The persistence of profits, sectoral heterogeneity and innovation

by

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Abstract: The analysis of the persistence of profits has long been a controversial issue within empirical industrial organisation literature. The aim of our paper is to provide new empirical findings that may account for sectoral patterns of profit persistence. The distinctive feature of our study is that we analyse a number of firms' ergodic distribution in each sector according to their profit level; we then calculate the difference between such a distribution and that prevailing in manufacturing on the whole. Finally we break down this distribution; the resulting breakdown highlights the impact of each transition probability on inter-sectoral differences clearly, and it also emphasises the role of intra-sectoral dynamics in determining different persistence patterns. In addition, we apply this methodology to both innovating and non-innovating firms, and conclude that innovation is indeed crucial to the persistence of profits in the longer run.

JEL Classification: D21, O30

Key words: Persistence, Profitability, Markov Chain

1. Introduction

The persistence of profits, i.e. the phenomenon according to which some firms earn profits that are systematically higher than those earned in a competitive market, has been a controversial issue since the beginning of the '70s. Since then the dominant paradigm – structure, conduct, performance (Bain 1956) – has predicted that, without barriers to entry, discrepancy between actual profit level and the equilibrium level would disappear in the long run as a consequence of competitive market forces.

Since the '70s, however, new research studies have emphasised the role of strategic behaviour in determining a firm's profitability (Fudenberg and Tirole 1985), while on empirical grounds, most of the studies have focused on the role of industry or firms' specific effects (Demsetz (1973), Marche (1974), Caves et. al (1977), Peltzmann (1977)). The industry view has emphasised the importance of industry structure indicators such as sectoral concentration and capital intensity in explaining intersectoral profit differential and, through this route, profit persistence. The firm efficiency view, on the other hand, has stressed the role of firms' characteristics, i.e., size, efficiency measures or market share, which have been regarded as the most relevant firm specific factors.

A different perspective is described in Mueller (1990), who considers the persistence of profits in a Schumpeterian framework, driven by creative destruction. This implies that persistence is eventually determined by entry conditions, which may represent a threat to the incumbent firm, thus allowing for the adjustment of profits toward their equilibrium level. The model proposed by Mueller (1990), which is an extension of Mueller (1986) and a refinement of a model by Cubbin and Geroski (1987), shows a pure autoregressive structure, in that profits at time t are determined by entry conditions which in turn define profits at time t-1. The results of the empirical estimates show that a firm's profit rate tends to converge to its long-run equilibrium, but this equilibrium level does significantly differ across firms and sectors.

In a different framework, Cefis (2003a, 2003b) and Cefis and Orsenigo (2001) analyse persistence by using a Transition Probability Matrix (TPM) approach, similar to the approach used by Quah (1993, 1997) for analysing the distribution of world per capita-income. Their approach is Schumpeterian, in that persistence is the result of either creative destruction or monopolistic competition. Cefis (2003a) underlines how profit persistence is closely related to innovation persistence, though this result is confined to a small number of sectors and firms, and thus one cannot generalise these findings to the whole manufacturing sector.

In our study we analyse persistence by applying the TPM approach to a large number of Italian manufacturing firms over the period 1989-97. In addition, the distinctive feature of our approach is that we break down the intersectoral difference in the distribution of firms by using an approximation which allows us to determine the impact of each transition probability on such an inter-industry difference. This enables us to pinpoint the main sectoral characteristics with respect to profit persistence; in addition, we apply this methodology to both innovating and non-innovating firms, and conclude that innovation may affect profitability in the long run.

In section two we briefly summarise the methodology and results of previous studies which are based on a Markov Chain approach. In section three, we describe the methodological approach we have applied to the decomposition of intersectoral firm distribution, while section four and five respectively describe the data base used for the analysis and the results of the application of our methodology to explaining differences in profit persistence by sector and innovation attitude of firms. Finally, section six concludes the paper.

2. Persistence and Markov Chains

The use of TPM to analyse persistence behaviour has recently been extended to a wider range of applications, particularly within empirical growth and industrial organisation studies. The empirical literature, which has increased since the early '90s, has focused on the definition of short-run and long-run transitions, and the identification of a steady-state (or ergodic) distribution which can describe the equilibrium of the dynamic process underlying the Markov process under observation.

In previous studies, the Markov chain has primarily been used to analyse labour market dynamics. Clark and Summers (1979) and Marston (1976) describe unemployment persistence by using labour market TPM for the US economy. In a different framework, Baussola (1985) uses TPM for the Italian labour market to describe unemployment differentials by sex and to describe how unemployment duration is affected by different transition probabilities.

Quah (1993, 1997) studies cross-country patterns of economic growth by analysing the transition of countries' economic development from one state to another according to the change in their per-capita income level. The stylised empirical finding of these studies is a twin peak phenomenon in the cross-sectional distribution of income, thus suggesting that persistence characterises the growth patterns of world economies, and convergence may eventually occur within "clubs" of countries.

Within industrial organisation literature, studies by Cefis (2003a, 2003b) and Orsenigo and Cefis (2001) use TPM to describe persistence with respect to profitability and innovation activities. These studies do find some evidence that both innovation activity and profitability are characterised by some (not negligible) degree of persistence, by using both sectoral- and country-specific micro-data. However, bimodality or, in the terminology of growth theory literature, the twin peaks phenomenon, appears to be relevant. This means that the distribution of firms towards the polar states is relatively high. In the following section we describe our methodological approach, and provide findings which throw light on the persistence of profits within different manufacturing sectors.

3. Methodology: Decomposition of Transition Probability Differentials

We use Transition Probability Matrices to identify a firm movement from one state to another, i.e., from state *i* to state *j*. In our case the set of states is simple, as it only includes state H (high profit level), state M (mean profit level) and state L (low profit level). In order to identify each state we first calculate the average profit rate over the period 1989-97 for manufacturing on the whole and the corresponding standard deviation. Thus, a firm belongs to the high profit state (H) if its profit rate is higher than the average rate defined above plus one standard deviation. By contrast, a firm belongs the low profit state (L) if its profit rate is less than such an average rate minus one standard deviation. Those firms whose profit rate falls within the range of the average rate plus/minus one standard deviation determine the mean profit state (M).

We compute the total number of transitions from each state towards the other by adding up each yearly flow, and then averaging the total amount thus calculated over the entire time period (1989-97). Thus, we can compute the average annual transition probability from one state to another by dividing the average annual flow by the average annual initial stock. The result is a TPM which reflects a first order discrete Markov process with transition probabilities given by

$$\mathrm{p}_{\mathrm{ij}} = P\left[X_t \in i \middle| X_{t-1} \in j\right] = \begin{bmatrix} p_{hh} & p_{hm} & p_{hl} \\ p_{mh} & p_{mm} & p_{ml} \\ p_{lh} & p_{lm} & p_{ll} \end{bmatrix} := \begin{bmatrix} hh & hm & hl \\ mh & mm & ml \\ lh & lm & ll \end{bmatrix} \qquad 1)$$

where *X* represents the variable under investigation, i.e., the profit rate of a firm, and *i* and *j* represent the possible states of the process, which in our case are H (high profits), M (mean profits) and L (low profits) respectively, and t = 1989, 1990…..1997.

Each element on the main diagonal of the TPM describes the persistency in each state; thus *hh* reflects the average annual probability of remaining a high profit firm during the period 1989-97, while *ll* reflects the corresponding probability of being a low profit firm and *mm* the probability of being an averagely profitable firm. On the one hand, *hl* and hm represent the probability of leaving the high profit state for the low and mean profit states respectively. On the other hand, *lh* and *lm* show the corresponding probability of leaving the bw profit state for the high and average profit states respectively, while *mh* and *ml* show the corresponding probability of leaving the mean profit state.

In addition, we have calculated the ergodic distribution of firms according to their profit condition, i.e., high, mean or low. Such a distribution represents the steady state or the limit distribution, according to the definition provided by Basu (2003).

The ergodic distribution corresponding to the TPM in 1) may be calculated, recalling that it has to be:

$$x \ A = x \qquad 2)$$

where X is the row vector which reflects the distribution of firms by their profit state (H, M, L), and A is the associated TPM. Equation 2) implies that the ergodic distribution may be found by calculating the eigenvector associated to the unit eigenvalue.

The associated eigenvector may be found by applying the usual methodology, and this implies that:

$$\begin{cases} (hh-1)N_H + mhN_M + laN_L = 0 & 3.1) \\ lmN_H + (mm-1)N_M + lmN_L = 0 & 3.2) \\ alN_H + mlN_M + (ll-1)N_L = 0 & 3.3) \end{cases}$$

where N_H, N_M and N_L is the number of firms (stocks) in each state. Recall that by definition of the properties of a TPM, the sum of the *i-th* row element must be equal to one; therefore, it follows that *(hh-1) = -hm-hb, (mm-1)= -mh – ml and (ll-1) = -lh-lm.* Therefore we can rewrite equations 3.1, 3.2 and 3.3 as follows:

$$\begin{cases} (hm+hl)N_H = mhN_M + lhN_L & 4.1) \\ (mh+ml)N_M = hmN_H + lmN_L & 4.2) \\ (lh+lm)N_L = hlN_H + mlN_M & 4.3) \end{cases}$$

In other words, the system of equations 4.1 – 4.3 shows the steady-state condition of the stochastic process implied by the TPM in 1), and thus it implies that the sum of flows into and out of each stock must be equal.

We can now calculate the non-trivial solutions (N_H, N_M, $N_L = 0$) of the system of equations 4.1 – 4.3. From 4.1) we get:

$$N_H = \frac{mhN_M + lhN_L}{(hm+hl)} \qquad 5)$$

and from 4.2) and 4.3)

$$N_M = \frac{\left(\frac{lh + lm}{hl}\right) + \frac{lm}{hm}}{\left(\frac{mh + ml}{hm}\right) + \frac{ml}{hl}} N_L \qquad 6)$$

Substituting 6) into 5) and then rearranging, we get:

$$N_H = \frac{mh(hm(lh + lm) + hllm) + lh(hl(mh + ml) + hmml)}{(hm + hl)(hl(mh + ml) + hmml)} N_L \qquad 7)$$

and

$$N_M = \frac{hm(lh + lm) + hllm}{hl(mh + ml) + hmml} L \qquad 8)$$

Therefore, a non trivial solution of the system of equations 4.1– 4.3 is given by

$$\mathbf{x}_1 = N_L \begin{bmatrix} g & m & 1 \end{bmatrix} \qquad 9)$$

where $g = \frac{mh(hm(lh + lm) + hllm) + lh(hl(mh + ml) + hmml)}{(hm + hl)(hl(mh + ml) + hmml)}$

and $$m = \frac{hm(lh + lm) + hllm}{hl(mh + ml) + hmml}$$

Our aim is to derive the distribution of firms according to their profit level, and thus we can express L (the number of low profit firms) in relative terms, i.e., relative to the total number of firms. We now define π_L as the ratio of low profit firms to the total number of firms, and then we can express 9) as

$$\mathbf{X}_2 = p_L [g \quad m \quad 1] \qquad 10)$$

Since it has to be

$$\gamma\pi_L + \mu\pi_L + \pi_L = 1$$

and $$p_L = \frac{1}{g + m + 1}$$

we can therefore write:

$$p_H = g p_L \qquad 11)$$

$$p_M = m p_L \qquad 12)$$

where π_L and π_M are respectively the ratio of high and mean profit firms to the total number of firms. Substituting the values of γ and μ into 11) and 12) we get:

$$p_H = \frac{mh(hm(lh + lm) + hllm) + lh(hl(mh + ml) + hmml)}{(hm + hl + mh)(hm(lh + lm) + hllm) + (hm + hb + la)(hl(mh + ml) + hmml)} \qquad 13)$$

$$p_M = \frac{(hm(lh+lm)+hllm)(hm+hb)}{(hm+hl+mh)(hm(lh+lm)+hllm)+(hm+hb+la)(hl(mh+ml)+hmml)} \quad 14)$$

Given π_H and π_M , π_L is immediately calculated, i.e., $\pi_L = 1 - \pi_h - \pi_m$. It is worth recalling that π_h, π_m and π_L represent the ergodic distribution of firms according to their profit level. The crucial implication of equations 11) and 12) is that we can express the ergodic distribution in terms of transition probabilities. This allows us to discuss the transition towards different states of a firm in different industrial sectors. At the same time we can manipulate equation 11) (or 12)) to obtain a decomposition of sectoral differentials in π_H (π_M). Thus we can raise the following issues:

i) Is there any persistency in profits and, if any, does it prevail in all sectors?

ii) What are the dynamics, i.e., the movement between different states that characterises a firm's profitability within each sector?

iii) How can the dynamics at point ii) affect the ergodic distribution and its differential between sectors?

iv) Is there any systematic evidence of persistency, and how does this evidence change if we consider a different time horizon?

We first discuss the persistence hypothesis by breaking down the difference we observe in the ergodic distribution between sectors; in particular, we are interested in a representation of the high profit firm ratio which enables us to account for the total differences one may observe according to sectoral transition probabilities.

From equation 13) we can consider the derivatives of π_H with. respect to each transition probability. We apply the methodology which has previously been adopted by Marston (1976) and Baussola (1985) to analyse how different transition probability patterns by demographic groups affect unemployment rate differentials. Table 1 shows the derivatives of π_H with respect to each transition probability.

Table 1 - Partial derivatives of $\mathbf{p}_{\mathbf{H}}$

$$\frac{\partial \boldsymbol{p}_H}{\partial mh} = \frac{\left[\left(hm\left(lh+lm\right)+hllm\right)+lhhl\right]D - N\left[\left(hm\left(lh+lm\right)+hllm\right)+hl\left(hm+hl+lh\right)\right]}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

$$\frac{\partial p_H}{\partial ml} = \frac{\left(lhhl+lhhm\right)D - N\left(\left(hm+hl+lh\right)\left(hl+hm\right)\right)}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

$$\frac{\partial \boldsymbol{p}_H}{\partial hm} = \frac{\left[\left(mh\left(lh+lm\right)+lhml\right)\right]D - N\left[\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hl+mh\right)\left(lh+lm\right)+\left(hl\left(mh+hl\right)+hmml\right)+\left(hm+hl+lh\right)ml\right]}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

$$\frac{\partial p_H}{\partial hl} = \frac{\left(mhlm+lh\left(mh+ml\right)\right)D - N\left[\left(\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hl+mh\right)lm+\left(hl\left(mh+ml\right)+hmml\right)+\left(hm+hl+lh\right)\left(mh+ml\right)\right)\right]}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

$$\frac{\partial p_H}{\partial lm} = \frac{mh\left(hm+hl\right)D - N\left(hm+hl+mh\right)\left(hm+hl\right)}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

$$\frac{\partial \boldsymbol{p}_H}{\partial lh} = \frac{\left(mhhm+hl\left(mh+ml\right)+hmml\right)D - N\left[\left(hm+hl+mh\right)hm+\left(hl\left(mh+ml\right)+hmml\right)\right]}{\left(\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)\right)^2}$$

where N= $mh\left(hm\left(lh+lm\right)+hllm\right)+lh\left(hl\left(mh+ml\right)+hmml\right)$

and D = $\left(hm+hl+mh\right)\left(hm\left(lh+lm\right)+hllm\right)+\left(hm+hb+la\right)\left(hl\left(mh+ml\right)+hmml\right)$

We can now compare the high profit rate firm ratio in each industrial sector, as derived from equation (13), to that prevailing in the manufacturing sector as a whole. The difference in their values crucially depends on the pattern of transition probabilities in each sector with respect to manufacturing. Thus, we break down such a difference by labelling $p_1 := p_{hm}$, $p_2 := p_{hl}$, $p_3 := p_{mh}$, $p_4 := p_{ml}$, $p_5 := p_{lh}$, $p_6 := p_{lm}$, and by using the following approximation

$$\Delta p_H \approx \sum_{k=1}^{6} \frac{1}{2}\left(\frac{\partial p_H}{\partial p_k}(s) + \frac{\partial p_H}{\partial p_k}(M) \right)\left(p_k(s) - p_k(M)\right) \qquad 15)$$

where Δp_H is the difference in the high profit rate firm ratio between manufacturing and the *s-th* sector, i.e., ($\pi_H(s) - \pi_H(M)$), and *M* refers to manufacturing.

4. Data description

We have applied the methodology described in the previous section to our data set, which includes 5445 firms drawn from the Micro1 data set selected by ISTAT (Italian National Institute of Statistics)[1] to analyse the dynamics of industrial sectors in the Italian economy during the '90s.

This data set includes data from different statistical sources and surveys set up by ISTAT, including the Firms' Account System Survey (SCI) and the Community Innovation Survey (CIS1), which investigates the innovative activity performed by industrial firms during the period 1990-1992. The link between these two data sets generates a closed panel of firms covering the period 1989-97 which, however, does not account for mergers, as the panel is by definition closed.[2]

Table 2 describes the characteristics of the data set by showing the distribution of firms by sector and firm size. We observe that during the eight years between 1989 to 1997 the distribution of firms is substantially steady with respect to big firms (> 500 employees) and small-medium sized firms (50-99 employees). The two central classes (100-199) and (200-499) show a mild increase, while, conversely, the bottom class (20-49) shows a corresponding decrease. This pattern partially corresponds to that which has characterised the Italian manufacturing industries during the same period. Indeed, we have to remember that our data set excludes firms with less than 20 employees, which however is the majority of manufacturing firms. Small firms, that is firms with less than 20 employees,

[1] We gratefully acknowledge Roberto Monducci's help in providing assistance in the selection of the data set.

[2] In the case of a merger, the "new" firm is identified by a new code. In this case it is excluded from the panel which is, by definition, closed and thus does not allow for the inclusion of a new firm.

do increase their weight within Italian manufacturing firms in the same period. Medium sized firms also increase their weight, but to a lesser extent, while large firms (>500 employees), in contrast, have experienced a reduction of their whole employment weight.

We also present the breakdown of innovative and non-innovative firms by size, according to the information derived from the CIS1 (Community Innovation Survey) and included in the MICRO1 data set. Innovative firms are those firms which have introduced either a process and/or a product innovation between 1990 and 1992.

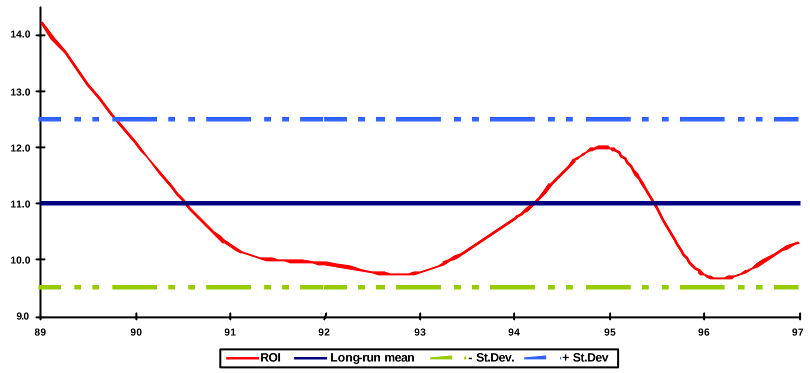
We have used this data base to set up the transition of firms according to their profit rate, and thus it has been necessary to exclude those sectors which did not have a sufficient number of firms, in order to get significant transition probabilities. We have thus excluded sector 23 (Petroleum refineries) and 30 (Office and computing machinery). We have also excluded sector 20 (Wood products), as firms do not always satisfy the three state representations of the Markov process we have described in the previous section.

The profitability variable that we have used is the return on investment (ROI), and is defined as the ratio of gross operating profits to total tangible and intangible assets. Figure 1 shows the long-term average of ROI within the whole manufacturing industries together with the standard deviation intervals. We have used these measures to classify the three states of the transition probability matrix we have adopted.

Table 2 Breakdown of firms by relevant characteristics - *selected years*

	1989	1992	1997	1989	1992	1997
by size		*number*			*column percentage*	
20-49 employees	2,547	2,507	2,365	46.8	46.0	43.4
50 - 99 employees	1,490	1,475	1,490	27.4	27.1	27.4
100 - 199 employees	710	750	846	13.0	13.8	15.5
200 - 499 employees	422	441	478	7.8	8.1	8.8
500 employees and more	276	272	266	5.1	5.0	4.9
Total	**5,445**	**5,445**	**5,445**	**100.0**	**100.0**	**100.0**
by sectors:ISIC CODE						
15+16 Foods, beverages	394	396	396	7.2	7.3	7.3
17 Textile	537	522	526	9.9	9.6	9.7
18 Wearing	221	228	226	4.1	4.2	4.2
19 Leather	168	178	172	3.1	3.3	3.2
20 Wood products	141	152	149	2.6	2.8	2.7
21 Paper products	173	169	168	3.2	3.1	3.1
22 Printing and publishing	175	170	169	3.2	3.1	3.1
23 Petroleum refineries	18	21	22	0.3	0.4	0.4
24 Chemicals	275	259	263	5.1	4.8	4.8
25 Rubber and plastic	337	317	317	6.2	5.8	5.8
26 Non metallic products	429	429	429	7.9	7.9	7.9
27 Basic metal industries	224	215	215	4.1	3.9	3.9
28 Metal products	632	615	601	11.6	11.3	11.0
29 Machinery and equipment	727	742	752	13.4	13.6	13.8
30 Office and computing machinery	8	8	8	0.1	0.1	0.1
31 Electrical machinery	218	214	213	4.0	3.9	3.9
32 Radio, TV and Telecom.	78	73	70	1.4	1.3	1.3
33 Professional, scientific etc.	87	101	104	1.6	1.9	1.9
34+35 Transp. Equipment	190	215	219	3.5	3.9	4.0
36+37Other manufact.industries	413	421	426	7.6	7.7	7.8
Total	**5,445**	**5,445**	**5,445**	**100.0**	**100.0**	**100.0**
innovative						
20-49 employees		773			35.3	
50 - 99 employees		601			27.5	
100 - 199 employees		379			17.3	
200 - 499 employees		248			11.3	
500 employees and more		187			8.5	
Total		**2,188**			**100.0**	
non innovative						
20-49 employees		1,734			53.2	
50 - 99 employees		874			26.8	
100 - 199 employees		371			11.4	
200 - 499 employees		193			5.9	
500 employees and more		85			2.6	
Total		**3,257**			**100.0**	

Figure 1 – Return on Investments (Roi) in the Italian Manufacturing Industry



5. Results: sectoral patterns and innovation

We firstly analyse the simple TPM of each sector (Table 3) according to the definition given in the previous section, and then discuss the decomposition of the difference in π_H according to equation 15). In addition, in Table 4 we show the decomposition of sectors by persistency rate, i.e., the rate at which firms do remain in the same state within an assigned interval. We consider both short- and long-run transitions, namely an average one-year transition probability and an eight-year transition probability between 1989 to 1997.

5.1 Short-run transition

If we look at the one-year transition probability, persistency is on the whole high, ranging between 0.8095 in the rubber and plastic sectors, and 0.6736 in the leather industries. Persistency is also high within low profit firms, as the persistency rate varies between 0.7871 in the food and beverages industries and 0.6374 in the rubber and plastic sectors. On average in the manufacturing sector persistency is higher within the high profit rate firms (0.7440), as compared with the low profit rate firms (0.7067). This is confirmed by the ergodic distribution, which implies that in manufacturing more than 44% of firms fall within the high profit state, while about 40% fall within the low profit state and more than 15% fall within the mean profit state respectively.

Table 3 - Average annual transition probabilities (1989-1997)

Food and beverages

	High	Medium	Low
High	0.7255	0.1361	0.1384
Medium	0.3561	0.2919	0.3520
Low	0.0962	0.1167	0.7871
Ergodic Distribution	0.3647	0.1501	0.4852

Textile

	High	Medium	Low
High	0.7467	0.1264	0.1269
Medium	0.3610	0.2627	0.3763
Low	0.1677	0.1685	0.6638
Ergodic Distribution	0.4736	0.1641	0.362

Wearing

	High	Medium	Low
High	0.6844	0.1265	0.1891
Medium	0.3140	0.2674	0.4186
Low	0.1389	0.1058	0.7553
Ergodic Distribution	0.3576	0.1351	0.5073

Leather and footwear

	High	Medium	Low
High	0.6736	0.1545	0.1719
Medium	0.2965	0.2389	0.4646
Low	0.1606	0.1498	0.6895
Ergodic Distribution	0.3762	0.1664	0.4574

Paper products

	High	Medium	Low
High	0.7524	0.1369	0.1107
Medium	0.4254	0.2588	0.3158
Low	0.1783	0.1654	0.6563
Ergodic Distribution	0.5151	0.1662	0.319

Printing and publishing

	High	Medium	Low
High	0.7295	0.1304	0.1401
Medium	0.3098	0.2337	0.4565
Low	0.1097	0.1227	0.7677
Ergodic Distribution	0.3628	0.1412	0.496

Chemical

	High	Medium	Low
High	0.7918	0.1041	0.1041
Medium	0.3666	0.2926	0.3408
Low	0.1682	0.1481	0.6836
Ergodic Distribution	0.5239	0.1462	0.3299

Rubber

	High	Medium	Low
High	0.8095	0.0989	0.0916
Medium	0.4048	0.2884	0.3069
Low	0.1774	0.1852	0.6374
Ergodic Distribution	0.5756	0.1511	0.273

Non metallic products

	High	Medium	Low
High	0.7560	0.1223	0.1218
Medium	0.3511	0.2447	0.4043
Low	0.1454	0.1286	0.7260
Ergodic Distribution	0.4485	0.1423	0.4092

Basic metal industries

	High	Medium	Low
High	0.7185	0.1347	0.1468
Medium	0.4104	0.2032	0.3865
Low	0.1832	0.1575	0.6593
Ergodic Distribution	0.4694	0.1538	0.3768

Metal products

	High	Medium	Low
High	0.7676	0.1126	0.1197
Medium	0.3975	0.2542	0.3483
Low	0.1659	0.1710	0.6630
Ergodic Distribution	0.5063	0.1543	0.339

Machinery and equipments

	High	Medium	Low
High	0.7074	0.1352	0.1575
Medium	0.3292	0.2539	0.4169
Low	0.1348	0.1311	0.7341
Ergodic Distribution	0.3841	1512	0.4647

Electrical machinery

	High	Medium	Low
High	0.7860	0.0892	0.1249
Medium	0.3587	0.1839	0.4574
Low	0.1670	0.1800	0.6531
Ergodic Distribution	0.5959	0.1346	0.3595

Professional, scientific, photogr. and opt.goods

	High	Medium	Low
High	0.7513	0.1269	0.1218
Medium	0.4174	0.2435	0.3391
Low	0.1548	0.1349	0.7103
Ergodic Distribution	0.4793	0.1471	0.374

Transp. Equipment

	High	Medium	Low
High	0.7447	0.1186	0.1366
Medium	0.3733	0.2304	0.3963
Low	0.1481	0.1003	0.7516
Ergodic Distribution	0.4367	0.1245	0.4388

Other manufact.industries

	High	Medium	Low
High	0.6911	0.1530	0.1559
Medium	0.3013	0.2864	0.4123
Low	0.1146	0.1872	0.6981
Ergodic Distribution	0.3562	0.1943	0.4495

Manufacturing

	High	Medium	Low
High	0.7440	0.1239	0.1321
Medium	0.3546	0.2627	0.3827
Low	0.1451	0.1482	0.7067
Ergodic Distribution	0.4428	0.1552	0.42

Innovating firms

	High	Medium	Low
High	0.7633	0.1194	0.1173
Medium	0.3645	0.2662	0.3693
Low	0.1542	0.1579	0.6879
Ergodic Distribution	0.4786	0.1564	0.365

Non innovating firms

	High	Medium	Low
High	0.7298	0.1272	0.1430
Medium	0.3480	0.2603	0.3917
Low	0.1397	0.1425	0.7178
Ergodic Distribution	0.4192	0.1543	0.4265

Table 4 Short-run decomposition of sectors by persistence rate

		High profit state	Mean profit state	Low profit state
15+16	Food and beverages	0.7255	0.2919	0.7871
17	Textiles	0.7467	0.2627	0.6638
18	Wearing	0.6844	0.2674	0.7553
19	Leather	0.6736	0.2389	0.6895
21	Paper products	0.7524	0.2588	0.6563
22	Printing and publishing	0.7295	0.2337	0.7677
24	Chemical	0.7918	0.2926	0.6836
25	Rubber	0.8095	0.2884	0.6374
26	Non metallic products	0.756	0.2447	0.7260
27	Basic metal industries	0.7185	0.2032	0.6593
28	Metal products	0.7676	0.2542	0.6630
29	Machinery and equipment	0.7074	0.2539	0.7341
31	Electrical machinery	0.786	0.1839	0.6531
33	Professional, scientific, photogr. and opt.goods	0.7513	0.2435	0.7103
34+35	Transp. Equipment	0.7447	0.2304	0.7516
36+37	Other manufact.industries	0.6911	0.2864	0.6981

5.2 Long-run transition

Persistence declines sharply if we look at the long-run transition between 1989 and 1997; in this case transition probabilities are derived by

$$p_{ij} = P\left[X_t \in i \middle| X_{t-1} \in j\right] = \begin{bmatrix} p_{hh} & p_{hm} & p_{hl} \\ p_{mh} & p_{mm} & p_{ml} \\ p_{lh} & p_{lm} & p_{ll} \end{bmatrix} := \begin{bmatrix} hh & hm & hl \\ mh & mm & ml \\ lh & lm & ll \end{bmatrix} \qquad 16)$$

where notation is the same as in equation 1), and t =1989,1997.

In this case the range of the persistence index in the high profit state (H) varies between 0.6742, in the rubber and plastic industries, to 0.2714 in leather and footwear. On the whole, this index declines to 0.5123 in manufacturing as compared with the value of 0.7440 in the short-run transition.

Persistence also declines within the other two states, i.e., mean (M) and low (L) profit states. In the former state persistence varies from 0.4167 in the professional, scientific, photographic goods industries to 0.0909 in the wearing sector, while in manufacturing on the whole it declines to 0.1829.[3]

In the latter, namely the low profit state, persistence declines although it remains high. In manufacturing on the whole this index is about 0.64 and it varies from 0.7831, in food, beverages and tobacco industries, to 0.4462 in rubber and plastic.

Table 5 Long-run decomposition of sectors by persistence rate

		High profit state	Mean profit state	Low profit state
15+16	Food and beverages	0.5030	0.2258	0.7831
17	Textiles	0.4845	0.1714	0.6475
18	Wearing	0.4286	0.0909	0.7826
19	Leather	0.2714	0.1923	0.6129
21	Paper products	0.6322	0.2581	0.5000
22	Printing and publishing	0.4301	0.1429	0.6744
24	Chemical	0.4845	0.1714	0.6475
25	Rubber	0.6742	0.2000	0.4462
26	Non metallic products	0.3926	0.1837	0.7397
27	Basic metal industries	0.4964	0.2857	0.6286
28	Metal products	0.6118	0.2090	0.6383
29	Machinery and equipment	0.4958	9.0000	0.6502
31	Electrical machinery	0.5929	0.2105	0.5128
33	Professional, scientific, photogr. and opt.goods	0.5116	0.4167	0.5294
34+35	Transp. Equipment	0.5567	0.1935	0.6522
36+37	Other manufact.industries	0.4339	0.1860	0.7128

Table (6) shows concentration indexes, the average firm size by sector, and sectoral innovation propensities, to verify whether there is a relationship with the sectoral pattern of profit persistence. Simple correlation indexes show that persistence is positively affected by innovation, as sectors with a higher proportion of innovating firms do show higher persistence indexes.

[3] We do not show the ergodic distribution as we are evaluating 8-year transition probabilities, and this implies that such probabilities may change as do the results for different factors which may depend on firm attitude and/or exogenous shocks such as technological shocks.

Table 6 Sectoral characteristics and persistence rate

	Persistence rate	CR4	Herfindal	Size	Innovation
15+16 Food and beverages	0.7255	38.4819	7.7287	52.5	0.3350
17 Textiles	0.7467	19.0043	1.6106	56	0.3259
18 Wearing	0.6844	28.6638	3.5704	48	0.2127
19 Leather	0.6736	15.3473	1.6133	43.5	0.2440
21 Paper products	0.7524	41.5328	6.4436	53	0.4335
22 Printing and publishing	0.7295	41.4656	6.3077	54	0.4686
24 Chemical	0.7918	19.4763	2.0176	70	0.4982
25 Rubber	0.8095	38.0127	5.9877	53	0.4481
26 Non metallic products	0.756	21.8946	1.8883	47	0.3566
27 Basic metal industries	0.7185	26.8875	2.9780	64	0.3304
28 Metal products	0.7676	6.8870	0.4726	44	0.3797
29 Machinery and equipment	0.7074	19.1226	1.5150	60	0.5365
31 Electrical machinery	0.786	26.2309	3.0663	65	0.4954
33 Professional, scientific etc.	0.7513	24.9823	2.8948	49	0.5632
34+35 Transp. Equipment	0.7447	79.4778	35.0543	76.5	0.4579
36+37 Other manufact.industries	0.6911	15.0830	1.0841	45	0.3245
Correlation		0.1286	0.0756	0.3555	0.5907

CR4= Four largest firms market share; Herfindal = Herfindal Index; Size = Median firm size; Innovation = Ratio of innovative firms to the total number of firms

5.3 The decomposition of sectoral differences and the role of innovation

We can analyse such sectoral patterns in depth by using the decomposition described in equation 15). It is clear that there is a relationship between the persistence analysis described before and the results of such a decomposition; however, by using this tool we want to emphasise that the steady state ratio of high profit firms also crucially depends on the dynamics within the three different states (H, M and L) and not on the persistence index alone.

Thus we can characterise industrial sectors as being above or below the average ratio of high profit firms prevailing in manufacturing on the whole, as describe in Table (7) and according to the short-run transition definition.

Most of the traditional sectors, food and beverages and tobacco, wearing, leather, lie below the manufacturing average. In this cluster we also find large-scale assembly industries like transport equipment and the machinery and equipment industry, which reflect specific sectoral performance mainly related to restructuring processes prevailing in those sectors during the nineties.

Table 7 - Comparison of ergodic distributions with respect to state H

Above the average value of manufacturing	
25 Rubber and plastic	0.5756
24 Chemicals	0.5239
21 Paper products	0.515
28 Metal Products	0.5063
31 Electrical machines	0.5059
33 Professional, scientific, photographic and optical goods	0.4793
18 Textiles	0.4736
27 Basic metal industries	0.4694
26 Non metallic products	0.4484
Below the average value of manufacturing	
34+35 Transport equipment	0.4367
29 Machinery and equipment	0.3841
20 Leather and footweare	0.3762
22 Printing	0.3628
36+37 Other manufacturing industries	0.3562
19 Wearing	0.3547

Above the manufacturing average ratio we find sectors in which technological opportunities are higher as measured by standard indicators, e.g. (R&D expenditure, patent activity).

In our case, we have used the number of innovating firms as a proxy for sectoral technological opportunities; from Tables (5,6,7) it is clear that industries with higher technological opportunities (at least in our sample) do show a higher than average steady-state ratio of high profit firms (see also Cefis 2003a).

In addition, this difference is broken down in order to determine which flows between each of the three states defining the TPM account for most of the intersectoral differential. The most relevant flows affecting the difference from manufacturing on the whole are *lh* and *hl*, for sectors which experience a higher than average value of π_H, They reflect two different kinds of behaviour by firms, the former implying exit from the low state towards the high state, with the latter exactly reflecting the opposite transition.

We can, nevertheless, identify other specific patterns particularly in the rubber and plastic, paper, metal products, professional and scientific goods, chemical and electrical machine industries, which reflect the impact of the flows from state M and state H.

In the rubber and plastic industries *hm* accounts for almost 2.5 percentage points of the intersectoral difference in π_H, while *mh* accounts for more than 1.4 percentage points. In the paper industry *mh* accounts for more than 2 percentage points of the intersectoral differential while in the metal products and in the professional and scientific goods industries the same flow accounts for 1.2 percentage points and 1.7 percentage points respectively.

The *hm* flow is relevant within the chemical and electrical machine industries where it accounts for more than 1.8 and 3.2 percentage point of the intersectoral differential.

If we consider the second cluster of industries, i.e. those sectors which show a value of π_H below the value prevailing in manufacturing on the whole, the *lh* flow accounts (negatively) for most of the intersectoral difference in all sectors but leather, clothing and machinery and equipment. However, in these sectors we observe a different pattern, which is worth discussing in more detail. In leather, *lh* affects the negative difference in π_h positively (about 1.5 percentage points), as this transition probability is higher in this sector as compared with manufacturing on the whole. In wearing *lh* affects the difference in π_H negatively although its impact is mild (about 0.7 percentage points). In the machinery and equipment industry the role of *lh* is not negligible (more than one percentage point) although it is more than half of the impact accounted for by *hl* (2.5 percentage points).

On the whole it is worth noting that our three-state representation of the transition between different profit conditions, allows for a more detailed analysis of the determinants of intersectoral differences in a firm's profitability condition.

If we look at the difference between innovative and non innovative firms, the steady-state value of π_H is almost six percentage points higher for innovative firms (47.86%) as compared with non innovative firms (41.92%). This difference confirms previous empirical results (Bartoloni and Baussola 1999, 2001) which have underlined how innovation affects profitability in future periods. This is also consistent with the previous sectoral analysis which has emphasised the relationship between sectoral technological opportunities and the value of π_H.

Table 8 - High profit firm ratio: decomposition of sectoral differences

	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0165	-0.0224	-0.0078	-0.0257	0.0145	0.0154		
partial derivatives innovative	0.2988	-0.0922	-0.9144	-1.1966	0.9125	0.2088		
partial derivatives non innovative	0.2850	-0.0881	-0.7744	-1.0138	1.0315	0.1933		
average of partial derivatives	0.2919	-0.0902	-0.8444	-1.1052	0.9720	0.2010		
differences in high profit rate	0.0048	0.0020	0.0066	0.0284	0.0141	0.0031	0.0590	0.0594

* sum of partial derivatives;

** differences resulting from the ergodic distribution

In any case, the difference in π_H between innovative and non innovative firms mainly depends on transition probability *hl*, which accounts for almost 3 percentage points of the total difference, and *lh*, which accounts for 1.4 percentage points. The rationale behind the explanation of such results has been discussed previously, as it is coherent with the findings we have analysed at the intersectoral level.

6. Conclusion

In this study we have analysed how profit persistence is distributed between industrial sectors. We have used a TPM approach which has also enabled us to present sectoral ergodic distributions of firms according to their profit level. The analysis of such a distribution shows, on the whole, the relevance of the twin peaks phenomenon, i.e. a high concentration of firms at both the top and the bottom level of the profit distribution. This means that we observe a significant degree of persistence both in the high profit state (H) and in the low profit state (L). However, this persistence pattern declines in the long run, as the eight-year persistence indexes do show a significant reduction in their values. It is worth underlining the fact that high profit rate persistence appears to be related to innovation, as those sectors showing a higher innovation propensity do show a high level of persistence.

We have also suggested a methodological approach to breaking down sectoral differences in the ergodic distribution of firms. This suggests that such a difference is mainly attributable, on the whole, to the *hm*, *mh* and *lh* transition probabilities, thus emphasising how sectoral-specific transition patterns may affect the sectoral ergodic distribution.

We have also applied this methodology to describe the difference in the ergodic distribution between innovating and non-innovating firms. The results show that the significant difference in such a distribution does confirm the impact of innovation in determining the profitability pattern of a firm, particularly affecting the transition probability between the low state to the high state profit condition.

Appendix 1 –Decomposition of sectoral differences in transition probabilities

Food and beverages	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0015	-0.0307	0.0122	0.0063	-0.0489	-0.0315		
partial derivatives	0.2819	-0.1297	-0.6851	-1.0004	1.3308	0.4243		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2866	-0.1100	-0.7580	-1.0444	1.1594	0.3118		
differences in high profit rate	0.0004	0.0034	-0.0092	-0.0066	-0.0567	-0.0098	-0.0785	-0.0781

Textiles	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0064	-0.0064	0.0025	-0.0052	0.0226	0.0203		
partial derivatives	0.3000	-0.0814	-0.8665	-1.1015	0.8427	0.1612		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2956	-0.0858	-0.8487	-1.0950	0.9153	0.1802		
differences in high profit rate	0.0019	0.0005	-0.0021	0.0057	0.0207	0.0037	0.0304	0.0308

Wearing	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0406	0.0359	0.0026	0.0570	-0.0062	-0.0424		
partial derivatives	0.2373	-0.0626	-0.6285	-0.7944	1.1270	0.1363		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2643	-0.0764	-0.7297	-0.9414	1.0575	0.1677		
differences in high profit rate	-0.0107	-0.0027	-0.0019	-0.0537	-0.0066	-0.0071	-0.0827	-0.0852

Leather	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0581	0.0819	0.0306	0.0398	0.0155	0.0016		
partial derivatives	0.2911	-0.0510	-0.6582	-0.7736	0.9406	-0.0024		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2912	-0.0707	-0.7446	-0.9310	0.9643	0.0984		
differences in high profit rate	-0.0169	-0.0058	-0.0228	-0.0371	0.0149	0.0002	-0.0674	-0.0666

Paper products	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0708	-0.0669	0.0130	-0.0214	0.0332	0.0172		
partial derivatives	0.2789	-0.1045	-0.8640	-1.1878	0.7348	0.3439		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2851	-0.0974	-0.8475	-1.1381	0.8614	0.2715		
differences in high profit rate	0.0202	0.0065	-0.0110	0.0244	0.0286	0.0047	0.0733	0.0723

Printing and publishing	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0448	0.0738	0.0065	0.0080	-0.0354	-0.0255		
partial derivatives	0.2890	-0.0840	-0.7429	-0.9587	1.3106	0.1368		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2901	-0.0871	-0.7869	-1.0235	1.1493	0.1680		
differences in high profit rate	-0.0130	-0.0064	-0.0051	-0.0082	-0.0407	-0.0043	-0.0777	-0.0800

Chemical	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0120	-0.0419	-0.0198	-0.0280	0.0231	-0.0001		
partial derivatives	0.2904	-0.0877	-2.2247	-1.3552	0.3382	0.2388		
partial derivatives manufacturing	0.2912	-0.0903	-1.4704	-1.0884	0.4739	0.1992		
average of partial derivatives	0.2908	-0.0890	-1.8476	-1.2218	0.4060	0.2190		
differences in high profit rate	0.0035	0.0037	0.0366	0.0342	0.0094	0.0000	0.0874	0.0811

Rubber	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0502	-0.0758	-0.0250	-0.0405	0.0323	0.0370		
partial derivatives	0.2894	-0.0983	-1.1023	-1.4767	0.7012	0.3390		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2903	-0.0943	-0.9666	-1.2826	0.8446	0.2691		
differences in high profit rate	0.0146	0.0071	0.0242	0.0519	0.0273	0.0100	0.1351	0.1328

Non metallic products	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0035	0.0216	-0.0016	-0.0103	0.0003	-0.0196		
partial derivatives	0.2792	-0.0847	-0.8801	-1.1470	1.0468	0.1746		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2852	-0.0875	-0.8555	-1.1177	1.0174	0.1869		
differences in high profit rate	-0.0010	-0.0019	0.0014	0.0115	0.0003	-0.0037	0.0066	0.0056

Basic metal industries	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0558	0.0038	0.0108	0.0147	0.0381	0.0093		
partial derivatives	0.2493	-0.0779	-0.7608	-0.9985	0.8014	0.2158		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2703	-0.0841	-0.7959	-1.0435	0.8947	0.2075		
differences in high profit rate	0.0151	-0.0003	-0.0086	-0.0153	0.0341	0.0019	0.0268	0.0266

Metal products	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0429	-0.0344	-0.0113	-0.0124	0.0208	0.0228		
partial derivatives	0.2792	-0.0944	-0.9164	-1.2262	0.8219	0.2734		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2852	-0.0923	-0.8737	-1.1573	0.9049	0.2363		
differences in high profit rate	0.0122	0.0032	0.0099	0.0144	0.0188	0.0054	0.0638	0.0635

Machinery and equipment	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0254	0.0342	0.0113	0.0254	-0.0103	-0.0171		
partial derivatives	0.2760	-0.0786	-0.7009	-0.9004	1.0892	0.1514		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2836	-0.0844	-0.7659	-0.9944	1.0386	0.1753		
differences in high profit rate	-0.0072	-0.0029	-0.0087	-0.0253	-0.0107	-0.0030	-0.0577	-0.0587

Electrical machinery	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0041	0.0747	-0.0347	-0.0072	0.0219	0.0318		
partial derivatives	0.2727	-0.0650	-1.0250	-1.2693	0.9020	0.0478		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2820	-0.0776	-0.9280	-1.1789	0.9450	0.1235		
differences in high profit rate	0.0012	-0.0058	0.0322	0.0085	0.0207	0.0039	0.0607	0.0631

Professional, scientific etc.	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0628	-0.0436	0.0030	-0.0103	0.0097	-0.0133		
partial derivatives	0.2556	-0.1067	-0.8331	-1.1810	0.9206	0.3749		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2734	-0.0985	-0.8320	-1.1347	0.9543	0.2871		
differences in high profit rate	0.0172	0.0043	-0.0025	0.0117	0.0093	-0.0038	0.0361	0.0365

Transp. Equipment	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	0.0187	0.0136	-0.0053	0.0045	0.0030	-0.0479		
partial derivatives	0.2315	-0.0809	-0.8121	-1.0958	1.1009	0.2560		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.2614	-0.0856	-0.8215	-1.0921	1.0444	0.2276		
differences in high profit rate	0.0049	-0.0012	0.0044	-0.0049	0.0031	-0.0109	-0.0046	-0.0061

Other manufact. industries	mh	ml	hm	hl	lh	lm	total*	total**
differences in transition probabilities	-0.0533	0.0296	0.0291	0.0238	-0.0305	0.0390		
partial derivatives	0.3577	-0.0935	-0.6559	-0.8274	1.0438	0.1144		
partial derivatives manufacturing	0.2912	-0.0903	-0.8309	-1.0884	0.9880	0.1992		
average of partial derivatives	0.3245	-0.0919	-0.7434	-0.9579	1.0159	0.1568		
differences in high profit rate	-0.0173	-0.0027	-0.0216	-0.0228	-0.0310	0.0061	-0.0893	-0.0866

* sum of partial derivatives;

** differences resulting from the ergodic distribution

Appendix 2: Sectoral Classification

Sectoral description	ISIC (2 digit)
1. Foods, Beverages and Tobacco	15+16
2. Textiles	17
3. Wearing	18
4. Leather and Footwear	19
5. Wood Products except Furniture	20
6. Paper Products	21
7. Printing and Publishing	22
8. Petroleum Refineries	23
9. Chemicals	24
10. Rubber and Plastic	25
11. Non Metallic Products	26
12. Basic Metal Industries	27
13. Metal Products	28
14. Machinery and Equipment	29
15. Office and Computing Machinery	30
16. Electrical Machines	31
17. Radio, TV and Communication Equipment	32
18. Professional, Scientific, Photographic and Optical Goods	33
19.Transport Equipment	34
20. Other Transport Equipment	35
21. Other Manufacturing Industries	36+37

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