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Could they grow faster? An explorative and counterfactual exercise of the Firms' Core during the Golden Age in Italy

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Abstract

The firms' size distribution in the Italian Golden age has been described as a successful example of the adoption of the *big business model* which is characterized by large firms able to exploit the economies of scale of the modern technologies. Two main questions are present in literature: was it enough or could have been done better? Are the two decades homogeneous? The paper tries to answer to these questions observing a panel of a Core of firms, estimating their changing of size distribution and the tendency to upsize, by the Mover-Stayer model. The upsizing of firms emerges clearly, considering the distribution among the size classes in the years 1950, 1960 and 1970, the transition matrices and directional index which shows a rate of growth more than considerable and a strong tendency to upsizing of firms in every class. Moreover, the equilibrium distribution is characterized by a relevant increase of the frequencies in the last two classes. A slowdown of the growth of the size in the last years of the second decade appears too, but the remarkable shift of frequencies on the last two classes - both of the effective and equilibrium distribution- point anyway to a success story. The difference observed in the equilibrium configuration according to 1960-1970 decade, shows a stronger shift of

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frequencies on the right of the distribution and it seems to confirm the traditionally observed effect of a more selective industrial policy at sectorial level - in the second part of the Sixties - than to an early presence of the perverse effect of intrusive policy in management.[2]

1. The economic history of Italian firms' size

In Italian economic history the topic of the firm size focuses on their concentration, i.e. few large firms dominate the domestic market. Two different narratives can be observed: financial capital and monopoly approach (Grifone, 1945; Sereni, 1966) and *relative backwardness* (Gerschenkron, 1962; Bonelli, 1978; Zamagni, 1990) .From the financial and monopolistic capitalism perspective, the few big firms observed come from the late capitalism development in Italy, which depends on finance and on limiting production to maintain a declining rate of profit. From the side of *backwardness,* the presence of few large firms depends on the *relative backwardness* of the country. Italy, in the Golden Age (1950-1970), adopted the leading technologies of mass production (iron and steel, electricity, chemicals, etc.) to *catch up* the modern economic growth, and adopted the large firm model (minimum efficient size of the modern sectors), i.e. the Chandlerian *Big Business* (Amatori, Bugamelli, & Colli, 2013), which was the leading form to exploit these technologies worldwide (Lazonick, 1992). The Italian market was limited according to the *relative backwardness* perspective and few large firms prevailed.

The most of recent literature emphasizes instead the institutional arrangement of the ownership ("salotti buoni") and the organization (groups) of firms entangled in a network of relationship between the banks, the State and the large firms-private and public- which characterized the Italian *Big Business.* (See, for example, Bigazzi, 1990; Rossi & Toniolo, 1992; Barca, 1996; Amatori & Brioschi, 1997; De Cecco, 2000). These authors usually distinguish two phases in the Golden Age: *the virtuous Fifties* and *Early Sixties*, when the catching up happened, and *the perverse one*, starting in the middle of the Sixties and lasting up to the crisis of 1992, when the oligopolistic collusion and the political influence on firms increased and finally collapsed (Crafts & Magnani, 2013). More radically, Fenoltea (2007) complains a prevailing perverse

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effect, due to a long lasting and deleterious aptitude of Italian ruling class to consider industrialization and the policies to promote it the only way for economic growth, pointing instead to a "natural" way to growth, based on the resource endowment of the country.

This paper tests this representations observing the distribution of firms' size and its equilibrium distribution by the Mover -Stayer model (Blumen, Kogan, & McCarthy, 1955), trying to answer to the following couple of questions: is the observed increase of firms' size a proof of successful adoption of the *big business* in Italian Golden Age? Are there differences between the two decades and what does it mean?

We use a source -IMITA.db - for firms' data, which includes companies' balance sheets during the Golden Age. We extract a firms' Core from this dataset and we build up the transition matrices by grouping firms in five size classes and their mobility. Afterwards, we fit on these data a specific model of stochastic process, the Mover-Stayer: this model is an extension of the classical Markov chains, which considers the possibility that statistical units may not have all the same behavior. In addition, from this model we estimate the equilibrium distribution and compare it with the observed one.

The paper is organized as follows: Section 2 contains a short description of IMITA.db and the data we use; Section 3 introduces the observed transition matrices and the mobility of firms; Section 4 estimates the parameters for the Mover-Stayer model; Section 5 concludes.

2. The source

The source for this paper is the digitalization (IMITA.db) of a serial source *Notizie statistiche sulle principali società per azioni,* published since 1908 to 1926 by Credito Italiano (1908-1910-1912-1914-1916-1918-1920-1922-1925) and afterwards by Associazione fra le società italiane per azioni, *Notizie Statistiche*, up to 1984 (1928-1930-1932-1934-1937-1940-1949-1953-1956-1958-1961-1964-1967-1970-1973-1980-1984). IMITA.db, includes three archives:

a) Companies' data set for benchmark years (1911-1913- 1921-1927-1936-1952-1960-1972-1983), covering the following items: firm name; year of foundation; legal location; share capital and paid – up capital.
b) The list of board of directors and board of auditors for the years above.

c) Balance sheet covering all the years between 1950 and 1971 for the following items: share capital; reserves; physical assets; inventory; securities and investments; cash and credits; bonds; debts; sinking founds; reserves; profits (losses); total dividends and per share.

We use the firms' data set and the balance sheets for the years 1950-1970. Firm size is in total Assets (Millions of Lire at 1970 price).[3]

We use a sample of firms, the "Core", instead of the entire set of IMITA.db, for economic and statistical considerations. From the economic side we focus on survived firms, i.e. firms that are present at the beginnings and at the end of the period. From the statistical side, the use of the mobility indices and the estimation of Markov Chain (MC) and Mover Stayer (MS), requires a panel to be estimated (Goodman, 1961; Frydman, 1984; Fougere & Kamionka, 2003).

The panel is composed of 849 firms, excluding financial and insurance companies, according with the two digits ATECO 2007 (

).

Table 1 Sectorial composition of the panel of firms

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Agricolture, forestry and fishing	14	14	14	13	13	13	13	13	13	13	13	13	13	14	14	14	14	14	14	14	14
Mining and quarrying	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
Other mining and quarrying	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Manufacture of food products, beverages and tobac	77	77	77	77	77	77	77	80	80	80	80	79	79	78	78	78	77	77	77	77	77
Manufacture of textiles and textile products	135	135	135	136	136	136	136	136	136	136	136	135	135	134	134	134	132	132	132	132	132
Manufacture of leather and leather products	12	12	12	12	12	12	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14
Manufacture of wood and wood products	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
Manufacture of pulp, paper and paper products	47	47	47	47	47	47	48	48	48	48	48	47	47	47	47	47	48	48	48	48	48
Manufacture of coke, refined petroleum products	22	22	22	22	22	22	22	21	21	21	21	20	20	22	22	22	22	22	22	22	22
Manufacture of chemicals	88	88	89	90	90	90	90	89	88	88	88	91	91	91	91	91	90	90	90	90	90
Manufacture of rubber and plastic products	11	11	11	11	11	11	11	11	11	11	11	9	9	9	9	9	10	10	10	10	10
Manufacture of other non-metallic mineral products	47	47	47	47	47	47	47	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Manufacture of basic metals and fabricated metal	85	85	85	85	85	84	84	75	75	75	75	73	73	71	71	71	71	71	70	69	69
Manufacture of machinery and equipment n.e.c.	49	49	49	49	49	50	50	54	54	54	54	61	61	61	61	61	59	59	59	60	60
Manufacture of electrical and optical equipment	61	61	61	60	61	61	61	62	62	62	62	59	59	60	60	60	60	60	60	59	59
Manufacture of transport equipment	25	25	25	25	25	25	25	27	27	27	27	26	26	27	27	27	29	28	28	28	28
Manufacturing n.e.c.	12	12	12	12	12	12	12	13	13	13	13	13	13	13	13	13	13	13	14	14	14
Electricity, gas and water supply	17	17	17	17	17	17	17	18	18	18	18	18	18	14	14	14	14	14	14	14	14
Construction	14	14	14	14	14	14	14	13	13	13	13	13	13	14	14	14	14	14	14	14	14
Wholesale and retail trade;	59	59	58	58	57	57	56	56	57	57	57	58	58	59	59	59	59	60	60	61	61
Hotels and restaurants	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8
Transport, storage and communication	27	27	27	27	27	27	27	26	26	26	26	27	27	28	28	28	29	29	29	29	29
Real estate, renting and business activities	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5
Health and social work	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Other community,	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	9
	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849	849

[3]The IMITA.db is at http://imitadb.unisi.it.

3. Transition matrices and analysis of mobility

3.1Explorative analysis and observed matrices

To analyze the firms' size evolution we divide the firms of the panel in five classes, according with their total assets, as suggested in Vasta (2003): [0,500), [500,1000), [1000,2500), [2500,10000), [10000,+∞) (Millions of Lire at 1970 price). The upsizing of firms is evident when we consider the distribution among the size classes in the years 1950, 1960 and 1970 (**Table 1**).

Table 1: The observed 1950-, 1960- and 1970-frequencies distributions**.**

Year	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,+∞)
1950	53.71%	16.17%	14.73%	11.41%	3.99%
1960	11.41%	18.05%	28.57%	25.69%	16.28%
1970	3.43%	8.97%	19.60%	34.77%	33.22%

The distribution does not provide information about the degree of mobility of firms conditioned to their starting class and on the expected equilibrium distribution, therefore we construct the observed five-years transition matrices to estimate the decomposition of mobility according to their starting size. (Table 2 and

Table **3**).

Table 2: The observed five-years transition matrices of the first decade 1950-1960.

1950-1955	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)
[0,500)	48.25%	33.40%	16.49%	1.65%	0.21%
[500,1000)	0.00%	15.07%	65.75%	19.18%	0.00%
[1000,2500)	0.00%	0.75%	24.81%	69.92%	4.51%
[2500,10000)	0.00%	0.00%	0.97%	47.57%	51.46%
[10000,…)	0.00%	0.00%	0.00%	0.00%	100.00%

1955-1960	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)
[0,500)	43.16%	44.87%	11.11%	0.85%	0.00%
[500,1000)	1.08%	31.35%	67.03%	0.54%	0.00%
[1000,2500)	0.00%	0.00%	49.52%	49.05%	1.43%
[2500,10000)	0.00%	0.00%	2.25%	68.54%	29.21%
[10000,…)	0.00%	0.00%	0.00%	4.17%	95.83%

Table 3: The observed five-years transition matrices of the second decade 1960-1970.

1960-1965	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)
[0,500)	42.72%	48.54%	5.83%	1.94%	0.97%
[500,1000)	1.23%	38.65%	56.44%	3.68%	0.00%
[1000,2500)	0.00%	2.33%	49.22%	47.67%	0.78%
[2500,10000)	0.00%	0.43%	1.72%	65.52%	32.33%
[10000,…)	0.68%	0.00%	0.00%	1.36%	97.96%

1965-1970	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)
[0,500)	53.19%	40.43%	4.26%	2.13%	0.00%
[500,1000)	4.17%	44.17%	48.33%	2.50%	0.83%
[1000,2500)	0.44%	3.06%	49.78%	45.85%	0.87%
[2500,10000)	0.00%	0.70%	0.70%	70.18%	28.42%
[10000,…)	0.00%	0.00%	0.45%	2.25%	97.30%

Transition matrices give the observed distribution of firms among the classes, conditioned to the initial size. Then, differently from the yearly observed marginal distribution, we can grasp information about the decomposition of mobility according to their starting size. The observed matrices are the basis to analyze the mobility in the following paragraphs.

3.2 The directional mobility

Existing literature on mobility indexes generally gives indexes which synthesize the absolute degree of "turbulence" of units firms among the different classes (Bartholomew, 1973; Shorrocks, 1978; Geweke, Robert & Zarkin, 1986; Parker & Rougier, 2001), without considering the fact the overall movement involves an upsizing or at the opposite a downsizing of the units among the different classes. On the contrary, our index not only measures the intensity of the movement but also the overall direction of the units.

Given a transition matrix *P* (observed or theoretical) with *k* rows and *k* columns, the directional index (Ferretti & Ganugi, 2013)has the following form:

$$I_{\omega,v}(P) = \frac{1}{Z}\sum_{i=1}^{k} \omega_i \sum_{j=1}^{k} p_{ij}\, sign\ (j-i)v(|\ j-i\ |)$$

$\omega = (\omega_1,...,\omega_k)$ is a vector of weights to be attributed to the states, *sign(x) is* the sign function, equal to -1 if *x<0*, +1 if *x>0* and 0 if *x=0,* and v is a function to measure the magnitude of the jumps from the *i*-th to the *j*-th state. *Z* is a normalizing constant to have values among-1 and +1. The index sign provides information on the prevailing direction of firms, for example, an index value equal to -0.15 indicates the presence of downsizing in the considered span of time.

$I_{\omega,v}$ is compared to the trace index (Prais, 1955; Shorrocks, 1978):

$$I_{tr}(P) = \left(k - \sum_{i=1}^{k} p_{ii}\right) \Big/ (k-1)$$

This is a measure of the absolute degree of mobility among firms, i.e. the intensity of movements without recognizing a prevailing direction, as in Table 4. The directional index is evaluated with $v(|j-i|) = |j-i|$, firstly setting the ω_i's equal to the starting relative frequencies in every class. Firms' size increases, whereas the degree of mobility decreases respect to time. The matrices and the values of the directional index show a slowdown in growth of the size in the last years of the second decade even if the rate remains more than considerable.

Table 4: Trace Index and Directional Index on the observed five-years transition matrices.

Span of time	Trace Index	Directional Index
1950- 1955	52.86%	23.95%
1955-1960	42.32%	21.06%
1960-1965	41.19%	21.71%
1965-1970	37.08%	19.83%

Finally we evaluate the directional index considering, at every turn, only firms starting from a given size class (it is possible by setting $\omega = (1,0,0,0,0)$ for firms moving from the first class, (0, 1, 0, 0, 0) for firms from the second class and so on). Table 5 shows a strong tendency to upsizing of firms in every class, especially in the first five years of the Golden Age and for firms moving from the fourth class. Firms in the last class can have only null or negative values for the directional index, since they can only move towards lowest classes. We can however see that the degree of mobility of these firms is very near to zero, i.e. the biggest firms remain in the upper class, i.e. their size depends essentially on the technologies of mass production asking for large plants.

Table 5: Directional mobility indices for the five-years matrices on to the starting class.

Span of time	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)
1950- 1955	18.04%	34.70%	39.10%	50.49%	0.00%
1955-1960	17.41%	22.34%	25.95%	26.97%	-1.04%
1960-1965	17.48%	20.86%	23.45%	29.74%	-1.02%
1965-1970	13.83%	17.22%	21.83%	26.32%	-0.79%

4. The Mover Stayer model

observed transition matrices, we estimate two stochastic processes, the classical Markov Chain (MC), and the Mover Stayer (MS). If the process is a MC we can say that the growth of firms in the Golden Age is characterized by temporal homogeneity,

i.e. the structure of growth (in particular the yearly transition probabilities) does not change significantly as time goes by.

If the process is MS and not MC it implies that the process of growth shows again a temporal homogeneity, but it is also characterized by a simple form of spatial heterogeneity, since MS is based in the hypothesis that there is a group of Stayers, that is firms never moving from their starting state. If MS holds, a group of Incumbents has a peculiar evolution, which is markedly different from the others**.**

We proceed, both with MC and MS models to the estimation of:

- two transition matrices for the two decades;
- two equilibrium distributions.

We find a better fit of MS respect to MC.

The firms' size equilibrium distribution represents the size structure, which the Core would present nowadays if it had developed in absence of shocks.

To evaluate the equilibrium distribution, we choose to model our data with the continuous - in - time MS model. We estimate separately in the two decades 1950 - 1960 and 1960 - 1970, since they show a different behavior in the firms' size development. Afterwards the corresponding equilibrium distributions are calculated.

MS at continuous time is a mixture of two chains and the ruling matrix of the evolution of the units is given by the formula $P = \{p_{ij}(t)\}_{i,j=1,\dots,k}$ with $p_{ij} = s_i \cdot I(i=j) + (1-s_i) \cdot m_{ij}(t)$, where s_i is the probability of being a Stayer in the i-th state, and the $m_{ij}(t)$'s are transition probabilities for the Movers. In particular $m_{ij}(t)$ is the probability for a firm to be in the *j*-th class at time t, given that it was in the *i*-th class at time 0 (see Appendix A for more details).

The estimation method we have used is Gibbs sampling which is based on a Bayesian approach (as in Fougere & Kamionka, 2003). The estimated parameters are shown in Table 7.

To compare the estimates with the effective frequency distributions among classes we use a normalized Euclidean distance as suggested in Frydman, Kallberg, & Kao (1985):

$$err = \frac{\|\hat{a} - a_{obs}\|_2}{\|a_{obs}\|_2}$$

(see **Table 6**).

Table 6: Distance between the observed and the estimated frequency distribution, obtained by MC and MS.

Year	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
MC	0.079	0.134	0.105	0.106	0.095	0.078	0.095	0.092	0.079	0.099
MS	0.078	0.131	0.101	0.098	0.085	0.070	0.091	0.084	0.067	0.093
Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
MC	0.095	0.076	0.074	0.102	0.114	0.085	0.111	0.115	0.111	0.094
MS	0.092	0.075	0.076	0.099	0.111	0.084	0.111	0.117	0.112	0.092

Results show that the distance is lower for MS than MC, i.e. MS fits better our data, confirming the heterogeneity of evolution of Italian firms during Golden Age as to size. Finally, we try to answer to the question about the different evolution of firms 'size in Fifties and in the early Sixties and in the second part of the Sixties. In this decade, according to the most of economic historians, politics became more intrusive in the management of the firms by giving discretionary subsidies to private firms and by a direct intervention in public ones.

To test this point we calculate two equilibrium distributions: the first uses the estimated matrix of the first decade, the second uses the estimated matrix of the second decade**.**

The comparison of the two equilibrium distributions confirms the difference between the two decades: both the distributions show a relevant shift of frequencies to the right. The equilibrium distribution calculated on the first decade shows a lower increase in the fifth size class and a major one in the third and fourth size class; this is coherent with a heavier intervention of government by a selective industrial policy according to a "strategic sectors policy" more concentrated in the heavy sectors (Federico & Giannetti, 1999)

Table 7: The estimated $\hat{m}_{ij}(t)$ (for t = 1 year) and the MS model.

1950-1960	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)	Stayers
(0,500)	82.27%	17.06%	0.50%	0.13%	0.04%	6.73%
(500,1000)	2.18%	75.64%	21.95%	0.17%	0.06%	0.90%
(1000,2500)	0.05%	1.63%	84.79%	13.38%	0.15%	1.06%
(2500,10000	0.10%	0.12%	1.60%	91.30%	6.87%	2.07%
(10000,…)	0.13%	0.16%	0.33%	1.42%	97.96%	86.65%

1960-1970	[0,500)	[500,1000)	[1000,2500)	[2500,10000)	[10000,…)	Stayers
(0,500)	73.56%	24.13%	1.35%	0.58%	0.38%	13.92%
(500,1000)	2.14%	79.41%	18.12%	0.24%	0.08%	4.34%
(1000,2500)	0.17%	2.43%	85.79%	11.52%	0.09%	1.34%
[2500,10000)	0.08%	0.07%	1.38%	92.35%	6.12%	2.24%
[10000,…)	0.19%	0.10%	0.10%	2.39%	97.22%	71.54%

Table 8: Comparison among the two equilibrium distributions obtained using data about the first and the second decade.

Class size	0 - 500	500 – 1000	1000 – 2500	2500 - 10000	>10000
1950 - 1960	0.96%	1.44%	5.59%	20.01%	72.00%
1960 - 1970	1.86%	1.28%	3.43%	16.72%	76.72%

5. CONCLUSIONS

We can now try to advance some answers to the starting questions. Is the observed increase of firms' size a proof of successful adoption of the *big business* in Italian Golden Age? The upsizing of firms is evident when we consider the distribution among the size classes in the years 1950, 1960 and 1970. Transition matrices and directional index show a rate of growth more than considerable and a strong tendency to upsizing of firms in every class, especially in the first five years of the Golden Age and

for firms moving from the fourth class. The equilibrium distribution shows a relevant shift of frequencies in the last two classes. The MS model shows also that the group of Incumbents has a peculiar evolution, which is markedly different from the others**,** confirming the heterogeneity of evolution of Italian firms during Golden Age respect to their size.

As to the second question: are there differences between the two decades and what does it mean? The matrices and the values of the directional index shows a slowdown in growth of the size in the last years of the second decade, but the convergence of observed size of firms and the equilibrium configuration point to a success story. The difference in the equilibrium distribution in the first decade and the second one seems to confirm the traditional view of a more selective public intervention at sectorial level in the second part of the Sixties than to an early presence of the perverse effect of an intrusive politics.

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Appendix A: the Mover-Stayer Model

The discrete-time Mover-Stayer model has been proposed in Blumen, Kogan, & McCarthy (1955) as a mixture of two Markov chains, with the aim to solve some drawbacks of the simple MC, such as the tendency to overestimate the diagonal elements of the transition matrix. The population is then partitioned in two groups: the *Movers* and the *Stayers* and every individual starting from the *i*-th state may be a Stayer with probability s_i, or a Mover, with probability $1 - s_i$. Movers evolve across the states according with a classical MC with transition matrix M, whereas Stayers never move from the starting state, then they "evolve" following a degenerate MC with the identity matrix I as transition matrix. In consequence of that, the global transition matrix *P* is given by the formula

$$P = S + (I - S) * M \ ,$$

where $S = diag(s_1, \ldots, s_k)$.

The estimation of the parameters $(s_1, \ldots, s_k)$ and M has to be done considering the unobserved heterogeneity among Movers and Stayers, in the sense that we do not know the exact number of Stayers in every state. This question has been faced in Goodman (1961) and Frydman (1984).

The MS has been extended also to a *continuous time* framework by Singer & Spilerman (1976). "Continuous time" means that Movers can move from one state to the others at each instant of time $t>0$. Then the transition probabilities are continuous functions of the time t and that there exists a *generating matrix* Q such that the transition matrix can be expressed as

$$M(t) = \exp(t * Q)$$

(the exponential matrix function). We recall that $m_{ij}(t)$ expresses the probability to be in state *j* after a time *t*, for every $t \in R_+$ given that the state at time 0 was *i*.

In such a case, the parameters of the model are *s* and *Q* and they are estimated through a Bayesian approach as in Fougere & Kamionka (2003) and Cipollini et al. (2013).