

Privatizations, Partial Privatizations and Competition

Francesco Del Prato*

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Abstract

What is the effect of privatizations on the market openness, depending on the government's decision to sell the control stake of the privatized company? This work studies how the privatizations affected the entry rate in different Italian industries, using data from 1998 to 2013. Panel data estimation shows a negative effect on competition when the government maintains the control over the sold company. Given this evidence, I propose a theoretical model – taking into account “strategic” and political costs of privatization – in order to discuss the optimal choice about the amount of shares to be sold.

Keywords: partial privatizations, government ownership, market openness.

*IMT School for Advanced Studies, Lucca – Email: francesco.delprato@imtlucca.it.

1 Introduction

Privatizations have been a leading phenomenon in the European politics of the late nineties. The ownership of State's companies has been perceived for long as a necessary condition to promote growth and produce adequate public goods, while in the last twenty years many countries have faced different selling streams of the State Owned Enterprises (SOEs) – as shown, among others, in OECD (2009). The decision to privatize remains a non-trivial problem for a government: a notable amount of trade-offs naturally arises from these actions, which typically involve many different choice dimensions, from politics to economics. Still, privatizations are often undertaken in the face of considerations regarding efficiency gains, better management and public spending review. Much less is known about the effects of privatizations on market openness and the incentives they create for the competitors of a former SOE.

To address this question, this study uses the Italian case of large privatization program enacted between the 90's and the 10's of this century. More specifically, using data on privatizations in different sectors of Italian activities, I separately identify the effect on the industries entry rate of the privatizations, taking into account the decision to cede – or not to – the control stake of the SOE. Indeed, whenever the government faces the decision to cede the whole control of the firm to be sold (*full privatization*), or maintain the control by selling just a minority stake (*partial privatization*), it creates an incentive scheme that could possibly affect competition in the industry where the privatization happened. If a potential competitor of the sold firm is considering to enter in the industry after the privatization, her behavior will depend on the extent of that privatization.

To better understand this mechanism, suppose the government maintains the control over the (partially) privatized firm. A competitor may prefer to challenge for the minority stake and participate to the revenues of a partially privatized (but still State-controlled) firm, rather than directly compete in the market. On the other hand, knowing that a former SOE is no more under government's control could end up in an incentive to enter the market for a competitor. This behavior can be explained by the mix of advantages that a government-owned firm can rely on: know-how, State's financial and regulatory help, possibility to bypass bureaucratic costs and requirements, and so on.

Italy's multiple waves of privatization constitute a good environment for the research question I have just introduced. First, because the privatizations regarded many different sectors, allowing to exploit variation across industries. Second, because they were distributed on a quite large amount of time, evenly undertaken by both center-left, center-right and so-called *technical* governments. Third, because Italy used to show a massive presence of different companies under (either central or local) government's ownership: this allows to exploit the variation among a high number of different privatizations, conducted with disparate methods.

Panel estimation on Italian privatizations between 1998 and 2013 shows a sizable negative effect of partial privatization on the entry rate in the treated industries. At the same time, no statistical evidence is shown for the effect of full privatizations. These findings seem to substantiate the incentive scheme I propose when facing partial privatizations, whose

occurrence seems to work as a classical entry barrier in the market, reducing the stimulus for potential competitor to enter in direct clash with a partially privatized incumbent.

Moreover, when facing a privatization decision the government needs to find a suitable balancing between social welfare benefit, privatization's revenues, and the cost to possibly loose control of the company. The latter trade-off is relevant not only from an economic perspective;¹ but also has possibly relevant strategic and political implications. Indeed, the decision to maintain the control on the firm can be regarded either as a possibility of a (positive) strategic integration with the government's policies, or as the allowance for (negative) nepotism and patronage activities, which are usually functional to mere electoral purposes.

When the government takes into account the effects of its decisions on market dynamics, it must choose the optimal amount of shares to be privatized. I develop a simple theoretical model of competition in which a welfare-maximizing government chooses the stake to be sold in the privatization process of a SOE. In a partial privatization, the optimal share to be privatized depends on the cost suffered by the government for losing some influence inside the company. Such a cost can have multiple interpretations, that foster the discussion around the opportunity to privatize. In a full privatization, if the government does not take into account the possibility that the extent of the privatized share may affect the buyer's behavior, it will sell the whole stake as long as it is profitable. Interestingly, this theoretical result is confirmed in the data. On the other hand, when the government cares about the effects of its decision on the effort of the new property, the optimal choice depends on the relative weights assigned by the government to the social welfare function: more attention to revenues is associated to larger ownership maintenance.

Notably, neither theoretical nor empirical literature on partial privatizations – despite both being quite extensive – investigated the effect of the produced incentive scheme on competition. From a microeconomic perspective, Matsumura (1998) builds a founding model investigating a quantity-setting duopoly that involves a private and a privatized firm – jointly owned by the public and private sectors – taking into account the trade-off between profit and social welfare maximization for the privatized firm. The study finds that neither full privatization, nor full nationalization is optimal under moderate conditions – still without taking into account post-privatization competition. Lee and Hwang (2003) elaborates on Matsumura (1998)'s framework to allow for managerial inefficiency: again, partial ownership ends up to be a reasonable choice of government in a monopoly market as well as in a mixed duopoly market. In a similar framework, Ishibashi and Kaneko (2008) show how partial ownership could be a reasonable choice for the government to pursue a mixture of welfare and profit maximization, similarly as what Schmitz (2000) does within a framework of incomplete contracts in which the proper role of government is reconsidered. Bennett and Maw (2003) show how partial state's ownership affects the firm's subsequent investment and output in a two-firm differentiated-product oligopoly, and how the optimum retained state ownership share depends on product-market competitiveness: partial state ownership is optimal if the proportionate welfare weight on government revenue is high, but less than

¹See, for instance, De Fraja and Delbono (1989) and Cavaliere and Scabrosetti (2008).

unity. Fershtman (1990) demonstrates that a partially nationalized firm might obtain higher profits in duopoly than its private profit-maximizing competitor, under the assumption that it still puts some emphasis on social welfare. The literature, anyhow, seems to be scanty on the effects of partial privatizations on the derived incentive scheme – particularly for competitors considering to enter the market.

At the same time, theoretical literature concerning the effects of the efficiency of State and private ownership is mostly a subset of literature about the economics of ownership and the role of the government in the market. Most of the theoretical arguments in favour of private ownership rely on the First Welfare Theorem: under some assumptions, every competitive equilibrium is Pareto efficient. These assumptions imply that theoretical arguments for government intervention must rely on some actual or perceived market failure that can be fixed by the government itself. Sheshinski (2003) summarizes most of the discussion regarding how privatizations effects depend on the degree of market failure, and how competition affects privatization decisions. Shleifer (1998) outlines most of the classic literature about contract theory in the efficiency analysis, and classic principal-agent issues that arise when government’s goals are inconsistent with efficiency and social welfare maximization. Sappington and Stiglitz (1987) discuss how the ownership structure affects the attitude of government intervention in firms operations. Frydman et al. (1999) and Kornai (2003) discuss on SOE’s “soft” budget constraints due to government’s ownership and funding, pointing at it as a major source of inefficiency. De Fraja and Delbono (1989), in a groundbreaking work, show how privatization of welfare-maximizing SOEs can improve social welfare. Davis et al. (2000) offer a review about the evidence on the macroeconomic effects of privatization programs, specifically on developing countries, showing how privatization can affect efficiency through its effect on the fiscal balance of the government.

This article proceeds as follows. Section 2 outlines a brief historical background of privatizations. Section 3 shows the data analysis, with a dataset for Italian full and partial privatizations and their effects on market openness, between 1998 and 2014. Empirical evidence of the negative effect of partial privatization to market openness as compared to full privatizations is provided. Section 4 reports a simple theoretical model, grounded on empirical evidence, to find the best choice of privatization for the State, after full-or-partial decision is taken. The model is then extended to account for effect of the privatized shares amount on post-privatization private investment. Section 5 contains conclusions and final remarks.

2 An historical overview of privatizations

Relying on the extensive work contained in Megginson and Netter (2001), that gathers a broad taxonomy of literature, empirical evidence and historical facts about privatizations, it is possible to outline a brief yet useful historical background of these choices and how they impacted the recent history of political economy.

The government’s ownership of companies producing public goods (or alleged so) has often been perceived as a necessary condition to promote adequate growth. For example,

after the Great Depression or The World War II, many forces pushed governments into a stronger direct intervention in the market, including ownership of production and provision of different types of goods and services. Governments debated how deeply involved the State should be in regulating the national economy, and which industrial sectors should be reserved *exclusively* for State ownership. Until 1979, when Margaret Thatcher's mass privatization program was implemented, in western Europe the certainty that government had to control at least telecommunications, postal services, energetic utilities and most transportation infrastructures and services was still very strong and deeply-rooted. Anyhow, contrary to what is commonly thought, Thatcher's government was not the first one to undertake privatizations in Europe. Adenauer's German government, for example, launched a first large-scale "denationalization" program already in 1961.

Although not the first, Miss Thatcher's privatization program has been, without any doubts, the most important from an historical, political and cultural impact: it was not by chance, the label "privatization" started to become of common use right after her political experience. After the British Telecom public offering in 1984, the privatizations became established as a fundamental policy in United Kingdom, where an increasingly massive share issue privatizations (SIPs) occurred in the ensuing years – until the early '90s – involving *British Airways*, *British Gas*, *British Steel* and many others prominent British industries. The impact on the European politics was astonishing: as the success of British privatization program was perceived through the Continent, many other industrialized countries started divesting SOEs, like under Chirac's government in France – where 22 companies, worth \$12 billion, were privatized in a bunch of years – and to whose experience followed other important privatizations initiatives such as *France Telecom* in 1997-1998.

Italy, Germany and Spain followed with similar experiences through the '90s and the first years of the new millennium, though with less intensity – whereas also Japan raised about \$80 billions selling, for example, telecommunications SOEs in the late '80s.

On the other side of the world, Latin America has undergone truly massive privatization policies. Chile's experience has been historically the first and the most important – both in term of economic impact for the Country and because of the prominent role of US investments during the whole process. Mexico also significantly reduced its State's role in internal market, somehow constraining a significant public interventionism in the economy. Soon after, several other countries followed similar decisions, including Bolivia and Brazil.

Finally, the former Soviet Block deserves a mention – even though these countries began privatizing SOEs within a broader effort to transform themselves from command to market economies. Their challenge here was definitely harder and it is impossible to separate their privatization programs from an overall, broader, social and cultural transformation. This led, on occasion, to misuse of the pure privatization purposes, with negative and even unpredictable effects (Hamm et al., 2012 and Kim and Yelkina, 2003).

In summary, after Thatcher's revolution, privatizations have been used in more than a hundred countries around the world, with a remarkable impact not only on the economy, but also on the society as a whole (see for instance Xu and Lee, 2012).

3 Empirical Analysis

This section uses a panel dataset of full and partial privatizations per year per industry, in Italy between 1998 and 2013, to investigate the effect of these sells on the entry rate in the industries in which they happened, accounting for time and industry fixed effects.

3.1 Data overview

Using data from the M&A's database *Zephyr*, I isolated a sample of 57 different full privatizations – with an average privatized share of 88.3% – and 69 partial privatizations – with an average privatized share of 24.2% – that occurred in Italy from 1998 through 2013. This database has already been cleaned from potential “apparent” privatizations, i.e. reallocations of the shares from a government-controlled company to another.

Figure 1 shows the percentages' densities of the privatized shares for full and partial privatizations in my sample. The median value is 21.5% for partial privatizations, and 100% for full privatizations. Indeed, in the case of partial privatizations, the histogram shows a substantial flatness within the choice of the amount to be privatized: government faces a trade-off between revenues from privatization and a “strategic” cost of losing influence in the company while maintaining its control.² On the other hand, when the decision to sell the majority stake is taken, the preference shifts to the whole sale of the SOE, as the State does not incur in any further political cost. This empirical evidence is strongly consistent with the results of the model, as discussed in Section 4.

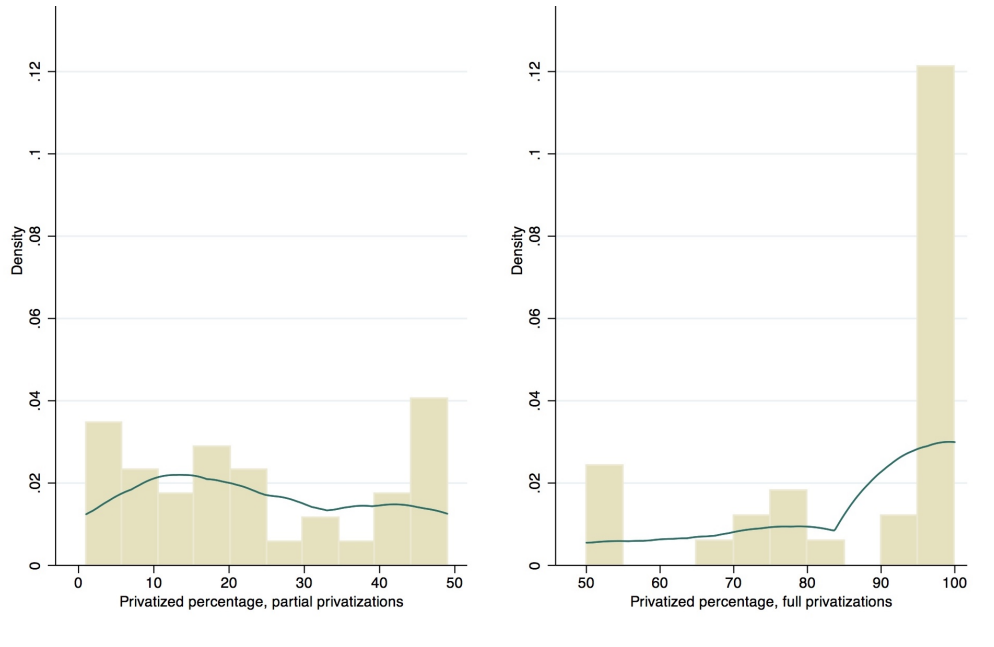


Figure 1: Partial privatizations vs. full privatizations: privatized percentages of the shares. Note how, within partial privatization, the kernel density is flat, whereas in full privatization a big prevalence of complete sales is observed. Source: Zephyr Database.

²The role of this cost will become central in the model proposed in Section 4.

Since the markets rapidly discount the information of a privatization announcement (Otchere and Zhang, 2001), I chose the official announcement of the deal given by the parts as the reference year to count a privatization. Still, most of the times this date coincides with the effective (or supposedly effective) date of transaction.³

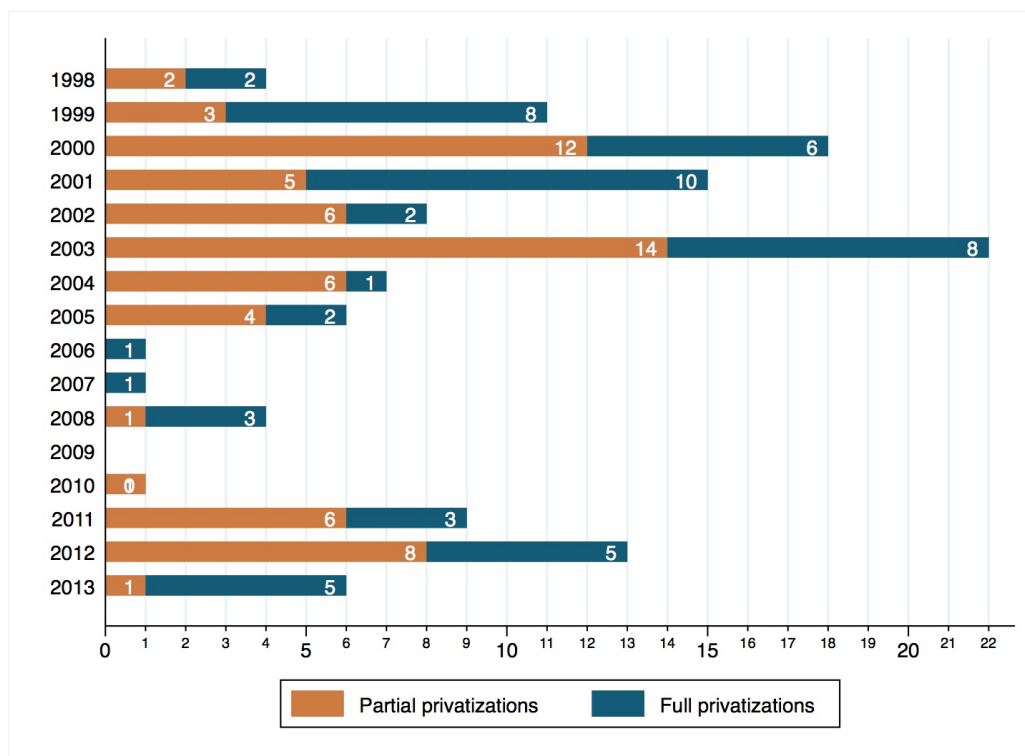


Figure 2: Number of partial and full privatizations, by year, occurred in Italy. Lots of privatizations, both partial and full, are concentrated in the first years of the century, whereas the period between 2006 and 2010 shows a consistent drop due to financial and political crisis.

Figure 2 depicts the breakdown of the number of full and partial privatization, by year, in Italy. We can observe a stronger privatization trend between 1999 and 2005 under governments Amato II (center-left from April, 2000, to June 2001) and Berlusconi II (center-right from June, 2001 to April, 2005); with a subsequent deep drop between 2006 and 2010 under Italian governments Prodi II (center-left from May, 2006, to May, 2008) and Berlusconi IV (center-right May, 2008, to November, 2011). This change of direction, therefore, appears to be independent on the political orientation of the in-charge government, while rather it seems to reflect a limited political strength, due to strong difficulties of the Italian economy and instability of its political governance around the 2007-2009 crisis. A recovery of privatizations is experienced between 2011 and 2013, under the political guidance of Monti's emergency technical government. This evidence most likely reflects the cash flow needs during the most difficult period of our recent domestic economy.

In order to offer an analysis of the impact of full and partial privatizations on competition and market openness, an industry-level analysis is required. *Zephyr* database allows to

³Moreover, from the *Zephyr* database is always possible to obtain the date of the official privatization announcement, whereas the completion date is sometimes just estimated. In any case, again, for the very vast majority of the sample, announcement and completion dates coincide.

indicate the NACE Rev. 2 code of the privatizations' targets, specified to the fourth digit, indicating the primary industry in which the target operates or used to operate.⁴ If a target is assigned to more than one primary industry, I consider the case as more than one privatization in more than in one industry. Moreover, where not directly specified in the deal shares amount, IPOs are always treated as partial privatizations.

As a dependent variable for the measure of competition, in terms of industry openness after privatizations, I use the birth rate measure between 1998 and 2014, taken from the *Eurostat Structural Business Statistics* database. The birth rate is defined as the ratio between new companies born in the industry in a year and the active companies population in the very same year. Such a construction allows to deal with scale problems: as it is going to be explained, industries aggregations are not homogeneous in depth (i.e., the number of digits used in specification). Therefore, using a relative measure allows for the assumption that trends in birth rates within nested industries are similar. Moreover, entry rate is built identifying and excluding those entries that are due exclusively to firms' mergers or takeovers. Furthermore, activities changes at the firm level do not result in entry into a given industry. Descriptive statistics for the entry rate, broken down by industry and year, are reported in Table 2 and Table 1, respectively. We observe an average entry rate of 8,04%, with some peaks for certain industries, for instance telecommunications industry (labelled 61), that shows an average entry rate of 20,43% in the considered period.

Eurostat Business Demography database provides entry rate data with a time-inconsistent industry specification: NACE Rev. 1.1 for data between 1998 and 2007 and NACE Rev. 2 for data between 2008 and 2014. Moreover, the industry aggregation offered by *Eurostat* database is not always homogeneous: some data are available for deeply specified industries (i.e., 4-digit NACE codes), while some others are aggregated to the second digit. Therefore, some specification is needed in order to match data from NACE Rev. 1.1 to NACE Rev. 2 and *Zephyr* data 4-digit specifications to *Eurostat*'s case-by-case codes. To solve the latter problem, *Zephyr* Nace Rev. 2 4-digit specification has been matched with *Eurostat*'s NACE Rev. 2 to the best available digit. To solve the former, using documentation provided by the European Commission, the two databases have been manually matched to the best of their fitting, with the effective belonging of the privatized firm, case by case. Table 3 shows the NACE Rev. 2 codes used in the analysis with their official description: note, again, the different levels of specification. The table of conversion rules from NACE Rev. 1.1 to NACE Rev. 2 is here omitted, because of its scarce relevance to the purpose of this discussion.

Figure 3 shows the number of full and partial privatizations in the dataset divided by industry, with a reference to Table 3 for industries description. Note how a large majority of privatizations occur within three main industries: electricity, gas, steam and air conditioning supply (labelled 35); warehousing and support activities for transportation (labelled 52); and retail sale of other goods in specialized stores (labelled 477). A time trend for full and partial privatizations in these industries is given in Figure 4 and 5. A more detailed qualitative analysis of these numbers shows that:

⁴For more information about NACE statistical classification of economic activities in the European Community, see <http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>.

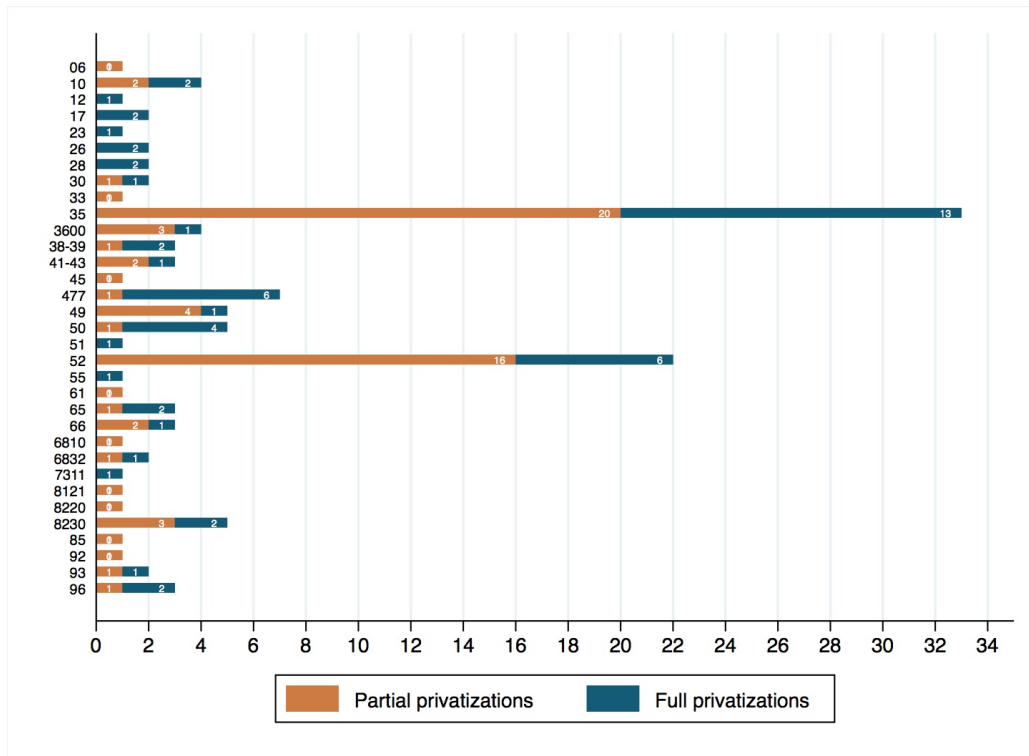


Figure 3: Number of partial and full privatizations, by industry, occurred between 1998 and 2004 in Italy.

1. Electrical (labelled 35) industry is well balanced between partial and full privatizations: most of full involved sales of research-intensive branches of ENEL, or its controlled; whereas partial privatizations were mostly divestitures of minority stakes of ENEL itself. The vast majority of these transactions occurred in the five years after the so-called *decreto Bersani* of liberalization of Italian electric sector.
2. Transportation support activities (labelled 52) industry faces many partial privatizations and less full ones (16 vs. 6). This could probably well reflect the seek of efficiency gain, from letting private investors in the property without losing full control of the public service in such a critical market.
3. Retail goods in specialized store (labelled 477) industry registers a higher number of full privatizations than partial ones. Privatizations in this industry regard mostly local drug-stores.

Notice how, given this description, full privatizations seem to have happened mostly in less strategically relevant industries. This could be attributed to both a strategic cost that State suffers while leaving the control stake in these sectors, and a “clientelism” cost of losing control in industries which constitute electoral and political levers. These considerations result to be very important for the model development.

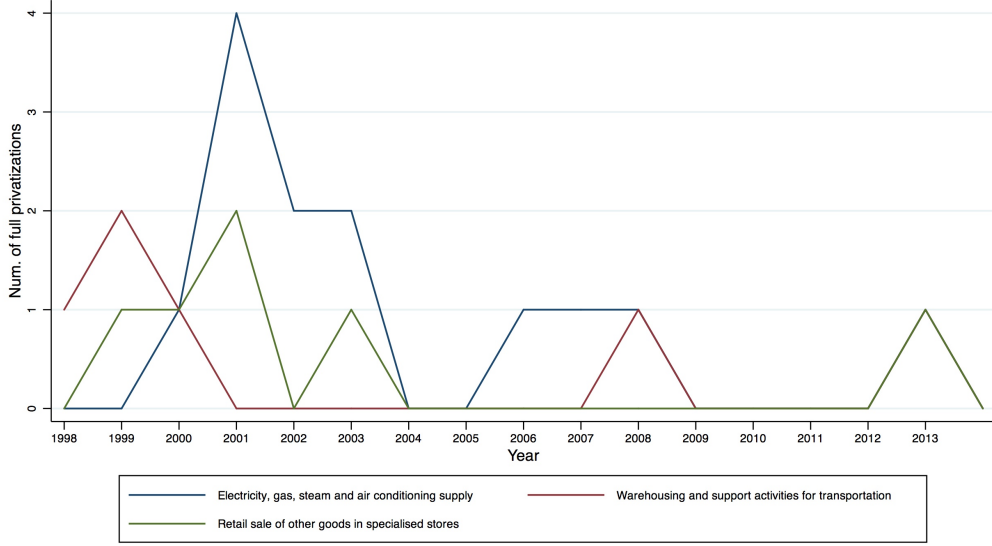


Figure 4: Trend of full privatizations, in three representative industries, occurred between 1998 and 2004 in Italy.

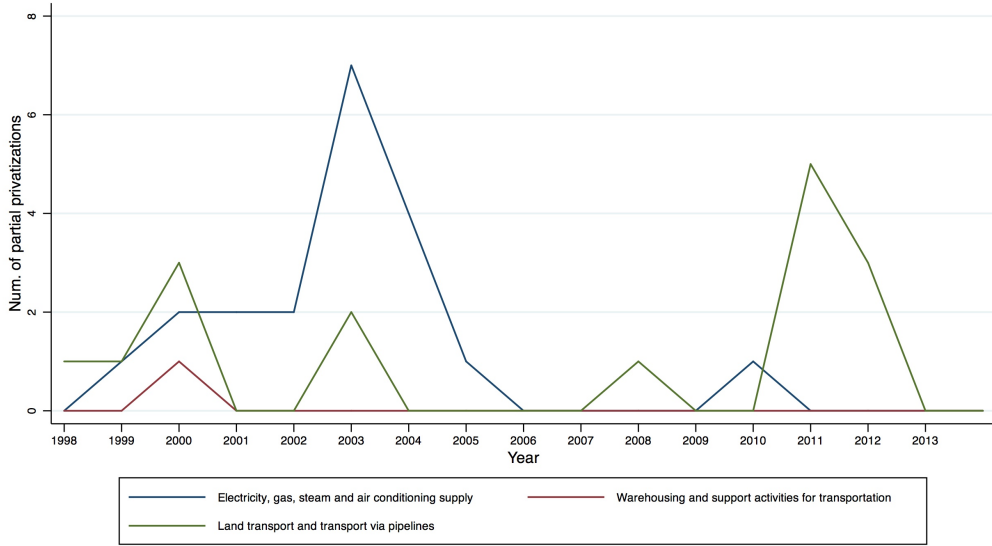


Figure 5: Trend of partial privatizations, in three representative industries, occurred between 1998 and 2004 in Italy.

3.2 Econometric Framework

I investigate the impact of the number of full and partial privatizations on the industry entry rate, as separately identified, by estimating the following industry-year fixed effect specifications:

$$y_{it}^s = c + \sum_{j=1}^4 \alpha_j \text{Num.partial}_{t-j} + \sum_{j=1}^4 \beta_j \text{Num.full}_{t-j} + \gamma_i + \lambda_t + \varepsilon_{it}, \quad \text{for } s = 1, 2, 3 \quad (1)$$

Here, y_{it}^1 is the measure of competition in terms of market openness, defined by the *entry rate*, as the ratio between the new firms in a year and the active firms in that year, per industry; y_{it}^2 and y_{it}^3 are, respectively, the two-years and three-years moving average of the entry rate. Num.partial and Num.full are, respectively, the number of partial and full privatizations occurred in the industry-year pair; c is a constant term. The specifications shown in (1) include an industry-specific fixed effect, γ_i , which reflects fixed differences across industries that are constant but unobserved over time; a year-specific effect λ_t to capture contemporaneous correlation; and a random unobserved component ε_{it} that captures unobserved shocks affecting the market openness.

The results from panel estimation for the specification (1) are presented in Table 4. In the first column uses the single-year entry rate as a measure of market openness; while the second and the third columns uses, respectively, a two-years and three-years entry rate moving averages: this specification allows to control for possible subsequent peaks in new firms. Indeed, by construction, if two contiguous years register many entries, the entry rate is going to be very high only in the first year: the moving averages are used to smooth out these effects.

These results show that partial privatizations have a negative statistically significant effect on the industry entry rate, whereas full privatizations have a mostly non-statistically significant effect. Regressions of single-year entry rate and two-years-average entry rate show a negative statistically significant coefficient just for the effect of full privatizations in $t - 1$. This result goes in the opposite of all the other findings, and can be explained by the time taken for the privatization effects to take place in the market: planning processes and administrative procedures are required for a new firm to start operating in an industry (see, among others, Djankov et al., 2002, and Colantone and Sleuwaegen, 2010). This is the same argument under which goes the explanation of the weaker results given by the further specifications when measuring short-term effects. Moreover, looking at the last two rows of Table 4, we can observe that – although not significantly different from zero – the effect of full privatizations on market openness is positive. This finding is consistent with literature linking full privatizations and competition increase (see, for instance, Carter, 2013). Overall, it is possible to observe stronger and more significant effects when considering the two years average entry rate as market openness measure.

Now, consider not only the aggregation of the dependent variable, but also the aggregation of the regressors. Indeed, it is interesting to investigate if, summing the number of full and partial privatizations within two and three years, a change in the effect and magnitude shown with the previous model specification is observed. In order to do so, I use the following, new specifications:

$$\bar{y}_{it}^s = c + \alpha \sum_{j=1}^r \text{Num.partial}_{t-j} + \beta \sum_{j=1}^r \text{Num.full}_{t-j} + \gamma_i + \lambda_t + \varepsilon_{it}, \quad (2)$$

for $s = 2, 3$ and $r = 1, 2, 3$ – with the same notation used in equation (1).

The panel estimation for the six equations in (2) are reported in Table 5. We observe, again, a statistically significant negative effect of partial privatizations on market openness, whereas

no coefficient significantly different from zero is found for full privatizations. Considering two- and three-years moving averages of the regressors allows to observe a more comprehensive effect, as well as the eventual differences in the amount of time needed for the effect to take place. Moreover, Figure 6 shows partial privatization residuals for the last four specifications given in (2): notice how the captured effect is mainly due to small number of partial privatizations and therefore not driven by outliers.

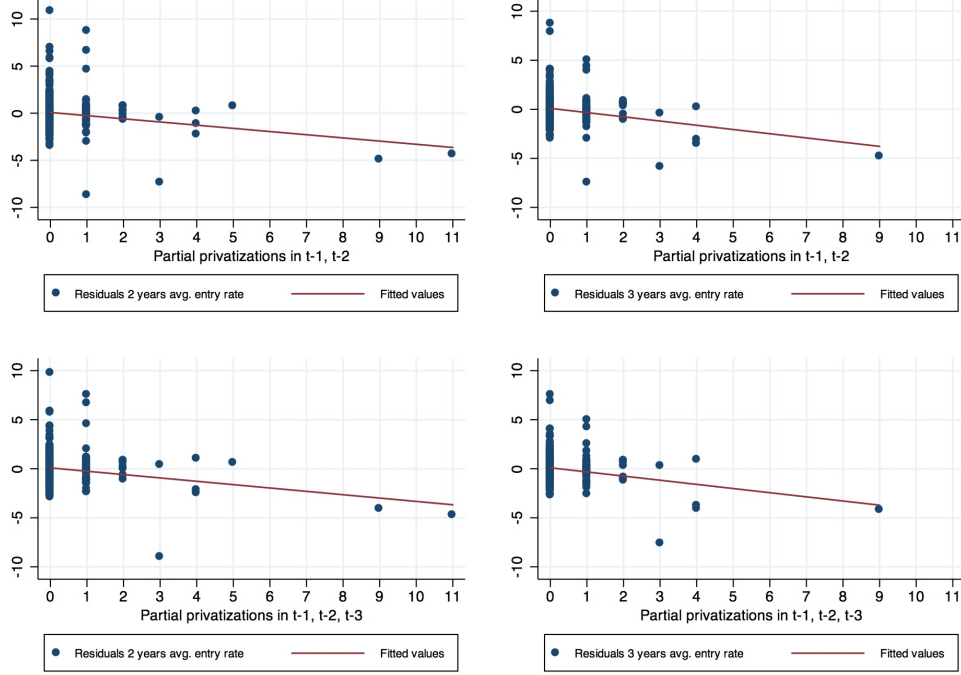


Figure 6: Scatters of partial privatizations residuals of the last four specifications given in (2). Notice how captured variation is mainly due to small number of partial privatizations and not driven by outliers.

As a robustness check for specifications in (2), Table 6 shows the results of that very same specification, with a shifted dependent variable: it is indeed allowed for an “adjustment year” of the effect between the aggregates. Results remain, again, consistent with the direction and the magnitude of the effects previously found. Notice that some significance is lost when considering three years aggregates of entry rate. This is because of dilution of the effect in time, due to the addition of another year (the gap year) between the privatizations and the measured entry rate.

Finally, as a placebo test, consider the following specifications, that try to estimate the effect of full and partial privatizations treated as a continuum, using as regressor the average amount of privatized shares in a certain year in an industry:

$$y_{it}^s = c + \sum_{j=2}^4 \alpha_j \bar{\theta}_{t-j} + \gamma_i + \lambda_t + \varepsilon_{it} \quad \text{for } s = 1, 2, 3 \quad (3)$$

as well as

$$y_{it} = c + \alpha \left(\frac{\sum_{j=1}^r \bar{\theta}_{t-j}}{r} \right) + \gamma_i + \lambda_t + \varepsilon_{it}, \quad \text{for } r = 2, 3 \quad (4)$$

The notation is the same as before, where $\bar{\theta}$ is the average privatized amount by year in an industry.⁵ Panel estimates of the specifications given in (3) and (4) are reported in Table 7. Interestingly, there are no statistically significant coefficients found, and all the estimated coefficients are extremely close to zero. This result can be interpreted as a remark of the importance, for the effects on market openness, to cede or not to the control stake, rather than the extent itself of the privatization. It does not matter *how much* the government privatizes in both cases, what matters is just whether it is keeping the control or not.

Still, there could be concerns regarding some possible reverse causality threat: it could be the case that privatizations are driven by market openness, for example by some lobbying activity. In order to address this possibility, I build an event study for multiple events panel in the spirit of Sandler and Sandler (2014). The specification is given by

$$y_{it} = \sum_j^{J_i} \sum_{d=-D}^D \mathbb{1}(t - \text{privatization}_i^j = d) \beta_d + \gamma_i + \lambda_t + \varepsilon_{it}, \quad (5)$$

where J_i denotes the number of events (privatizations, both partial and full) occurring in industry i ; while D is the size of the event window. In this specification, in contrast to “classic” event study setting, it is allowed more than event time dummy to be turned on: in this case a “dummy” associated with β_d is equal to 2 if there are two events occurring D (or more) periods ago. Moreover, such a specification allows to take into account not only multiple events per industry, but also multiple events per year-industry pair. The result of specification (5) is shown in Figure 7, with a seven-periods window. Standard errors are clustered at industry-firm level. The effect of partial privatization is clearly negative and persistent within three years after the event. In the pre-treatment period, a small positive trend can be identified, although no statistically significant: still, the direction is the opposite as the post-treatment, which allows for the interpretation of the estimates as a *lower bound* (negative) effect. This descriptive analysis should reassure about the absence of reverse causality for partial privatizations. On the other hand, some pre-trend is shown for full privatizations: this is somehow coherent with the absence of significance in the investigation of the effect of these events on market openness. Still, the interpretation of the mechanism of such a pre-trend is not straightforward.

4 The Model

4.1 Baseline model

In this simple model, the government sells on the market a fraction $\theta \in [0, 1]$ of a firm it owns. The firm produces a public good and is assumed to hold a monopoly position. Two

⁵(For example, if in the same year in an industry occur a partial privatization of 2% and a full privatization of 100%, $\bar{\theta} = 51\%$).

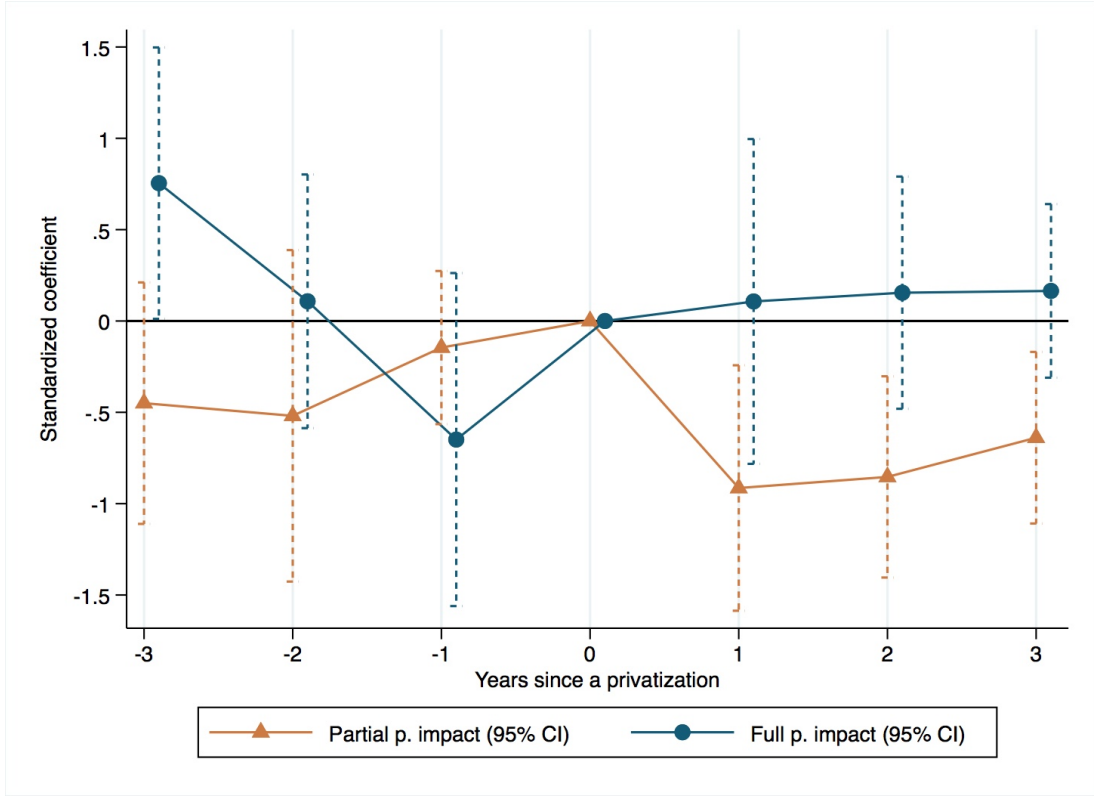


Figure 7: Multiple event study as specified in equation (5). The effect of partial privatizations is negative and persistent within three years after the event. No statistically significant pre-trend is shown. For full privatizations, it is possible to observe some pre-trend of no straightforward interpretation.

perfectly symmetric entrepreneurs own, respectively, a firm that produces a good that is homogeneous with the one produced by the monopolistic SOE. These two entrepreneurs compete for the entrance in the industry, after the privatization has been announced. The sale occurs through a competitive auction.

Consistently with the evidence provided in this study, the argument goes as follows. If the amount of sold shares guarantees the continuation of the government's control (i.e. $\theta < \frac{1}{2}$), each investor prefers to compete for that amount of share, rather than try to compete with his own company *after* the privatization is completed. This is because each investor expects the State control to assure some advantages for the firm, like preferred fiscal treatment, soft budget constraints, and favourable *ad-hoc* laws and political decision. Therefore, the firm is going to remain monopolistic while still controlled by the government, because the entrepreneur who lost the auction prefers to avoid entering the market. On the other side, if more than one half of the shares are sold – and therefore the government has lost the control – the investors are indifferent between competing in the auction and competing in the market once the privatization is done: the auction loser will enter the market with his own firm, moving to an oligopoly. Moreover, such a setting is consistent with results in Fershtman (1990), where is shown that a profit-maximizer firm facing a State-controlled competitor obtains lower profits than in a regular Cournot equilibrium.

Let γ_m be the government's private evaluation of the net present assets value of the

firm in case $\theta < \frac{1}{2}$ (where subscript stands for *monopoly*) and γ_o in case $\theta > \frac{1}{2}$ (where the subscript stands for *oligopoly*). Of course, $\gamma_m > \gamma_o$, i. e. a monopolistic firm is always considered more profitable than an oligopolistic one.

The social welfare is given by a classic convex combination of two factors: the consumer surplus and the government's revenue, given by the sum of the private evaluation of the firm's amount the government retains, the revenues from the sold shares, and a private cost of losing government's control in the firm. We face the following objective functions:

$$W_m = (1 - \beta)[w - p_m] + \beta \left[(1 - \theta)\gamma_m + \theta\pi_m - \frac{\lambda}{2}\theta^2 \right] \quad \text{for } 0 \leq \theta < \frac{1}{2} \quad (6a)$$

$$W_o = (1 - \beta)[(w - p_o)] + \beta[(1 - \theta)\gamma_o + \theta\pi_o - r] \quad \text{for } \frac{1}{2} < \theta \leq 1 \quad (6b)$$

where π_i for $i = m, o$ is the expected profit of the sold firm for the buyer. Since the auction is competitive, the entrepreneurs bid their private evaluation of the SOE: therefore, π_i for $i = m, o$ is also the revenue obtained by the government from the auction. $\beta \in [0, 1]$ is the exogenous weight of the government's revenues component of the social welfare function. $h(\theta) = -\frac{\lambda}{2}\theta^2$ is a private cost-function, strictly decreasing in θ : it measures the cost suffered by the government for the sell of the shares, while still maintaining control. This term can be interpreted either as a "positive" element referable to the conservation of some strategic function of the SOE which can benefit the State, the effectiveness of its policies and the possibility to embrace long-term coherent reforms; or a "negative" term, in the sense of a possible misuse of the firm, for example, for electoral or solely political reasons. In equation (6b), r is a constant that captures the (fixed) cost suffered by the government when losing the control stake: once more than a half of the stake is sold, the government is assumed not to suffer any "strategic cost" anymore, since its direct control on the firm is gone. Further, p_i for $i = m, o$ is the price of the good in the two different regimes after the privatization has occurred; w is the consumer willingness to pay – and, therefore, $(w - p_i)$ is the consumer surplus. For now, these values are taken as exogenous, since it is implicitly assumed that, once the decision between full or partial privatization is taken, the privatized amount θ has no effect on the entrepreneurs' behavior, and therefore on the competition. This assumption relies on the evidence shown in Table 7 and previously discussed. Still, it is going to be relaxed further, endogenizing the competition stage and allowing for θ to affect the investment level made by the entrepreneur in the acquired company.

That said, putting together (6a) and (6b), the social welfare function reads as

$$W = \max \left\{ (w - p_m) + (1 - \theta)\gamma_m + \theta\pi_m - \frac{\lambda}{2}\theta^2, (w - p_o) + (1 - \theta)\gamma_o + \theta\pi_o - r \right\}.$$

Proposition 1. *Given that the firm is partially privatized, i.e. $\theta < \frac{1}{2}$, the optimum amount of sold shares is given by*

$$\theta_m^* = \frac{\pi_m - \gamma_m}{\lambda} \quad \text{for } \theta < \frac{1}{2} \quad (7)$$

Proof. Since $\frac{d^2 W_o}{d\theta^2} = -\beta\lambda < 0$ because $\beta > 0$ and $\lambda > 0$, just take the first order condition with respect to θ for (6a). \square

As shown in equation (7), if the entrepreneurs evaluate the future profits of the sold firm more than the government does, the latter decides to sell it. The higher this margin, the bigger the amount of sold shares. This amount is multiplied by a scale factor measuring the “strategic” (or “patronage”) cost of selling the shares. The larger this cost is, the smaller the amount of sold shares. Of course, if the difference $\pi_m - \gamma_m$ is smaller than zero, it is *ex-ante* not profitable for the government to sell the firm, and therefore no privatization takes place.

Proposition 2. *Given that the firm is fully privatized, i.e. $\frac{1}{2} < \theta \leq 1$, the optimum amount of sold shares is 100% if the margin for the government is positive, just over 50% if it is negative. The government is indifferent about θ if the margin is equal to zero.*

Proof. Equation given in (6a) is simply a straight line. For $\pi_o - \gamma_o \neq 0$ corner solutions for the maximization problem are given as stated in the Proposition. For $\pi_o - \gamma_o = 0$, every interior point $\theta \in [\frac{1}{2}, 1]$ is a solution. \square

Proposition 2 shows that, when facing a fixed cost r due to the loss of the control stake – which is independent on the amount of the privatized shares – if the privatization is profitable, the optimum is to sell the whole firm. This result is consistent with the empirical evidence shown in Figure 1: once the decision to lose the control stake is taken, the vast majority of transactions end up in the sale of the entire firm.

4.2 A model extension for the oligopoly

In the simple model I have just proposed, at the optimum the government is not concerned with the social welfare function weights. Indeed, the amount of privatized share is not allowed to influence the behavior of the entrepreneur who buys the stake, in terms of effort the new management is going to exert. This assumption can be freely maintained for the monopoly case, when the government keeps the control of the company: holding a minority stake does not influence the private (entrepreneur’s) effort amount in the company itself. On the other hand, in oligopoly the government has lost the control stake: the extent of the acquired control, θ , has now an influence on the entrepreneur’s behavior in term of exerted effort.⁶ To do so, I have to introduce an effort variable and endogenize competition, proposing two new stages in the model – in the spirit of the model given in Bennett and Maw (2003), with the needed adaptations.

Consider the following four-stages game: a) in the first stage the government decides to partially or fully privatized its firm, that produces a single public good, within the same setting of the base model; b) again as before, the two entrepreneurs compete for the privatized shares through a competitive auction; c) the firms decide the amount of effort e to exert in the company, which is not directly observable by the government; d) the firms compete in a classic Cournot duopoly fixing output quantities, given the effort decisions and the amount of privatized stake.

⁶The definition of this *effort* measure is kept voluntarily broad, as it can be regarded as any action undertaken by the entrepreneur to better run the privatized company, e. g. management improvement, higher investment, processes reorganization, and so on.

Consider the representative consumer utility function, given by

$$U_c = c + q - \frac{a}{2}q^2, \quad (8)$$

where $a > 0$ is an exogenous factor that ensures strict concavity and $c \geq 0$ is the consumption of other goods. Given the budget constraint $I = c + pq$, the inverse demand function is given by

$$p = 1 - a(q_o + q_{-o}),$$

where q_o is the quantity produced by the former State-owned enterprise and q_{-o} is the quantity produced by the other, completely private, firm entered in the market just after the privatization.

The net profit received by the entrepreneur who acquired the majority stake at the third (effort decision) and fourth (production) stages taken together is given by

$$\pi(\theta, e_o) = \theta \Pi(e_o) - e_o, \quad (9)$$

where $\Pi(e)$ denotes the profit earned by the firm at the final (production) stage, e denotes the effort – entirely borne by the private owner and not directly observable by the government – whose cost is normalized to unity.

The revenue obtained by the government is built as in the base model. Please notice how, since the auction is competitive, the price paid by the entrepreneur is given exactly by (9). Moreover, since the effort cost is entirely borne by the entrepreneurs, the government receives $(1 - \theta)$ of $\Pi(e)$ but does not share e . Therefore, we have:

$$R_o = \pi(\theta, e_o) + (1 - \theta)\Pi_o(e_o) - r = \Pi_o(e_o) - e_o - r \quad \text{for } \frac{1}{2} < \theta \leq 1.$$

As in the base model, r is the fixed cost suffered by the government for losing the control stake. The social welfare function for the oligopoly, with the same notation of the basic model, is therefore given by

$$\begin{aligned} W_o &= (1 - \beta)[w - p_o] + \beta \{ \mathbb{E} [\Pi_o(e_o) - e_o] - r \} \\ &= (1 - \beta)U_c + \beta \{ \mathbb{E} [\Pi_o(e_o) - e_o] - r \} \quad \text{for } \frac{1}{2} < \theta \leq 1. \end{aligned} \quad (10)$$

In order to determine the optimal amount of shares to be sold, I work backwards through the game. Consider, respectively, the profit of the entrepreneur who acquired the former SOE and the profit of the completely private one:

$$\Pi_o(e_o) = [p_o - c(e_o)] q_o \quad (11a)$$

$$\Pi_{-o}(e) = [p_{-o} - c(e)] q_{-o} \quad (11b)$$

where $c(e_o)$ and $c(e)$ are strictly decreasing effort's cost functions. The entrepreneur who acquired the former government-controlled firm maximizes (11a) given $\{\theta, e_o\}$, while the entrepreneur just entered in the market maximizes (11b) just given e . It is easy to derive

the Cournot-Nash equilibrium for this market, baring in mind that only in the case of the privatized firm the effort is affected by the amount of privatized shares. We have:

$$q_o^* = \frac{1 - c(e_o)}{3a}, \quad p_o^* = 1 - \frac{2}{3} [1 - c(e_o)] \quad (12a)$$

$$q_{-o}^* = \frac{1 - c(e)}{3a}, \quad p_{-o}^* = 1 - \frac{2}{3} [1 - c(e)] \quad (12b)$$

and therefore

$$\Pi_o^*(e_o) = \frac{[1 - c(e_o)]^2}{9a}, \quad (13a)$$

$$\Pi_{-o}^*(e_o) = \frac{[1 - c(e)]^2}{9a}. \quad (13b)$$

Since $a > 0$ and $c(e) < 1$, we have $\{q_o^*, q_{-o}^*\} > 0$, $\{p_o^*, p_{-o}^*\} > 0$ and $\{\Pi_o^*(e_o), \Pi_{-o}^*(e)\} > 0$. Please also notice that, since the firms compete in a Cournot duopoly, $dq_o/dq_{-o} = 0$.

Within the Nash equilibrium in the third stage, the effort is chosen by the entrepreneur who bought the privatized firm to maximize the profit. Optimum effort is therefore strategically set from (9) and then given by:

$$-[1 - c(e_o)]c'(e_o)\theta = \frac{9}{4}a. \quad (14)$$

I assume that, for all $e \geq 0$, we have

$$\frac{\partial \{-[1 - c(e_o)]c'(e_o)\}}{\partial e} = c'(e)^2 - [1 - c(e_o)]c''(e_o) < 0.$$

Now, $\frac{de}{d\theta} > 0$ as long as θ is large enough for e to be positive: there must be a critical value $\tilde{\theta}$ such that for $\theta < \tilde{\theta}$, $e = 0$ and for $\theta > \tilde{\theta}$, $\frac{de}{d\theta} > 0$. Moreover, I assume $\tilde{\theta} < 1$, i.e. there is a value θ less than unity for which positive investment is profitable.

Proposition 3. *Comparative statics for (14) is given by*

$$\frac{de_o}{d\theta} = \frac{[1 - c(e_o)]c'(e_o)}{\{c'(e)^2 - [1 - c(e_o)]c''(e_o)\}\theta} > 0, \quad \text{for } \theta \geq \tilde{\theta}.$$

Proposition 3 shows that the effort, when profitable, is increasing in the amount of the privatized shares. This means that, the more the autonomy in the firm, the larger the amount of private effort: in some sense, the government retirement encourages the private buyer to put more effort in the company.

Proposition 4. *Given that the firm is fully privatized, i.e. $\frac{1}{2} < \theta \leq 1$, the optimal amount of sold shares is given by*

$$\theta_o^* = \min \left\{ \tilde{\theta}, 1 \right\}$$

where

$$\tilde{\theta} = \frac{3 - \beta}{4\beta} \quad (15)$$

Proof. Substitute (8), (12a), (13a) into (10) and then take the first order condition with respect to θ . The full derivation of this result is given in Appendix B. \square

Proposition 4 shows that, when the government expects that the extent of the privatization may influence the entrepreneurs' behavior, it is concerned with the weights it assigns to its own revenues inside the social welfare function. While in the basic model – where the government did not take into account the effect on private effort of the privatized stake's size – we had corner solutions at the optimum, now the problem becomes concave. Somehow surprisingly, a greater relative weight on government's revenue in the social welfare function is associated with *more* government ownership. This is because the effect of competition is expected to reduce the profit of the former SOE. To better clarify this point, consider β in (15): for $\beta = 1$, the government does not care about consumer surplus – which is increasing in the amount of private effort – and therefore tries to limit it.⁷ On the other hand, for sufficiently small β , i. e. $0 \leq \beta < \frac{3}{5}$, government is concerned more with consumer surplus, and faces the corner solution of selling the whole stake. Therefore, the more the government is interested about competition effects on consumer surplus, the more it is going to divest in the privatized company.

Evidence given in Figure 1 shows that full privatizations in Italy involved, for the vast majority, the sale of the entire firm. Taking into account results from Proposition 2 and Proposition 4, it is possible to explain such an evidence either with a strong attention, by Italian governments, on welfare effects of competition within the privatization process; or with short term needs of revenues, therefore conducting privatization process with only *ex-ante* evaluations and neglecting effects on private investments.

5 Conclusions

Privatizations remain a topic of great interest within public debate. Their relevance is still high both in advanced countries — that experienced a larger and longer impact — and developing countries — which are experiencing a more recent effort toward privatizations. This work has tried to link privatizations, market openness and optimal government's behavior, analyzing the impact of these policies taking into account the incentive scheme that naturally arises depending on the decision to either partially or fully privatize a company.

In Italy, privatizations still constitute a hot topic among political debate — and this work is intended to offer an economic perspective to it, from a competition perspective. Both full and partial privatizations took place in this Country over the past 15 years. Full privatizations mainly occurred in less strategic markets, such as council drug-stores, whereas partial privatizations seem to have been more common in the sectors that are supposed to be more linked with political activity, such as highway activities or electrical industry. I offer both a “positive” and a “negative” explanation for this phenomenon: the former has to deal with strategic necessity to keep the government's presence in industries that are more relevant for an organic political action; the latter is referred to influence peddling, and electoral role of State-controlled enterprises.

Full and partial privatizations, in Italy, empirically showed interesting effects on market

⁷The effort can be intended as a reduction in the unit cost of production. Since the equilibrium output is decreasing in unit cost, consumer surplus results to be increasing in the effort level.

openness. Full privatizations are associated with some average positive — though not statistically significant — correlation with market openness after some years of adjustment. On the other hand, partial privatizations exhibit a robust and statistically significant correlation with lower market openness, having a negative impact on the industries entry rate. The explanation I provide for this evidence is the following. Knowing that a firm is going to be partially privatized, private entrepreneurs who look for entering the market prefer to compete for the minority stake, rather than directly afford competition with their own companies. This is because of the benefits of a State-controlled enterprise can count on: know-how, financial and regulatory cronyism, possibility to bypass bureaucratic costs and requirements. On the other hand, when the control stake is ceded, it could be the case that private entrepreneurs receive incentives to enter the market directly, resulting in higher market openness.

Grounded on this evidence, some policy conclusions can be drawn. First, whenever the amount of sold shares is not supposed to affect the behavior of the private buyer after the privatization, the government's decision on the shares amount to be privatized is independent on the weights put on the social welfare. Indeed, when partially privatizing, the government sells an amount of optimal shares that depends on the sale's margin size and on the magnitude of the "strategic cost" suffered for losing influence while maintaining control. When fully privatizing, the government just faces corner solutions: if the sale margin is positive, it is optimal to sell the whole enterprise. Still, if allowing the amount of sold shares to affect private effort exerted by the buyer after a full privatization, the government sells a stake that depends on the attention it puts on consumer surplus, i.e. on competition benefit. Therefore, the more the government cares about consumers, the more it privatizes – and the other way around.

Further developments of this work could embody a classical IO model with entry barriers, looking at the extent of the government presence in an industry as a barrier that disincentives future entries. Moreover, it would be interesting to investigate if the same relationship between partial privatizations and competition stands also when looking at innovation; as well as, also, try to empirically observe how and to which extent the amount of privatized shares can affect private investment.

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A Tables

Year	Mean	Standard Deviation	Min	Max
1998	13.10	6.78	2.87	32.60
1999	7.14	3.54	1.10	21.98
2000	8.06	3.69	2.40	22.63
2001	7.63	4.13	1.31	18.57
2002	7.55	3.48	0.00	17.17
2003	7.36	3.79	0.00	19.29
2004	8.18	5.12	0.00	29.37
2005	7.81	4.47	0.00	23.87
2006	7.48	3.58	1.85	21.45
2007	8.73	4.06	3.69	19.27
2008	8.57	5.15	3.44	24.08
2009	7.75	4.61	1.72	17.62
2010	7.62	4.74	2.36	23.94
2011	7.42	4.71	2.85	26.09
2012	7.61	4.37	2.74	20.40
2013	7.70	4.05	3.20	17.64
2014	7.03	3.94	0.90	17.95
Total	8.04	4.57	0.00	32.60

Table 1: Descriptive statistics for the entry rate, by year. Source: Eurostat Business Demography Statistics.

NACE code	Mean	Standard Deviation	Min	Max
06	4.88	5.87	0.00	22.99
10	5.28	0.82	4.76	8.29
12	5.28	0.82	4.76	8.29
17	4.75	1.30	3.33	8.71
23	4.27	1.23	2.91	7.93
26	4.79	1.31	3.54	9.02
28	4.63	1.64	2.84	8.93
30	7.35	1.44	5.36	10.21
33	7.28	1.49	5.36	10.21
35	12.18	6.83	2.99	26.09
3600	6.02	2.00	4.70	12.96
38-39	6.22	1.42	4.96	10.91
41-43	9.25	1.56	7.09	13.25
45	4.40	0.60	3.70	6.20
477	5.87	0.93	3.48	7.68
49	5.69	1.53	4.09	10.44
50	7.87	3.69	4.40	20.39
51	5.62	2.39	1.72	9.28
52	8.21	1.77	6.80	14.65
55	5.26	0.77	4.03	7.23
61	20.43	4.64	15.83	32.60
65	3.18	2.40	0.85	10.21
66	10.04	3.34	6.55	17.89
6810	8.33	2.40	5.96	15.16
6832	7.50	0.77	5.96	8.99
7311	11.85	2.34	9.63	20.04
8121	9.52	1.64	7.68	14.85
8220	15.84	4.12	8.12	26.53
8230	13.27	4.32	8.12	26.53
85	10.98	2.10	7.54	17.10
92	13.42	3.32	10.35	24.08
93	9.99	1.56	8.10	13.81
96	5.82	1.22	4.40	10.05
Total	8.04	4.57	0.00	32.60

Table 2: Descriptive statistics for the entry rate, by industry. Source: Eurostat Business Demography Statistics.

NACE 2	Description
06	Extraction of crude petroleum and natural gas
10	Manufacture of food products
12	Manufacture of tobacco products
17	Manufacture of paper and paper products
23	Manufacture of other non-metallic mineral products
26	Manufacture of computer, electronic and optical products
28	Manufacture of machinery and equipment n.e.c.
30	Manufacture of other transport equipment
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
3600	Water collection, treatment and supply
38-39	Waste collection, treatment and disposal activities; materials recovery Remediation activities and other waste management services
	Construction of buildings
41-43	Civil engineering Specialised construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
477	Retail sale of other goods in specialised stores
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
55	Accommodation
61	Telecommunications
65	Insurance, and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities
6810	Buying and selling of own real estate
6832	Management of real estate on a fee or contract basis
7311	Advertising agencies
8121	General cleaning of buildings
8220	Activities of call centres
8230	Organisation of conventions and trade shows
85	Other education
92	Gambling and betting activities
93	Sports activities and amusement and recreation activities
96	Other personal service activities

Table 3: Correspondence table between chosen NACE Rev. 2 for industry entry rate and their description.

VARIABLES	(1) Entry rate	(2) 2y avg. entry rate	(3) 3y avg. entry rate
Partial in $t - 1$	-0.270 (0.286)	-0.512* (0.273)	-0.933*** (0.302)
Partial in $t - 2$	-0.369 (0.311)	-0.921*** (0.304)	-0.872*** (0.338)
Partial in $t - 3$	-0.462* (0.276)	-0.899*** (0.326)	-0.834*** (0.307)
Partial in $t - 4$	-0.873** (0.353)	-0.586*** (0.223)	-0.108 (0.166)
Full in $t - 1$	-0.689** (0.347)	-0.969*** (0.326)	-0.726 (0.498)
Full in $t - 2$	-0.232 (0.351)	-0.316 (0.271)	-0.346 (0.309)
Full in $t - 3$	0.0114 (0.283)	0.242 (0.268)	0.268 (0.312)
Full in $t - 4$	0.264 (0.375)	0.125 (0.302)	0.0291 (0.199)
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	426	357	321
Number of ind	33	33	33
R_o^2	0.831	0.900	0.922

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Results for industry and year level fixed effect regressions to estimate the impact of full and partial privatizations on successive years entry rates, as specified from equation (1) at page 10. Dependent variables are (1) entry rate in a single year; (2) the average entry rate in two contiguous years; (3) the average entry rate in three contiguous years.

VARIABLES	(1) 2y avg. entry rate	(2) 3y avg. entry rate	(3) 2y avg. entry rate	(4) 3y avg. entry rate	(5) 2y avg. entry rate	(6) 3y avg. entry rate
Partial in $t - 1$	-0.593 (0.435)	-0.736** (0.346)				
Full in $t - 1$	-0.114 (0.173)	0.0530 (0.171)				
Partial in $t - 1, t - 2$			-0.628** (0.268)	-0.864** (0.401)		
Full in $t - 1, t - 2$			-0.0562 (0.148)	0.115 (0.163)		
Partial in $t - 1, t - 2, t - 3$					-0.683*** (0.250)	-0.891** (0.409)
Full in $t - 1, t - 2, t - 3$					-0.0653 (0.165)	0.0939 (0.226)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	456	420	423	387	390	354
Number of ind	33	33	33	33	33	33
R_o^2	0.837	0.873	0.859	0.895	0.880	0.909

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Results for industry and year level fixed effect regressions to estimate the impact of full and partial privatizations on averages entry rates, as specified from equations in (2) at page 11.

VARIABLES	(1) Sh. 2y avg. entry rate	(2) Sh. 3y avg. entry rate	(3) Sh. 2y avg. entry rate	(4) Sh. 3y avg. entry rate	(5) Sh. 2y avg. entry rate	(6) Sh. 3y avg. entry rate
Partial in $t - 1$	-0.815** (0.381)	-0.960 (0.736)				
Full in $t - 1$	0.0757 (0.157)	0.133 (0.185)				
Partial in $t - 1, t - 2$			-0.890** (0.409)	-0.950 (0.651)		
Full in $t - 1, t - 2$			0.0851 (0.171)	0.0748 (0.172)		
Partial in $t - 1, t - 2, t - 3$					-0.859** (0.356)	-0.666* (0.394)
Full in $t - 1, t - 2, t - 3$					-0.0317 (0.188)	-0.151 (0.198)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	423	387	390	354	357	321
Number of ind	33	33	33	33	33	33
R_o^2	0.854	0.887	0.874	0.900	0.888	0.904

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Robustness check for specifications described in (2). The effect remains robust allowing for a year shift of the dependent variable.

VARIABLES	(1) Entry rate	(2) 2y avg. entry rate	(3) 3y avg. entry rate	(4) Entry rate	(5) Entry rate
θ in $t - 2$	-0.00116 (0.00593)	0.00115 (0.00424)	0.00215 (0.00396)		
θ in $t - 3$	0.00680 (0.00808)	0.00589 (0.00588)	0.00193 (0.00327)		
θ in $t - 4$	0.0113 (0.0115)	0.00247 (0.00532)	0.00255 (0.00381)		
Avg. θ in $t - 1, t - 2$				-0.00729 (0.00549)	
Avg. θ in $t - 1, t - 2, t - 3$					-0.00522 (0.0104)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	415	348	312	481	446
Number of ind	33	33	33	33	33
R_o^2	0.821	0.878	0.914	0.803	0.820

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: OLS coefficient estimation for models specified in equations (3) and (4) at page 12. No coefficient significantly significant is found, and all the estimation are extremely close to zero.

B Derivations

What follows is the formal derivation of the result given in Proposition 4. For notational simplicity, I omit the underscore o , since the investment is always implicitly dependent on θ .

After the substitution of (8), (12a), (13a) into (10), we obtain

$$W_o = (1-\beta) \left[\frac{1-c(i)}{3a} - \frac{[1-c(i)]^2}{18a} - \frac{[1-\frac{2}{3}[1-c(i)]] [1-c(i)]}{3a} \right] + \beta \left[\frac{[1-c(i)]^2}{9a} - i - r \right].$$

Now, differentiating with respect to θ we have

$$\begin{aligned} \frac{dW_o}{d\theta} = & \beta \left[-\frac{2[1-c(i)]c'(i)\frac{di}{d\theta}}{9a} - \frac{di}{d\theta} \right] \\ & + (1-\beta) \left[-\frac{c'(i)\frac{di}{d\theta}}{3a} - \frac{[1-c(i)]c'(i)\frac{di}{d\theta}}{9a} + \frac{[1-\frac{2}{3}[1-c(i)]] c'(i)\frac{di}{d\theta}}{3a} \right]. \end{aligned}$$

First order condition is given by $\frac{dW_o}{d\theta}$. Grouping $\frac{di}{d\theta}$ and rearranging terms leads to

$$\frac{dW_o}{d\theta} = -\frac{9a\beta + (\beta-3)[-1+c(i)]c'(i)}{9a} \frac{di}{d\theta} = 0.$$

Since $\frac{di}{d\theta} \neq 0$, we can eliminate it from the equation. Now, substituting from (14) we obtain

$$\frac{dW_o}{d\theta} = -\frac{\frac{9a(\beta-3)}{4} + 9a\beta}{9a} = \frac{3-\beta-4\beta\theta}{4\beta} = 0.$$

Solving for θ leads to

$$\theta = \frac{3-\beta}{4\beta}.$$