Higher educated, Lower paid:
The fixed-term wage penalty among graduates

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Abstract

This paper studies the temporary-permanent wage gap on graduate workers using data on job placement of graduates drawn from the *Inserimento Professionale dei Laureati* (2015), a survey conducted by the National Institute of Statistics (Istat). We employ a semi-parametric (unconditional quantile regression) approach to evaluate the wage gap along the entire wage distribution. In particular, in order to take into account for heterogeneous effects of temporary employment at different percentiles of the wage distribution, we apply the *Recentered Influence Function* (RIF) regression proposed by Firpo *et al.* (2009). Finally, we decompose the wage differential at each quantile applying the Oaxaca-Blinder (1973) method. The results suggest that the monthly net wage of graduate workers employed with a temporary contract is lower than that of their "permanent" counterparts even after controlling for a plethora of personal and job characteristics. The wage gap seems due to the unobserved characteristics, and the *discrimination* effect of the job contract is higher at the bottom of the wage distribution.

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1. Introduction

Over the last decade, the implementation of policies aimed to increase flexibility in the Italian labour market has led to an increase of flexible work arrangements, such as part-time, fixed-term contracts and temporary agency work (Eurofound, 2017). In particular, in Italy the share of temporary employment has raised by almost 10 percentage points – from 6.8% in 1994 to 15.4% in 2017.The diffusion of flexible work arrangements has fuelled an increasing debate on the possible consequences of flexibilisation on firms' performances, wages as well as on working conditions experienced by workers.

According to De Cuyper *et al.* (2008), several arguments can explain the increase of temporary employment observed in the Italian labour market. On one hand, institutional factors such as the implementation of labour market reforms aimed to liberalize the use of temporary contracts; on the other hand, structural factors such as the progressive shift of employment from manufacturing to services characterized by a higher share of temporary employment mainly among low-skills and low-qualified jobs (Burgess, 1997). The increasing use of fixed-term work arrangements has been also related to shifts in the composition of the active population with an increasing share of women entering the labour market, mainly in the services (Hall *et al.,* 1998). Finally, the fluctuations of labour market demand with upswings and downswings might orient firms toward the election of temporary workers easy to dismiss during economic downturns. Conversely, workers during downturns, in order to avoid unemployment, are more likely to accept fixed-term work arrangements instead of permanent positions (Nunziata and Staffolani 2008).

Focusing on fixed-term contracts, some authors (Bentolila e Bertola 1990; Booth *et al.* 2002; Berton et al. 2011; Corsini and Guerrazzi, 2007) analyse the nature of these contracts focusing on their possibility to represent both "*stepping stone*" towards more stable work arrangements or "*dead ends*". Other studies face the issue focusing on the impact of the temporary contracts on wages in order to evaluate the existence of a possible wage gap between workers employed with permanent contracts versus those workers employed with fixed-term ones (Jimeno and Toharia 1993; Davia e Hernanz 2004; Lass e Wooden 2017). Most of these studies focus on the mean wage differentials observed ignoring the heterogeneity within fixed-term contracts and the extent to which the wage differential might differ between low-paid and high-paid temporary workers. To take into account these aspects some authors propose to apply a quantile regression (QR) approach. Picchio (2008), Comi and Grasseni (2012) and Bosio (2014), for example, study the wage gap along the entire wage distribution highlighting a substantial penalty for temporary workers especially at the bottom of wage distribution both in Italy and in other European countries.

Our paper aims to contribute to this empirical research question focusing on the wage gap between permanent and fixed-term workers – having a university degree - emphasizing the differences along the entire wage distribution of workers with tertiary education. Indeed, compared to the mean distribution, analysing the contract wage gap along the wage distribution allows gaining additional insights. In particular, the phenomena of *glass ceiling* and *sticky floors*, i.e. more pronounced wage gap at the top or at the bottom of the distribution, have been revealed using quantile regression approaches. Furthermore, our analysis focus on a sample of new graduated workers – those obtained a university degree in 2011 – and it aims to evaluate to what extent those workers experience a wage gap given their job contract (open-ended versus short-term contract). To our knowledge, few studies have explicitly focused on new graduates workers.

The standard approach generally used in labour economics to decompose wage gap is the Oaxaca (1973) and Blinder (1973) method. Advantages of this decomposition are its relatively simple implementation and intuitive approach. A detailed decomposition allows to gain information on the contribution of

various individual, labour market or job characteristics. However, it implies additional functional form restrictions to identify the various elements of the decomposition. To overcome these drawbacks it is useful to perform the decomposition beyond the mean (Fortin *et al.*, 2011; Longhi *et al.*, 2012). Machado and Mata (2005) propose a method based on conditional quantile regression where, unfortunately, the detailed decomposition depends on the order of the decomposition (Fortin et al., 2011). Moreover, the method proposed by Machado and Mata (2005) does not allow for the unconditional mean interpretation. Following Comi and Grasseni (2012) and Bosio (2014), we use a different approach: the unconditional quantile regression. We apply the method proposed by Firpo *et al.* (2009), the Recentered Influence Function (RIF) regression, that allows computing a decomposition in a path-independent way and obtaining an unconditional mean interpretation of the coefficient estimates.

The RIF-regression method is one of the very few approaches allowing conducting detailed Oaxaca-Blinder type decompositions beyond the mean. Thereby, the model allows calculating the significance of workers differences in endowments as well as in coefficients at different points of the wage distribution. Unfortunately, the estimates could be bias by the sample selection problem. Indeed, differences between temporary and permanent workers occur when it comes to labour market participation (Heckman, 1979). Biases due to differences between graduates in the propensity to work may be important in determining the wage gap between temporary and permanent workers and failure to account for this bias may result in inaccurate and biased estimation of the wage equations. Consequently, also the components of the pay differential may be biased. Hence, due to the potential issues of *self-selection*, we decide to implement a two-stage estimation strategy similar to Heckman (1979). At the first stage, we estimate a *probit* regression, in order to control for the employability of the graduate; at the second stage, we estimate the selectivity-corrected model.

The study is applied to Italian microdata. We explicit focus on new graduate workers taking advantage of an ad-hoc survey run by the Italian National Institute of Statistics (Istat) covering a representative sample of Italian individuals graduated in 2011 - *Inserimento Professionale dei Laureati*. In line with the literature, differences between temporary and permanent workers are evident suggesting a wage penalty for temporary workers. Moreover, focusing on the 90th, 50th and 10th percentiles we find a pronounced sticky floor and a less glass ceiling. In particular the wage gap between temporary and permanent workers tends to decrease as movement is made toward the top of the wage distribution. The Oaxaca-Blinder decomposition suggests that most of the total wage differences between the two groups is due to the discrimination effect of the contract. These results are confirmed also when we control for the self-selection bias.

The rest of the paper is structured as follows: Section 2 briefly discusses the empirical literature on wage differentials stating our research question and our main hypothesis; Section 3 discusses the estimation strategy used in the analysis. The data and some descriptive statistics on wage trends are presented in Section 4. Section 5 shows the main results. Section 6 concludes.

2. Wage differentials due to contractual arrangements: the background literature

The relationship between fixed-term contracts and wages has been deeply studied both from a theoretical and empirical perspective. A first set of explanations refers to compensating wage differentials theories concluding that workers with disadvantaged working conditions have to earn more. Sattinger (1977) emphasize the role of non-monetary factors into the formation of wages and the existence of a sort of premium for unpleasant job (Rosen, 1986). According to these theories, in a market without information asymmetries, those workers employed under a fixed-term work contract should earn more in order to compensate the uncertainty deriving from the fixed term contract (Amuedo-Dorantes and Serrano-

Padial, 2007). However, the majority of empirical studies do not detect a wage premium for workers working under fixed-term work arrangements; conversely, most empirical analyses highlight a wage penalty for temporary workers (Stancanelli, 2002; Brown and Session, 2003; Picchio et al. 2006; Kahn, 2012; Comi and Grasseni, 2012; da Silva et al., 2015; Kahn, 2016). Almost all empirical exercises focusing on workers' wages have shown a negative gap toward temporary employees (OECD, 2003; Brown and Session, 2005; Booth and Francesconi, 2002; Picchio, 2008).

Among the explanations accounting for the existence of wage differentials among workers, the efficiency wage theory states that workers might be paid more than the marginal productivity, in this context the possibility of a contractual renewal might be used to increase productivity of temporary workers that would be more prone to accept a lower wage than their permanent counterpart in the fixed-term (Guell 2000; Engellandt and Riphahn 2005). From a more institutional perspective, *insider-outsider* models explain the coexistence of different regimes of work in the labour market corresponding to heterogeneous wages. The labour market reforms implemented over the last decade have increased the segmentation of labour markets creating two coexisting clusters: on the one hand, the *insiders* group including those workers employed under permanent contract type and receiving a higher wage; on the other hand, workers under fixed-term work arrangements receiving a lower wage and defining the so-called cluster of *outsiders*. Under this approach, the wage differential between the two groups of workers – permanent and temporary workers - might proxy the market power of *insiders* with respect to *outsiders*. Finally, still from a microeconomic perspective, fixed-term contract might be used as a screening device by firms to select workers that are more productive in presence of information asymmetries and moral hazard (Loh 1994). Rebitzer and Taylor (1991) showed that it might be optimal for a profit-maximising firm to hire both temporary and permanent workers paying a lower wages to temporary workers in case of high monitoring costs and uncertainty of product demand. Therefore, the possibility of contract renewal may be used as an effort-incentive device instead of wages. From a macroeconomic perspective, the existence of wage differentials between types of workers should be linked to the heterogeneity of firms and sectors characterized by different contractual powers of workers in appropriating the extra-rents deriving from positions of temporary monopoly on the market (Pianta and Tancioni, 2008). According to this perspective, the subdivision between categories of workers might depend on institutional factors – such as presence of unions and their strategies – able to intervene in the process of negotiation and subdivision of gains between capitalist and workers and, between different types of workers with different contractual powers.

Empirical studies show that wage differentials between permanent and temporary workers strongly varies among countries in Europe – from 4% in Denmark to 20% in Lithuania (see on that Stancanelli 2002; Dias da Silva, Turrini 2015). Most of studies estimate wage differentials between types of workers in terms of average wage of the two category of workers. With respect to Italy, the existence of a wage gap between permanent and temporary workers as been clearly highlighted by Picchio (2006) and Rossetti and Tanda (2007) emphasizing that the wage differential is not explained by observable characteristics of workers and jobs, but should be mainly related to their different contractual power with unions and employers. Focusing on career prospects of employees, Booth et al. (2002) detect a strong penalization in wage prospects of those workers employed under fixed-term work arrangements at the early stage of their careers.

The temporary wage penalty might vary across the wage profile of workers. If it is greater in the lower tiers of the wage distribution, a sticky floor effect is at work. Reversely, a glass ceiling effect means that the wage gap widens in the upper tail of the wage distribution. The literature on such effects are mostly dedicated to gender wage or earnings gap, however, important lessons could be drawn and applied in the context of temporary wage differentials. For example, Mertens et al. (2007) evaluate the wage gap across

the wage distribution of temporary and permanent workers through a quantile approach finding that the wage gap decreases as higher quantiles are considered, and that having a fixed-term contract penalizes low-skilled workers more than high-skilled ones. Bosio (2009) applying the same methodology of Mertens (2007), examine the wage gap differs across the wage distribution for Italian data. He finds a wider wage gap at the bottom of the distribution (of approximately 30%), which slowly decreases as movement is made toward the top of the wage distribution. Finally, Comi and Grasseni (2012), using data from nine European countries (Austria, Greece, Hungary, Ireland, Italy, Poland, Portugal, Spain, and the UK) highlight the existence of a permanent wage premium in almost all countries sampled and that this result is consistent across the wage distribution. Their findings suggest a widespread discrimination against temporary workers in particular at the bottom of the distribution.

Building on previous evidence, we expect that temporary workers receive lower wages than permanent ones; however, we also expect that such negative relationship is mostly verified for low paid workers while the wage gap between permanent and fixed-term workers shrinks among high-paid workers. Therefore, the main aim of the analysis is to estimate how much of the wage gap is attributable to the contract type of the employee (*discrimination* effect) and how this wage penalty changes over the distribution. Furthermore, we focus on an ad-hoc population of workers namely those entering the labour market with a tertiary degree in order to evaluate the existence of a wage gap for a representative group of recently graduated workers distributed along different jobs.

3. Estimation strategy

In this Section, we describe the estimation strategy used to empirically evaluate the role played by the type of contract in the definition of the wage gap between temporary and permanent workers along the wage distribution. We focus on the impact of temporary contract occurring at different quantiles applying a linear Recentered Influence Function (RIF)-regression to estimate Mincer-type wage equations for permanent and temporary workers (Firpo *et al.*, 2009). Estimation at specific quantiles is thereby based on Unconditional Quantile Regression. The main advantage of an unconditional quantile regression model is that it allows for the unconditional mean interpretation. Finally, we use the Oaxaca-Blinder (1973) decomposition to each quantile to identify the effect of unobserved characteristics (the *discrimination* effect) on the wage gap.

RIF-Regressions at quantile

The procedure proposed by Fortin *et al.* (2009) aims to estimate the impact of changing in distribution of covariates, X, on quantiles, Q_τ, of the unconditional distribution of an outcome variable, Y. It consists of running a simple regression where the outcome variable is replaced with a transformation of it, the (recentered) influence function (RIF). Once we have computed the dummy variable, $\mathbb{I}\{Y \leq Q_\tau\}$ (which specifies whether the value of Y is greater or smaller than Q_τ), the RIF is estimated in quantile regressions by first calculating the sample quantile $\hat{Q}_\tau$ and computing the density at $\hat{Q}_\tau$, that is $f(\hat{Q}_\tau)$ using kernel methods. Estimates for each observation *i* of the RIF, $\widehat{RIF}(Y_i;\ Q_\tau)$, are then obtained by inserting $\hat{Q}_\tau$ and $f(\hat{Q}_\tau)$ in the aggregate RIF-function, defined as:

$$RIF(Y_i;\ Q_\tau) = Q_\tau + IF(Y; Q_\tau) \tag{1}$$

where $IF(Y; Q_\tau)$ is the influence function for the τth-quantile. It measures the influence of an individual observation on the τth quantile. Adding the quantile Q_τ to the influence function yields the RIF. Then a value of transformed outcome variable is available for each observation and it can be used to estimate a simple regression on a vector of covariates. The expected value of the RIF-regression model is viewed as an unconditional quantile regression.
Given the assumptions that the mean of the RIF-function is equal to the actual quantile as well as to the mean of the conditional expectation given X, we have that:

$$\Delta_\tau = \bar{X}_P \beta_{P\tau} - \bar{X}_T \beta_{T\tau} \quad (2)$$

where Δ_τ can be considered as the wage differential between permanent and temporary workers at τth-quantile. As in the Oaxaca-Blinder decomposition, the wage differential is decomposed in an *endowments* (explained) and a *coefficients* (unexplained) component as following:

$$\hat{\Delta}_\tau = \hat{\Delta}_{E\tau} + \hat{\Delta}_{C\tau} = (\bar{X}_P - \bar{X}_T)\hat{\beta}_{T\tau} + \bar{X}_P(\hat{\beta}_{P\tau} - \hat{\beta}_{T\tau}) \quad (3)$$

where E indicates the *Endowments* effect and C the *Coefficient* effect. In the RIF-regression model, the detailed components can be estimated in the same way as in the Oaxaca-Blinder decomposition at the mean. However, the decomposition based on RIF changes according to the choice of the reference category (Oaxaca and Ransom, 1994). Following the standard literature, we use permanent coefficients as the reference category.
However, the estimation strategy presented above could induce to a biased estimates of the wage equation and thus, to a biased decomposition because of the sample selection problem (Heckman, 1979). Indeed, the wage is observed only for the employed workers and this condition is not a randomly distributed characteristic in the population. The selection into wage work may depend on some factors such as individual ability, educational quality, and family background, raising both the probability of being employed and wages. To take into account this bias, we apply the estimation procedure of two steps proposed by Heckman (1979). At the first step, we estimate the probability to be employed running a *probit* model on a set of individual characteristics obtaining the inverse Mills ratio λ. At the second step, we estimate the RIF quantile regression including, as an explanatory variable, the correction term λ.

4. Data and Descriptive statistics

The data

The data used in the analysis are drawn from the National Institute of Statistics (Istat) database. We use the 2015 ad-hoc module on the job placement of graduates, "*Inserimento Professionale dei Laureati*", focusing on individuals that obtained a tertiary education degree in 2011. This survey is particularly relevant as it delivers broad information on the personal university to labour market transition, on individual characteristics and on job characteristics. Moreover, it provides information about the contract type (temporary or permanent) and the monthly net wage from the main job (defined in terms of hours worked per day).
The wave covers 41,459 employed workers: 28,345 employees and 13,114 self-employed workers. Since the self-employed workers are structurally different from employees and it is unreasonable to classify them in terms of the type of contract, we remove them from the dataset. Finally, we excluded

observations with missing values for some of the relevant variables, ending up with a sample of 25,013 dependent workers.
For the first stage of estimation strategy, the sample of dependent workers has been expanded to the labour force and active population of working age. We added people declaring to be not employed for one of the following reasons: first-job seeker, unemployed, homemaker and well-off (see Picchio, 2006). We obtain a final sample of 33,474 individuals.
The main variable is the type of contract that is a dummy variable equal to one if the individuals is a temporary worker and equal to zero if he/she is a permanent one. The dependent variable is the natural logarithm of the monthly net wage, ln(*wage*), full time equivalent to evaluate the wage differential regardless of the number of hours worked (Villosio and Conitni, 2008)[1]. The explanatory variables used in the regressions analysis can be grouped in the following categories: *Individual characteristics, Tenure, Job Characteristics, Occupations and Industries, Socio-Demographic Background and Selection*. Individual characteristics contains variables controlling for gender, class of age, the level of educational degree (master degree or three-year degree) and the field of study. The category *Tenure* includes job tenure and job tenure squared. *Job characteristics* include job-specific variables such as dummy controlling for the type of contract (part-time and full-time) and the dummy for the macro-area of work (equal to one if he/she works in the South of Italy, zero otherwise). The set of explanatory variables *Occupations and Industries* contains sectoral and occupations dummies, while the *Socio-Demographic Background* set of variables is composed by geographical controls as well as dummy taking into account for family status (single or not) and the occupational background of father (whether he is employed or retired or not). Finally *Selection* refers to the selection correction term. The list of variables used in the first stage regression will be discussed in the Section 5.

Descriptive statistics

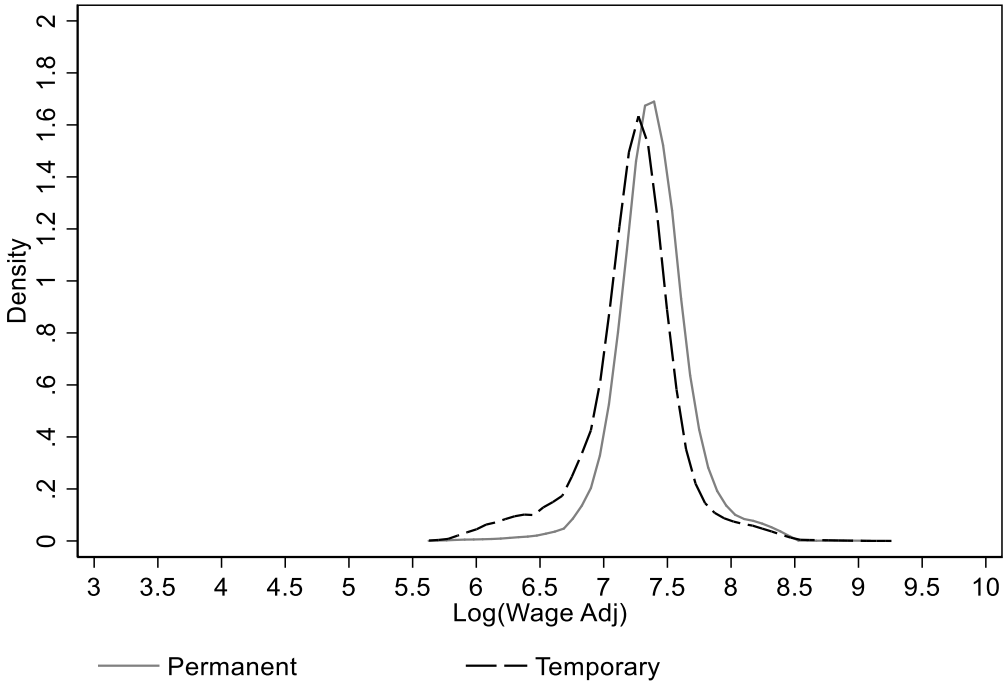
Table 1 shows the main descriptive statistics for the variables used in the analysis. Two main groups compose the sample: permanent employees with tertiary education (61%) and short-term employees with tertiary education (39%). Table 1 highlights the existence of a wage gap between the two typology of workers – those having a permanent contract and those covered by short-term work arrangements. The adjusted net monthly wage of permanent workers (adjusted for full-time equivalent) is about 1.682 euros; conversely, temporary workers earn a monthly net wage of about 1.420 euros. Focusing on workers' characteristics, on average graduates with a temporary contract are younger – the majority of them are in the first two age classes (<26 and 27-28 years old) suggesting that the temporary contract might be a *port-of-entry* into the labour market. Conversely, almost 40% of permanent employees are between 29 and 33 years old and almost 28% are more than 34 years old; overall 69% of employees with permanent contract is more than 29 years old suggesting a positive correlation between employee's age and permanent contract.
Focusing on the main characteristics of the university career, major differences do not emerge in terms of career *performance* (graduation mark/years of study) and field of study. The duration of the university is similar between the two groups of workers – almost 4 years – as well as the graduation mark. Graduates in Letters, Philosophy, Languages, Psychology, Pedagogy and Physical education compose more than 30% of the sample, while less than 20% are graduated in Sciences. Finally, 20% of permanent and 30% of temporary workers receive a degree in Medicine.
Finally, focusing on job characteristics it emerges that 25% of both temporary and permanent workers are public employees. In terms of professions, the majority of graduates' workers in the sample are

1 The monthly net wage is expressed in euro at current prices (2014).

concentrated in the following categories: technicians and associate professions, intellectuals, scientists and clerks. The share of temporary and permanent workers is uniformly distributed across professional categories, with the exception of shop assistants whose percentage is slightly higher – 2 percentage points – among temporary employees. Among high qualified and managerial professions, the share of temporary employees is higher (4%) than workers with permanent contracts (1%). Finally, 22% of permanent workers and 17% of temporary ones work in Southern regions; while 5% - with a temporary contract - and 6% - with a permanent contract - work abroad.

Figure 1 shows the kernel distribution of the adjusted wage (in logarithms). On average, Figure 1 highlights the existence of a wage gap between the two groups of workers along the entire distribution.

Figure 1. Distribution of monthly wage for temporary and permanent workers



Source: Authors calculations based on data Istat 2015.

Table 2 underlines the mean wage and the standard deviation of wage across three groups of workers, those at the bottom of the wage distribution (10^{th} percentile), at the middle (50^{th} percentile) and at the 90^{th} percentile, corresponding to the top paid occupations. The wage differential is decreasing along the wage distribution and it is reverted among the highest paid jobs, where temporary workers on average earn more than permanent workers.

Table 1. Descriptive statistics for permanent and temporary workers

Variables	Definition	Mean and SD			
		Permanent		*Temporary*	
Monthly net wage	Monthly net wage full time equivalent	1,682.22	541.3	1,421.8	538.83
Employees with permanent contract	Dummy variable: 1= Permanent employee; 0= otherwise	0.59	-	-	-
Employees with temporary contract	Dummy variable: 1=Temporary employee; 0= otherwise	-	-	0.40	-
Individual characteristics					
unmarried	Dummy variable: 1=unmarried; 0= otherwise	0.71	0.45	0.88	0.32
female	Dummy variable: 1=female; 0= male	0.53	0.49	0.65	0.47
Areageog1				0.48	
areageog2				0.21	
areageog3				0.32	
<26 years old	Share of graduates with less than 26 years old	0.08	0.27	0.17	0.37
27 – 28 years old	Share of graduates with age between 27 and 28	0.22	0.41	0.35	0.47
29 – 33 years old	Share of graduates with age between 29 and 33	0.42	0.49	0.38	0.48
>34 years old	Share of graduates with age >34	0.28	0.45	0.09	0.29
Field of study					
Engineering, Architecture and Agriculture	Share of graduate workers	0.12	0.33	0.08	0.27
Mathematics, Physics, Chemistry, Biology	Share of graduate workers	0.20	0.39	0.18	0.39
Economics, Statistics and Law	Share of graduate workers	0.08	0.26	0.10	0.29
Letters, philosophy, languages, psychology	Share of graduate workers	0.39	0.48	0.33	0.46
Medicine	Share of graduate workers	0.21	0.40	0.31	0.46
Duration of studies	Average years of study	4.28	3.13	4.11	2.14
*/ macroaruniv_2 macroaruniv_3					
Graduation mark	Graduation mark	102.3	8.04	102.37	7.83
Lyceum					
Distance from the university (time)					
fuoricorso					
impossibilit					
motivaz					
PhD	Dummy variable: 1=; 0=	0.004	0.06	0.01	0.11
Specialist postgraduate course.	Dummy variable: 1=; 0=	0.03	0.18	0.06	0.23
Postgraduate degree (master)	Dummy variable: 1=; 0=	0.03	0.17	0.04	0.19
Grant	Dummy variable: 1= ; 0=	0.03	0.17	0.06	0.23
Stage	Dummy variable: 1=; 0=	0.20	0.40	0.28	0.45

Internship	Dummy variable: 1=; 0=	0.13	0.33	0.20	0.40
Vocational training	Dummy variable: 1= ; 0=	0.05	0.22	0.05	0.21
International Mobility	Dummy variable: 1=; 0=	0.10	0.30	0.09	0.28
Training	Dummy variable: 1=; 0=	0.11	0.31	0.13	0.33
Family background					
Father employed	Dummy variable: 1=Father employed or retired; 0 =otherwise	0.95	0.21	0.96	0.19
Mother employed	Dummy variable: 1=Mother employed or retired; 0 =otherwise	0.93	0.24	0.94	0.22
Father's educational level	Dummy variable: 1= University graduate ; 0 =otherwise	0.15	0.35	0.17	0.37
Mother's educational level (University graduate)	Dummy variable: 1= University graduate ; 0 =otherwise	0.13	0.33	0.14	0.35
Job characteristics					
Part-time	Variabile dummy: 1=part time worker; 0=full-time worker	0.13	0.33	0.22	0.41
Public employee	Variabile dummy: 1=public employee; 0=otherwise	0.26	0.43	0.23	0.44
tenure tenure2					
ripartlavor1-ripartlavor6)/*	Variabile dummy: 1=work in South or Islands; 0=otherwise	0.22	0.41	0.17	0.38
Legislators, entrepreneurs and high management	Variabile dummy: 1= ISCO 1; 0=Other profession	0.01	0.07	0.04	0.19
Intellectual and highly specialized professions	Variabile dummy: 1= ISCO 2; 0= Other profession	0.32	0.46	0.34	0.47
Technicians and associate professionals	Variabile dummy: 1= ISCO 3; 0= Other profession	0.38	0.48	0.34	0.47
Clerks	Variabile dummy: 1=ISCO 4; 0= Other profession	0.13	0.34	0.16	0.37
Service and sales workers	Variabile dummy: 1=ISCO 5; 0= Other profession	0.07	0.25	0.09	0.28
Craftsmen, skilled workers and farmers	Variabile dummy: 1=ISCO 6; 0= Other profession	0.001	0.03	0.002	0.05
Plant and machine operators and assemblers	Variabile dummy: 1=ISCO 7; 0= Other profession	0.001	0.003	0.0008	0.02
Elementary occupations	Variabile dummy: 1=ISCO 8; 0= Other profession	0.002	0.05	0.002	0.05
Armed forces	Variabile dummy: 1=ISCO 9; 0= Other profession	0.03	0.17	0.0005	0.02
Number of observations		**17,296**		**11,049**	

Source: Authors calculations based on data Istat 2015.

Table 2. Mean wage at different percentiles of the wage distribution

	Percentiles of the Wage Distribution					
	10th		50th		90th	
	Mean	Sd	Mean	Sd	Mean	Sd
Permanent Workers	634.38	140.63	1425.66	20.99	2737.23	681.95
Temporary Workers	621.08	140.56	1425.75	21.51	2872.64	780.12

Source: Authors calculations based on data Istat 2015.

5. Results

At the beginning we investigate how the wage gap, between temporary and permanent jobs, varies along the wage distribution. We introduce in our estimation model a dummy variable that takes value one if worker has a temporary contract and zero otherwise using the standard Mincerian wage equation
Table 3 reports coefficient estimates for the dummy variable "temporary contract" for the 10th, 50th and 90th percentile using both the unconditional quantile regression and, for comparison purpose, the OLS model.

Table 3: OLS and Unconditional Quantile Regression of log monthly wage – Contract wage penalty

		10th percentile	*50th percentile*	*90th percentile*
	OLS	**UQR**	**UQR**	**UQR**
Temporary	-0.108***	-0.178***	-0.093***	-0.065***
	(0.006)	(0.044)	(0.006)	(0.014)
Individual Characteristics	Yes	Yes	Yes	Yes
Job Characteristics	Yes	Yes	Yes	Yes
Sectoral Dummies	Yes	Yes	Yes	Yes
Isco Dummies	Yes	Yes	Yes	Yes
Observations	24,655	24,655	24,655	24,655

Note: Robust standard errors in parentheses for OLS; bootstrapped standard errors, 100 replications for UQR.

The effect of being a temporary worker is, as expected, strictly negative all along the wage distribution as well as at the mean. According to the OLS estimate, for temporary employees wages are reduced by approximately 14.3 percent. The unconditional quantile regression shows that being an employee with a temporary contract decreases wage and this negative effect on log monthly net wages decreases from the bottom to the top of the distribution. Table 4 shows the detailed decomposition of contract gap at specific percentiles (10^{th}, 50^{th} and 90^{th}). Firstly, the difference between permanent and temporary workers is higher at the bottom of the distribution showing a sticky floor pattern (wage gap in favour of permanent is equal to 0.37 at the bottom vs 0.16 at the top). Moreover, only a small fraction of the total gap is explained by the endowment effect (about 8%), whereas the largest part (about 28%) is explained by the coefficient effect. The predominant role played by the *discrimination* effect on the wage gap between permanent and temporary workers tends to increase as we move towards the top of the distribution. Analysing in detail the decomposition, Table 4 shows that the endowment effect of individual characteristics (for gender, master's degree) seem to increase the contract gap slightly all along the wage distribution, whereas the job characteristics, that is the part-time and geographical area of the job, reduce the gap especially at the top of the distribution. According to the *Occupations and Industries* variables, the industry sector as well as to be a sales workers increase the wage differences at the upper half of the distribution. In terms of coefficients effect, only job tenure differences in coefficients are significant and

negative both at the bottom and the top of the distribution. Different remuneration to job characteristics (part-time) between permanent and temporary workers significantly decreases the wage gap only at the 90th percentile. Contract-specific distributional differences in specific occupations or industries have a statistically significant impact on the coefficients effect only in the middle of the distribution. In particular, both industry and services sectors are negative as well as being a clerks or a service worker. The total unexplained part is statistically significant and positive throughout the distribution and, as discussed before, it seems to be the main driver of the wage gap. The coefficient component includes the constant term. Its effect in contract wage differentials tends to be large and significant at the upper half of the distribution, which may reflect the effect of contract differences in some hard-to-measure characteristics and attributes.

Table 4: RIF Detailed Decomposition at different quantile

	10th percentile	**50th percentile**	**90th percentile**
Wage Gap (Unadjusted)	0.367***	0.128***	0.155***
	(0.015)	(0.004)	(0.010)
Total Explained	0.104***	0.053***	0.084***
	(0.009)	(0.003)	(0.007)
Total Unexplained	0.263***	0.076***	0.071***
	(0.018)	(0.005)	(0.011)
Endowment Effect			
Female	0.008***	0.008***	0.013***
	(0.002)	(0.001)	(0.002)
Tenure	0.131***	0.018**	0.049***
	(0.035)	(0.011)	(0.03)
Tenure2	-0.091***	-0.004	0.023
	(0.028)	(0.009)	(0.025)
Master's Degree	-0.000	0.003***	0.001
	(0.002)	(0.001)	(0.002)
Part-Time	0.006**	-0.006***	-0.013***
	(0.003)	(0.001)	(0.002)
Work In The South	-0.004***	-0.002***	-0.004***
	(0.001)	(0.000)	(0.001)
Age Class Dummies	Yes	Yes	Yes
Sectoral Dummies	Yes	Yes	Yes
Coefficient Effect			
Female	0.016	-0.010*	-0.023*
	(0.018)	(0.006)	(0.014)
Tenure	-0.203**	-0.059***	-0.009
	(0.084)	(0.023)	(0.052)
Tenure2	0.149***	0.045***	0.028
	(0.52)	(0.015)	(0.034)
Master's Degree	-0.040***	0.001	-0.020
	(0.015)	(0.005)	(0.013)
Part-Time	-0.007	0.005*	-0.043***
	(0.010)	(0.003)	(0.007)
Work In The South	-0.007	-0.002	-0.009**
	(0.006)	(0.001)	(0.004)
Age Class Dummies	Yes	Yes	Yes
Sectoral Dummies	Yes	Yes	Yes
Constant	0.151	0.240***	0.146
	(0.270)	(0.077)	(0.191)

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.05, * p<0.1

5.1 The RIF-decomposition with Selection Adjustment

The RIF regressions and the decomposition presented Table 3 and 4, respectively, can be biased due to the endogeneity of contract type, but also due to the sample selection bias (Heckman, 1979). In this section we deal with the second kind of bias. Indeed, wages are observed only for those individuals who participate to the labour market accepting the wage offer. If the error term of the labour market participation equation is correlated with the error term of the wage equation selectivity bias into the labour force rises and the observed sample does not represent the underlying population.

Column 1 of Table 5 shows the probit estimation results for the selection into employment, through which the inverse Mills ratio has been computed. The last three columns reports the RIF-regression of the wage Mincerian equation, the second stage of the procedure. The set of independent variables in the selection model contains at least one variable not included in the second equation. The following variables are included in the selection equation only: a dummy for the single status, its interaction with the gender, a dummy variable for the student worker status, the graduation mark, the duration of studies, the field of study and other socio-economic background variables (father's occupation, geographical area of residence). All the variables have the expected signs and are statistically different from zero. The presence of an employed father or who collects retirement benefits has a positive effect on the probability to be participate to the labour market. This result could be due to the important role of parents background into the Italian labour market. On the contrary, Picchio (2006) finds that the number of income earners in the household has a negative impact on the individual's labour supply since higher is the number of earners and higher is the household level of income and lower the probability to want to find a job. The RIF regression adjusted for the self-selection confirms the existence of a wage gap between permanent and temporary workers, even if it is slightly lower, and that the penalty is more pronounced at the bottom of the wage distribution. The estimate of the inverse Mills ratio, λ, is negative and statistically significant suggesting that the sample selection bias due to labour market participation is an issue. The sign and significance of the other variables does not change.

Table 5: Labour market participation (Probit estimate) and RIF-regression.

	Prob. to be employed	*10th Percentile*	*50th Percentile*	*90th Percentile*
Female	-0.213***	-0.037***	-0.072***	-0.135***
	(0.017)	(0.014)	(0.006)	(0.013)
Nubile/Single	-0.153***			
	(0.016)			
Student Worker	0.107***			
	(0.006)			
Duration of studies	-0.014***			
	(0.001)			
Graduation mark	0.002***			
	(0)			
Master degree	0.077***	0.032**	0.013**	0.080***
	(0.007)	(0.015)	(0.006)	(0.016)
27 – 28 Years old	-0.030**	-0.047	-0.034***	-0.017
	(0.012)	(0.034)	(0.009)	(0.022)
29 – 33 Years old	-0.045***	-0.009	-0.033***	-0.050**
	(0.013)	(0.038)	(0.010)	(0.023)
>34 Years old	0.050***	0.017	-0.010	0.051*
	(0.016)	(0.034)	(0.011)	(0.026)
Employed father	0.036***			

	(0.013)			
Field of study2	0.056***			
	(0.011)			
Field of study4	-0.036***			
	(0.01)			
Field of study5	0.128***			
	(0.012)			
Nubil*fem	0.185***			
	(0.018)			
Centre	-0.102***			
	(0.009)			
South and Islands	-0.175***			
	(0.007)			
Temporary		-0.157***	-0.114***	-0.109***
		(0.047)	(0.006)	(0.011)
Job characteristics		Yes	Yes	Yes
Sectoral Dummies		Yes	Yes	Yes
Isco Dummies		Yes	Yes	Yes
Mills		-0.185	-0.209***	-0.142***
		(0.115)	(0.018)	(0.048)
Number of Obs.	33,474	25,013	25,013	25,013

Note: Bootstrapped standard errors in parentheses, 100 replications.*** p<0.001, ** p<0.05, * p<0.1

Table 6 reports the decomposition outcome at the three specific percentile when we account for sample selection. It summarizes the main results: the unexplained component of the wage gap appears as the main driver of the pay penalty along all the wage distribution also after controlling for sample-selection bias. Thus, the sticky floor pattern still remains evident. However, not accounting for sample selection leads to an overestimate of the wage gap and of the discrimination effect. Finally, the selection component is significant highlighting that it contributes to the variation of contract wage gape across the wage distribution.

Table 6: RIF Decomposition at different quantile

	10th Percentile	*50th Percentile*	*90th Percentile*
Wage Gap (Adjusted)	0.275***	0.133***	0.125***
	(0.016)	(0.003)	(0.007)
Total Explained	0.079***	0.024***	0.022***
	(0.006)	(0.002)	(0.004)
Total Unexplained	0.196***	0.109***	0.103***
	(0.02)	(0.004)	(0.009)
Mills Ratio	0.192***	0.046***	0.073***
	(0.059)	(0.009)	(0.022)

Note: Robust standard errors in parentheses.*** p<0.001, ** p<0.05, * p<0.1

6. Conclusions

In this paper we evaluate the wage gap along the entire wage distribution of temporary and permanent workers in Italy focusing on a particular group of individuals: those who have obtained a tertiary education. We use an unconditional quantile regression approach showing that the fixed-term wage gap decreases as we consider higher quantiles and that having a fixed-term contract penalizes more low skilled workers than high skilled – meaning those workers employed in high paid versus low paid jobs. Moreover,

we decompose the wage differential at different percentile of the wage distribution using the procedure developed by Oaxaca-Blinder (1973).
In general, the analysis performed in this paper shows that different factors, such as educational characteristics, labor market tenure, job characteristics, employment in different industries or demographic and family background characteristics contribute differently to the contract-wage gap along the wage distribution. In particular, by splitting the various categories in an endowments and a coefficients part, differences in the contribution to the gap at different quantiles are found. Moreover, we detect a sticky floor pattern, i.e. significant differences between the wage-gap at the bottom of the distribution. In line with this, the wage penalty of being a temporary worker is higher at the bottom. The results suggest that it is important to consider contract-wage gap throughout the wage distribution and hence to go beyond the mean. This may be particularly relevant, when it comes to policy implications. According to selection adjustment model the correction terms contribute differently to the quantile-specific wage gap. Yet, the main pattern of results remains the same. The unexplained part is overestimated at the bottom and the top but underestimated at the median of the wage distribution.

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