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THE POST-ENTRY SIZE ADJUSTMENT
OF NEW SMALL FIRMS

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2002/08 **January 2002**

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by

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Abstract

The hypothesis underlined in this paper is that apart from "infant mortality" there is another relevant phenomenon taking place within new-born Small Business Enterprises (SBEs) in the period immediately after entry; namely that the smaller ones among them, having entered with a marked sub-optimal scale, adjust their size towards the mean size exhibited by larger SBEs. In the paper this hypothesis is tested using a cohort of 1,570 new firms, and applying a Gibrat-like specification with sample selection.

The hypothesis of a size adjustment by smaller new entrants immediately after entry is confirmed in most selected industries in Italian manufacturing; more specifically, surviving smaller new SBEs show higher rates of growth in the first year (in one case in the first two) immediately after start-up, while they converge towards the average rate of growth of the whole cohort of new SBEs in the following years.

JEL codes: L11.
Keywords: industrial dynamics; small firms; survival; sample selection.

This version: 28 January 2002

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* Previous versions of this paper were presented at the 40th Annual SIE (Italian Economic Association) Conference (Ancona, 29-30 October 1999), the 27th Annual EARIE Conference (Lausanne, 7-10 September 2000) and at seminars held between 2000 and 2002 at the Economics Department of Harvard University, the Catholic University of Milan, and the University of Pavia. We would like to thank all participants at these meetings for their valuable comments. This paper is part of the research project "The post-entry performance of Italian firms: technology, growth and survival, co-financed by the Italian MIUR (year 2000; prot. #MM13038538_001; under the direction of E. Santarelli).

1. Introduction

While much is known about determinants and barriers to entry, our knowledge about what happens to new-born firms in the period immediately after entry is still not extensive. Most new entrants are very small firms, starting at a sub-optimal scale (see Audretsch, 1995): this observed sub-optimality has opened the way to studies devoted to the investigation of survival and growth patterns immediately after entry. This paper belongs to this line of analysis, focusing on the post-entry size-adjustment of smaller firms within a cohort of new Italian Small Business Enterprises (SBEs) in manufacturing.

One of the stylized facts about the post-entry performance of new firms (see the illuminating contribution by Geroski, 1995) is that high entry rates are generally associated with high exit rates, and that hazard rates in the first years of a firm's life cycle are very high. From an empirical point of view, an important result is that a smaller start-up size increases the probability of early exit (see Audretsch, 1991; Wagner, 1994; Audretsch and Mahmood, 1995; Mata, Portugal and Guimaraes, 1995). The hypothesis put forward in this paper is that - together with "infant mortality" - another important phenomenon takes place among new small entrants in the periods immediately after start-up: the adjustment towards the average size of large entrants.

The basic idea is that in many cases entry can be considered a "try and see" decision subject to a Bayesian learning process involving the entrepreneur's real talents and his/her real market chances (for theoretical developments of these issues, see Jovanovic, 1982; Frank, 1988; Cabral, 1995; Ericson and Pakes, 1995). This view is consistent with the empirical observation of high early failure rates but also suggests that, *conditional on survival, new smaller firms adjust their size in the period(s) immediately after entry*. In other words, if entry is characterized by "mistakes" (see Cabral 1997) and post-entry is characterized by learning, it is legitimate to put forward the hypothesis that, within a cohort of new firms, one can detect a sort of size-adjustment of the smaller ones - which have entered with a marked sub-optimal scale - towards the mean size exhibited by their counterparts (larger entrants). This should imply that the post-entry learning process of smaller entrants can have a twofold outcome: either a negative one, with a firm becoming aware of its weaknesses and leaving the market; or a positive one, with a firm chasing its larger counterparts in order to fill the initial size gap.

The empirical specification that will be used for testing this hypothesis is the traditional Gibrat's one. It is well known that most recent empirical studies tend to deny the validity of the law both for incumbent firms (see, for instance, Kumar, 1985; Hall; 1987; Evans, 1987; Dunne and Hughes, 1994; Reid, 1995; Hart and Oulton, 1996; Harhoff, Stahl and Woywode, 1998; Goddard, Wilson and Blandon, 2002; for comprehensive surveys see Sutton, 1997 and 1998, Caves, 1998) and for new entrants (see the original and valuable contributions by Dunne, Roberts and Samuelson, 1989; Mata, 1994; Almus and Nerlinger, 2000). The general result of these studies is that firms' growth is not equi-proportional, since smaller firms grow at a higher rate compared with their larger counterparts.

It is worth pointing out that we are not interested in another empirical test of Gibrat's law *per se*, but in discovering whether something else is hidden by the failure of the law over the medium-term. Indeed, the point here is that the failure of Gibrat's law within a population of new SBEs over a given post-entry period can hide a more complex behaviour, namely a post-entry size-adjustment process which takes place immediately after entry and is followed by convergence towards Gibrat-like behaviour. If such is the case, the hypothesis discussed above would be confirmed, with smaller among new SBEs either failing or growing fast immediately after entry and then converging - conditional on survival - to a uniform pattern of growth common to the entire cohort of new firms.

From an empirical point of view, this hypothesis is tested here through a Gibrat model with sample selection (in order to take into account early failures) estimated - differently from any previous study - every year for the first six years after entry. The general finding of the study is that the hypothesis of a size adjustment immediately after entry by smaller new SBEs is confirmed across different manufacturing sectors; in more detail, surviving smaller new SBEs show higher rates of growth in the year - in one case two years - immediately after start-up while they converge towards average rates of growth in the following years.

The paper is organized as follows. In the next section data and methodology are described; regression results are discussed in section 3, while some conclusions are presented in Section 4.

2. Data and methodology

The main hindrance to empirical analysis of the post-entry performance of newborn firms has been the lack of longitudinal data sets tracking the evolution of firms subsequent to their birth. In this paper we use a unique data set from the Italian National Institute for Social Security (INPS). This data set identifies 1,570 new manufacturing firms (with at least one paid employee) born in January 1987 and tracks their post-entry employment performance at yearly intervals until January 1993. No information on firms with zero paid employees is obtainable from the INPS file; however, these firms usually identify self-employment and only occasionally become true entrants with positive post-entry employment growth rates[1]. Most firms show a small start-up size and micro-firms with fewer than 5 employees represent more than 50 per cent of the initial population. Thus, this data set appears to be particularly suitable for testing the post-entry size adjustment of small entrants.

The main relationship tested in this study is the original logarithmic specification of Gibrat's Law:

$$(1) \quad \log S_{i,t} = ?_0 + ?_1 \log S_{i,t-1} + ?_{i,t}$$

Where $S_{i,t}$ is the size of the ith firm at time t, $S_{i,t?1}$ is the size of the same firm at the previous period and $?_{i,t}$ is a random variable distributed independently of $S_{i,t?1}$. Following Chesher (1979, p.404), if both sides of equation (1) are exponentiated, it becomes clear that if $?_1$ is equal to unity, then growth rate and initial size are independently distributed[2] and Gibrat's Law is in operation. By contrast, if $?_1 < 1$ smaller firms grow at a systematically higher rate than do their larger counterparts, while the opposite is the case if $?_1 > 1$.

If - as in the majority of previous studies (see Section 1) - growth and exit are not treated as homogeneous phenomena (that is, assuming the disputable hypothesis that exit is equal to a minus one rate of growth), empirical estimates need deal only with surviving firms, obtaining results conditional on survival. However, here the sample selection problem arises. Since growth can only be measured for firms which have survived over the examined period, and since slow-growing firms are more likely to exit, small fast-

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[1] All private Italian firms are obliged to pay national security contributions for their employees to INPS. Consequently, the registration of a new firm as "active" signals an entry into the market, while the cancellation of a firm denotes an exit from it (this happens when a firm finally stops paying national security contributions). For administrative reasons - delays in payment, for instance, or uncertainty about the actual status of the firm - cancellation may sometimes be preceded by a period during which the firm is "suspended". The present paper considers these suspended firms as exiting from the market at the moment of their transition from the status of "active" to that of "suspended", while firms which have halted operations only temporarily during the follow-up period, and which were "active" in January 1993, have been treated as survivors.
In addition to the procedure described above, the original INPS file was subjected to further checking, in order to identify entry and failure times correctly and to detect inconsistencies in individual tracks due to administrative factors, problems related to file truncation in January 1993, cancellations due to firm transfers, mergers and take-overs. This cleaning procedure reduced the total number of firms in the database from 1,889 to 1,570.
Finally - owing to problems of numerousness high numbers over time (until January 1993) - only seven industries were examined (for a total of 970 firms born in January 1987, out of 1,570).

[2] Following a random walk (with drift) stochastic process.

growing firms may be over-represented in the surviving sample and this may bias the results of the empirical research.

As discussed in Hall (1987), Evans (1987), Mata (1994), Dunne and Hughes (1994), Sutton (1997) and Scherer, 2000, the appropriate econometric method to deal with this problem is the two-step procedure suggested by Heckman (1979) (see also Amemiya, 1984). This specification requires a two-step estimation of a probit model (the selection equation) and of Gibrat's Law (the main equation). Since survival and growth are not independent phenomena, residuals from the two equations are very likely correlated. To overcome this problem it is worth introducing an additional explanatory variable (inverse Mill's ratio) obtained by a probit model (selection equation) in the main equation. Accordingly, the estimates of the relationship between a firm's survival and its size at the beginning of the examined period result unbiased. Since the relationship between size and survival can assume a non-linear feature (as in Evans, 1987; Dunne and Hughes, 1994 and Harhoff, Stahl and Woywode, 1998), a squared term was introduced in the selection equation. While equation (1) in isolation was preliminary estimated by means of OLS, the sample selection model including equation (2) was estimated using a maximum likelihood method[3].

$$(2) \qquad P(f_i=1) = F(? + ?\log S_{i,t?1} + ? \log S^2_{i,t?1} + ?_{i,t})$$

with: $f_i = 1$ if firm *i* survived at time t; $f_i = 0$ if firm *i* exited at time t; $?_{i,t}$ = disturbance.

As in most previous empirical studies (see Section 1), tests for heteroskedasticity were carried out using the OLS estimations of (1) and White's (1980) correction was introduced when necessary, both in the OLS and in the sample selection model (SSM) estimations.

Finally, the possible occurrence of persistence in firms' patterns of growth was tested using annual growth rates (as in Kumar, 1985 and Dunne and Hughes, 1994): in the vast majority of cases no significant AR(1) process emerged, so that specification (1) was not extended (see table A1 in the Appendix).

The use of the dataset described above in the empirical test of equation (1) should shed some light on the hypothesis of this study that a detectable post-entry size-adjustment process is in operation for smaller entrants. If such is the case, Gibrat's Law should exhibit a behaviour dependent on a firm's life cycle: the

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[3] Since Heckman's estimator may be inefficient and biased for small samples.

Law should fail to hold during the first year(s) after entry and should become valid once convergence within entrants has taken place.

3. Results

Tables 1(i), 1(ii), and 1(iii) report the OLS and SSM results from the estimations of equation (1). The results from the corresponding selection equations are not given but are available from the authors upon request. The first two columns of each panel in the tables set out the results from the estimations carried out for the entire six-year period (i.e. regressing 1993 size on initial size), along with the usual statistical diagnoses (including the correlation between the selection and growth equation, ?) and a specific *t* test for the validity of Gibrat's Law ($?_1=1$) [4]; the final rows report White's test for heteroskedasticity (when significant a consistent covariance matrix has been used) and sample sizes with and without exits. In the following columns the same estimations are replicated for each year, in order to characterize the possible convergence path with the passing of time. Thus, 14 estimates are presented for each industry.

We first consider the results for the six-year period (87-93). In six out of seven industries - with the sole partial exception of food - both the OLS and the SSM estimates of $?_{1,}$ although significantly different from zero[5], are significantly less than one[6]. Consistently with previous studies, this confirms that, in general, smaller firms grow faster than their larger counterparts over the entire post-entry period.

insert tables 1(i), 1(ii), 1(iii)

More interesting results are yielded by the separate estimations carried out for each year and each industry (from the second to the seventh column in the tables). In order to test the hypothesis put forward in this study, attention has to be focused on the value and significance of coefficient $?_1$ (second row in the tables) and on the test $?_1 = 1$ (fourth row). If the hypothesis is confirmed, the expectation is than $?_1$ starts with a value less than 1 and then converges towards 1 over time.

Indeed, in four industries out of seven, Gibrat's Law fails to hold in the year(s) immediately following start-up, whereas it holds, or fails less severely, when firms approach maturity. In electrical & electronic

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[4] Besides the *t* tests for $?_1 = 1$ reported in the fourth line of each frame in tables 1(i), 1(ii), and 1(iii), unit root-like tests were also carried out, with similar findings. Results from the application of this procedure are available from the authors upon request.

[5] Cf. the asterisks on the coefficients reported in the second line of each group of industry estimates reported in tables 1(i), 1(ii), and 1(iii).

[6] Cf. the asterisks on the coefficients of the *t* test for $?_1 = 1$ reported in the fourth line of each group of industry estimates reported in tables 1(i), 1(ii), and 1(iii).

engineering, only in the first and second year following start-up does the SSM estimate yield a $?_1$ significantly less than one, with a value of 0.73 in 1988 and 0.89 in 1989. The convergence towards a Gibrat-like pattern of growth is confirmed by the almost monotonic growth of $?_1$ in subsequent years, with a value of 0.94 in 1991 and 1.04 in 1992. For instruments, footwear & clothing, and rubber & plastics, Gibrat's Law significantly fails to hold only in the first year following start-up. More specifically, for the instruments industry the coefficient of $?_1$ in the SSM estimate is equal to 0.77 in 1988 (with $t(?_1=1)$ significant at a 99% level of confidence), whereas for the same year it is 0.80 in footwear & clothing and 0.67 in rubber & plastics, with $t(?_1=1)$ significant in both cases at a 99% level of confidence. In the following years - in all the three sectors - the SSM estimates of $?_1$ increase towards 1 - although not monotonically - and the *t* test does not reject the Law. Thus, in these four industries one finds that smaller entrants rush to achieve an acceptable size immediately after their start-up, while once they reach (in subsequent years) a size large enough to enhance their likelihood of survival, their pattern of behaviour matches that of larger entrants. More controversial patterns of growth emerge for the remaining three industries: although for all industries $?_1$ shows a tendency to increase over time and to converge to 1, this pattern is not monotonic and the test $?_1=1$ is not always consistent with the hypothesis put forward in this study.[7]

4. Conclusions

The main finding of this paper is that, conditional on survival, new smaller firms adjust their size in the period(s) immediately after entry. Indeed, for six out of the seven industries examined, Gibrat's Law only fails to hold during the first year(s) following start-up - when smaller entrants grow faster than their larger counterparts - whereas it becomes valid once a minimum threshold in terms of size and age has been reached.

To sum up, the statistical regularities that emerged from six of the seven groups of estimates carried out in section 3 are such that the hypothesis of this study cannot be rejected: *within* the sub-population of

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[7] The most significant exception is the food industry, where for the entire period and for each of the six years following start-up, Gibrat's Law is never significantly rejected in the SSM estimates. This finding suggests that some industry-specific determinants of firm growth are in operation. The regularity over time in the patterns of post-entry growth by small and larger entrants in the food industry indicates that, more than strategic interdependence within submarkets, in this case it is independence across submarkets that is involved (see Sutton, 1997 and 1998). In fact, seventeen out of eighty-one entrants in this sector (21%) are bakeries, which by definition operate in very small markets (neighborhoods rather than municipal areas) which in most cases are characterized by the presence of a single firm. Thus, even new

new entrants, surviving smaller firms, which tend to enter at a sub-optimal scale, have initially to rush in order to reach a size comparable to that of larger entrants, while subsequently they converge towards random growth rates. Of course, this evidence is not in contrast with a possible rejection of Gibrat's law once incumbents are taken into account together with new entrants: in this case, the test is heavily influenced by the comparison *between* the patterns of growth of (smaller) new entrants and (larger) incumbents. An extension of the present analysis to the comparison between the two sub-populations might be matter for further research.

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entrants with a very small start-up size are likely to operate at the MES level of output of their submarket and do not need to rush to enhancing their likelihood of survival.

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Table 1(i) - OLS and Sample Selection Model (SSM) estimates of Gibrat's Law: Electrical & electronic engineering, instruments, food

Electrical & electronic engineering

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.36***	1.30*	0.80***	0.72***	0.40***	0.35*	0.11	(a)	0.06	0.19*	-0.10	-0.10	-0.10	(a)
$?_1$	0.61***	0.61***	0.71***	0.73***	0.88***	0.89***	0.97***		0.98***	0.94***	1.04***	1.04***	1.02***	
?	—	0.12	—	1.00***	—	0.31	—		—	-0.93****	—	-0.01	—	
t($?_1$= 1)	4.11***	4.63***	3.63***	5.06***	3.00***	1.92*	1.00		0.50	1.29	1.00	0.44	0.67	
F	58.80***	29.04***	201.51***	108.55***	759.69***	443.18***	768.45***		577.28***	286.31***	763.13***	377.07***	1157.33***	
R^2 adj.	0.41	—	0.62	—	0.88	—	0.89	—	0.86	—	0.90	—	0.93	
LRI	—	0.19	—	0.34	—	0.80	—		—	0.70	—	0.78	—	
White [§]	2.67*	—	7.41***	—	7.11***	—	1.00	—	0.32	—	1.48	—	5.87***	
N. tot	129		129		123		104		101		94		86	
N. surv.	83		123		104		101		94		86		83	

Instruments

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.18***	1.44***	0.67***	0.61***	0.23***	0.24	0.01	-0.01	0.13*	0.11	0.05	0.15	0.08	0.03
$?_1$	0.62***	0.59***	0.77***	0.77***	0.95***	0.95***	1.02***	1.02***	0.94***	0.94***	0.96***	0.94***	0.94***	0.95***
?	—	-0.40	—	0.66***	—	-0.15	—	0.08	—	0.12	—	-0.70***	—	0.35
t($?_1$=1)	3.53***	6.53***	5.75***	6.73***	2.50**	1.07	1.00	0.42	2.00**	0.98	1.33	1.55	2.00**	1.15
F	108.20***	53.78***	526.44***	266.17***	1408.94***	721.47***	1528.35***	766.45***	1035.51***	518.73***	1013.57***	503.11***	1064.19***	542.72***
R^2 adj.	0.45	—	0.72	—	0.88	—	0.90	—	0.87	—	0.88	—	0.89	—
LRI	—	0.20	—	0.42	—	0.71	—	0.73	—	0.65	—	0.66	—	0.72
White [§]	1.17	—	6.17***	—	3.86**	—	3.31**	—	2.29	—	1.05	—	0.29	—
N. tot	214		214		200		183		168		155		141	
N. surv.	131		200		183		168		155		141		131	

Food

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	0.98***	1.72*	0.42***	-0.03	0.34***	0.34*	-0.01	0.06	0.10	0.12	-0.03	-0.05	-0.12	(a)
$?_1$	0.79***	0.78***	0.93***	1.03***	0.88***	0.88***	1.01***	1.00***	0.97***	0.97***	1.00***	1.00***	1.04***	
?	—	-0.62	—	0.98***	—	-0.04	—	-0.79*	—	-0.11	—	0.17	—	
t($?_1$=1)	1.29	1.08	0.70	0.35	2.00**	1.27	0.25	0.00	0.50	0.29	0.00	0.00	1.33	
F	23.80***	15.98***	187.07***	98.15***	245.76***	120.68***	580.82***	300.59***	333.82***	163.45***	632.93***	318.19***	1317.64***	
R^2 adj.	0.38	—	0.66	—	0.81	—	0.92	—	0.88	—	0.94	—	0.97	—
LRI	—	0.19	—	0.44	—	0.53	—	0.75	—	0.63	—	0.82	—	
White [§]	0.87	—	7.89***	—	0.73	—	0.26	—	3.65**	—	2.35	—	0.50	—
N. tot	81		81		63		58		54		45		42	
N. surv.	39		63		58		54		45		42		39	

*** = significant at 99% level of confidence; ** = significant at 95% level of confidence; * = significant at 90% level of confidence. [§] , F- statistic; null hypothesis: homoskedasticity; in case of heteroskedasticity (at least at 90% level of confidence) a consistent covariance matrix was used (White's correction). (a) the algorithm did not reach convergence.

Table 1(ii) - OLS and Sample Selection Model (SSM) estimates of Gibrat’s Law: Footwear & clothing, wood & furniture

Footwear & clothing

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.27***	1.09	0.86***	0.65***	0.25***	0.25	0.16**	0.15	0.20**	0.18	0.06	0.01	-0.02	0.08**
$?_1$	0.64***	0.63***	0.76***	0.80***	0.94***	0.94***	0.93***	0.93***	0.92***	0.92***	0.95***	0.96***	0.99***	0.97***
?	—	0.29	—	0.79***	—	0.00	—	0.05	—	0.08	—	0.18	—	-0.93***
$t(?_1 = 1)$	5.49***	3.79***	6.00***	3.80***	2.00**	1.04	2.33**	1.87	2.67**	0.46	1.25	0.33	0.50	0.83
F	96.10***	43.67***	416.09***	208.88***	1693.55***	841.97***	1003.16***	498.45***	697.09***	346.41***	501.06***	249.14***	1665.67***	912.11***
R^2 adj.	0.46	—	0.68	—	0.91	—	0.87	—	0.83	—	0.80	—	0.94	—
LRI	—	0.18	—	0.36	—	0.75	—	0.64	—	0.56	—	0.50	—	0.87
White §	0.52	—	6.07***	—	6.20***	—	0.32	—	0.16	—	0.56	—	1.19	—
N. tot	231		231		204		179		157		144		124	
N. surv.	112		204		179		157		144		124		112	

Wood and furniture

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.42***	1.41	0.86***	0.83***	0.12*	0.13	0.11	0.15	0.24	0.25*	0.38**	0.26**	0.03	0.03
$?_1$	0.56***	0.56	0.75***	0.76***	0.96***	0.96***	0.97***	0.98***	0.90***	0.90***	0.85***	0.88***	1.00***	1.00***
?	—	0.01	—	0.17***	—	-0.04	—	-0.70***	—	-0.53	—	1.00***	—	-0.01
$t(?_1 = 1)$	5.67***	…	5.00***	2.29**	1.33	0.80	1.00	0.26	1.43	1.55	2.14**	1.90*	0.00	0.00
F	63.01***	31.05***	299.32***	162.19***	1215.32***	601.11***	636.30***	323.96***	323.35***	160.31***	408.15***	201.29***	1002.02***	493.71***
R^2 adj.	0.47	—	0.75	—	0.93	—	0.89	—	0.81	—	0.85	—	0.94	—
LRI	—	0.26	—	0.51	—	0.93	—	0.77	—	0.60	—	0.76	—	0.95
White §	6.28***	—	22.46***	—	0.50	—	2.47*	—	5.54***	—	14.10***	—	6.64***	—
N. tot	115		115		100		91		81		78		72	
N. surv.	70		100		91		81		78		72		70	

*** = significant at 99% level of confidence; ** = significant at 95% level of confidence; * = significant at 90% level of confidence.

§ , F- statistic; null hypothesis: homoskedasticity; in case of heteroskedasticity (at least at 90% level of confidence) a consistent covariance matrix was used (White’s correction).

Table 1(iii) - OLS and Sample Selection Model (SSM) estimates of Gibrat's Law: Paper & printing, rubber & plastics

Paper & printing

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.25***	0.61	0.39***	0.35**	0.20**	0.29***	0.24***	0.22	0.14*	0.20	0.22	-0.75***	0.24***	0.19**
$?_1$	0.55***	0.60***	0.86***	0.87***	0.91***	0.91***	0.92***	0.92**	0.94***	0.93***	0.90***	1.35***	0.91***	0.92***
?	—	0.82***	—	0.29	—	-0.78***	—	0.13	—	-0.67	—	1.00***	—	0.93
t($?_1$ = 1)	6.59***	3.77***	3.50***	2.12**	2.25**	1.01	2.00**	0.19	1.50	1.05	1.67	2.77***	3.00***	1.79*
F	65.04***	32.46***	422.55***	212.67***	413.36***	205.52***	507.20***	251.07***	679.87***	372.17***	350.23***	177.31***	878.12***	432.62***
R^2 adj.	0.52	—	0.81	—	0.83	—	0.87	—	0.91	—	0.85	—	0.94	—
LRI	—	0.28	—	0.53	—	0.56	—	0.67	—	0.82	—	0.65	—	0.98
White §	0.05	—	2.01	—	1.39	—	0.13	—	1.33	—	2.96*	—	0.80	—
N. tot	109		109		99		88		77		68		64	
N. surv.	60		99		88		77		68		64		60	

Rubber & plastics

	OLS 87-93	SSM 87-93	OLS 87-88	SSM 87-88	OLS 88-89	SSM 88-89	OLS 89-90	SSM 89-90	OLS 90-91	SSM 90-91	OLS 91-92	SSM 91-92	OLS 92-93	SSM 92-93
$?_0$	1.36***	1.33***	0.92***	0.94***	0.48**	0.49***	-0.04	-0.06	0.08	0.08	0.02	0.05	0.05	0.07
$?_1$	0.56***	0.56***	0.67***	0.67***	0.87***	0.88***	1.04***	1.03***	0.97***	0.97***	0.96***	0.95***	0.97***	0.97***
?	—	0.07	—	-0.22	—	-0.25	—	1.00***	—	0.60	—	-0.50	—	-0.50
t($?_1$ = 1)	3.48***	2.98**	4.71***	3.78***	1.63	1.87	1.33	0.83	0.60	0.64	0.80	0.57	0.60	0.41
F	19.70***	9.69***	79.83***	39.48***	215.51***	106.75***	1024.94***	514.28***	663.40***	334.02***	366.12***	180.25***	414.36***	234.67***
R^2 adj.	0.23	—	0.50	—	0.75	—	0.94	—	0.91	—	0.85	—	0.87	—
LRI	—	0.10	—	0.27	—	0.52	—	0.97	—	0.83	—	0.64	—	0.71
White §	0.23	—	2.02	—	4.53**	—	4.26**	—	5.22***	—	0.00	—	0.30	—
N. tot	85		85		79		74		71		69		67	
N. surv.	65		79		74		71		69		67		65	

*** = significant at 99% level of confidence; ** = significant at 95% level of confidence; * = significant at 90% level of confidence.

§ , F- statistic; null hypothesis: homoskedasticity; in case of heteroskedasticity (at least at 90% level of confidence) a consistent covariance matrix was used (White's correction)

APPENDIX

Table A1 – Persistence in firms' patterns of growth

$G_t = ?_0 + ?_1 G_{t-1} + ?_t$? ***AR(1)*** ***where*** G_t ***is the growth rate at time*** t

Electrical & electronic engineering

	1988-93	1989	1990	1991	1992	1993
$?_0$	-0.02	0.31***	0.13***	0.08*	0.05	-0.02
$?_1$	0.00	-0.03	-0.04	0.02	-0.15	-0.07
F	0.00	1.04	0.56	0.03	2.08	0.56
R^2 adj.	-0.01	0.00	-0.01	-0.01	0.01	-0.01
White §	0.30	1.59	0.06	1.72	1.45	1.84

Instruments

	1988-93	1989	1990	1991	1992	1993
$?_0$	0.01	0.24***	0.14***	0.16*	0.04	0.00
$?_1$	0.00	0.02	-0.08	-0.48*	-0.04	0.00
F	0.00	0.69	1.51	11.99***	0.73	0.00
R^2 adj.	-0.01	0.00	0.00	0.07	0.00	-0.01
White §	1.36	3.44**	0.90	5.70***	1.59	0.52

Food

	1988-93	1989	1990	1991	1992	1993
$?_0$	-0.04	0.47	0.07	0.30	0.03	0.01
$?_1$	0.03**	0.04	0.05*	-0.52	0.01	-0.13
F	5.68**	0.08	3.07*	2.59	0.03	1.71
R^2 adj.	0.11	-0.02	0.04	0.03	-0.03	0.02
White §	0.90	1.06	0.31	2.61*	3.15**	1.16

Footwear & clothing

	1988-93	1989	1990	1991	1992	1993
$?_0$	0.01	0.24***	0.07*	0.09**	0.03	0.00
$?_1$	0.00	-0.01	0.01	-0.08	0.12	-0.02
F	0.59	0.14	0.18	0.74	1.15	0.14
R^2 adj.	0.00	0.00	-0.01	0.00	0.00	-0.01
White §	0.73	0.27	0.15	0.45	0.69	1.61

Wood & furniture

	1988-93	1989	1990	1991	1992	1993
$?_0$	0.04	0.04	0.12**	0.20	0.18*	0.07**
$?_1$	0.02	0.04	0.10	-0.28	-0.17	-0.05
F	1.76	6.47**	0.44	1.38	4.03**	1.38
R^2 adj.	0.01	0.06	-0.01	0.00	0.04	0.01
White §	2.55*	5.27***	0.07	3.33**	3.77**	3.61**

Paper & printing

	1988-93	1989	1990	1991	1992	1993
$?_0$	0.10**	0.25**	0.19***	0.13**	0.09	0.10**
$?_1$	-0.03	-0.07	0.03	-0.13	0.54	-0.05
F	0.55	1.11	0.18	1.49	6.18**	0.49
R^2 adj.	-0.01	0.00	-0.01	0.01	0.08	-0.01
White §	0.29	3.35**	1.16	0.05	4.47**	1.55

Rubber & plastics

	1988-93	1989	1990	1991	1992	1993
$?_0$	0.06	0.59**	0.08**	0.09	0.03	0.06
$?_1$	-0.01	-0.04	0.00	-0.04	-0.20**	-0.04
F	0.14	0.20	0.01	0.03	5.04**	0.11
R^2 adj.	-0.01	-0.01	-0.01	-0.01	0.06	-0.01
White §	0.88	0.19	0.15	0.04	2.93*	0.04

*** = significant at 99% level of confidence; ** = significant at 95% level of confidence; * = significant at 90% level of confidence. §, F- statistic; null hypothesis: homoskedasticity; in case of heteroskedasticity (at least at 90% level of confidence) a consistent covariance matrix was used (White's correction).