


# Collective Bargaining and the Evolution of Wage Inequality in Italy

Francesco Devicienti, Bernardo Fanfani   
and Agata Maida

## Abstract

*Italian male wage inequality has increased at a relatively fast pace from the mid-1980s until the early 2000s, while it has been persistently flat since then. We analyse this trend, focusing on the period of most rapid growth in pay dispersion. By accounting for worker and firm fixed effects, it is shown that workers' heterogeneity has been a major determinant of increased wage inequalities, while variability in firm wage policies has declined over time. We also show that the growth in pay dispersion has entirely occurred between livelli di inquadramento, that is, job titles defined by national industry-wide collective bargaining institutions, for which specific minimum wages apply. We conclude that the underlying market forces determining wage inequality have been largely channelled into the tight tracks set by the centralized system of industrial relations.*

## 1. Introduction

Wage inequalities rose in most Western countries during the last decades of the past century. Several theories link this growth in the dispersion of the pay structure to market forces. Katz and Murphy (1992) were among the first to attribute the growth in US wage inequality to the demand and supply of workers' skills. Similarly, Acemoglu and Autor (2011) show that several innovations in the production process may have disrupted routine-based occupations over time, leading to a more polarized structure of the workforce. Even if theories linking wage dispersion to market forces highlight important mechanisms and have several merits, they do not always accurately predict the substantial heterogeneity in wage inequality trends

Francesco Devicienti is at the University of Turin and Collegio Carlo Alberto, Bernardo Fanfani is at the University of Turin, and Agata Maida is at the University of Milan and LABORatorio Revelli.

observed not only between Europe and the English-speaking countries (e.g. Blau and Kahn 1996; Koeniger *et al.* 2007), but also within Continental Europe (e.g. Hipólito 2010). Given that many of these economies share fairly similar characteristics in terms of trade openness, educational attainments and production technologies, such evidence suggests that labour market institutions could be as important as supply and demand factors in shaping pay differentials and that their influence on the wage structure should be carefully considered. In this regard, several studies indicate that declining minimum wages and union strength (e.g. Di Nardo *et al.* 1996), or changes in social norms (e.g. Piketty and Saez 2003) could be the main drivers of the observed secular rise in wage differentials.

A more recent literature, based on matched worker–firm databases, has suggested that a large part of the increase in wage inequality is between–rather than within–firms (see the evidence in Barth *et al.* 2016 for the USA, and in Faggio *et al.* 2010 for the United Kingdom). One important factor behind the rise of the between-firm component appears to be related to rising heterogeneity in the wage policies of observationally similar firms. In particular, Card *et al.* (2013) show that firm-specific components of the wage variance explain up to one-fourth of the inequality growth that occurred in West Germany between the late-1980s and the beginning of the new century.

In studying the dynamics of between-plants wage dispersion, several authors have focused on market-driven explanatory mechanisms, such as investments in computer technology (e.g. Dunne *et al.* 2004), dispersion in productivity (e.g. Barth *et al.* 2016; Faggio *et al.* 2010) and international trade (e.g. Helpman *et al.* 2017). Others have instead attributed the rise in the dispersion of firms' wage premiums to the changes that have occurred in wage setting institutions. In interpreting their results, Card *et al.* (2013) argue that changes that have occurred in the wage bargaining system since the early-1990s, namely the possibility for German firms of *opting-out* from national contractual agreements, may have driven up between-plants wage differentials. Dustmann *et al.* (2014) argue that this decentralization in the wage setting process has made it possible to cut unit labour costs and to improve international competitiveness, fostering the German economic growth observed in the last decade.

The aim of our article is to show the importance of collective bargaining in driving the developments of wage inequality in another large manufacturing and export-oriented EU economy: Italy. It also seeks to draw comparisons with (West) Germany, a country similar to Italy in many respects. Although both countries have been exposed to similar forces related to globalization and technological change, we show that developments in wage inequality have been different in important respects (e.g. the role of firm wage policies). We then argue that the specificities of Italian institutions have a close bearing on these results.

To conduct our comparative analysis, we apply the methodology of Card *et al.* (2013) and rely on similar matched employer–employee data. The main dataset used covers the entire population of private-sector workers

and firms in a major region of the country: Veneto. For our purposes, this sample has a number of advantages. First, Veneto is a relatively self-contained labour market, emblematic of a manufacturing-oriented economy, highly exposed to international competition and technological change. As such, its trends in inequalities are less affected by regional differences in economic performance, sectoral composition and internal migration; differences that can be particularly large between the north and south of the country. On the other hand, the features and dispositions of the Italian system of industrial relations are uniform across regions. Second, the Veneto data provide us with the longest currently available dataset to document the long-run evolution in wage inequality. Finally, we show that the main trends in wage inequality and regression decomposition exercises, when computed on the smaller, more homogeneous and manageable Veneto dataset, are very similar to results derived from a much larger (but shorter and heterogeneous) dataset covering the entire Italian country.

We first document the episodic nature of the increase in Italian wage inequality. Inequality in Veneto (and in Italy) diminished in the 1970s, increased from the early-1980s until the early 2000s, and has been relatively constant until the present day. Focusing on the male sample and on the period of most rapid growth in pay dispersion, we then study the evolution of the following components of inequalities: time-varying characteristics of the workforce, time-constant individual characteristics and firm-specific wage premiums, along with the contribution arising from the correlation between them. We finally introduce a variance decomposition technique designed to measure the influence of wage setting institutions on the pay structure. In particular, we test whether the growth of different components of wage inequality have occurred mostly within or between the fine job title categories defined and protected by the country's collective bargaining institutions. Our data provide reliable information on these job titles at the worker level, but only until 2004. This is, however, not a major limitation of the analysis, as the job-title data cover precisely the only period in which Italian wage inequality was increasing.<sup>1</sup>

Studying the period from the 1980s until the early 2000s, which is characterized by a similar growth in pay dispersion between Italy and Germany, we show that, differently from the results documented by Card *et al.* (2013), there has been no growth in firms' wage premiums dispersion in the Italian case. Thus, our evidence suggests that Italian highly centralized sector-wide wage setting mechanisms have not undergone the same renewal processes characterizing the German labour market during the 1990s, and that consequently Italian firms have been unable to opt out, or diverge in any other significant way, from the wage dynamics established within the relevant industry-wide collective agreements.

A large proportion of the growth of Italian pay dispersion is due to rising heterogeneity in the *portable* component of a worker's pay. This is the part of the wage attributable to individual-specific characteristics equally rewarded across employers. In principle, a growing contribution of workers'

heterogeneity to the total wage variance may simply reflect the underlying dynamics of supply and demand factors. However, we show that, in practice, this component of inequality is closely linked to the wage pay scales bargained at the industry level by the main union confederations and employers' associations. Hence, we interpret the finding of rising workers' heterogeneity as yet another outcome induced by the Italian system of industrial relations, which seems to impose significant constraints on wage dynamics.

To substantiate our claim, we divide the variance of (log) wages and of workers' *portable* pay components into a *within*- and a *between*-job titles part. These job titles (called *livelli di inquadramento* in Italian) are occupations, defined by the relevant sectoral collective agreements, for which a specific minimum wage applies regardless of a worker's union membership. We find that the growth in the *between*-variance component virtually explains the entire inequality trend observed in the data; evidence that, partly due to data limitations in past research on Italian wage inequality, has never previously been so extensively documented.

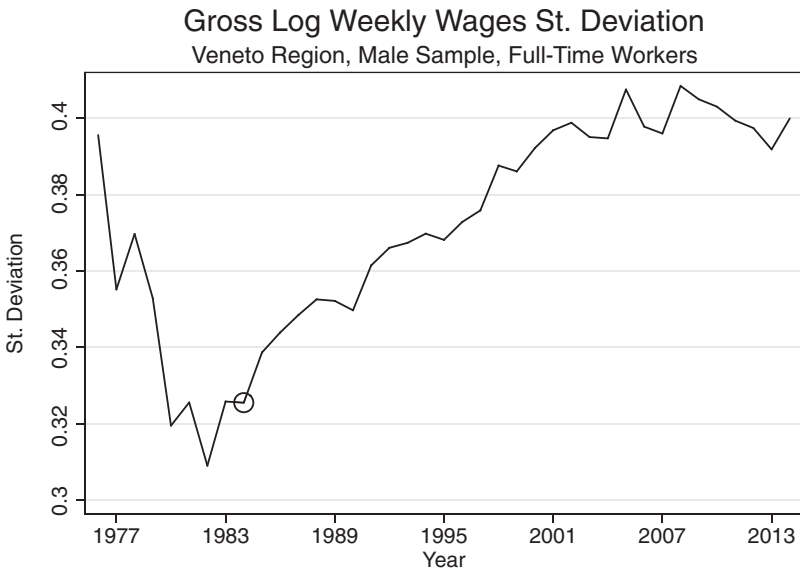
Our analysis also shows that another important component of the growth in wage inequality has been more positive sorting between firms' pay premiums and the human capital of the workforce. While part of this growth may simply be an indirect consequence of increased dispersion in workers' portable wage components, it is also tempting to associate the improved assortative matching with the general labour market modernization and deregulations experienced by Italy since the mid-1980s.

## 2. Institutional context

During the entire period considered in this study, and largely still today, Italy has been characterized by a wage setting mechanism fairly centralized at the sector-wide national level. Collective contracts are *de facto* binding for all employers and all workers, irrespective of union membership. Such agreements are signed (typically every two years) by the major trade unions and employers' associations at the industry-wide level. It is important to note that there are no *opting-out clauses* in the Italian system. That is to say, firms cannot decide to resort to firm-level contractual agreements derogating to the wage standards settled at the sectoral level. Regional- or firm-level agreements can only distribute *top-up* wage components, typically related to indicators of profitability or productivity.

Each industry-wide collective contract regulates specific job titles (*livelli di inquadramento*) and the contractual minimum wages that is to apply for each of them. Such *livelli di inquadramento* are job classifications defined by collective bargaining agreements, which are based on the complexity of workers' tasks and, in some circumstances, also on qualifications and seniority levels. It follows that such job titles can be considered similar to occupations, with the important differences that, depending on the sector of activity, the same type of job may be classified in more than one *livello di inquadramento*

FIGURE 1  
Long-Run Evolution of Gross Weekly Wage Standard Deviation in Veneto.



Source: Veneto Worker Histories data for the period 1976–1983. From the year 1984 (denoted by the hollow circle in the figure), the series is derived from universe of Italian social security records (VisitINPS data) and computed considering only firms located in Veneto.

and that for each of these groups, a sector-specific binding minimum wage applies.

In 1993, a major reform of collective bargaining was approved. Its purpose was to achieve the following main objectives (Casadio 2003): (i) coordination across industries and moderation on wage growth to achieve low inflation targets; (ii) growth of regional differences in wages to adapt them better to the heterogeneous cost of living and labour market conditions at the local level; (iii) distribution of premiums related to performance (*on top* of the sectoral minimums) and negotiation at the firm-level of some other contractual provisions not related to compensation. This reform resulted in an increase of geographical differences in the top-up components of negotiated wages. However, Devicienti *et al.* (2008) find that, overall, the amount of flexibility in bargaining agreements introduced by the 1993 reform has been quite limited. In particular, using a sample covering around 60 per cent of national private-sector contracts, these authors show that the average share of all top-up components over total wages increased from around 18 per cent during the mid-1980s, to only 22 per cent by the end of the 1990s.

Figure 1 provides an overview of the long-run evolution of the standard deviation of log weekly wages, computed from the social security records of male private-sector workers in Veneto (the data are presented in the next section). It is apparent that inequalities declined sharply until around

1983. Previous research has attributed this remarkable trend to the strong compressing effects of the *Scala Mobile* (e.g. Leonardi *et al.* 2015; Manacorda 2004).

The *Scala Mobile* was a cost-of-living allowance added quarterly to the bargained contractual minimum wages. The institution was in place from the 1970s until 1993, but was weakened and extensively reformed in 1984 and then through a referendum in 1985. Since this wage-adjustment mechanism had been particularly disadvantageous for more qualified white collars and skilled workers, from 1987 on most nation-wide collective bargaining agreements attempted to mitigate its egalitarian effects further. As a consequence, the compensations associated with the qualifications embedded in each *livello di inquadramento* were improved, widening the gaps in the minimum wages stipulated for each of these job titles (this tendency is highlighted by industrial relations reports of the time, such as CESOS 1989). Figure 1 shows indeed that the period between the early-1980s and early 2000s, the one on which we focus our analysis, was instead characterized by a very persistent growth in pay inequality. Note, however, that during the most recent years, as overall wage dispersion has reached levels similar to those of the 1970s (before the introduction of the *Scala Mobile*), this trend of growth has actually stopped.

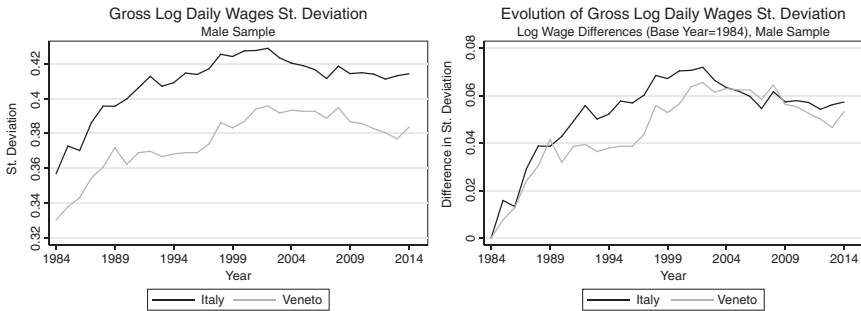
### 3. Data and preliminary evidence on inequality

#### *Choice of the Data and of the Time Period*

The Veneto Working Histories (VWH) database, which is studied here, contains earnings data from social security records for all dependent workers of the private sector in the Veneto region. The database covers the population of private-sector firms that are registered in one of Veneto's INPS agencies, and the population of their employees. The careers of workers in these firms are also observed if they have job spells outside the Veneto region, as long as they are working in the private sector. They are instead not observed if they work in the public sector or are self-employed. To analyse a more homogeneous and consistent sample across time, we have divided the data by gender and, throughout this article, we discuss only results obtained among men. This choice enables us to compare our results more easily with evidence available in other studies (most notably Card *et al.* 2013) and it eases their interpretation, given that the dynamic of female labour force participation is quite different from that of men.

Veneto represents a particularly informative case study for our purposes. This region has a well-developed manufacturing sector, close-to-natural unemployment rates, limited out-migration; and it is fairly large, given that its economy represents around 10 per cent of the national GDP. These features make it quite comparable to other well-developed Western economies exposed to international competition and technological advances, most notably West Germany. Studying inequalities considering only one region of Italy is convenient also because different rates of economic growth have been

FIGURE 2  
Standard Deviation of Log Daily Wages in Italy and Veneto.



Source: Universe of Italian social security records (VisitINPS data).

observed across the country (particularly between the North and the South) and it can be difficult to account for genuine adjustments of wages to local market conditions. In this regard, Devicienti *et al.* (2008) show that, after the 1993 industrial relations reform, wages started to adapt better to economic conditions at the regional level, leading to a tenuous resurrection of the Italian wage curve.

The original version of VWH covers the period from 1975 to 2001, and hence would not allow us to document the developments in wage inequality for the most recent years. However, we argue that neither the focus on a single region nor that on the period that ends in the early 2000s are significant limitations for the article's aims and analysis.

To show that this is indeed the case, we complement our analysis based on VWH with evidence from the recently available country-level matched employer–employee VisitINPS database, which contains the universe of Italian social security records for private-sector employees.<sup>2</sup> This allows us both to compute inequality in Veneto for the extended 1975–2015 period (as in our Figure 1), and to compare wage inequality developments in Veneto and in Italy across the (shorter) 1983–2015 period.

We can summarize some initial evidence obtained from the two databases as follows. First, the main inequality trends observed in Veneto are similar to those obtained from the national population of social security records. Figure 2 compares the standard deviation of daily wages observed in Italy and in Veneto, as derived from the VisitINPS data. In computing both series, we have selected job spells longer than four months and excluded wages below the first and above the 99th percentiles. The level of this statistic is lower when computed considering only Veneto's firms, a finding mostly attributable to the large regional differences in economic conditions across Italy. However, when considering the trend in wage dispersion, which is provided in the right panel of the figure, a fairly similar pattern between the two series emerges. Second, according to Figure 2, in both Veneto and Italy wage, dispersion



increases quite persistently from the early-1980s up until the early 2000s, but this trend is followed by a period of flat or negative growth until the most recent years. Therefore, the years more carefully studied in this work (from the early-1980s until the early 2000s) coincide with the only episode of growth in inequalities observed in Italy since the 1970s. Arguably, this also represents the most interesting period for an analysis of the evolution of the wage structure in the Italian case. Finally, as we show in Section 4, also the trends in the various AKM variance components are similar between Veneto and Italy (see, in particular, Table 3).

### *Sample Selection and Descriptive Statistics*

The VWH data gather information on pay gross of taxes and inclusive of all cash benefits, but they exclude all in-kind benefits. We choose log gross *daily* wages, adjusted to the 2003 level, as the unit of measurement for earnings. Other available alternatives (e.g. weekly or monthly wages) are less precise in controlling for time worked since, by law, employers have to report all weeks and months during which an employee has worked *at least one day*.

We have taken a number of steps that are relatively standard in the literature using similar data. First, for each employee with multiple jobs during the same year, we have selected the longest spell in terms of months, weeks and days worked; to break the few remaining ties, we have selected the spell with highest earnings. Second, we have excluded from the sample all spells shorter than approximately four months (16 weeks), and finally, we have trimmed wages at the 1st and 99th percentiles calculated over a six-year period.

In the rest of the article, we study in detail the years from 1982 to 2001, since our main purpose is to shed light on the determinants of the inequality growth, which takes place during this most recent period. To estimate the two-way fixed-effect model of Abowd *et al.* (1999), we have divided the 1982–2001 years of data into five, partially overlapping, six-year panels. All the results derived from the VWH database are computed considering only firms of Veneto, but we have included employment spells outside this region in the estimation sample of the two-way fixed-effect model. The rationale of these choices is further discussed in the section providing the details of our econometric method.

Table 1 contains descriptive statistics for each of the five panels that we have constructed. It emerges that the composition of the sample is quite homogeneous across periods. Given that public-sector workers, self-employed workers and firms with no dependent workers are excluded from the social security archives, the secondary sector is relatively large, and this pattern is reflected in the occupational composition of the sample, where the majority of individuals are blue-collar workers. Note that secondary sector is defined as manufacturing and construction, the primary sector as agriculture, forestry, fishing and mining, while the service sector is defined as the residual category. Tenure is left-censored at the year 1975, but, to correct for this problem, in the empirical analysis, we control for this variable by including dummy variables



TABLE 1  
Summary Statistics (Mean and St. Dev.) by Period

<i>Period</i>	<i>1982–1987</i>	<i>1984–1989</i>	<i>1988–1993</i>	<i>1992–1997</i>	<i>1996–2001</i>
Log daily wages	4.783	4.803	4.860	4.873	4.883
<i>St. Dev.</i>	0.286	0.300	0.332	0.343	0.352
Age	36.76	36.37	35.946	35.84	35.82
<i>St. Dev.</i>	11.07	11.04	10.90	10.39	9.85
Firms' workers	7.599	7.272	6.958	7.443	7.398
<i>St. Dev.</i>	43.76	48.72	38.17	51.38	52.50
Tenure	5.072	5.551	6.015	6.453	6.479
<i>St. Dev.</i>	3.631	4.325	5.494	6.252	6.823
<i>Proportions</i>					
Part Time	0.002	0.004	0.008	0.013	0.018
Apprentice	0.015	0.020	0.024	0.024	0.035
Blue Collar	0.730	0.729	0.723	0.724	0.708
White Collar	0.247	0.243	0.242	0.245	0.250
Manager	0.004	0.007	0.008	0.007	0.007
Primary Sect.	0.043	0.045	0.045	0.044	0.042
Secondary Sect.	0.626	0.631	0.648	0.651	0.662
Tertiary Sect.	0.331	0.324	0.307	0.305	0.296
Total Workers	698,410	724,459	753,529	776,988	846,633
Total Firms	65,019	72,689	80,301	80,869	85,402

*Notes:* The sample is composed of firms located in Veneto belonging to the largest connected set. Part-time contracts have been introduced only since 1985. Tenure is censored at 1975. Average firms' size is non-weighted and measured by the number of employees working for at least six months in a year.

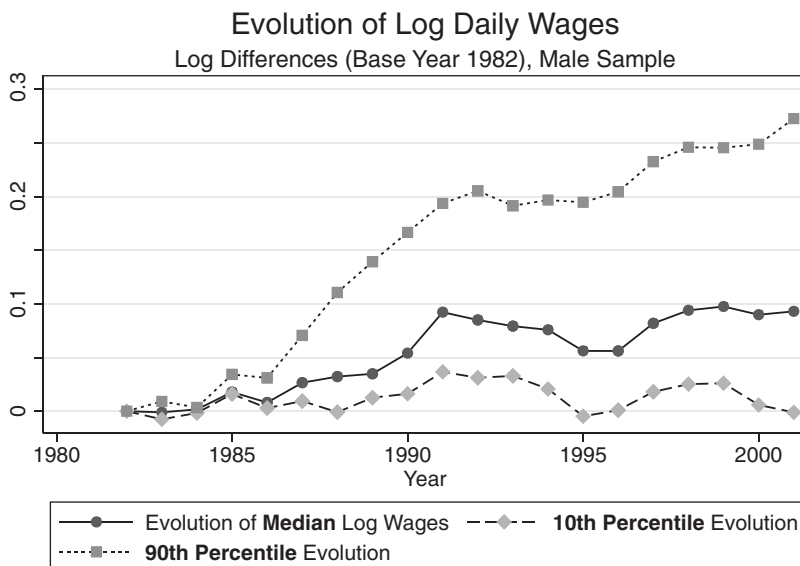
for its first six years, leaving higher seniority levels as the reference category. The percentage of part time contracts is relatively low and it grows over time, a tendency attributable to the fact that such contracts have been introduced in the Italian legislation only since 1985. Finally, Table 1 shows that real wages have been quite flat during the overall period considered, while their dispersion, as measured by the standard deviation, steadily increases. In the next section, we present a more accurate description of this trend.

### *Preliminary Evidence on Inequality*

Figure 3 describes the evolution of log daily wages at the 10th, 50th and 90th percentiles of the earning distribution. To be noted is that the 50th–10th and 90th–50th wage percentile ratios have all increased. Another finding is the very flat growth of wage levels at the bottom of the distribution. In particular, men's earnings at the 10th percentile have remained stable over the whole period, while median wages have risen by only slightly less than 10 per cent. Instead, the 90th percentile of the pay distribution has risen by more than 25 per cent in real terms, even if it stagnated during most of the 1990s.

In the left panel of Figure 4, using a method similar to Card *et al.* (2013), we test the predictive performance of a series of log-linear conditional wage models. To construct this figure, we have run year-by-year ordinary least

FIGURE 3  
Evolution of Log Daily Wages at by Percentile and Year.



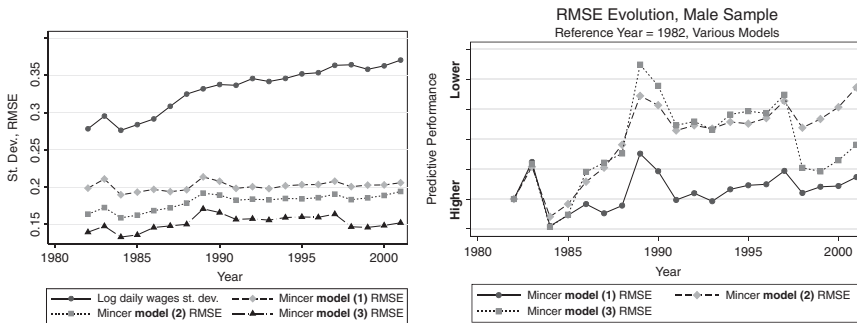
Source: Veneto Worker Histories.

squares regressions on the workers of firms located in Veneto, using different sets of controls. The uppermost line represents the unconditional log wage standard deviation. The other lines represent the root mean squared error (RMSE) of the regressions. In each model, we have used the same set of baseline covariates, namely: a quadratic term in age, occupation dummies, tenure dummies, log of firm size (number of employees), around 30 sector fixed effects, national industry-wide collective contract fixed effects and a set of interactions (age with occupation and age with tenure).

In addition to these covariates, each regression model is fully saturated for one of the following categories: (i) job titles (*livelli di inquadramento*), (ii) firms or (iii) both. National industry-wide collective contract fixed effects are not collinear with *livelli di inquadramento*, since the latter are specific job titles (usually between 5 and 10 defined by the former. Instead, firm fixed effects are collinear with sectors and, typically at least, also with industry-wide contracts. The procedure adopted in constructing job title and collective contract fixed effects is discussed in more detail in Section 5.

In general, the trend in residual wage standard deviation (RMSE) is fairly flat, while total pay dispersion shows a clear increasing pattern. Therefore, workforce composition and returns to its characteristics do much to explain the rise in wage standard deviation over time because they become increasingly relevant over time. Only a fairly small proportion of the unconditional wage variation remains unexplained when we estimate a model fully saturated

FIGURE 4  
Wage Standard Deviation and RMSE from Alternative Wage Models.



**Baseline Controls:** Age (quadratic), tenure dummies, four qualification dummies, log of employees number, sector fixed effects, national industry-wide collective contract fixed effects.

**Models' definition:** (1) job title (*livello di inquadramento*) fixed effects; (2) firm fixed effects; (3) fully saturated fixed effects for job titles and firms.

*Note:* National collective contracts vary within and across sectors, and might be not homogeneous across years. *Livelli di inquadramento* are job titles determined by each national collective contract, and are not homogeneous across years.

for job titles and firms. Firm fixed effects explain a greater proportion of wage variation than do job title fixed effects. However, when focusing on the evolution of the RMSE across time, the same pattern does not hold. In order better to compare the evolution of the relative performance of each of the three regression specifications, in the right panel of Figure 4, we normalize each year-specific RMSE to the 1982 level of the corresponding model. In interpreting the graph, note that the *absolute* predictive performance of a model has to be evaluated with respect to the unconditional wage variance. The right panel of Figure 4 is useful in order to compare the *relative* predictive performance of a model with respect to the others, but not the *absolute* one, which indeed tends to grow over time for all specifications.

When considering the right panel of the figure, a clear pattern emerges, because over time the explanatory power of fixed effects for job titles gains importance with respect to the models where firm effects are controlled for. Thus, we interpret this result as preliminary evidence of the importance of collective bargaining in shaping the evolution of pay dispersion. In Section 5, employing a more informative regression framework, we analyse this point in more detail.

#### 4. Decomposition of the wage structure using the AKM regression model

##### *Econometric Methodology*

The contributions of firm-specific, time-constant and time-varying components of wages to raising inequality are identified by relying on

the higher dimensional linear panel model of Abowd *et al.* (1999) (we also refer to this method as *two-way fixed-effects model* or AKM regression). In order to make inter-temporal comparisons, we adopt the same strategy of Card *et al.* (2013), dividing the years under study into different sub-periods.

Let  $i$  index a specific worker,  $t$  the time period and  $j = \iota(i, t)$  the firm in which  $i$  is working at  $t$ . Moreover, let  $y_i$  represent a  $T \times 1$  vector of log wages and  $x_i$  a  $T \times P$  matrix of time- and firm-varying individual characteristics. Then, the two-way fixed-effects model can be specified as follows:

$$y_{it} = x_{it}\beta + \phi_j + \eta_i + e_{it},$$

where  $y_{it}$  and  $x_{it}$  are rows of  $y_i$  and  $x_i$  and  $\beta$  is a  $P \times 1$  vector of parameters, while  $\phi_j$  and  $\eta_i$  are, respectively, firm-constant and time-constant components of individual wages, which are allowed to be arbitrarily correlated with any of the characteristics in  $x_i$ , and which may not be perfectly observable. We will often refer to  $\eta_i$  with the term *unobserved individual heterogeneity*, and to  $\phi_j$  with *firm wage premium* or *firm wage policy*.

In the above equation,  $e_{it}$  is the error term, which we assume to have an expected value equal to zero in all periods. As in Card *et al.* (2013), we assume that innovations in workers' unobserved earning abilities (which enter in  $e_{it}$ ) have mean zero for each individual, but contain a unit root. Match-specific effects, which may arise due to productivity shocks associated with particular job matches, are assumed to have mean zero for each firm and worker in the sample interval. In the next section, we show that including match fixed effects provides only marginal gains in the overall fit of the model, suggesting that the size of these idiosyncratic components is quite limited overall. Finally, we assume that  $e_{it}$  is not correlated with any of the elements in  $x_i$ ,  $\phi_j$  and  $\eta_i$ . This restriction, which we define as *strict exogeneity*, can be stated formally as

$$E[e_{it}|x_{is}, \phi_{j=\iota(i,s)}, \eta_i] = 0 \quad \forall s, t.$$

The above assumption rules out any pattern of endogenous mobility of workers between firms. Any realization of  $\iota(i, s) = j$  should be uncorrelated with  $e_{i,t}$ , so that, for example, negative idiosyncratic shocks in wages should not lead to mobility towards a certain type of firms. However, note that correlation between  $\iota(\cdot)$  and  $\eta_i$  or  $\phi_j$  is allowed under *strict exogeneity*. If this assumption holds, the model can be consistently estimated by OLS, via inclusion of dummies for individuals' and firms' effects.

Card *et al.* (2013) develop several tests to support the validity of the strict exogeneity assumption and the additive separability of firm and worker effects. These tests have been conducted on German data (Card *et al.* 2013), Portuguese data (Card *et al.* 2016) and also on Italian Social Security earnings data, albeit for a matched sample of large firms only (above 50 employees, see Macis and Schivardi 2016). All papers find no evidence in support of the endogenous workers' mobility hypothesis and conclude that the AKM model

provides a good approximation of the wage process. In an online Appendix, we compute several of these tests on the VWH data, showing evidence that does not support the presence of mis-specifications or endogenous mobility patterns.

The baseline control variables included in the AKM model are a cubic polynomial in age, a dummy for part-time workers, three dummies for occupation, dummies for the first five years of tenure and a full set of time fixed effects.<sup>3</sup> To account better for the seniority profile of earnings, we interact the age polynomial and tenure dummies with occupation fixed effects.

Workers' fixed effects measure the personal earning ability that is constant over time and is largely portable as individuals move to other firms during their labour market career. Instead, firm fixed effects measure the extent to which differences in wages paid by observationally similar employers matter, keeping employee time-constant characteristics and other observable factors constant. Unlike a simple average of the workers' wages in the firm,  $\phi_j$  can be interpreted as a firm-specific wage policy because the AKM model controls for worker observed and unobserved heterogeneity, and hence accounts for the potential non-random sorting of workers to firms. However, firms' wage premiums cannot be directly interpreted as indexes of efficiency or performance (Eeckhout and Kircher 2011). Nevertheless, since the focus of this analysis is on the determinants of *wage dispersion*, rather than on firms' performance variability, the parameter  $\phi_j$  is still highly informative for our purposes.

There are several reasons why similar firms may adopt differentiated wage policies. As highlighted by a large body of literature, firms may offer efficiency wages (Akerlof 1982), or they may adopt a so-called *wage posting behaviour*, offering higher wages in order to reduce the cost of vacancies (Burdett and Mortensen 1998). Moreover, firms may differ in the degree of rent-sharing, a phenomenon which Card *et al.* (2014) found to be small, but significant in magnitude, in the labour market analysed here.

In the AKM regression, each firm wage effect is computed with respect to an arbitrary reference category and, as shown by Abowd *et al.* (2002), it is identified only by workers who changed at least one employer within a given *connected set*. This is the group comprising all workers who ever worked for any of the firms in the group, and all the firms at which any of the workers in the group were ever employed. As in Card *et al.* (2013), we have dropped observations outside the largest connected set of firms, a restriction that implies the loss of an extremely small proportion of observations (around 1–2 per cent, depending on the period of observation).

The estimates of firms wage premiums may be biased whenever mobility across workplaces is low and the entire workforce is not observable (Andrews *et al.* 2008). For this reason, we report the main results only for firms located in Veneto, that is, those for which we can observe all their employees. However, firms outside this region are included in the regression, since otherwise we would have a loss in efficiency due to the exclusion of observable job mobility episodes from the estimation sample.

Given the linearity of our panel model, and under the assumption of *strict exogeneity*, the total variance of log wages can be decomposed as follows:

$$\begin{aligned} \text{Var}(y_{it}) = & \text{Var}(\phi_{j=l(i,t)}) + \text{Var}(\eta_i) + \text{Var}(x_{it}\beta) + \text{Var}(\epsilon_{it}) + \\ & + 2\text{Cov}(\phi_{j=l(i,t)}, x_{it}\beta) + 2\text{Cov}(\phi_{j=l(i,t)}, \eta_i) + 2\text{Cov}(\eta_i, x_{it}\beta). \end{aligned} \quad (1)$$

Thus, we can measure what are, among firm-specific, time-constant and observable time-varying factors, the main drivers of wage dispersion, and what forces lessen their magnitude over time. With the exception of the error term, the effect of each component on the total variance is mediated by the covariance terms. Of particular interest are the covariances associated with firms' pay premiums, since they measure positive or negative sorting of workers' earning ability into types of firms adopting specific wage policies.

The term  $\text{Cov}(\eta_i, x_{it}\beta)$  measures whether workers with higher wage components related to observable time-varying characteristics exhibit higher or lower time-constant unobserved heterogeneity. In practice, it is often difficult to provide an economic intuition concerning which human capital factors are absorbed by unobserved heterogeneity, and what drives the sorting between time-varying and time-constant characteristics of workers, since to some extent,  $\text{Cov}(\eta_i, x_{it}\beta)$  is also determined by how well given workers' skills are measured by the time-varying characteristics included in the regression. Therefore, in presenting our results, we more often rely on the following, more parsimonious decomposition:

$$\begin{aligned} \text{Var}(y_{it}) = & \text{Var}(\phi_{j=l(i,t)}) + \text{Var}(\eta_i + x_{it}\beta) + \text{Var}(\epsilon_{it}) \\ & + 2\text{Cov}(\phi_{j=l(i,t)}, \eta_i + x_{it}\beta). \end{aligned} \quad (2)$$

In equation (2), the term  $\text{Var}(\eta_i + x_{it}\beta)$  captures the joint effect of workers' time-constant and (observable) time-varying characteristics on the total wage variance, conditional on firm-specific factors. The variability of the term  $(\eta_i + x_{it}\beta)$  (which we also call *workers' portable pay component* or *workers' wage premium*) provides more concise information and has the advantage of avoiding an often data-driven and arbitrary division of time-constant and time-varying human capital factors. For this reason, the analyses that follow often refer to this term only.

#### *Variance Decomposition from the AKM Regressions*

Following Card *et al.* (2013), we have calculated the variance decomposition of equation (1) on five, partially overlapping, six-years panels.<sup>4</sup> In each panel, we have computed two-way fixed-effects regressions controlling for human capital and aggregate shocks in wages. The coefficients associated with the regressors included in  $x_{it}$  were all significant and had the expected sign. The adjusted *R*-squared ranged between 0.87 and 0.93.

For each panel, Table A1 reports the detailed AKM wage variance decomposition, as well as a comparison of these results with a model saturated with match fixed effects. Notice that the fit of the latter model is only marginally better, while the implied variance of match effects does not contribute to the growth of pay dispersion, as it is relatively constant across time. In other words, match components, representing additional pay premiums or discounts specific of each worker-firm pair, are a modest source of wage variability in the Italian context; thus, the additively separable specification of firm and worker effects in the standard AKM model provides a good approximation to the wage structure.

During the overall period considered, the total wage variance, as computed on each six-years sample, has increased from 0.082 to 0.124, growing by around 40 per cent. In each period, the largest contribution to the total variance derives from the joint effect of worker heterogeneity, both observed and unobserved. The variance of time invariant worker effects ( $\eta_i$ ) is always higher than the variance related to time varying characteristics ( $x_{it}\beta$ ). Indeed, having accounted for worker- and firm-specific intercepts, only a low proportion of overall variability in wages could be attributed to observable time-varying characteristics in our model. Moreover, the covariance between  $\eta_i$  and  $x_{it}\beta$  is always small and positive.<sup>5</sup>

Notice that the variance component related to firms' pay premiums provides a smaller contribution to overall wage dispersion than both worker's heterogeneity (i.e. the joint effect of time-constant and observable time-varying individual characteristics) and constant individual effects. Importantly, employers' pay policies are more relevant in the first period of the sample (1982–1987) than afterwards. Thus, firm-specific variability in wages has a lower explanatory power than worker-level factors, and its overall importance reduces over time. Finally, the estimated correlation between firm wage effects and worker's heterogeneity, considering both its observed and unobserved components, is increasing over time. Hence, there is a significant tendency towards more positive sorting of firms' wage premiums with workers' overall human capital.

To show these trends more clearly, Table 2 reports the decomposition of equation (2), computed in the first and in the last panel only. It emerges that during both periods (1982–1987 and 1996–2001), the most important determinant of total wage dispersion is the variance of workers time-constant and time-varying heterogeneity ( $\eta_i + x_{it}\beta$ ), which constitutes around three-fourth of the total pay variance. The lower part of Table 2 shows the evolution of earning dispersion from the earliest to the latest panel. For each pay dispersion component, we have computed the difference across samples, the percentage change and the contribution of this change as a percentage of the growth in the total wage variance.

Between the 1982–1987 and 1996–2001 periods, the total wage variance has risen by more than 40 per cent. Around 60 per cent of this growth is driven by higher dispersion in our comprehensive measure of workers' earning ability. On the contrary, the dispersion in firms' wage premiums declines between the



TABLE 2  
Decomposition of the Total Wage Variance Evolution

<i>Period</i>	$Var(\phi_j)$	$Var(\eta_i + x_{it}\beta)$	$Var(e_{it})$	$2Cov(\phi_j, \eta_i + x_{it}\beta)$	<i>TOTAL VAR.</i>
1982–1987	0.032	0.064	0.008	−0.022	0.082
% of Total	39.0%	78.0%	9.8%	−26.8%	100%
1996–2001	0.027	0.089	0.007	0.003	0.124
% of Total	21.8%	71.8%	5.6%	2.4%	100%
Difference	−0.005	0.025	−0.001	0.025	0.042
% $\Delta$	−16.9%	32.7%	−13.3%	263.2%	40.8%
% $\Delta/\Delta_{TOT}$	−11.9%	59.5%	−2.4%	59.5%	100%

*Note:* Percentage changes for a given quantity  $z$  from  $t - 1$  to  $t$  are computed using a reference value  $z_r$  defined as  $z_r = \frac{|z_t| + |z_{t-1}|}{2}$ .

first and the last panels, providing a *negative* contribution of about 12 per cent to the growth in wage dispersion. Finally, increasing assortative matching between highly paid workers and better paying firms provides another positive contribution to the growth in inequalities. This component represents around 60 per cent of the total trend, even if the correlation between individual skills and firm fixed effect ( $\phi_j$ ) is relatively small and close to zero in all sub-periods.

We interpret rising assortativeness as the result of at least two tendencies. First, it is tempting to relate the growth in sorting to some changes occurred in the Italian labour market and in its legislation since the 1980s. Like other EU countries, in fact, Italy has experienced a general trend of labour market modernization and liberalization that has affected virtually all aspects of labour market regulations. This process may have gradually reduced search and matching frictions, eventually improving allocative efficiency. For instance, during the 1980s, manual workers had to be selected almost exclusively from the unemployment workers' lists maintained by the public employment service, and not via direct selection mechanisms, because the hiring process was fully liberalized only in the early-1990s. Similarly, in the 1980s, hiring typically involved only open-ended contracts, while temporary contracts were gradually liberalized only from the second half of the 1990s onwards (in this regard, however, note that the growth in sorting characterizes also the years prior to this reform).<sup>6</sup>

A second set of potential mechanisms behind the growth in sorting is more mechanical and linked to the growth in the dispersion of human capital. In particular, a rise in relative wages of skilled workers may induce greater sorting in a market where assortative matching is (slightly) positive to being with. Moreover, since by construction, the measurement errors of  $\eta_i$  and  $\phi_j$  are negatively correlated, and this induces a downward bias on estimates of  $Cov(\eta_i, \phi_j)$  derived from AKM-style regressions (Andrews *et al.* 2008), a growth in the relative wage of skilled workers, by reducing the measurement error of unobserved abilities, may induce a rise in the covariance term. Unfortunately, with wage data alone, it is difficult to provide more nuanced tests on the relative importance of the various mechanisms mentioned above.

The issue of sorting, and of the determinants of its changes over time, is a key area for future research.

In the next section, we discuss how changes in the industrial relations system may have had a more direct bearing on the other two main findings of the article, that is, declining dispersion in firm wage policies and positive contribution of worker-specific wage components to the overall inequality growth. To this end, it is useful to assess the experience of the second largest manufacturing economy in Europe (Italy) in light of what has already been documented for its manufacturing leader (Germany).

### *Wage Inequality and Institutions: A Comparative Perspective*

Since we have used a sampling strategy and a method similar to the one applied by Card *et al.* (2013) on German data, it is particularly interesting to compare their evidence with that provided in our study. Moreover, in order to test whether the case of Veneto can be considered coherent with tendencies observed at the nation-wide level, we also compare our results with those obtained by estimating an AKM variance decomposition on the nation-wide visitINPS data.

Table 3 reports the decomposition of equation (2) applied to the VWH sample, to visitINPS data and that derived from the results of Card *et al.* (2013), considering comparable periods of time. It will be noted that the level of the variance in Veneto is always lower than in West Germany and in Italy. However, when considering the evolution over time, it emerges that male wage dispersion increases at a fairly similar pace in the three samples. This result is in part driven by the choice of the time period, as Card *et al.* (2013) document a persistent rising trend in pay inequality until 2008, while evidence provided by Figures 1 and 2 shows that in Italy, this growth lasted only until the early 2000s.

Table 3 shows that, remarkably, the determinants of inequality trends are very similar in Veneto and Italy, but they are quite different when compared with German results. Card *et al.* (2013) show that, considering differences between the first and the last period, only 34 per cent of the total growth in wage variance can be attributed to greater individual heterogeneity dispersion, while the same amount is more than 60 per cent in the case of Veneto and more than 70 per cent in Italy. Between the same periods, firms' pay premiums dispersion rose by almost 25 per cent in Germany, while it reduced by around 7 per cent in Veneto and 6 per cent in Italy. Finally, Card *et al.* (2013) also find that the sorting between firm-specific and employee-specific pay premiums contributed for another 36 per cent to the overall growth in earnings inequality, which is a weaker figure than what we have documented for Italy (42 per cent) and Veneto (55.9 per cent).

Card *et al.* (2013) link their findings, and, in particular, the growth in firms' wage policies dispersion, to the major changes that occurred in the German industrial relation system from the early-1990s onwards. As discussed by Dustmann *et al.* (2009), rather than in legislation reforms, such changes were

TABLE 3  
Wage Variance Evolution in Veneto, Italy and West Germany

<i>Veneto, Veneto working histories data, male sample</i>					
<i>Period</i>	$Var(\phi_j)$	$Var(\eta_i + x_{it}\beta)$	$Var(e_{it})$	$2Cov(\phi_j, \eta_i + x_{it}\beta)$	<i>TOTAL VAR.</i>
1984–1989	0.029	0.068	0.008	−0.016	0.090
% of Total	32.2%	75.6%	8.9%	−17.8%	100%
1996–2001	0.027	0.089	0.007	0.003	0.124
% of Total	21.8%	71.8%	5.6%	2.4%	100%
% $\Delta$	−7.1%	26.8%	−13.3%	292.3%	31.8%
% $\Delta/\Delta_{TOT}$	−7.1%	61.8%	−2.9%	55.9%	100%
<i>Italy, VisitINPS data, male sample</i>					
<i>Period</i>	$Var(\phi_j)$	$Var(\eta_i + x_{it}\beta)$	$Var(e_{it})$	$2Cov(\phi_j, \eta_i + x_{it}\beta)$	<i>TOTAL VAR.</i>
1984–1990	0.039	0.087	0.013	0.004	0.143
% of Total	27%	61%	9%	3%	100%
1997–2003	0.036	0.117	0.010	0.022	0.185
% of Total	20%	63%	5%	12%	100%
% $\Delta$	−7%	29%	−27%	141%	26%
% $\Delta/\Delta_{TOT}$	−6%	71%	−8%	42%	100%
<i>West Germany, IAB Data, male sample (from Card et al. 2013)</i>					
<i>Period</i>	$Var(\phi_j)$	$Var(\eta_i + x_{it}\beta)$	$Var(e_{it})$	$2Cov(\phi_j, \eta_i + x_{it}\beta)$	<i>TOTAL VAR.</i>
1985–1991	0.025	0.095	0.014	0.005	0.139
% of Total	18.1%	67.9%	10.2%	3.8%	100%
1996–2002	0.038	0.112	0.017	0.023	0.190
% of Total	19.9%	59.0%	8.9%	12.3%	100%
% $\Delta$	39.3%	16.6%	17.6%	125.5%	30.5%
% $\Delta/\Delta_{TOT}$	24.6%	34.2%	5.5%	35.7%	100%

Note: Percentage changes for a given quantity  $z$  from  $t - 1$  to  $t$  are computed using a reference value  $z_r$  defined as  $z_r = \frac{|z_t| + |z_{t-1}|}{2}$ .

laid out in contracts and mutual agreements between employer associations, trade unions and works councils. In response to the challenges of the post-reunification period (e.g. increasing threats of firms' offshoring and massive migration flows), these actors allowed for an unprecedented decentralization of the German wage-setting process after the early-1990s. Deviations from industry-wide agreements through "opting-out," "opening" or "hardship" clauses were all increasingly used, even though the dominant system of industry-wide bargaining basically remained unchanged. In this regard, Card *et al.* (2013) observe that firms' pay premiums, as computed on the 1996–2002 sample, are disproportionally lower among establishments that had *opted out* from national collective agreements, a tendency that enlarges the overall dispersion in such wage components. Thus, in Germany, the growth in the variance of firm-specific wage policies ( $Var(\phi_j)$ ) was associated with a growth in the share of workers not covered by any kind of union agreement and to a rise in the number of firm-level deviations from industry-wide union agreements.

Italy's system of industrial relations shares many features with that of Germany, particularly as regards the importance of industry-wide collective bargaining. However, in many respects, the Italian system has not shown the flexibility exhibited by the German one, nor have the reforms that occurred in Italy during the mid-1990s significantly weakened the influence of collective bargaining on wage setting. Italian firms have never been able to opt out from the industry-wide settlements, adjusting wages downwards whenever the local or firm-specific economic conditions so required (see Section 2). This may explain why, unlike in the German case, the variance of Italian firms' wage policies has not widened over time, despite the fact that also Italy has been exposed to the long-run challenges posed by the introduction of new technologies and increased international competition.

Note that, according to our estimates, the variance of firms wage policies actually decreased from the mid-1980s to the early 2000s. Unable to deviate from the industry-set minimum wages, Italian firms could still resort to *incremental* firm-level wage bargaining to differentiate their firm wage policies. Our data do not allow us to observe which firms or workers were covered by firm-level agreements. Nevertheless, the available evidence suggests that the incidence of firm-level agreements declined over time (e.g. Sestito and Rossi 2000), partly as a consequence of a reduction in unionization rates, as shown for Veneto by Vaona (2006). The resulting standardization of compensation schemes across employers is consistent with our finding of a decreasing dispersion in firms' pay policies.

Table 3 shows that the dispersion of observed and unobserved individual heterogeneity has instead been a major contributing factor to the overall wage inequality growth in the Italian case. While, in principle, this trend may reflect the underlying labour market forces, for example, demand for and supply of skills, in the following section, we argue that such market forces have been largely "channelled" into the tight tracks set by the Italian system of industrial relations, particularly through the sectoral-level bargaining process. We do so by showing that the growth in individual heterogeneity dispersion has been almost entirely driven by broadened differences in pay among the job title categories (*livelli di inquadramento*) defined by industry-wide collective contracts.

## 5. The impact of collective bargaining on wage and human capital dispersion

### *Variance Decomposition Method*

This section shows that overall pay dispersion is mostly determined by *between job titles* earning variability and it links this outcome to the evolutions occurred within collective bargaining agreements. For this purpose, we have applied a variance decomposition methodology that divides total variation of a given quantity, which is partitioned into groups, into differences among groups and differences among members of the same group.

Keeping fixed a given period  $t$ , let  $y_{ij}$  represent wages (or another quantity of interest) of worker  $i$  in group  $j$ , let  $n$  be the total number of workers, let  $J$  be the number of groups and let  $n_j$  be the set of employees in group  $j$ . Define  $\bar{y}_j$  as the average level of wages within group  $j$ , and define the within group variance as

$$V_j = (\|n_j\| - 1)^{-1} \sum_{i \in n_j} (y_{it} - \bar{y}_j)^2,$$

where we indicate by  $\|n_j\|$  the cardinality of the set  $n_j$  (i.e. the number of employees in group  $j$ ). Using the above notation, we can decompose the total wage variance into a *within group component* and a *between group component* as follows:

$$\text{Var}(y) = \frac{1}{n-1} \left( \underbrace{\sum_{j=1}^J (\|n_j\| - 1) V_j}_{\text{within component}} + \underbrace{\sum_{j=1}^J \|n_j\| (\bar{y}_j - \bar{y})^2}_{\text{between component}} \right). \quad (3)$$

The next section presents results obtained by using *livelli di inquadramento*, as defined by collective bargaining institutions, to partition the population. Then we also apply the same decomposition using firms to define groups  $j$  in equation (3). The discussion of potential mechanisms driving the respective *within* and *between components* of the variance is provided in each of these sections.

Since the term  $(\eta_i + x_{it}\beta)$  in the AKM regression model is one of the main determinants of inequality, we have applied the decomposition technique defined above to this worker's *portable* wage component. For comparison, we have also applied the same procedure to total wages. Note that when the variance of *total* wages is decomposed across time, the resulting trend provides a composite effect, that is, it is the result of greater sorting, greater human capital dispersion and relatively stable firms' wage policies dispersion (see Table 2).

### *Wage Components Dispersion Within and Between Job Titles*

In the Italian system of industrial relations, the allocation of a worker to a given *livello di inquadramento* is typically related to the tasks performed on the job and to other time-invariant personal characteristics, mostly captured by the fixed effect embedded in the workers' portable pay component. The effect of promotion to higher ladders of the scale, as well as the (fairly automatic) seniority wage premiums stipulated at each ladder by the relevant collective contract, are reflected in the time-varying component of the estimated worker premium. Individual firms can affect pay differentials among *livelli di inquadramento* only as regards the part above the statutory minimum wages,

which are set at the industry-wide level. Moreover, by law, employers are not allowed to downgrade workers into less remunerative job titles, an element providing further rigidity in firms' wage adjustment decisions.

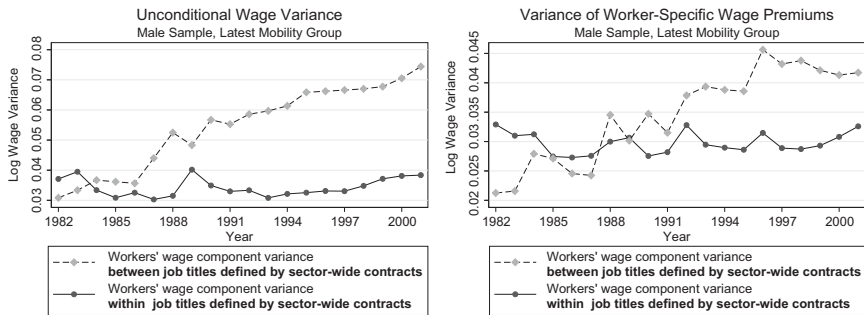
Given this institutional context, the *between* job titles variance in workers' portable wage components can be considered an informative parameter to quantify the impact of collective bargaining on wages. A different measure is proposed by Torres *et al.* (2013), who directly include occupation dummies in an AKM model to study the effect of job title membership on wages. However, in the Italian context, our approach is more suitable for studying the influence of collective bargaining on *wage dynamics*, since the rules for assigning each worker to a job title are set by the relevant collective contract and can change over time. For example, several managerial occupations have been regulated by autonomous industry-wide collective contracts since the end of the 1980s. The resulting shift in the segregation of workers across minimum wage levels defined by collective contracts raises challenges on how to compare and interpret the variance of job title fixed effects across time. Instead, the proposed variance decomposition, computed on a yearly basis, makes it possible to capture to a full extent such institutionally-driven shifts in the segregation of workers across various minimum wage levels.

Before presenting the decomposition results, we provide further information on how *livelli di inquadramento* have been identified in the data. As mentioned in Section 2, several economic activities, despite being similar in their nature, can be regulated by more than one collective contract and the number of such industry-wide agreements, as well as the number of job titles defined by them, can change over time. Therefore, we have not attempted to harmonize the definition of job titles across years. We have instead considered the year-specific definition of *livelli di inquadramento*, based on their classification code. As an inclusion rule, we have adopted the criterion of considering as a legitimate job title only those for which at least 150 observations were present in a given year in the largest connected set of Veneto firms.<sup>7</sup> The total number of *livelli di inquadramento* included in the decompositions ranged between 435 (in 2001) and 520 (in 1984). Moreover, the percentage of observations which we were able to include in our decompositions ranged between 83 per cent of the total in 2001 and 69 per cent in 1986.

Figure 5 reports the results of the variance decomposition of wages (left panel) and human capital (right panel) into a *between*- and a *within*-job titles components applied year-by-year. Given that the sum of the two series provides the total variance, the growth in the dispersion of raw wages represents the composite effect of greater sorting of better paid workers to better paying firms and of individual heterogeneity (see Table 2), while the right panel of the figure gives the evolution of the latter component only. Both graphs show that practically, all of the growth in the dispersion of wages and of workers' *portable* wage components is accounted for by *increased variability between livelli di inquadramento*. Indeed, in the case of both unconditional wages and individual heterogeneity, the *between* part of the total variance

FIGURE 5

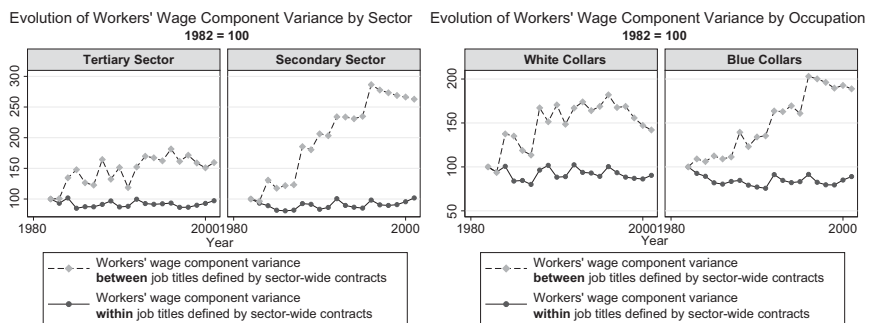
Unconditional Wage Variance and Workers' Wage Premiums Variance Decomposition Within- and Between-Job Titles.



Job titles (*livelli di inquadramento*) are defined within each sector-wide collective contract. In each year, we have selected only job titles represented by at least 150 workers in the largest connected set of Veneto firms, including a total number of distinct job titles between 435 (in 2001) and 520 (in 1984).

FIGURE 6

Workers' Wage Premiums Variance Within- and Between-Job Titles by Sector and Occupation.

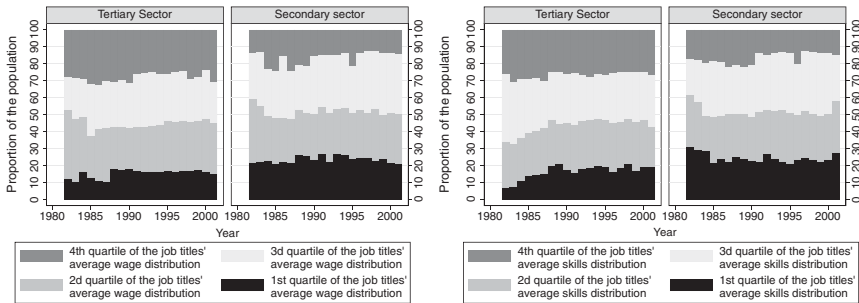


shows a growing trend, with the partial exception of the second half of the 1990s, while the within component is persistently flat. As a consequence, in relative terms, this latter source of variation loses importance as a determinant of overall inequality.

Figure 6 reports the evolution of between- and within-job titles workers' wage premiums dispersion by sector (secondary and tertiary) and by broad occupation (white and blue collars), computed by normalizing the 1982 levels of dispersion to 100. A trend similar to the one implied by the right panel of Figure 5 is observed for all categories of workers, but the growth of between-job titles dispersion in human capital is considerably stronger among production workers and in the secondary sector. In the next section, we show that, even if the pace of growth in workers' heterogeneity dispersion is different across sectors, it is not driven by a handful of (secondary sector and low skilled) industries. Indeed, as we discuss below, the growth in this component of the wage variance is entirely driven by within-firms dispersion.



FIGURE 7  
Proportion of Workers Within Quartiles of the Job Titles' Average Pay and Skills Distribution.



Two main mechanisms can explain the trend towards higher between-job titles differences in wages. First, several collective contract renewals may have enlarged the gaps between job-titles pay scales. Alternatively, firms may have simply increasingly assigned employees to higher (lower) *inquadramento levels*, as a way to raise (lessen) the base wage of workers. Below, we provide evidence on the relative role of these two mechanisms. The left panel of Figure 7 shows the proportion of workers within each quartile of the job titles' average wage distribution, while the right panel shows the same statistic using the average workers' heterogeneity distribution. In constructing the graph, we have computed year-by-year the average wage (or its portable component) within each job title, separately considering workers in the secondary and tertiary sectors. For each of these two sectors, we have classified each job title according to the quartile of the job titles' average pay distribution to which it belongs. Then, we have computed year-by-year the proportion of workers within each quartile group of job titles. Note that, since we have not weighted this distribution by the number of observations within each job title, a given percentile of the job titles' average pay distribution can be quite different from the same percentile of the wage distribution.

The left panel of Figure 7 shows that the proportion of workers within each quartile of the job title pay distribution has been fairly constant during the overall period considered. There are some exceptions to this general trend, but most discrepancies across time tend to be year-specific and small in magnitude. Moreover, they may in part be attributed to differences in the job title classification codes from one year to the other. The right panel of Figure 7 shows that even when differences in employers' wage policies are controlled for in defining job titles quartiles, most tendencies remain similar to the ones provided in the left panel. Overall, by analysing the composition of job title categories across time, we can conclude that the main channel driving greater wage dispersion is linked to differences in how the same occupations are rewarded across time. Thus, there is no clear evidence of a process of *polarization* of the workforce.

To sum up, increased differences in minimum wage levels and seniority premiums set for each *livello di inquadramento* are the most likely drivers of the growth of Italian pay dispersion observed from the 1980s until the early 2000s. Indeed, almost all of the inequality growth has arisen from differences in pay among these job titles. Still unclear is the extent to which institutions have simply reacted to market forces, or whether they have represented a distortion to the wage structure. Some hypotheses on the relative importance of market-driven and institutions-driven mechanisms are further tested in the next section, where we consider the role of workers' segregation across firms. Nevertheless, we can conclude that the growth in Italian wage inequality has been allowed by the opening of the pay gaps between the various *livelli di inquadramento* stipulated in a fairly centralized way at each industry-wide contract renewal, combined with the gradual dismantling of the egalitarian wage indexation system since the mid-1980s.

#### *Wage Components Dispersion and Segregation across Firms*

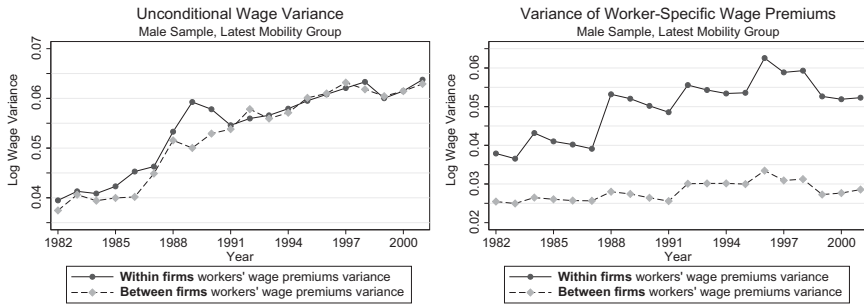
The growth of pay differentials among job titles, which we have just documented, could also derive from a process of segregation of the more qualified workers into given enclaves of firms. Such a market-driven process would then probably be reflected in collective bargaining dynamics, given that more skill-intensive firms could be able to grant better economic conditions to selected groups of job titles. On the other hand, if this segregation is low, despite a general growth in job title heterogeneity, we may think that employers are constrained by the sectoral bargaining standards, given that most of the growth in the dispersion of human capital occurs within establishments, instead of across them. We test this hypothesis by computing year-by-year the decomposition of equation (3), this time using firms as the partitioning group of the population.

Figure 8 reports the within- and between-firms variance decomposition, applied to wages and to the estimated individual heterogeneity of the workforce. The left panel of the figure shows that raw wage variation is almost equally split into a within- and a between-firms component. Given the results that emerged from the AKM variance decomposition (see, in particular, Table 2), the growth across time in the unconditional wage variance *between firms* can be entirely ascribed to increased sorting of workers' wage premiums with firms' pay premiums. Indeed, there is no evidence of increased dispersion of firms' pay policies.

In the right panel of Figure 8, we compute the same variance decomposition using workers' wage premiums alone, instead of total wages. This exercise makes it possible to test whether the *segregation* of workers' earning abilities across firms has increased, or whether differences in this component of the total variance have been growing mostly *within* workplaces and among co-workers. It emerges that the dispersion of human capital *between employers* has been persistently flat over the entire period considered. Therefore, we find no evidence of greater segregation of workers' skills across employers, as the

FIGURE 8

Within- and Between-Firms Decomposition of Unconditional Wage Variance and Workers' Wage Premiums Variance.



Worker's wage premiums variance is defined as  $\text{Var}(\eta_i + x_{it}\beta)$ . Since each panel that we have constructed is partially overlapping, for each year, we report only estimates of  $\text{Var}(\eta_i + x_{it}\beta)$  from the latest available period. For each year, the unconditional wage variance is computed on the largest connected set in the latest panel. Only firms located in Veneto are considered.

growth in the variance of this wage component is entirely driven by *within firms* heterogeneity.

The low level of segregation in human capital across workplaces documented here is coherent with the findings of previous studies on Italy (such as Iranzo *et al.* 2008), but it is a quite peculiar result when compared with evidence available for other European countries and the USA (see, e.g., Faggio *et al.* 2010 on the United Kingdom, Card *et al.* 2013 on Germany and Barth *et al.* 2016 on United States). Overall, Italy is not characterized by strong dispersion in firms' wage policies, and the distribution of workers has not shifted towards a more segregated structure, where successful firms are able to attract the best employees, leaving out those who do not have access to such networks. These two tendencies could have been relevant if, for example, greater dispersion in productive performance across employers, often considered an outcome of technological changes and international competition, had induced greater heterogeneity in wages and workforce composition between plants.

Considering the importance of pay dispersion among job titles, which is documented by Figure 5, together with the evidence just presented, we can conclude that the growth of Italian pay inequality has entirely occurred within the collective bargaining framework. That is to say, over the years, the system of industrial relations has granted more heterogeneous conditions for selected categories of workers (i.e. job titles), while it has provided limited margins of flexibility for firms. Arguably, the flat growth in wage dispersion observed from the early 2000s until the most recent years (see Figures 1 and 2) could be the consequence of more egalitarian tendencies within this institution, especially given its important role uncovered by our analysis and the absence of major reforms in wage setting mechanisms characterizing this period.

## 6. Conclusions

In this article, we have analysed the evolution of Italian wage inequality in the most recent decades. We have documented that, after a period of strong wage compression taking place in the 1970s, there was a substantial growth in several measures of pay dispersion from the 1980s until the early 2000s and a relatively flat tendency since then. To interpret this trend, we have analysed the period of growth in wage inequality by decomposing the wage variance into components capturing heterogeneity in firms pay policies, heterogeneity in workers' time-varying and time-constant characteristics, as well as their sorting. We have relied mostly on matched employee–firm data from the Veneto region, a large and self-contained labour market that shares several characteristics with the most developed and manufacturing-oriented Western countries. We have found that earnings dispersion has been mostly driven by differences in the workers' portable component of wages. Instead, the variability of employer-specific pay premiums has diminished over time. Interestingly, when we replicate our analyses on the recently released data for the entire country, we find that the Veneto results are very similar to those obtained for Italy as a whole, despite the large territorial differences that characterize the country.

Our results are different from evidence documented for other countries, and Germany in particular. In this respect, we have provided indirect support for the conclusions of Card *et al.* (2013). These authors report evidence of a growth in firms' pay premiums dispersion. They attribute this finding to firm-level deviations from the dispositions of industry-wide collective agreements (e.g. the *opting-out* clauses), which were allowed by the German system and became increasingly used from the mid-1990s onwards. We have documented the lack of such a flexible adaptation process in a similar manufacturing-oriented economy, which has undergone qualitatively different reforms in its system of industrial relations. Italian firms have been unable to apply heterogeneous pay policies, and to circumvent the constraints on wage dynamics imposed by the sectoral level of bargaining.

To shed further light on the role played by collective bargaining in the observed inequality trend, we have analysed the evolution of pay differentials across so-called *livelli di inquadramento*, job titles defined by nation-wide sectoral collective agreements, for which specific minimum wages apply regardless of a worker's union membership. A simple variance-decomposition exercise allowed us to show that the increased dispersion in wages, and in the workers' portable component of wages, has almost entirely occurred between such job titles.

In general, our results show that market forces have been largely “channelled” into the tight tracks set by the rules governing the country's fairly centralized system of industrial relations. Collective bargaining can also account for the episodic nature of the observed increase in inequality. Our results suggest that minimum wage levels set at the industry-wide level have become increasingly more dispersed during the 1980s and 1990s, and

this has been the main mechanism driving the growth of inequality in Italy. The most plausible explanation for why unions and other industrial relations actors pursued such an opening-up of the wage differentials is obtained by simply looking at the long-run evolution of wage inequality. During the 1970s, the automatic wage-indexation clause known as *Scala Mobile* produced a strong wage compression. This fostered resentment not only among top-paid workers but also among those at the middle of the hierarchy (on this topic, see, among others, Manacorda 2004). Our interpretation of the growth in wage inequality that followed, between 1983 until the early 2000s, is as a sort of “compensation” for the excessive compression of the previous decade. If so, one would expect that, once the wages set in subsequent rounds of collective agreements had reached the “desired” level of dispersion, the increasing trend in wage inequality would flatten out, which is exactly what we document in the article. After 2001 (and largely before the Great Recession), Italian inequality has remained relatively stable.

Overall, there are some valuable lessons to be learned from our analysis. First, the specificities of a country’s labour market institutions and industrial relations system matter for the developments of wage inequality, and they do so in more nuanced ways than typically emphasized by the empirical literature. For the same reason, we should not expect that countries subject to largely similar underlying market forces, for example, related to globalization and technological changes, should exhibit the same increasing pattern of wage inequality. Since Italy is the second largest EU manufacturing economy and is characterized by wage setting institutions quite similar to those of other important countries (e.g. France), we believe that the article presents a notable case study. Our analysis also provides a method to test the relative importance of collective bargaining institutions in shaping wage dynamics. This method has the potential to be applied in several European countries that are characterized by fairly centralized collective bargaining institutions.

Finally, we believe that important lessons can be learned from comparison of the Italian experience with that of Germany, a country that — despite the dominant role of industry wage-bargaining — displayed an unexpected degree of flexibility and decentralization in its industrial relations system. According to Dustmann *et al.* (2014), this factor has been important in boosting the German economic performance after the early 2000s, albeit at the cost of more wage inequality. In this regard, our comparative analysis informs the ongoing debate on the relative merits and costs of decentralization of wage bargaining in European countries.

Final version accepted on 2 September 2018

## Acknowledgements

We would like to thank Fabio Berton, Tito Boeri, David Card, Pietro Garibaldi, Lia Pacelli, Giovanni Sulis, Andrea Weber, participants at the

XXXII AIEL Conference, V Linked Employer Employee Data Conference, 2016 European Association of Labour Economists Conference, 2016 Conference of the European Society of Population Economics, VisitINPS seminars and Collegio Carlo Alberto workshops for useful comments and feedbacks. We would also like to thank Massimo Antichi and Mariella Cozzolino for their support throughout this project. We kindly acknowledge funding support and data access provided by the VisitINPS programme. Francesco Devicienti and Bernardo Fanfani kindly acknowledge funding support provided by the PROWEDEC (Productivity, Welfare and Decentralized Bargaining) project, financed by the Compagnia di San Paolo and by the University of Turin.

## Notes

1. Other works on Italian wage inequality include Dell'Aringa and Lucifora (1994), Erickson and Ichino (1995), Brandolini *et al.* (2002), Manacorda (2004), Naticchioni and Ricci (2009), Devicienti and Borgarello (2001), Cappellari (2004) and Cappellari and Leonardi (2016). Although they all emphasize the role of Italian institutions and collective bargaining, none of them study the wage variance decomposition based on the AKM method developed by Abowd *et al.* (1999) and its evolution over time, because of limitations in the type of data that they use. AKM models are estimated by, for example, Iranzo *et al.* (2008) and Macis and Schivardi (2016), but their focus is not on the dynamics of wage inequality.
2. The Veneto data are freely accessible to researchers through the Fondazione Rodolfo De Benedetti (<https://www.frdbo.org>). The data covering the entire country are only accessible to researchers holding one of a small number of competitive VisitINPS grants. See the VisitINPS Scholars section at <https://www.inps.it>
3. Following Card *et al.* (2018), we identify all time effects by omitting the linear age term and we include the higher order age terms in deviation from age 50.
4. By fitting separate models in each sub-period (even if partially overlapping), we can measure long-run changes occurred in both returns to workers and firms characteristics (changes in average prices) and sample composition across periods. An alternative approach would be to estimate worker and firm fixed effects interacted by sub-periods dummies. We have chosen the less computationally demanding strategy adopted by Card *et al.* (2013), which provides a smoother representation of the wage structure evolution across time and it eases the comparability of our results. Finally, notice that, due to limited mobility bias (e.g. Andrews *et al.* 2008), in general, there is a trade-off between the length of each time period over which the AKM parameters are estimated and the precision of such estimates, so that letting the panels be overlapped can be considered the most consistent choice.
5. This is an indirect evidence that  $\eta_i$  and  $x_{it}\beta$  are separately identified. Indeed, as suggested by Card *et al.* (2018), the presence of a strongly negative covariance between these two terms is typically the outcome of an incorrect specification of the time-varying controls of the model.
6. Fixed-term contracts were liberalized only after 1997, with the so-called Treu reform, and then in 2003 with the Biagi law. An evaluation of specific labour market interventions on sorting falls outside the scope of this article, and, in general,

it would be difficult to conduct because there has been a constant flow of often overlapping and across-the-board (i.e. for the entire private sector) reforms.

7. This inclusion rule has been chosen to mitigate measurement error issues which are embedded in job titles' classification codes. When computing the variance decomposition using different thresholds, we did not find great sensitivity in the results.

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## Appendix

TABLE A1  
Detailed Variance Decomposition of Log Daily Wages

<i>Period</i>	<i>Var</i> ( $\phi_j$ )	<i>Var</i> ( $\eta_i$ )	<i>Var</i> ( $x_{it}\beta$ )	<i>Var</i> ( $\epsilon_{it}$ )	<i>2Cov</i> ( $\phi_j, x_{it}\beta$ )	<i>2Cov</i> ( $\phi_j, \eta_i$ )	<i>2Cov</i> ( $\eta_i, x_{it}\beta$ )	<i>TOTAL</i> <i>VAR.</i>
1982–1987	0.032	0.052	0.008	0.008	0.002	−0.025	0.004	0.082
1984–1989	0.029	0.052	0.009	0.008	0.002	−0.020	0.007	0.090
1988–1993	0.027	0.058	0.010	0.008	0.005	−0.010	0.012	0.110
1992–1997	0.028	0.061	0.010	0.006	0.006	−0.011	0.014	0.117
1996–2001	0.027	0.060	0.018	0.007	0.007	−0.007	0.011	0.124

<i>Comparison of AKM and match models</i>						
	<i>1982–1987</i>	<i>1984–1989</i>	<i>1988–1993</i>	<i>1992–1997</i>	<i>1996–2001</i>	
AKM adj. $R^2$		0.866	0.877	0.908	0.928	0.926
Match model adj. $R^2$		0.886	0.896	0.922	0.942	0.942
Variance of match effects		0.006	0.006	0.006	0.005	0.006

*Note:* The estimation sample is composed of all workers in the largest connected set, provided that they were employed for at least four months. The AKM variance decomposition is computed only for firms located in Veneto. The variance of match effects is estimated as difference in mean squared errors between the AKM model and a match effect model (i.e. a model with separate fixed effects for each worker–firm pair).

## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.