Evolution of Profit Persistence in the US: Evidence from Three Periods

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Abstract

The present study analyses and compares profit persistence during the periods 1950-66, 1967-83 and 1984-99 in the US. While most of the previous studies performed persistence analysis on survivors only, the present setup allows for companies to enter and exit the analysed sample, giving a more comprehensive depiction of the US economy during this half of the century. The results point toward a constant increase of competition after the opening of the US economy to international competition in the 1960-1980s. Key determinants of profit persistence seem to be the firm's and industry size, industry-growth, and more recently risk and advertising.

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

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1 Introduction

The persistence of profits literature aims at analysing the static and dynamic long-run equilibrium of company's profits. Outside static long-run equilibrium, the persistence approach is needed rather than the simple comparison of industry means as per Bain (1956). Starting with the seminal contributions by Mueller (1977, 1986), a growing and fruitful literature analysing the dynamic structure of company's profits using the persistence approach, emerged. Geroski and Jacquemin (1988), Kambhampati (1993), Goddard and Wilson (1999), McGahan and Porter (1999) and Cable and Jackson (2008) are just some of the studies that find support for profit persistence for different economies and different time periods. Yurtoglu (2004) analyses the persistence of firm-level profitability in Turkey and concludes that the intensity of competition is no less than in developed countries. Glen *et al.* (2001) analyses the persistence of profitability and competition in seven emerging markets and concludes that the intensity of competition is, if anything, greater in emerging than in advanced countries. A recent study by McMillan and Wohar (2009) analyses 57 UK firms over the period 1980-2007 and finds a large degree of profit persistence when using a random effects model. The common feature of these studies is that they look only at surviving companies which are more successful than the average firm in the market at least in one respect: they survived.[1]

The present study analyses the evolution of competition in the US in the last half of the twentieth century by splitting this time period into three subperiods, 1950-66, 1967-83, 1984-99, analysing each period separately and comparing the results. There are four reasons to adopt this methodology. The first reason is that the time interval 1950-99 covers at least one period of structural break in the US economy. After the 1960s and 1970s the US economy felt international competition more strongly and it is worthwhile to observe whether this is reflected in the comparison of the first two periods. It is also of interest to observe if the effect of increased competition is replicated in the third period.[2] The second reason for dividing the sample is to allow for the change in the composition of firms. Analysing the active firms in one period and comparing them with the ones in the next periods gives firms the opportunity to enter and exit the analysed sample. This is relevant for at least two reasons. First, new large firms like Microsoft, that were not in existence in 1950, can be included. These companies may be essential in characterizing the competitive process in the US. Looking only at survivors from 1950-99 would not make it possible for companies that were created after 1950 to

[1] One of the first attempts made to compare two different time periods for the same economy was made by Mueller (1990), where the periods 1950-72 and 1964-84 in the US were compared and increased competition in the second period was found.

[2] 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/.

be included in the sample. Second, it takes into consideration the effect of firm failure. Firms that are active in the first period might not be active in the second or subsequent period. Looking only at survivors may lead to an artificial stability in the sample.[3] The third reason for dividing the sample into three subperiods is to make it possible to apply advanced methodologies like the best lag structure or the time varying state space model, in order to compare the results and to obtain increased insight in the competitive process in the US during the last half of the twentieth century. The fourth reason for the time splitting is to make use of the improved data for the final period 1984-99. Most of the variables analysed for the last period were not available in the first two.

The paper contributes to the literature by presenting results over a time period considerably longer than those used in previous studies. While most of the previous persistence of profits studies use on average no more than twenty annual observations and occasionally less, the present study analyses profit persistence over half a century. This gives time for the competitive forces to be at work and makes the results of the tests more robust. Secondly, the time splitting method had never been applied before to three periods. Applying this methodology brings the advantages mentioned above, among which the most important are the possibility of detecting structural breaks and allowing for the firm composition to change. Thirdly, while the autoregressive process of first order (AR(1)) has become the modeling workhorse for empirically evaluating the adequacy of the competitive environment hypothesis, the present study estimates autoregressive processes up to order four and chooses 'the best lag model' for further analysis. This is crucial since the dynamic process of companies profits might be more complex than a simple AR(1) and the inability of AR(1) to capture the essential dynamics of time series of corporate earnings has already been posited in the literature. Cable and Jackson (2008) for example show that structural time series analysis is much more suitable in order to identify structural breaks, trends and cyclical behavior. McMillan and Wohar (2009) develop an asymmetric autoregressive model that enables to differentiate between entry and exit as conduits of the competitive model. Crespo-Cuaresma and Gschwandtner (2006) use threshold autoregressive model that allows for nonstationary behaviour over subsamples and find a much lower persistence level. Many other examples could be given. Fourthly, the present paper estimates a time varying state space model AR(1) where the profit persistence is allowed to change each period developed in Crespo-Cuaresma and Gschwandtner (2008). This addresses a serious limitation of previous studies that have in general unrealistically assumed that persistence is fixed over relatively long periods. Finally, this enriched econometric structure attempt to describe the evolution of profit persistence in the US in the second half of the twentieth century; something that has not been done in the past literature.

The paper proceeds as follows. The methodology is presented in section 2. The

[3] However the same issue of survivor bias still affects the estimates *within* each period.

empirical results are presented in sections 3 and 4. The conclusions appear in section 5.

2 Hypothesis and Methodology

There are essentially two views at the core of the competitive environment hypothesis that states that competition drives economic profits to zero - a static and a dynamic view of competition. The static view can be associated with the names of Cournot and Bain while the dynamic view with the name of Joseph Schumpeter. At the core of the static view lies the relationship between the profit-to-sales ratio of a firm and the Herfindhal index of concentration for the industry divided by the industry elasticity of demand. Therefore in the world of Joe Bain (1956) the characteristics of the industry (like industry concentration and industry elasticity of demand) are the driving forces behind persistent differences across firms. In Joseph Schumpeter's (1934, 1950) world the focus is on the characteristics of firms. Firms compete against each other by introducing innovations and copying one another's innovations. They start with 'monopoly power' upon their innovation, enjoy 'first mover advantages' and increase their market power over time. Theoretically abnormally high rates of return are competed away by entry and the threat of entry and firms that are making abnormally low profits should restructure or exit. Although the process of 'creative destruction' should drive all firms' profits toward zero, first mover advantages and other entry and exit barriers may hinder firms reaching this point. Therefore, the dynamic view is consistent with non-zero economic profits at different points in time. The large number of empirical studies that lead to what has become known as the persistence of profits literature tries to explain these non-zero profits with the help of various firm and industry characteristics.

In the Schumpeterian world today's profits are related to yesterday, but are expected to be converging onto the competitive norm. A firm's profitability in year t, π_{it} is assumed to consist upon three components: (1) a competitive return c common to all companies; (2) a permanent rent r_i specific to firm i; and (3) a short-run rent s_{it} which is also firm specific and tends to erode over time:

$$\pi_{it} = c + r_i + s_{it} \tag{1}$$

If the environment is perfectly competitive firms will not be able to earn a rate of return on capital above the competitive norm (c), implying that $r_i = 0$ and $E(s_{it}) = 0$ as t converges to infinity. Short-run rents are assumed to be correlated over time so that short-run deviations might take some periods in order to reach their competitive level. A possible assumption for the adjustment process of s_{it} is that they are intertemporally related but converge on zero:

$$s_{it} = \lambda_i s_{it-1} + \mu_{it} \quad (2)$$

where $|\lambda_i| < 1$ for stability and convergence upon a finite steady state and μ_{it} is an error term with zero mean and constant variance.[4]

Assuming that equation 2 holds in every period, it can be used to remove s_{it} from equation 1 obtaining:

$$\pi_{it} = (1 - \lambda_i)(c + r_i) + \lambda_i \pi_{it-1} + \mu_{it} \quad (3)$$

Letting $\hat{\alpha}_i$ and $\hat{\lambda}_i$ being the estimates of the previous autoregressive equation we get:

$$\pi_{it} = \alpha_i + \lambda_i \pi_{it-1} + \mu_{it} \quad (4)$$

The autoregressive process of order one (AR(1)) described by equation (4) has been one of the most used representations of the dynamics of profits since Mueller (1986) and Odagiri and Yamawaki (1986).

π_{it} denote firm i's profit rate defined as profits after taxes divided by its total assets in year t, [5] normalized by taking the difference from an economy-wide measure of profitability in year t and then expressing the result as a proportion of this economy-wide measure of profitability.[6] This normalization serves two ends. First, it removes the impact of macroeconomic cycles and second, π_{it} can be interpreted as a deviation from the competitive norm, with attendant welfare implications.

The unconditional expectation of π_{it} in (4) is then given by

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

[4]Note that the specification given by (4) 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).

[5]Many studies have used as a measure for profitability income plus interest divided by total assets in order to make the variable independent of the funding. However, adding back interest to an after-tax income figure does not accomplish this, since the tax level is affected by the capital structure. A truly capital structure-independent variable would use, for example, income before interest and taxation. However, this variable was not possible to obtain for a time span of this length.

[6]The economy-wide measure is the median of the profit of a sample consisting of at least 677 and at most 10,710 companies per year. 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).

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) and $\hat{\lambda}_i$ is a measure of the speed of adjustment of short-run profits (also called the short-run projected profit rate). Lambda is at the same time a measure for the competitiveness of the economy or the sample. The closer lambda is to zero, the faster short-run rents are eroded and the stronger the competition process is considered to be. The *Schumpeterian* notion views competition as a process in which the forces of entry are strong and rapid enough to bid away profits, therefore as a process where $\hat{\lambda}_i$ is sufficiently close to zero.

It is crucial, however, to consider both measures concomitantly. If lambda is very high (in absolute value), one might be inclined to conclude that we have to deal with a persistently profitable firm. However, if $\alpha_i = 0$ then also $\hat{p}_i = 0$ and long-run persistence is zero. Alternatively $\hat{p}_i$ could be negative, meaning that the firm persists in rents below the norm. Similarly, even if lambda is zero but $\hat{\alpha}_i$ is very high, we could have very strong long-run profit persistence. While most of studies look only at one profit persistence measure (in general the short-run persistence $\hat{\lambda}_i$) the present study considers both profit persistence measures simultaneously. Cable and Mueller (2008) stress out that the notion of profits persistence is inherently more subjective when one uses $\hat{\lambda}_i$ to represent it than when one uses $\hat{p}_i$. They show that the accuracy of the predictions made by $\hat{\lambda}_i$ is much more subjective to the length of the sample period than the ones made by $\hat{p}_i$. They also show that $\hat{p}_i$ has an advantage when one is thinking of persistence in terms out-of-sample projections. [7] Therefore it is important to consider both measures.

The present study extends the classical methodology by using the 'best lag model'. Autoregressive models up to order four have been estimated for each company and Akaike Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBC) have been employed in order to decide which model best describes the adjustment path. The model with the lowest AIC or SBC value is judged the best and has been chosen for further analysis.[8]

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

$$\hat{p}_i = \frac{\hat{\alpha}_i}{1 - (\sum_{j=1}^{L} \hat{\lambda}_{ij})} \tag{6}$$

[7]See the discussion in Cable and Mueller (2008) on pages 7 and 8.

[8]To see why it might not be appropriate to use the criteria of highest R^2 or even the criteria of highest adjusted R^2 when deciding among different models, see Greene (1993).

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.

This extension is important since the adjustment path of profitability might be more complex than a simple AR(1). Glen *et al.* (2001) find, for example, that AR(2) is a better method to model profitability. Cable and Jackson (2008) use structural time series analysis on a sample of 53 UK companies and find evidence for cyclical behavior. Crespo-Cuaresma and Gschwandtner (2006) use a nonlinear modeling strategy and find a better fit to the data compared to the simple AR(1). Cable and Gschwandtner (2008) and Cable and Mueller (2008) point out that not only the question of convergence is of interest but also the depiction of the convergence profile. If one wishes to obtain a more accurate picture of the profit dynamics of individual firms 'a more arduous econometric approach will be needed'. They suggest using both the AR1 framework to model the adjustment process and structural time series (STS) analysis in order to estimate the underlying trend. This methodology enables to describe more exactly the convergence profile. Kengelbach, le Grand and Ross (2007) fit an autoregressive exponential decay AR(1) model to a sample consisting of more than 10,000 US listed companies since 1965 and find further support that fading exists in abnormal profitability measured by Cash Flow Return on Investment. The 'best lag model' allows for more general dynamics than the simple AR(1) and at the same time enables comparison with most of the previous literature. A table with the distribution of the best autoregressive models due to the SBC and AIC criteria per period is contained in the Appendix (Table 10). While the first period strongly favours the AR1, in the second and third periods the further lags become more important. This might be explained through a more complex dynamic of profits in the more recent periods caused for example by increased merger activity. Table 10 also includes measures for the goodness of fit (adjusted R squared and the P-Value of the F-Statistic) and the autocorrelation of the residuals (the Durbin-h Statistic). For the further analysis the 'best lag models' were chosen due to the SBC criteria. However, the results using the AIC criteria are in general very similar as can be seen, from table 10. The kappa coefficient of agreement takes values between 0.72 and 0.82 which indicates very high agreement between the two decision criterias.

The procedure used in the present study is appropriate only for stationary AR processes, as $\alpha_i/(1-\lambda_i)$, the measure for long-run persistence, is not defined for unit root processes, where $\lambda_i = 1$. If $\lambda_i \approx 1$, the long-run persistence is poorly defined because the denominator is close to zero. The implications of non-stationarity for profit persistence are very important and have been discussed at length in Crespo-Gschwandtner (2006). The practice of testing for non-stationarity has its roots in macroeconomics, where some macro economic variables can drift off endlessly. But non-stationarity seems far less likely to be a problem for profits time series because a continuous downward trend in profits must either drive a firm out of the market or has to cause correction policies to stop this downward trend. At the same time competition must stop any continuous upward trend in profits. The right null hypothesis for profits time series should therefore be one of stationarity as it is for example in the KPSS test and not one of non-stationarity as it is in the commonly used ADF test. Moreover, it is known that the power of the ADF test is low for time series of short time dimension. Therefore, also a panel KPSS stationary test was done for each period and due to the KPSS test most of the series were stationary. Finally, both the results for stationary and non-stationary series will be presented but in order to preserve space the results for the stationary series will be presented in the Appendix.[9] As Cable and Mueller (2008) show in their study, stationarity tests are very important since apparent violations of stationarity usually signal the kind of breaks in the data that are expected when innovations occur.

The present paper introduces also an additional extension. It estimates for each period an AR(1) state space model that allows for the persistence parameter to change with time.[10] A simple generalization of (4) 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

$$\pi_{i,t} = \alpha(\mathbf{X_{i,t}}) + \lambda(\mathbf{Z_{i,t}})\pi_{i,t-1} + \varepsilon_{i,t}. \tag{7}$$

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 analysing 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, (7) 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 $\pi_{i,t-1}$.

A summary of previous studies and their average estimated $\hat{\lambda}_i$ is provided in table 1.

As it can be seen the analysed period ranges between 8 and 32 years and the number of firms between 17 and 4,488. The present study presents the longest time series available (50 years) and given this time period the highest number of firms (up to 1,099). This is important because the notion of profit persistence

[9]Due to the KPSS test in each period more 90% of the series were stationary. Due to the ADF test less than 20% of the series were stationary in each period. Due to the Im, Pesaran and Shin (2003) panel stationarity test, the panels for all three periods were stationary. See also the results for the stationary series in the Appendix.

[10]This methodology was first introduced in Crespo-Gschwandtner (2008).

Table 1: *Persistence of Profits Studies: International Comparison*

Nr.	Country	Source	Period (Years)	# Firms	Mean $\hat{\lambda}_i$
1	US	Mueller (1990)	1950-72 (23)	551	0.18
2	US		1964-80 (17)	413	0.47
3	US	Waring (1996)	1970-89 (20)	128	0.66
4	US	McGhan & Porter (1999)	1981-94 (14)	4,488	0.54
5	UK	Cubbin & Geroski (1990)	1951-77 (27)	243	0.49
6	UK	Geroski & Jacquemin (1988)	1949-77 (29)	51	0.49
7	UK	Cable, Jackson & Rhys (2001)	1968-99 (32)	53	0.63
8	UK	McMillan & Wohar (2009)	1980-2007 (28)	57	0.61
9	W. Germany	Geroski & Jacquemin (1988)	1961-81 (21)	28	0.41
10	W. Germany	Schwalbach et.al. (1989)	1961-82 (22)	299	0.49
11	W. Germany	Schol (1990)	1961-81 (21)	283	0.51
12	France	Geroski & Jacquemin (1988)	1965-82 (18)	55	0.41
13	France	Jenny & Weber (1990)	1965-82 (18)	450	0.37
14	Japan	Odagiri & Yamawaki (1990)	1964-82 (19)	376	0.47
15	Japan	Odagiri & Maruyama (2002)	1983-97 (15)	357	0.54
16	Canada	Khemani & Shapiro (1990)	1964-82 (19)	129	0.43
17	Sweden	Mueller (1990)	1967-85 (19)	43	0.78
18	Europ. firms	Eklund & Wiberg (2007)	1984-2004 (21)	293	0.47
19	Turkey	Yurtoglu (2004)	1985-98 (14)	172	0.38
20	Ukraine	Stephan & Tsapin (2008)	1999-2006 (8)	3,000	0.41
21	Brazil	Glen, Lee and Singh (2001)	1985-95 (11)	56	0.01
22	India		1982-92 (11)	40	0.23
23	Jordan		1980-94 (15)	17	0.35
24	Korea		1980-94 (15)	82	0.32
25	Malaysia		1983-94 (12)	62	0.35
26	Mexico		1984-94 (11)	39	0.22
27	Zimbabwe		1980-94 (15)	40	0.42

and the time series methodology need long time periods in order to yield robust results. Profits need time in order to adjust to a specific competitive norm. And the higher the number of firms the more representative the sample is for the whole economy. The present work differs from that of previous studies in that it conducts its tests using longer time series on company profits, thereby increasing their power. Additionally our sample allows for firms to enter and exit the analysed sample and therefore takes into account to some extent the firm failure effect. Looking only at surviving firms (as most of the previous studies have done) might be misleading. The length of the time series, the high number of firms and the new developed technologies are expected to increase the robustness of the results. Moreover, the main aim of the present study is to analyse the evolution of profit persistence over time, something that has not been done before in the literature.

3 Empirical Results

The empirical results sections refer first to some properties of the profit persistence parameters $\hat{\lambda}_i$ and $\hat{p}_i$, and then address the question of profit persistence. The two persistence parameters were calculated using equation (4) and (5) respectively. Finally they analyse its determinants: firm and industry characteristics.

3.1 Some properties of the profit persistence parameters

The speed of adjustment parameter $\hat{\lambda}_i$ shows how quickly the firm's profit rate π_{it} converges to its long-run level $\hat{p}_i$. If $\hat{\lambda}_i$ is close to zero, then the degree of persistence of past profits is small and therefore short-run rents are quickly eroded. The literature usually interprets this as sign of increased competitiveness.[11]

Table 2 presents the frequency distribution and mean $\hat{\lambda}_i$ for each period for the full sample. The mean $\hat{\lambda}_i$ for the period 1950-66 is 0.49 and it is the highest from all periods. This indicates that the speed of adjustment to the competitive norm for this period is lower than for all other periods and therefore competition is weaker. In the next period mean $\hat{\lambda}_i$ falls to 0.42 indicating that the degree of persistence decreases and therefore competition increases. This is consistent with the hypothesis that after the opening of the US economy to international competition in the 1960s, competition strengthened in the US. In the next period competition seem to increase even more, since mean $\hat{\lambda}_i$'s falls further to 0.36. [12] [13] It is important to stress that increased competition due to a more open US economy is just one possible explanation for the falling $\hat{\lambda}_i$. Additional interpretations could be given, e.g. the evolution of distribution of industries towards sectors with lower barriers to entry, such as services. Since we do not have data to support this interpretation we prefer for simplicity to stick to the 'more open US economy' explanation, for which we have provided numerical support. However, this should not exclude also other potential explanations.

[11]For all samples only the companies with values of lambda within the range (-1,1) were chosen for the analysis. Only for these values convergence is ensured.

[12]Due to a t-test the mean $\hat{\lambda}_i$'s for the three periods are significantly different from one another.

[13]The values for mean $\hat{\lambda}_i$ are similar to the ones of France for 1965-82 (0.37), Japan for 1964-82 (0.47) and United Kingdom for 1951-77 (0.49) presented by Mueller (1990) and are comparable to other economies worldwide. Goddard and Wilson (1999) summarize previous results for eight countries (seven advanced nations plus India), for varying periods between

Table 2: *Frequency Distribution of the Persistence Coefficient $\hat{\lambda}_i$:*

	50-66		67-83		84-99	
Interval	# $\hat{\lambda}_i$	%	# $\hat{\lambda}_i$	%	# $\hat{\lambda}_i$	%
-1-0	44	8.01	102	11.24	154	14.54
0-0.2	41	7.47	99	11.01	166	15.68
0.2-0.4	93	16.94	170	18.91	216	20.40
0.4-0.6	139	25.32	231	25.70	269	25.40
0.6-0.8	150	27.32	204	22.69	191	18.04
0.8-1	82	14.94	93	10.34	63	5.95
Mean $\hat{\lambda}_i$	0.49		0.42		0.36	

Due to a t-test all mean $\hat{\lambda}_i$ are significantly different between periods.
The test has been done using the values of $\hat{\lambda}_i$ divided by their standard errors.

A similar frequency distribution for the persistence coefficient $\hat{p}_i$ is presented in Table 3. A striking fact is that for the last period the mean long-run projected profit rate is negative. This might not seem so surprising if it is kept in mind that the profit rate is a deviation from the norm. While a negative profit rate could lead firms to bankruptcy, profit rates slightly below the economy average do not necessarily force companies out of the market. This might be the reason why a negative projected profit rate is not an exception in the literature. Mueller (1986), analysing US companies for the period 1950-72, finds a mean long-run projected profit rate of -0.003 (Table 2.2., page 22). He argues that if average profitability in the economy includes monopoly rents then the profit of a competitive firm shall be below this average. Odagiri and Maruyama (2002) find negative mean long-run projected profit rates for both period 1964-82 and period 1983-97 independently if the first or second period are used for the ranking of the companies (Table 1, page 1519).[14] It is important to keep in mind that the norm from which deviations are measured is a median return on assets in the economy in the specific year, therefore it does not measure the mean return on the total capital in the economy.

The results in Table 3 reveal that after the opening of the US economy to international competition, the mean projected profits first increased slightly in the second period and then decreased substantially in the last. The increased competition after the opening of the US economy is associated with decreasing average projected profitability. However, it is worth mentioning that the percentage of

1950 and 1985 and all other values than for the US are greater than 0.4.

[14]Means were calculated by the author on the basis of the group averages reported in the respective studies.

Table 3: *Frequency Distribution of the Persistence Coefficient $\hat{p}_i$:*

	50-66		*67-83*		*84-99*	
Int.	# $\hat{p}_i$	%	# $\hat{p}_i$	%	# $\hat{p}_i$	%
<-1	10	1.82	66	7.34	187	17.66
-1 to -0.6	25	4.55	74	8.23	71	6.70
-0.6 to -0.3	92	16.76	87	9.68	80	7.55
-0.3 to 0	147	26.78	156	17.35	79	7.46
0 to 0.3	115	20.95	176	19.58	95	8.79
0.3 to 0.6	77	14.03	131	14.57	112	10.58
0.6 to 1	41	7.47	96	10.68	92	8.69
>1	42	7.65	113	12.57	343	32.39
Mean $\hat{p}_i$	0.10		0.11		-0.09	

Mean $\hat{p}_i$ for the periods 50-66 and 67-83 are not significantly different from one another. The test has been done using the values of $\hat{p}_i$ divided by their standard errors.

long-run projected profit rates above 1 is highest in the last period.[15]

3.2 Profit persistence

In order to analyse the persistence of profits, the autoregressive equation was estimated for each company in each sample. According to the standard methodology used in the literature starting with Mueller (1986) the samples were then each divided into subgroups of about equal size on the basis of average profit rates enjoyed during the first three years of the sample period.

Table 4 presents the mean $\hat{p}$'s and the mean $\hat{\lambda}$'s per group for each of the periods analysed. The last two columns present the average initial profit rate (π_0) and the mean profit rate (π_{it}).

On average the long-run projected profit rate (Mean $\hat{p}$) is positive and significantly greater than zero in the group with the highest initial profit rate and falls almost uniformly as one moves to the two groups with lower average profit rates in the initial three years. In the last group (with the lowest initial profit rate), the coefficients are on average significantly less than zero.[16]

In all periods the first group (with the highest initial profit rate) converges from a mean initial profit rate (Mean π_0) high above the norm to a level closer to the

[15] A longer discussion about $\hat{p}_i$ significantly positive and $\hat{p}_i$ significantly negative will be done in the next subsection.

[16] The means of the first and the last group are due to a t-test always significantly different from zero.

norm (Mean $\hat{p}$). The strongest adjustment both in the first and in the last group seems to take place in the third period since companies in the first group start on average with a profit rate almost 300% above the norm and converge to a level of 200% above it and companies in the last group (with the lowest initial profit rate) start on average with a profit rate well below the norm (almost 500%) and converge to a level closer but still much below it (about 200%). The fact that the strongest adjustment seems to take place in the last period is consistent with the fact that for this period we have the closest mean $\hat{\lambda}_i$ to zero (0.36), and therefore the most intense competition process from all periods. Even though these values do imply convergence to the norm, the regression is far from complete. The ordering of the projected profit rates across the groups is in general the same as the one of the initial profit rates for all periods suggesting that firms tend to stay in the same group and that differences in profitability across firms persist.[17] Moreover, the mean $\hat{p}$ in the group with the highest initial profit rate is always highest and the mean $\hat{p}$ in the group with the lowest initial profit rate is always lowest suggesting persistence of positive/negative profitability in all periods.

The other very important measure in the analysis of persistence is the speed of adjustment parameter $\hat{\lambda}_i$. In general, all the mean $\hat{\lambda}$'s are similar for each period and suggest no systematic pattern from subsample to subsample. This is not what one expects 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 their normal returns will tend to persist. In contrast, companies with very high or low initial profits should have lower $\hat{\lambda}_i$'s, since their returns should be converging more rapidly to the norm. However, this is not what we observe. The smallest mean $\hat{\lambda}_i$'s are for the group with the lowest initial profit rate for the periods 1950-66 and 1984-99 and for the middle group for the period 1967-83. On the contrary, the highest mean $\hat{\lambda}_i$ and therefore the highest degree of persistence is in general in the group with the highest initial profit rate. This indicates that firms that started with the greatest positive deviation from the norm exhibit a slower average decline towards it.

Table 5 summarizes the main profit-persistence parameters in order to give a better overview over the three periods analysed.

The lower the percentage of long-run projected profit rates significantly different from zero, the more firms will converge to the norm, and therefore the more intense the competition process is. One can observe that this percentage is highest for the first period reinforcing the conclusion that in this period competition is rather weak. In the period 50-66 more than 50% of the companies had a projected profit rate significantly different from zero. In the next two periods this percentage decreases to 47.3 and finally to 43.4 suggesting an increase of

[17] Exceptions are between group 2 and 3 in the second period and between group 4 and 5 in the third period.

Table 4: *Mean $\hat{p}$'s and $\hat{\lambda}$'s for the Three Periods.*

	Obs.	*Group*	*Mean $\hat{p}$*	*Mean $\hat{\lambda}$*	*Mean π_0*	*Mean π_{it}*
1950-66	91	1	0.72	0.59	0.87	0.85
	91	2	0.21	0.48	0.30	0.28
	91	3	0.06	0.50	0.08	0.10
	91	4	0.02	0.49	-0.07	-0.12
	91	5	-0.11	0.47	-0.24	-0.25
	94	6	-0.26	0.41	-0.58	-0.56
	549	Mean	0.11	0.49	0.06	0.05
1967-83	150	1	0.89	0.53	1.38	1.39
	150	2	0.14	0.42	0.51	0.53
	150	3	0.18	0.41	0.16	0.16
	150	4	0.06	0.35	-0.07	-0.08
	150	5	-0.10	0.39	-0.30	-0.28
	149	6	-0.50	0.41	-0.92	-0.99
	899	Mean	0.11	0.42	0.13	0.12
1984-99	177	1	1.96	0.50	2.98	2.22
	177	2	0.89	0.40	1.43	1.06
	177	3	-0.10	0.40	0.70	0.49
	177	4	-0.79	0.31	0.16	0.05
	177	5	-0.40	0.31	-0.67	-0.42
	174	6	-2.13	0.22	-4.96	-3.75
	1059	Mean	-0.09	0.36	-0.06	-0.06

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

competition after the opening of the US economy.

The next two rows present the percentage of companies with a long-term predicted profitability that is over 100% or 100% less than the competitive norm. These are companies that managed to sustain their profits throughout the whole analysed period significantly above or significantly below the competitive norm. Therefore some impediments to competition must exist for them. McMillan and Wohar (2009) consider an asymmetric autoregressive model that allows the parameter governing persistence to vary between positive and negative profits relative to normal profits and are able to differentiate between entry and exit as conduits of the competitive model. They bring evidence that persistence is higher

Table 5: *Persistence Parameters:*

	50-66	**67-83**	**84-99**
# of firms *	549	899	1059
% of $\hat{p}_i$'s significantly different from 0	53.19	47.27	43.44
% of $\hat{p}_i$'s significantly positive	27.50	26.70	32.29
% of $\hat{p}_i$'s significantly negative	25.68	15.57	11.14
% of $\hat{\lambda}_i$'s significantly different from 0	65.76	52.61	42.12
Mean $\hat{\lambda}$	0.49	0.42	0.36
$\hat{\lambda}$ time varying model	0.63***(0.008)	0.54***(0.07)	0.19***(0.008)
% of equations with $\bar{R}^2 > 0.1$	78.84	79.29	69.15
Mean STDROA	0.38	0.73	2.62

*Companies with lambda in the range (-1,1).
STDROA is the average standard deviation of π_{it}.

for above average profit firms, suggesting that the factors determining entry are less effective in restoring competitive equilibrium than the factors determining exit. They show that firms with profits above normal are firms that have high barriers to entry and exit, while firms with below normal profits have lower barriers to entry and exit. Above normal profits firms sustain their profits because they both develop economies of scale and barriers to entry thus both forcing out inefficient firms and preventing entry. Therefore competitive pressures seem to operate better for firms with profits below the norm than for firms with profits above the norm. This might be of high importance to policymakers in establishing competition legislation. In our case the percentage of firms with a long-run profit rate significantly above the norm is in each period higher than the percentage of firms with a long-run projected profit rate significantly below the norm. Moreover the percentage of over the norm firms increases over time while the percentage of below the norm firms decreases. This might confirm the results of McMillan and Wohar (2009) that competition forces work better for firms with below normal profits.

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 profit persistence. This percentage decreases with time. It is highest in the first period and then decreases from 65.8% in 1950-66 to 52.6% in 1967-83 and further to 42.1% in 1984-99. The pattern of $\hat{\lambda}_i$ significantly different from zero reveals the same facts as the one of $\hat{p}_i$. At the beginning competition is weak and both percentages are the highest from all periods. After the opening of the US to international competition both percentages decrease. In the last period both percentages were the smallest from all periods. Furthermore, these results are also consistent with the development of mean $\hat{\lambda}_i$, the profit persistence parameter used in the literature to compare competitiveness between economies. The average degree of persistence is highest in the first period (0.49), then it decreases to 0.42 in the second and further to 0.36 in the most recent period analysed.[18]

The seventh row of table 5 presents the results of the AR (1) state space model for each of the three periods with a common intercept and a common short-run persistence parameters for the whole panel.[19] Even though the coefficients for the first two periods are slightly higher, the pattern is similar. The highest value for the short-run persistence parameter is in the first period. The estimated $\hat{\lambda}$ is 0.63 and it decreases to 0.54 in the second. In the third period it is more than one third smaller than in the first period (0.19). All the coefficients are highly significant.

The percentage of equations where the autoregressive process explains more than 10% in the variation in profits is above 69% in all three periods. In Mueller (1990) for four of the seven countries analysed, this percentage is smaller than 50% and for the period 1950-72 it is only 21.2%. The higher explanatory power in the present study is probably due to the 'best lag structure'.

The average standard deviation of π_{it} (STDROA) is almost seven times higher in the last period than in the first. Could this increased volatility of profits be caused at least partly by the increased merger activity in the 1980s and 1990s? We will analyse this hypothesis in more depth in the next section.

Finally, the hypothesis has been tested that all long-run projected profit rates ($\hat{p}_i$) converge to a common competitive level by restricting all firms to have the same ($\hat{p}_i$). The F-statistics for all periods were 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 could be easily rejected in all periods. Therefore, it cannot be denied that even if competition seems to have increased in the US since the 1950s, and even if convergence of profits towards the norm can be observed, there is still a considerable degree of profit persistence in each period.

[18] Even if not perfectly comparable, the percentages of $\hat{p}_i$ and $\hat{\lambda}_i$ significantly different from zero as shown in Mueller (1986) for the period 1950-72 are similar to the present results.

[19] Therefore the parameters cannot be equal to the ones in table 8 where also other variables were considered.

4 Explaining Profit Persistence

This section performs an integrated second stage analysis aimed at explaining profit persistence. The effect of the following industry and firm characteristics upon the two profit persistence measures is analysed:

Concentration measures (CR)

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. Several studies report a positive relationship between concentration and different measures of profitability (see for ex. Yurtoglu (2004) and Kambhampati (1995)). It should be noted, however, that firms in highly concentrated industries might want to hold prices low in order to retard entry. Scherer and Ross (1990) argue that it is not clear if 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 Odagiri (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. He argues that nonprice competition increases with concentration and lowers profits.

Industry size (VS)

It might be expected that the larger the number of establishments in the industry the higher the volatility of profits and the stronger the competition and therefore less profit persistence is found. In principle, a negative relationship between the profit persistence measures and the size of the industry is expected (see for ex. Kessides 1990). 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. In the present study the size of the industry was measured by the value of shipments (VS). Initially also the number of firms has been considered. This measure has the drawback that it can be negatively correlated to the concentration in the industry. Another measure for the size of the industry could be the capital employed. Unfortunately, data were not available.

Industry growth (Gvs, Gnf)

Changes in the size of 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 profits and their persistence might decrease subsequently. 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. Several empirical studies (see Kessides 1990, Gschwandtner 2005, Kambhampati 1995, Comanor and Wilson 1974, Fisher and Hall 1969, Esposito and Esposito 1971 and Coate 1989) tend to isolate this latter effect. In the present study the growth of the industry was measured by the growth in the value of shipments and the growth in the number of firms in the industry.

Market share (MS)

Market share (MS) may theoretically be 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). Several other examples could be given (see for ex. Mullin et al. 1995 and Marion et al. 1979). 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.[20]

Firm's growth (GS)

The impact of the growth rate of a firm on profitability is not always unambiguous but in general is supposed to be positive. In the present study growth is measured as the growth rate of a 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 (lnA)

As in the case of the growth the effect of the size of the firm on profit persistence 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 any significant impact of the size of the firm on profit persistence.

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

Risk proxies (Sd)

Some 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 firms with low variability in profits could also have 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 an 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 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).[21] The exact source and definition of the variables is contained in the Appendix.

Dividing the time period 1950-99 into three subperiods enables us to analyse how

[21] 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. 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. The share of exports in total sales has also 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, calculated as the logarithm of the number of years from its foundation, can account for life-cycle effects. Several variables related to ownership and control 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. Some of these additional variables have been considered for the last period when the data situation is improved but unfortunately most of them were not available for the whole time span.

the impact of industry and firm characteristics on the two estimated profit persistence measures ($\hat{\lambda}_i$ and $\hat{p}_i$) evolve over time. Since both measures are estimated parameters, the equations are weighted by the inverse of their standard errors, as suggested by Saxonhouse (1976).[22] [23]

Table 6 presents the results. The first equation always explains the impact of the **industry** characteristics (like concentration) on the long-run projected profit rate $\hat{p}_i$ and the second on the speed of adjustment parameter $\hat{\lambda}_i$. The third equation explains the impact of **firm** characteristics (like market share) on $\hat{p}_i$ and the fourth on the speed of adjustment parameter $\hat{\lambda}_i$. Finally, the last two equations include the impact of both industry and firm characteristics on $\hat{p}_i$ and respectively on $\hat{\lambda}_i$.

[22]The standard errors were determined with the Delta method.

[23]Tolerance is always > 0.1 and the variance inflation factor (VIF) is always < 10 indicating that possible multicolinearity is not biasing the results.

Table 6: *Regressions Explaining the Estimated Parameters of Equation 4.*

Per.	*D.Var.*	*Int.*	*VS*	*CR*	*Gnf*	*Gvs*	*MS*	*Sd*	*lnA*	*GS*	$\bar{R}^2$	*P*
50-66	$\hat{p}_i$	0.80	-6.4E-8	-0.01	-0.04	-0.07					0.02	0.80
		(0.73)	(-0.70)	(-0.50)	(-0.24)	(-0.22)						
	$\hat{\lambda}_i$	4.01	9.41	-0.02	-0.13	0.02					0.04	0.01
		(8.76)	**(2.39)**	**(-2.62)**	**(-1.75)**	(0.15)						
	$\hat{p}_i$	1.29					-1.62	0.37	-0.23	-0.27	0.01	0.01
		(1.34)					**(-2.06)**	(0.59)	(-1.26)	(-0.37)		
	$\hat{\lambda}_i$	2.15					0.02	0.31	0.19	-0.70	0.02	0.02
		(5.11)					(0.05)	(1.15)	**(2.38)**	**(-2.17)**		
	$\hat{p}_i$	2.27	-5.9E-8	-0.01	-0.03	-0.09	-1.80	0.52	-0.24	0.04	0.02	0.61
		(1.43)	(-0.62)	(-0.59)	(-0.19)	(-0.26)	(-1.43)	(0.51)	(-0.81)	(0.04)		
	$\hat{\lambda}_i$	2.98	7.8E-8	-0.02	-0.13	0.03	-0.29	0.46	0.32	-0.88	0.06	0.02
		(4.47)	**(1.95)**	**(-3.09)**	**(-1.77)**	(0.23)	(-0.55)	(1.05)	**(2.55)**	**(-2.30)**		
67-83	$\hat{p}_i$	0.86	0.00	-0.00	-0.80	0.74					0.00	0.88
		(0.87)	(0.31)	(-0.09)	(-0.94)	(0.83)						
	$\hat{\lambda}_i$	3.32	-0.00	-0.02	-0.78	0.74					0.02	0.01
		(7.01)	(-0.72)	**(-2.97)**	**(-1.92)**	**(1.74)**						
	$\hat{p}_i$	2.38					-0.59	-1.80	0.41	-0.05	0.10	0.05
		(9.37)					(-1.15)	**(-7.53)**	(1.00)	(-0.14)		
	$\hat{\lambda}_i$	2.36					0.15	-2.10	-0.10	0.17	0.04	0.08
		(18.37)					(0.57)	**(-1.73)**	(-0.50)	(0.86)		
	$\hat{p}_i$	2.55	- 0.00	-0.00	-0.79	0.79	-0.74	-1.99	1.27	-1.41	0.07	0.00
		(2.43)	(-0.22)	(-0.18)	(-0.96)	(0.91)	(-1.06)	**(-6.00)**	(1.57)	(-1.58)		
	$\hat{\lambda}_i$	3.43	-0.00	-0.02	-0.78	0.74	-0.07	-0.26	-0.05	0.26	0.03	0.04
		(6.63)	(-0.76)	**(-2.79)**	**(-1.92)**	**(1.72)**	(-0.19)	**(-1.67)**	(-0.12)	(0.58)		
84-99	$\hat{p}_i$	3.22	0.00	-0.02	0.06	-0.28					0.02	0.03
		(3.89)	(1.21)	**(-1.86)**	(0.99)	**(-2.47)**						
	$\hat{\lambda}_i$	1.33	-0.00	0.00	0.03	0.01					0.05	0.06
		(3.19)	(-0.90)	(0.98)	(1.02)	(0.13)						
	$\hat{p}_i$	2.30					0.30	-0.99	-0.18	-0.01	0.02	0.00
		(5.07)					(0.77)	**(-3.94)**	**(-2.57)**	(-1.16)		
	$\hat{\lambda}_i$	1.84					-0.08	-0.03	0.02	-0.00	0.01	0.01
		(9.45)					(-0.47)	**(-3.01)**	(0.66)	(-0.47)		
	$\hat{p}_i$	3.09	- 0.00	-0.01	0.07	- 0.22	-0.01	-0.37	-0.17	-0.07	0.15	0.00
		(3.55)	(-0.56)	(-1.20)	(1.07)	**(-2.01)**	(-1.61)	**(-6.79)**	**(-1.80)**	-1.16		
	$\hat{\lambda}_i$	1.84	-0.00	-0.01	0.02	0.01	0.32	-0.10	-0.13	-0.02	0.04	0.01
		(4.00)	(-0.45)	**(-1.93)**	(0.72)	(0.12)	(1.22)	**(-3.61)**	**(-2.45)**	-0.66		

Industry Var.: CR=concentration ratio, Gnf=growth in the number of firms,
Gvs=growth rate of the value of shipments. Company Var.: MS=company sales/industry sales,
Sd=Standard Deviation of the return on assets, lnA=natural logarithm of total assets,
GS=percentage change in Sales. All industry and firm variables are averages over the sample period.
Numbers in parentheses are heteroscedasticity consistent t-values. P refers to the P-value of the F-test.

In the initial period three industry variables had a significant impact on short-run persistence: the value of shipments, the growth in the number of firms and concentration. While the coefficient of the value of shipments is positive, the coefficient of the other two significant variables is negative. The higher the value of shipments, the lower the growth rate in the number of firms and the concentration the higher short-run persistence is. The entry-deterring argument seems to dominate in this case. Firm characteristics do seem to explain about 2% in the variation of the speed of adjustment parameter $\hat{\lambda}_i$. The coefficient of the logarithms of assets is positive and highly significant showing that larger firms have a higher lambda and therefore a higher degree of persistence. At the same time firms with a high growth in sales do not seem to have a high short-run persistence since the coefficient of the growth parameter is negative and significant. The overall firm characteristics equation is significant at 5% (P-Value 0.02). At first sight, the results for the long-run persistence seem puzzling since the coefficient of market share is significantly negative. However, if market share is a proxy for diversification, this result is no longer surprising since several studies find a negative correlation between profitability and diversification (see for example Ravenscraft (1983) or Lang and Stulz (1994) and their citations).

Furthermore, when all the variables are added to the equation, the coefficient of the market share becomes insignificant while all other variables remain significant. It can therefore be concluded that in the 1950-66s rather big, slow growing companies operating in big industries (with high value of shipments) characterized by low growth and concentration were persistently profitable firms.

In the second period (67-83) the analysed industry characteristics certainly explain around 2% in the variation of $\hat{\lambda}_i$ and this is due to the small positive and significant coefficient of the growth in the value of shipments and due to the negative and significant coefficients of concentration and the growth in the number of firms. Firms being active in industries where the value of shipments grows but the number of firms and the concentration do not, seem to achieve a higher degree of short-profit persistence.[24] Firm characteristics explain approximatively 10% of the variation in $\hat{p}_i$ and approximatively 4% of the variation in $\hat{\lambda}_i$. The volatility of the return on assets seems to influence negatively both profit persistence variables. Companies with a higher volatility in profits (Sd) seem to converge to a lower profit level and seem to reach this level relatively fast. This is in contradiction with risk theory, which states that companies with higher risk (and therefore with higher volatility of profits) should have on average a higher profit level than companies with lower risk. The reason for the negative coefficient of the risk measure might be the reversed causality argument mentioned before. Firms with low profitability might be forced to take higher risks in order to increase profitability. When all the variables are added to the equation, all the significant variables keep their sign and significance and the equation is overall

[24] A similar result was obtained by Kambhampati (1995) and by Coate (1989).

significant at a level of 5% (as measured by the P-value of the F-Test).

In the last period (1984-99) firm- and industry characteristics together explain 15% of the variation of the long-run projected profit rate $\hat{p}_i$ and 4% of the variation of the speed of adjustment parameter $\hat{\lambda}_i$. The size of the company (lnA) has now a negative and significant impact on short- and long-run persistence. Being a big company is not a guarantee for profit persistence anymore. The risk proxy (Sd) has a negative and significant impact on both persistence measures indicating that firms with a low volatility in profits converge to higher profit levels. The fact that the volatility of profits has a significant coefficient could also be explained by the more intense merger activity in this period. Therefore, in the following table (Table 19) the impact on profit persistence of the merger related variable M1 will be analysed.

The results for the stationary series for all periods are presented in Table 18 in the Appendix. In general the results for the stationary series are similar but less significant than the one for the full sample.

Table 7 presents the impact of all industry and firm characteristics available for the last period. Since the data situation for this period has improved, more firm- and industry characteristics could be considered.[25] Additional firm characteristics that could be taken into consideration were Advertising (Av), R&D (Rd) and the merger activity of the company (M1). Firm characteristics have a significant impact on both profit persistence measures as the P-value of the F-test shows. Advertising has a strong positive impact both on short and long run persistence. Advertising is the basis for product differentiation that could help firms to sustain profits. At the same time Advertising is crucial in a competitive environment. This might explain the strong positive impact. On the other hand R&D has a negative impact on long-run persistence. This might be surprising since an intense R&D activity should lead to sustainable profits. However this is just the case if the R&D activity is efficient and successful. Our measure is a pure input measure that does not automatically reflect technological knowledge or any positive economic activity. Audretsch and Mahmood (1995) show that the impact of the innovative activity on the probability of survival of a firm depends on the technological environment. 'The exposure to risk confronting new establishments is presumably greater in industries where incumbent firms tend to have the innovative advantage.' They find that the total innovation rate defined as the total number of innovations divided by industry employment has a positive impact on the hazard rate of a firm and increases its probability of exit, therefore lowers profit persistence. Audretsch (1995) finds that both the impact of the total innovation rate and the impact of small firm innovation rate on the likelihood of survival and therefore implicitly on profit persistence, are negative

[25]For comparability reasons we thought it would be correct to present first the results with the same variables as in all other periods and only after the results for the additional variables.

(Table 3 on page 454). He concludes that the innovative environment serves on average as a barrier to survival. Moreover, Cantner and Krger (2004) show that the technological and the economic spheres may be only weakly related. The impact of risk (Sd) on both profit persistence measures is again negative and significant indicating that companies with lower risk converge to higher profit levels relatively fast. Additional industry characteristics that could be taken in consideration were the average exports (Exp) and imports (Imp) in the industry. Whereas exports do not seem to have an significant impact upon profit persistence, imports do have a negative impact upon $\hat{p_i}$. The negative impact might be explained by the fact that imported goods are a form of competition to domestic goods and could therefore decrease the long-run profitability. However, when all variables are added to the regression, the negative significant impact of imports disappears. Other industry variables that have a significant impact upon profit persistence are the size (VS) and the growth of the industry (Gnf, Gvs). This time the effect is significantly positive as expected. Fast growing industries are expected to be profitable and successful. When all the variables are added to the regression, the growth in the number of firms and advertising still have a strong positive - and the measure for risk still has a negative significant impact upon $\hat{p_i}$. To this the positive effect of the firm's growth adds. The negative impact of imports and R&D disappears. Together firm and industry characteristics explain 17% of the variation of $\hat{p_i}$ and the overall regression is highly significant. The explanatory power of firm and industry characteristics of the parameter $\hat{\lambda_i}$ is smaller (only 7%), however the overall regression is significant at 5%. This is mainly due to the negative impact of risk and of size. These results resemble strongly the ones of the regression without the new variables added (Table 6). The hypothesis that merger activity might be correlated to profit persistence after the 1980s does not seem to be confirmed here since the coefficient of our proxy for merger activity (M1) is not significant. This is the main variable when the results for the full sample and the stationary series do not comply. Therefore we conclude that the impact of the merger activity in our sample is inconclusive.

In general it has to be stated that even if the equations are overall significant (as shown by the P-Values of the F-test) the adjusted R^2 is relatively small. The first and most important reason is that, as previously discussed, several other variables have been found to be correlated to profit persistence (corporate governance variables, market orientation, membership to major business groups etc.) that could not be taken into consideration here because of data limitation. In a recent paper, for example, Singh et. al. (2009) find that the level of shareholder protection index is positively correlated with profit persistence in civil law countries and negatively correlated in the common law countries. The R^2 for various countries ranges between 0.11 and 0.58. The second reason is the relative inefficient 'two step methodology' where in a first step the persistence parameters are estimated and only in a second step the impact of various explanatory variables upon the two persistence parameters is estimated. Crespo-Cuaresma and Gschwandtner (2008) show that biases and efficiency losses are the result of the two step methodology and propose a direct estimation that is more efficient. This methodology is applied next in the present paper and it can be observed that the significance of the coefficients and the adjusted R^2 increases significantly. Finally in the present paper the adjusted R^2 has been reported while most of previous studies report on the simple R^2. While the simple R^2 rises with the number of explanatory variables included in the model (including the lags), the adjusted R^2 corrects for this and is in general much smaller.

Table 7: *Regressions Explaining the Estimated Parameters of Equation 4, for the Period 84-99 including Advertising, Exports, Imports and the Merger Activity.*

De.V.	*Int.*	*Vs*	*Cr*	*Gnf*	*Gvs*	*Exp*	*Imp*	*Av*	*Rd*	*M1*	*Ms*	*Sd*	*lnA*	*GS*	$\bar{R}^2$	*P*
$\hat{p}_i$	2.41	1.9e-8	-0.01	1.61	-0.62	3.8e-12	-5.2e-11								0.03	0.09
	(2.36)	**(2.08)**	(-0.90)	**(1.73)**	(-1.45)	0.09	**(-1.88)**									
$\hat{\lambda}_i$	1.87	1.5e-9	-0.00	-0.71	0.54	-3.1e-11	5.2e-12								0.03	0.1
	(3.62)	(0.32)	(-0.50)	(-1.51)	**(2.50)**	(-1.41)	0.37									
$\hat{p}_i$	2.41							37.99	0.26	-0.05	-0.36	-0.10	0.12	-0.01	0.17	0.00
	(2.36)							**(6.78)**	(0.11)	(-0.35)	(-1.06)	**(-4.53)**	**(1.88)**	(-0.93)		
$\hat{\lambda}_i$	1.87							6.37	-2.65	-0.08	-0.09	-0.03	0.01	-0.00	0.02	0.00
	(8.54)							**(2.24)**	**(-2.15)**	-1.11	-0.52	**(-2.64)**	(0.21)	(-0.56)		
$\hat{p}_i$	1.90	4.7e-9	-0.01	2.32	-0.84	6.9e-12	-2.9e-11	23.72	0.44	-0.19	-0.57	-0.33	0.20	0.03	0.17	0.00
	(1.81)	(0.48)	(-0.68)	**(2.59)**	(-1.00)	(0.16)	(-1.08)	**(2.86)**	(0.14)	-0.64	(-0.93)	**(-5.20)**	(1.60)	**(1.74)**		
$\hat{\lambda}_i$	2.57	4.3e-7	0.00	-0.74	0.48	-2.4e-11	1.4e-12	3.50	0.52	0.09	0.52	-0.11	- 0.14	0.01	0.07	0.02
	(3.99)	(1.44)	(0.37)	(-1.53)	**(2.14)**	(-1.08)	(0.20)	(0.78)	(0.30)	(0.60)	(1.60)	**(-3.16)**	**(-2.28)**	(1.44)		

Industry Var.: Cr=concentration ratio, Gnf=growth in the number of firms,
Gvs=growth rate of the value of shipments, Exp=Mean Exports per Industry, Imp=Mean Imports per Industry.
Company Var.: Ms=company sales/industry sales, Sd=Standard Deviation of the return on assets,
lnA=natural logarithm of total assets, GS=percentage change in Sales, M1=Mean merger value/Mean assets,
Rd=Mean Expenditures for research and development/Mean Assets, Av=Mean Advertising expenditures/Mean assets.
All industry and firm variables are averages over the sample period.
Numbers in parentheses are heteroscedasticity consistent t-values. P refers to the P-value of the F-test.

A panel estimation was done for each period (full sample and stationary series) in order to determine the persistence parameter for each industry.

Mean profit persistence per industry is highest in the first period and it decreases then in the second. In the third period it is almost only half as big as in the first, reinforcing the conclusion that after the opening of the US economy to international competition also profit persistence decreases. Therefore the average profit persistence per industry shows the same pattern as the average profit persistence per firm.

Finally equation 7 was estimated using the full set of available variables as potential covariates of the persistence measures. The results are presented in Table 8 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).

The results resemble the ones of the 'best lag model' but are in general more robust. The adjusted R^2 is much higher and the significance of the coefficients is stronger. In the first period rather big firms characterized by slow growth and low market share seem to be persistently profitable firms. The impact of risk (measured by the standard deviation of the return on assets 'Sd') is inconclusive since it is negative on short-run persistence an positive on long-run persistence. In this setting none of the industry variables has a significant impact on profit persistence. The reason is probably because the data situation on industry level is not very good for the first period since many data points for the 1954 census are missing. When using averages over the whole times span in the 'best lag model' this has not such a strong impact. In the second period the data situation for the industry characteristics improves and the negative impact of concentration becomes visible. At firm level we can observe that risk and size have strong negative impact underlining the results of the 'best lag model' that show that in this period the ability to avoid risk becomes crucial. At the same time, size is not a guarantee for profit persistence anymore since its impact (measured by the logarithm of assets) on profit persistence is negative. In the third period the ability to grow becomes important since the coefficient of the growth rate of the firm (as measured by the growth rate of its sales) has a positive and significant impact on short-run persistence. As in the previous period size and risk have a negative impact on profit persistence. Additionally imports and advertising have a significantly positive impact on profit persistence. In a competitive world the importing and advertising activity seem to play a crucial role. The results resemble the ones of the 'best lag model' presented in Tables 6 and 7 but are in general stronger.

In interpreting the results, it can be concluded that in all periods both industry- and firm characteristics contributed in explaining profit persistence. In 1950-66 mainly the size of the company was associated with higher profit persistence.

Table 8: *Regressions Explaining the Estimated Parameters of Equation 7.*

Variable	1950-66	1967-83	1984-99
Inter.	$-0.19^{***}(0.024)$	$0.288^{***}(0.018)$	$1.16^{***}(0.098)$
$\pi_{i,t-1}$	$0.722^{***}(0.013)$	$0.664^{***}(0.037)$	$0.549^{***}(0.045)$
MS $\times \pi_{i,t-1}$	$-0.07^{**}(0.028)$		
Sd $\times \pi_{i,t-1}$	$-0.02^{***}(0.003)$	$-0.243^{***}(0.01)$	-0.017^{***} (0.002)
lnA $\times \pi_{i,t-1}$	$0.014^{***}(0.004)$	$-0.025^{***}(0.005)$	-0.031^{***} (0.008)
GS $\times \pi_{i,t-1}$	$-0.04^{***}(0.001)$		0.0002^{*} (0.000)
VS $\times \pi_{i,t-1}$			
CR $\times \pi_{i,t-1}$		$-0.001^{***}(0.00)$	
Gnf $\times \pi_{i,t-1}$		$-1.712^{***}(0.49)$	
Gvs $\times \pi_{i,t-1}$		$-0.249^{***}(0.08)$	
Imp $\times \pi_{i,t-1}$			0.0002^{**} (0.000)
Av $\times \pi_{i,t-1}$			
MS			
Sd	$0.401^{***}(0.019)$	$-0.404^{***}(0.02)$	-0.437^{***} (0.023)
lnA			
GS		0.09889(0.0788)	
VS			
CR			
Gnf			
Gvs			
Imp			
Av			12.193^{***} (2.503)
Adj. R-squared	0.487	0.364	0.219
F-stat.	$1,381.13^{***}$	608.85^{***}	188.69^{***}
Observations	8,717	8,482	4,674

Large, slow growing firms operating in big industries characterized by low concentration and growth were successful profitable firms. This resembles the picture of an economy not exposed to international competition. Starting with the second period, companies with low profitability seem to be forced to take higher risks in order to increase their profitability (the coefficient of the risk has a negative impact on both profit persistence measures). The size of the industry does not seem to play such an important role anymore as opposed to its growth. Both measures for the growth of the industry (the growth in the number of firms and the growth in the value of shipments) are correlated with higher short-run profit persistence. In the last period 1984-99 the data situation is improved and therefore more variables could be added to the regression. The impact of advertising, research and development, exports and imports as well as the intensity of the merger activity could be taken into consideration. The size of the company has now a negative impact upon profit persistence meaning that rather small firms become profitable. At the same time the ability to perform advertising and to avoid risk. These characteristics are usually associated with a competitive environment. Therefore, in the last period rather small firms with the capacity to avoid risk, being active in fast growing competitive industries seem to be successful profitable firms.

5 Conclusions

The present study analyses the evolution of the competition process in the US in the second half of the 20th century by dividing the period 1950-99 into three different subperiods (50-66, 67-83, 84-99). This structure allows for companies to enter and exit the analysed sample and therefore a clearer pattern of competition can be traced than by looking just at surviving companies, as most of the previous studies have done before. The firm failure effect is at least partly taken into account.

As Table 1 reveals, the paper improves on the previous literature by using a larger sample given the length of the time series. This is important for the notion of persistence of profits and for the representativeness of the sample. The paper contributes also by using advanced econometric tools like the 'best lag model' and the AR(1) state space model. This model allows for the profit persistence parameters to vary with time and therefore addresses a serious limitation of the existing literature that unrealistically assumes persistence to be constant over periods of 20 years or longer. The results prove to be more robust and the power of the tests is increased. Moreover, the study analyses the evolution of profit persistence over time, something that has not been done previously in the literature.

Profit persistence in 1950-66 is considerable but decreases strongly after the opening of the US to international competition in the 1960-80s. Other reasons like the change in the structure of the industries and the movement towards sectors with lower entry barriers, such as services might be responsible for that. The intensity of competition increases even more in the next period. Both mean short- and long- persistence decrease significantly and the companies earn on average less then the competitive norm. This resemble the picture of an economy exposed to competition. Nevertheless, a considerable degree of profit persistence could be found in all three periods especially for companies with profits significantly above and below the norm.

In explaining profit persistence both industry and firm characteristics have been analysed. Since placing the companies into their market context is crucial for understanding profit persistence, a profit persistence parameter per industry has also been estimated. Average profit persistence per industry resembles the pattern of average profit persistence per firm. It is highest in the first period and then decreases in the following two periods.

While in the period 1950-66, being a large company in a big slow growing industry, seemed to be sufficient for profit persistence, in the next periods other variables correlated with a more intense competitive process became important. The capacity of the company to perform advertising, the ability to avoid risk, and the affiliation to a fast growing competitive industry became crucial determinants of profit persistence.

Future work may consider an asymmetric autoregressive model as the one used by McMillan and Wohar (2009). As already discussed this model makes it possible to differentiate between entry and exit as conduits of the competitive model and is therefore important for policymakers in establishing competition legislation. As competitive pressures seem to operate better for below normal profit firms - the above normal profits firm might be of stronger focus to policy makers.

Furthermore, if one is interested not only in the question whether persistence of profit across firms exists and matters of the competitiveness of the economy (or sample) as a whole but also in a more accurate picture of the profit dynamics of individual firms, then an useful tool might be the structural time series analysis proposed for example in Cable and Mueller (2008). The authors show that the histories of the firms analysed reveal important 'shocks' in the form of technological innovations, mergers, changes in advertising strategies, that seem to have important effects on the profit dynamics of the companies. If one is interested in an accurate description of the evolution of the profit dynamics of individual firms then the simple AR(1) might be insufficient. Adding lags will surely lead to a better description of the evolution of profitability but structural time series analysis would allow also to identify structural breaks, trends and cyclical behavior. Cable and Gschwandtner (2008) analysing and comparing a larger sample of US and UK firms show that there might be merit in the joint application of AR(1) and structural time series analysis.

Finally in industrial organization, as in all other fields, more data are better than less. The sample could be extended to include a longer time series and more variables in order to better explain the dynamics of company profits. While most additional variables that are considered recently come from corporate governance, various other financial variables (like leverage, stock return, dividends etc.) might be also of future interest especially in the light of the actual financial crisis. As suggested by Singh et. al. (2009) the product market might be an important 'missing link' in explaining changes in financial markets.

A Appendix

Data

The database contains yearly data on profits for three different samples for the periods 1950-66, 1967-83 and 1984-99. First, all available firms in Compustat for the years 1950, 1967 and 1984 where selected. Next, the companies that survived until the end of the periods (1966, 1983 and 1999) and had complete series were chosen for the further analysis. Finally the Augmented Dickey-Fuller (ADF) test and the KPSS test were applied in order to determine how many firms were stationary in each period. Table 9 gives an overview over the firms that survived, that exited and the ones that were stationary in each period.[26]

Table 9: *Disposition of Companies 1950-66, 1967-83, 1984-99*

Period	**1950-66**	%	**1967-83**	%	**1984-99**	%
Firms at the start of period	677		1,736		4,776	
Firms at the end of period	602	88.92	1,021	58.81	1,126	23.58
Complete time series	567	83.75	980	56.45	1,099	23.01
Stationary (ADF) (10%)	112	19.75*	186	18.98*	203	18,56*
Stationary (ADF) (5%)	48	8.47*	95	9.69*	94	8,55 *

* Percentage from complete time series.

Due to the KPSS test in each period more than 90% of the series are stationary.

The issue arises if any sample of surviving companies is representative of the population of all firms in a country. Surviving firms usually bring an artificial stability into the sample since they are more successful than other companies at least in one respect: they have survived. If all the companies that did not survive had done this because of bad performance, would we not then conclude that there is considerable convergence in firm' profit rates over time? The best way to answer this question is to analyse also non-surviving companies. However, Gschwandtner (2005) shows that non-survivors do not behave significantly different than survivors. For this and for comparability reasons, only surviving firms in each period have been considered in the present study. The time splitting methodology however, allows for fluctuation of firms in the analysed sample and therefore at least to some extent the firm failure effect has been taken into account.

[26]The number of companies used in the present study is comparable or even higher than in any persistence-of-profit study. For example: In the international study by Mueller (1990) where 7 developed economies were analysed in terms of profit persistence, the sample of firms were as follows: Sweden 43 firms, Canada 161 firms, UK 243 firms, Germany 290 firms, Japan 376 firms, France 450 firms, US '1964-80' 413 firms, US '1950-72' 551 firms.

The starting point, 1950, was determined by necessity because this was the starting year of the Compustat database, the main data source for this study. Especially for the first years, missing data had to be completed using 'Moody's Industrial Manual'. Profit data for the last years were compiled using the Global Vantage database.[27]

The firm level data contains the following firm characteristics used to explain profit persistence: market share (MS), the volatility of the profit rate (Sd), industry (SIC), the size of the company in terms of assets (lnA) and the company's growth rate of sales (GS). The only industry characteristics for which it was possible to obtain data for all three time periods are: concentration (CR), size (value of shipments -VS) and growth (of the number of firms, value of shipments- Gnf, Gvs). These variables are contained in the Census of Manufacturing Bulletin, Concentration Ratios in Manufacturing. For the years 1947-1992 a summarized document could be obtained from the economics archive of the College of Wooster, Ohio.[28] The data for 1997 are available online at the official Census Website.[29] The industry characteristics database was split in 3 different periods of about equal coverage as the profitability data. The industry variables are means over each period. From 1997 onwards, the census data uses the new NAICS industry definitions, rather then the previously cited SIC definitions. Therefore the SIC code found in Compustat had to be translated into the NACIS code using an NACIS/SIC Codes Conversion Table.[30] After 1980, data on R&D, advertising, exports/imports and mergers could be obtained. R&D and advertising data are from Compustat and Global Vantage. US import and export data was assembled by Robert Feenstra and updated by Peter Schott.[31] The merger data are from Gugler *et. al.* (2004b) and contain information on the average value that a company has spent on mergers in the specific period. Descriptive statistics for the profit rates, for the firms- and industry characteristics for all periods are available in tables 11, 12 and 13. The compilation of the database was a very tedious process that lasted for more than three years.

[27] The variable in the Compustat Database for firm i's profit rate is known as *Income Before Extraordinary Items* and 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 are made. *Total-Assets* represent current assets plus net property, plant and equipment plus other noncurrent assets.

[28] Source: http://www.wooster.edu/economics/archive/indconc.html

[29] Source: http://www.census.gov/

[30] Source: http://www.loglink.com/sic.asp

[31] Source: http://www.som.yale.edu/faculty/.

Table 10: *Distribution of the Autoregressive Models.*

Per.	*50-66*				*67-83*				*84-99*			
	# Firms (%)		*stat.*		*# Firms (%)*		*stat*		*# Firms (%)*		*stat*	
Model	*SBC*	*AIC*	*SBC*	*AIC*	*SBC*	*AIC*	*SBC*	*AIC*	*SBC*	*AIC*	*SBC*	*AIC*
AR1	444(78.3)	388(68.4)	63(56.3)	47(42.0)	703(71.7)	595 (60.7)	76(40.9)	61(32.8)	821(74.7)	737(67.1)	116(57.1)	97(47.8)
AR2	67(11.8)	90(15.9)	33 (29.5)	41(36.6)	160 (16.3)	185(18.9)	72 (38.7)	75(40.3)	129(11.7)	145(13.2)	55(27.1)	62(30.5)
AR3	27(4.8)	35(6.2)	6 (5.4)	5(4.5)	64(6.5)	101(10.3)	24(12.9)	29(15.6)	68(6.2)	92(8.3)	10(4.9)	13(6.4)
AR4	29(5.1)	54 (9.5)	10(8.9)	19(16.9)	53(5.4)	99(10.1)	14 (7.5)	21(11.3)	81(7.4)	125(11.4)	22(10.8)	31(15.3)
$\bar{R}^2$ *Min*	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09
Max	0.94	0.94	0.80	0.80	0.95	0.95	0.82	0.82	0.93	0.93	0.85	0.85
Med	0.29	0.32	0.07	0.18	0.28	0.31	0.19	0.23	0.17	0.23	0.05	0.16
AC Min	0.69	0.69	0.84	0.84	0.52	0.52	1.02	1.02	0.65	0.57	0.69	0.57
Max	2.92	2.77	2.55	2.55	3.28	3.28	2.89	2.89	2.99	3.04	2.98	2.99
Med	1.82	1.81	1.84	1.82	1.86	1.85	1.87	1.88	1.94	1.93	1.96	1.95
PF Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.97	0.95	0.94	0.94	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Med	0.05	0.16	0.23	0.29	0.05	0.17	0.15	0.23	0.10	0.25	0.26	0.32
Match(%)	504 (88.9)		92 (82.1)		851(86.84)		163(87.63)		998(90.81)		180(88.67)	
kappa	0.75***		0.72***		0.75***		0.82***		0.80***		0.82***	

AC=Autocorrelation Statistic, PF= P-Values of the F Statistic
Adjusted R^2 is a modification of R^2 that adjusts for the number of explanatory terms in a model.
Unlike R^2, the adjusted R^2 increases only if the new term improves the model more than would be expected by chance.
The adjusted R^2 can be negative, and will always be less than or equal to R^2.
Match=The number of firms for which there is a perfect match between AIC and SBC.
The simple kappa coefficient measures the agreement between the raters beyond what would be expected by chance.
A value of 0 indicates only chance agreement, and a value of 1 indicates complete agreement.

Table 11: *Descriptive Statistics for* π_{it}

Sample	*Mean*		*Median*		*Std.Dev.*	
		stat.		*stat.*		*stat.*
1950-66	0.05	-0.13	0.01	-0.03	0.64	0.51
1967-83	0.12	0.08	0.04	0.06	1.08	0.85
1984-99	-0.06	-0.79	0.31	-0.03	3.17	3.58

$\pi_{it} = (\Pi_{it} - \bar{\Pi}_t)/\bar{\Pi}_t)$.

Π_{it}=firm i's profit rate in year t defined as profits after taxes divided by its total assets

$\bar{\Pi}_t$=the median of the profit of a sample consisting of at least 677 and at most 10,710 per year.

Table 12: *Descriptive Statistics for Firm Characteristics*

Period	*Statistics*	*MS*	*Sd*	*lnA*	*GS*	*Av*	*R&D*	*M1*
50-66	*Mean*	0.28	0.38	4.61	0.12			
	Median	0.15	0.30	4.54	0.03			
	Std. Dev.	0.31	0.40	1.38	0.44			
stat	*Mean*	0.27	0.39	4.60	0.15			
	Median	0.10	0.56	4.78	0.07			
	Std. Dev.	0.31	0.45	1.44	0.58			
67-83	*Mean*	0.22	0.73	4.98	0.19			
	Median	0.10	0.56	4.78	0.07			
	Std. Dev.	0.27	0.59	1.78	0.50			
stat	*Mean*	0.22	0.62	4.94	0.17			
	Median	0.11	0.51	4.82	0.06			
	Std. Dev.	0.27	0.45	1.75	0.34			
84-99	*Mean*	0.31	2.62	6.09	0.30	0.02	0.02	0.18
	Median	0.15	1.50	5.92	0.03	0.01	0.01	0.06
	Std. Dev.	0.34	5.43	2.00	3.41	0.02	0.05	0.77
stat	*Mean*	0.31	2.68	6.26	0.24	0.02	0.02	0.15
	Median	0.18	1.68	6.07	0.03	0.01	0.01	0.07
	Std. Dev.	0.33	3.02	2.07	0.61	0.02	0.04	0.29

MS=Market Share (Firm Sales/Industry Sales), Sd=Volatility of the Profit Rate π_{it} (Standard Deviation of Return on Assets), lnA=Size of the Firm (Logarithm of Total Assets measured in Millions of Dollars), GS=Growth of firm's sales, Av=Mean Advertising expenditures/Mean Assets, R&D=Mean Expenditures for research and development/Mean Assets, M1=Mean merger value/Mean Assets[32]

[32] A list with the companies for each period can be obtained from the author upon request.

Table 13: *Descriptive Statistics for Industry Characteristics*

Period	*Statistics*	*CR*	*VS*	*Gnf*	*Gvs*	*Exp*	*Imp*
50-66	*Mean*	43.57	2849565.7	0.60	0.82		
	Med	43.17	1694633.33	0.02	0.44		
	Std. Dev.	20.45	3854543.9	2.11	1.16		
stat	*Mean*	47.04	3043560.8	0.54	0.90		
	Med	44.5	2504850	0.11	0.45		
	Std. Dev.	21.67	3055462.2	1.06	1.38		
67-83	*Mean*	40.92	13545114.1	0.11	0.41		
	Med	38.44	5862330	0.07	0.36		
	Std. Dev.	17.89	34942466.1	0.26	0.25		
stat	*Mean*	41.13	10656182.8	0.11	0.40		
	Med	38.44	5354020	0.06	0.34		
	Std. Dev.	18.13	31513466.2	0.25	0.24		
84-99	*Mean*	37.70	24907963.1	0.13	0.46	4912.34	7020.78
	Med	34.93	13490196	0.10	0.39	2572.71	2931.51
	Std. Dev.	16.97	28262666.9	0.22	0.48	6239.58	12232.23
stat	*Mean*	38.80	23528174.9	0.14	0.45	5457.95	6851.58
	Med	35.03	15279901	0.10	0.40	2705.42	3347.18
	Std. Dev.	16.75	21958637.4	0.23	0.53	6604.82	7863.79

CR=Percentage of industry output produced by the largest 4 firms in the industry, VS=Value of Shipments classified in the industry, Exp=US Exports by SIC4 (1987 revision, Millions of Dollars), Imp=US Exports by SIC4 (1987 revision, Millions of Dollars).[33]

[33]For definitions see 'US Imports, Exports and Tariff Data, 1989-2001' (NBER 9387).

Results for the Stationary Series

Table 14: *Frequency Distribution of the Persistence Coefficient $\hat{\lambda}_i$:*

	50-66		*67-83*		*84-99*	
	stat		*stat*		*stat*	
Interval	# $\hat{\lambda}_i$	%	# $\hat{\lambda}_i$	%	# $\hat{\lambda}_i$	%
-1-0	29	27.10	64	37.65	79	41.59
0-0.2	19	17.76	40	23.53	49	25.79
0.2-0.4	34	31.78	44	25.88	41	21.58
0.4-0.6	16	14.95	17	10.00	17	8.95
0.6-0.8	8	7.48	5	2.94	4	8.95
0.8-1	1	0.93	0	0	0	0
Mean $\hat{\lambda}_i$	0.17		0.06		0.04	

Due to a t-test all mean $\hat{\lambda}_i$ are significantly different between periods.
The test has been done using the values of $\hat{\lambda}_i$ divided by their standard errors.

Table 15: *Frequency Distribution of the Persistence Coefficient $\hat{p}_i$:*

	50-66		*67-83*		*84-99*	
	stat		*stat*		*stat*	
Int.	# $\hat{p}_i$	%	# $\hat{p}_i$	%	# $\hat{p}_i$	%
<-1	4	3.74	6	3.53	34	17.89
-1 to -0.6	6	5.61	15	8.82	14	7.37
-0.6 to -0.3	24	22.43	27	15.88	17	8.59
-0.3 to 0	34	31.78	36	21.18	26	13.68
0 to 0.3	16	14.95	36	21.18	21	11.05
0.3 to 0.6	13	12.15	24	14.12	26	13.68
0.6 to 1	5	4.67	13	7.65	10	5.26
>1	5	4.67	13	7.65	42	22.11
Mean $\hat{p}_i$	-0.06		0.07		-0.16	

Table 16: *Mean $\hat{p}$'s and $\hat{\lambda}$'s for the stationary series.*

	Obs.	*Group*	*Mean* $\hat{p}$	*Mean* $\hat{\lambda}$	*Mean* π_0	*Mean* π_{it}
1950-66	27	1	0.37	0.25	0.54	0.43
	27	2	-0.13	0.28	0.09	0.18
	27	3	-0.09	0.12	-0.15	-0.22
	26	4	-0.40	0.01	-0.48	-0.45
	107	Mean	-0.06	0.17	0.00	-0.02
1967-83	43	1	0.61	0.13	0.93	0.93
	43	2	0.14	0.03	0.19	0.23
	43	3	-0.11	-0.06	-0.13	-0.12
	41	4	-0.39	0.13	-0.72	-0.75
	170	Mean	0.07	0.06	0.07	0.08
1984-99	48	1	0.77	0.06	1.64	1.34
	48	2	0.14	-0.03	0.13	0.02
	48	3	-0.34	0.07	-0.85	-0.41
	46	4	-1.22	0.06	-5.26	-4.12
	190	Mean	-0.16	0.04	-1.09	-0.79

Table 17: *Persistence Parameters for the Stationary Series*

	50-66	**67-83**	**84-99**
	stat.	*stat.*	*stat.*
# of firms *	107	170	190
% of $\hat{p}_i$'s significantly different from 0	72.90	61.76	47.36
% of $\hat{p}_i$'s significantly positive	27.10	34.12	28.95
% of $\hat{p}_i$'s significantly negative	45.79	27.65	18.42
% of $\hat{\lambda}_i$'s significantly different from 0	26.16	15.88	12.63
Mean $\hat{\lambda}$	0.17	0.06	0.04
% of equations with $\bar{R}^2 > 0.1$	56.25	70.43	59.61
Mean STDROA	0.39	0.62	2.68
Corr. coef. betw. STDROA and GRWASS	0.08	0.04	0.14

Companies with lambda in the plausible range (-1,1).
STDROA is the average standard deviation of π_{it}. GRWASS is the growth rate of Total Assets.

Table 18: *Regressions Explaining the Estimated Parameters of Equation 4, Stationary Series*

Per.	*D.Var.*	*Int.*	*VS*	*CR*	*Gnf*	*Gvs*	*MS*	*Sd*	*lnA*	*GS*	$\bar{R}^2$	*P*
50-66	$\hat{p}_i$	-2.44	7.3E-7	0.02	-0.28	1.84					0.06	0.7
		(-0.48)	(1.44)	(0.26)	(-0.14)	(1.14)						
	$\hat{\lambda}_i$	2.08	1.3E-7	-0.01	-0.076	0.26					0.18	0.02
		(2.53)	**(1.60)**	(-1.21)	**(-2.38)**	**(3.40)**						
	$\hat{p}_i$	-1.92					-5.48	1.40	0.18	-0.21	0.04	0.04
		(-0.54)					**(-1.80)**	(0.66)	(0.27)	(-0.12)		
	$\hat{\lambda}_i$	0.25					-0.09	-0.22	0.21	-0.28	0.05	0.03
		(0.38)					(-0.16)	(-0.54)	**(1.67)**	(-0.81)		
	$\hat{p}_i$	1.31	-7.3E-8	0.00	-0.23	1.64	-6.57	1.23	-0.21	- 0.14	0.09	0.6
		(0.20)	(-1.52)	(0.01)	(-0.11)	(0.99)	(-1.17)	(0.45)	(-0.14)	(-0.06)		
	$\hat{\lambda}_i$	1.28	1.6E-7	-0.02	-0.91	0.99	-0.52	0.08	0.38	-0.38	0.25	0.03
		(1.23)	**(1.63)**	**(-1.71)**	**(-2.79)**	**(3.73)**	(-0.58)	(-0.18)	**(1.64)**	(-1.07)		
67-83	$\hat{p}_i$	1.57	0.00	0.01	0.66	-2.23					0.01	0.95
		(0.38)	(0.45)	(0.14)	(0.20)	-0.26						
	$\hat{\lambda}_i$	2.18	-0.00	-0.02	0.60	-0.02					0.05	0.25
		(2.48)	(-1.63	**(-2.09)**	(0.83)	(-0.02)						
	$\hat{p}_i$	4.00					-2.95	-2.94	0.70	-1.30	0.05	0.06
		(3.86)					(-1.55)	**(-2.60)**	(0.22)	(-0.55)		
	$\hat{\lambda}_i$	0.21					0.15	0.31	1.69	-0.96	0.04	0.09
		(0.95)					(0.57)	(1.26)	**(2.51)**	**(-1.87)**		
	$\hat{p}_i$	3.51	0.00	0.01	-0.11	-1.89	-2.98	-2.32	12.54	-13.77	0.08	0.07
		(0.84)	(0.55)	(0.32)	(-0.03)	(-0.53)	(-1.27)	**(-1.67)**	**(1.66)**	**(-1.88)**		
	$\hat{\lambda}_i$	2.13	-0.00	-0.02	0.54	- 0.12	-0.21	0.25	1.20	-0.57	0.08	0.04
		(2.34)	(-1.52)	**(-2.17)**	(0.75)	(-0.16)	(-0.40)	(0.81)	(0.72)	(-0.36)		
84-99	$\hat{p}_i$	4.80	-0.00	-0.04	0.11	-0.36					0.07	0.2
		(2.59)	(-0.17)	**(-1.89)**	(1.05)	**(-1.67)**						
	$\hat{\lambda}_i$	0.73	-0.00	-0.00	0.10	0.04					0.05	0.1
		(1.01)	(-0.97)	(-0.42)	**(2.52)**	(0.41)						
	$\hat{p}_i$	2.38					0.84	-0.27	-0.22	-0.02	0.03	0.03
		(1.62)					(0.74)	**(-2.06)**	(-1.07)	(-0.11)		
	$\hat{\lambda}_i$	0.72					0.53	0.01	-0.08	0.04	0.02	0.39
		(1.50)					(1.43)	(0.13)	(-1.28)	(0.70)		
	$\hat{p}_i$	2.44	- 0.00	-0.03	0.15	-0.24	-0.72	-0.23	-0.49	-0.20	0.19	0.01
		(1.12)	(-0.96)	(-1.47)	(1.49)	(-1.11)	(-0.55)	**(-1.92)**	**(-2.10)**	(-0.39)		
	$\hat{\lambda}_i$	1.40	-0.00	0.00	0.09	0.00	0.55	-0.09	-0.21	0.04	0.04	0.01
		(1.56)	(-0.14)	(0.38)	**(2.04)**	(0.05)	(1.02)	**(-1.93)**	**(-1.93)**	(0.21)		

Ind. Var.: CR=conc. ratio, Gnf=growth in the nr. of firms, Gvs=growth rate of value of ship. Comp. Var.: MS=comp. sales/ind. sales, Sd=Stand. Dev. of ROA, lnA=nat. log. of tot. ass., GS=perc. change Sales. All variables are averages over the sample period.

Table 19: *Regressions Explaining the Estimated Parameters of Equation 4, for the Period 84-99 Including Advertising, Exports, Imports and the Merger Activity, Stationary Series.*

De.V.	*Int.*	*Vs*	*Cr*	*Gnf*	*Gvs*	*Exp*	*Imp*	*Av*	*Rd*	*M1*	*Ms*	*Sd*	*lnA*	*GS*	$\bar{R}^2$	*P*
$\hat{\lambda}_i$	0.53	1.4e-8	-0.00	2.26	0.86	7.8e-11	-4.7e-11								0.04	0.20
	(0.54)	(1.53)	(-0.05)	**(2.38)**	**(2.06)**	**(1.71)**	(-1.23)									
$\hat{p}_i$	0.55							71.19	6.77	-0.45	0.47	-0.31	-0.05	-0.01	0.11	0.00
	(0.38)							**(3.45)**	0.92	-0.41	(0.45)	**(-2.64)**	(-0.25)	(-0.07)		
$\hat{\lambda}_i$	0.74							3.26	-0.72	-0.07	0.56	0.01	- 0.10	0.04	0.03	0.61
	(1.37)							(0.42)	(-0.26)	(-0.17)	(1.43)	(0.27)	(-1.40)	(0.66)		
$\hat{p}_i$	0.94	1.9e-8	-0.03	0.05	0.04	5.4e-11	2.1e-11	64.67	0.17	-0.26	-0.35	-0.22	0.57	-0.01	0.25	0.1
	(0.32)	(0.83)	(-0.99)	(0.02)	(0.39)	(0.46)	(0.46)	**(1.78)**	(0.02)	(-0.12)	(-0.22)	**(-1.77)**	(0.95)	(-0.02)		
$\hat{\lambda}_i$	0.27	1.0e-8	0.01	1.71	0.64	5.9e-11	-2.3e-11	18.86	-2.04	1.88	0.32	-0.10	-0.22	-0.13	0.27	0.07
	(0.24)	(1.09)	(1.19)	**(1.74)**	**(1.69)**	(1.31)	(-0.58)	(1.13)	(-0.53)	**(2.29)**	(-0.52)	**(-2.06)**	**(-1.96)**	(-0.61)		

Industry Var.: Cr=concentration ratio, Gnf=growth in the number of firms,
Gvs=growth rate of the value of shipments, Exp=Mean Exports per Industry, Imp=Mean Imports per Industry.
Company Var.: Ms=company sales/industry sales, Sd=Standard Deviation of the return on assets,
lnA=natural logarithm of total assets, GS=percentage change in Sales, M1=Mean merger value/Mean assets,
Rd=Mean Expenditures for research and development/Mean Assets, Av=Mean Advertising expenditures/Mean assets.
All industry and firm variables are averages over the sample period.
Numbers in parentheses are heteroscedasticity consistent t-values. P refers to the P-value of the F-test.

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