA results (Contribution of effects to R^2 and adj. R^2)

Effect class	Contribution of effect when introduced first		Mean contribution[a]	
	R^2	Adj. R^2	R^2	Adj. R^2
Year	0.007***	0.007	0.007	0.007
Industry	0.010***	0.009	0.007	0.006
Country	0.023***	0.023	0.019	0.019
Y-I interactions	0.026***	0.021	0.010	0.005
Y-C interactions	0.032***	0.031	0.002	0.001
I-C interactions	0.035***	0.031	0.008	0.004
Firm	0.540***	0.425	0.531	0.414

[a] Average contribution of the effect to R^2 and adj. R^2 over all steps in which it is introduced according to Figure 1.
*** significant at the 1 % level or less.

COV results are depicted in Table 37. All effect classes together account for 47 % of the variance in ROA. The results provide strong evidence for the predominance of firm effects which are responsible for almost 40 % of the variation in ROA.[111] While year and country effects are restricted to zero by the estimation[112], the magnitude of industry effects which only account for 0.2 % of the variation in firm profitability is negligible. Regarding the interaction terms industry*country and year*industry only contribute marginally while year*country interactions account for 6.1 % of the variability in ROA giving hints for idiosyncratic business cycles across the five countries.

Table 37: COV results[a]

Variance component	%
Year	0.0%[b]
Country	0.0%[b]
Industry	0.2%
Firm	39.9%
I-C interactions	0.2%
Y-I interactions	0.6%
Y-C interactions	6.1%
error	53.0%

[a] Estimated using the restricted maximum likelihood (REML) method.
[b] Restricted to zero by the estimation

When comparing the results to preceding research based on ANOVA and COV our study confirms the dominance of firm effects which in general contribute more than 30 % to total variance in ROA (e.g. McGahan and Porter, 1997, 2002; McNamara et al., 2005). The negligible 1 % contribution of year effects is also in line with most previous studies (e.g. Hawawini et al., 2003). The same holds for country effects (e.g. Goddard et al., 2009). Regarding studies on the food sector our ANOVA results are mainly in line with those of Schumacher and Boland (2005) for the U.S. food economy. However, within their COV framework they find industry effects that contribute around 20 % to the variance in ROA. This divergence in the results might be caused by the fact, that the industry classification system used in the present study (NACE 4) is much broader than the one used by Schumacher and Boland (SIC 4) and thus observations in each industry more heterogeneous. As a result industry effects may appear less important in our study.

[111] This implies that firm effects make up 84.9 % of the total variance explained.
[112] Goddard et al. (2009) also report year effects which are restricted to zero.

5. Hierarchical Linear Model

5.1. Methodology

In contrast to classical ANOVA and COV, HLM addresses the correlation between effects through complex error structures within each effect class (Hough, 2006). Additionally, HLM provides the possibility to analyze the effect of structural variables by modelling appropriate relationships at each level of the analysis. Thus, in addition to ANOVA and COV, a multilevel hierarchical linear model (HLM) is estimated using the framework provided by Raudenbush and Bryk (2002).

At first a three-level model without structural covariates is estimated which partitions the total variance in ROA into a time, a firm and an industry component by means of iteratively estimated nested regressions. At the first level, ROA at each time period is modelled as mean ROA over time plus a random error:[113]

(3) $$r_{tki} = \pi_{0ki} + e_{tki}$$

with the indices *t*, *k* and *i* denoting time, firms and industries, respectively. π_{0ki} is mean ROA over time of firm *k* in industry *i* and e_{tki} is the random time-level error which is normally distributed with mean zero and variance σ^2. Therefore, σ^2 represents variance within the firms across time. This variance is assumed to be unique for the observations within each of the *k* firms.

At level two, mean firm ROA over time π_{0ki} is modelled as an outcome varying randomly around the industry mean:

(4) $$\pi_{0ki} = \beta_{00i} + \alpha_{0ki}$$

where β_{00i} is mean ROA of firms in industry *i*. α_{0ki} is the random firm-level error which is assumed to be normally distributed with mean zero and variance τ_{π}. The variance between firms in each industry is therefore captured by τ_{π}. It is assumed that this variance is equal only for firms within the same industry.

[113] A detailed description of the model can be found in Raudenbush and Bryk (2002) Chapters 2 and 8 or in Misangyi et al. (2006).

At the third level, mean ROA of firms in industry *i* (β_{00i}) is modelled as an outcome varying randomly around the grand mean:

(5) $$\beta_{00i} = \gamma_{000} + \mu_{00i}$$

where γ_{000} is the grand mean of all ROA observations. The random industry-level error (μ_{00i}) is normally distributed with a mean of zero and variance τ_β which measures between-industry variance.

Since the model specified by equations (3) - (5) does not contain explanatory variables it is referred to as fully unconditional (Raudenbush and Bryk, 2002). The percentage of variance ascribed to each effect in the unconditional model can then be calculated as $\sigma^2 / (\sigma^2 + \tau_\pi + \tau_\beta)$ for variance across time, $\tau_\pi / (\sigma^2 + \tau_\pi + \tau_\beta)$ for variance between firms and $\tau_\beta / (\sigma^2 + \tau_\pi + \tau_\beta)$ for variance between industries.

The magnitude of year effects is estimated by incorporating corresponding dummy variables at the time level.[114] Thus, equation (3) becomes:

(3a) $$r_{tki} = \pi_{0ki} + \pi_{1ki}(Year\ 1)_{tki} + \pi_{2ki}(Year\ 2)_{tki} + ... + \pi_{5ki}(Year\ 5)_{tki} + e_{tki}$$

where *Year* 1, *Year* 2, ..., *Year* 5 are dummy variables for each of the five years analyzed in this study (2004 - 2008). Year effects are therefore represented by π_{1ki}, π_{2ki},... , π_{5ki} and π_{0ki} can now be interpreted as mean ROA over time of firm *k* in industry *i* adjusted for year effects. The magnitude of year effects is calculated by the reduction in time-level variance (σ^2) compared to the unconditional model. Country effects can be incorporated by means of dummy variables at the firm level. Equation (4) then becomes:

(4a) $$\pi_{0ki} = \beta_{00i} + \beta_{01i}(Country\ 1)_{ki} + \beta_{02i}(Country\ 2)_{ki} + ... + \beta_{05i}(Country\ 5)_{ki} + \alpha_{0ki}$$

where *Country* 1, *Country* 2, ..., *Country* 5 are country dummies and β_{01i}, β_{02i},... , β_{05i} thus represent country effects. Consequently β_{00i} can now be interpreted as mean ROA of firms in industry *i* adjusted for country effects. The degree of country effects is calculated as the reduction of variance at the firm level that occurs when country dummies are introduced in

[114] Within the HLM framework, incorporation as a level is only meaningful for effects with at least 20 manifestations (Hox, 2008). Since only 5 years of data are available and 5 countries are considered the respective effects have to be incorporated by means of fixed-effect dummy variables.

relation to total variance of the model including only year effects. Finally, firm and industry effects are calculated by adjusting the firm- and industry-level variance estimated in the unconditional model by year and country effects.

5.2. Effect magnitude results using HLM

The results of the unconditional HLM model are reported in the upper panel of Table 38 and indicate that firm and industry effects are statistically significant with the firm explaining 42 % and the industry 0.8 % of the variance in ROA. Around 57 % of the variance in ROA can be attributed to the time level which corresponds to the error components of COV and ANOVA.

The magnitude of year effects is reflected by the proportional reduction in variance at the time level which occurs when year dummies are introduced at this level (substituting equation (3) by (3a)). As summarized by the second panel of Table 38, year effects account for 0.9 % of the variance in ROA.[115] Similarly, country effects are calculated by comparing the firm-level variance of the model incorporating both year and country dummies with the respective variance of the model including only year dummies and thus account for 1.8 % of the variance in ROA.[116] The significance of year and country effects can be determined by a Wald test which indicates whether the inclusion of explanatory variables leads to a significant improvement in comparison to the null model. According to this test, both year and country effects contribute significantly.

Finally, the percentage of variance attributable to the time-, firm- and industry level after adjusting for year and country effects has to be determined. This is done by relating the variance of the time-, firm- and industry level of the model incorporating year and country dummies to total variance in ROA as estimated by the unconditional model.[117] The final results are presented in the bottom panel of Table 38 and indicate that firm effects account for 40.2 % of the total variance in ROA while 0.4 % is attributable to industry effects and 56.5 % occurs at the time level.

Regarding firm and year effects our results are in line with previous studies based on HLM which also indentify firm effects as crucial while year effects only contribute

[115] Calculated as: $[\sigma^2_{\text{unconditional model}} - \sigma^2_{\text{model with year dummies at time level}}]/(\sigma^2 + \tau_\pi + \tau_\beta)_{\text{unconditional model}}$.

[116] Calculated as: $[\tau_{\pi\ \text{model with year dummies}} - \tau_{\pi\ \text{model with year and country dummies}}]/(\sigma^2 + \tau_\pi + \tau_\beta)_{\text{model with year dummies}}$.

[117] For example, the magnitude of firm-effects is calculated as $\tau_{\pi\ \text{model with year and country dummies}} /(\sigma^2 + \tau_\pi + \tau_\beta)_{\text{unconditional model}}$.

marginally (Misangyi et al., 2006; Chaddad and Mondelli, 2012). An important difference of our results is the smaller impact of industry effects. Chaddad and Mondelli (2012) in their study of the U.S. food industry find industry effects which account for 7 % of the variance in ROA. However, similar to Schumacher and Boland (2005) their study is based on 4-digit SIC which might be a reason for more distinct industry effects.

Table 38: HLM estimates of firm, industry, country and year effects

Level	Variance components	Percentage
Unconditional model		
Time level	0.0022471	57.37 %
Firm level	0.0016377***	41.81 %
Industry level	0.0000319***	0.82 %
Model with year dummies introduced at time level		
Time level	0.0022113	
Firm level	0.0016450***	
Industry level	0.0000319***	
Variance explained by year-effects		0.91 %
Wald χ^2_4 =358.83***		
Model with year dummies introduced at time level and country dummies at the firm level		
Time level	0.0022113	
Firm level	0.0015736***	
Industry level	0.0000160***	
Variance explained by country-effects		1.84 %
Wald χ^2_4 =208.92***		
Final results		
Time		56.46 %
Firm		40.18 %
Industry		0.41 %
Year		0.91 %
Country		1.84 %

Dependent variable: Return on assets (ROA)
***, **, * significant at the 1%, 5%, 10% level respectively.
Wald χ^2 for country effects refers to a model with country dummies only

As regards the contribution of the theoretical approaches in determining corporate profitability our results provide strong evidence for the validity of the RBV since firm effects are the dominant effect class. Proponents of the IV and MBV would expect relatively large industry effects. These schools of thought are therefore not supported by our results. The same holds for the relevance of trade theory as country effects and industry*country interactions only contribute marginally. Similarly, most effect classes that represent macroeconomic fluctuation are weak. An exception are year*country interactions which, in the COV framework, account for 6.1 % of the variance in ROA. Artis et al. (2004) analyze the European business cycle and find evidence for idiosyncratic business cycles across European countries. They identify a high correlation between the cycles of a core group of countries such as Belgium, France and Italy while the UK's business cycle progresses independently.

5.3. The impact of structural factors on firm profitability

In order to estimate the effect of specific structural factors on ROA, firm and industry characteristics are included in the unconditional model. It is important to determine whether these variables should be treated as transient (incorporation at the time level) or stable (incorporation at the firm or industry level). Treating a variable as transient implies that all available observations across the analyzed time span are considered, thus estimating the variable's impact on ROA across time. In contrast, a stable variable is incorporated by means of its average across time, hence explaining cross-sectional variance in ROA between firms or industries (Misangyi et al., 2006). In order to determine if specific variables should be treated as transient or stable Misangyi et al. (2006) use intra-class correlation analyses to estimate the portions of variance in each variable which occur across time and across firms (industries), respectively. Variables for which the majority of variance occurs across time are treated as transient and thus incorporated at the time level. Those variables for which the greater part of variance arises in a cross-sectional manner are treated as stable and therefore added to the model at their respective higher level. A similar analysis was conducted for the explanatory variables used in the present study with the result that for the majority of variables a significant amount of variance occurs across time.[118] Additionally, treating variables as stable by incorporating their mean values leads to a considerable loss of information and therefore appears unfavorable. Therefore, it appeared most reasonable to treat all explanatory variables as transient hence adding them to the model at the time level.

Equation (3) then becomes:

(3b) $$r_{tki} = \pi_{0ki} + \pi_{1ki}(X_1)_{tki} + \pi_{2ki}(X_2)_{tki} + \pi_{3ki}(X_3)_{tki} + ... + \pi_{nki}(X_n)_{tki} + e_{tki}$$

[118] For each explanatory variable the transient and stable parts were determined by means of a COV analysis which decomposes the variance into a year and a firm (industry) effect. Results are available upon request.

where X_l with $l = 1,2,...,n$ are *n* firm and industry characteristics such as firm size or industry concentration. These characteristics are assumed to be fixed, meaning that their effect on ROA is constrained to be the same for all firms: $\pi_{1ki} = \gamma_{100}$, $\pi_{2ki} = \gamma_{200}$, ..., $\pi_{nki} = \gamma_{n00}$.

The results of the model incorporating explanatory firm and industry characteristics are reported in Table 39. The variables were chosen due to data availability and were constructed by means of AMADEUS and the Eurostat (2012) database.[119]

Market Share (MS) is measured as firm *i*'s sales divided by total sales of the 4-digit NACE industry in which the firm operates. In the present study market share has no significant impact on ROA. Given the empirical evidence for a positive relationship of market share and profitability (e.g. Szymanski et al., 1993) this result is rather surprising.

Firm age (Age) can account for life-cycle effects. Usually, costs are expected to decrease with age due to learning effects leading to higher profits. However, the impact on ROA is significantly negative. Loderer and Waelchli (2010) show, that a negative relationship can occur if corporate aging is aligned with organizational rigidities, slower growth, and assets which become obsolete with time.

Firm size (Ln TA) is measured by the logarithm of total assets. While many previous studies find a positive impact (e.g. Misangyi et al., 2006; Chaddad and Mondelli, 2012; Hirsch and Gschwandtner, 2013), there is also evidence for the inefficiency of large firms (e.g. Goddard et al., 2005). However, the latter does not seem to hold for the food sector since firm size has a significant positive impact. Due to the fact that price competition is the dominant competition strategy among food processors (e.g. Sutton, 1991), achieving economies of scale seems to be a crucial matter.[120] Furthermore, large firms tend to be more adept at counteracting the superiority of a highly concentrated retailing sector.[121] The impact of firm growth (Gr. TA) measured as the growth rate of a company's assets[122] has no significant impact.

Two proxies for firm risk were derived from AMADEUS. Short-run risk (1/Curr) is measured by the ratio of current liabilities to current assets[123] and long-run risk is measured by the firm's gearing ratio (Gear), defined as the ratio of non-current liabilities plus loans to shareholders' funds. While risk theory states that firms with higher risk should achieve higher

[119] Descriptive statistic on these variables can be found in the appendix (Table 40).
[120] Ollinger et al. (2000), e.g., show that U.S. chicken slaughtering plants which are twice as large as the average-sized plant have 8 % lower per unit costs.
[121] In most EU countries, the top 5 retail chains have a market share of around 70 % (Wijnands et al., 2007).
[122] Since it can be expected that the impact of growth in assets occurs with a time lag, we use the growth rate in *t-1* in order to explain profits in *t*.
[123] This corresponds to the reciprocal of a firm's current ratio.

profits, Bowman's (1980) 'risk-return paradox' assumes a negative relationship. In accordance to Bowman both risk proxies have a significant negative impact. Chaddad and Mondelli (2012), also find that gearing has a negative impact on food-processors' profits.

Industry concentration (HHI) is measured by the Herfindahl-Hirschman Index. While Chaddad and Mondelli (2012) find no impact of concentration on ROA, similar to Misangyi et al. (2006) we find a positive effect which indicates that firms in highly concentrated industries might have the ability to prevent entry which in turn leads to higher profit levels.

Industry size (NF) is measured by the number of firms in an industry divided by industry sales while industry growth (Gr. NF) is measured by the corresponding growth rate. The respective net effect on ROA is, however, not totally unambiguous. On the one hand, in larger industries with rapid growth, the ability of incumbents to maintain their market shares might decrease, leading to a reduction of oligopolistic discipline with stronger competition and a decrease in ROA. On the other hand, if industries grow and reach a particular size due to increasing demand, the pressure on firms to reduce prices in order to increase sales is reduced and therefore high profits might result. The results show that industry size has no significant impact, however, growth in the number of firms leads to lower profits.

Research and development (R&D) measured by the 'share of R&D expenditure in total industry value added' is expected to be a basis for product differentiation and for the creation of entry barriers, and should therefore have a positive impact on ROA.[124] Surprisingly the impact is insignificant. Chaddad and Mondelli (2012) also find an insignificant impact of industry R&D intensity for the U.S. food sector. These results can be explained by the fact that R&D in the food industry has a different character compared to other industries. As Stewart-Knox and Mitchell (2003) show, only 7-25 % of the newly launched food products can be considered as being completely novel and the vast majority (72-88 %) of the products brought to the market fail. Hoban (1998), however, shows that the failure rate of entirely new products is only 25 %, leading to the conclusion that the insignificant coefficient of R&D is a result of the large share of small and rather insignificant innovations.

[124] Since the benefits of R&D expenditure are not likely to occur in the same period we use lagged R&D expenditure.

Table 39: HLM estimates of structural variables

Intercept	0.04414	(0.00456)
Firm characteristics		
MS	-0.00000	(0.00000)
Age	-0.00010**	(0.00005)
Ln TA	0.00102**	(0.00049)
Gr. TA	-0.00101	(0.00134)
1/Curr	-0.00151***	(0.00027)
Gear	-0.00001***	(0.00000)
Industry characteristics		
HHI	0.02672**	(0.01140)
NF	-0.00100	(0.00077)
Gr. NF	-0.00766***	(0.00183)
R&D	-0.00141	(0.00112)
Variance components		
Time (level 1)	0.001764	
Firm (level 2)	0.001664***	
Industry (level 3)	0.000058***	
Wald χ^2_{10}	190.15***	

Dependent variable: Return on assets (ROA)
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.
Industry variables: HHI = Herfindahl-Hirschman Index; NF = number of firms in industry adjusted by industry sales; Gr. NF = Growth rate of NF; R&D = Share of R&D expenditure in industry value added. CR5 = Five-firm concentration ratio of the food retail sector.
Numbers in parentheses are standard errors.
***, **, * significant at the 1%, 5%, 10% level respectively.

The Wald test indicates that the inclusion of the explanatory variables leads to a significant improvement of the model. The percentage of variance in ROA which is explained by the explanatory variables is reflected by the proportional reduction in variance attributed to the time level, which occurs when structural firm and industry variables are introduced to the model. All structural variables together explain 12.3 % of the variance in food industry ROA.[125]

[125] Calculated as follows: $[\sigma^2_{\text{unconditional model}} - \sigma^2_{\text{model with firm and industry variables at time level}}]/(\sigma^2 + \tau_\pi + \tau_\beta)_{\text{unconditional model}}$. That is (0.0022471-0.0017639)/0.0039167=0.1234.

6. Discussion and Conclusions

The results are robust across the employed methods - COV, ANOVA and HLM - and provide strong evidence for the predominance of firm effects in the EU food industry. Depending on the method used, firm effects account for 39.9 to 53.1 % of the variance in firm profitability. Year, country and industry effects as well as the corresponding two-way interactions only contribute marginally with the exception of year*country effects which in the COV framework explain 6.1 % of the variance in profitability.

Previous findings were confirmed by our analysis with regard to the dominance of firm effects, as well as the relatively small contributions of year effects (e.g. McGahan and Porter, 1997; Schumacher and Boland, 2005), country effects (Makino et al., 2004; Brito and Vasconcelos, 2006; Goddard et al., 2009), and two-way interactions (e.g. Hawawini et al., 2004; Schumacher and Boland, 2005). However, there is less agreement on the relevance of industry effects. Similar to our analysis, a number of studies found that industry effects account for less than 5 % in ROA variation (e.g. Ruefli and Wiggins, 2003; Hawawini et al., 2004; Szymański et al., 2007). Others estimated this effects class to be larger than 18 % (e.g. McGahan and Porter, 1997; Schumacher and Boland, 2005). As some authors focused on specific sectors, and others looked at the general economy, this variation may partly be due to differences in industry heterogeneity. In addition to this, industry effects seem to be smaller if their estimation is based on a broader industry classification system, and on the corporate level rather than business-unit level. The restriction of the given data to NACE 4-digit and the corporate level is therefore a major limitation of our study. Furthermore, our data does not allow us to assess the impact of related or unrelated diversification on profitability which is an interesting issue within the food industry. Dorsey and Boland (2009), e.g., show that diversification of food processors in unrelated activities outside the food economy is unsuccessful while the opposite holds for related diversification.[126]

The HLM results show that several firm characteristics are related to profitability. While firm size, seems to be an important driver of firm performance in the food industry, age and risk tend to have a negative impact. Furthermore, the results show that industry concentration has a positive and industry growth a negative impact on ROA. Many other variables have been related to profitability by previous studies such as advertising, or import and export activity. Especially within the food sector, industry advertising intensity can act as a barrier to entry that leads to higher firm profit margins (e.g. Sutton, 1991; Chaddad and

[126] Chaddad and Mondelli (2012) also find that related corporate diversification positively effects ROA.

Mondelli, 2012). However, due to data limitations these variables could not be considered in this study.

Regarding the contribution of the discussed theoretical viewpoints, our results show that macroeconomics seems to provide little potential for explaining performance differentials in the food industry. The only exception are year*country interactions which contribute 6.1 % to the variance in ROA within the COV framework which is an indication for idiosyncratic business cycles across the five countries analyzed. Furthermore, as most effect classes emphasized by IO and trade theory were weak, while firm effects were strong, our results provide support for the validity of the RBV in EU food processing. This is further reinforced by the fact that several firm characteristics such as firm size, age and risk are estimated to have a significant impact on ROA. Nevertheless, it would be misleading to deny the influence of the industry dynamics and competitive context in which firms operate since concentration and industry growth are estimated to have a significant influence on profitability.

Appendix

Table 40: Descriptive statistics of firm and industry characteristics (2004-2008)

Label	Variable		Obs.	Mean	SD	Min.	Max.
	Firm characteristics						
ROA	Return on assets (%)		27,420	4.86	6.26	-76.40	40.72
ROA by size class[a]		Micro	16,017	5.10	7.02	-76.40	40.72
		Small	6,888	4.45	5.06	-24.00	29.68
		Medium	3,088	4.26	4.61	-19.83	32.87
		Large	1,427	5.50	5.20	-11.01	29.43
MS	Market share		18,742	0.03	0.38	0.00	0.32
Age	Age		27,370	30.64	18.44	12	199
Ln TA	Logarithm of total assets		27,420	7.33	1.91	2.77	15.85
Gr. TA	Growth in total assets		27,420	0.06	0.27	-0.94	11.10
1/Curr	Current liabilities / Current assets		27,382	1.21	2.67	0.01	200.00
Gear	Gearing ratio		26.969	1.50	4.08	0.00	99.31
	Industry characteristics						
HHI	Herfindahl index		26,838	0.09	0.11	0.00	1
NF	Number of firms in the industry		21,454	1,262	5,205	1	49,173
Gr. NF	Growth in the number of firms		21,448	0.02	0.28	-0.78	4.29
R&D	Research and development		22,895	0.01	0.01	0.00	0.03

Source: Own calculations based on AMADEUS and Eurostat (2012).
[a] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 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 their total assets.

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Chapter 3: Profit persistence in the food industry: evidence from five European countries[127]

Abstract: The present article is the first that analyzes profit persistence in the European food industry. Based on the Arellano and Bond GMM estimator, the degree of profit persistence and the drivers of persistence are quantified for a large sample of food processing firms. The analysis reveals that the degree of profit persistence in the food industry is lower compared with other manufacturing sectors due to strong competition among food processors and high retailer concentration. Furthermore, firm size is an important driver of persistence, while firm age, risk and R&D intensity have a negative influence.

Key words: profit persistence, competitive environment hypothesis, food industry.
JEL Classification: L12, L66, M21

1. Introduction

It is commonly observed that actual profit rates differ heavily between firms, contradicting the proposition of the competitive environment hypothesis (e.g. Carlton and Perloff, 2005).

Starting with Mueller's studies (1977, 1986), a number of articles aiming to analyze the persistence of such 'abnormal' profitability has emerged. Most of these studies confirm the existence of a considerable number of firms with 'abnormal' profits that persist in the long run. While those studies generally consider entire manufacturing sectors, differentiated studies which only focus on the food industry are rare. To provide further evidence for this important sector, the present article estimates 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 1996-2008.

With a 13 % share of total turnover in 2007, the food industry[128] is the largest economic sector within EU manufacturing (Eurostat, 2010). European food markets are characterized by high market saturation and strong competition. Beyond that, food processors are confronted with a high concentration in the retail sector and by increasing price volatility in their input markets (Wijnands, van der Meulen and Poppe, 2007: 10). Due to these special

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[128] Manufacture of food products and beverages excluding tobacco according to NACE Rev. 1.1 division DA15. NACE is the statistical classification of economic activities in the European Community. The present study is based on NACE Rev. 1.1

characteristics and the high economic importance of the food industry, carrying out a differentiated examination of it in terms of profit persistence is both useful and necessary.

Besides being the first analysis of profit persistence in the European food industry, this study's contribution to the field is twofold. First, in contrast to most of the previous studies, which have either been restricted to publicly quoted firms or to a minimum firm size criterion, this study is based on data which have almost no restrictions regarding firm size, making a more precise representation of the industry possible. This is particularly important for the EU food industry, where 96 % of all producers are small firms[129] (Eurostat, 2010). Second, while the autoregressive model of order one AR(1) has become the general econometric method to investigate profit persistence, this study improves the methodology by implementing dynamic panel models based on Arellano and Bond's (1991) GMM estimator. This approach accounts for some of the econometric drawbacks of the AR(1) standard approach and is thus expected to yield more reliable results.

The article is organized in the following way. Section 2 reviews the existing literature on persistence of firm profitability. The models used to estimate profit persistence and its determinants are introduced in Section 3, while a description of the data is provided in Section 4. Section 5 presents the empirical results and Section 6 closes the article with some conclusions.

2. Literature background

The question as to why firms have persistent 'abnormal' profits is an important research theme both from a theoretical point of view as well as from the perspectives of strategic management and accounting and finance. The traditional 'Structure-Conduct-Performance' paradigm, emerging with the seminal contributions of Bain (1956, 1968), explains persistent 'abnormal' profitability with the help of industry-level determinants of competition such as concentration and economies of scale as well as entry and exit barriers (e.g. Caves and Porter, 1977; Waring, 1996; Slater and Olson, 2002). According to this approach, the main drivers of abnormal profitability are therefore the structural characteristics of the industry.

The so-called 'new learning' theory, in contrast, emphasizes the importance of firm-level differences in explaining the variations observed in firm profitability. Several studies find that firm characteristics such as market share (MS), firm growth, R&D and advertising, rather than industry effects, account for the differences in long-term profits (e.g. Teece, 1981;

[129] According to the SME definition of the European Commission (2005), small firms are defined as having fewer than 50 employees and total assets of less than €10 million.

Conner, 1991; Levinthal, 1995; Roquebert, Phillips and Westfall, 1996; Barney, 2001; Hawawini, Subramanian and Verdin, 2003). Within the 'new learning' theory, the 'resource-based view' sees both the firm's tangible internal resources, like financial and physical factors of production, as well as its intangible internal resources, such as technology, management skills, quality reputation and customer loyalty, as the firm's main strengths, which lead to sustained profitability (e.g. Lippman and Rumelt, 1982; Wernerfelt, 1984; Prahalad and Hamel, 1990; Mahoney and Pandian, 1992; Brush, Bromiley and Hendrickx, 1999; Bowman and Helfat, 2001; Winter, 2003).

In an attempt to clarify the debate about the importance of industry and firm characteristics, Schmalensee (1985) applies ANOVA and variance decomposition analysis (COV) to U.S. business unit profitability data. His results reveal strong evidence for the importance of industry effects, which account for 20 % of the variance in business unit returns. In contrast, Rumelt (1991) reports significant business-unit effects that strongly outweigh industry and corporate effects. Many subsequent studies find support for stronger business-unit effects compared with industry effects (e.g. McGahan and Porter, 1997, 2002; Goddard, Tavakoli and Wilson, 2009). As regards the food sector, Schiefer and Hartmann (2009), using ANOVA and COV, quantify firm, industry, year and country effects on profitability in the EU food industry and find evidence for the relevance of firm-specific characteristics as determinants of superior performance.

All these studies are based on cross-sectional data or on panel data with a short time series dimension of up to 5 years. Most of the more recent contributions, however, are based on panel data with longer time series dimensions, thus offering the possibility of examining the persistence of 'abnormal' firm profitability (e.g. Geroski and Jacquemin, 1988; Mueller, 1990; Kambhampati, 1995; Goddard and Wilson, 1999; McGahan and Porter, 1999, 2003; Maruyama and Odagiri, 2002; Yurtoglu, 2004; Gschwandtner, 2005; Cable and Mueller, 2008; McMillan and Wohar, 2011; Gschwandtner, 2012). While the majority of these studies are based on simple autoregressive models of order one, which are estimated by means of ordinary least squares (OLS), Goddard, Tavakoli and Wilson (2005) are the first to estimate profit persistence using the more sophisticated GMM approach by Arellano and Bond (1991).

The evidence regarding profit persistence in the food and agribusiness sector is, nevertheless, still insufficient. Schumacher and Boland's (2005) study of profit persistence in the U.S. food economy is the only exception so far. Their approach proportions the persistence in abnormal profits into a firm/corporate and industry component by means of a sequential weighted-least-squares technique leading to the result that industry effects are more important for persistence than corporate effects. However, in contrast to the present study, Schumacher and Boland's analysis only assesses the impact of entire effect classes (i.e. firm/corporate effects vs. industry effects) on profit persistence while the structural firm and industry characteristics (e.g., firm size or industry concentration) that determine profit persistence are not quantified. It can be expected that some of these variables have a different impact in the food industry compared with other manufacturing sectors. Nonetheless, Schumacher and Boland's study has the advantage that it focuses on four different sectors of the food economy (industry, retail, wholesale and restaurant) while the present study, as a consequence of data limitations, only focuses on the food industry.

Thus, the food sector deserves further investigation due to its special characteristics and its crucial position within manufacturing. Furthermore, there is hardly any other sector with more intensive debate about the balance of market power between the industry and the retail sector (Wijnands, van der Meulen and Poppe, 2007: 277).[130]

3. Methodology

The standard method[131] that has been used in the profit persistence literature so far is based on two estimation steps. In the first step, the degree of profit persistence is examined by means of a simple autoregressive process of order one AR(1), at which profits of firm *i* at a given point in time ($\pi_{i,t}$) are regressed on the immediate previous level:

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

where $\varepsilon_{i,t}$ is a white noise error term with zero mean and constant variance. Most previous studies use OLS regressions in order to estimate equation (1).

This approach yields two persistence measures. The first one is the coefficient on lagged profit ($\hat{\lambda}_i$) which reflects the 'stickiness' of profits from period to period. The coefficient $\hat{\lambda}_i$ can be, therefore, interpreted as 'short-run persistence', and as a measure for the speed of adjustment to the long-run level. Small values of $\hat{\lambda}_i$, i.e. close to zero, indicate a quick erosion of short-run rents as well as high fluctuations in profits over time and therefore a low degree of persistence. In contrast, values for $\hat{\lambda}_i$ close to 1 are an indication for high

[130] See Digal and Ahmadi-Esfahani (2002) for a survey on studies regarding market power in food retailing and Sexton and Zhang (2001) for an analysis of the U.S. food sector.
[131] A comprehensive description of the standard methodology can be found in Mueller (1990).

profit persistence and, therefore, a slow adjustment to the competitive norm as well as low fluctuations of profits over time. In the literature, the mean value of $\hat{\lambda}_i$ across all firms in a sample usually serves as an indicator for the degree of profit persistence within it.

The second persistence measure is the long-run average of the autoregressive process. This value, defined as $\hat{p}_i = \hat{\alpha}_i /(1-\hat{\lambda}_i)$, is the steady-state equilibrium value to which, according to the model, the series is ultimately heading. Thus, $\hat{p}_i$ is a measure of 'permanent rents', which are not eroded by competitive forces. Since $\hat{p}_i = 0$ implies a long-run return on assets (ROA) equal to the competitive norm, the percentage of long-run projections significantly different from zero in a given sample can be used as a measure of the degree of long-run profit persistence.

Some studies (e.g. Gschwandtner, 2005) have extended this classical methodology by estimating AR models up to order four for each company and employing Schwarz Bayesian Information Criterion in order to decide which model best describes the adjustment path.

The majority of studies based on AR models implement a second estimation step in order to explain profit persistence, where specific firm and industry characteristics are regressed on the two persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$.

Nonetheless, this standard method has its drawbacks. It is assumed that the error term in (1) is composed of a time-invariant component which includes all unobserved firm-specific effects (η_i) and an observation-specific error ($\nu_{i,t}$). The basic problem is that $\pi_{i,t}$ is a function of η_i, meaning that $\pi_{i,t-1}$ is also a function of η_i. Therefore, the independent variable in (1) is correlated with the error term even if there is no autocorrelation between the $\nu_{i,t}$'s, implying that the OLS estimator is biased and inconsistent (Baltagi, 2008). Thus, in order to overcome these shortcomings, the present study implements a dynamic panel model for each country as formulated in (2), using the Arellano and Bond (1991) GMM estimator which is especially applicable to samples with small T and large N:[132]

$$(2) \qquad \pi_{i,t} = \sum_j \alpha_j (X_{j,i,t}) + \lambda \pi_{i,t-1} + \sum_j \lambda_j (X_{j,i,t}) \pi_{i,t-1} + \varepsilon_{i,t},$$

where $\varepsilon_{i,t} = \eta_i + \nu_{i,t}$. Within this framework, the autoregressive parameter ($\hat{\lambda}$) serves as the measure for short-run persistence. In addition, specific firm and industry characteristics (X_j's) that are expected to influence profit persistence are added to the model. Here, the impact of

[132] See, e.g. Baltagi (2008: 147 ff) for a detailed description of the methodology.

the X_j 's on short-run persistence can be evaluated by the $\hat{\lambda}_j$'s. The dynamic panel approach does not yield a long-run persistence measure comparable with the $\hat{p}_i$ of the standard approach. However, the $\hat{\alpha}_j$'s reflect the impact of the X_j 's on abnormal profits over the entire time period analyzed and it can be assumed that the direction of this impact prevails in the long run. It is therefore possible to assess the direction of change in long-run profit persistence for a given change in the variables X_j by means of the algebraic signs of the $\hat{\alpha}_j$'s.

The GMM estimator is transforming the equation by means of first differentiation, hence removing the individual time-invariant firm effects (η_i). The differentiated equation can then be estimated using instruments from within the data set. While the lagged-dependent variable and the interaction terms with the lagged-dependent variable are endogenous, all other independent variables are treated as exogenous similar to Goddard, Tavakoli and Wilson (2005). The endogenous variables are instrumented by their lagged levels while the exogenous variables ordinarily instrument themselves (Roodman, 2009).[133]

While the standard approach yields short-run persistence measures for each individual firm and then takes the mean across the sample as a measure for short-run persistence, the panel model provides coefficients that are common to all firms in each sample analyzed. The persistence measures $\hat{\lambda}$ and the mean of $\hat{\lambda}_i$ are, however, not directly comparable across the methods. Thus, in order to assure comparability to previous studies, results of the standard two-step methodology are provided in the appendix. However, due to the methodological shortcomings of the standard AR method the focus is put on the dynamic panel estimation.

4. Data

The firm data were taken from Bureau van Dijk's AMADEUS, a trans-European database of financial information. Data availability restricts the analysis to the time span 1996 through 2008. Most studies of profit persistence are based on longer time spans of ~ 15-25 years. However, these studies mainly analyze entire manufacturing sectors, which makes the data availability easier. In contrast, the 13-year time span in the present study is the longest available specifically for the European food industry.

[133] A detailed description of the dynamic panel estimation in terms of profit persistence is also given in Goddard, Tavakoli and Wilson (2005) or Gschwandtner and Crespo Cuaresma (2013).

The profitability of firm *i* in year *t* ($\pi_{i,t}$) is measured as the deviation of a firm's ROA from the competitive norm in *t*, which is usually approximated by mean ROA across the sample of firms. ROA is calculated as a firm's profit–loss before taxation and interest divided by its total assets. Interest are included in the numerator in order to make the profit measure independent of the source of funds used. The normalization of profits by the competitive norm 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 $\pi_{i,t}$ as deviations from the competitive norm or as 'abnormal' profitability.

It has to be noted that accounting profit data can be subject to criticism since they might be biased by profit-smoothing and cross-subsidization and therefore do not necessarily reflect real economic profit.[134] However, alternative measures of performance - such as economic value added (EVA) developed by Stern Steward & Co, which measures the economic returns generated for shareholders - are not without problems, either. Biddle, Bowen and Wallace (1997), e.g., show that EVA is outperformed by earnings as a performance measure. Thus, due to data availability and to assure comparability to the previous literature, ROA was chosen as the best measure for firm performance.

The data were screened by eliminating firms for which fewer than 13 years of ROA data were available. In fact, firm exit during the time span analyzed is considered as a sign for profit 'non-persistence'. However, due to the already short time series available it is not possible to check for a survivorship bias by estimating persistence for firms with fewer than 13 observations. Gschwandtner (2005) analyses survivors and exiters separately and comes to the result that exiters have lower short-run persistence on average. Thus, it can be expected that the results will overestimate the real value of profit persistence to some degree. However, only 1.4 % of the firms with fewer than 13 observations are reported as bankrupt while the remainder of firms with fewer than 13 observations is likely a consequence of mergers and acquisitions or of flaws in the database.[135] Thus, although it is not possible to quantify the extent of overestimation, it should not be significant. 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. Regarding the size of firms in the sample the preceding literature has either

[134] See Fisher and McGowan (1983) as well as Long and Ravenscraft (1984) for an extensive discussion on the usefulness of accounting profits in reflecting real economic profit.

[135] Four hundred and sixty-two of the 33.400 firms that, according to the AMADEUS database, operate in the food industries of the five analyzed countries are reported as bankrupt during the analyzed time span.

implemented minimum firm size criteria (e.g. McGahan and Porter, 1999)[136] or is restricted to publicly quoted firms (e.g. Cubbin and Geroski, 1990; Schumacher and Boland, 2005). For the European food industry, a minimum size criterion would lead to a tremendous loss of information, since small enterprises make up 96 % of the EU food industry corporations (Eurostat, 2010). It is true that small firms only account for 21 % of industry turnover in 2007 (Eurostat, 2010), which might indicate the usefulness of a minimum size criterion, since the estimation considers all firms in an equal way regardless of economic importance. However, the large number of micro- and small-sized firms is a characteristic of the industry that should not be neglected. In contrast to other databases, AMADEUS has the advantage that it has almost no restrictions regarding firm size or legal form.

Observations lying 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. Like Goddard, Tavakoli and Wilson (2005), the elimination of a single profit rate observation means that there are fewer than 13 years of ROA data available for any particular firm, leading to its overall elimination from the sample.

Table 41: Comparison of the sample with the population (2007)

	Belgium	France	Italy	Spain	UK
# observations in the sample	841	2,786	596	1,043	228
# observations in the population	7,511	70,823	72,691	28,657	7,027
% shares by size class[a]					
Large	4.7 (0.8)	3.6 (0.5)	5.5 (0.2)	5.2 (0.8)	30.7 (5.0)
Medium	6.5 (3.1)	5.8 (1.5)	35.4 (1.1)	14.9 (3.4)	30.7 (11.4)
Small	18.9 (15.8)	16.7 (8.7)	51.5 (9.3)	37.0 (18.4)	32.0 (28.0)
Micro	69.8 (80.4)	73.9 (89.3)	7.6 (89.4)	42.9 (77.4)	6.6 (55.6)

Note: Shares for the population (in parentheses) are derived from Eurostat (2010).
[a] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 million. Due to data availability, firms in the population are classified by size according to the number of employees while firms in the sample are classified by their total assets.

The countries considered were selected according to data availability. Five countries are comprised: Belgium, France, Italy, Spain and the UK. Together they account for 59 % of the enterprises and 51 % of the turnover of the EU-27 food industry in 2007 (Eurostat, 2010).

[136] McGahan and Porter only include firms with at least USD 10 million in total assets.

The final sample comprises four of the top five countries regarding food industry turnover[137] with a total of 5,494 firms active in 30 4-digit NACE industries.

The allocation of firms to the five countries can be found in row one of Table 41. Table 41 further provides a comparison of the sample with the population by size class for each country. Despite the fact that only a minor size criterion is used, micro enterprises are still underrepresented in all country samples. This is particularly true for Italy and the UK.

To avoid repetition, data on firm and industry characteristics which serve as covariates for profit persistence are described when introduced in Section 5.

5. Estimation results

Table 42 shows the results of the dynamic panel estimations for each of the five countries according to equation (2). The short-run persistence parameters $\hat{\lambda}$ are significant at the 1 % level for all countries. This implies that abnormal profits persist from year to year and that the forces of competition are not strong enough to erode all abnormal profits within 1 year. Short-run profit persistence ($\hat{\lambda}$) turns out to be highest in the UK (0.304) followed by Spain (0.250), France (0.205), Italy (0.151) and Belgium (0.110). However, the degree of short-run profit persistence in the food industry tends to be lower compared with other manufacturing sectors. Goddard, Tavakoli and Wilson (2005) who analyze the entire manufacturing sectors of the same five countries find $\hat{\lambda}$ values between 0.323 for the UK and 0.452 in Italy.[138] Gschwandtner (2012) finds values between 0.549 and 0.722 for the U.S manufacturing sector.[139] The present results therefore indicate a high degree of competition and market saturation in the European food industry.

The coefficients ($\hat{\lambda}_j$) of the interaction terms of the explanatory variables with the lagged-dependent variable (e.g., R&D*$\pi_{i,t-1}$) show the impact of the specific variables on short-run persistence and the coefficients ($\hat{\alpha}_j$) of the explanatory variables show their impact on long-run persistence.

[137] According to Eurostat (2010) Germany, France, the UK, Spain and Italy are the European leaders regarding food industry turnover while Belgium takes the eighth place. Unfortunately, Germany, the European leader regarding food industry turnover, is not covered by the study due to lack of data.

[138] Goddard, Tavakoli and Wilson (2005) analyze the period 1993-2001. Their study is also based on AMADEUS.

[139] For the periods 1984-99 and 1950-66, respectively.

Table 42: Dynamic panel model estimation results

Variable	Belgium	France	Italy	Spain	UK
$\pi_{i,t-1}$	**0.110 (7.12)*** **	**0.205 (21.07)*** **	**0.151 (9.49)*** **	**0.250 (15.95)*** **	**0.304 (10.27)*** **
MS * $\pi_{i,t-1}$	**-0.004 (-2.52)** **	0.000 (0.46)	-0.000 (-0.02)	-0.001 (-1.20)	-0.002 (-1.11)
Age * $\pi_{i,t-1}$	**-0.019 (-3.57)*** **	**-0.005 (-2.47)** **	0.013 (0.81)	0.001 (0.62)	-0.001 (-0.41)
Ln TA * $\pi_{i,t-1}$	-0.013 (-0.22)	**0.049 (2.12)** **	-0.248 (-1.56)	**0.038 (1.80)* **	**0.125 (2.71)*** **
Gr. TA * $\pi_{i,t-1}$	-0.084 (-1.00)	-0.055 (-1.55)	**-0.995 (-1.72)* **	**-0.147 (-2.80)*** **	**-0.375 (-2.44)** **
Gear * $\pi_{i,t-1}$	-0.000 (-0.17)	**0.000 (1.76)* **	-0.000 (-0.76)	**-0.000 (-3.49)*** **	0.000 (0.24)
1/Curr * $\pi_{i,t-1}$	**-0.067 (-4.88)*** **	-0.018 (-1.52)	0.720 (1.16)	**-0.066 (-2.36)** **	**0.124 (3.48)*** **
HHi * $\pi_{i,t-1}$	**4.091 (3.75)*** **	**-1.785 (-1.76)* **	11.905 (0.68)	-0.327 (-0.96)	0.482 (0.57)
NF * $\pi_{i,t-1}$	**-0.000 (-1.88)* **	**-0.000 (-2.71)*** **	-0.000 (-0.26)	-0.000 (-1.58)	0.000 (1.05)
Gr. NF * $\pi_{i,t-1}$	**-0.781 (-4.36)*** **	**-0.787 (-3.68)*** **	-0.618 (-0.17)	0.081 (1.42)	0.387 (0.67)
R&D * $\pi_{i,t-1}$	**-2.478 (-3.64)*** **	**-0.048 (-1.70)* **	0.031 (0.33)	-0.004 (-0.13)	0.058 (0.75)
CR5 * $\pi_{i,t-1}$	**-43.503 (-7.34)*** **	**-3.498 (-2.98)*** **	**-3.925 (-1.63)* **	**-0.605 (-3.48)*** **	-0.021 (-0.03)
MS	-0.000 (-1.47)	0.000 (0.46)	**0.001 (1.62)* **	**0.000 (2.14)** **	-0.000 (-0.46)
Age	[a]	**-0.026 (-2.98)*** **	[a]	-0.000 (-0.43)	0.000 (0.08)
Ln TA	**0.037 (1.70)* **	0.009 (1.04)	-0.037 (-0.38)	0.000 (0.61)	0.003 (1.11)
Gr. TA	-0.006 (-0.97)	-0.002 (-0.75)	-0.031 (-0.37)	**-0.011 (-5.07)*** **	**-0.018 (-1.78)* **
Gear	**-0.000 (-3.58)*** **	**-0.000 (-5.85)*** **	0.000 (0.64)	**-0.000 (-2.23)** **	0.000 (-0.50)
1/Curr	**-0.004 (-2.96)*** **	**-0.004 (-3.50)*** **	0.020 (0.94)	**-0.004 (-2.77)*** **	0.004 (1.15)
HHi	0.636 (1.57)	0.662 (0.63)	2.840 (0.93)	0.016 (0.97)	0.066 (1.52)
NF	0.000 (1.19)	**0.001 (4.07)*** **	-0.000 (-0.87)	**0.000 (2.35)** **	0.000 (0.72)
Gr. NF	**-0.027 (-4.03)*** **	0.002 (0.07)	-0.022 (-0.31)	**0.004 (1.90)* **	0.003 (0.09)
R&D	0.041 (1.37)	0.011 (1.60)	0.009 (1.03)	-0.002 (-1.27)	-0.004 (-1.25)
CR5	0.003 (0.01)	2.885 (1.06)	0.082 (0.98)	-0.005 (-1.12)	0.004 (0.20)
Wald	$\chi^2_{(21)}$ = 246.62*** p=0.000	$\chi^2_{(25)}$ = 364.95*** p=0.000	$\chi^2_{(24)}$ = 192.45*** p=0.000	$\chi^2_{(22)}$ = 472.58*** p=0.000	$\chi^2_{(22)}$ = 318.88*** p=0.000
AR(2)	z = -1.64 p=0.100	z = 1.30 p=0.195	z = -1.924 p=0.054	z = -0.28 p=0.777	z = -1.04 p=0.296
Sargan-Hansen	$\chi^2_{(3)}$ = 3.33 p=0.344	$\chi^2_{(11)}$ = 100.98*** p=0.000	$\chi^2_{(24)}$ = 30.91 p=0.157	$\chi^2_{(6)}$ = 5.30 p=0.506	$\chi^2_{(34)}$ = 41.45 p=0.178

Dependent variable: $\pi_{i,t}$. 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. Industry variables: HHI = Herfindahl-Hirschman Index; NF = number 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; CR5 = Five-firm concentration ratio of the retail sector
Numbers in parentheses are z-values.
[a] dropped due to multicollinearity
***, **, * significant at the 1%, 5%, 10% level respectively.

MS is measured as firm *i*'s total sales divided by total sales in *J*, where *J* is the 4-digit NACE industry to which the firm is assigned by AMADEUS.[140] Usually one would expect a positive effect on profitability (e.g. Szymanski, Bharadwaj and Varadarajan, 1993). However, the impact has not always been entirely unambiguous from a theoretical point of view. For instance, Prescott, Kohli and Venkatraman (1986) suggest that the effect can depend on the environment in which firms operate. As the estimations show, the impact on long-run

[140] Technically, market share should be measured as firm *i*'s sales in industry *J* divided by total sales in *J*. However, AMADEUS does not provide information about the diversification of firm activity in different NACE industries. Since the majority of firms in the present study are small and therefore presumably not greatly diversified, the formula used here should be an adequate measure of market share.

profitability is significantly positive in Italy and Spain. However, with regard to the Belgian food industry, a higher MS leads to a decrease in short-run persistence (as indicated by the coefficient of MS*$\pi_{i,t-1}$) and therefore stronger profit fluctuation.

Firm age (Age) calculated by means of incorporation dates can account for life-cycle effects. One might expect that ageing decreases costs due to learning effects within the firm and learning spillovers from other firms. In contrast, Majumdar (1997) suggests that increasing age can lead to inertia and bureaucratic ossification which in turn leads to a reduced capacity of reaction to changing economic circumstances and thus to higher profit fluctuations and lower short-run persistence. This seems to hold for the Belgian and the French food industry where age has a negative impact on short-run persistence. In addition, Loderer and Waelchli (2010) show that the relationship between firm age and profitability is negative. They argue that corporate aging is attended by organizational rigidities, slower growth and assets which become obsolete with time. Loderer and Waelchlis's results also seem to hold for the French food industry where age has a negative impact on long-run profit persistence.

The relationship between firm size (Ln TA) measured as the logarithm of total assets and firm profitability has not always been unequivocal. In a recent study, Goddard, Tavakoli and Wilson (2005) find evidence for the inefficiency of large firms in the case of diseconomies of scale. However, the opposite holds for the food industry, since firm size has a significant positive impact on short-run persistence in France, Spain and the UK. In addition, the effect on long-run persistence is significantly positive in Belgium. 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, furthermore, tend to be less affected by administrative burdens such as pre-market approval[141] or the handling of EU legislation regarding, e.g., food safety, animal welfare or packaging and labeling.

The impact of firm growth (Gr. TA) measured as the growth rate of a company's assets is, however, mainly negative. Spain and the UK show significant negative coefficients for short- and long-run persistence. For Italy, the impact on short-run persistence is significantly negative. If firms aim to grow through diversification because they have exhausted growth in their original field of action, a negative impact of growth on long-run profitability may result. Dorsey and Boland (2009), e.g., find that the diversification of food

[141] In particular, pre-market approval for new additives, novel foods, genetically modified organisms (GMOs) and health claims are out of reach for the majority of small food processors in the EU (Wijnands, van der Meulen and Poppe, 2007).

processors in unrelated activities outside the food economy is unsuccessful. The negative impact on short-run persistence might be a result of increasing profit fluctuation due to the high costs of growth.

Two risk proxies, one for short-run risk and one for long-run risk could be derived from AMADEUS. 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 shareholder funds. According to risk theory, firms with higher risk should have, on average, a higher profit level. In strategic management literature, however, a negative relationship between risk and returns, also known as the Bowman's (1980) 'risk-return paradox', seems to be a long-established fact (e.g. Andersen, Denrell and Bettis, 2007). In contradiction with risk theory but reinforcing Bowman's 'risk-return paradox', the impact of firm risk appears to be negative. Both risk measures have a negative impact on long-run persistence in Belgium, France and Spain confirming the negative risk profitability relationship already found in previous literature (e.g. Ben-Zion and Shalit, 1975; Gschwandtner, 2005). Additionally, taking higher risks is expected to increase fluctuations in firm profitability, leading to a decrease in short-run persistence. The latter could be detected for Belgium and Spain. However, some puzzling results arise for France where the gearing ratio has a positive impact on the short-run value and the UK where an increase in the reciprocal of the current ratio leads to increasing short-run persistence and thus less profit fluctuations.

Industry characteristics were constructed from Eurostat's (2010) 'Annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing'.

Concentration is the industry characteristic one would most likely expect to affect the level of profit persistence. In the present study, concentration is measured by the Herfindahl-Hirschman Index (HHI) which is calculated as the sum of the squared MSs of the 50 largest firms in each 4-digit NACE industry. Firms in industries characterized by high concentration might have the ability to prevent entry, leading to a higher degree of long-run profitability and smaller fluctuations. However, there is also the possibility that high concentration leads to very strong rivalry between a few firms resulting in a negative impact on persistence. The results show, that the former holds for the Belgian food industry while the latter appears to be the case in France.

Industry size (NF) is measured by the number of firms in an industry, and industry growth (Gr. NF) is measured by the corresponding growth rate. The effect on profit persistence is, however, ambiguous at the theoretical level. On the one hand, in larger industries with rapid growth, the ability of incumbents to maintain their MSs might decrease, leading to a reduction of oligopolistic discipline with stronger competition, higher profit fluctuations and a low long-run profit level. On the other hand, if industries grow and reach a particular size due to increasing demand, the pressure for firms to reduce prices in order to reach an increase in sales is reduced and therefore high long-run profits and smaller fluctuations might result. The results indicate that firms operating in large and fast-growing industries in Belgium and France are characterized by lower short-run persistence and thus higher profit fluctuations. However, the impact on long-run profit persistence is mainly positive. For Spain both industry size and growth lead to an increase in long-run persistence. Firms operating in large industries in France obtain higher long-run profit values, while Belgian firms operating in fast-growing industries show lower long-run values.

Research and development (R&D) measured by the 'share of R&D expenditure in total industry value added' might account for some of the differences in profit persistence. It has to be recognized, though, that R&D in the food industry has a different character from R&D in, for example, the electronics industry. Conventional foods and beverages have been in this world for a long time and the invention of completely new ones is rather unusual. Overall, innovation tends to be 'more process, marketing and management oriented and less a technology push based on science' (Wijnands, van der Meulen and Poppe, 2007: 11). In general, one might expect that R&D is a basis for product differentiation and for the creation of entry barriers. Waring (1996) finds that industry-level R&D intensity has a positive impact on short-run persistence. Surprisingly, R&D has a negative influence on short-run persistence in Belgium and France. These results corroborate Stewart-Knox and Mitchell's (2003) findings that the vast majority of new food products (72-88 %) fail. However, only 7-25 % of these newly launched food products can be considered as being truly novel. Hoban's (1998) results emphasize that the failure rate of truly new products is only 25 %, which might explain to some degree the negative impact of R&D. In their analysis of the impact of retailer concentration on product innovation in German food manufacturing, Weiss and Wittkopp (2005) find that, as a result of retailers' upstream market power, food processors achieve lower profits, which reduces their incentive for cost-intensive product innovation. Baumol (2010) shows how the over-optimism and prospects of psychic compensations of R&D activity can lead to the under-payment of innovative entrepreneurs.[142]

[142] The negative influence of R&D might be reinforced by the fact that R&D during period *t* is used to explain persistence in *t*. Even though the time span until economic returns of R&D occur is expected to be rather short in the food industry, it is likely that the benefits of R&D will not occur in the same period. Therefore, lagged R&D

As expected, retailer concentration measured by the five-firm concentration ratio[143] negatively affects short-run persistence in all countries except the UK, underlining the assumption that pressure on the part of retailers increases profit fluctuations. However, the impact of retailer concentration on long-run persistence is not significant. This result is surprising since the bargaining power of retailers is reinforced by an increasing importance of private labels, which achieve a MS of 27 % in the European food sector[144] (Datamonitor, 2006). Regarding the five countries under analysis Italy has the lowest MS of private labels in 2009 (17 %) followed by France (34 %), Spain (39 %) and Belgium (40 %). With 48 % the highest share of private labels in the EU is found for the UK (European Commission, 2011). It would thus be interesting to assess the impact that the share of private labels has on profit persistence in each country. However, due to data limitations - values are barely available for the analyzed period - this variable could not be incorporated.

While studies based on the two-step standard approach in general report rather low values of R^2 (e.g. Gschwandtner, 2005), Gschwandtner and Crespo Cuaresma (2013) stress that the results of the dynamic panel model are in general more robust. For example, Gschwandtner (2012) provides results based on the same dataset with very low R^2 values for the standard methodology and rather high R^2 values using a GMM dynamic panel estimation method. However, the Arellano and Bond GMM estimator implemented in the present study does not provide R^2 values. Nevertheless, other parameters describing the model fit are available and confirm the overall fit of the models.

In fact, the Wald test, which indicates the joint significance of the independent variables, is significant at the 1 % level or less for all countries and thus confirms the overall fit of the models. All other model diagnostics are also proper. For none of the models the null hypothesis of no second-order serial correlation is rejected, which is an important requirement for the Arellano and Bond estimator being consistent (Arellano and Bond, 1991). Based on the results of the Sargan-Hansen test of overidentification restrictions, lags of second order or higher are used as instruments for the transformed endogenous variables. The Sargan-Hansen test does not reject the null hypotheses that the instruments are implemented in an adequate

should ideally have been used. However, due to the rather poor data availability of R&D and the short period analyzed, this approach seemed to be disadvantageous.

[143] Here, the five-firm concentration ratio had to be used since data on the Herfindahl index was not available for the food retailing sector.

[144] Data for 2006.

way in any model except for France. Here, the statistic remains significant even after various attempts of instrument specification have been implemented.[145]

6. Conclusion

This analysis of profit persistence in the European food industry indicates that, in general, profits converge towards a competitive norm. Nevertheless, a considerable degree of persistence can be found, as the impact of past abnormal profits on today's abnormal profit is significant at the 1 % level in each of the five countries under investigation. This implies that abnormal profits persist from year to year and that the process of convergence is incomplete. The results reveal that short-run profit persistence is highest in the UK, followed by Spain and France, and lowest in Italy and Belgium.

It was shown that young, large firms in particular, which are also characterized by low risk, are the ones earning high persisting profits. Additionally, the level of industry R&D expenditure has a negative impact on the degree of profit persistence in some countries while retailer concentration has, as expected, a negative impact on short-run profit persistence.

The most obvious difference to other manufacturing sectors is that profit persistence within the food industry is considerably lower, as indicated by the lower $\hat{\lambda}$ values. It has to be noted though, that exit of firms during the analyzed time span could not be considered, which is one of the limitations of the present study and - with a few exceptions (e.g. Gschwandtner, 2005) - of the profit persistence literature in general. This implies that profit persistence in the food industry could indeed be even lower. Nonetheless, this bias should be rather low as only 1.4 % of the firms in the database are reported as bankrupt under the period of investigation. The low $\hat{\lambda}$ values can be related to a high degree of market saturation, strong price competition and high concentration in the food retailing sector which exceeds 70 % in most EU countries (Wijnands, van der Meulen and Poppe, 2007).[146] Bargaining power of the retail sector is further reinforced by a high and still increasing share of private labels. As mentioned previously, this issue could not be incorporated due to a lack of available data, which is another limitation of this study.

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 is a very important matter in the food industry. Finally, the special nature of R&D and its negative

[145] Goddard, Tavakoli and Wilson (2005) also report significant Sargan test statistics for some of the countries analyzed in their study.
[146] Values refer to 2004.

influence on profit persistence in some countries has to be pointed out. Nevertheless, the negative impact of R&D on profit persistence should not lead to the wrong conclusion that R&D in the food sector is bad and should not be pursued or subsidized. On the contrary, it should lead to the conclusion that it is important to encourage and subsidize the 'right' innovations that lead to success within the food sector, namely truly new product innovations. Any measures taken to reduce concentration among retailers and to shift the market power from retailers towards producers as well as measures to increase collaboration between producers and retailers would also seem beneficial.

Appendix

Results of the standard two-step approach

This section reports the results of the standard approach according to equation (1). The two persistence measures $\hat{\lambda}_i$ and $\hat{p}_i$ have been estimated by means of OLS regression for each firm. The results are based on the extended version (e.g. Gschwandtner, 2005) which implements AR processes up to order four and afterwards decides based on the SBC which of the four models best describes the adjustment path. Short-run persistence $\hat{\lambda}_i$ is then defined as $\hat{\lambda}_i = \sum_{j=1}^{L} \hat{\lambda}_{i,t-j}$, where L is the number of lags of the 'best' AR process. Consequently the long-run profit rate becomes: $\hat{p}_i = \hat{\alpha}_i / (1 - \sum_{j=1}^{L} \hat{\lambda}_{i,t-j})$.

Table 43: Choosing between AR(1)-AR(4) based on SBC[a]

Country	AR(1)	AR(2)	AR(3)	AR(4)
Belgium	58.76	24.30	7.51	9.43
France	67.29	14.37	6.52	11.82
Italy	84.85	4.93	7.30	2.92
Spain	68.28	13.26	6.81	11.65
UK	64.36	15.96	6.38	13.30

[a] Percentages of firms for which the AR(1) to AR(4) is chosen based on the SBC.

The distribution of firms on AR(1) to AR(4) based on the SBC is summarized for each country in Table 43. The table reveals that even though the AR(1) is the model which best describes the adjustment path for the bigger part of firms, models with higher order lags are more efficient for a significant percentage of firms in all countries, thus justifying the best lag methodology.

Table 44 presents the mean values of $\hat{\lambda}_i$ per country. The highest mean value of $\hat{\lambda}_i$ can be found for the UK (0.232), followed by Spain (0.201) and France (0.188). The lowest short-run persistence is found for Italy (0.143) and Belgium (0.057). Hence, the ranking order corresponds with the short-run persistence values ($\hat{\lambda}$) estimated with the Arellano and Bond dynamic panel model.[147]

Table 44: Mean $\hat{\lambda}_i$ values per country

Country	Mean $\hat{\lambda}_i$
Belgium	0.057
France	0.188
Italy	0.143
Spain	0.201
UK	0.232

Again the values for the food industry turn out to be rather small compared to other studies based on entire manufacturing sectors. Goddard and Wilson (1999), e.g., give an overview of previous studies for entire manufacturing sectors based on the AR(1) model. For six of the seven countries considered, the mean $\hat{\lambda}_i$ values exceed 0.4.[148]

Table 45 provides an overview of the long-run profit persistence parameters per country. The percentage of long-run projected profit rates significantly different from zero in row one reflects the share of firms within each country that do not converge to the competitive norm in the long run. This percentage is around 40 % for all countries. Rows two and three reveal that for Belgium, France, Spain and the UK, the percentage of firms with a significantly positive $\hat{p}_i$ value is more or less similar to the percentage of firms with a significantly negative $\hat{p}_i$ value. For Italy, in contrast, the percentage of firms showing significantly negative $\hat{p}_i$'s is much higher than the percentage of firms with significantly positive values. This suggests that within the Italian food industry, competition forces operate better for firms with profits above the norm than for firms with profits below the norm. Overall, these results show that a significant proportion of the firms analyzed tend to earn profits both above and below the norm that persist in the long run.

The bottom row of Table 45 shows the percentage of equations with a $R^2 > 0.1$. For all countries except Italy, this share is larger than in previous studies[149], indicating that the best

[147] The values of the Arellano & Bond GMM estimator cannot be directly compared to the mean $\hat{\lambda}_i$'s of the AR processes due to the differences in methods.
[148] An additional overview with similar results can be found in Gschwandtner (2012: 180).
[149] For four of the seven countries analyzed in Mueller's (1990) study this percentage is smaller than 50 %.

lag structure has a greater explanatory power and is more efficient than the AR(1) model on which most previous studies are based.

Table 45: An overview of the long-run persistence parameter

	Belgium	France	Italy	Spain	UK
% of $\hat{p}_i$'s significantly different from 0[a]	38.0	39.0	38.3	42.0	40.4
% of $\hat{p}_i$'s significantly >0	20.6	18.1	11.5	21.7	18.6
% of $\hat{p}_i$'s significantly <0	17.4	20.9	26.8	20.3	21.8
% 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.

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Chapter 4: Persistence of firm-level profitability in the European dairy industry[150]

Abstract: Based on autoregressive (AR) models and Arellano-Bond dynamic panel estimation this article analyses profit persistence in the European dairy industry. The sample comprises 590 dairy processors from the following five countries: Belgium, France, Italy, Spain and the UK. The AR models indicate that cooperatives which account for around 20 % of all firms in the dairy sector are not primarily profit oriented. In addition, the results point towards a high level of competition as profit persistence is rather low even if cooperatives are excluded. The panel model reveals that short- as well as long-run profit persistence is influenced by firm and industry characteristics.

Keywords: profit persistence, competition, dairy industry.
JEL Classification: L12, L66, M21

1. Introduction

The competitive environment hypothesis postulates that profits below or above the competitive norm cannot persist in the long run. In the real world, however, profits diverging from the norm which are often referred to as 'abnormal profits' are commonly occurring. From a theoretical perspective, concepts that aim to explaining profit differentials have their origin in industrial economics. Bain's (1968) 'Structure-Conduct-Performance' (SCP) paradigm, which is the core of traditional industrial organization (IO), presumes that specific industry characteristics such as concentration, economies of scale, or entry and exit barriers have an influence on firm conduct and thus firm performance. Contrary to IO, the resource-based view (Barney, 1991) focuses on specific internal firm resources as a driver for abnormal profits. Due to its focus on firm characteristics, this theory is also known as the firm-view (FV). Within IO, persisting inter-industry profit differentials are feasible while the FV allows for persisting profit differentials among firms within a specific industry.

From an empirical point of view, extensive literature has emerged initially analyzing profit differentials only at a specific point in time (e.g. Schmalensee, 1985; Rumelt, 1991; McGahan and Porter, 1997, 2002; Schiefer and Hartmann, 2009). Another branch of studies

[150] This chapter is the first version of an article that has been submitted to an international agricultural economics journal as Hirsch, S. and Hartmann, M.: Persistence of firm-level profitability in the European dairy industry.

starting with Mueller's seminal contributions (1986 and 1990) are based on panels with larger time series dimensions, thus facilitating the investigation of persistence of profit differentials over time. Further important studies that emerged within profit persistence literature are, e.g.: Geroski and Jacquemin (1988), Kambhampati (1995), Goddard and Wilson (1999), McGahan and Porter (1999 and 2003), Glen et al. (2001), Maruyama and Odagiri (2002), Gschwandtner (2005), Cable and Mueller (2008) and Gschwandtner (2012).

While most of these contributions cover all manufacturing sectors, studies focusing on the food industry or its subsectors are still rare. Exceptions are the papers of Schumacher and Boland (2005) for the U.S. food economy and Hirsch and Gschwandtner (2013) for the EU food industry. Schumacher and Boland's (2005) results show that the level of persistence differs between the analyzed food subsectors (restaurant, retail, processing) but that for all subsectors industry persistence effects are greater than corporate persistence effects. Hirsch and Gschwandtner (2013) find that profit persistence in the food sector is in general lower when compared to the results of studies covering other manufacturing sectors. In addition, their results indicate that having sufficient scale plays an important role for firms in the food sector to achieve higher degrees of profit persistence. The present study adds to this literature by bringing evidence for the level and determinants of profit persistence in the European dairy industry[151].

Contributing 14 % of total EU-27 food industry turnover[152], the dairy industry is the third largest sector within the food industry following the meat and the beverage sector[153] (Eurostat, 2011). In 2008 the industry processed around 134 million tons of raw milk into a wide range of products, for both consumption and as supplements for the production of other food products or animal feeds (Eurostat, 2011a). An important characteristic of the sector is the fact that it is heavily regulated by the Common Agricultural Policy (CAP) and that interventions in the European dairy market are in flux. Milk quotas have been increased over the last years and the quota system, introduced in 1984, will be abandoned in 2015. In addition, intervention prices for butter and skimmed milk powder have been considerably reduced since 2005/06 while direct payments have been introduced to stabilize agricultural income. With EU dairy prices aligning more closely with world prices, price volatility for dairy commodities has increased considerably in the EU (Keane and Connor, 2009). While these fluctuations affect all firms in the EU dairy sector, the impact will be more pronounced

[151] Manufacture of dairy products regarding to NACE Rev. 1.1 group 155.
[152] Data for 2007.
[153] Since NACE 158 "Manufacture of other food products" actually would take first place regarding turnover in 2007 due to its broad definition, including a variety of large subsectors such as "Manufacture of sugar" or "Processing of tea and coffee" it was split into its 4-digit subsectors to eliminate this bias.

for those firms more dependent in their cost structure on the raw material milk and thus firms that primarily produce bulk products such as butter, milk powder or milk. Another feature of the EU dairy sector is the high number of cooperatives. As cooperatives in general pay out part of the profit to farmers, which are the owners of the cooperatives, via the price of raw milk, this likely will influence the results on profit persistence (Tacken, 2009).

The contribution of the present study is twofold. First, the analysis is based on a database which has nearly no restrictions regarding firm size and legal form. This is a crucial point for a study of the dairy industry where the majority of enterprises are either micro or small sized.[154] In addition, micro and small sized firms play an important role regarding competition within industries and therefore also for the examination of profit persistence. Second, while the autoregressive model of order one AR(1) has become the econometric workhorse of the persistence of profits literature, this study is based on an improved methodology at which autoregressive models up to order four are estimated for each firm and the 'best lag model' is chosen for further analysis. This approach is crucial, since the dynamics of firm profits can be more complex than what the simple AR(1) process can capture (Gschwandtner, 2012). Beyond that, a dynamic panel model based on the Arellano and Bond (1991) GMM estimator is used in order to determine the factors that have an influence on profit persistence.

The remainder of the paper proceeds as follows. Section 2 describes the methodology used to estimate profit persistence and its determinants. Section 3 gives a description of the data while section 4 presents the empirical results. Finally a conclusion is presented in section 5.

2. Methodology

Starting with Mueller (1986), the simple autoregressive process of order one AR(1) has become the econometric cornerstone of the empirical profit persistence literature.[155] The AR(1) is a simple regression of firm i's profit at time t ($\pi_{i,t}$) on its lagged value:

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

[154] According to Eurostat (2011) 94 % of the firms in the dairy industry are either micro or small sized whereat the classification is based on size classes according to the SME definition of the European Commission (2005).
[155] For an extensive description of the model see Mueller (1986 and 1990).

where $\varepsilon_{i,t}$ is a white noise error term with zero mean and constant variance and $\pi_{i,t}$ is firm profitability which is measured as the deviation from the competitive norm with the sample mean considered as the norm. Therefore, $\pi_{i,t} = ROA_{it} - \overline{ROA}_t$, where ROA denotes return on assets and $\overline{ROA}$ its mean across the sample of firms. This normalization removes the variations in profits which are induced by, e.g., business cycle and external influences with an equal impact on all firms. This implies that firm profitability can be interpreted as deviations from the competitive norm or as 'abnormal' profitability.

Similar to Gschwandtner (2005) the present study extends the classical methodology by estimating autoregressive processes up to order four for each firm (equation 1b) and afterwards using Schwarz-Bayesian Information Criterion (SBC) in order to decide which model best describes the adjustment path. The AR process with the lowest SBC is the 'best lag model' and is chosen for further analysis.

(1b) $$\pi_{i,t} = \alpha_i + \sum_j \hat{\lambda}_{ij} \pi_{i,t-j} + \varepsilon_{i,t}$$

where $j = \{1 \ldots . L\}$ is the number of lags of the 'best' AR process. This improvement is important as it allows for more dynamics in the adjustment path than the simple AR(1) and at the same time maintains comparability with most of the previous literature.

Equation 1a and 1b yield two profit persistence measures, respectively. The first one is the coefficient $\hat{\lambda}_i$ (or $\hat{\lambda}_i = \sum_j \hat{\lambda}_{ij}$ for the 'best lag model') which indicates the speed of convergence of profits to the long-run level. Since $\hat{\lambda}_i$ also reflects the fluctuations of profits from period to period, it can be interpreted as short-run persistence. A value of $\hat{\lambda}_i = 0$ implies that the competitive process works fast enough to completely erode abnormal profits within one to four periods. Small values of $\hat{\lambda}_i$ close to zero therefore imply that competitive forces on firm i are rather strong while persistence is low. On the other hand, $\hat{\lambda}_i = 1$ means that firm i is not affected by the competitive process and that persistence is complete. In the literature the mean value of $\hat{\lambda}_i$ across the analyzed firms has become the main measure for persistence (e.g. Mueller, 1990).

The second measure is long-run persistence. It is reflected by the long-run average of the AR(1) process (see equation 2a) or a higher order process (see equation 2b), respectively.

(2a) $$\hat{p}_i = \hat{\alpha}_i / (1 - \hat{\lambda}_i)$$

(2b) $\hat{p}_i = \hat{\alpha}_i / (1 - \sum_j \hat{\lambda}_{ij})$

This measure is the steady-state equilibrium value to which, according to the model, the series is ultimately heading and therefore indicates ‘permanent rents’, which are not eroded by competitive forces in the long run. The percentage of $\hat{p}_i's$ significantly different from zero in a given sample can therefore be interpreted as an additional indicator of the degree of profit persistence.

In order to assure stability, and convergence upon a finite steady state, $|\hat{\lambda}_i|$ has to be smaller than one. AR processes with $|\hat{\lambda}_i| > 1$ are implausible due to their explosive dynamics. Since the measure for long-run persistence $\hat{p}_i$ is not defined for unit root processes with $\hat{\lambda}_i = 1$ a panel KPSS test was employed in order to test for stationarity.[156]

Though the AR approach allows comparison of the results with most of the previous literature, it is based on the following shortcoming. It is assumed that the error term in equations (1a) and (1b) consists of a time-invariant component which includes all unobserved firm specific effects (η_i) and an observation specific error ($\nu_{i,t}$). Since $\pi_{i,t}$ is a function of η_i, it immediately follows that $\pi_{i,t-1}$ is also a function of η_i. Therefore, the independent variable in (1a) and (1b) is correlated with the error term even if serial correlation among the $\nu_{i,t}$’s is not present. This implies that the OLS estimator is biased and inconsistent (Baltagi, 2008). Therefore, a dynamic panel model based on equation (3) has been estimated using the Arellano and Bond (1991) GMM estimator[157] which is particularly suited for panels having a small time series dimension and a large number of firms:

(3) $\pi_{i,t} = \sum_j \alpha_j (X_{j,i,t}) + \lambda \pi_{i,t-1} + \sum_j \lambda_j (X_{j,i,t}) \pi_{i,t-1} + \varepsilon_{i,t}$

with $\varepsilon_{i,t} = \eta_i + \nu_{i,t}$.

Besides the autoregressive parameter (λ), which serves as the measure for short-run persistence within this framework, specific firm and industry characteristics (X_j) that are

[156] The custom to test for non-stationarity has its roots in macroeconomics, where specific variables can show explosive behavior. However, non-stationarity seems to be a far smaller problem for firm profit time series since competition is expected to prevent a permanent upward development of profits while a continuous downward trend will drive a firm out of the market. Nonetheless, the consequences of non-stationarity for profit persistence are very important and are extensively discussed in Crespo Cuaresma and Gschwandtner (2006).
[157] See, e.g., Baltagi (2008) for a detailed description.

expected to have an impact on profit persistence are integrated into the model.[158] Here, the λ_j 's indicate the effect of the firm and industry characteristics on short-run persistence while the direction of change in long-run profit persistence for a given change in the variables X_j is represented by the α_j 's.[159]

The Arellano and Bond GMM estimator uses first differentiation in order to remove the individual firm specific effects (η_i). This transformed equation can then be estimated using instruments from within the dataset. At this, the lagged dependent variable and the interaction terms with the lagged dependent variable are endogenous while all other independent variables are treated as exogenous similar to Goddard et al. (2005). The endogenous variables can then be instrumented by their lagged levels while the exogenous variables are instrumented by themselves (Roodman, 2009).

Despite the methodological shortcomings, the best-lag AR processes are estimated in order to assure comparability to previous literature since the autoregressive parameter of the dynamic panel model (λ) is not directly comparable with the mean $\hat{\lambda}_i$ values of the AR processes. The autoregressive parameter of the dynamic panel model (λ) shall serve as an additional indicator of short-run persistence.[160]

3. Data

ROA data was constructed from AMADEUS, a trans-European database of financial information provided by Bureau van Dijk. While most studies of profit persistence are based on time spans of about 15 to 25 years the present study is based on the 13 year period 1996 through 2008 since this is the longest available for the EU dairy industry.[161] As previously mentioned, firm profitability in year *t* ($\pi_{i,t}$) is measured as the firms ROA in year *t* normalized by mean ROA of that year whereas ROA is calculated as a firm's profit/loss before taxation and interest divided by total assets. To assure that ROA is independent of the

[158] Subsequent to the estimation of the autoregressive processes the preceding literature in most cases implements a second estimation step based on OLS regressions in order to determine the impact of specific firm and industry characteristics on the two persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$. However, these studies use mean values of the explanatory factors which leads to a tremendous loss of information. The panel structure therefore appears more efficient.

[159] A detailed description of the dynamic panel estimation in terms of profit persistence can also be found in Gschwandtner and Crespo Cuaresma (2013) or Goddard et al. (2005).

[160] The panel model does not provide the possibility to derive a long-run persistence measure such as the limit of the AR process ($\hat{p}_i$).

[161] Most previous profit persistence studies analyze whole manufacturing sectors or entire economies which makes data availability over longer time spans simpler than for specific sectors such as the dairy industry.

financial means used to create total assets, interest are added to the numerator.[162] The sample was constructed by choosing all firms active in the NACE classes 1551 (Operation of dairies and cheese making) and 1552 (Manufacture of ice cream) for which ROA data for the entire 13 year time span 1996 to 2008 were available. However, firm exit can be part of profit 'non-persistence', and eliminating firms with fewer than 13 ROA observations might therefore lead to a survivorship bias.[163] To prevent the results from being biased by outliers, observations in the top and bottom 5 % of the distribution in each year were dropped from the sample.[164] After screening, the sample contains 590 firms active in NACE 1551 and 1552 in the following five countries: Belgium, France, Italy, Spain and the UK. These countries were chosen by means of sample sizes and by total dairy industry turnover. Overall these five countries account for 51.6 % of total EU-27 dairy industry turnover in 2007 (Eurostat, 2011). The country selection also highlights the contrast between northern and southern countries as well as the contrast between continental and Anglo-Saxon countries. Germany, the largest raw milk producer in the EU (Tacken, 2009) could not be included in the sample due to a lack of data availability as a consequence of minor legal regulations regarding the publication of financial statements during the time span analyzed.

Most of the preceding studies only include firms of specific size (e.g. McGahan and Porter, 1999, 2003)[165] or use databases comprised only of publicly quoted firms (e.g. Schumacher and Boland, 2005). However, a characteristic of the EU food industry which also applies to the dairy industry is that the majority of firms (94 %) are either micro or small sized (Eurostat, 2011). For an analysis of the dairy industry, a minimum firm size criterion or a restriction to publicly quoted firms would disqualify a large number of firms. Although micro and small sized firms in the dairy industry only account for 16.7 % of industry turnover[166] (Eurostat, 2011), disregarding these firms would mean neglecting a special characteristic of the industry.[167] Compared to other databases, AMADEUS has the advantage that firms are

[162] Even though most previous profit persistence studies are based on *ROA* as a profit measure, it has to be noted that accounting data can be subject to criticism since it might be biased due to profit smoothing or cross subsidization of subsidiaries. See Grant and Nippa (2006: 66 ff), Fisher and McGowan (1983) as well as Long and Ravenscraft (1984) for a discussion on how well accounting profits reflect real economic profits.

[163] Nonetheless, due to the short time series of 13 years firms with fewer observations cannot be incorporated. See Gschwandtner (2005) for a study analyzing survivors and exitors separately.

[164] The elimination of a single *ROA* observation means that there is less than 13 years of data available for that firm leading to its overall elimination from the sample.

[165] These studies implement minimum firm size criteria based on specific balance sheet items. E.g. McGahan and Porter (1999, 2003) only include firms with at least 10 million US$ in total assets and in sales in their sample.

[166] Regarding the five countries analyzed in the present study. Data refers to 2007.

[167] However, it has to be noted that the estimation considers all firms in an equal way regardless of firm size a fact that has to be kept in mind when interpreting the results.

included regardless of firm size or legal form. The present study therefore incorporates firms of all size classes.

Table 46: Comparison of the sample with the population by size class, sub-sectors and countries (2007)

	Observations in the sample		Observations in the population	
	#	%	#	%
Size Class[a]				
Large	47	7.97	115	1.41
Medium	129	21.86	372	4.56
Small	215	36.44	1320	16.18
Micro	199	33.74	6350	77.85
Sub-Sectorss[b]				
1551	511	86.61	5869	71.95
1552	79	13.39	2288	28.05
Countries				
Be	72	12.20	411	5.04
Fr	178	30.17	1457	17.86
It	228	38.64	4325	53.02
Sp	81	13.73	1446	17.73
UK	31	5.25	518	6.35

Note: Values for the population were derived from Eurostat (2011).
[a] Size classes according to the SME definition of the European Commission (2005): Micro: < 10 employees and total assets < EUR 2 million; Small: < 50 employees and total assets < EUR 10 million; Medium: < 250 employees and total assets < EUR 43 million. Due to data availability firms in the population are size-classified by the number of employees while firms in the sample are classified by their total assets.
[b] Subsector is 4-digit NACE

Table 46 evaluates how well the sample reflects the population. Despite the fact that AMADEUS includes firms of all sizes micro sized firms are underrepresented in the sample. Table 46 also shows that the subsector NACE 1552 'Manufacture of ice cream' and the country Italy are underrepresented in the sample while the opposite holds for Belgium and France.

In order to determine the factors that have an impact on profit persistence, data on firm and industry characteristics which are expected to influence persistence are included in the analysis. AMADEUS provides data on the following firm-level characteristics which have been included as explanatory factors: Market share, firm age, firm size, firm growth, and two risk proxies. Data on industry characteristics that are expected to have an impact on persistence are constructed from Eurostat's 'Annual detailed enterprise statistics on manufacturing subsections DA-DE and total manufacturing' and AMADEUS. The following industry-level variables are included: concentration in the sector and at the retail level, industry size and growth as well as expenditure on research and development. To avoid repetitions these variables are explained when discussed in section 4.2.

4. Empirical results

First the results of the two persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$ are presented. Next, section 4.2 introduces and discusses the findings of the dynamic panel estimation, aimed at explaining profit persistence.

4.1. Profit persistence

The two persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$ were estimated for each firm in the sample using equation (1b). As previously mentioned, in order to assure convergence, only firms with $|\hat{\lambda}_i|$ smaller than one are considered in the analysis reducing the initial sample to 439 firms.[168] The KPSS test reveals that almost 86 % of the series in the reduced sample are stationary.[169]

Table 47 presents the distribution of the best autoregressive models based on the SBC and reveals that the AR(1) is the model which best describes the adjustment path for the majority of firms. However, for around 30 % of the firms an AR process of higher order describes the dynamics in profitability best, thus justifying the use of higher order lags.

Table 47: Choosing between AR(1)-AR(4)[a]

	AR(1)	AR(2)	AR(3)	AR(4)
#	304	58	43	34
%	69.25	13.21	9.79	7.74

[a] Percentages of firms for which the AR(1) to AR(4) is chosen based on the SBC.

Table 48 shows the frequency distribution of the short-run persistence measure $\hat{\lambda}_i$. Here, the large fraction of negative values (41 %) which considerably exceeds the share found in previous studies[170] is remarkable. Negative $\hat{\lambda}_i$ values indicate that profits fluctuate heavily

[168] 129 (21.86 %) of the firms were showing $\hat{\lambda}_i$'s outside -1 and 1. Furthermore, 22 firms with $\hat{p}_i$ values lying in the top and bottom 2.5 % of the distribution were removed from the sample since for $\hat{\lambda}_i$'s close to one $\hat{p}_i$ is poorly defined leading to extremely high values of the latter.

[169] See Table 53 in the Appendix.

[170] E.g. Gschwandtner (2012) finds for U.S manufacturing fractions of negative values between 8 and 14.5 %.

over time. According to Gschwandtner (2005) negative $\hat{\lambda}_i$ values can be commonly observed for small firms and those which are about to exit the market due to bankruptcy.[171] The large fraction of negative $\hat{\lambda}_i$ values could therefore be a consequence of the considerable share of small and micro sized firms in the present sample which are in general excluded in most previous studies. Additionally, due to the relatively short time span analyzed, it is possible that the sample contains a significant number of firms which are on the verge of exiting the market. Finally, recent CAP reforms which aim at opening EU agricultural markets to world markets have led to increasing price volatility in raw materials which may be reflected in more pronounced profit fluctuations and therefore low short-run persistence for those dairy firms for which the costs of raw milk account for a large share in total costs (von Ledebur and Schmitz, 2011).

Furthermore, Table 48 shows that the mean value of $\hat{\lambda}_i$ for the dairy industry is 0.094, thus indicating a very low level of profit persistence. Goddard and Wilson (1999) give an overview of previous results of profit persistence studies based on the AR model for manufacturing sectors of seven countries[172] presenting mean values for $\hat{\lambda}_i$ between 0.183 and 0.509.[173] Hirsch and Gschwandtner (2013) found for the entire food industry mean $\hat{\lambda}_i$ values of 0.057 in Belgium, 0.143 in Italy, 0.188 in France, 0.201 in Spain and 0.232 in the UK and concluded that short-run profit persistence for the food industry is rather low compared to other manufacturing sectors. Therefore, the mean $\hat{\lambda}_i$ value for the EU dairy industry of 0.094 is not only low compared to previous results analyzing entire manufacturing sectors but also lower compared to the entire food industry with the exception of Belgium. With 20 % the share of cooperatives in the dairy sector is higher than in other sectors. The question is whether the specifics of this legal form can explain the low mean $\hat{\lambda}_i$ value as well as the high share of negative $\hat{\lambda}_i$'s discussed earlier.[174] To investigate this hypothesis the differences between cooperatives and other legal forms are summarized in Table 48. The results provide support for the above hypothesis. While the mean value of $\hat{\lambda}_i$ is negative for cooperatives (-0.184) meaning that profits of these firms fluctuate heavily over time, the respective value

[171] Gschwandtner finds that the fraction of negative $\hat{\lambda}_i$'s is 20 % for firms exiting the market during the analyzed time span while the fraction for surviving firms is only 7 %.
[172] UK, France, Germany, U.S., Canada, Japan and India.
[173] Additionally, Glen et al. (2001) present results for manufacturing firms in seven emerging countries ranging from 0.221 in India to 0.421 in Zimbabwe, whereat Brazil showing a value of only 0.013 seems to be a lower outlier.
[174] According to AMADEUS the share of cooperatives in the population of the dairy industries in the five countries analyzed is 19 % while 20 % (88 firms) in the present sample are cooperatives.

for all other legal forms equals 0.163 and thus is comparable to the findings for the entire food industry obtained in Hirsch and Gschwandtner (2013).[175]

Table 48: Short-run persistence ($\hat{\lambda}_i$)

	Whole sample (n=439)		**Cooperatives (n=88)**[b]		**Sample w/o cooperatives (n=351)**[c]	
Interval [a]	$\#\hat{\lambda}_i$	%	$\#\hat{\lambda}_i$	%	$\#\hat{\lambda}_i$	%
-1 to 0	178	40.55	63	71.59	115	32.76
0 to 1	261	59.45	25	28.41	236	67.24
Mean $\hat{\boldsymbol{\lambda}}_i$	0.094		-0.184		0.163	

[a] Only $\hat{\lambda}_i$ values between -1 and 1 are considered in the analysis since only for these values convergence to the norm is assured.
[b] only cooperatives
[c] all firms except cooperatives

In order to further investigate the pattern of profit persistence, the firms in the sample were divided into six subgroups of equal size according to firm profits in the starting year of the analysis (π_{0i}). Table 49 shows the mean initial profits (π_{0i}), mean $\hat{\lambda}_i$'s and mean $\hat{p}_i$'s for each of the six groups. The majority of cooperatives are thereby in the groups with the lowest initial profits (groups 1 and 2). The findings reveal that though convergence of profits closer to the competitive norm takes place, profits persist to some degree. The latter is revealed by the fact that the group ordering stays the same in the long run with the exception of the first two groups, meaning that those firms earning initially the lowest/highest profits also tend to earn the lowest/highest profits in the long run. These results are affirmed by the correlation coefficient between initial profits and long-run profits, which is positive and significant at the 1 % level.

Usually one would expect a pattern, where mean $\hat{\lambda}_i$ values for the firms in the middle groups, whose initial profits are already close to the norm, should be relatively high compared to the respective mean values of the peripheral groups. The pattern depicted in Table 49, however, indicates fast upward convergence for firms with lower initial profitability and slower convergence for firms with high initial profits. Thus, competition in the dairy sector seems to quickly improve the performance of firms earning low initial profits[176] while it reduces above normal profitability at a lower speed.

[175] The difference between mean $\hat{\lambda}_i$ for all firms and the mean for all firms except cooperatives is statistically significant at the 5 % level based on a t-test.
[176] The fast improvement of below average profits could also be reinforced by the fact that firm exit cannot be considered by the analysis.

Table 49: Mean $\hat{p}_i$'s and $\hat{\lambda}_i$'s for subgroups (all firms in the sample)

# Obs.	Group	Mean π_{0i}	Mean $\hat{\lambda}_i$	Mean $\hat{p}_i$	$\rho\pi_{0i}; \hat{p}_i$
74	1	-10.48	0.0102	-2.85	0.181***
73	2	-3.86	-0.0655	-3.01	
73	3	-1.88	0.0062	-2.16	
73	4	0.47	0.1513	-1.81	
73	5	4.09	0.1766	-0.42	
73	6	12.40	0.2850	0.50	

$\rho\pi_{0i}; \hat{p}_i$ = correlation coefficient between initial profits (π_{0i}) and long-run profits($\hat{p}_i$).
***significant at the 1 % level

Table 50 presents the results for all legal forms except cooperatives.[177] Although, the group ordering with respect to initial and long-run profits does not stay the same, the respective correlation is again significant at the 5 % level. The mean long-run values are somewhat higher if cooperatives are excluded while the pattern of mean $\hat{\lambda}_i$'s per group also indicates in this case faster upward convergence for firms in low initial groups and slow downward convergence for firms in higher initial profit groups.

Table 50: Mean $\hat{p}_i$'s and $\hat{\lambda}_i$'s for subgroups (without cooperatives)

#Obs.	Group	Mean π_{0i}	Mean $\hat{\lambda}_i$	Mean $\hat{p}_i$	$\rho\pi_{0i}; \hat{p}_i$
59	1	-11.27	0.0849	-1.96	0.124**
59	2	-2.88	0.1200	-2.51	
58	3	-0.49	0.1002	-1.46	
58	4	1.97	0.1127	-1.45	
58	5	5.48	0.2334	0.47	
59	6	13.67	0.3287	0.08	

$\rho\pi_{0i}; \hat{p}_i$ = correlation coefficient between initial profits (π_{0i}) and long-run profits ($\hat{p}_i$).
**significant at the 5 % level

Table 51 provides more detailed information with respect to the long-run persistence measure ($\hat{p}_i$). For the complete sample, the share of long-run projected profit rates significantly different from zero is 41.2 % meaning that profits of these firms do not converge to the norm in the long run. However, the percentage of firms showing significant negative $\hat{p}_i$'s (31.4 %) is much higher than the percentage of firms with significant positive values

[177] The number of cooperatives in the sample is too small for a separate group analysis of these firms.

(9.8 %). Firms with significant positive long-run values presumably possess special advantages or are protected by entry barriers. On the contrary, firms with significant negative long-run values are probably hampered to exit the market due to sunk costs or other sorts of exit barriers. It must be noted, that a negative long-run value does not necessarily mean that a firm is making financial losses but only that the firm is making profits below the competitive norm which can indeed be larger than zero. Around 77 % of cooperatives show long-run projected profit rates significantly different from zero. However, all of these values are negative underlining the fact that these firms are not primarily profit oriented. For all other legal forms the share of long-run projected profit rates significantly different from zero is 32.2 % with 12.3 % of the firms showing long-run values significantly larger than zero. Regarding entire manufacturing sectors, Gschwandtner (2012) shows for the U.S. that around 30 % of the firms achieve long-run profits above the norm while 11 % of the firms have negative $\hat{p}_i$ values. Hirsch and Gschwandtner (2013) find for the entire food industry that in the five European countries analyzed around 40 % of the firms show significant $\hat{p}_i$'s with an equal portion of positive and negative values. Within the dairy industry the share of firms with $\hat{p}_i$'s significantly larger than zero is therefore smaller even if cooperatives are excluded from the sample.

Table 51: Long-run persistence ($\hat{p}_i$)

	All firms	Coop.[b]	All other[c]
% of $\hat{p}_i$'s significantly[a] different from 0	41.2	77.3	32.2
% of $\hat{p}_i$'s significantly[a] >0	9.8	0.0	12.3
% of $\hat{p}_i$'s significantly[a] <0	31.4	77.3	19.9
% of equations with $R^2 > 0.1$	49.9	15.9	58.4

[a] Significant at the 5 % level or less
[b] Cooperatives
[c] All other legal forms except cooperatives

The last row of Table 51 reveals that only for 16 % of cooperatives more than 10 % of the variation in profitability is explained by the autoregressive process. This raises suspicion that the AR approach, which is based on the assumption that firms are profit maximizers, is not suited to analyze cooperatives which can be assumed to be not primarily profit oriented. Among all other legal forms 58.4 % of the firms show R^2 values larger than 10 %. This share exceeds the one found in previous studies based on AR(1) processes, indicating that for all firms except cooperatives considering the best lag structure increases the explanatory power of the model.[178]

4.2. Explaining profit persistence

So far the results reveal a relatively low level of short-run profit persistence. Nevertheless, around one out of three firms in the dairy sector earns long-run profits above or below the norm. To better understand this issue, the main drivers of profit persistence must be identified. Table 52 therefore presents the results of the dynamic panel estimations based on equation (3) excluding cooperatives in the further analysis. The coefficient on lagged abnormal profits (λ) which serves in this model as the measure for dairy industry short-run persistence is equal to 0.174. Hirsch and Gschwandtner (2013) find values between 0.110 and 0.304 for the entire food industries of selected European countries using the same approach. Thus, similar to the AR model, the short-run value for the dairy industry in the dynamic panel model is of about the same size as the values for the entire food industry.[179]

The coefficients (α_j) show the impact of the explanatory variables (X_j) on long-run persistence while the coefficients (λ_j) of the interaction terms of the explanatory variables (X_j) with the lagged dependent variable (e.g., R&D*$\pi_{i,t-1}$) show their impact on short-run persistence.

Market Share (MS), which is measured as the ratio of firm sales to industry sales at the country level, is expected to be an important determinant of profit persistence. Many previous studies find a positive relationship between market share and profitability or profit persistence (e.g. Szymanski et al., 1993; Yurtoglu, 2004). In the present study, market share has as expected a positive impact on short-run persistence while its effect on long-run persistence is negative which is puzzling. This result might be due to the fact that in this study market share could only be measured as the share of firm *i*'s total sales in total sales in J, where J is the 4-digit NACE industry to which the firm is assigned.[180] However, firms are often not only active in one of the 4-digit NACE industries. Especially for the dairy sector recent studies indicate that the high price volatility has induced a higher diversification in the sector (e.g. Ife, 2012). This development is likely more pronounced among larger enterprises, e.g., those

[178] Mueller (1990) finds for four of the seven countries analyzed in his study based on AR(1) that this percentage is smaller than 50 %.

[179] Due to the difference in methods, the value of the dynamic panel estimation cannot be directly compared to the mean $\hat{\lambda}_i$ of the AR processes.

[180] Correctly market share should be measured as firm i's sales in industry J divided by total sales in J. However, AMADEUS does not provide information about the diversification of firm activity in different NACE industries.

with a higher market share. Unfortunately, AMADEUS does not provide information about this kind of diversification of firm activity. Diversification into other sectors reduces volatility of profits if the streams of rent in the different business segments are imperfectly correlated. This 'coinsurance effect' therefore increases short-run profit persistence (e.g. Qureshi et al., 2012). At the same time several studies show that diversification in sectors that are not directly linked to the primary area of operation can lead to a negative impact on profitability. Dorsey and Boland (2009), e.g., show that diversification of food industry firms in unrelated sectors outside the food economy has a negative impact on profitability. Thus, as far as market share is linked to diversification this could explain the results obtained for long-run persistence.

Firm age (Age) can be expected to lower the level and fluctuations of costs due to the realization of learning effects which may lead to higher long-run profits and smaller profit fluctuations. On the contrary, Loderer and Waelchli (2010) find a negative impact on profits which is caused by a corporate aging problem with organizational rigidities, slower growth, and assets which become obsolete with time. They also predict that corporate governance is perishing and CEO[181] pay is increasing as firms grow older. In addition, Majumdar (1997) supposes that firm age can lead to inertia and bureaucratic ossification which in turn leads to a reduced capacity of reaction to changing economic circumstances and thus to higher profit fluctuations. As Table 52 shows, the latter is supported by the results since firm age has a significant negative impact on short-run persistence.[182]

In a previous study by Hirsch and Gschwandtner (2013), firm size (Ln TA) measured by the logarithm of total assets turned out to be an important driver of profit persistence for food industry firms. The impact of firm size can first of all be attributed to a simple cost-scale effect (e.g. Ollinger et al., 2000).[183] However, in the dairy industry it seems that several

[181] This issue is mainly important for larger firms.
[182] The variable measuring the impact of firm age on long-run persistence (age) was dropped from the estimation due to collinearity.
[183] Nonetheless, in the case of diseconomies of scale firm size can as well have a negative impact on profit persistence (see, e.g. Goddard et al., 2005).

Table 52: Dynamic panel estimation of equation 3

Variable	**Coefficient**
$\pi_{i,t-1}$	**0.174 (5.19)*** **
MS * $\pi_{i,t-1}$	**0.001 (2.40)** **
Age * $\pi_{i,t-1}$	**-0.045 (-6.31)*** **
Ln TA * $\pi_{i,t-1}$	**0.136 (1.76)* **
Gr. TA * $\pi_{i,t-1}$	**0.006 (2.11)** **
Gear * $\pi_{i,t-1}$	**-0.000 (-1.85)* **
1/Curr * $\pi_{i,t-1}$	**-0.408 (-2.98)*** **
HHI* $\pi_{i,t-1}$	**9.060 (3.32)*** **
NF * $\pi_{i,t-1}$	-0.605 (1.40)
Gr. NF * $\pi_{i,t-1}$	**-2.211 (-4.77)*** **
R&D * $\pi_{i,t-1}$	**-1.961 (-7.76)*** **
CR5 * $\pi_{i,t-1}$	**-11.925 (-9.51)*** **
MS	**-0.000 (-2.02)** **
Ln TA	0.007 (1.44)
Gr. TA	**0.001 (2.14)** **
Gear	**-0.000 (-1.71)* **
1/Curr	**-0.023 (-2.99)*** **
HHI	0.177 (0.89)
NF	**-0.092 (-2.64)*** **
Gr. NF	0.014 (1.46)
R&D	0.024 (0.40)
CR5	**-0.137 (-2.94)*** **
Wald	$\chi^2(21) = 222.86$*** p=0.000
Hansen	$\chi^2(36) = 45.48$ p=0.134
AR(2)	z = -1.61 p=0.108

Dependent variable: $\pi_{i,t}$ (abnormal profit)
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. Industry variables: HHI = Herfindahl-Hirschman Index; NF = number of firms in industry divided by industry sales; Gr.NF = Growth rate of NF; R&D = Share of R&D expenditure in industry value added; CR5 = Five-firm concentration ratio of the retail sector.
Age was dropped from the model due to multicollinearity.
Numbers in parentheses are z-values based on robust standard errors.
***, **, * significant at the 1%, 5%, 10% level respectively.

additional factors play an important role for the impact of firm size on profit persistence. For instance, larger firms are more capable of countervailing the superiority of a highly concentrated retailing sector and are less affected by the handling of EU legislation.[184] It is only the largest firms that can afford to integrate food law as a tool in their business strategy, e.g., by employing staff responsible for legal affairs (Poppe et al., 2009). Similar to firm size firm growth (Gr. TA) measured as the growth rate of firm assets is in general expected to

[184] Especially the burdens coming along with pre-market approval for new additives, novel foods or genetically modified organisms (GMOs) are too severe for the majority of small food processors in the EU (Wijnands et al., 2007).

increase profits and the degree of persistence.[185] These points also hold for the dairy industry where firm size and firm growth significantly increase short-run persistence and firm growth has a significant positive effect on long-run persistence.

AMADEUS provides two risk proxies. The first one is short-run risk (1/Curr) which is measured by the ratio of current liabilities to current assets. This is equal to the reciprocal of the firms' current ratio.[186] Additionally, the firms' gearing ratio (Gear) calculated by the ratio of non-current liabilities plus loans to shareholder funds is used as a measure for long-run risk. Higher risk is expected to increase fluctuations in profits therefore leading to lower short-run persistence. In addition, risk theory states that higher risk should on average lead to higher profit levels. However, within strategic management it is an approved fact that the relationship between risk and profitability can be negative as summarized by the 'Bowman's risk-return paradox' (Bowman, 1980; Andersen et. al., 2007). Both risk measures have a significant negative impact on short- and long-run persistence, thus reinforcing 'Bowman's risk-return paradox' and the fact that higher risk increases profit fluctuations.

According to IO the persistence of abnormal profits can also be explained by industry factors. Concentration is the industry characteristic that is first and foremost linked to profit persistence. In the present study, the Herfindahl-Hirschman Index (HHI) is used to measure concentration. As regards the impact on profitability there are two different perspectives. Concentration can lead to entry barriers and high long-run profits as well as less fluctuations for incumbent firms. Using different considerations, high concentration can cause strong competition between a few firms leading to a negative relationship between concentration and the persistence measures. The results indicate that the former is the case for the dairy sector in the five EU countries under consideration as concentration turns out to significantly increase short-run persistence. No significant impact of concentration could be detected regarding long-run persistence.

Industry size (NF) is measured by the number of firms in an industry adjusted by the sales of the industry while the growth rate of this variable serves as a measure for industry growth (Gr. NF). A large number of firms in an industry might provide an indication for a high level of competition while an increase in the number of firms decreases the ability of incumbents to maintain their market shares, thus as well leading to stronger competition.

[185] However, if firms aim at growing through diversification in activities unrelated to the primary field of action, a negative effect on long-run profitability might be the consequence as suggested by Dorsey and Boland (2009). Diversification, however, should reduce risk hence leading to lower fluctuations in profits and therefore to higher short-run persistence. Nonetheless, growth is usually associated with high costs which might in turn lead to higher fluctuations in profits.

[186] The reciprocal was taken in order to make interpretation of the results easier since a high current ratio implies low risk and the other way around.

Therefore, both explanatory variables likely increase profit fluctuations and decrease long-run profit levels. As the results show, this is to some degree true for the dairy industry as the size of the industry has a negative effect on long-run persistence while industry growth has a negative impact on short-run persistence.

Research and development (R&D) is assumed to be an important driver of product and process innovation. Respective investments of a firm are in general expected to increase the firm's short- as well as long-run profit persistence. In fact, most previous studies (e.g. Waring, 1996) find a positive impact of a firm's R&D expenditure on profit persistence.[187] Due to data limitations we were only able to consider R&D at the sector level by using the 'share of expenditure for research and development in total industry value added' as a proxy. R&D at the sector level can be assumed to serve as an entry barrier in growing sectors thereby increasing short- and long-run profit persistence for the incumbent firms. In declining sectors it is an indication for the fight to stay in the market and thus an indication for the high level of competition in the sector. The dairy, cheese and ice cream industries fall in the second group. This is partly supported by the results since the impact of R&D on short-run persistence turns out to be negative for the dairy sector.[188]

Finally, retailer concentration (CR5)[189] was included in the model. As expected, CR5 has a negative influence on short- and long-run persistence indicating that high retailer concentration leads to strong bargaining power, putting processors under pressure. A high market share of private labels, which is larger than 25 % in most EU countries (Wijnands et al., 2007), further increases retailer bargaining power and is expected to reduce profit persistence. However, due to data limitations this variable was not included in the model.

The Wald statistic which indicates the joint significance of the independent variables is significant and thus confirms the overall fit of the model. All other model diagnostics are also proper. The correct implementation of the instruments is confirmed by the Hansen test

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[187] Innovations in the dairy sector are usually simple product variations in the form of new ingredients while marketing- and process innovation or the introduction of completely new products is of minor relevance (Tacken, 2009). As Steward-Knox and Mitchell (2003) show, only 7-25 % of launched food products are truly new while the rest are simple product extensions. It is well established, however, that the vast majority of these extensions (72-88 %) fail while the failure rate of truly new products is only 25 % (Hoban, 1998). Thus, it is difficult to predict whether the relationship between R&D and firm profitability also holds for the dairy sector.

[188] The negative influence might be reinforced by the fact that R&D during period *t* is used to explain persistence in *t*. Even though the time span until economic returns of R&D occur is expected to be rather short in the food industry, it is likely that the benefits of R&D will not occur in the same period. Therefore, ideally lagged R&D should have been used. However, due to the rather poor data availability of R&D, this seemed to be disadvantageous and attempts to implement first-order lags of R&D did not alter the results.
Hirsch and Gschwandtner (2013) also find for the whole food industry that the relationship of R&D and profit persistence is negative in most countries.

[189] Here the five-firm concentration ratio had to be used since data on the Herfindahl index was not available for the food retailing sector.

which does not reject the overidentification conditions. Furthermore, the test for serial correlation does not reject the null of no second-order autocorrelation which is an important condition for the consistency of the GMM estimator (Baltagi, 2008).

5. Conclusions

The present study analyzes profit persistence in the European dairy industry, one of the most important sub-sectors of the European food industry, which is characterized by considerable policy intervention and a high share of cooperatives (20 %) relative to other sectors. The results indicate that the majority of firms' profits converge towards the competitive norm. However, around 40 % of all firms are estimated to earn long-run profits partly above but mostly below the competitive norm indicating that the process of convergence is incomplete. This is further confirmed by a positive correlation between initial and long-run profits which is significant at the 1 % level. The results also reveal that short-run profit persistence measured by mean $\hat{\lambda}_i$ is lower compared to other manufacturing sectors and lower in comparison to the entire food industry. However, it has to be kept in mind, that firm exit could not be considered by the analysis. This is one of the limitations of the present study meaning that profit persistence could indeed be even lower.

The fact that most cooperatives (77 %) earn long-run profits significantly below the norm suggests that this legal form is not primarily profit oriented. Those enterprises were therefore excluded from the further analysis. This leads to short-run persistence values which are in the range of those for the entire food industry, although the fraction of firms earning profits above the norm in the long run (12.3 %) is still lower in the dairy sector compared to the entire food industry (20 %). Thus, the results provide evidence for a rather high level of competition and therefore indicate that the dairy sector is not objectionable under anti-trust law.

Regarding the drivers of profit persistence, the results of the dynamic panel model indicate that c. p. profit persistence is higher for large and young firms, with low risk factors. As expected industry characteristics revealing a high level of competition in the sector such as the number and growth of firms or R&D investment reduce profit persistence. The same holds for a high level of concentration in the retail sector which is an indicator of retailer's bargaining power.

From an entrepreneurial point of view the results imply that besides reaching a sufficient scale firms need to keep liabilities and assets in balance to reduce their risk exposure. From the perspective of policy, improvements on EU food legislation could be a useful measure in order to decrease administrative burdens especially for the large number of small enterprises. The results indicate at first sight no need for anti-trust measures as competition seems to work in the dairy sector. However, the findings clearly reveal that food retailer concentration has a negative impact on short and long-run persistence. Since concentration in the food retail sector exceeds 70 % in most EU countries[190] this sector has recently drawn special attention of competition authorities. At this, the emphasis was particularly put on retailer's buyer power vis-à-vis the producers (European Competition Network, 2012). Retailer power has been further strengthened in recent years by a high and still increasing share of private labels. This has induced an intensive debate focusing on the competition issues regarding private labels (e.g. Frank and Lademann, 2012). As mentioned above, due to a lack of available data this issue could not be incorporated which is another limitation of this study. While retailers see in private labels valuable alternatives for brands, producers of branded products criticize that private labels lead to an increase of power imbalance between the dairy industry and retailing. Since especially small and medium sized producers have to fear the delisting of their lesser-known brands as a consequence of private label introduction it is most likely that these producers have to reduce prices, thus implying a shift of profits from producers to retailers. In addition, if the introduction of private labels leads to a displacement of high-quality brands the overall quality of the product assortment may decrease. However, as retailers are directly linked to consumers the introduction of private labels can lead to a larger product assortment which better suits consumer preferences hence improving consumer welfare (Frank and Lademann, 2012). Thus, while increasing retailer bargaining power as a consequence of private label introduction further increases competitive pressure for producers and reduces the degree of profit persistence, the question in how far consumers may benefit from private labels remains debatable.

[190] Wijnands et al. (2007). With the exception of Italy and Greece were the CR5 is around 40 %.

Appendix

Table 53: Percentages of stationary series[a]

Sample	Percentage
Full sample	84.24
Firms with $|\hat{\lambda}_i|<1$	85.88

[a] Based on a KPSS test.

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