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in Italy**

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Collective Bargaining and the Evolution of Wage Inequality in Italy

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Collective Bargaining and the Evolution of Wage Inequality in Italy

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Abstract

Italian male wage inequality has increased at a relatively fast pace from the mid-1980s until the early 2000s, while it has followed a flat trend 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*, *i.e.* 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.

JEL Codes: J00, J5, J31, J40.

Keywords: Wage Inequality; Collective Bargaining; Firm Wage Policy; Two-Way Fixed Effects; Matched Employer-Employee Data.

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1 Introduction

Wage inequalities have risen 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] are 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 occurred 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 relevant mechanisms and have several merits, they do not always accurately predict the substantial heterogeneity in the wage inequality trends observed not only between Europe and Anglo-Saxon countries (*e.g.* Blau and Kahn [1996] and 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 evidences suggest 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. On this respect, several contributions 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 US, and in Faggio et al. [2010] for the UK). One important factor beyond the rise of the between-firm component appears to be related to raising 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 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.* Faggio et al. [2010] and Barth et al. [2016]) 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 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 allowed to cut unit labour costs and to improve international competitiveness, fostering the German economic growth observed in the last decade.

Our paper aims at showing the relevance of collective bargaining in driving the developments of wage inequality in another large manufacturing and export-oriented EU economy: Italy. We also aim at drawing comparative lessons with (West) Germany, a country similar to Italy in many respects. Despite 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 much to bear on these results.

To draw 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. To our aims, 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 evolu-

tion 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) reduced in the 1970s, increased from the early 1980s until the early 2000s, and stayed relatively constant until the present days. 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, 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 provides 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.¹

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 settled within the relevant industry-wide collective agreements. A large proportion of the growth of Italian pay dispersion is due to raising 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, an evidence that, partly owing to data limitations in past research on Italian wage inequality, has never been so extensively documented before.

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 to 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 notice 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 could be classified in more than one *livello di inquadramento* and that for each of these groups a sector-specific binding minimum wage applies.

In 1993 a major reform of collective bargaining was approved, in order 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 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% of national private-sector contracts, these authors show that the average share of all top-up components over total wages increased from around 18% during the mid-1980s, to only 22% 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 can be noticed that inequali-

ties 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] and 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 at further mitigating its egalitarian effects. As a consequence, the compensations associated to 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, is instead characterized by a very persistent growth in pay inequality. Notice however that during the most recent years, as overall wage dispersion reaches levels similar to those of the 1970s (before the introduction of the *Scala Mobile*), this trend of growth actually stops.

3 Data and Preliminary Evidences on Inequality

3.1 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 career of workers in these firms is observed also if they have job spells outside of 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 as self-employed. In order to analyse a more homogeneous and consistent sample across time, we have divided the data by gender and, throughout this paper, we discuss only results obtained among men. This choice allows us

to compare more easily our results to evidences 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 men's one.

To our aims, Veneto represents a particularly informative case-study. 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% of the national GDP. These features makes 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 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. On this topic, 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 on the period that ends in early 2000s are significant limitations for the paper's aims and analysis. To show that this is indeed the case, we complement our analysis based on VWH with evidences from the recently available country-level matched employer-employee VisitINPS database, which contains the universe of Italian social security records for private-sector employees.² This allows us to both compute inequality in Veneto for the extend 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, an evidence mostly attributable to the relevant 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 4.3, even the trends in the various AKM variance components are similar between Veneto and Italy (see in particular Table 3).

3.2 Sample Selection and Descriptive Statistics

The VWH data gathers information on pay gross of taxes and inclusive of all cash benefits, but it excludes 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 the 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 paper 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-years 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 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-collarers. Notice that secondary sector is defined as manufacturing and constructions, 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 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 paragraph, we present a more accurate description of this trend.

3.3 Preliminary Evidences on Inequality

Figure 3 describes the evolution of log daily wages at the 10th, 50th and 90th percentiles of the earning distribution. It can be noticed that the 50th-10th and 90th-50th wage percentile ratios have all increased. Another evidence 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%. Instead, the 90th percentile of the pay distribution has risen by more than 25% in real terms, even if it has been stagnating 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 OLS regressions on the workers of firms located in Veneto, using different sets of controls. The highest 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 thirty sector fixed effects, national industry-wide collective contract fixed effects, 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: (1) job titles (*livelli di inquadramento*), (2) firms or (3) both. National industry-wide collective contract fixed effects are not collinear with *livelli di inquadramento*, since the latter are specific job titles (usually between five and ten) 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 a good job in explaining the rise in wage standard deviation over time, as 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 for job titles and firms. Firm fixed effect explain a greater proportion of wage variation than job title fixed effects. However, when focusing on the evolution of the RMSE across time, the same pattern does not hold.

In order to better 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, notice 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, as 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 a 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

4.1 Econometric Methodology

The contributions of firm-specific, time-constant and time-varying components of wages to raising inequality are identified 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, 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 , β is a $P \times 1$ vector of parameters, while ϕ_j and η_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 could be not perfectly observable. We will often refer to η_i with the term *unobserved*

individual heterogeneity, and to ϕ_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 could arise due to productivity shocks associated to particular job matches, are assumed to have mean zero for each firm and worker in the sample interval. In Section 4.2 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, ϕ_j and η_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, notice that correlation between $\iota(\cdot)$ and η_i or ϕ_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 evidences that do 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.³ To account better for the seniority profile of earnings, we interact the age polynomial and tenure dummies with and 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 how much differences in wages paid by observationally similar employers matter, keeping constant employee time-constant characteristics and other observable factors. Unlike a simple average of the workers' wages in the firm, ϕ_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 can not 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 ϕ_j is still highly informative for our purposes.

There are several reasons why similar firms may adopt differentiated wage policies. As highlighted by a vast stream of literature, firms could offer efficiency wages (Akerlof [1982]), or they could adopt a so-called *wage posting behaviour*, offering higher wages in order to reduce the cost of vacancies (Burdett and Mortensen [1998]). Moreover, firms could 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 containing 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 of the largest connected set of firms, a restriction that implies the loss of an extremely small proportion of observations (around 1-2 %, depending on the period of observation).

The estimates of firms wage premiums could 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 including only for firms located in Veneto, *i.e.* 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

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

Thus, we can measure which are, among firm-specific, time-constant and observable time-varying factors, the main drivers of wage dispersion, and which 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 to 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 for 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

$$\text{Var}(y_{it}) = \text{Var}(\phi_{j=\iota(i,t)}) + \text{Var}(\eta_i + x_{it}\beta) + \text{Var}(\epsilon_{it}) + 2\text{Cov}(\phi_{j=\iota(i,t)}, \eta_i + x_{it}\beta) \quad (2)$$

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 a 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 follows often refer to this term only.

4.2 Variance Decomposition from the AKM Regressions

We have calculated the variance decomposition of equation (1) on five, partially overlapping, six-years panels. In each panel, we have computed two-way fixed effects regressions controlling for human capital and aggregate shocks in wages. The coefficients associated to 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 A.1 (in the Appendix) 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 variance of match effects does not contribute to the growth of pay dispersion, as it is relatively constant across time. Overall, these results suggest that the additively separable specification of the AKM model provides a good approximation to the wage process.

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%. In each period, the largest contribution to the total variance derives from the joint effect of worker heterogeneity, both observed and unobserved. Moreover, the variance of η_i dominates the variance of $x_{it}\beta$, while the covariance of these two terms is always small and positive. The component related to firms' wage premiums provides a smaller contribution to overall wage dispersion than worker's heterogeneity. Importantly, employers' pay policies are more relevant in the first period of the sample (1982-1987), but lose importance thereafter. The estimated correlation between firm wage effects and worker's heterogeneity, consider-

ing 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 the term $(\eta_i + x_{it}\beta)$, 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 1982-87 and 1996-01 periods, the total wage variance has risen by more than 40%. Around 60% 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 first and the last panel, providing a *negative* contribution of about 12% 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% of the total trend, even if the correlation between individual skills and ϕ_j is relatively small and close to zero in all sub-periods.

We interpret raising assortativeness as the result of at least two tendencies. First, it is tempting to relate the growth in sorting to some evolutions occurred in the Italian labour market and in its legislation since the 1980s. In common with other EU countries, Italy has indeed experienced a general trend of labour market modernization and liberalization that has touched upon 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 held by the public employment service, and not via direct selection mechanisms, as the hiring process was fully liberalized only in

the early 1990s. Similarly, in the 1980s hiring typically involved only open-end contracts, while temporary contracts were gradually liberalized only starting from the second half of the 1990s (on this respect, notice however that the growth in sorting characterizes also the years prior to this reform).⁴

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 error of η_i and ϕ_j are negatively correlated, and this induces a downward bias on estimates of $\text{Cov}(\eta_i, \phi_j)$ 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 turn the discussion on how changes in the industrial relation system might have had a more direct bearing on the other two main findings of the paper, *i.e.* declining dispersion in firm wage policies and positive contribution of worker-specific wage components to the overall inequality growth. In doing so, 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).

4.3 Wage Inequality and Institutions: A Comparative Perspective

Since we have used a sampling strategy and a method similar to the one that has been 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 to those obtained by estimating an AKM variance decomposition on the nation-wide visitINPS data.

Table 3 reports the decomposition of equation (2) applied on the VWH sample, on visit-INPS data and that derived from the results of Card et al. [2013], considering comparable periods of time. As can be noticed, 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 up to 2008, while evidences provided by Figure 1 and Figure 2 show that in Italy this growth lasts only up to 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% of the total growth in wage variance can be attributed to greater individual heterogeneity dispersion, while the same amount is more than 60% in the case of Veneto and more than 70% in Italy. Between the same periods, firms' pay premiums dispersion rose by almost 25% in Germany, while it has reduced by around 7% in Veneto and 6% in Italy. Finally, Card et al. [2013] also find that the sorting between firm-specific and employee-specific pay premiums contributed for another 36% to the overall growth in earnings inequality, which is a weaker figure than what we have documented for Italy (42%) and Veneto (55.9%).

Card et al. [2013] link their findings, and in particular the growth in firms' wage policies dispersion, to the major changes occurred in the German industrial relation system since the early 1990s. As discussed by Dustmann et al. [2009], rather than in legislation reforms, such changes were 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' off-shoring and massive migration flows), these actors allowed for an unprecedented decentralization of the German wage-setting process since the early 1990s. Deviations from industry-wide agreements through "opting-out", "opening" or "hardship" clauses were all increasingly used, even though the dominating system of industry-wide bargaining basically remained unchanged. On

this respect, Card et al. [2013] observe that firms' pay premiums, as computed on the 1996-2002 sample, are disproportionately 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 ($\text{Var}(\phi_j)$) was associated to 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 of the German one, particularly for what concerns the importance of industry-wide collective bargaining. However, in many respects the Italian system has not shown the flexibility demonstrated by the German one, nor have the reforms 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 downwardly 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.

Notice that, according to our estimates, the variance of firm 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 have resorted 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 unionisation 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, e.g. demand 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 between 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

5.1 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 between groups and differences between 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 paragraph presents results obtained by using *livelli di inquadramento*, as defined by collective bargaining institutions, to partition the population. In Section 5.3 we 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 are provided in each of these paragraphs.

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 on this worker's *portable* wage component. For comparison we have also applied the same procedure on total wages. Notice that when the variance of *total* wages is decomposed across time, the resulting trend provides a composite effect, *i.e.* it is the result of both, greater sorting, greater human capital dispersion, and relatively stable firms' wage policies dispersion (see Table 2).

5.2 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 at work 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 between *livelli di inquadramento* only for what concerns the part above the statutory minimum wages, which are set at the industry-wide level. Moreover, by the 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 started to be 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 is a source of 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, allows 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 at harmonizing 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 criteria 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.⁵ The total number of *livelli di inquadramento* included in the decompositions ranges between 435 (in 2001) and 520 (in 1984). Moreover, the percentage of observations which we have been able to include in our decompositions, ranges between 83% of the total in 2001 and 69% 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, both in the case of unconditional wages and of individual heterogeneity, the *between* part of the total variance 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.

Two main mechanisms could explain the trend toward higher between-job titles differences in wages. First, subsequent rounds of collective bargaining may have enlarged the gaps between in the job-title pay scale. 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. Notice 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 are no clear evidences 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 between these job titles. It remains unclear to which extent institutions have simply reacted to market forces, or whether they have represented a distortion to the wage structure. Some hypothesis on the relative importance of market-driven and institutions-driven mechanisms are further tested in the next paragraph, 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.

5.3 Wage Components Dispersion and Segregation Across Firms

The growth of pay differentials between 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 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 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 on wages and on 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 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 allows 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 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 previous studies on Italy (such as Iranzo et al. [2008]), but it is a quite peculiar result when compared with evidences available for other European countries and the US (*e.g.* see Faggio et al. [2010] on UK, Card et al. [2013] on Germany and Barth et al. [2016] on US). Overall Italy is not characterized by strong dispersion in firms' wage policies, and the distribution of workers has not shifted toward 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 between job titles, which is documented by Figure 5, together with the evidences 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 the firms. Arguably, the flat growth in wage dispersion observed from the early 2000s until the most recent years (see Figure 1 and Figure 2) could be the consequence of more egalitarian tendencies emerged 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 paper 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 has been 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 decom-

posing the wage variance into components capturing heterogeneity in firm pay policies, heterogeneity in workers' time-varying and time-constant characteristics, as well as their sorting. We have relied mostly on matched employer-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 reduced over time. Interestingly, when we replicate our analyses on the recently released data for the entire territory, we find that the Veneto results are very similar to the ones obtained for Italy as a whole, despite the large territorial differences that characterize the country.

Our results are different from evidences documented for other countries, and Germany in particular. On this respect, we have provided an indirect support to 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 since the mid 1990s. 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 to 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 actors of industrial relations pursued such 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 on those at the middle of the hierarchy (on this topic, see among other 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 has reached the “desired” level of dispersion, the increasing trend in wage inequality would flatten out, which is exactly what we document in the paper. After 2001 (and largely before the Great Recession) Italian inequality has remained relatively stable.

Overall, there are some valuable lessons from our analysis. First, the specificities of a country’s labour market institutions and system of industrial relations matter for the developments of wage inequality, and they do so in more nuanced ways than typically emphasised by the empirical literature. For the same reason, we should not expect that countries subject to largely similar underlying market forces, e.g. 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 it is characterized by wage setting institutions quite similar to those of other important countries (e.g. France), we believe that the paper 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 learning lessons can be drawn from the 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. On this respect, our comparative analysis informs the on-going debate on the relative merits and costs of decentralization of wage bargaining in European countries.

Notes

¹Other work 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 on Italian institutions and collective bargaining, none of them can study the AKM-based wage variance decompositions, and its evolution over time, due to limitations in the type of data they use. AKM models are estimated by *e.g.* Iranzo et al. [2008] and Macis and Schivardi [2016], but their focus is not on the dynamics of wage inequality.

²The Veneto data are freely accessible to researchers through the Fondazione Rodolfo De Benedetti (www.frdb.org). The data covering the entire territory is only accessible to researchers holding a small number of competitive VisitINPS grants. See the VisitINPS Scholars section at <https://www.inps.it>

³Following 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.

⁴Fixed-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 is beyond the scope of the present paper, and, in general, it would be difficult to conduct, as there has been a constant flux of often overlapping and across the board (*i.e.* for the entire private sector) reforms.

⁵This 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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Figures and Tables

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

Period	1982-1987	1984-1989	1988-1993	1992-1997	1996-2001
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

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

Table 2: Decomposition of the Total Wage Variance Evolution

Period	$\text{Var}(\phi_j)$	$\text{Var}(\eta_i + x_{it}\beta)$	$\text{Var}(e_{it})$	$2\text{Cov}(\phi_j, \eta_i + x_{it}\beta)$	TOTAL VAR.
1982-1987	0.032	0.064	0.008	-0.022	0.082
<i>% of Total</i>	<i>39.0</i>	<i>78.0</i>	<i>9.8</i>	<i>-26.8</i>	<i>100</i>
1996-2001	0.027	0.089	0.007	0.003	0.124
<i>% of Total</i>	<i>21.8</i>	<i>71.8</i>	<i>5.6</i>	<i>2.4</i>	<i>100</i>
Difference	-0.005	0.025	-0.001	0.025	0.042
% Δ	-16.9	32.7	-13.3	263.2	40.8
% Δ/Δ_{TOT}	-11.9	59.5	-2.4	59.5	100.0

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

Table 3: Wage Variance Evolution in Veneto, Italy and West Germany

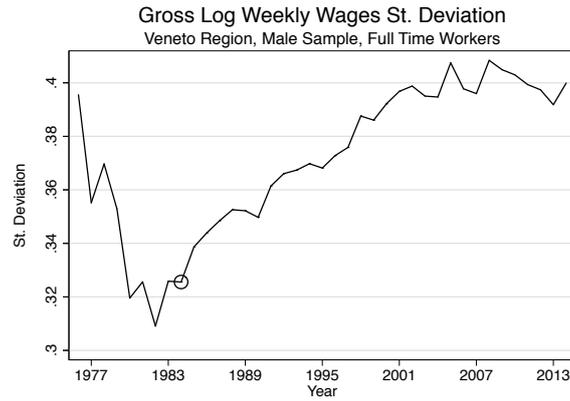
Veneto, Veneto Working Histories Data, Male Sample					
Period	Var(ϕ_j)	Var($\eta_i + x_{it}\beta$)	Var(e_{it})	2Cov($\phi_j, \eta_i + x_{it}\beta$)	TOTAL VAR.
1984-1989	0.029	0.068	0.008	-0.016	0.090
<i>% of Total</i>	<i>32.2%</i>	<i>75.6%</i>	<i>8.9%</i>	<i>-17.8%</i>	<i>100.0%</i>
1996-2001	0.027	0.089	0.007	0.003	0.124
<i>% of Total</i>	<i>21.8</i>	<i>71.8</i>	<i>5.6</i>	<i>2.4</i>	<i>100</i>
% Δ	-7.1%	26.8%	-13.3%	292.3%	31.8%
% Δ/Δ_{TOT}	-7.1%	61.8%	-2.9%	55.9%	100.0%

Italy, VisitINPS Data, Male Sample					
Period	Var(ϕ_j)	Var($\eta_i + x_{it}\beta$)	Var(e_{it})	2Cov($\phi_j, \eta_i + x_{it}\beta$)	TOTAL VAR.
1984-1990	0.039	0.087	0.013	0.004	0.143
<i>% of Total</i>	<i>27%</i>	<i>61%</i>	<i>9%</i>	<i>3%</i>	<i>100%</i>
1997-2003	0.036	0.117	0.010	0.022	0.185
<i>% of Total</i>	<i>20%</i>	<i>63%</i>	<i>5%</i>	<i>12%</i>	<i>100%</i>
% Δ	-7%	29%	-27%	141%	26%
% Δ/Δ_{TOT}	-6%	71%	-8%	42%	100%

West Germany, IAB Data, Male Sample (from Card et al. [2013])					
Period	Var(ϕ_j)	Var($\eta_i + x_{it}\beta$)	Var(e_{it})	2Cov($\phi_j, \eta_i + x_{it}\beta$)	TOTAL VAR.
1985-1991	0.025	0.095	0.014	0.005	0.139
<i>% of Total</i>	<i>18.1%</i>	<i>67.9%</i>	<i>10.2%</i>	<i>3.8%</i>	<i>100.0%</i>
1996-2002	0.038	0.112	0.017	0.023	0.190
<i>% of Total</i>	<i>19.9%</i>	<i>59.0%</i>	<i>8.9%</i>	<i>12.3%</i>	<i>100.0%</i>
% Δ	39.3%	16.6%	17.6%	125.5%	30.5%
% Δ/Δ_{TOT}	24.6%	34.2%	5.5%	35.7%	100.0%

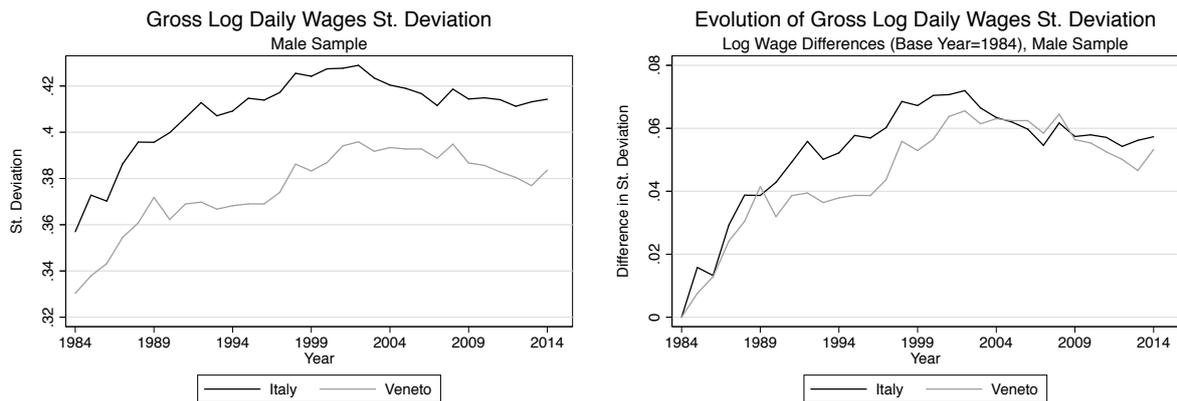
Percentage changes for a given quantity z from $t-1$ to t are computed using a reference value z_r defined as $z_r = \frac{|z_t| + |z_{t-1}|}{2}$

Figure 1: Long-Run Evolution of Gross Weekly Wage St. Dev. in Veneto



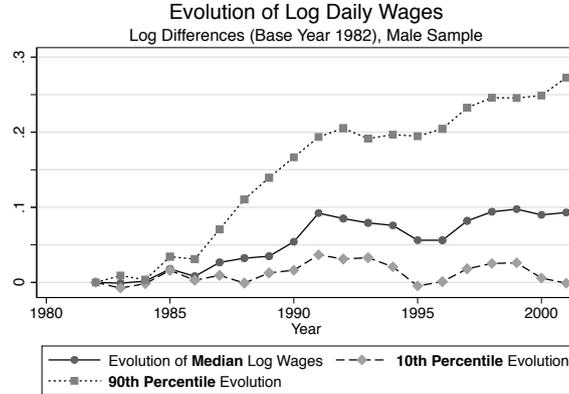
Source: Veneto Worker Histories data for the period 1976-1983. From the year 1984 (denoted by the hollow circle in the figure) the series is derived from universe of Italian social security records (VisitINPS data) and computed considering only firms located in Veneto.

Figure 2: St. Dev. of Log Daily Wages in Italy and Veneto



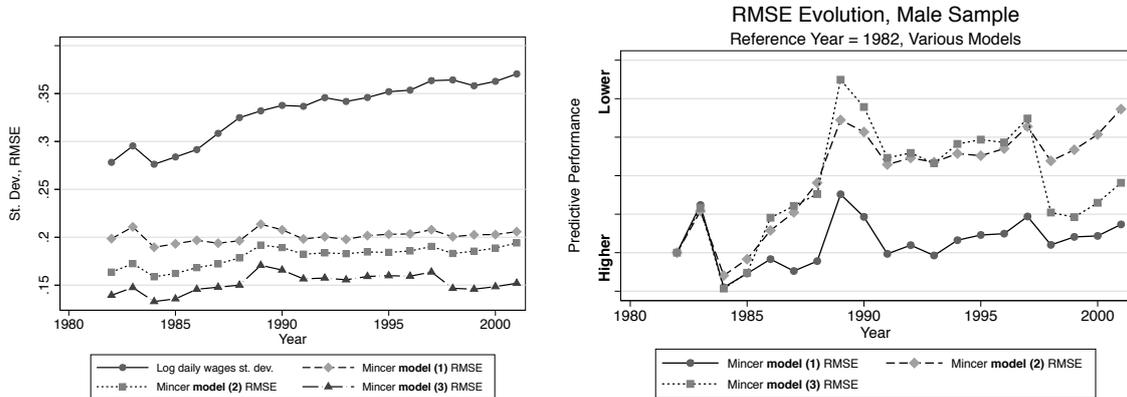
Source: Veneto Worker Histories.

Figure 3: Evolution of Log Daily Wages at by Percentile and Year



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

Figure 4: Wage St. Dev. and RMSE from Alternative Wage Models

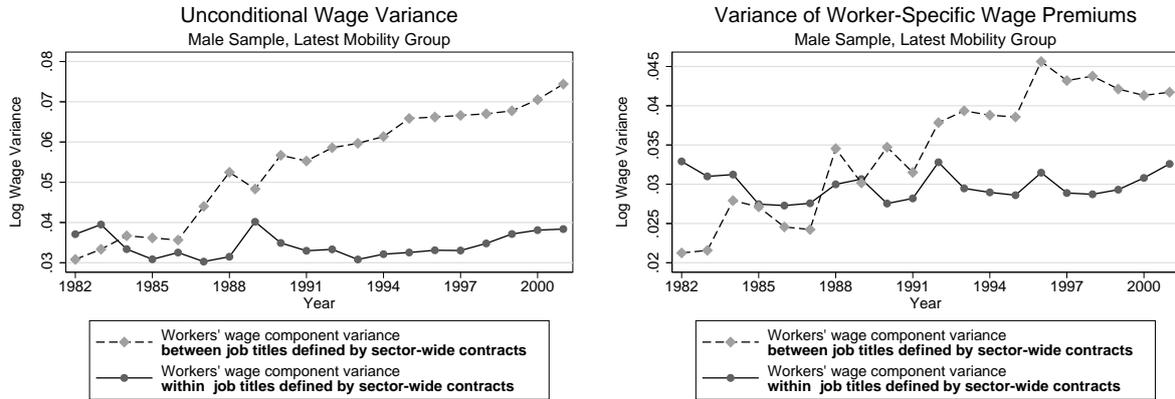


Baseline controls: age (quadratic), tenure dummies, four qualification dummies, log of employees number, sector fixed effects, national industry-wide collective contract fixed effects.

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.

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

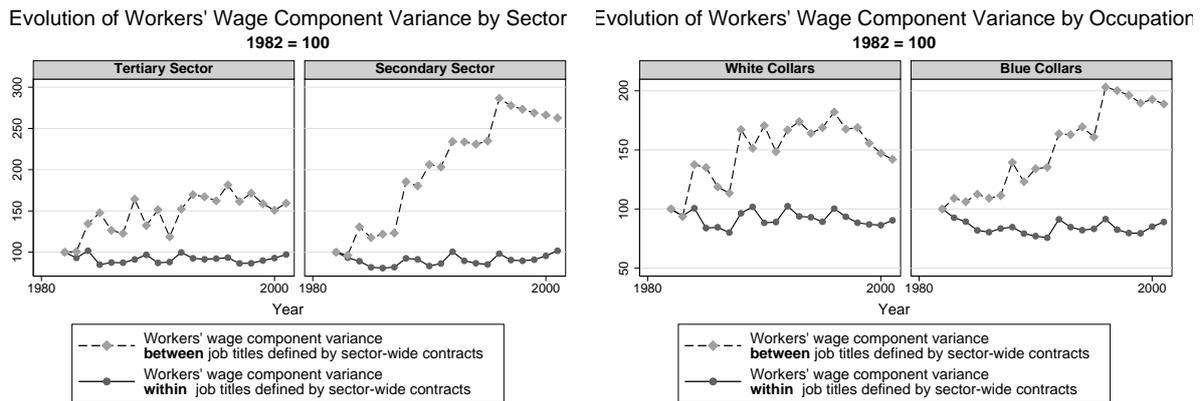


Figure 7: Proportion of Workers Within Quartiles of the Job Titles' Average Pay and Skills Distribution

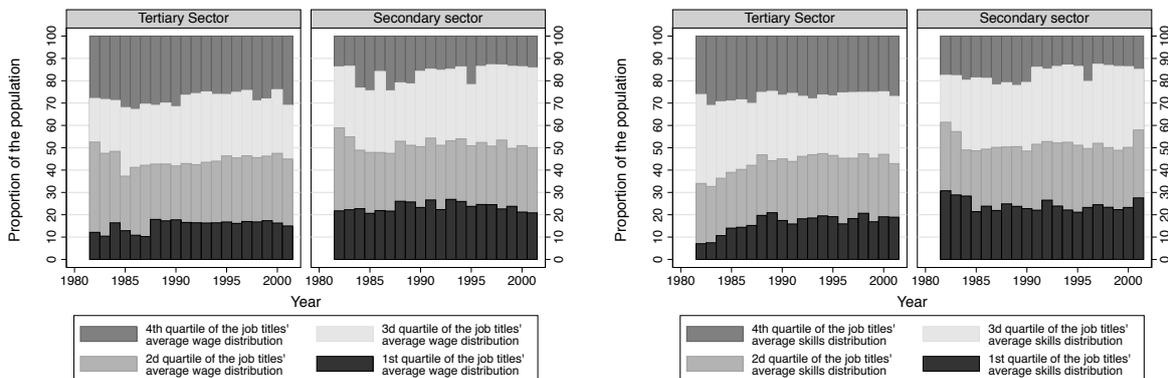
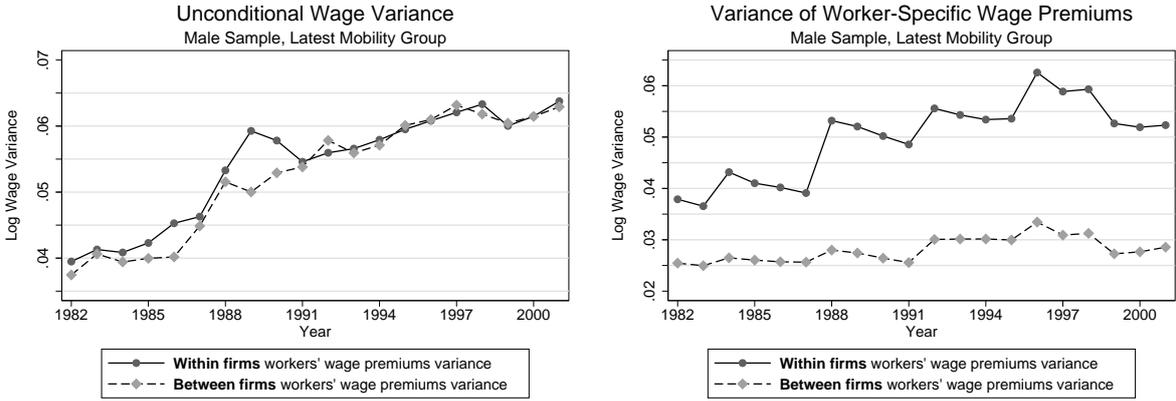


Figure 8: **Within- and Between-Firms Decomposition of Unconditional Wage Variance and Workers' Wage Premiums Variance**



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.

A Other Tables

Table A.1: Detailed Variance Decomposition of Log Daily Wages

Period	Var(ϕ_j)	Var(η_i)	Var($x_{it}\beta$)	Var(ϵ_{it})	2Cov(ϕ_j , $x_{it}\beta$)	2Cov(ϕ_j , η_i)	2Cov(η_i , $x_{it}\beta$)	TOTAL VAR.
1982-87	0.032	0.052	0.008	0.008	0.002	-0.025	0.004	0.082
1984-89	0.029	0.052	0.009	0.008	0.002	-0.020	0.007	0.090
1988-93	0.027	0.058	0.010	0.008	0.005	-0.010	0.012	0.110
1992-97	0.028	0.061	0.010	0.006	0.006	-0.011	0.014	0.117
1996-01	0.027	0.060	0.018	0.007	0.007	-0.007	0.011	0.124
Comparison of AKM and Match Models								
			1982-1987	1984-1989	1988-1993	1992-1997	1996-2001	
	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	

The estimation sample is composed of all workers in the largest connected set, provided 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).