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Explaining the persistence of profits: A time-varying approach*

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Abstract

The present paper analyzes the determinants of profit persistence using a newly developed methodology that allows for the persistence parameter to vary with time. It therefore addresses a significant limitation of previous persistence models, which have assumed unrealistically that persistence is fixed over relatively long period of 20 years upwards. The concentration and the size of the industry are found to have a significant positive impact on profit persistence. However, at firm level, market share and risk have surprisingly a negative impact on profit persistence.

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JEL classification: L00, C22.

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1 Introduction

Since the late 1970s a growing and fruitful literature developed aiming at analyzing the persistence of profits and its determinants. The basic idea behind what later became known as the "*persistence of profits*" (POP), is that for reasons like entry and exit barriers, first mover advantages or external shocks firms might earn profits that are substantially above or below the norm over longer time periods. The main purpose of the POP literature is to study how fast and to what extent this exceptional positive or negative returns are reduced and to uncover the driving forces behind.

The present paper aims to use a newly developed methodology (Crespo and Gschwandtner *forthcoming*) in order to examine the influence of industry- and firm determinants upon profit persistence. The impact of industry and firm characteristics has been extensively analyzed before. Schmalensee (1989), Scherer and Ross (1990), and Martin (2002) are just three examples for surveys that summarize empirical studies analyzing the impact of industry and firm characteristics upon profitability. Although the main focus of analysis has usually been profit data from highly developed countries, some studies also analyze profit data from emerging markets (see for example Kambhampati, 1995, for India or Yurtoglu, 2004, for Turkey).

What all these previous studies have in common is the fact that for each company or industry just one profit persistence measure for the whole time-span has been estimated while the explanatory variables usually were just averages over the analyzed period. The present methodology allows for the profit persistence estimate to vary with time and to determine more precisely which industry or firm characteristics characterize a persistent profitable firm. Is it the ability of the firm to grow and to obtain a large market share or is it just the affiliation to a specific industry that makes a firm more successful? These are important questions that are of high interest equally to theoreticians and practitioners.

The paper contributes to the literature by addressing a significant limitation of previous persistence models, which have assumed unrealistically that persis-

tence is fixed over relatively long period of 20 years upwards. Instead of using the two-step procedure which is commonly applied in the literature, where time-invariant persistence parameters are estimated for individual firms the present paper exploits the time dimension of the dataset by estimating an autoregressive specification with interaction effects in the persistence parameters.

At industry level the results confirm the Chamberlinian hypothesis that predicts higher profit persistence in small and concentrated industries. However, at firm level the results are rather surprising: market share and risk are found to be negative determinants of profit persistence.

The structure of the paper is as follows. Section two presents the new developed methodology and its advantages compared to the main methodology used until now. Section three introduces the data and the empirical results. Section four concludes.

2 Profit persistence and firm characteristics: Methodology

Since the seminal contribution by Mueller (1986), the dynamics of company profits tend to be specified as an autoregressive process, usually of first order. Geroski (1990) provides a theoretical justification for such an empirical specification, based on the assumption that profits depend on the threat of entry in the market, which in turn depends on past profits. This implies that firm i's profit rate ($\pi_{i,t}$), defined as the percentage deviation from the average profit across firms in time t can be thought of as being the realization of the data generating process given by

$$\pi_{i,t} = \alpha_i + \lambda_i \pi_{i,t-1} + \varepsilon_{i,t}, \tag{1}$$

where λ_i (assumed in principle to lie in the (-1,1) interval) is the short-run persistence parameter and $\varepsilon_{i,t}$ is assumed to be a white noise disturbance term.[1] The unconditional expectation of $\pi_{i,t}$ (the long-run projected profit

[1] A number of contributions to the literature on persistence of profits deal with the existence of unit roots in profit data. Empirical investigations dealing with large sets of firms

rate for firm i) in (1) is given by $\pi_i^* = \alpha_i/(1-\lambda_i)$. While the competitive environment hypothesis would imply zero long-run projected profit rates, the empirical literature on modelling profit rates tends to find significant differences in π_i^* across firms. The aim of this study is to empirically assess the potential determinants of the differences in profit persistence, defined as both λ_i (short-run persistence) and π_i^* (long run persistence). In order to carry out such an analysis, a simple generalization of (1) is proposed, where both α_i and λ_i are functions of a set of economic variables, $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$, respectively, so that

$$\pi_{i,t} = \alpha(\mathbf{X_{i,t}}) + \lambda(\mathbf{Z_{i,t}})\pi_{i,t-1} + \varepsilon_{i,t}. \tag{2}$$

This specification allows us to evaluate the impact of changes in the variables included in $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$ on both short-run profit persistence, by studying the effect of changes in $\mathbf{Z_{i,t}}$ on $\lambda(\mathbf{Z_{i,t}})$, and long-run persistence, by analyzing the elasticity of $\alpha(\mathbf{X_{i,t}})/[1-\lambda(\mathbf{Z_{i,t}})]$ to the elements of $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$. If the relationships implied by $\alpha(\mathbf{X_{i,t}})$ and $\lambda(\mathbf{Z_{i,t}})$ are linear, (2) can be estimated directly using the variables in $\mathbf{X_{i,t}}$ as explanatory variables, together with interactions of the variables in $\mathbf{Z_{i,t}}$ with $\pi_{i,t-1}$.

Despite the simplicity of the specification in (2) for the case of linearity of the $\alpha(\cdot)$ and $\lambda(\cdot)$ functions, most of the empirical literature on the determinants of profit persistence uses a two-step procedure in order to estimate the effects of $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$ on λ_i and $\alpha_i/(1-\lambda_i)$. In a first step, (1) is estimated for each one of the profit series available. Using the estimates of λ_i and $\alpha_i/(1-\lambda_i)$ from (1), the effect of other variables on these measures of persistence are then estimated by regressing these estimates on the group of variables which are assumed to affect them. If the variables do have an effect on profit persistence in the form specified in (2), it is obvious that this procedure is suboptimal as compared to estimating (2) directly. In the first step, if (2) is the data generating process but (1) is estimated, $\hat{\lambda}_i$ will be biased due to omitted variables in the specification, and this will have also an effect on the estimates of the

tend to report that a significant proportion of the profit series present unit root behaviour. See Crespo Cuaresma and Gschwandtner (2005) for a brief survey of the literature on unit roots in profit data and a potential explanation of the source of nonstationarity.

effects of other variables on λ. The problem is especially serious if the effect of $\mathbf{Z_{i,t}}$ implies a time-varying λ_i but the scientist (since he or she just obtained a single λ_i per company) estimates the effect in the second stage making use exclusively of the cross-firm differences in $\mathbf{Z_{i,t}}$.

A small experiment allows us to grasp the quantitative effect that the two-step procedure could have on the elasticities of λ to the variables in $\mathbf{Z_{i,t}}$. Assume that the data generating process is given by

$$\pi_{i,t} = \alpha + (\lambda_0 + \lambda_1 z_{i,t})\pi_{i,t-1} + \varepsilon_{i,t}, \tag{3}$$

and that $\alpha = \lambda_0 = \lambda_1 = 0.5$ and $\varepsilon_{i,t} \sim N(0, 0.1)$. Let us consider two different experimental designs. In the first one, $z_{i,t}$ is constant for a given company i ($z_{i,t}$=z_i), and in the second one $z_{i,t}$ is time varying. The values of z are drawn from a uniform (0,1) distribution. We simulate 100 series of 50 observations of $\pi_{i,t}$, and estimate (3) both directly (that is, with an interaction of $z_{i,t}$ and $\pi_{i,t-1}$) and using the two-step procedure. Table 1 summarizes the results of 1000 estimations of λ_1, the effect of $z_{i,t}$ on the persistence parameter of $\pi_{i,t}$. The suboptimal efficiency of the two-step estimation can be easily recognized in the table. In the case of a constant z_i variable, the standard deviation of the estimate for the two-step estimation is three times higher than for direct estimation, and the estimate is biased by more than 1%. The problems of the two-step method are much more serious in the setting with a time-varying z_i variable, with a standard deviation which is more than 200 times bigger than in the case of direct estimation.

Table 1: Estimation of effects on persistence

	Constant firm specific z_i		Time varying firm specific $z_{i,t}$	
	Direct estim.	Two-step proced.	Direct estim.	Two-step proced.
Mean $\hat{\lambda}$ (% bias)	0.500 (0.015%)*	0.506 (1.251%)	0.500 (-0.002%)	0.491 (-1.856%)
Maximum	0.508	0.533	0.504	1.225
Minimum	0.491	0.473	0.495	-0.122
Standard dev.	0.003	0.009	0.001	0.214

For each setting (constant firm effects versus time varying firm effects) the results are based on 1000 estimations, each one based on 100 series of 50 observations generated by (3).
∗If we would have infinitely many series this bias would go asymptotically to zero.

3 Empirical setting and results

3.1 Variables affecting profit persistence

In this section we will estimate model (2) using profit data and both industry and firm characteristics for 156 US companies in the period 1950-1999. We will assume that the $\alpha(\cdot)$ and $\lambda(\cdot)$ functions are linear on $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$, respectively, so that the econometric specification can be written as

$$\pi_{i,t} = \alpha_0 + \sum_{i=1}^{\bar{x}} \alpha_i x_{i,t} + (\lambda_0 + \sum_{i=1}^{\bar{z}} \lambda_i z_{i,t})\pi_{i,t-1} + \varepsilon_{i,t}, \tag{4}$$

where some variables in the $\mathbf{X_{i,t}}$ and $\mathbf{Z_{i,t}}$ may be similar. Several variables at the firm and industry level have been identified in the literature as factors affecting profit persistence. The following variables were used as potential explanatory variables in the model given by (4).[2]

Concentration measures

Incumbents in highly concentrated industries might have the ability to prevent entry and therefore might be able to enjoy a higher degree of profit persistence. A positive relationship between concentration and different measures of profitability has been found in several studies. Gschwandtner (2005) finds a small and positive coefficient for the concentration variable when studying the determinants of profit persistence using US data. Yurtoglu (2004) also finds a significantly positive coefficient for the concentration variable when analyzing its impact on both short run and long run profit persistence measures, as does Kambhampati (1995) also, albeit at the 10% level of statistical significance. It should be noticed, however, that firms in highly concentrated industries might

[2]Although some other variables have been claimed to be related to profit persistence in the literature, data availability at the firm level limits our choice of potential explanatory variables to those described below.

want to hold prices low in order to retard entry. Scherer and Ross (1990) argue that it is not clear whether the relationship between profitability and concentration is a positive one, since companies in the industry keep prices high in order to increase profits, a negative one because they keep prices low in order to deter entry, or not significantly different from zero because the two effects cancel out. Ravenscraft (1983), Martin (2002), and Maruyama (1992) found for example that industry concentration had a negative impact on profitability when market share was also included as an explanatory variable in the model. Mueller (1986, 1990) adds to the studies finding a negative relationship between profitability and concentration for US data. It it is argued that nonprice competition increases with concentration and this lowers profits.

Industry size

One might expect that the larger the number of establishments in the industry the higher the volatility of profits, the stronger the competition and therefore the less profit persistence is to be found. In principle, a negative relationship between the two measures of persistence and the size of the industry is expected. Using US data, Kessides (1990) finds a negative relationship between the number of firms in an industry and the short run persistence of profits, however Gschwandtner (2005), using a larger dataset in the time dimension, does not find a significant relationship between size of the industry and profit persistence.[3]

Industry growth

Changes in the size of the industry may also be an important factor in explaining profit differentials, although its net effect remains ambiguous at a theoretical level. In industries with rapid growth it might be more difficult for incumbents to maintain their market share and oligopolistic discipline, and thus subsequently profits and their persistence might decrease. On the other hand, if output is growing fast, firms are not under pressure to reduce prices in order to increase sales and therefore profit differentials might be maintained over time. Empirical studies (see Kessides, 1990, and Gschwandtner, 2005,

[3]Kessides (1990) uses industry profit data.

for the US or Kambhampati, 1995, for India) tend to isolate this latter effect. Other examples of studies that find a positive relationship between industry growth and different measures of profitability are Comanor and Wilson (1974), Fisher and Hall (1969), Esposito and Esposito (1971) and Coate (1989).

Market share

Market share (MS) is maybe theoretically the most important firm-determinant of profitability. The relationship between market share and profitability has often been found to be positive and highly significant. One of the earliest efforts is due to Shepherd (1972). His main result is that market share has a significant positive effect on firm profitability and this result is supported by recent work using firm data. Mullin et al. (1995) find a small but significant impact of market share on the rate of return. Marion et al. (1979) find a strong and significant positive effect of market share on price. Several other examples could be given. However, if market share is a proxy for diversification the positive relationship might be reversed since most studies find a negative correlation between profitability and diversification.[4]

Firm's growth

The impact of the growth rate of the firm (GRWSales) on profitability is not always unambiguous but in general seems to be positive. In the present study growth is measured as the growth rate of the company's sales. Yurtoglu (2004) found a positive impact of firm's growth on long run profit persistence but significant only at 10%.

Firm's size

In order to control for size the total assets (Size) were also included in the regression. As in the case of sales growth the effect of size might be positive or negative. A big firm might have reached its present size because of constant superior performance. At the same time there is evidence of the inefficiency of large firms. Yurtoglu (2004) and Gschwandtner (2005) did not find a signifi-

[4]See for example Ravenscraft (1983) or Lang and Stulz (1994) and their citations.

cant impact of the size of the firm on profit persistence.

Risk proxies

Part of the differences in profitability and profit persistence may be due to differences in risk. Yurtoglu (2004) shows that Turkish firms with the highest profit rate are also those with the highest variability in accounting profits. However, if barriers to entry are strong then the possibility exists that firms with low variability in profits have also high profit rates. Gschwandtner (2005) finds a small negative coefficient of the risk measure, which is marginally significant. Mueller (1986) constructs one type of risk measure (among others) based on the covariance of a firm's returns with those of other firms. This risk measure has a negative and significant impact on profit persistence. The profits of companies with persistently above-normal returns seem to vary less over the business cycle than do the profits of the average firm and the profits of persistently below-normal companies exhibit greater than normal procyclical variability. Reverse causality between profits and risk may explain this result. Firms with low profitability are forced to take risks to try to raise their profitability levels and firms with persistent profits seem to be associated with lower risk. Mueller (1986) argues that if this reverse causality explanation for the negative association between projected profits and systematic risk is correct, then the negative coefficient of risk is further confirmation of the existence of persistent profit differences, and of the existence of permanent impediments to competition. Several other examples of studies that find a negative correlation between profitability and risk can be given: Ben-Zion and Shalit (1975), Bothwell and Keeler (1976), Bowman (1980, 1982) and Harris (1986).[5]

[5]Ideally, more industry and firm characteristics could have been used in order to explain profit persistence. Exports and imports have often been found to be related to profitability (see for instance Yurtoglu, 2004). Imports are expected to have a negative impact on persistence since they represent the most immediate new entry in the domestic markets and a high level of imports will reduce domestic margins. A large number of other firm characteristics have been found to be related to the persistence of profits. The share of exports in total sales has been found to have a negative impact on long run persistence (see Yurtoglu, 2004). Export oriented firms compete in international markets where systematic forces that erode rents might be stronger than in domestic markets. The age of a company,

3.2 Data description and empirical results

The dataset on company profits for US firms was compiled using Compustat, Global Vantage and Moody's Industrial Manual as sources, and it contains yearly data on profits for 156 surviving companies for the period 1950-1999. The sample corresponds to those firms among the largest 500 US manufacturing companies (in terms of sales) as of 1950 for which a complete time series on profits spanning the period 1950-1999 existed.[6] Profit (returns on assets) is defined as income over total assets, and throughout the study the profit rate of company i at time t ($\pi_{i,t}$) is defined as the relative deviation from the sample mean profit across companies at time t, in order to (at least partly) avoid business cycle effects. The Compustat variable name corresponding to the proxy for income is "Income before extraordinary items" and it represents the income of a company after all expenses, including special items, income taxes and minority interests, but before provisions for common and/or preferred dividends. Total assets includes current assets plus net property, plant and equipment plus other noncurrent assets.

The firm level data contain the following firm characteristics used to explain profit persistence: market share (MS), the volatility of the profit rate (RISK), the size of the company (measured in the value of assets, ASSETS) and the growth rate of the company's sales (GRSALES). The way the firm character-

calculated as the logarithm of the number of years from its foundation, can account for life-cycle effects. There are also several variables related to ownership and control that have been found to be related to profit persistence. Khanna and Rivkin (2001) show that the business group affiliation raises profitability in emerging markets. Yurtoglu (2004) finds also a positive impact of the business group affiliation on profit persistence. Yurtoglu (2000) finds a small but significant negative impact of concentrated ownership on the return on assets of listed Turkish companies. The percentage of equity capital owned by the largest owner seems to have a negative impact on profitability. Advertising and research and development set up entry barriers for new firms and therefore enable high profits for incumbents over time. Mueller (1986) finds that mergers have an averaging effect on companies profitability. Several other examples of firm characteristics could be given. Unfortunately data for these variables were not available for the whole time span.

[6]The sample ends in 1999, as this the year for which data are available for all companies of the sample. Although Compustat provides information for some firms until 2005, we decided to use a balanced sample with the same number of observations for each company.

istics are calculated is described below, together with the results from some empirical studies using these variables to explain profitability and profit persistence.

The only industry characteristics for which it was possible to obtain (non constant) data for a time period of this extent are: concentration (CR4, percentage of industry output produced by the largest 4 firms in the industry), size (NFIRMS, number of firms in the industry, VS, value of shipments) and growth of the number of firms. These variables are sourced from the Census of Manufacturing Bulletin, Concentration Ratios in Manufacturing. For the years 1947-1992 a summarized document could be downloaded from the economics archive of the College of Wooster, Ohio.[7] The data for 1997 are available online at the official Census Website.[8] From 1997 onwards, the Census data follow the new NAICS industry definitions rather than the previous SIC definitions. Therefore, the SIC code found in Compustat had to be translated into the NACIS code using a NACIS/SIC Codes Conversion Table.[9] The Compustat data exist on a yearly basis and the Census data are collected every five years. For the industry variables, yearly data were obtained through linear interpolation. In addition to cross-firm variability, the present study therefore exploits the time dimension of the variation in both industry and firm characteristics for the sample.

Table 2 contains descriptive statistics for the variables used. An interesting feature is that although the mean and median profit rate are very close to zero, the median is negative suggesting that many of the companies in the sample had a profit rate below average. The high volatility of the profit rate in the last 20 years, mostly caused by the merger wave of the eighties, can be held responsible for this result. There is also another explanation for this rather unexpected feature of surviving companies. Mueller (1986, 1990) argues that if average return contains monopoly rents, then the competitive profit rate should be below the mean.

[7]Available at http://www.wooster.edu/economics/archive/indconc.html.The matching of the firms to the industries was done using the SIC codes of the companies.

[8]Available at http://www.census.gov/.

[9]Available at http://www.loglink.com/sic.asp.

Our descriptive statistics contain also another rather surprising result. While CR4 is 42 based on 100, the implied MS is 62. How can one firm on average account for a greater fraction of industry sales than the top 4? The answer lies probably in the fact that our MS measures diversification. We will bring further evidence to sustain this assertion.

Table 2: *Descriptive Statistics*

Variable	*Mean*	*Med.*	*StD.*
π_{it}	0.001	-0.033	1.095
CR4	42.382	40.5	19.513
GRSALES	0.095	0.082	0.194
MS	0.621	0.718	0.382
RISK	0.744	0.551	0.584
VS	18385017.8	6916050	36446679.6
NFIRMS	2619.38	655	9046.831
SIZE	6.524	6.557	6.524

π_{it}=Profit rate, CR4=Percentage of industry output produced by the largest 4 firms in the industry, GRSALES=Growth rate of firm's sales, MS=Market Share (Firm Sales/Industry Sales), Risk=Volatility of the profit rate π_{it}, VS=Value of shipments classified in the industry, NFIRMS=Number of firms classified in the industry, SIZE=Size of the Firm (Logarithm of Total Assets measured in Millions of Dollars).

We estimate equation 4 using the full set of available variables as potential covariates of the persistence measures. The results are presented in Table 3 for different specifications and correspond to models including only significant variables (insignificant variables were iteratively excluded from the estimation until a model was reached that contained only significant covariates).

Table 3: *Regressions Explaining Short-and Long Run Persistence.*

Variable	Common inter.	Fixed eff.	Ind. fixed eff.	Ind. + firm var.	AR1 fixed eff.	AR1 ind. + firm var.
Inter.	0.013(0.010)		-0.005 (0.044)		0.542^{**}(0.244)	0.221^{**}(0.09)
$\pi_{i,t-1}$	0.667^{***} (0.009)	0.538^{***} (0.010)	0.435^{***}(0.026)			
CR4 $\times \pi_{i,t-1}$				0.005^{***} (0.0004)		0.003^{***} (0.001)
GRSALES $\times \pi_{i,t-1}$			-0.207^{***}0.037	-0.123^{***} (0.037)	1.084^{*}(0.651)	1.423^{**}(0.560)
MS $\times \pi_{i,t-1}$			0.184^{***} 0.027	0.121^{***} 0.024	0.088(0.06)	0.057(0.052)
RISK $\times \pi_{i,t-1}$			-0.107^{***} (0.013)	-0.032^{***} (0.008)	0.005(0.040)	0.019(0.034)
VS/10^9 $\times \pi_{i,t-1}$				-1.7^{***} (0.33)		$-1.16E-9^{*}$(0.6E-9)
NFIRMS/100 $\times \pi_{i,t-1}$				-0.001^{***} (0.000)		$2.09E-6^{*}$(1.08E-6)
SIZE $\times \pi_{i,t-1}$			-0.023^{***}(0.006)		0.004(0.019)	
GRSALES			0.550^{***}(0.050)	0.597^{***} (0.053)	4.334^{**}(1.852)	22.158^{***}(6.597)
MS			-0.058^{**}(0.029)	-0.079^{***} (0.026)	-0.211(0.166)	-0.492(0.602)
NFIRMS/100				-0.0001^{***} (0.000)		-5.892(9.753)
RISK			-0.153^{***}(0.019)	-0.088^{***} (0.018)	-0.069(0.108)	-0.135(0.419)
SIZE				0.011^{**} (0.005)		-0.148 (0.180)
Adj. R-squared	0.437	0.471	0.498	0.467	0.09 (λ), 0.30(lrpp)	0.08 (λ), 0.06(lrpp)
F-stat.	5931.0^{***}	44.7^{***}	136.2^{***}	540.0^{***}	$1.58^{**}(\lambda)$,$3.38^{***}(lrpp)$	$3.3^{***}(\lambda)$,$2.4^{**}(lrpp)$
Observations	7644	7644	7644	7382	156	156

As a reference, the first column of Table 3 presents the persistence estimates resulting from estimating a common AR(1) process to the full panel and the second panel presents the estimates of an AR(1) model with fixed effects.[10] These simple models are relatively successful in explaining profit rate differences across firms and in time, but contain no information about the effects of economic variables on profit persistence. The third column presents the estimates of a model with fixed industry effects and industry-specific short run persistence parameters, coupled with effects of variables at the firm level. The fourth column presents the results of the model exclusively with industry and firm variables (but without fixed effects).

The last two columns mirror the results in column three and four using the "classical two-step methodology". Column five presents the results of the two-step estimation using industry fixed effects and firm variables and column six presents the results using firm and industry variables. In general the results using the two-step methodology are similar but less significant. The adjusted R^2 is much smaller and the coefficients either have the same sign but are less significant or are not significant at all. There is just one exception: the effect of GRSALES on λ is now positive and significant while it is negative and significant when using the direct estimation.

It has to be stated that the industry SIC codes might not be a perfect indicator of industry affiliation. Some companies are active in more than one industry and during this long time period might have changed their main line of business. Nevertheless the SIC codes are an indicator of the industry in which the main production of the companies is at the moment. Mueller (1986) finds that roughly 30% of the variance in long-run projected returns was explained by the industry participation vectors. However, recent empirical evidence of the importance of industry determinants is poor. Yurtoglu (2004) and Gschwandtner (2005) find that industry dummies explain less than 26% of the total variation in the permanent profits. The reason might be the fact that the competitive

[10]Panel unit root tests give systematic evidence against the existence of a unit root in the panel of profit data.

process is probably far more localized than the three- or four-digit industry classification suggests and of course the fact that industry participation might have been measured with errors. In our sample, industry effects do seem to play an important role in explaining differences in profitability since industry dummies explain almost 50% of the variation in profits (third column). The inclusion of industry fixed effects in the intercept and the persistence parameter does not affect the results of firm-specific variables on profit rates and profit persistence, as the comparison of column three and four show. This implies that the effects picked up by the firm-level variables are not a result of industry-specific differences, but of differences at the company level. The fact that the firm variables analyzed stay highly significant when including industry dummies pleads for the robustness of the results.

As discussed before, the effect of concentration on profit persistence is not unambiguous and depends on the price policy of the firms in the (concentrated) industry. In the present study the estimated coefficient of the interaction of the lagged profit rate with our concentration measure (CR4) is positive and highly significant. This is in concordance with the more intuitive view that incumbents in highly concentrated industries are able to prevent entry and therefore seem to enjoy a higher degree of (short and long run) profit persistence. The estimated *ceteris paribus* effect of CR4 on long-run projected profits is positive, since the only significant effect found for the sample is the one described above for the short-run persistence parameter.

The effect of the size of the industry (VS and NFIRMS) on short-run persistence appears negative and significant. This result is consistent with the result for concentration and is similar to the result obtained in Mueller (1990) for the US. Notice that the results for CR4 and the size variables lend support to the Chamberlinian hypothesis (see for example Scherer, 1980, and Kessides, 1990), namely that in an industry of small size, firms are bound to accept their mutual strategic interdependence and therefore maintain oligopolistic discipline. Given the estimated effects of the size variables on α and λ, the effect on the long run projected profit rate is unambiguously negative.

Turning to firm-specific covariates, the impact of the market share (MS) on

short-run persistence appears positive and highly significant, implying that profit shocks to companies with higher market shares disappear more slowly than those for firms with low market share.[11] Notice that MS affects the profit rate negatively through the effect on α, and that the net *ceteris paribus* effect on the long run projected profit rate is actually negative. This implies that firms with a high market share converge to relatively lower profit levels. A plausible explanation for this phenomenon is related to the high correlation between product diversification and market share. The profits of diversified firms may take longer to move to equilibrium values, since it requires movements in many industries. At the same time many studies have found a negative relationship between profits and diversification. The view that focus is necessary for business success has recently gained quite widespread support in the international empirical literature. [12]

RISK is also a significant variable in explaining differences in the level and persistence of profits for our sample. The impact of risk on short and long run persistence is negative and highly significant. The result may be surprising if it is hypothesized that above-normal profits persist because of the existence of above-normal risks, however, these results are consistent with those reported in Mueller (1986) and several other empirical studies in the profit persistence literature. The estimated coefficients of the growth rate of the company (GR-SALES) has an opposing effect on short- and long run persistence. While the net effect on long-run persistence is positive, the effect on short-run persistence is negative. The negative effect on short-run persistence indicates that

[11] Admittedly, the ratio of firm's sales to industry sales is a rather poor proxy for market share, even if commonly used in the literature. Many firms are diversified and moreover, many changed their main products during the 50-years period. Furthermore, if the sample contains only a few firms from one specific industry, their market share might be exaggeratedly high.

[12] For example Copeland and Weston (1992) and Galai and Masulis (1976) argue that the positive valuation effect of combining two firms with imperfectly correlated income flows, and so reducing default risk, is illusory and involves changing the relative positions of bond and equity holders. They show that the value of the company's equity is therefore consequently reduced. Levy (1991) suggests that diversification may destroy value by inferring with shareholders' ability to diversify their portfolios.

firms that are growing fast have a low speed of adjustment to the norm.[13] The results for SIZE in the model without industry fixed effects imply that large firms converge to relatively higher profits in the long-run.

4 Conclusions

The literature on profit persistence has identified several variables, both at the industry and company level, that may help explain differences in the dynamics of company profits. In this study, we analyzed empirically the effects of several company and industry-specific variables on profit persistence for the longest sample available of profit data for US companies, spanning data for more than 150 firms over a period of 50 years. Instead of using the two-step procedure which is commonly applied in the literature, where time-invariant persistence parameters are estimated for individual firms and differences across these persistence parameters are explained using time-invariant industry and company variables, we exploit the time dimension in our dataset by estimating an autoregressive specification with interaction effects in the persistence parameters.

We find significant effects of concentration and industry size which confirm the Chamberlinian hypothesis, that predicts more profit persistence in relatively small and concentrated industries. At the company level, proxies for market share, firm growth, firm size and profit volatility appear as significant determinants of short and long run profit persistence.

References

[1] Ben-Zion, U. and Shalit, S. S., (1975). Size, Leverage and Dividend Record as Determinants of Equity Risk. *Journal of Finance*, September, 30, 1015-26.

[13] Yurtoglu (2004) also documents a negative impact of sales growth on the short run profit persistence (albeit not significant) and a positive impact on long run persistence for Turkish data.

[2] Bothwell, J. L. and Keeler, T. E., (1976). Proifts, Market Structure, and Portofolio Risk, in Robert T. Masson and P. David Qualls, eds, *Essays on Industrial Organization in Honor of Joe S. Bain*, Cambridge: Ballinger, 71-88.

[3] Bowman, E. H., (1980). A Risk/Return Paradox of Strategic Management, *Sloan Management Review*, Spring, 21, 17-31.

[4] Bowman, E. H., (1982). Risk seeking by Troubled Firms, *Sloan Management Review*, Summer, 23, 33-42.

[5] Coate, M.B., 1989. The dynamics of price-cost margins in concentrated industries. *Applied Economics*, 21, 261-72.

[6] Comanor, W.S. and Wilson, T.A., 1974. *Advertising and Market Power*. Cambridge, MA: Harvard University Press.

[7] Copeland, T. E. and Weston J. F., 1992. *Financial Theory and Corporate Policy*, Reading: Addison Wesley.

[8] Crespo-Cuaresma, J. and A. Gschwandtner, 2005. The competitive environment hypothesis revisited: Nonlinearity, nonstationarity and profit persistence. *Applied Economics*, 38, 465-472.

[9] Crespo-Cuaresma, J. and A. Gschwandtner, 2007. Tracing the dynamics of competition: Evidence from company profits. *Economic Inquiry*, forthcoming.

[10] Esposito, L. and Esposito, F.F., 1971. Foreign competition and domestic industry profitability. *Review of Economics and Statistics*, 53, 343-53.

[11] Fisher, I.N. and Hall, G.R. 1969. Risk and corporate rates of return. *Quaterly Journal of Economics*, 83(1), 79-92.

[12] Galai, D. and Masulis, R. W., 1976. The Option Pricing Model and the Risk Factor of Stock. *Journal of Financial Economics*, January-March, pages 53-82.

[13] Geroski, P A. (1990) Modelling persistent profitability, in D C Mueller (ed) The Dynamics of Company Profits, Cambridge: Cambridge University Press.

[14] Gschwandtner, A. 2005. Profit persistence in the 'very' long run: evidence from survivors and exiters. *Applied Economics*, 37, 793-806.

[15] Harris, F. H. deB., (1986). Market Structure and Price-Cost Performance under Endogenous Profit Risk, *Journal of Industrial Economics*, 35(1), 35-59.

[16] Kambahampati, U.S., 1995. The Persistence of Profit Differentials in Indian Industry. *Review of Economics and Statistics*, 81, 143-53.

[17] Kessides, I. N., 1990. The persistence of profits in U.S. manufacturing industries, in D.C. Mueller (ed.) *The dynamics of company profits. An international comparison*, Cambridge University Press, Cambridge, UK.

[18] Khanna, T. and Rivkin, J.W., 2001. Estimating the performance effects of business groups in emerging markets. *Strategic Management Journal*, 22, 45-74.

[19] Lang, L. H. P. and Stulz, R.M., 1994. Tobin's q, Corporate Diversification and Firm Performance. *Journal of Political Economy*, 102 (6), 1248-80.

[20] Levy, H. 1991. Possible Explanations of No-Synergy Mergers and Small-Firm Effect by the Generalised Capital Asset Pricing Model. *Review of Quantitative Finance and Accounting*, 1, 101-27.

[21] Martin, S., 2002. *Advanced Industrial Economics*. Blackwell Publishers Inc., Massachusetts.

[22] Marion, B.W., Mueller, W.F., Cotterill, R.W., Geithman, Frederick, E., and Schmelzer, J.R., 1979. *The Food Retailing Industry: Market Structure, Profits, and Prices*. New York, Praeger.

[23] Maruyama, N. and H.Odagiri, 2002. Does the 'Persistence of Profits' Persist?: A Study of Company Profits in Japan, 1964-97. *International Journal of Industrial Organization*, 20, 1513-1533.

[24] Mueller, D.C., 1986. *Profits in the Long Run*. Cambridge University Press, Cambridge.

[25] Mullin, G.L., Mullin, J.C., and Mullin, W.P., 1995. The competitive effects of mergers: stock market evidence from the U.S. Steel dissolution suit. *Rand Journal of Economics*, 26(2), 314-30.

[26] Ravenscraft, D. 1983. Structure-Profit Relationships at the Line of Business and Industry Level. *Review of Economics and Statitstics*, 65, 22-31.

[27] Scherer, F.M., 1980. *Industrial Market Structure and Economic Performance*. Houghton Mifflin Company, Boston.

[28] Schmalensee, R. (1989). Inter-industry studies of Structure and Performance, in R. Schmalensee and R. Willig (eds) *Handbook of Industrial Organization*, North-Holland, Amsterdam et al., 951-1009.

[29] Shepherd, W.G., 1972. The elements of market structure. *Review of Economics and Statistics*, 54(1), 25-37.

[30] Yurtoglu, B.B., 2000. Business Groups, Liquidity and Investment: Evidence from Turkey, mimeo, University of Vienna.

[31] Yurtoglu, B.B., 2004. Persistence of Firm-Level Profitability in Turkey, *Applied Economics* 36, April (6), 615-625.