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Profit Persistence in the "Very" Long Run: Evidence from Survivors and Exiters

Adelina Gschwandtner*

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Abstract

One of the main shortcomings of the profit persistence literature is the fact that it looks only at surviving companies. This paper uses a unique dataset to analyze profit persistence in two different stationary series: 85 surviving US companies from 1950-1999 and 72 exiters. While the exiters perform more competitive than the survivors there is still significant evidence for profit persistence in both samples. Concentration and growth of the industry as well as size and volatility of profits seem to play an important role in explaining persistence.

Keywords: Profit Persistence; Competition.
JEL classification: L00.

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1 Introduction

Since the seminal contributions by Mueller (1977,1986) there is a growing literature that tries to deal with the empirical puzzle of the competitive environment hypothesis. Although the competitive process should eliminate profit differentials between different firms/industries in the long run this does not seem to be what we observe in the real world. The theory states that if a firm has excess profits then competitors enter the market offering similar products at lower costs until the profitability in the market equals the competitive rate. At the same time if firms have profits below average, investors move to markets with higher profits and firms with profits below average are eliminated unless corrective measures are introduced, restoring at least normal profits. However this theory does not seem to find enough empirical support. Profits seem to persist.

Geroski and Jaquemin (1988), Mueller (1990), Kambhampati (1993), Goddard and Wilson (1999), MGahan and Porter (1999), Calbe et.al (2001) and Glen et al.(2001) are just some of the papers that find support for profit persistence for different economies and different time periods. Odagiri and Maruyama (2002) follow up 376 Japanese firms which were previously analyzed for the period 1964-82 and find that by adding up 15 more years of data the conclusion stays the same: profits persist.

One of the main strengths of this paper is that the persistence of profit (POP) analysis is based on 50 years. Most of the studies mentioned before use time series about 20 years or less. One might argue that the competition process did not have enough time to erode all economic profits and losses. Fifty years should be long enough for the competitive forces to be at work. However the present study demonstrates that even after 50 years the adjustment process is not complete.

Another reason why the time period is of interest is because it covers a period of structural break in the US economy. Although the first studies have been completed for the 50-60s, the US economy was only opened more strongly to international competition in the 70-80s therefore one would expect more evidence in favor of the competitive environment hypothesis after this period.[1] Mueller (1990) explicitly compares the periods 1950-72 with 1964-84 and finds stronger evidence for competition in the second but it was interesting to find that this trend continued until today. Although the US economy has encountered many ups and downs in the last 50 years, competition has strengthened.

The second important contribution of the paper is that it includes not only surviving firms but also exiters. Exiters are companies that belonged to the largest 500 in 1950 and exited the market until 1999. Looking just at surviving companies might be misleading. Survivors might be regarded as more successful than

[1] Average US Imports/GDP in the period 1971-2000 were 200 % higher than in the period 1950-1970. Source: Bureau of Economic Analysis, http://www.bea.doc.gov/.

other members of the market and thus an artificial stability might be built into the sample. The reason for profit persistence for companies with profits positively above the average could be the survival of the companies themselves. For example if all 72 exiters would have left the market because of bad performance one might conclude that the competition process is working. The present study shows that among exiters there is a group of successful firms that are projected to earn profits significantly above the norm, therefore not all exiters could have left the market because in lieu of bankruptcy. Even if exiters perform more competitive than survivors there is still enough evidence for profit persistence also in their sample.

The third innovation of the paper is the technique. While using an established methodology following Mueller (1986) that allows for comparison with other results in the literature, it also brings important improvements: in order to allow for a more complex adjustment process, autoregressive models up to order four have been explored and the model with the "best lag" has been chosen for the analysis. More detailed tests for stationarity and convergence than in most previous POP studies have been used.

Fourth the firms are viewed in a market context. Because the degree of persistence is affected by characteristics of the market, the present study tries to place the companies in their competitive environment in order to understand the source of their persistence. The industries in which the companies are operating do seem to play an important role in explaining profit persistence. The ability of the industry to grow and to build strategic barriers seem to lead to a higher degree of persistence. At the same time the size of the company and the volatility of it's profits seem to play an important role in explaining profit persistence.

The paper proceeds as follows: the methodology is presented in section 2. The database is discussed in section 3. The empirical results are presented in section 4 and the conclusions appear in section 5.

2 Methodology

The methodology is similar to the one used since Mueller (1986) in most of POP studies but brings also important improvements.[2]

Let Π_{it} denote firm i's profit rate defined as profits after taxes divided by its total assets in year t.[3] To remove the variations in Π_{it} due to business cycle

[2]For a comprehensive description of the methodology see Mueller (1986) and Mueller (1990).

[3]In order to make the profit measure independent of the source of funds used to create total assets, interest should have been added to income before dividing by total assets. Due to data restrictions for interest especially for the beginning years (1950-1977) this variable could not be taken into account. A sensitivity analysis has been done for the period 1980-1999 when interest

factors, this measure of profit was transformed as the relative deviation from an economy-wide measure of profitability $\bar{\Pi}_t$ in year t:[4],

$$\pi_{it} = \frac{\Pi_{it} - \bar{\Pi}_t}{\bar{\Pi}_t} \tag{1}$$

The dynamic behavior of π_{it} can be modelled than as an autoregressive (AR) equation of the form:

$$\pi_{it} = \alpha_i + \lambda_i \pi_{it-1} + \mu_{it} \tag{2}$$

where $|\lambda_i| < 1$ and μ_{it} is an error term with constant variance and zero mean.[5]

The unconditional expectation of π_{it} in (2) is then given by

$$\hat{p_i} = \hat{\alpha_i}/(1 - \hat{\lambda}_i) \tag{3}$$

Since $\hat{p_i} = \hat{\alpha_i}/(1 - \hat{\lambda}_i)$ is not defined for unit root processes where $\lambda_i = 1$ the present methodology is appropriate only for stationary AR processes. For this reason in the present study only stationary time series have been considered.

The two measures of profit persistence used in the literature are $\hat{p_i}$ and $\hat{\lambda}_i$ where $\hat{p_i}$ is a measure of permanent rents, which are not eroded by competitive forces also called the long run projected profit rate. If all firms earn the competitive rate of return, and ignoring differences in risk, then $\hat{p_i}$ should be equal for all firms.

The second measure for profit persistence $\hat{\lambda}_i$ is a measure of the speed of adjustment of short run profits. The short-run rents can converge slowly (high $\hat{\lambda}_i$) or fast (low $\hat{\lambda}_i$). Companies with initially very high or low profits should have low $\hat{\lambda}_i$'s, since their returns should be converging on the norm. Companies earning normal returns should have relatively high $\hat{\lambda}_i$'s, meaning that their normal returns should tend to persist. Lambda is also a measure for the competitiveness

data was available and the results using interest were not significantly different from the ones without interest.

[4]The economy wide measure is the median of the profit of a sample consisting of more than 175000 observations and more than 15500 companies. The number of annual observations is at least 677 and at most 10710. Note that using the sample mean (or median) might be misleading. The profits of the sample studied might be not abnormal with respect to the own sample average but might be well above (or below) the economy average (or median).

[5]Note that the specification given by 2 can be justified theoretically as a reduced form of a two-equation system were profits are assumed to depend on the threat of entry in the market, and the threat is assumed to depend on the profits observed in the last period (see Geroski 1990).

of the economy (or the sample). If lambda is high then short run rents are persistent and competition is weak. If lambda is small then short run rents are quickly eroded and competition is strong.

The main technical improvement in the present study is the use of a "best lag model". Autoregressive models up to order four have been estimated for each company and two different criteria have been employed in order to decide which model describes best the adjustment path: Akaike's Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBC).[6] The model with the lowest AIC or SBC value is judged the best and has been chosen for the further analysis.[7]

After choosing the best lag model the long run projected profit rate becomes:

$$\hat{p_i} = \frac{\hat{\alpha}_i}{1 - (\sum_{j=1}^{L} \hat{\lambda}_{ij})} \tag{4}$$

where L is the number of lags of the AR process and $\hat{\lambda}_i = \sum_{j=1}^{L} \hat{\lambda}_{ij}$ is the speed of adjustment parameter.

While the AR(1) process employed in most of the previous literature is straight forward and brings useful insights it might not capture all the dynamics. Singh et al. (2001) find for example that AR(2) is a better method to model profitability. Cable et al. (2001) find in a sample of time series for 53 UK manufacturing firms systematic evidence of cycles (which are usually modelled as AR(2) processes). Choosing the best model between autoregressive models up to order four is just another step in trying to find the best way to model profitability.

The tests for stationarity and convergence employed in the present study are going to be discussed in detail in section 4.

3 Data

The database contains yearly data on profits for two different stationary series: 85 stationary US surviving manufacturing companies and 72 exiters. The survivors are those firms among the largest 500 US manufacturing companies (in terms of sales) for which a complete time series for the period 1950-1999 was available. Exiters are companies that belonged to the largest 500 in 1950 but did not manage

[6] For a definition of AIC and SBC see for example SAS/ETS User's Guide, Version 8, Volume 2 page 1482.

[7] To see why it might not be proper to use the criteria of highest R^2 or even the criteria of highest adjusted R^2 when deciding among different models, see Green 1993 page 244.

to survive until 1999 and had time series of 10 years or more. The starting point 1950 was determined by necessity because this was the starting year of the Compustat data base, the main data source. Especially for the first years, missing data had to be completed from the "Moody's Industrial Manual". Data for the last years was compiled using Global Vantage. The database for profitability is unique and has the advantage that it has never been used before.[8]

The firm level data contains also the following firm characteristics used to explain profit persistence: market share (MS), the volatility of the profit rate (SDROA), industry (SIC), the size of the company (LnAssets) and the company's growth rate (Growth). How the firm characteristics are calculated and how one would expect them to be correlated to profit persistence is described in the next section.

The only industry characteristics for which it was possible to obtain data for a time period of this extent are: concentration (CR4-CR50), size (number of firms, value of shipments) and growth (of the number of firms). These variables are contained in 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.[9] The latest data (1997) is available online at the official Census Website.[10]

Beginning in 1997, the census data use the new NAICS industry definitions rather then 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.[11]

Although neither the conversion nor the time period matching between the Compustat data and the Census data are perfect the attempt to place the companies in their market context seems to be crucial.

Descriptive statistics for the profit rates, for the firms - and industry characteristics are in table 7, 8 and 9 (Appendix).

4 Empirical Results

The results section is organized as follows: first some empirical properties of the data are discussed, next the results concerning profit persistence will be presented and finally some attempts are made in trying to explain profit persistence.

[8] As described in section 2 profits were defined as income over total assets. Comprehensive description of the two variables are available from Compustat (data definitions).

[9] Available: http://www.wooster.edu/economics/archive/indconc.html

[10] Available: http://www.census.gov/

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

4.1 Empirical Properties of the Data

- Testing for Stationarity

  The existence of a unit root in the firm-level profitability series would indicate that shocks to profitability persist indefinitely and that competitive pressures never erodes differences in profitability. The presence of a high percentage of non-stationary series in profit data is often reported in empirical literature and univariate methods for testing for unit roots are well known to have low power, especially for relatively small sample sizes such as those used in most of the empirical literature on profit persistence (see Crespo and Gschwandtner 2003). However the methodology presented before is appropriate only for stationary AR processes, as the long run projected profit rate, $\alpha_i/(1-\lambda_i)$ is not defined for unit root processes where $\lambda_i = 1$.

  Originally the sample of survivors consisted of 187 companies. Out of these about 40 were deleted because of extreme observations that could be due to accounting errors. However the results for the full sample of 187 survivors do not differ substantially from those reported in the paper.[12] The remaining series were tested for stationarity using the Dickey Fuller Test. Finally about 60 % (85 companies) of the series were stationary and were therefore used for the further analysis.

  The sample of exiters consisted originally of more than 300 companies. Fortyfive companies were deleted because they had a time span shorter than 10 years. Out of the remaining companies only 72 were stationary due to the Dickey Fuller test. The relatively small percentage of stationary series is not surprising given the fact that exiters have usually relatively short time series.

  Several tests have been recently proposed in order to improve the the power of unit root testing. Glen *et al.* (2001) apply a relatively powerful unit root test provided by Im *et al.* (1997) to a sample of seven emerging countries and find that the unit root hypothesis is systematically rejected in all countries. Ioannidis *et al.* apply a panel unit root test recently proposed by Chang (2002) to the dataset of Goddard and Wilson (1999) and strongly reject the hypothesis of a joint unit root.

  In the present study the Im *et al.* (1997) test was also applied to the survivors that were non-stationary due to the Dickey Fuller test and to the whole sample of survivors. In both cases the hypothesis of a joint unit root could be easily rejected. Still it is unjustified to conclude that individual profit rates are stationary after rejection of a common unit root when testing in panels. The alternative hypothesis in the panel unit root test by Im *et al.* (1997), for example, states that a fixed proportion of the cross-sections

[12] The results for the full sample are available from the author upon request.

is stationary. The relative size of the stationary units with respect to the whole panel plays no direct role in the testing procedure, and could actually be minimal.[13]

- Choosing between AR(1)-AR(4).

  As described in section 2 two different criteria were employed in order to choose which autoregressive model among AR(1)-AR(4) describes best the profit adjustment process: Akaike's Information Criterion (AIC) and Schwarz-Bayesian Information Criterion (SBC). The model with the lowest AIC and SBC value is the best. Since the results were similar, in order to conserve space only the results concerning the SBC value will be presented. The columns in the next table present the percentage of firms with lowest SBC value for each model for survivors and exiters.

Table 1: *Choosing between AR(1)-AR(4)*

	Criterion	AR(1)	AR(2)	AR(3)	AR(4)
Survivors	*SBC*	77.65	12.94	4.71	4.71
Exiters	*SBC*	62.50	22.22	9.72	5.56

  It can be observed that the model with the highest percentage of firms with lowest (best) SBC value, is for both survivors and exiters the AR(1) with 77.65% for survivors and 62.50 % for exiters followed by the AR(2) with only 12.94 % for survivors and 22.22% for exiters. The AR(3) is slightly better than the AR(4) for exiters while for survivors AR(3) and AR(4) have the same rather small percentage of firms with the lowest SBC value.

- Some properties of the speed of adjustment parameter lambda.

  The speed of adjustment parameter $\hat{\lambda}_i$ should take values between -1 and 1. A value of 1 implies infinite profit persistence. Both for survivors and exiters all the values of lambda were within this statistically plausible range.[14] The mean lambda for survivors is 0.34, while the mean lambda for exiters is 0.19. This means that the speed of adjustment for exiters is on average almost twice as high as for survivors. However if we look at the absolute value of lambda (which measures the impact of last year profits independently of the fact if it was positive or negative) the difference is not as significant anymore. While survivors have an mean absolute value of lambda of 0.37

[13] Neither the exiters series that were nonstationary due to the Dickey Fuller test, nor the whole panel of exiters were stationary due to the Im *et al.* (1997) test.

[14] The economically plausible range is rather $\hat{\lambda}_i > 0$.

the mean absolute value for exiters is 0.31.[15] These values for mean lambda are similar to the mean lambda of other economies worldwide. Singh *et al.* (2001) find mean lambdas for 7 emerging markets between 0.013 and 0.421. In the same article one can find summarized mean lambdas from different studies for different economies ranging from 0.183 to 0.54. The mean lambda of 0.34 (or 0.37) for survivors in the present study is smaller than the mean lambda of 0.49 found in Mueller (1986). This might support the argument that competition strengthened in the US after 1970.[16]

The next table presents a frequency distribution for the speed of adjustment parameter lambda for survivors and exiters.

Table 2: *Frequency distribution of the persistence coefficient* $\hat{\lambda}_i$*:*

	Survivors		*Exiters*	
Interval	# $\hat{\lambda}_i$	*%*	# $\hat{\lambda}_i$	*%*
-1-0	6	7.06	14	19.44
0-0.2	11	12.94	22	30.56
0.2-0.4	33	38.82	17	23.61
0.4-0.6	25	29.41	15	20.83
0.6-1	10	11.76	4	5.56

One can observe that most of the $\hat{\lambda}_i$ for survivors are within the interval (0.2-0.4) as in the study of Kamphampati (1995) about the largest companies in India. The highest number of $\hat{\lambda}_i$ for exiters is in the interval (0-0.2) which reinforces the conclusion that exiters might perform slightly more competitive than survivors.[17]

4.2 Profit Persistence

In order to analyze the persistence of profits equation 2 was estimated for each of the 85 survivors and 72 exiters.[18] The full sample was then divided into three sub-groups of about equal size on the basis of average profit rates enjoyed during

[15]Note that if you would have for example just two companies, one with a very high but positive $\hat{\lambda}_i$ and a second one with a very high but negative $\hat{\lambda}_i$ then the mean $\hat{\lambda}$ would be close to zero implying perfect competitiveness when in fact both companies have a high degree of persistence.

[16]See Mueller (1986) page 22. Note that comparison with Mueller (1986) is slightly more suitable than with Mueller (1990) since Mueller (1986) also uses normalized profits, as the present study, while Mueller (1990) uses just firm i's return on capital.

[17]A similar frequency distribution for the persistence coefficient $\hat{p}_i$ is Table 11 (Appendix).

[18]General estimates of long-run projected profit rates and speed of adjustment are in Table 10 (Appendix).

the first three years of the sample period. The number of groups was not chosen randomly. Ideally one would have more than three groups but since a t-test will be performed on the mean values of the groups the number of observations should be higher than 20.

Table 3 presents the mean $\hat{p}$'s (the long-run projected profit rate calculated by equation 3) and the mean $\hat{\lambda}$'s for each group for both survivors and exiters. On average the long-run projected profit rate is positive and significantly greater than zero in the group with highest initial profit rate and falls uniformly as one moves to the two groups with lower average profit rates in the initial three years. In the third group (with the lowest initial profit rate), the coefficients are on average significantly less than zero.[19]

The first group of the survivors converged from a mean initial profit rate of 47% above the norm to a level still 35 % above the norm. The middle group hardly changed and the last group started with 30% below the norm and converged to a level still 14% below the norm.

Even if the adjustment for exiters is stronger their pattern is similar. The first group of the exiters converged from an average initial level 45 % above the norm to a level of 9% above the norm. The middle group converged from a level 5 % below the norm to a level 19% below the norm. The last group started with an average value 37 % below the norm and instead of converging to the norm it converged to an even lower level (41 % below the norm). Therefore the adjustments in the middle and in the last group were in the opposite direction then expected.

Although these values imply also some convergence to the norm the regression is sometimes in the wrong direction and far from complete. The ordering of the projected profit rates across the 3 groups is exactly the same as the one of the initial profit rates suggesting that firms tend to stay in the same group and that differences in profitability across firms persist. Moreover the mean $\hat{p}$ in group 1 is highest and the mean $\hat{p}$ in group 3 is lowest suggesting persistence of positive/negative profitability. Profits observed at any time reflect the degree of competition in the market, and in this (neoclassical) sense competition is the sate which requires that the projected profits for all companies are equal $\hat{p}_i = c$. If the competitive environment hypothesis would be true then all the mean $\hat{p}$ should be equal. But this is not what one can observe. The means of the three groups for the long run projected profit rates are different and due to a t-test the differences are significant.

The result that differences in profitability are going to persist is reinforced by the correlation coefficient between the initial profit rate (π_0) and the long-run

[19] All the means are significantly different from zero.

[20] Normalized means subtracting and dividing by the mean profit rate in the economy per year.

Table 3: *Mean $\hat{p}$'s and $\hat{\lambda}$'s of "Survivors and Exiters".*

	Obs.	*Group*	*Mean* $\hat{p}$	*Mean* $\hat{\lambda}$	*Mean* $\lvert\hat{\lambda}\rvert$	*Mean* π_0	*Mean* π_{it}
Survivors	29	1	0.35	0.36	0.37	0.47	0.37
	28	2	0.09	0.28	0.35	0.05	0.09
	28	3	-0.14	0.37	0.38	-0.3	-0.15
	85	Mean	0.1	0.34	0.37	0.07	0.1
Exiters	24	1	0.09	0.22	0.29	0.45	0.09
	24	2	-0.19	0.27	0.38	-0.05	-0.21
	24	3	-0.41	0.19	0.25	-0.37	-0.42
	72	Mean	-0.17	0.23	0.31	-0.01	-0.18

Mean $\hat{p}$ = Mean long-run projected profit rate
Mean $\hat{\lambda}$ = Mean speed of adjustment
Mean π_0 = Mean initial profit rate
Mean π_{it} = Mean normalized profit per company [20]

projected profit rate ($\hat{p_i}$). For survivors it is positive and 42%. For exiters is a little bit smaller but still positive and higher than 35 % (0.363).

The other very important measure in the analysis of persistence is the the speed of adjustment $\hat{\lambda_i}$. It indicates how fast the profit rate π_{it} approaches the long-run equilibrium level $\hat{p_i}$.

For survivors all the mean $\hat{\lambda}$'s are around 0.3 and suggest no systematic pattern from subsample to subsample. This is not what one expects to find if all deviations from the norm are short-run rents. If this were true then the $\hat{\lambda_i}$'s for companies earning normal returns would be relatively high meaning that that their normal returns will tend to persist. In contrast, companies with initially very high or low profits should have lower $\hat{\lambda_i}$'s, since their returns should be converging more rapidly on the norm. But what the results in Table 3 show is quite the opposite. The first and the the last group have the highest mean $\hat{\lambda}$ meaning that firms that started with the greatest positive and negative deviation from the mean exhibit a slower average decline towards the mean. To the contrary, the middle group has the lowest mean $\hat{\lambda}$'s when in fact it's mean $\hat{\lambda}$'s should have been higher meaning that profits will stay on the norm.

For exiters the pattern of mean $\hat{\lambda}$ is as expected (smaller for the first and last group and higher for the middle group) but the differences between groups are relatively small. The last group has the highest speed of adjustment (the lowest mean $\hat{\lambda}$) but as we have seen the profits adjust in the wrong direction.

Table 4 brings further insight to the way in which the long-run projected profit

rates and the speed of adjustment are distributed per group. It lists the fractions of $\hat{p}_i$ ' s and $\hat{\lambda}_i$'s that are significantly different from zero for each of the three groups for the whole sample of survivors and exiters. For survivors 38.82% (33) of the long-run projected profit rates are significantly different from zero at the 5 % level. For exiters this percentage is even higher (50%).

Recalling that a long-run projected profit rate of zero implies a long-run projected return on assets equal to the norm, the finding that such a large fraction has a $\hat{p}_i$ significantly different from zero reinforces the conclusion that there are different profit rates to which companies converge over time.

From the 33 surviving companies that had a long run projected profit rate significantly different from zero 22 (25.88 % of the whole sample) had a significantly positive long-run projected profit rate. Thus there is evidence that a solid core of successful firms is estimated to be able to earn profit rates significantly above the norm. For these firms some firm specific advantages or industry wide entry barriers must exist. The fraction of firms with significantly positive long-run projected profit rates was highest in the first group (14 firms), the same group that had almost the lowest speed of adjustment. This means that these firms have also a high degree of persistence. This is consistent with the prediction that firms with the highest profit rates should have the greatest incentives to block entry. What one would expect is that the convergence process should work most slowly for these firms, and this is also what can be observed. The first group is also the group with the highest fraction of $\hat{\lambda}_i$'s that are significantly different from zero.

Also among exiters there seems to be a group of successful firms that are able to earn profit rates significantly above the norm. More than 12 % of the whole sample of exiters is estimated to have a long run projected profit rate that is significantly positive. This means that not all of the companies have exited the market because of bad performance. Since most of the companies exit the market through mergers and acquisitions these companies might have been acquired or have merged especially because of their good performance. In fact the literature on mergers shows that the profits of acquired firms do not differ significantly from the ones of the nonacquired companies and are usually even higher than their industry average.[21]

Ideally, in a competition process where forces of entry are strong and rapid enough to bid away profits, $\hat{\lambda}_i$ would be close to zero. But again this is not what the results show. As one can see from Table 4 the percentage of $\hat{\lambda}_i$'s that were significantly different from zero is 65.8 for survivors and 36.1 for exiters. This means that in more than 35 % of the cases in both samples the competitive process was not strong enough to bid away short-run profits within one year.

The next table summarizes some parameters for survivors and exiters in order to have a better comparison between the two samples.

[21] See for example Mueller (1980), Melicher and Rush (1974) and Lynch (1971).

Table 4: *Fractions of positive $\hat{p}$'s and $\hat{\lambda}$'s. by subsample for "Survivors" and "Exiters"*

	Group	*Obs.*	$\hat{p}_i > 0$	*# of $\hat{p}_i$ significantly different from 0**	*# of $\hat{p}_i$ significantly positive*	$\hat{\lambda}_i > 0$	*# of $\hat{\lambda}_i$ significantly different from 0**	*# of $\hat{\lambda}_i$ significantly positive*
Survivors	1	29	23	15	14	27	20	20
	2	28	16	10	6	25	17	16
	3	28	12	8	2	27	19	19
	Sum	85	51	33	22	79	56	55
	%	100	60	38.82	25.88	92.94	65.88	64.71
Exiters	1	24	14	8	5	21	7	7
	2	24	6	15	3	19	13	12
	3	24	4	13	1	18	6	5
	Sum	72	24	36	9	58	26	24
	%	100	33.33	50	12.5	80.56	36.11	33.33

**5 percent level, two-tail test*

Table 5: *Persistence Parameters Survivors-Exiters:*

	Survivors	**Exiters**
# of firms	85	72
% of $\hat{p}_i$'s significantly different from 0	38.82	50
% of $\hat{p}_i$'s significantly positive	25.88	12.5
% of $\hat{\lambda}_i$'s significantly different from 0	65.88	36.11
Mean $\lvert\hat{\lambda}\rvert$	0.37	0.31
Correlation coefficient between $\hat{p}_i$ and π_0	0.42	0.36
% of equations with $\bar{R}^2 > 0.1$	65.88	55.4

The lower the percentage of long run projected profit rates significantly different from zero, the more firms will converge to the norm. Concerning this parameter survivors seem to have behaved more competitive than exiters since their percentage of long run projected profit rates significantly different from zero is smaller (38.82<50).

The percentage of long run projected profit rates that are significantly positive is twice as high for survivors than for exiters. Still 12.5 % of the exiters were able to earn long run projected profit rates that are significantly above the norm reinforcing the conclusion that not all of the firms exited the market in lieu of bankruptcy.

The higher the percentage of $\hat{\lambda}_i$'s significantly different from zero, the higher the

number of firms for which the competitive process was not strong enough to bid away profits within one year and therefore the more persistence. With respect to this parameter exiters seem to have behaved more competitive then survivors.

Also the correlation coefficient between initial and projected profits is smaller for exiters than for survivors meaning that their differences in profitability seem to persist less than the ones of survivors.

Explanatory power is for both samples above 50 % and comparable to previous work. In Mueller (1990) for example this percentages are comparable with the ones for Japan 1964-82 (66.5) and Germany 1961-82 (55.2). Even if the results are not always unequivocal, exiters seem to adjust slightly more systematically toward the long run level than survivors. This is consistent with the result for the intensity of competition as measured by the mean speed of adjustment parameter lambda which is slightly lower for exiters than for survivors.

Finally the hypothesis has been tested that all long run projected profit rates ($\hat{p_i}$) converge to a common competitive level c by restricting all firms to have the same $\hat{p_i}$. For this, equation 2 was estimated simultaneously for each company under the following N-1 nonlinear restrictions:

$$\hat{p_1} = \frac{\hat{\alpha_1}}{(1-\hat{\lambda}_1)} = \frac{\hat{\alpha_i}}{(1-\hat{\lambda}_i)}$$

i.e.

$$\frac{\hat{\alpha_1}}{(1-\hat{\lambda}_1)} = \frac{\hat{\alpha_i}}{(1-\hat{\lambda}_i)}$$

where i=2 to N, N=number of firms.[22] [23]

The F-statistic for survivors is 3.35 and for exiters is 2.12 and therefore both values are above the critical value of 1.36 for a one percent level significance test. Hence the hypothesis that all long run projected profit rates converge to the same level can be easily rejected in both samples. The same test was done by Yurtoglu (2004) in his analysis of company profits for 172 manufacturing firms in Turkey, except that there AR(1) has been used and the present study uses AR models up to order four, with a similar result.

Therefore one can conclude that even if exiters seem to have performed slightly more competitive than survivors and even if there is some convergence of profits

[22] In order to test the hypothesis for each company simultaneously N dummies for the coefficients ($\hat{\lambda_i}$) and N dummies for the intercepts ($\hat{a_i}$) were constructed.

[23] The Wald Test was employed. For more information on the theoretical properties of the Wald test see Phillips and Park 1988.

towards the norm there is still also considerable evidence for profit persistence in both samples.[24]

4.2.1 Explaining Profit Persistence

Both from a policy and an empirical point of view the determinants of profits might be even more interesting than patterns in profits per se. The legitimate question arises what market and industry characteristics affect the degree of persistence. Understanding the source of profit persistence is definitively an important issue. Unfortunately it is extremely difficult to find sistematic information about firm and industry characteristics for such a long time period. The absence of perfect data, however, need not deter one from exploration of the data available.

First the effect of industry characteristics is analyzed. Compustat provides for all the companies used in the present study SIC (Standard Industry Codes). It has to be noted however that the industry affiliation resulted from the SIC codes might not be perfect. Most of the companies are active in more than one industry and during this long time period might have changed their main line of buisiness. Nevertheless the SIC codes are an indicator of the industry in which the main production of the companies is at the moment.

For the 85 survivors 61 different industries could be identified. A set of 61 industry dummies has been created and their effect on the two profit persistence parameters ($\hat{\lambda}_i$ and $\hat{p}_i$) has been analyzed.[25] While the industry dummies seem to have no impact on the profit level at which companies converge ($\hat{p}_i$) they do seem to explain 26% of the variation of the speed of adjustment parameter ($\hat{\lambda}_i$). Seven industry dummies had a significantly negative impact on the speed of adjustment parameter meaning that companies in these industries have a lower $\hat{\lambda}_i$ and therefore a higher speed of adjustment. Interestingly enough these industries seem to be characterized by low sunk costs (Pharmaceutical Preparations, Industrial Organic Chemicals, Concrete, Gypsum and Plaster Products for example) suggesting that companies in industries with low sunk costs seem to adjust faster to the norm and have therefore a lower degree or persistence. On the other hand two industry dummies had a significantly positive impact on $\hat{\lambda}_i$. These two industries are: Aircraft and Computer Peripheral Equipment both characterized by higher capital than labor costs. Surviving companies in these industries seem to adjust more slowly to the norm and therefore seem to have a higher degree of persistence.

[24]The fact that inferences made about firm performance using data on survivors is often robust to data on non-survivors was also noticed in Geroski (1998).

[25]Note that looking for industry level patterns in the estimated $\hat{\lambda}_i$ and $\hat{p}_i$ imposes an unique $\hat{\lambda}_i$ and $\hat{p}_i$ level for each industry assuming that the firms in an industry are all alike. The dummy approach used here allows for firm level differences as the "new learning" emphasizes.

Exiters are active in 53 different industries. In their case industry dummies explain 73% of the variation of $\hat{p}_i$ and 57% of the variation of $\hat{\lambda}_i$. All of the significant coefficients concerning $\hat{p}_i$ were negative meaning that the profits of the companies in these industries converge to a negative level. There were 15 such industries most of them in the food sector, steel products or motor vehicles. Almost all the 12 significant coefficients concerning $\hat{\lambda}_i$ are negative meaning that companies are reaching their long run level (eventually negative) relatively fast.

The results concerning industry dummies are consistent with the profit persistence results from the previous section. Exiters usually converge to a lower level and their speed of adjustment is usually higher than the one of survivors.

The industry characteristic that one would most obviously expect to be related to profit persistence is concentration. 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 many studies. Yurtoglu (2004) finds a small but significantly positive coefficient for the concentration variable when analyzing its impact on both $\hat{\lambda}_i$ and $\hat{p}_i$. Kambhampati (1995) also finds a positive relationship between concentration and the speed of adjustment parameter but significant only at 10% level. In the present study 4 different measures for concentration have been analyzed: CR4, CR8, CR20, CR50 as being the percentage of industry output produced by the largest 4 (8,20,50) firms in the industry.

The second industry characteristic that could be obtained data for was the size of the industry as measured by the mean number of establishments (NF). One might expect that the higher the number of establishments in the industry the higher the volatility, the stronger the competition and therefore the less profit persistence to be found. Therefore a negative relationship between the two measures of persistence and the size of the industry is expected.

The growth rate of the industry is also important in explaining profit differentials but its net effect is ambiguous. In industries with rapid growth it might be more difficult for incumbents to maintain their market share and oligopolistic discipline thereby profits 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. Rapidly growing industries, like pharmaceuticals for example, are sometimes characterized by persistent high profitability. Kambhampati (1995) finds a positive small but highly significant coefficient for industry growth when analyzing its impact on the profit persistence parameter $\hat{\lambda}_i$. Two different measures for industry growth have been used in the present study: the growth in the number of establishments (Growth NF) and the growth in the industry value of shipments (Growth VS).

Ideally more industry characteristics should have been used in order to explain

profit persistence. Exports and imports have often been found to be related to profitability. Advertising and research and development set up entry barriers for new firms and therefore enable high profits for incumbents over time. Unfortunately the variables mentioned before were the only one for which data was available for this time period (1950-1999).

While the traditional structure-conduct-performance model emphasizes the role of the industry-, the so called "new learning" points out the importance of firm characteristics in explaining the variations of firm level profitability.

Market share (MS) is an important determinant of profitability. The higher the market share the higher the expected profitability. The relationship between market share and profitability has often been found to be positive and highly significant.[26] As a proxy for market share the ratio of firm's sales to industry sales has been used.

Another variable that seems to be positively correlated with profitability is the standard deviation of annual rates of return (SDROA). This can prove that part of the differences in profitability are due to differences in risk. However this is valid only if markets work competitively.

The impact of the growth rate of the firm (Growth) on profitability is not always unambiguous but in general seems to be positive. Here growth was measured as the growth rate of the company's sales.

In order to control for size the total assets (lnAssets) were included. As in the case of sales growth the effect of size might be positive or negative.

A table with the expected impact of the different industry and firm characteristics is provided in the Appendix (Table 12).

Table 6 reports the results. The first three equations explain the determinants of speed of adjustment parameter $\hat{\lambda}_i$ and the next three the ones of the long run projected profit rate $\hat{p}_i$ for survivors. The first equation contains the industry- and the second the firm characteristics. The third equation contains both industry- and firm characteristics. While the industry characteristics seem to play no role for the long run projected level, they do seem to explain about 10 % of the variation in the speed of adjustment parameter. This result seems to be consistent with the fact that industry dummies explained 26 % of the variation of $\hat{\lambda}_i$ but played no role in the variation of $\hat{p}_i$ for survivors. The coefficient of the growth in the number of firms is positive and significant at 1% while the coefficient of the concentration is positive and significant at almost 10%. This leads to the conclusion that the extent of persistence is greater in concentrated industries with high growth.[27] [28]

[26] See for example Yurtoglu (2004) and his references.

[27] A similar result was obtained by Kambhampati (1995).

[28] All the results for CR4-50 were similar.

The firm characteristics on the other hand seem to play no role in explaining $\hat{\lambda}_i$ but they do seem to explain a small percentage in the variation of $\hat{p}_i$ (about 6 %). This seems to be mainly due to the negative and significant (at 5 %) coefficient of the standard deviation of the returns on assets (SDROA). This suggests that companies with the highest $\hat{p}_i$ are the ones with the lowest variability in their return on assets. This is in contradiction with the risk theory which assumes that this relationship should be positive. The present result might be just another proof for the fact that for survivors the competitive process is weak.

However when the impact of all the variables is analyzed (equations 3 and 6) the coefficient of STDROA becomes insignificant and the only significant characteristic is the growth in the number of firms (Growth NF) when explaining the variation of $\hat{\lambda}_i$. Surviving companies active in an rapidly growing industry seem to have a higher degree of profit persistence.

Equations 7-12 present the results for the same analysis for exiters. While no industry characteristic seem to play a role in explaining the differences in $\hat{\lambda}_i$ and $\hat{p}_i$ firm characteristics do seem to have an impact. They explain about 4 % of the variation in $\hat{\lambda}_i$ and about 15 % of the variation in $\hat{p}_i$. The size of the firm (lnAssets) has in both cases a positive and significant coefficient suggesting that size is positively correlated with profit persistence. The bigger the company the higher the long run projected profit rate $\hat{p}_i$ and $\hat{\lambda}_i$ and therefore the lower the speed of adjustment. The coefficient stays positive and highly significant when all the other variables are included in the regression.

Interpreting the results one can conclude that a big firm with a low volatility of profits operating in an concentrated industry characterized by rapid growth is a persistent profitable company.

5 Conclusions

The results for survivors go in line with the existing literature: profits converge on average to a competitive norm but there is also a considerable degree of profit persistence. Even after a period of 50 years the adjustment process is far from complete. However the intensity of competition of the US surviving companies seem to have increased in the more recent period.

Extending the analysis to non-survivors does not alter considerably the results. Exiters seem to behave more competitively than survivors but among them there is also a significant fraction of firms for which the convergence to the norm is incomplete. There is also evidence for a core of successful firms among exiters which are projected to earn profits significantly above the norm thus one cannot conclude that all exiters have left the market because of bad performance.[29]

[29]Since the group of exiters is not homogenous consisting of firms that exit the market

The present study shows that the ability of the industry to grow and therefore to avoid price competition as well as strategic barriers seem to encourage persistence. At the same time a low variation in returns on assets and a big size seem to be correlated with a higher long run projected profit rate.

because of bad performance and firms that have been acquired maybe especially for their good performance the present methodology might be not optimal in their case. However in order to be able to compare it is necessary to apply the same methodology to both samples. Future work might consider improving the methodology for exiters.

Table 6: *Regressions Explaining the Estimated Parameters of Equation 2*

Sur	*Cons.*	*CR8*	*NF*	*Grw NF*	*Grw VS*	*MS*	*SDROA*	*lnAssets*	*Grw*	$\bar{R}^2$
(1)	1.086	0.024	0.000	0.903	-0.127					0.096
	(1.183)	(1.657)	(0.472)	(2.819)	(-0.923)					
(2)	0.855					-0.141	-0.119	0.211	8.601	0.011
	(0.505)					(-0.230)	(-0.447)	(1.249)	(1.109)	
(3)	-0.435	0.020	0.000	0.906	-0.077	0.563	-0.118	0.110	8.980	0.090
	(-0.210)	(1.293)	(0.306)	(2.703)	(-0.524)	(0.822)	(-0.427)	(0.500)	(1.076)	
(4)	0.083	0.015	0.00	-0.131	0.025					-0.056
	(0.046)	(0.516)	(0.154)	(-0.206)	(0.092)					
(5)	1.356					0.326	-0.840	-0.144	16.641	0.059
	(0.499)					(0.332)	(-1.957)	(-0.529)	(1.336)	
(6)	1.384	0.012	9.701	-0.331	0.106	0.136	-0.907	-0.215	16.488	-0.009
	(0.997)	(0.405)	(0.346)	(0.646)	(0.375)	(0.103)	(-1.710)	(-0.508)	(1.025)	
Ext	*Cons.*	*CR8*	*NF*	*Grw NF*	*Grw VS*	*MS*	*SDROA*	*lnAssets*	*Grw*	$\bar{R}^2$
(7)	0.956	0.009	0.000	-0.207	0.022					-0.037
	(0.914)	(0.562)	(0.950)	(-0.785)	(0.157)					
(8)	-1.162					0.520	0.138	0.416	-3.176	0.039
	(-0.909)					(0.744)	(0.658)	(2.238)	(-1.096)	
(9)	-1.650	0.008	0.000	-0.118	0.021	0.137	0.097	0.456	-2.396	-0.008
	(-0.920)	(0.462)	(1.111)	(-0447)	(0.135)	(0.1664)	(0.433)	2.085	(-0.754)	
(10)	-0.485	-0.016	-0.00	-0.273	0.028					-0.063
	(-0.145)	(-0.297)	(-0.32)	(-0.322)	(0.005)					
(11)	-15.535					1.954	0.225	2.188	-2.04	0.149
	(-4.06)					(0.932)	(0.359)	(3.924)	(-0.235)	
(12)	-14.659	-0.027	-0.000	0.129	0.065	1.890	0.293	2.269	-2.626	0.074
	(-2.705)	(-0.539)	(-0.118)	(0.160)	(0.137)	(0.755)	(0.429)	(3.411)	(-0.272)	

Dependent variables: Equations (1-3) and (7-9): $\hat{\lambda}_i$; Equations (4-6) and (10-12):$\hat{p}_i$.Since the dependent variable is an estimated parameter, all equations are weighted with the inverse of its standard error.
Industry Variables: CR8=eight firm concentration ratio, NF=number of firms in the industry,
Grw NF=growth rate of NF, Grw VS=growth rate of the value of shipments in the industry.
All industry variables are averages over the sample period.
Company Variables: MS=company sales/industry sales, SDROA=Standard deviation of the return on assets, lnAssets=natural logarithm of total assets, Grw=percentage change in Sales.
MS, SDROA and GRW are averages over the sample period.

A Appendix

Table 7: *Descriptive Statistics for* π_{it}

Sample	*Mean*	*Median*	*Std.Dev.*
Stationary Survivors	0.11	0.15	1.68
Statationary Exiters	-0.17	-0.08	1.80

π_{it} is the relative deviation of the firms return on assets Π_{it} from the economy wide measure $\bar{\Pi}_t$.

Table 8: *Descriptive Statistics for the Firm Characteristics*

	Survivors			*Exiters*		
Variables	*Mean*	*Median*	*Std.Dev.*	*Mean*	*Median*	*Std.Dev.*
MS	0.694	1.000	0.363	0.646	0.612	0.330
SDROA	1.258	0.903	0.998	1.050	0.572	1.315
lnAssets	6.700	6.681	1.486	5.786	5.443	1.234
Growth	0.087	0.088	0.031	0.091	0.077	0.094

MS=Market Share, SDROA=Volatility of the Profit Rate π_{it}, lnAssets=Size of the Firm, Growth=Growth of firm's Assets.

Table 9: *Descriptive Statistics for the Industry Characteristics*

	Survivors			*Exiters*		
Variables	*Mean*	*Median*	*Std.Dev.*	*Mean*	*Median*	*Std.Dev.*
CR4	41.382	41.491	16.441	42.748	40.147	15.971
CR8	54.963	55.342	17.742	56.741	53.592	16.764
CR20	70.310	70.108	17.146	72.564	75.013	15.498
CR50	82.896	86.838	14.875	84.679	88.210	13.131
NF	2202.55	705.733	4029.91	1417.91	520.517	2687.90
Growth NF	18.215	1.280	64.725	26.700	0.727	86.333
Growth VS	95.058	15.294	355.251	45539.31	19.036	363560.74

CR4-50=Percentage of industry output produced by the largest 4 (8, 20, 50) firms in the industry, NF=The number of firms classified in the industry, VS=Value of Shipments classified in the industry.

The reported parameters of table 10 are firm level estimates of the autoregressive equation 2. t($\hat{p}_i$) and t($\hat{\lambda}_i$) are the values of the t-statistics of $\hat{p}_i$ and $\hat{\lambda}_i$.

Table 10: *Estimates of Long-Run Projected Profit Rates and Speed of Adjustment*

Model	*Statistics*	$\hat{p}_i$	t($\hat{p}_i$)	$\hat{\lambda}_i$	t($\hat{\lambda}_i$)	$\bar{R}^2$
Survivors	*Mean*	0.11	1.01	0.34	2.78	0.19
	Median	0.09	0.85	0.38	2.73	0.16
	Std. Dev.	0.58	3.32	0.24	2.02	0.17
Exiters	*Mean*	-0.17	-1.56	0.23	1.44	0.18
	Median	-0.16	-0.85	0.21	1.25	0.15
	Std. Dev.	0.57	6.07	0.33	1.91	0.19

Table 11: *Frequency distribution of the persistence coefficient $\hat{p}_i$:*

	Survivors		*Exiters*	
Interval	# $\hat{p}_i$	*%*	# $\hat{p}_i$	*%*
<-1	4	4.71	6	8.33
-1 to -0.6	4	4.71	4	5.56
-0.6 to -0.3	9	10.59	20	27.78
-0.3 to 0	17	20.00	18	25.00
0 to 0.3	19	22.35	13	18.06
0.3 to 0.6	20	23.53	7	9.72
0.6 to 1	7	8.24	3	4.17
>1	5	5.88	1	1.39

Table 12: *Predicted Impact of Variables on the Estimated Parameters $\hat{\lambda}_i$ and $\hat{p}_i$*

Variables	*Main Source*	*Predicted Impact on*	
		$\hat{\lambda}_i$	$\hat{p}_i$
CR4	Census of Manufacturing	+	+
CR8	Census of Manufacturing	+	+
CR20	Census of Manufacturing	+	+
CR50	Census of Manufacturing	+	+
NF	Census of Manufacturing	-	-
Growth NF	Census of Manufacturing	+/-	+/-
Growth VS	Census of Manufacturing	+/-	+/-
MS	Compustat + Global Vantage	+	+
SDROA	Compustat + Global Vantage	+	+
lnAssets	Compustat + Global Vantage	+/-	+/-
Growth	Compustat + Global Vantage	+/-	+/-

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