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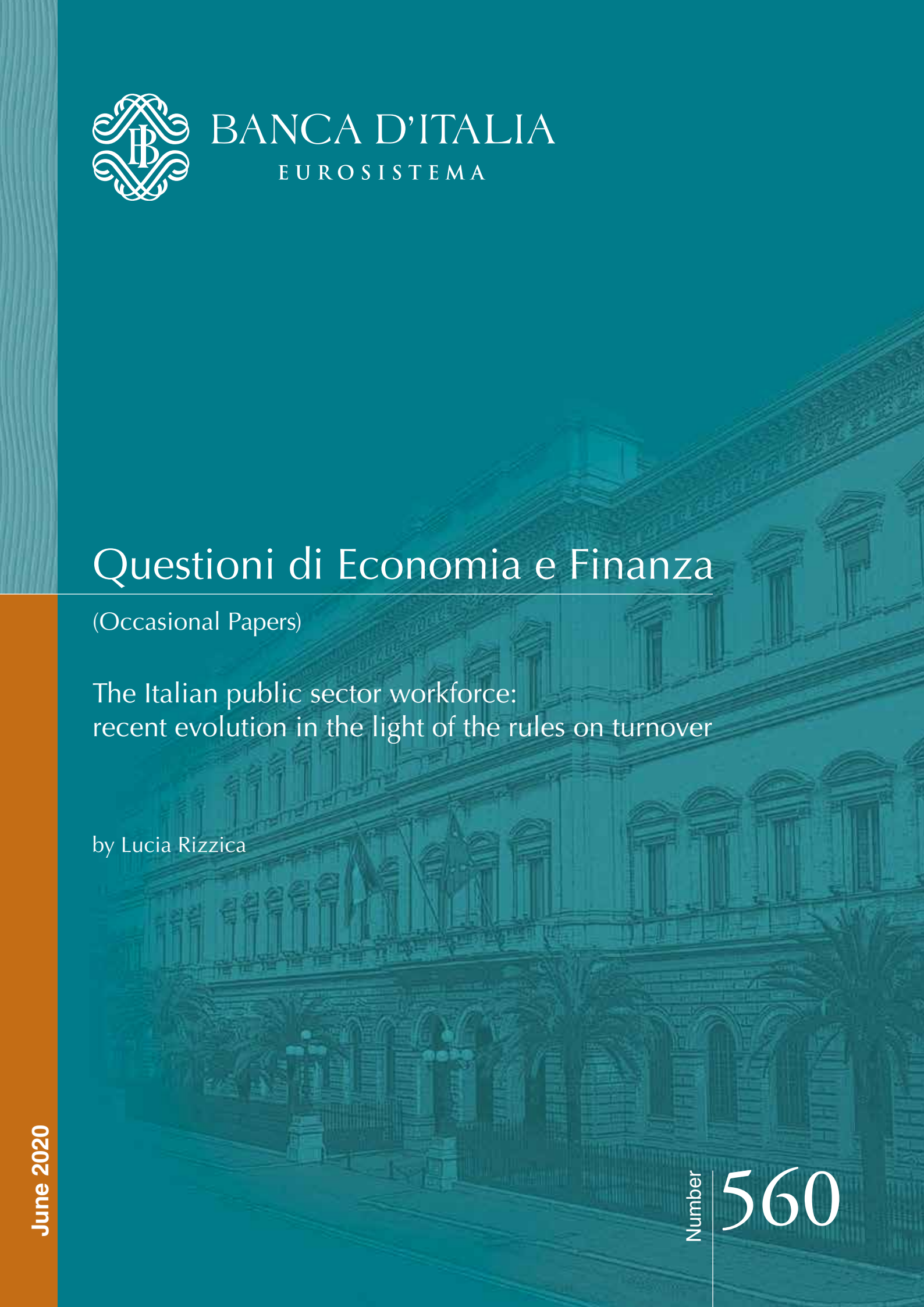
by Lucia Rizzica



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THE ITALIAN PUBLIC SECTOR WORKFORCE: RECENT EVOLUTION IN THE LIGHT OF THE RULES ON TURNOVER

by Lucia Rizzica*

Abstract

The public sector represents the largest employer in all the OECD countries, however the size of the public workforce varies significantly across countries and sectors and over time. This paper provides an analysis of the evolution of public sector employment in Italy over the past decade, combining an overview of the main legislative interventions that have shaped the recruitment and exit processes and an empirical descriptive analysis of the resulting trends and workforce composition. Finally, I provide an in-depth analysis of the case of universities, where the contraction in the size of the workforce was most severe.

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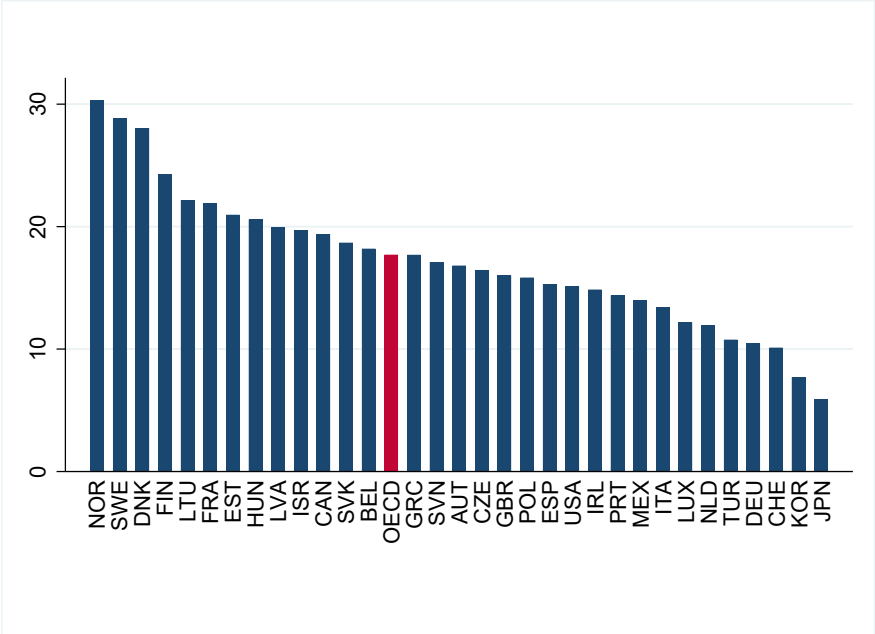
1 Introduction*

The public sector represents the largest employer in all OECD countries. According to the OECD (OECD, 2019) in 2017 it employed almost 18% of the labor force on average, with considerable variation across countries (Figure 1). The observed differences are due both to different definitions of the borders of the public sector[2] and to different degrees of labor intensity in the same functions. The international comparison, thus, points to the existence of two extreme models: at the one end are the Scandinavian countries, where over one quarter of the workers are employed by the Government, at the other end is Japan with only 6% of workers in the public sector. In this context Italy is currently placed below the OECD average, with a public sector size around 13.4%.

Figure 1: Employment in general government as a percentage of total employment, 2017.



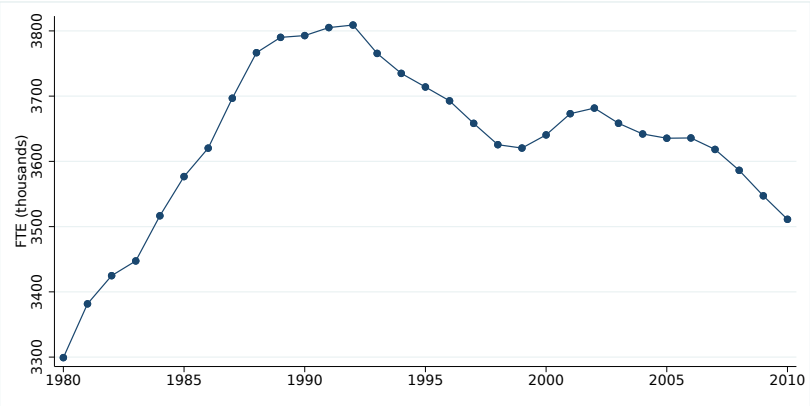
Notes: OECD (2019). The figures refer to employment in all levels of government (central, state, local and social security funds) and include core ministries, agencies, departments and non-profit institutions that are controlled by public authorities. Data represent the total number of persons employed directly by those institutions and by publicly owned resident enterprises and companies. Data are derived from the OECD National Accounts Statistics (database), which are based on the System of National Accounts (SNA). For Japan, Korea, Mexico, Switzerland, Turkey and the United States, data are from the International Labour Organization (ILO), ILOSTAT (database).

*I wish to thank Fabrizio Balassone, Silvia Giacomelli, Sauro Mocetti, Sandro Momigliano, Paolo Sestito and Roberto Torrini for their insightful comments and suggestions. All errors are my own.

[2]With the increasing and yet heterogeneous use by governments of market mechanisms and private sector provision of public services, the borderline between the public and private sectors has become more blurred and comparisons across countries significantly harder (Lienert, 2009).

In a dynamic perspective, the size of the Italian public workforce experienced large fluctuations over the past 40 years. Figure 2 shows its trend between 1980 and 2010: after a large and rapid increase in the 80s, it started shrinking until the late 90s and then remained stable until the mid 2000s, when it started shrinking again.

Figure 2: Public sector employment, Italy 1980-2010.



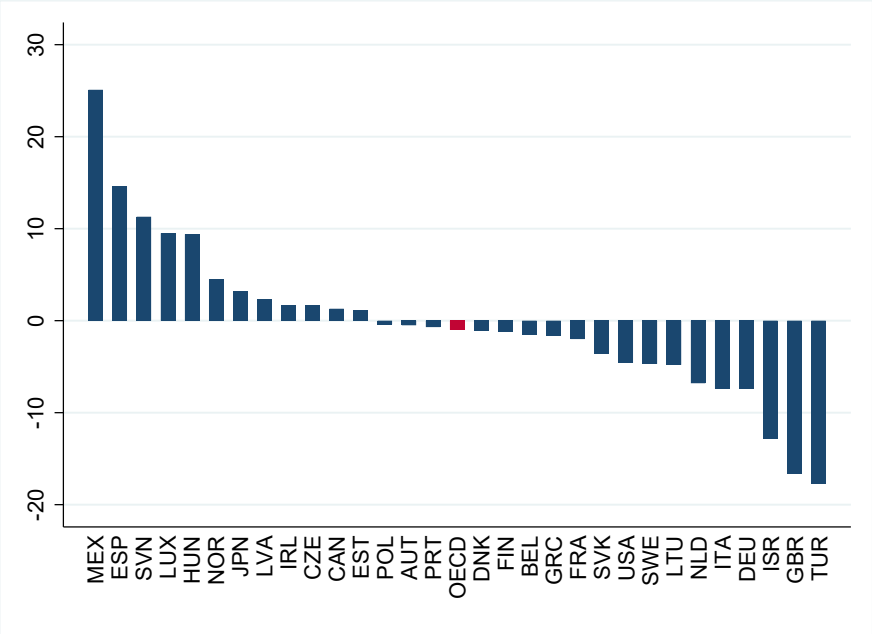
Notes: Istat, National Accounts Statistics. Data refer to Full Time Equivalent Units.

Indeed, according to the OECD data, between 2007 and 2017 Italy experienced a contraction of public sector employment of about 7.4%, the fifth most significant reduction across all OECD countries. At the opposite end of the distribution countries like Mexico, but also, in the EU, Spain expanded their public sector in a significant way (Figure 3).

This work aims to document the forces that drove the contraction of the public sector in Italy over the past decade and the consequences that such contraction had on the composition of the active workforce. As the public sector is a highly labor intensive one, understanding the changes in the quantity and quality of labor force inflows and outflows is crucial to eventually evaluate the quality of public service provision.[3]

[3]See Rizzica (2016) and Giorgiantonio et al. (2016) for a more comprehensive review of the selection and self-selection mechanisms in the public sector and their effects on the quality of the workforce.

Figure 3: Variation (%) in employment in general government as a percentage of total employment between 2007 and 2017.



Notes: OECD (2019).

The paper is structured as follows: in Section 2 I document the main legislative changes that occurred in Italy over the period of analysis in relation to the hiring and exit of workers from the public sector; in Section 3 I provide descriptive evidence on the effects of such regulatory changes; in Section 4 I focus on the sector of public universities, the latter having been subject to the adoption of a set of sector-specific that generated a radical re-composition of the workforce; in Section 5 I provide some concluding remarks.

2 The institutional setting and the main legislative measures

The contraction of the public sector workforce in Italy has been enacted mainly (but not exclusively) through norms that fixed caps on the rate of turnover, i.e., the ratio between the number of new hires and that of terminated contracts (mainly retirees). The effects of these norms, nevertheless, have been somehow attenuated by the progressive postponement of the minimum retirement age, which has effectively slowed down the pace of (capped) turnover.

The hiring squeeze started in the early 2000s in the attempt to control and rationalize public spending after the peaks reached in the late 90s (Servizio Studi, Camera dei Deputati, 2007a). The first legislative interventions only introduced the obligation to draw up three-year plans for recruiting (L. 449/1997, art. 39, and then D.L. 165/2001), but were soon overcome by the provisions of the yearly Budget Laws that blocked hiring in all public offices (L. 448/2001).[4] However, such ban was partially offset through some sector-specific recruitment interventions and, most importantly, through the employment of fixed-term workers, which were introduced in the public sector in the very early 2000s (L.D. 80/1998 and L.D. 165/2001) and whose contracts were eventually largely turned into permanent relations starting from 2007 (L. 296/2006, art. 519).[5]

Starting from 2008 the use of fixed-term contracts was very much limited and the hiring of new permanent-contract workers regulated by "partial turnover" rules. In particular, the 2007 Budget Law (L. 296/2006, art.1, comma 523) ruled that the hiring of permanent staff for the years 2008 and 2009 for all public sector institutions should be limited to a total expenditure equal to 20% of that related to the terminations occurred in the previous year and, in any case, should not exceed the same percentage of head units.

The Law, and all the subsequent recalling norms, applied to all public sector branches,[6] with the exception of Schools and the Army. Local Authorities (Regions, Provinces and Municipalities) were subject to slightly different rules, which also interacted with the budget constraints imposed on them by the Internal Stability Pact (L. 448/1998, art. 28).[7] Also the National Health Service was regulated by a set of ad-hoc rules that imposed numerical limits to hiring on the basis of the previous year's expenditure and inhibited it entirely for those institutions whose budget conditions did not comply with the Internal Stability pact rules. The 2010 Budget Law (L. 191/2009, art. 2, comma 206) further excluded from the general rules also the Police Corps and the National Corps of Firefighters.[8] The rules described in this Section, therefore, eventually applied to a limited number of institutions, accounting

[4]The rules were partially different for Local Authorities, which were prevented from hiring new resources only in case they did not comply with the Internal Stability Pact.

[5]See Rizzica (2015) and Servizio Studi, Camera dei Deputati (2007b) for more details on the use of fixed-term contract workers in the public sector.

[6]Specifically, administrations of the State, also with autonomous ordering, including the Police Corps and the National Corps of Firefighters, Agencies, including tax agencies, public non-economic bodies and institutions indicated in art. 70, paragraph 4, of L.D. 165/2001.

[7]For a review of the legislation applied to Local Authorities see Servizio Studi, Camera dei Deputati (2019a) and Aimone Gigio et al. (2020).

[8]The Law provided for such categories, for the years 2010, 2011 and 2012, a rate of turnover of 100% of the expenditure for the contracts terminated in the previous year (and not above 100% of the headcounts).

for about 15% of the total public sector workforce. However, all other sectors, with the partial exception of the School sector, were subject to similar limits on the rate of turnover, in combination with sector-specific rules (mostly related to budget conditions).

Over the following years the caps on the rate of turnover and their computation methods were repeatedly modified. Table 1 provides a summary of the legislative evolution of the norms applied over the years. A more detailed description follows below.

Table 1: Evolution of the limits on the rate of turnover in the public sector.

Year	L. 296/2006	L. 244/2007	D.L. 112/2008	D.L. 78/2010	D.L. 98/2011	L. 147/2013	D.L. 90/2014	L. 208/2015	L. 56/2019
2008	20% wb,hc	-	-	-	-	-	-	-	-
2009	20% wb,hc	20% wb,hc	10% wb,hc	-	-	-	-	-	-
2010	-	60% wb,hc	20% wb,hc	-	-	-	-	-	-
2011	-	-	20% wb,hc	20% wb,hc	-	-	-	-	-
2012	-	-	50% wb,hc	20% wb,hc	20% wb,hc	-	-	-	-
2013	-	-		20% wb,hc	20% wb,hc	-	-	-	-
2014	-	-	-	50% wb,hc	20% wb,hc	20% wb,hc	20% wb	-	-
2015	-	-	-	100% wb,hc	50% wb,hc	40% wb,hc	40% wb	-	-
2016	-	-	-	-	100% wb,hc	60% wb,hc	60% wb	25% wb	-
2017	-	-	-	-	-	80% wb,hc	80% wb	25% wb	-
2018	-	-	-	-	-	100% wb,hc	100% wb	25% wb	-
2019	-	-	-	-	-	100% wb,hc	100% wb	-	100% wb

Notes: *wb* refers to the wage bill of the previous year i.e., the total expenditure for the terminated full time permanent contracts. *hc* refers to the headcount of the previous year i.e., the number of terminated full time permanent contracts.

After the first introduction of the turnover caps in Law 296/2006, the rules changed with the 2008 Budget Law (L. 244/2007, art. 3, comma 102), which established that the hiring of permanent staff for the year 2010 should be raised to 60% of the wage bill paid for the contracts terminated in the previous year, and again, in any case, should not exceed the same percentage of head units.

A few months later, though, the Decree Law 112/2008 (art. 66, comma 3, 7 and 9) reduced the rate of turnover allowed to 10% only for 2009, 20% for 2010 and 2011 and 50% for 2012.

The 20% limit was extended to the years 2012 and 2013 by the Decree Law 78/2010 (art. 9, comma 5) and, later on, to the year 2014 by the Decree Law 98/2011 (art. 16).[9]

The 2014 Budget Law (L. 147/2013, art. 1, comma 460 and 462) established that for 2015, the 50% cap provided in the previous norms was to be lowered to 40% of the previous

[9]This was later enacted by the Decree Law 95/2012, art. 14.

year's expenditure and further planned that the rate of turnover for the following years was to increase gradually to 60% in 2016, 80% in 2017 and eventually 100% in 2018. The same limits were confirmed by the Decree Law 90/2014 (art. 3, comma 1), which, nevertheless, introduced a relevant change, i.e., eliminated the headcount cap. This implied that, under the assumption that the cost borne for a new hire is lower than that for a worker close to retirement, administrations could now exceed the previous caps (which, instead, imposed the double limit of expenditure and headcounts). Estimates based on data from the Survey on Household Income and Wealth (SHIW) suggest that the earnings of a new hire in the public sector amount to about 70% of those of a worker close to pension, the career patterns experienced by workers in the public sector in Italy being particularly flat. This coefficient of substitution implies that, for example, for every two (old) workers retiring administrations could hire three (young) new employees.

Two years later, the 2016 Budget Law (L. 208/2015, art. 1, comma 228) cut again the thresholds establishing that for the years 2016, 2017 and 2018, the cap was to be maintained at 25% of the expenditure of the previous year's terminations.

In the absence of further legislative interventions, for the year 2019, the cap was to be intended at 100% of the previous year's expenditure, yet the Budget Law 2019 (L. 145/2018, art. 1, comma 399) established that public sector institutions could not make any hiring of permanent workers until the 15 of November of the same year thus significantly limiting the possibility of effectively hiring new staff.

The Government eventually intervened with the Law 56/2019 ("*Concretezza*") which introduced the 100% rate of turnover. Such rate is to be computed exclusively on the basis of the wage bill of the previous year and is subject to the three-years hiring plans that each administration is required to compile (L.D. 165/2001). The law further allows administrations to cumulate the resources accruing from the retirement of the personnel that has taken place in the previous five years, thus allowing more flexibility and effectively increasing the number of new hirings allowed, especially for the smaller administrations.

The most recent 2020 Budget Law (L. 157/2019) did not intervene on the issue, thus leaving the cap for hirings at the 100% level of expenditure relative to terminations starting from 2019.

On the terminations side, the past decade has been marked by major changes in the retirement rules. In particular, the so-called "Sacconi reform" was implemented at the end of 2010 (L. 122/2010) and provided for a significant extension of the working age, especially for women employed in the public sector.

One year later, at the end of 2011, the so-called "Fornero reform" (L. 201/2011) increased the minimum retirement age for all workers and simultaneously raised the minimum years of pension contributions required for retirement (Carta and De Philippis, 2018).

Finally, in 2019 (L. 26/2019), the pension system was revised again with the (re)- introduction of a quota system that allows workers to anticipate their retirement for up to five years relative to the Fornero rules. Such new rules are particularly favourable to workers employed in the public sector because the latter typically have more continuous career patterns, which allow them to better exploit the opportunities given by the new norms.

Overall, until 2018 the progressive tightening of hiring was (partially) counterbalanced by a slowdown in the retirement of old workers through the extension of the minimum retirement age and criteria. The laws passed in the past year, on the other hand, are likely to produce a fast generational turnover by speeding up the retirement of old workers and easing the constraints on recruitment.

3 The empirical evidence

In order to provide a descriptive assessment of the consequences of the norms passed over the past decade in response to the need of restraining public expenditure, I draw from the data provided by the State General Accounting Department (*Ragioneria Generale dello Stato*, RGS). These provide aggregate yearly figures on the size and composition of public employment since 2001.

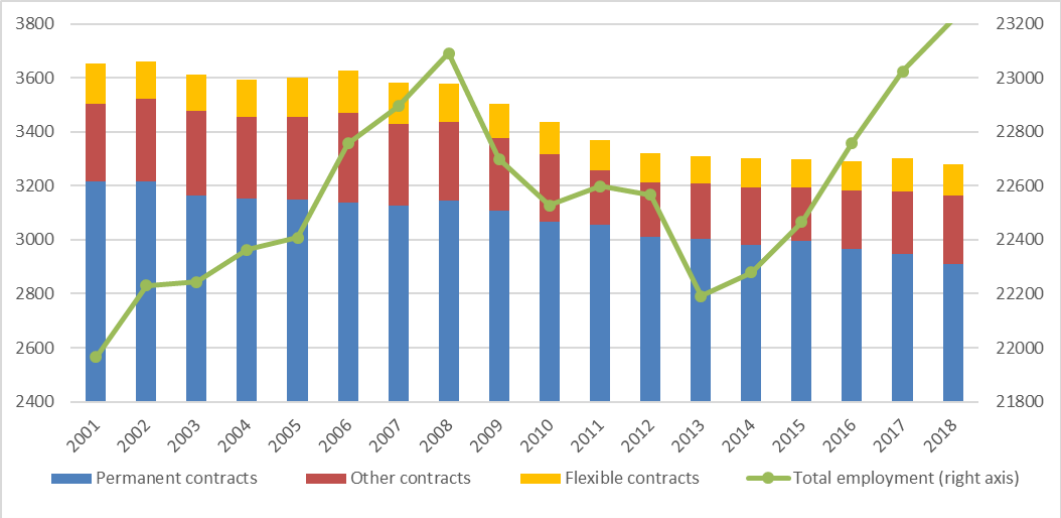
3.1 The trend of public sector employment

Figure 4 shows the aggregate trend in the number of public sector employees in Italy over the past 18 years. Between 2001 and 2018 the Italian public workforce has shrunk by about 10%, over 350,000 individuals. The sharpest reduction took place between 2008 and 2012. The trend has then been much flatter during the past 5 years as a consequence of the enactment of several sector-specific norms, the tightening of the pension requirements (L. 201/2011) and the adoption of turnover constraints based on the wage bill instead of headcounts in 2014 (D.L. 90/2014).

Note that, as shown in Figure 4, the dynamics of public employment only partially mimicked those of overall employment. First, in the period 2001-2008 total employment increased steadily while public employment was essentially stable; then, between 2008 and

2013 total employment decreased, with a contraction of about 4%, and public employment shrunk by almost 5%, such reduction accounted for about one fourth of total employment contraction over the period; finally, from 2013, total employment took off again to return to the levels of 2008, while public employment stagnated.

Figure 4: Public sector employment, by type of contract.



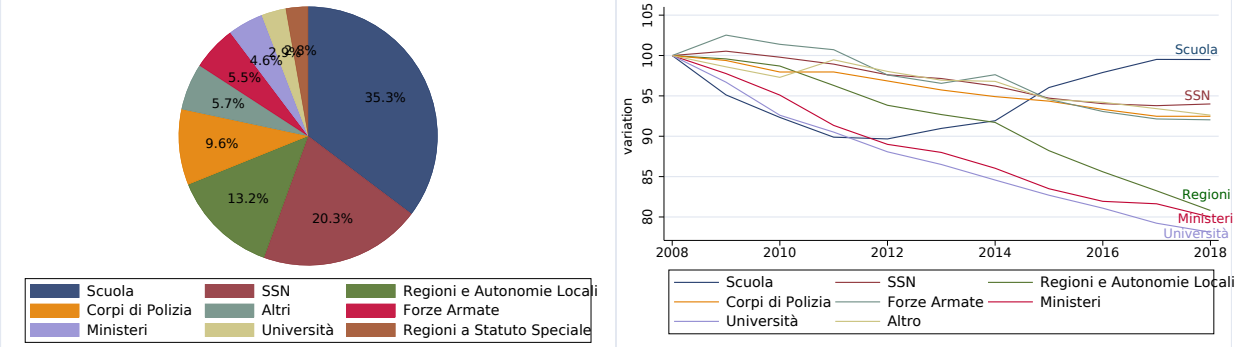
Notes: Thousand individuals. Elaborations on *Ragioneria Generale dello Stato* (RGS) and Istat data. Permanent contracts include also fixed-term Executives in that they hold function posts not properly attributable to temporary administration needs. The Other Contracts include some particular professional figures who have non-permanent employment relationships, such as the alternates of the School and of the Higher Artistic and Musical Institutes (AFAM), or who do not fall into the contractual categories of public employment, including in this definition also the personnel disciplined by public law rules (for example: general managers, contractors, volunteers and students of the Armed Forces and of the Police Corps). Flexible contracts include fixed-term, LSU, training contracts (*formazione lavoro*), agency contracts (*interinali*). The partition between Permanent and Other contracts in 2018 is imputed. Total employment is the number of people aged over 15 into employment.

This reduction in public employment was common to permanent and fixed-term workers. However, the dynamics experienced by the latter group were quite different: the use of flexible (i.e., fixed-term) contracts (as of the L.D. 368/2001) in the public sector in Italy was banned until the the very late 90s and then, when allowed, though only to face "temporary and exceptional needs" and for a duration of three years maximum, it was immediately very large and increasing over time (about 443,000 full time equivalent workers with flexible or other fixed-term contract in 2002, over 490,000 in 2006 i.e., +10.8%). Indeed, with the ban to recruit permanent contract workers introduced in 2002, flexible contracts were largely used to feed the public sector with new workers: while the number of permanent workers decreased from 3.22 millions in 2001 to 3.14 millions in 2006 (-2.5%), that of fixed-term workers increased constantly over the same period of time. This tendency reverted in 2008, when the exceptional spending cuts imposed with the burst of the economic crisis, led to a

reduction in the number of temporary workers too (about -20% over ten years).

In this context of general contraction of the public workforce, nevertheless, there appeared significant differences across sectors. In the left panel of Figure 5 I show the partition of the public workforce across sectors as of 2018: the School and Health sectors alone account for over half of the total, followed by Local Authorities, Police Corps and the Army, all other sectors employ less than 5% of the total public workforce each. The right panel of the figure, then, shows the percentage variation in the size of the workforce for the main services within the Public Sector.[10]

Figure 5: Public sector employment: composition in 2018 and variation 2008-2018.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

It appears that the decrease was constant in all sectors with the exception of schools, which were indeed subject to a different regime and benefited of a major injection of resources with the "Buona Scuola" Law in 2015 (L. 107/2015). Given the first order weight of School within the public sector, its trend effectively slowed down the overall contraction. The second largest sector, the National Health Service experienced a contraction of about 6% over the period, similar to that of the Army and Police Corps and the minor sectors, all these together accounting for about 40% of the total public workforce. Universities, Ministries and Local Authorities were (in order) the most affected sectors, with a loss of resources close to 20% in ten years.[11]

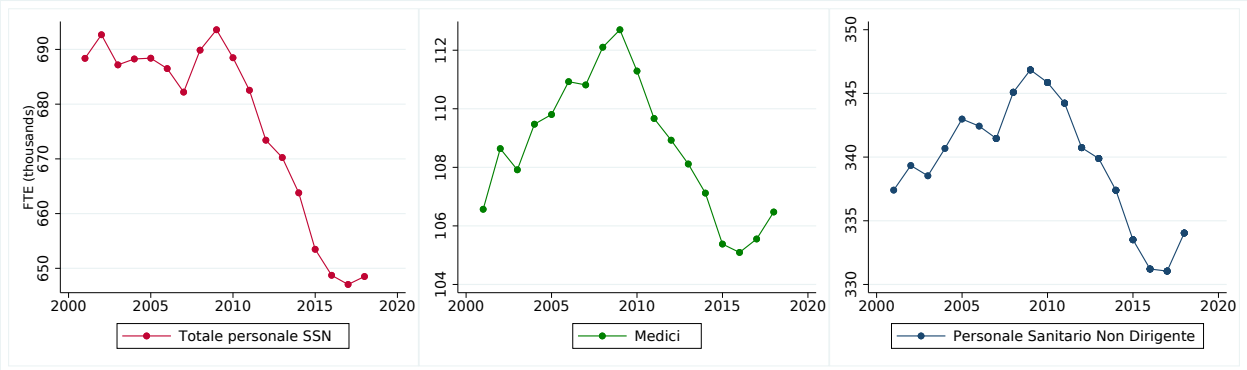
Even within sectors there appeared differences across professions. Figure 6, for example,

[10]These are defined as the sectors which make up for at least 2% of total public employment. All together they account for almost 90%. I exclude from the graph Regions with Special Statute, which account for about 3% of the public sector workforce, because the data they reported to RGS are not comparable over time.

[11]The trend for Local Authorities was less steep because the caps applied were generally less restrictive ranging between 20 and 60%, see (Frattola, 2019).

shows the aggregate trend recorded in the National Health Service and then the one experienced specifically by medical doctors and other medical staff (nurses and lab technicians). While the aggregate trend was constant between 2001 and 2009, the number of doctors and other medical staff increased (by 6 and 3%, respectively). Then, both figures dropped dramatically reaching levels below those of 2001 in less than five years. A small increase has finally been recorded in 2018. These trends diverge relative to an increasing demand for healthcare due to the ageing of the population: according to Istat (2019), as of January 1, 2019, the ratio between the population of over-64 and that of under-15 ("old age index") was 172.9%, while it was 143.4% only eleven years earlier.

Figure 6: Focus on the National Health Service. Trend in the number of total workers, medical doctors and other medical staff.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data. *Personale Sanitario Non Dirigente* includes rehabilitation (approximately 6%) and laboratory technicians (11%), nursing personnel (80%) and inspection teams (3%).

3.2 An analysis of inflows and outflows

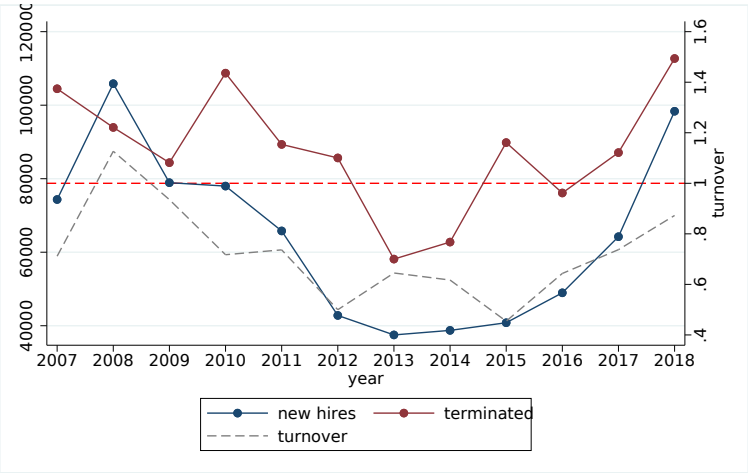
In order to gain a better understanding of the trends described above, it is particularly useful to analyze the flows in and out of public employment so as to disentangle the contribution of the two.

Figure 7 reports the absolute number of new hires every year, together with the number of terminations recorded in the same year for all public sectors except the School.[12] The ratio between the two values is thus the aggregate rate of turnover and is reported on the

[12]I consider all hiring and terminations with the exclusion of moves from/to other public offices. If we were to include the School sector the picture would show a peak in hiring in 2015 likely due to the above-mentioned Buona Scuola Law.

right axis.[13] The figure shows that both terminations and hiring decreased since 2008 but the speed of reduction in hiring was higher than that of terminations. The trend slowly reverted in 2013, but the ratio between hirings and terminations remained essentially constant around 69% after 2008, increasing after 2015.

Figure 7: Flows in and out of public employment, by year.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data. All sectors but School included.

In Figure 8 I split the aggregate flows depending on the reason for hiring or terminating the employment relation. The figure shows that until 2011 the stabilization of fixed-term workers represented a sizeable share of the hiring of permanent workers.[14] Since then the inflow of new workers in the public sector shrunk both in terms of newly selected resources and of stabilized fixed-term workers. On the terminations side, the trend was more erratic but shows a significant reduction in the number of retirees in 2013 and 2014 (presumably due to the enactment of the Law 201/2011).[15]

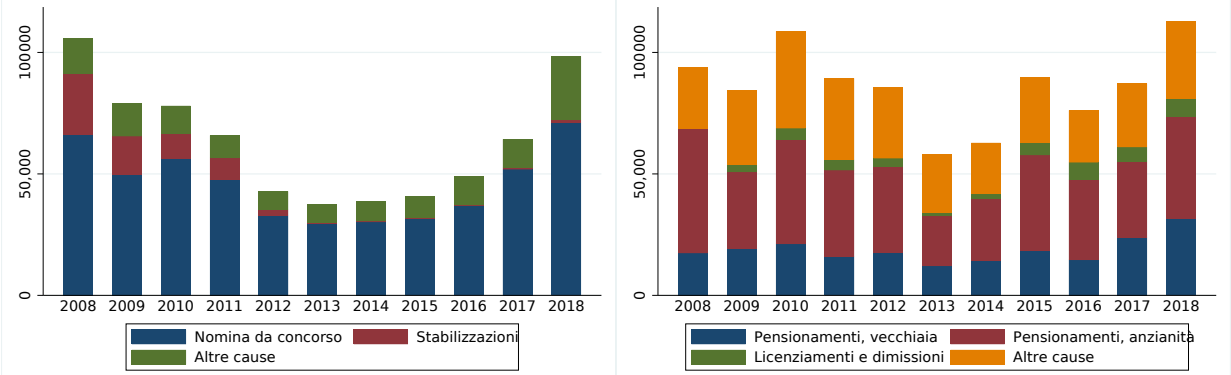
These figures above reveal that the pattern of terminations was not smooth but fluctuated over the years. Such erratic trend has posed challenges to the design of the hiring plans and the application of the rules on turnover. The origins of this pattern are to be found in the large waves of recruiting that happened towards the end of the 80s and early 90s. Figure 9 reports the composition of the public sector by workers' tenure. The figure shows that in

[13] Technically, one would want to use the terminations recorded in the previous year at the denominator, but because of differences across years in the classification of workers across sectors and in the set of institutions reporting the information to RGS, an intertemporal comparison of this kind is unfeasible.

[14] Appendix Figure A1 further shows the trend and type of stabilization by sector.

[15] A very similar pattern is observed in the health sector, as shown in Appendix Figure A2.

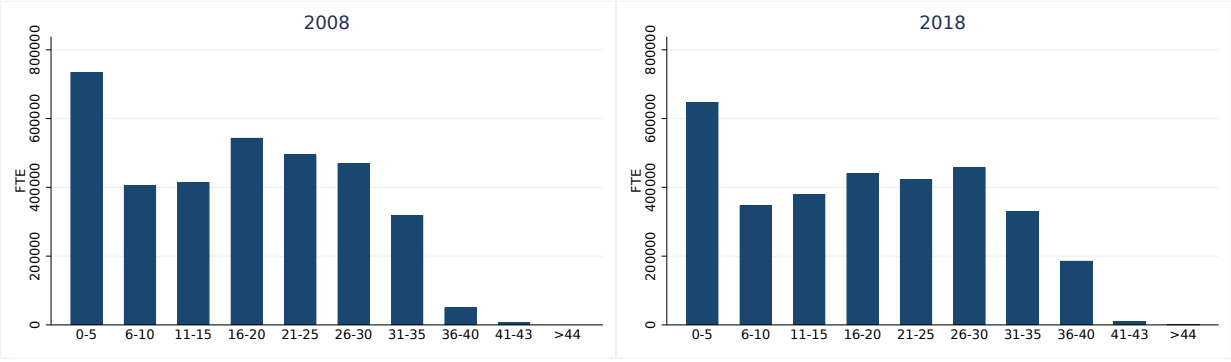
Figure 8: Flows in and out of public employment, by year and reason for hiring/termination.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data. All sectors but School included.

2008 there appeared peaks in the number of workers with more than 16 years of tenure, i.e., hired before 1992. While most of those with over 21 years of tenure presumably retired in the following ten years, those in the 16-20 years tenure bracket (i.e., hired between 1988 and 1992) are likely still active and due to retire in the coming years. This would thus produce a particularly high number of terminations, especially in the light of the most recent pension reform (L. 26/2019). Figure A3 further shows that these peaks were not uniform across sectors. For example, Local Authorities in 2008 displayed an excess of workers with 26-30 years of tenure, these likely retired over the most recent years thus determining a particularly significant surge of resources in the sector. On the other hand, the National Health Service displayed a peak in the 16-20 bracket, which implies that it will likely experience the largest outflow of workers in the next coming years.

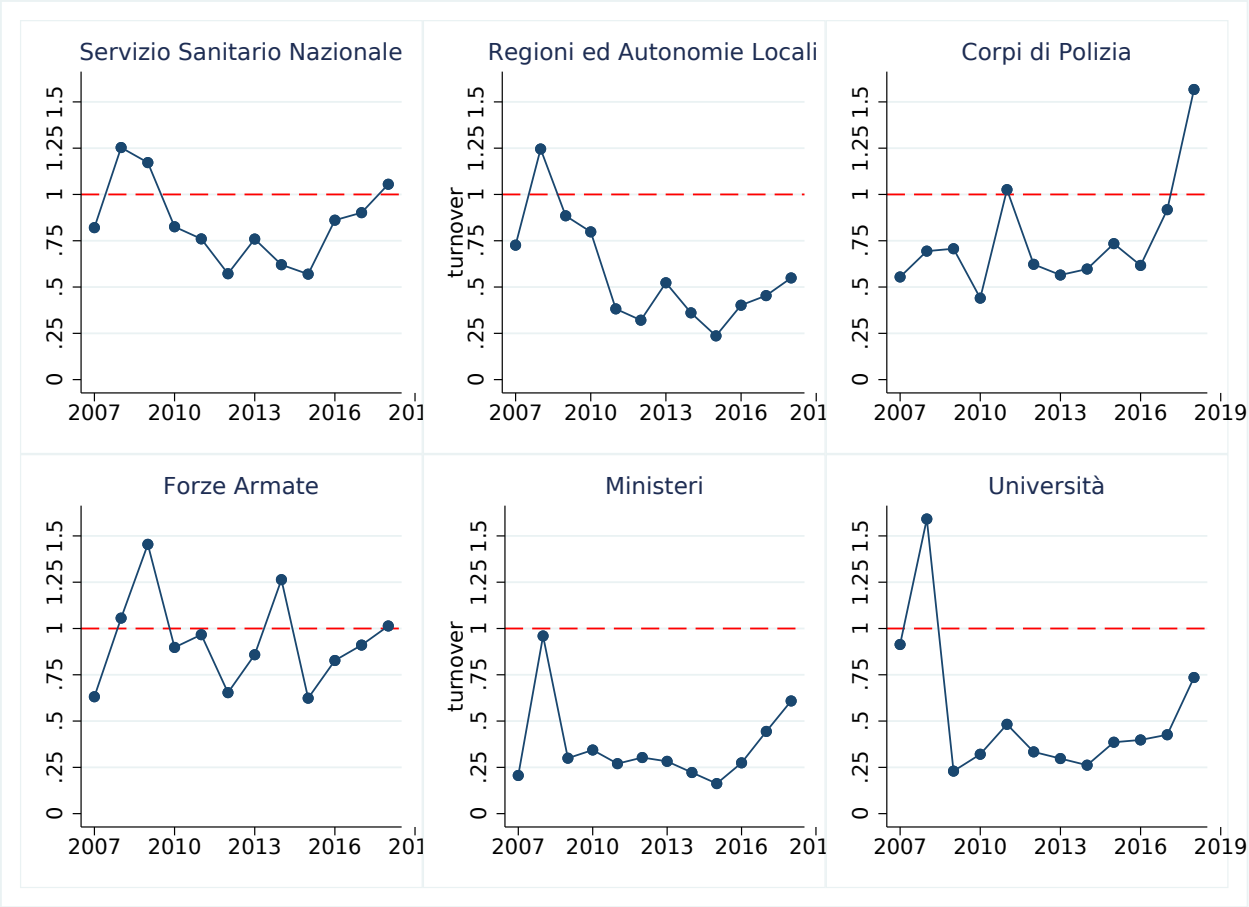
Figure 9: Tenure composition of the public sector workforce in 2008 and 2018.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

Given the observed trends in hiring and terminations, I compute the rate of turnover for the main sectors (Figure 10).[16] With very few exceptions, this has constantly been below 100% in the period of analysis, Ministries and Universities seem to be the sectors most severely affected by the limits on turnover, with effective rates of turnover (almost) constantly below 50%. All sectors display some increase in the rate of turnover in 2017 and 2018.

Figure 10: Computed rate of turnover, by sector.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

[16]The rate of turnover for the school sector fluctuated around one in the years of analysis, with a peak of almost three in 2015.

3.3 The demographic structure

The dynamics depicted above in terms of new entries and terminations, coupled with a general tendency to postpone entry in the labor market (D'Amuri et al., 2020), produced a dramatic ageing of the public sector workforce. Overall, the average age was 43.5 years in 2001 and raised to 50.7 in 2018.[17] In a cross-country comparison the Italian public sector employees are significantly older: according to OECD (2017) in 2015 the share of over-55 in Italy almost doubled the average across OECD countries.

Table 2 shows how the age distribution shifted over time across sectors. The largest variations were displayed by the Police Corps and the Army. As the rate of turnover was generally higher in these two sectors the observed ageing was likely due more to a postponement of the entry age than to a reduction in hiring (the rules applied were indeed quite different). On the other hand, a significant ageing of the workforce was experienced also by Ministries, Local Authorities and the National Health Service, sectors where the rate of turnover was particularly low. In the health sector, the average age raised less among doctors (from 50.4 to 52.5 years) than among the other medical staff (from 43.8 to 48.2 years).

Table 2: Average age of public sector workers.

Sector	Weight	2001	2018	Δ
School	35.6%	47.42	52.46	5.04
National Health Service	20.5%	43.53	50.71	7.18
Local Authorities	13.3%	45.20	53.22	8.02
Police Corps	9.7%	34.12	44.78	10.66
Army	5.6%	29.84	39.20	9.36
Ministries	4.6%	46.72	54.61	8.89
University	3.0%	47.45	53.00	5.55
Regions with a Special Statute	2.8%	44.02	51.02	7.01
Other	5.7%	48.57	51.45	2.88
Total	100%	43.51	50.74	7.23

To the extent that workers display a concave age-individual productivity profile, as extensively documented in the literature (Skirbekk, 2004; Castellucci et al., 2011; Bertoni et al.,

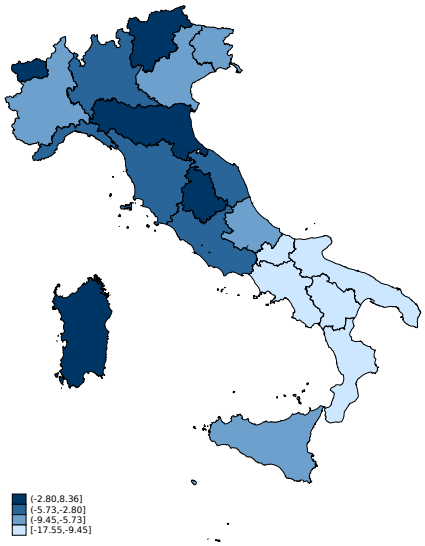
[17] Note that these figures reported by RGS do not include the workers employed through flexible contracts, who are presumably younger but account for less than 4% of the total.

2015), this rapid ageing of the workforce likely translated into a lower average level of productivity, due both to a process of physical and mental ability decline and to a missed renewal of skills and competences (e.g., digital skills).[18] In a labour-intensive sector as that of public services this can potentially produce severe consequences on aggregate productivity.[19]

3.4 The geographic distribution

Finally, the evolution of the public sector workforce size over the past decade has not been uniform across the different areas of the country. Financially autonomous Trentino Alto-Adige was the only region that recorded an increase in the number of public sector workers (+8%), all other regions experiencing losses between 1% (Sardinia and Valle d'Aosta) and 15% (Molise and Campania). Overall, as shown in Figure 11, the contraction was generally higher in the South of the country. This was due to the interaction between turnover caps and financial constraints, which primarily affected the more highly indebted institutions in the South.

Figure 11: Variation (2008-2018) in the total number of public sector workers, by region.



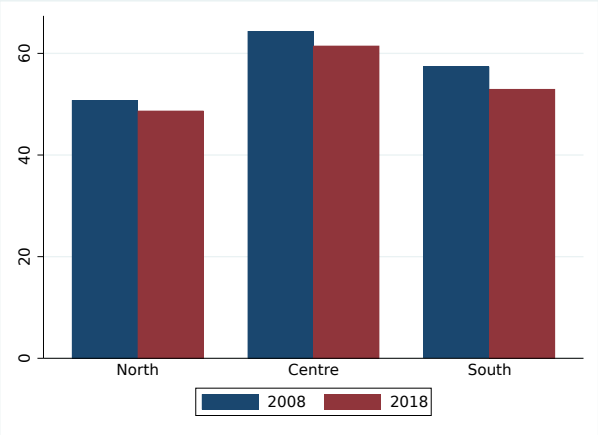
Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

[18] Productivity reductions at older age will vary depending on the type of job: they are generally higher when problem solving, learning and speed are important, whereas older individuals maintain a relatively high productivity level in tasks where experience and verbal and social abilities matter more (Deming, 2017).

[19] The most recent literature found mixed results about the relation between a firm's workforce age composition and its overall productivity (Mahlberg et al., 2013; Carta et al., 2020), while macro-level evidence agrees on the existence of an aggregate negative impact of population ageing on productivity (Feyrer, 2007; Aiyar and Ebeke, 2016; Daniele et al., 2019).

However, these dynamics produced some "convergence" in the staffing of the public sector across the areas of the country: in 2007 in the North there were about 50 public workers every 1,000 inhabitants while in the South 57.4; in 2018 these figures had shrunk to about 48.7 and 53 respectively, thus significantly reducing the territorial gap (Figure 12).[20]

Figure 12: Public sector workers per 1,000 inhabitants, by area.

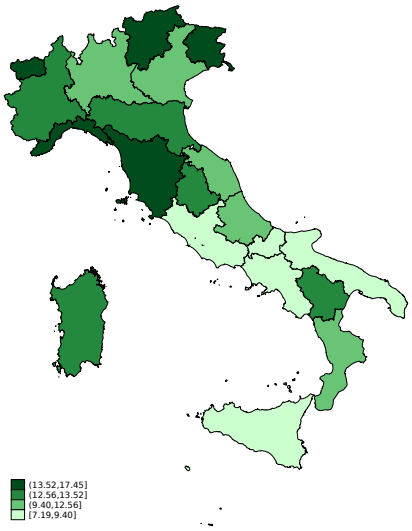


Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data and Istat (residing population, by region).

It is worth stressing, finally, that the territorial differences depicted in Figure 11 are not, as of today, common to all sectors: Figure 13, for example, shows that the supply of medical staff in the South is still generally lower than in the northern regions.

[20]Note that in the Centre the size of the public workforce is inflated by the presence of all the Central Government offices.

Figure 13: Focus on the National Health Service: total staff per 1,000 inhabitants, 2018.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

4 The case of Universities

As shown in Section 3, there was significant variation in the degree of enforcement of hiring restrictions across sectors. In this section I provide an overview of what happened in public universities, where the effects of the rules on hiring blocks were particularly severe (Figure 10), and review both the legislative acts adopted and the observed evolution of the workforce size and composition. Note, however, that the norms on hiring constraints were not the only type of spending cuts imposed on universities, as the sector experienced a general significant contraction in total funding over the past decade and the introduction of new rules for the allocation of funds across institutions (Sestito and Torrini, 2017).[21]

The rules for the hiring of new resources in public universities over the past decade have been designed over those applying to the general case of public offices (Section 2) combined with further limits related to the budget conditions of each single higher education institution.[22]

[21] For an overall analysis of the dynamics in place in the University sector, see ANVUR (2018).
[22] See Modica (2013) and Servizio Studi, Camera dei Deputati (2019b) for more details.

Table 3 below provides a synthetic picture of the evolution of the rules on turnover applicable to universities, the superscripts referring to the different systems used to allocate the national budget across universities within the nationwide indicated limit (N). A more detailed description of the norms follows.

Table 3: Evolution of the norms on the rate of turnover in public universities.

Year	L. 296/2006	L. 244/2007	D.L. 112/2008	D.L. 180/2008	D.L. 49/2012	D.L. 95/2012	D.L. 69/2013	L. 147/2013	L. 145/2018
2008	**20% wb, hc**	-	-	-	-	-	-	-	-
2009	20% wb,hc	20% wb,hc	10% wb,hc	**50% wb**	-	-	-	-	-
2010	-	60% wb,hc	20% wb, hc	**50% wb**	-	-	-	-	-
2011	-	-	20% wb, hc	**50% wb**	-	-	-	-	-
2012	-	-	50% wb, hc	-	50% wb N^1	**20% wb N^1**	-	-	-
2013	-	-	-	-	-	**20% wb N^2**	-	-	-
2014	–	-	-	-	-	20% wb N^2	**50% wb N^2**	-	-
2015	-	-	-	-	-	50% wb N^2	**50% wb N^3**	-	-
2016	-	-	-	-	-	100% wb N^2	100% wb N^3	**60% wb N^3**	-
2017	-	-	-	-	-	100% wb N^2	100% wb N^3	**80% wb N^4**	-
2018	-	-	-	-	-	100% wb N^2	100% wb N^3	**100% wb N^4**	-
2019	-	-	-	-	-	100% wb N^2	100% wb N^3	100% wb N^4	**100% wb N^5**

Notes: *wb* refers to the wage bill of the previous year's terminations i.e., the total expenditure for the terminated full time permanent contracts. *hc* refers to the headcount of the previous year's terminations i.e., the number of terminated full time permanent contracts. N indicates that the turnover cap is to be considered at the National level and not at the institution level. Subscripts 1-5 indicate the different rules in place for the allocation of the national funding across institutions. Specifically N^1 are the rules indicated in the M.D. 297/2012; N^2 those in the M.D. 713/2013; N^3 those in the DPCM 31 December 2014; N^4 those in the 2007 Budget Law (L. 232/2016) then confirmed by the DPCM 28 December 2018; N^5 those in the 2019 Budget Law (L. 145/2018).

Until 2008 the very same norms applying to the general system were applied to Universities. For 2008, following the provisions of the 2007 Budget Law (L. 296/2006, art.1, comma 523), each higher education institution was allowed to hire new resources for at most 20% of the wage bill of the contracts terminated in the previous year and, in any case, could not exceed the same percentage of units. The same cap applied to 2009, as confirmed in the following year's Budget Law (L. 244/2007). On top of this, though, the hiring of new resources was inhibited to those institutions that in the previous year had recorded a level of staff expenditure above 90% of their Ordinary Finance Fund[23] (L. 311/2004, art.1, comma 105).

In June 2008, the Decree Law 112/2008 (art. 66, comma 3, 7 and 9) reduced the rate of turnover allowed to all public sector institutions to 10% for 2009, 20% for 2010 and 2011

[23]This is the funding coming from the Central Government and represents the main source of income for Italian universities.

and 50% for 2012. For universities, the same Decree (art. 66, comma 13) also cut the Ordinary Finance Fund in preview of the shrinking of the wage bill induced by the new rules on turnover.

Later on in the same year, with the explicit objective of improving the quality of the tertiary education and research system, the Decree Law 180/2008, introduced an exceptional regime for hiring in universities, notwithstanding the general provisions of the D.L. 112/2008. The new regime prescribed a rate of turnover for universities equal to 50% of the previous year's terminations' wage bill for the years 2009, 2010 and 2011, irrespective of the headcount of the terminated resources.[24] This allowed institutions to hire more new resources to the extent that the latter are less costly than those retiring. While these changes eased somehow the hiring constraints, the budget criterion of not exceeding the 90% threshold for staff expenditure remained and became more binding given the contextual contraction of the Ordinary Finance Fund.[25]

The whole system was drastically changed in 2012 with the Decree Law 49/2012 implementing the Law 240/2010 (so-called "Gelmini reform"). The enabling Law passed in 2010 had the twofold objective of ensuring the financial sustainability of each university and of better balancing the structure of the faculty. On the latter aspect, the D.L. 49/2012 introduced new quota systems ruling that, for example, the number of full professors had to be below that of associate professors. With regard to the financial side, the Decree Law 49/2012 did not act on the rules for turnover, but established new criteria for the allocation of the available funding across institutions on the basis of their budget conditions. First, it ruled that the 50% limit for hiring had to be applied to the overall system rather than to the single institution and that the hiring allowed to each institution was to be determined on the basis of a set of budgetary indicators. Second, for this purpose, it established that the institutions' revenues to be considered was not anymore the amount of Ordinary Finance Fund only, but also the amount of student fees collected by each institution. Third, it split institutions in three groups on the basis not just of their staff expenditure but also of their indebtedness: (i) those with a high level of staff expenditure (above 80% of their income) and a high level of indebtedness (above 10% of their income); (ii) those with a high level of staff expenditure but a low level of indebtedness and (iii) those with low levels of both staff

[24]This threshold was then extended to 2012 with the D.L. 216/2011, art. 1, comma 3.

[25]The same law also introduced criteria about the ratios of faculty members with different qualifications, e.g., at least 60% of the new hires had to be permanent researchers, at most 10% full professors (*ordinari*). Moreover, a number of researchers could be hired notwithstanding the limits on turnover, in accordance with the Law 296/2006.

expenditure and indebtedness. On the basis of this partition the decree established that the applicable rate of turnover was (i) 10% for institutions in the first group, (ii) 20% for institutions in second group and (iii) 20% plus an extra for institutions in the third group. This extra amounted to a share of the budget equal to 15% of the difference between an arbitrary value of 82% and the level of staff expenditure over income (which was at most 80% in this group of institutions, so that the minimum extra budget was 0.3%).

This system introduced, for the first time, a very significant variability in funding and recruiting capabilities across institutions. In spite of a national rate of turnover established at 50%, institutions falling in the first two groups were allowed rates of 10% and 20% only, while those in the third group could exhibit large variation on the basis of their level of staff expenditure relative to revenues. On the other hand, differently from the previous regime, this new system, allowed also those institutions with a very high level of staff expenditure (above 90%) to hire new resources.

Before this new system was ever enacted, the spending review made by the Monti Government (D.L. 95/2012) cut the national threshold from 50 to 20% (until 2014), and established that the 50% threshold would be applied in 2015 and a 100% threshold from 2016 onward. The decree referred to Ministerial Regulations for the actual allocation of the resources across institutions. This was first applied, for 2012, with a safeguard clause that did not allow any institution to exceed a rate of turnover of 50% of the previous year's terminations wage bill (M.D. 297/2012). Then, from 2013 onward, the safeguard clause was not applied anymore, so that the most "virtuous" (spending-wise) institutions could reach rates of turnover above 100% (M.D. 713/2013).[26] The range of thresholds was first modified in 2014 for the period 2015-2017 (DPCM 31 December 2014), and again for 2017 by the 2017 Budget Law (L. 232/2016, art. 1, comma 303). Then the DPCM 28 December 2018 confirmed the same thresholds for the 2018-2020 period. These new rules, while being more lenient towards the virtuous and medium institutions, were also more severe with the others, thus eventually widening the differences in hiring limits across institutions.[27] Eventually, the 2019 Budget

[26]These Ministerial regulations also dictated the relative cost to be considered for faculty members with different qualifications: an associate professor would cost 0.7 relative to a full professor, a researcher with a permanent position (type B) would cost 0.5 relative to a full professor and a fixed-term researcher (type A) 0.4. Each year a Ministerial Decree assigns each University a hiring budget ("*punti organico*") that they can allocate as they wish given the established cost equivalence scale.

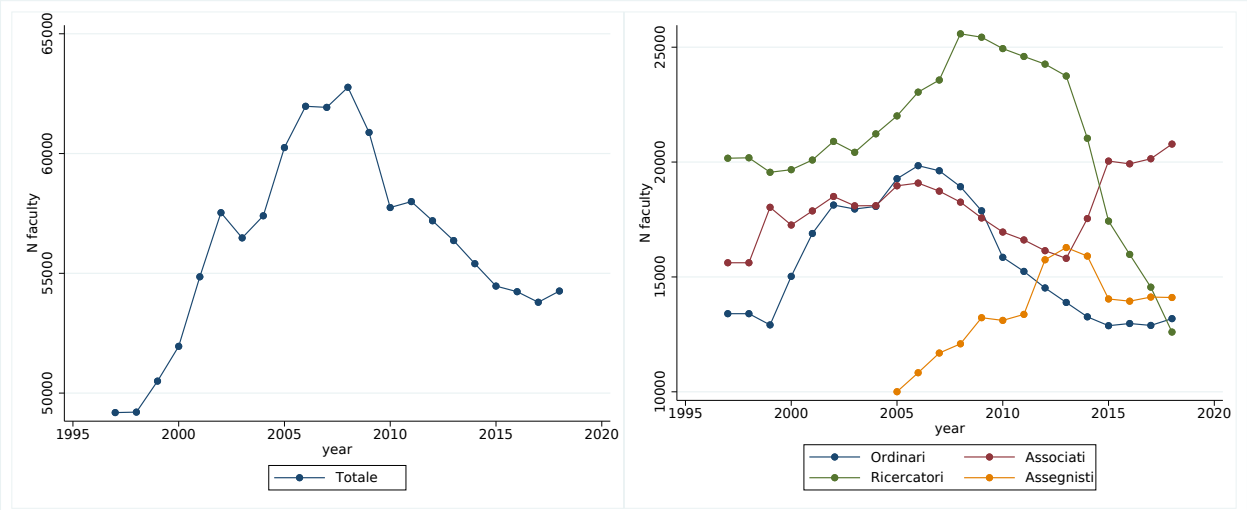
[27]More in detail, according to the DPCM 31 December 2014, for the period 2014-2017, institutions with very high staff expenditure ($> 82\%$) and very high indebtedness ($> 15\%$) could not hire at all, those with high staff expenditure and indebtedness could hire new resources conditional on receiving a ministerial approval, those with high staff expenditure and low indebtedness could hire for a cost of up to 30% of that of terminated

Law (L. 145/2018), ruled that those particularly virtuous (with a level of staff expenditure below 75%) would be allowed a rate of turnover above 100% for the years 2019 and 2020.

In order to evaluate the impact of the above described norms on the structure of the staff employed by public universities, I draw from the Ministry of Education data, which contain detailed and comparable information from 1998 onward.

Figure 14 reports in the left panel the trend in the total number of faculty members employed in Italian universities from 1998 to 2008. This includes full professors (*ordinari*), associate professors (*associati*) and researchers, both with permanent and fixed-term contracts. Starting from 2005, the series also records the number of post-docs (*assegnisti*).

Figure 14: Faculty size, by year



Notes: Elaborations on MIUR data. Ordinario= Professore I fascia (ordinario); Associato= Professore II fascia (associato); Ricercatore= Ricercatore a tempo determinato o Ricercatore a tempo indeterminato; Assegnista= Titolare di assegno di ricerca.

The figure impressively shows an inverted U-shape, the contraction starting sharply in 2008. Interestingly, the speed of contraction was maximum in the first period, then slightly lower in the period in which the first rules about the allocation of funds across institutions were introduced (2012-2015), and further lower from 2015 onward when both the national and the institution-specific caps were raised.

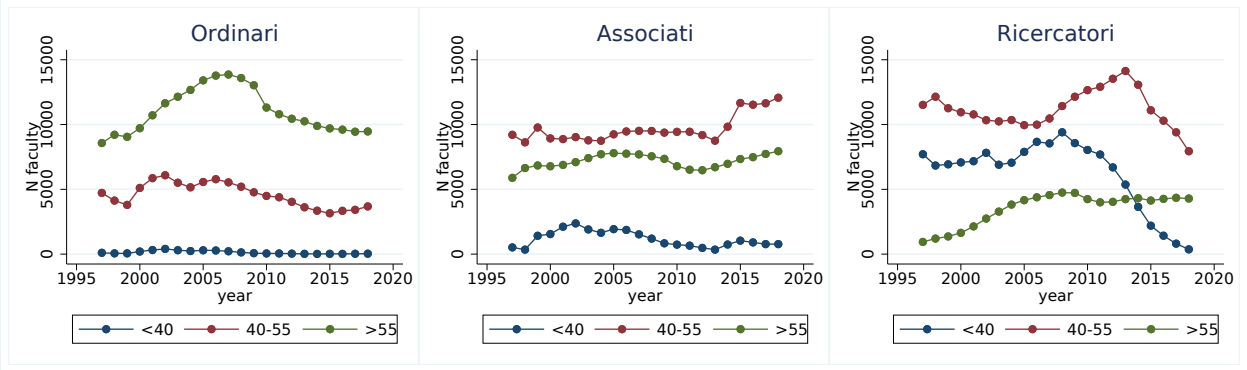
The contraction was not equally borne by all levels of faculty. As shown in the right panel of the figure, the stock of researchers halved between 2007 and 2018, passing from

contracts, those with low staff expenditure and low indebtedness could hire up to 30% plus a 20% of the margin between 82% and their level of staff expenditure. The range was thus widened significantly. Then, following the 2017 Budget Law, the 30% threshold was replaced by a 50% for the year 2017. This further increased the variability in hiring limits across institutions. The same scheme was confirmed by the DPCM 28 December 2018 for the period 2018-2020.

over 23,000 units to 12,600 in 2018. Also full professors experienced a very significant drop passing from about 20,000 units to 13,000 over the same period. The sharp contraction in the number of researchers observed from 2014, nevertheless, was, though only partly, offset by an increase in the number of associate professors. This was likely due to the internal promotions of permanent-contract researchers, as stimulated by specific interventions.[28]

The dynamics above, clearly affected the age composition of the Italian university faculty. According to RGS data, the average age of permanent-contract university staff passed from 47.45 years of age in 2008 to 53 in 2018. Figure 15 shows the relevant patterns by qualification. While the figures show that the number of older full professors shrunk significantly, this did not compensate for the massive drop in the number of younger researchers, the number of those aged below 40 passing from almost 10,000 units in 2008 to just few hundreds in 2018. Such figure reflects also the general tendency to postpone labour market entry due to the higher levels of educational attainment (D'Amuri et al., 2020). Moreover, the expansion of the stock of associate professors did not involve the youngest cohorts but was concentrated among the over-40s. The resulting picture is, with no doubts, one of a significantly ageing faculty.

Figure 15: Total number of faculty per year, by qualification and age group



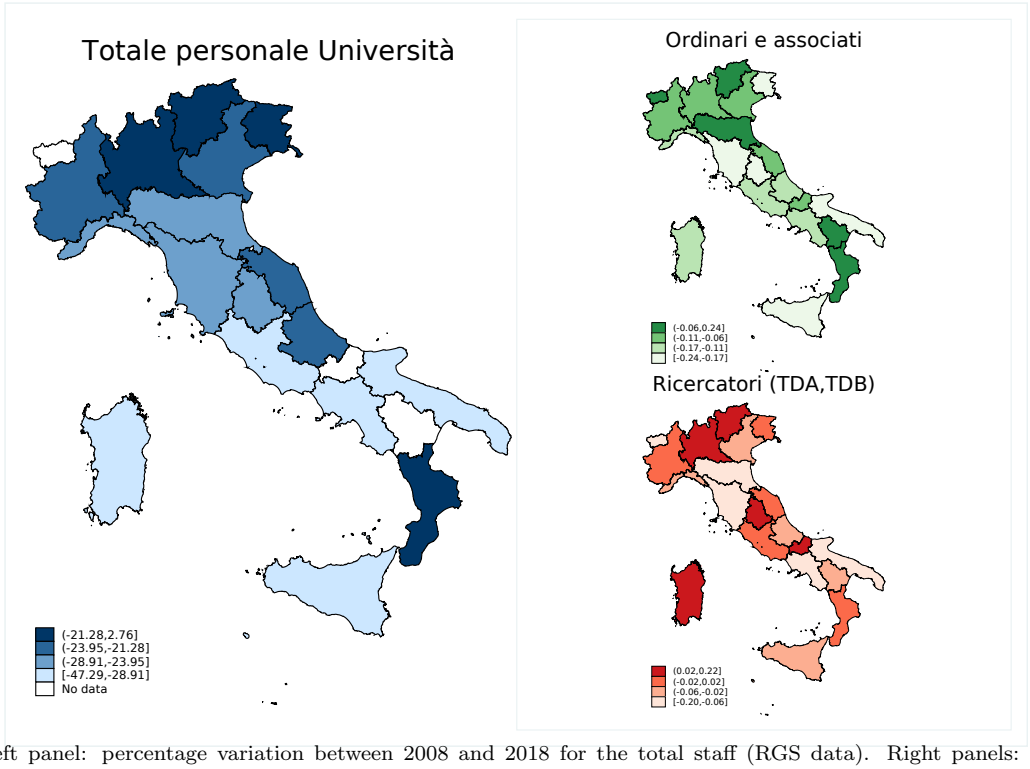
Notes: Elaborations on MIUR data.

The last piece of evidence worth describing, is that of the geographical patterns that emerged from the regulatory changes applied over the past ten years. The introduction of rules that more and more rewarded the most "virtuous" institutions, ended up widening up the pre-existing inequality across institutions. This resulted in generally larger losses of resources for universities located in the South, the sign of such difference holding constant

[28] *"Piani straordinari per la chiamata di professori associati"*. See for example the IMD 28 Dember 2012.

for researchers and full and associate professors (Figure 16). Such territorial pattern was generated by a combination of many factors (Sestito and Torrini, 2017), but primarily the less sound budget conditions of southern institutions coupled with lower student fees.

Figure 16: Variation (2008-2018) in the total number of university staff, by region and by qualification.



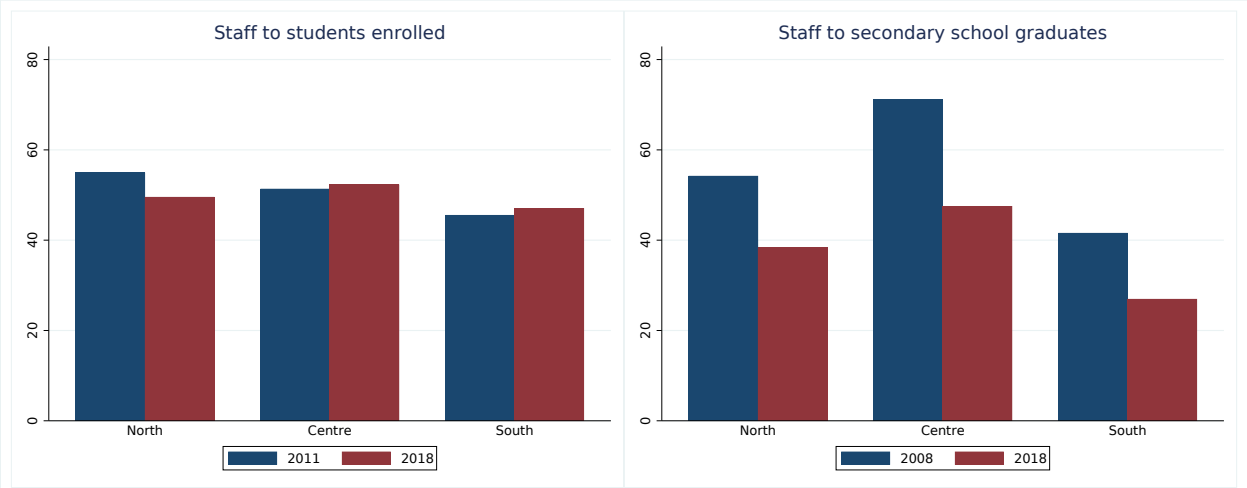
Notes: Left panel: percentage variation between 2008 and 2018 for the total staff (RGS data). Right panels: percentage variation between 2009 and 2014 for selected academic qualifications (MIUR data).

As for the general case, such data are to be read in combination with those on the size of the reference population of users. Figure 17 shows the distribution across areas of the number of university staff per 1,000 students. The left panel employs the total number of students enrolled in a given year. The figures are quite homogeneous across the country, showing a higher convergence in 2018 relative to 2011. This measure, though, clearly reflects an equilibrium situation in which the number of students enrolled is affected by the quantity and quality of the tertiary education supply, including the faculty size and composition.[29]

[29] Rizzica (2013), for example, showed that the expansion of tertiary education supply in the early 2000s due to the opening of secondary branches of universities had produced both an increase in the number of students enrolling in tertiary education and a substitution between studying away from home and studying in the local university. The progressive closure of these peripheral universities may have thus lowered the number of students and encouraged students' migration.

On the right panel, I thus plot the number of university staff over a proxy for the number of "potential students", i.e., the number of youths holding a 5-years secondary school degree. Despite there having been some convergence again in the staffing of universities across the three areas of the country, this graph shows a much higher degree of variability in the number of resources available, the number in the South (about 27 university staff per 1,000 students) being less than 60% of that in the Centre (47.5) and about 70% of that in the North (38.5).

Figure 17: University staff per 1,000 students, by area.



Notes: Left panel: total number of university staff (RGS data) per 1,000 students enrolled in the universities of the area (MIUR data). Right panel: total number of university staff (RGS data) per 1,000 population aged 15-24 holding a 5-year secondary school degree (Istat data).

5 Concluding remarks

The public sector is a highly labour-intensive one and the largest employer across all OECD countries. While it is hard to state a view on what should be its optimal size and composition, it is undeniably urgent to understand how it is evolving and what has been the role of the recent legislative interventions in shaping such pattern.

This paper attempted to reconstruct the dynamics observed over the last decade in the Italian public sector. In a decade that was characterized by a severe economic crisis, the management of the public sector workforce was mainly inspired by principles of cost saving and spending efficiency.

The analysis of the applicable legislative framework revealed that large cuts in the recruiting of new resources were achieved through the provision of caps to the so-called rate

of turnover i.e., the amount of new hiring allowed vis-á-vis the number of terminated contracts. The contemporaneous progressive postponement of the minimum retirement age slowed down such (capped) turnover thus limiting the staffing squeeze but enhancing the progressive ageing of the workforce. The most recent legislative actions, on the other hand, will likely accelerate the process of generational renewal of the public sector workforce in that they anticipate the retirement of the current workers and, at the same time, soften the limits on hiring.

Using data from the State General Accounting Department, I showed that the public sector experienced a contraction of about 10% between 2001 and 2018. Moreover, the age distribution has been progressively and rapidly skewed towards the elderly. This process was common to all the areas of the country, however the South was more severely affected. The reason of such different pattern between the North and the South likely relies in the interaction between turnover caps and budget constraints: as institutions in the South generally started off in weaker financial conditions and a higher incidence of staffing costs the constraints imposed on them in terms of spending and turnover were generally stricter. Indeed, the process produced a narrowing of the North-South difference in the number of available resources per population.

The observed reduction in the staff size was also not uniform across branches of the public sector: public universities turned out to be the most severely affected institutions, followed by ministries and local authorities. The case of universities is thus analyzed more in depth. These went through a period of massive resizing with the introduction of both nationwide caps to hiring possibilities and new rules on the allocation of funding across institutions. The latter norms, in particular, produced an extremely variegated picture, with universities in the North of the country generally able to capture more resources than those in the South. Understanding how this affected the demand for tertiary education and the quality of the students enrolling in different areas is of first order relevance but currently beyond the scope of this paper.

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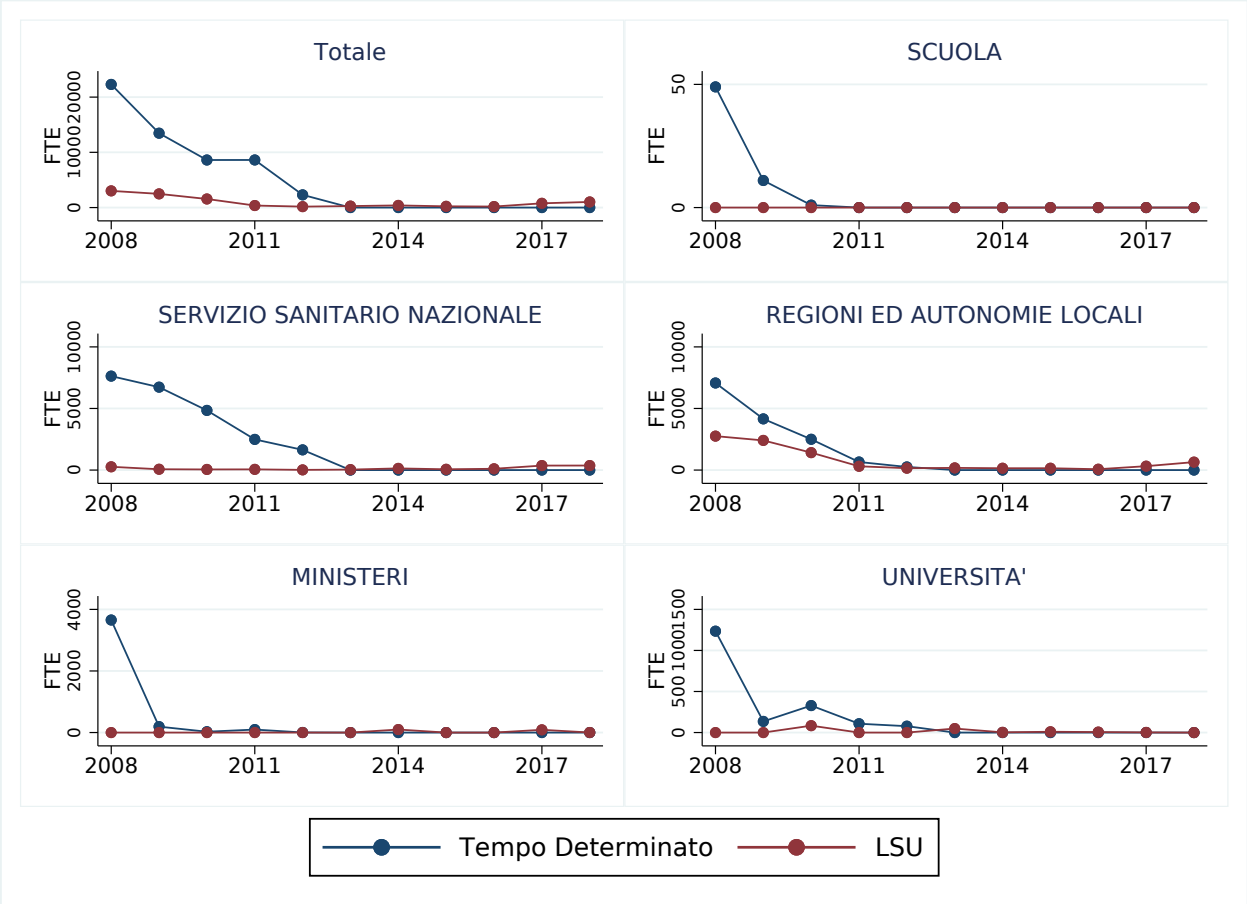
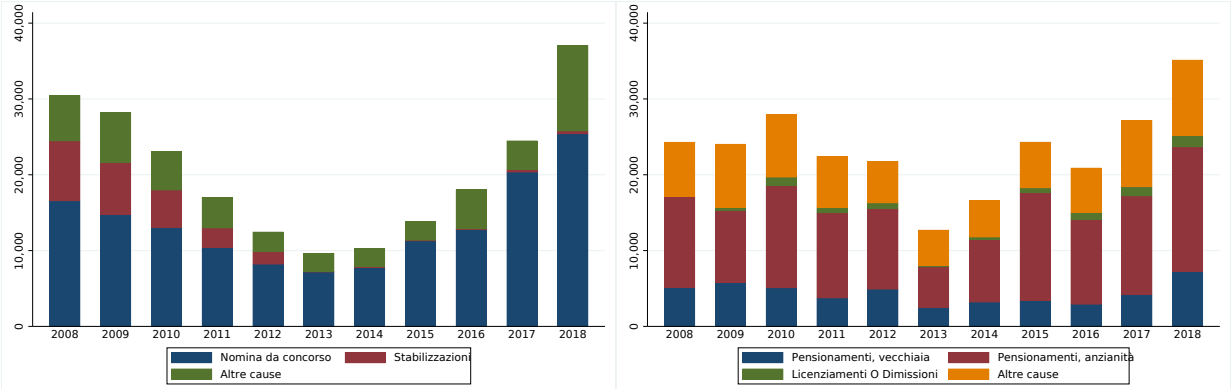
A Additional figures and tables

Figure A1: Number of fixed-term workers stabilized, by year, type of contract and sector.



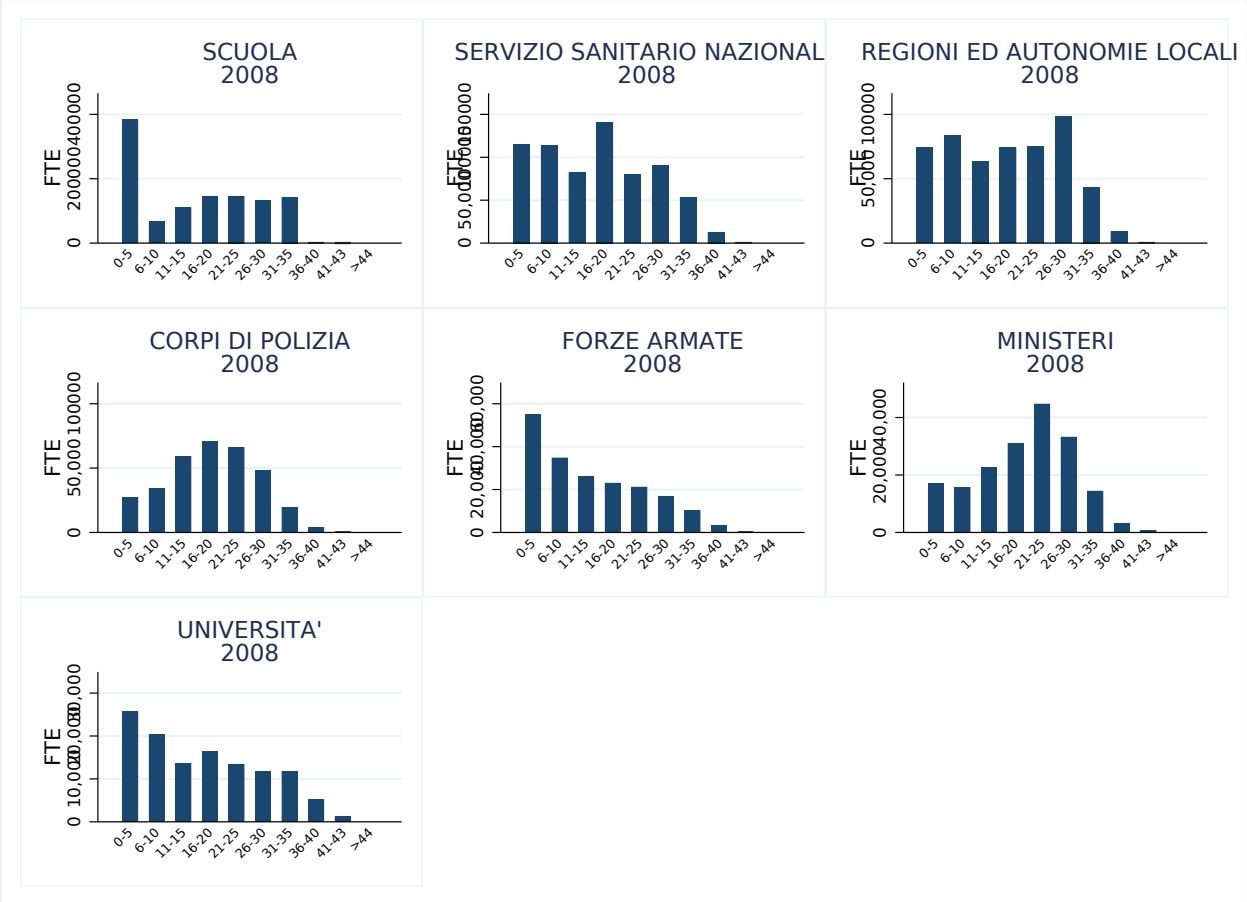
Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data. Police Corps and Army have no such categories of fixed term workers and thus stabilizations, hence were not included.

Figure A2: Focus on the National Health Service. Flows in and out of the sector, by year and reason for hiring/termination.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.

Figure A3: Tenure composition in 2008 by sector.



Notes: Elaborations on *Ragioneria Generale dello Stato* (RGS) data.