BANK OF GREECE
EUROSYSTEM

Economic Bulletin
ISSN 1105 - 9729 (print)
ISSN 2654 - 1904 (online)

WHAT DRIVES WAGE DIFFERENTIALS IN GREECE: WORKPLACES OR WORKERS?

Theodora Kosma
Economic Analysis and Research Department

Pavlos Petroulas
Economic Analysis and Research Department

Evangelia Vourvachaki
Economic Analysis and Research Department

ABSTRACT

Using a micro-aggregated dataset that contains gross wages as well as employer and employee characteristics, we investigate whether observed wage differentials in Greece reflect mostly the underlying variation in employer characteristics, i.e. the structure of the Greek production, or worker and job characteristics. Our results show that both employer and worker characteristics are important contributors to the observed wage dispersion of full-time private sector jobs in Greece. Occupation and workplace effects alone explain around 52% of the overall wage variation in Greece. An additional 11% is explained by controlling for the impact of workplace-occupation matching. Other observable characteristics of the workers such as age, gender and type of job contract add up to 23.5% more explanatory power. Finally, our results also show that both the observed gender and contract type wage gaps are more prevalent among high-skilled occupations, acting thus as a disincentive to the acquisition of skills.

Keywords: wage differentials; micro-aggregated data; wage gap

JEL classification: J31; C20

ΤΙ ΕΞΗΓΕΙ ΤΙΣ ΜΙΣΘΟΛΟΓΙΚΕΣ ΔΙΑΦΟΡΕΣ ΣΤΗΝ ΕΛΛΑΔΑ: ΤΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΤΩΝ ΕΡΓΟΔΟΤΩΝ Ή ΤΩΝ ΕΡΓΑΖΟΜΕΝΩΝ;

Θεοδώρα Κοσμά
Διεύθυνση Οικονομικής Ανάλυσης και Μελετών

Παύλος Πέτρουλας
Διεύθυνση Οικονομικής Ανάλυσης και Μελετών

Ευαγγελία Βουρβαχάκη
Διεύθυνση Οικονομικής Ανάλυσης και Μελετών

ΠΕΡΙΛΗΨΗ

Χρησιμοποιώντας στοιχεία που προέρχονται από τη σύνθεση μικροδεδομένων για τους ακαθάριστους μισθούς και τα χαρακτηριστικά των εργοδοτών και των εργαζομένων, διερευνούμε κατά πόσον οι παρατηρούμενες μισθολογικές διαφορές στην Ελλάδα αντικατοπτρίζουν περισσότερο διαφορές στα χαρακτηριστικά των εργοδοτών, δηλαδή τη δομή της ελληνικής παραγωγικής διαδικασίας, ή διαφορές στα χαρακτηριστικά των εργαζομένων και των θέσεων εργασίας. Τα αποτελέσματα δείχνουν ότι τα χαρακτηριστικά τόσο των εργοδοτών όσο και των εργαζομένων αποτελούν σημαντικούς προσδιοριστικούς παράγοντες της παρατηρούμενης διασποράς των μισθών πλήρους απασχόλησης στον ιδιωτικό τομέα στην Ελλάδα. Μόνο το επάγγελμα των εργαζομένων και τα χαρακτηριστικά των εργοδοτών εξηγούν περίπου 52% της συνολικής διασποράς των μισθών στην Ελλάδα. Ένα επιπλέον 11% της διασποράς εξηγείται από τη συνδυαστική επίδραση (matching) επαγγελμάτων και εργοδοτών. Άλλα παρατηρήσιμα χαρακτηριστικά των εργαζομένων όπως η ηλικία, το φύλο και ο τύπος της σύμβασης εργασίας εξηγούν έως και επιπλέον 23,5% της διασποράς. Τέλος, τα ευρήματά μας δείχνουν επίσης ότι το μισθολογικό χάσμα (wage gap) που υπάρχει μεταξύ των δύο φύλων και μεταξύ διαφορετικών τύπων συμβάσεων (αορίστου ή ορισμένου χρόνου) είναι μεγαλύτερο μεταξύ επαγγελμάτων υψηλής εξειδίκευσης, γεγονός που λειτουργεί ως αντικίνητρο για την απόκτηση δεξιοτήτων υψηλής εξειδίκευσης.

WHAT DRIVES WAGE DIFFERENTIALS IN GREECE: WORKPLACES OR WORKERS?[1]

Theodora Kosma
Economic Analysis and Research Department

Pavlos Petroulas
Economic Analysis and Research Department

Evangelia Vourvachaki
Economic Analysis and Research Department

1 INTRODUCTION

There is an extensive empirical literature analysing the sources of wage dispersion. Apart from the importance of worker characteristics, one stream of the literature has also stressed the role of employer characteristics. Along this line of research, a lot of studies have focused on the drivers of inter-industry wage differentials and have noted the role of wage differentials at the level of the establishment. The availability of longitudinal matched employer-employee microdata has also allowed to control for unobserved worker and firm heterogeneity (see e.g. Abowd et al. 1999b) and delve deeper into the role of matching between employer and employee characteristics (see e.g. Woodcock 2008). The findings regarding the relative importance of different factors in driving wage differentials of seemingly homogeneous workers contribute to understanding wage setting practices and the sources of wage inequality.

This study aims to shed some light on the relative importance of these factors in explaining wage differentials for private sector full-time jobs in Greece over the period 2016-2019. For this purpose, we use detailed administrative data from the ERGANI information system. The advantage of these data is that they offer up-to-date information at a granular level for key attributes of employers and workers that are the focal point of this study.

During our sample period, headcount employment in Greece grew at robust rates, supported by strong net job creation in the private sector, while wage dynamics were rather muted.[2] At the same time, there was considerable wage dispersion among full-time jobs in the private sector. There was, on average, a threefold difference between the average wage at the 90th percentile, compared with the average wage at the 10th percentile in our sample.

Understanding the drivers of these wage differentials would contribute to a better understanding of the factors shaping wage dynamics in Greece during the recent period. The main question we aim to address in this study is the following: Do wage differentials mostly reflect the underlying variation in employer characteristics, i.e. the structure of the Greek production, or worker and job characteristics? Answering this question would provide insights into the drivers of wage dispersion, which may also prove useful for designing policies aimed at supporting labour income.

Our results show that both employer and worker characteristics are important contributors to the observed wage dispersion of full-time private sector jobs in Greece. Occupation and establishment effects alone explain around 52% of the overall wage variation in Greece. An additional 11% is explained by controlling for the impact of workplace-occu-

1 We would like to thank the Ministry of Labour and Social Affairs for providing detailed micro-aggregated employment and wages data from the ERGANI information system. We would also like to thank Heather Gibson and Hiona Balfoussia for their constructive comments and suggestions. The views expressed in this paper are of the authors and do not necessarily reflect those of the Bank of Greece.

2 According to LFS data, average annual employment growth stood at 2% and, according to ERGANI data, about 137 thousand jobs on average were created annually. The growth rate of economy-wide compensation per employee moved into positive territory in 2017 for the first time since the beginning of the economic crisis and increased moderately by 1.4%, on average, during 2017-2019 (National Accounts data).

pation matching. Other observable characteristics of the workers such as age, gender and type of job contract add up to 23.5% more explanatory power. We further show that there are significant gender wage differentials and a wage premium for older workers as well as for those working on contracts of indefinite length.

The remainder of the article is structured as follows: Section 2 provides a short literature review. Section 3 describes the data and the methodology used in our analysis of wage differentials, while Section 4 presents and discusses our empirical findings. The final section concludes.

2 LITERATURE REVIEW

The literature has long looked into the drivers of wage dispersion and the relative importance of worker, employer and job characteristics, as it was understood early on that observable worker characteristics alone, like education, age, gender, tenure, etc., cannot account for the existing wage differentials at the individual level.

A large body of theoretical literature highlighted the importance of employers in the wage determination process and thereby in wage differentials, offering explanations such as wage efficiency considerations (see e.g. Shapiro and Stiglitz 1984) or rent sharing, the role of labour market institutions (see e.g. Booth 1995), search frictions (see e.g. Mortensen 2003), as well as differences in the firm technology (see e.g. Rosen 1986).

Along this stream of research, a long list of empirical studies focused on the importance of inter-industry wage differentials in accounting for wage dispersion (see e.g. Krueger and Summers 1988; Katz and Summers 1989; Gibbons and Katz 1992; Du Caju et al. 2010). They show that inter-industry wage differentials cannot be fully explained by observable worker or firm characteristics. In this respect, these findings point to the relevance of unobserved employee or job characteristics, or support non-competitive explanations regarding wage determination such as efficiency wages or rent sharing.

The seminal article by Groshen (1991) used data for six US manufacturing industries to show that a considerable part of the intra-industry wage variation is due to establishment wage differentials (20%-70%). Her empirical approach involves analysing the sources of the wage variance using controls for worker occupation (at a fine level of detail), the establishment and the interaction of the two. Her results indicate that these factors taken together account for almost all the variation in wages. Her findings are consistent with the theory that firms tend to sort their workers (irrespective of occupation) according to their (unmeasured) labour quality. They are also consistent with explanations relating to differences across establishments as regards compensation practices, wage efficiency, rent sharing, or technology.

Following a similar empirical approach, Lane et al. (2007) use data that cover all sectors of the US economy and exploit a very granular classification of occupations. Their findings concur with the conclusions of Groshen (1991) that wage differences between establishments account for an important fraction of total wage variation. Also, within-establishment analysis shows that there is a positive correlation of occupational wages, which provides further support to the sorting theory or to hypotheses resting on establishment-specific labour compensation policies.

The availability of matched employer-employee data was key to studying the role of unobserved heterogeneity in driving wage differentials and obtaining unbiased estimates of the relative importance of worker and employer effects. In their seminal work using longitudinal data for France, Abowd et al. (1999b) show that unobserved heterogeneity, like worker labour quality or the productivity of the firm, could bias the estimates of the drivers of wage differentials to the extent that

observables correlate with these unobserved factors (i.e. due to omitted variables).[3] They find that the main driver of wage differentials is the worker (person) effects. Firm characteristics are also found to have a bearing on wage differentials (see also Abowd et al. 2002). Moreover, they show that firms whose workers enjoy a wage premium (i.e. above the wage explained by workers' observable characteristics) tend to be more productive and use a more capital and skill intensive technology. A more important role for firm effects is found in a companion paper with data for the United States (the Washington State in partiuclar – see Abowd et al. 1999a).

This more recent stream of studies has also been able to assess the role of unmeasured characteristics of the worker-employer match, reflecting for example the match-specific human capital, in driving wage differentials. Similarly to the case raised by Abowd et al. (1999b) for unobserved worker and firm effects, Woodcock (2008) shows that omitting match effects in a regression-based analysis leads to biased estimates of the importance of different factors, thereby potentially leading to wrong conclusions as regards the sorting of workers into firms. Furthermore, in his empirical application he finds that match effects also make a meaningful contribution to wage differentials.

As regards studies for Greece which look into the sources of wage dispersion, Papapetrou and Tsalaporta (2017) and Nicolitsas (2011) use the Structure of Earnings survey and focus on inter-industry wage differentials. Nicolitsas (2011) finds important inter-industry wage differentials even after controlling for employer and employee characteristics. Papapetrou and Tsalaporta (2017) reach a similar conclusion using matched employer-employee data and a methodology that allows them to control for unobserved worker heterogeneity. Their findings offer support to efficiency wage or rent-sharing explanations, as they find weak evidence in favour of unobserved heterogeneity due to worker quality.

3 DATA AND METHODOLOGY

3.1 DATA

Our analysis of wage differentials is based on gross monthly earnings of private sector employees for four years (2016-2019). The data are from the annual accounts of ERGANI, an administrative database, covering the whole population of employees working under private law contracts in Greece. ERGANI includes very detailed information on various employer, employee and job characteristics.[4] Due to the sensitivity of the data contained therein, only micro-aggregated data are currently available for research purposes, albeit at a very fine level as detailed below.[5]

More specifically, data on wages are available for the following worker, employer and job characteristics, respectively: (i) worker gender, age and occupation; (ii) region, main sector of establishment activity, firm size (in number of employees); (iii) type of job contract (open-ended or fixed-term) and type of employment (full-time, part-time or intermittent). This information is available at the level of 89 2-digit NACE sectors of activity, 7 age categories, 46 occupation categories, 12 firm size categories and 13 NUTS 2 regions (see Tables A1-A5 in Appendix A for details). Our analysis is limited to full-time jobs, which ensures comparability of wages. Thus, one observational row may refer to the average gross monthly wage of full-time employees in the occupational category "physical and engi-

3 For example, to the extent that high-quality workers are sorted into specific industries (a positive correlation with industry features), absent any controls for the quality of the workers, the estimate of the inter-industry wage differentials would be overstated.

4 This database includes the information submitted annually by all private-sector employers and serves as a detailed registry of the employment history of all private sector employees. Employees working in public sector entities, whose contracts are governed by private sector labour law, are also registered in this database. The information collected is at the job/worker level (see also Kosma et al. 2019).

5 Being census data, the ERGANI data may differ from other statistical sources such as ELSTAT, the data of which are sample-based. Moreover, the data used in the current analysis are not directly comparable to those published in the annual ERGANI reports, as they are different in nature. Specifically, our data are micro-aggregated and include wages corresponding to employment positions, rather than individuals.

neering science associate professionals", who belong to the age category 25-34, are male, work on a fixed-term contract, in firms in sector 31 (manufacture of furniture) that employ between 51-250 people and are located in the area of Central Macedonia. Overall, our final dataset includes a total of 575,495 observation cells (unbalanced over the years).[6]

These data show that there is significant wage dispersion across occupations (see Table A6 in Appendix A), firm sizes, sectors and regions (see Bank of Greece 2020). As such, it is necessary to account for all these factors in a unified analysis of wage determination in Greece as well as analyse their relative importance.

3.2 METHODOLOGY

The methodology in this section follows that of Lane et al. (2007) and Groshen (1991). The main aim of this approach is to obtain a simple and intuitive decomposition of the variation in wages into the shares attributed to occupational and workplace characteristics, as well as the joint impact of workplace and occupational characteristics.

However, our dataset does not contain an establishment identifier. As such, in order to isolate, to the greatest extent possible, the impact of workplace characteristics on wages —given the structure of our data— we introduce "workplace type" dummies that are defined by the unique combination of sector (2-digit NACE), size (12 size classes) and region (13 regions) of operation. Therefore, one workplace type may be the following: firms in sector 31 (manufacture of furniture) employing between 51-250 people in the region of Central Macedonia. By doing so, we essentially define homogeneous workplaces. Moreover, given the granularity of the dimensions of our data, for specific regions, size classes and sectors, the workplace dummies may on several occasions refer to one firm. This approach yields a total of 3,863 homogeneous workplace dummies. As is evident from this description, our workplace dummies are sufficiently detailed and they can provide a reasonable approximation of a virtual establishment operating in a specific sector, in a specific region in Greece.[7]

We exploit the various dimensions of our rich data, attempting to isolate the impact of other characteristics beyond that of the homogeneous workplace, to which wage data refer, and, as in Lane et al. (2007), we estimate the following regressions:

$$W_{xijt} = a + \beta' workplace_i + \varepsilon_{xijt} \quad (1)$$

$$W_{xijt} = a + \gamma' occup_j + \varepsilon_{xijt} \quad (2)$$

$$W_{xijt} = a + \beta' workplace_i + \gamma' occup_j + \varepsilon_{xijt} \quad (3)$$

$$W_{xijt} = a + \beta' workplace_i + \gamma' occup_j + \delta' (workplace_i * occup_j) + \varepsilon_{xijt} \quad (4)$$

W_{xijt} is the log average wage of workers with personal characteristics x in workplace i, in occupation j at time t;

$workplace_i$ is a vector of workplace type dummies;

$occup_j$ is the vector of occupational dummies;

$(workplace_i * occup_j)$ is a vector of dummy variables indicating a specific workplace and occupation match.[8]

In equations (1) and (2) the log average wage of workers with personal characteristics x working in workplace i and occupation j are regressed on the vector of workplace and occu-

6 The final dataset is trimmed at the 1% level for wages. Nine sectors of activity with a very small employment share (NACE Rev. 2 codes 2, 5, 9, 37, 39, 75, 97, 98, 99) and employees aged below 15 are also discarded from the analysis.

7 Of course, we could simply include individual dummies for each workplace characteristic, but this is not the aim of this exercise, i.e. to estimate the impact of size, sector and region separately, which has already been done in the literature. The objective of this exercise is to exploit the granularity of our data and identify representative firm types for Greece as defined by the sector, size and region of operation.

8 For instance, a specific workplace-occupation match could be the following: machine operators in firms, in sector 31 (manufacture of furniture) employing between 51-250 people in the region of Central Macedonia.

pational dummies, respectively. In equation (3) workplace and occupational dummies are simultaneously introduced into the regression, while in equation (4) workplace and occupational dummies as well as their interactions are simultaneously included. Let us denote equation (3), which includes the main effects, as the *main equation*, following the intuitive terminology of Lane et al. (2007), and equation (4) as the *cell regression*, as it also accounts for the impact of the job match.

Our analysis focuses on the comparisons of R^2 from the above regressions in order to decompose the impact of the various characteristics on wages. Let R^2_{work} be the R^2 of equation (1), R^2_{occ} that of equation (2), R^2_{main} that of equation (3) and R^2_{cell} that of equation (4), which includes workplace and occupational dummies as well as the interaction of the two.

In this context, therefore, the marginal contribution of workplace characteristics on wages can be calculated as follows: $R^2_{main} - R^2_{occ}$. The marginal contribution of occupational characteristics can be similarly obtained by calculating the following difference: $R^2_{main} - R^2_{work}$.

It is not necessarily expected that the explanatory power of occupational and workplace characteristics in equation (3) is equal to the summation of the explanatory power of each characteristic from equations (1) and (2). The following difference $R^2_{work}+R^2_{occ}-R^2_{main}$, referred to as the *"joint"* explanatory power of occupation and workplace (see Lane et al. 2007), can be used to evaluate the importance of positive or negative sorting of occupations across establishments.[9] In particular, positive sorting implies a clustering of high-wage occupations in high-wage firms, while negative sorting refers to a clustering of high-wage occupations in low-wage workplaces.[10]

Finally, the difference $R^2_{cell} - R^2_{main}$ refers to the wage premium paid to a particular occupation in a particular workplace, above the premium predicted by the occupation and workplace characteristics alone. It basically captures the premium of a specific workplace-occupation match. It may involve the skill requirements of production process, on-the-job training or differences in occupational tenure across workplaces, basically workplace-specific wage policies.

The remaining unexplained component $1-R^2_{cell}$ refers to the unexplained part not captured by workplace and occupational indicators. This may be related to other personal and job characteristics not captured by variation of workplace and occupational characteristics, such as gender, contract type, tenure/work experience, and ability.

4 RESULTS

4.1 WAGE VARIANCE DECOMPOSITION RESULTS

Table 1 presents the main results of our empirical exercise. Our sample consists of 575,495 observations. The first panel of Table 1 presents the R^2s from the relevant equations described in the previous section. Our results show that there are significant occupational as well as workplace wage differentials in Greece. One can see that occupational and workplace characteristics along with their interaction explain 63% of wage variation. Therefore, occupational and workplace characteristics, as well as their interaction, explain most of the observed variation in wages. The lower panel provides information on the marginal contribution of workplace and occupation characteristics. In particular, almost 15% of the wage

9 More specifically, the explanatory power of workplace dummies will be overstated, if the wage equation is estimated using controls for workplace characteristics only, as it will also capture the "crowding" of certain occupations in certain types of workplaces. The same holds for the explanatory power of occupational dummies. Therefore, $R^2_{work}+R^2_{occ}$ will be higher than R^2_{main}, which accounts for both occupational and workplace differentials. As Hamermesh (2008) argues, if one has a lot of information on workers, it will look as if worker characteristics matter more and if one has a lot of information on firms, it will look as if firms matter more. The difference thus measures the "joint" (collinear) explanatory power of occupation and workplace characteristics (see Groshen 1991).

10 The correlation between occupation and workplace effects can also be used as an additional test of positive or negative sorting (see Gruetter and Lalive 2009). While the idea of positive sorting is easy to understand, the same is not true for negative sorting. For instance, as Gruetter and Lalive (2009) argue, negative sorting may refer to a situation where high-wage workers may "purchase" safer jobs.

Table 1 Wage variance decomposition

R^2_{work}	0.374
R^2_{occ}	0.281
R^2_{main}	0.520
R^2_{cell}	0.630
Marginal contribution of characteristics	
Occupation	0.146
Workplace	0.239
Joint contribution	0.135
Job cell	0.110
Unexplained	0.370

Source: ERGANI and authors' estimations.
Note: The estimation sample consists of 575,495 observations. The dependent variable is log (wage).

variation is unambiguously related to the impact of the occupation, i.e. occupational wage differentials, 24% to the impact of the workplace, i.e. workplace wage differentials, and 11% to the impact of the workplace-occupation cell, i.e. the wage premium of a specific occupation-workplace match. The joint contribution of occupation and workplace is positive at 14%, which, along with a correlation of 16% between occupation and workplace effects, point to a positive sorting in our data, i.e. a clustering of high-wage occupations in high-wage workplaces. Our results are in line with those of Lane et al. (2007), who provide similar evidence for the United States.[11]

A decomposition analysis at the sectoral level provides some very insightful results regarding the relative contribution of occupational and workplace characteristics in explaining the wage variation within broader sectors, i.e. intra-industry wage differentials. Table B1 in Appendix B provides similar information as Table 1 above at the level of broad NACE sectors. For expositional purposes, in the lower panel, where the marginal contributions are presented, the sectors with the highest value for each component are highlighted. Looking across sectors, we can see that occupational characteristics contribute relatively more in sectors like agriculture and accommodation and food services. These occupational wage differentials could potentially reflect a more distinct divide in the production process of these sectors across occupations. For example, an irrigation specialist will get a significantly higher wage than an unskilled worker in the agricultural sector. Similarly, a hotel manager in the accommodation and food services sector will get a wage premium compared with a waiter at a restaurant.

By contrast, the contribution of workplace characteristics seems to be higher within a specialised production process such as financial and insurance services and information and communications, where the production of the final output requires a specific bundle of occupations in order for the product to be produced.[12] For instance, in order to repair a computer or to produce a specific computer programme, specific skills are required. In such instances, it is the workplace rather than the occupation that contributes more to the wage variation within these sectors. Our results thus imply that an IT specialist will get a different —most probably a higher premium— if she works in a high-tech company like Nokia, rather than a regional store repairing home PCs. Also, an economist will get a higher wage premium if she works for a systemic bank rather than a small regional cooperative bank or a small insurance company.[13]

When it comes to the wage premium attributable to a specific occupation-workplace

11 There is plenty of evidence on the sorting of certain types of workers across certain types of firms. However, results depend on the dimension on which one focuses. For example, using Austrian data, Gruetter and Levine (2009) provide evidence of a positive sorting of workers across industries, but of negative sorting across firms. Woodcock (2008), using data for the United States, finds that there are indications of positive sorting of workers across industries. Woodcock (2008) also finds that there is sorting of women into lower-paying industries and lower-paying firms within industries, resulting in a gender wage gap in the United States.

12 Workplace characteristics also have high explanatory power in the transportation and storage sector, reflecting the relative importance of the subsectors of shipping, air and energy transport in the transportation and communications sector in Greece.

13 While the sectoral agreement of the banking sector union would tend to equalise wages among banking sector employees, we expect to see differences across workplaces in the banking sector, as firm/bank-level agreements, especially in systemic banks, are also prevalent in the sector. In our analysis these differences will be captured by the detailed nature of the size and regional variables.

match, the contribution appears to be higher in sectors with less standardised production processes such as agriculture, mining, administrative services, etc. Therefore, an irrigation specialist in the agricultural sector will get a higher premium in a big farm operating in a region from which a high share of fresh fruit are collected/packaged and exported.

Interestingly, the manufacturing sector, a goods producing sector with standardised production processes in terms of capital and labour requirements, does not seem to be an outlier in terms of the contribution of occupation or workplace characteristics, i.e. occupational and workplace differentials exist, but are not above average.

Table B2 in the Appendix B performs the same exercise by size categories for the 12 major firm size categories. Interestingly, the unexplained share of the wage seems to be higher at the two extremes, for very small firms and for very large firms in Greece. At the same time, matching between occupation and workplace characteristics plays a greater role for small firms. This result is similar to that found by Lane et al. (2007) and may reflect a more idiosyncratic production process (technology) and less standardised pay-setting practices in small firms.[14]

4.2 THE ROLE OF INDIVIDUAL CHARACTERISTICS

As can be seen from our results even after controlling for workplace, occupational and matching effects, there is a non-negligible unexplained variation in wages (37% – see Table 1). As such, we progress our analysis further by investigating the effects on wage determination of workers' individual characteristics, such as age, gender and type of contract (permanent or fixed-term).

Specifically, we take the "net" wage, after the impacts of workplace and occupation characteristics as well as the interactions of the two have been conditioned out, and examine the relative importance of various employee characteristics such age, gender and job characteristics, namely contract type (whether the job is of definite or indefinite length). Thus, we let ε_{xijt} from equation (4) be equal to $Wnet_{xt}$ and estimate the following equation:[15]

$$Wnet_{xt} = a + \beta_x' \, personal\ characteristics_{xt} + \varepsilon_{xt} \quad (5)$$

$Wnet_{xt}$: wage net of workplace, occupational and matching effects;

$personal\ characteristics_{xt}$: referring to controls for age (age categories: 15-24, 25-34, 35-44, 45-54, 55-64, 65+), gender (male, female) and contract type (fixed-term or open-ended).

Thus, equation (5) captures the effect of personal characteristics on wages.

In the first column of Table 2 (equation 5) we can note that including age alone accounts for an additional 20% of the variation in wages compared with equation (4).[16]

The wage increase due to age is somewhat moderate for the age group 25-34 compared with our reference category, which is the age group 15-24, and stands at about 14%. However, the age premium increases rapidly thereafter, up to 48% for the age categories 55-64 and above. This result may point in two directions. On the one hand, the return on employees' labour market experience or firm-specific human capital is very large. On the other hand, we see that there is clear positive wage discrimination due to age (or a negative discrimination towards younger workers). This may also partly reflect the institutionalised wage discrimination against younger employees, such as the introduction of sub-minimum

14 This result is also in line with the findings of Haltiwanger et al. (2007), who show that new firms (which tend to be smaller) exhibit greater earnings heterogeneity.

15 "Conditioning out" the impact of certain worker and firm characteristics and focusing on the impact of other factors of interest on the net or "clean" wage is something customarily done in the literature (see for example Christopoulou et al. (2010) and references therein).

16 It should be noted that this regression refers to the net wage, i.e. the one from which we have already conditioned out the effects stemming from occupation, establishment and occupation-establishment matching effects. Thus, 20% is the proportion of variation explained in addition to what has already been explained by equation (4).

Table 2 Impact of personal and job characteristics - OLS results

(dependent variable: log wage; net of workplace; occupational and matching effects)

	Equation (5): Age only	Equation (5): Contract type only	Equation (5): Gender only	Equation (5): All personal characteristics
Age 25-34	0.131*** (0.00127)			0.127*** (0.00124)
Age 35-44	0.271*** (0.00124)			0.261*** (0.00122)
Age 45-54	0.351*** (0.00127)			0.336*** (0.00124)
Age 55-64	0.389*** (0.00136)			0.370*** (0.00133)
Age 65+	0.390*** (0.00230)			0.368*** (0.00226)
Fixed-term contract		-0.138*** (0.000794)		-0.106*** (0.000718)
Female			-0.0477*** (0.000719)	-0.0333*** (0.000633)
Observations	575,476	575,476	575,476	575,476
R-squared	0.201	0.050	0.008	0.235

Source: ERGANI and authors' estimations.
Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

wages for younger workers in the period 2016-2018,[17] but also the fact that in several sectors/occupations, wages and promotions are tenure-related (instead of skill-related). For example, it is very difficult for a better-skilled younger person to become promoted and thereby receive a higher wage (say to obtain a lower/middle managerial position such as a head of section), as the position itself may be tenure-related and not available to anybody who does not have at least 15 years of related work experience.

In the second and third columns we see that a fixed-term contract is associated with a lower average wage of about 14%, while being female is associated with a lower average wage of about 5%.[18] Both these personal characteristics add explanatory power to our wage equations, albeit to a significantly lower degree than age. Finally, in the last column of Table 2 we add all personal characteristics at the same time and see that they retain their magnitude in terms of point estimates, but also that their total additional explanatory power for wages is about 23.5%. Thus, occupation, workplace, matching and personal characteristics are able to explain a total of 86.5% of the overall wage variation in our data.

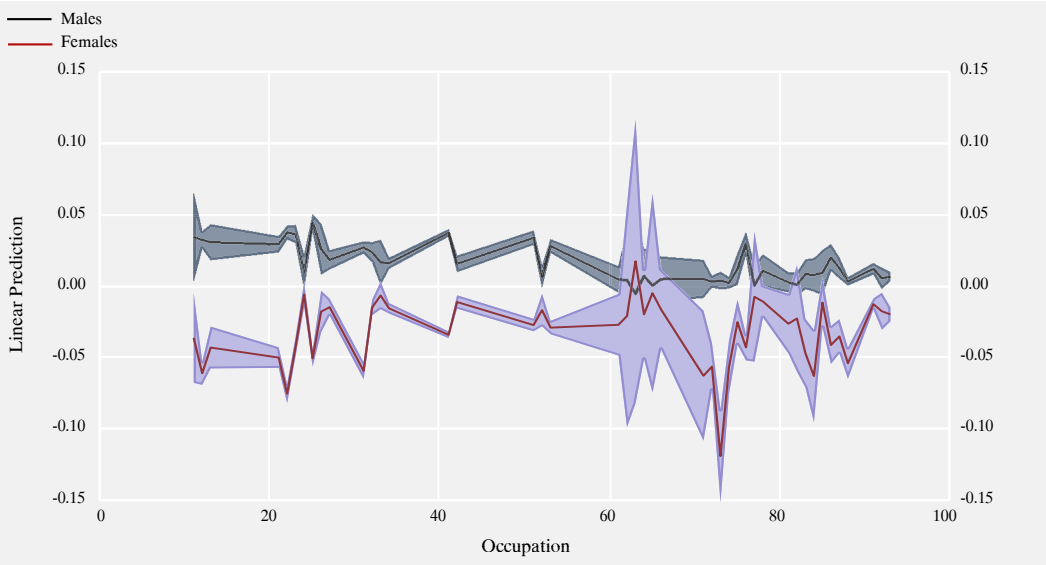
Delving further into wage discrimination emanating from gender and from working on fixed-term contracts, we interact these two variables with our occupational and age dummies. This will allow us to estimate our gender and contract wage gaps for each occupation and age category and obtain the respective marginal effects of each interaction. Specifically, we investigate how the main effects of gender and contract (-5% and -14%, respectively) obtained in Table 2 are distributed across occupations and age categories. Thus, we estimate and obtain the marginal effects of our variables of interest from the following regressions:

17 For example, younger workers would in principle not be eligible to any tenure-related benefits, as these were abolished in the early years of the economic adjustment programme and were retained only for older cohorts.

18 Negative effects on wages stemming from fixed-term contracts have long been documented in the literature, see e.g. Jimeno and Toharia (1993). The evidence on the gender pay gap is also extensive (see e.g. Papapetrou 2004; Albrecht et al. 2003; Blau and Kahn 1996).

Chart 1 Gender wage gap by occupation, marginal effects

(predicted gender effects by occupation with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

$$Wnet_{xt} = a + \theta' personal\ characteristics_{xt} + \mu'_{jx}(occup_j * personal\ characteristics_{xt}) + \varepsilon_{xt} \quad (6a)$$

and

$$Wnet_{xt} = a + \theta' personal\ characteristics_{xt} + \mu'_{kx}(age_k * personal\ characteristics_{xt}) + \varepsilon_{xt} \quad (6b)$$

The results are presented in Charts 1-4 and are in terms of marginal effects for our interaction variables.

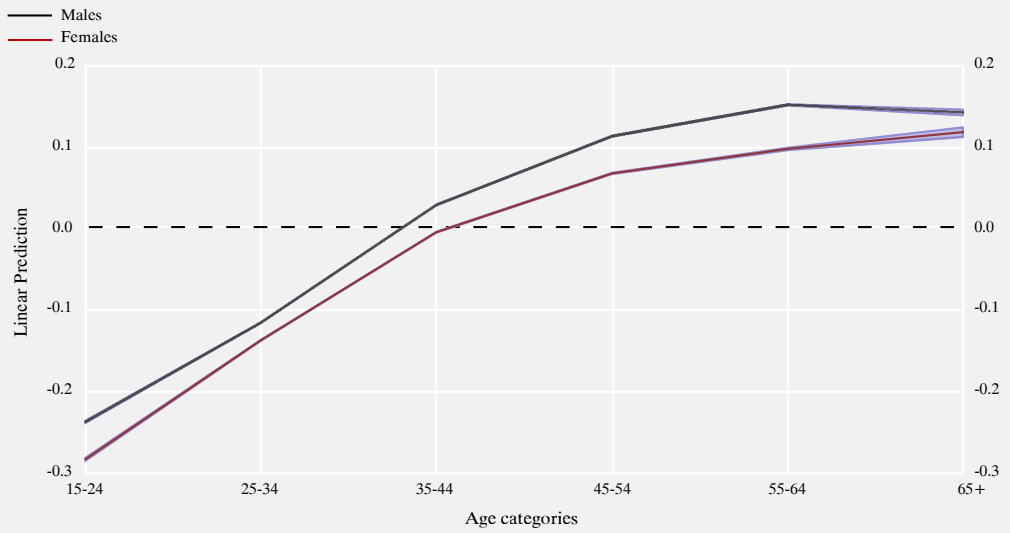
The gender wage gap, i.e. the difference between the estimated male and female effects, by occupation is shown in Chart 1. The wage gap can be understood as the difference between the black line – which is the estimated wage effect of being male in each occupation – and the red line – which is the estimated wage effect of being female in each occupation. Thus, if the estimate for males in one occupation is 0.035 and for females -0.04, it implies that the wage gap is about 7.5%. The results indicate that the wage gap between males and females tends to be larger, on average, for occupations in the range 11 to 34 rather than for occupations 41 to 93 (see Appendix A, Table A5), or rather the gender wage gap tends to be larger for high-skilled occupations and smaller for low-skilled occupations. These results are broadly in line with the so-called "glass ceiling" hypothesis. "Glass ceiling" refers to fact that women do quite well in the labour market up to a point beyond which there is an effective limit on their labour market prospects (Albrecht et al. 2003).[19]

In a similar fashion, Chart 2 shows that the gender wage gap tends to be smaller for younger individuals and increase for prime age individuals. In particular, the wage gap tends to widen from the age of 35 up to 64 and becomes narrower again after that. This may be connected with the child rearing age for females, when females tend to opt for career profiles

19 Albrecht et al. (2003) provide evidence of a "glass ceiling" in Sweden on the basis of quantile regressions. In particular, they find that the gender wage gap in Sweden increases throughout the wage distribution and accelerates in the upper tail. Since the wages of higher-skilled workers are expected to be at the upper tail of the wage distribution, our results can be considered as being broadly in line with the results of this literature.

Chart 2 Gender wage gap by age category, marginal effects

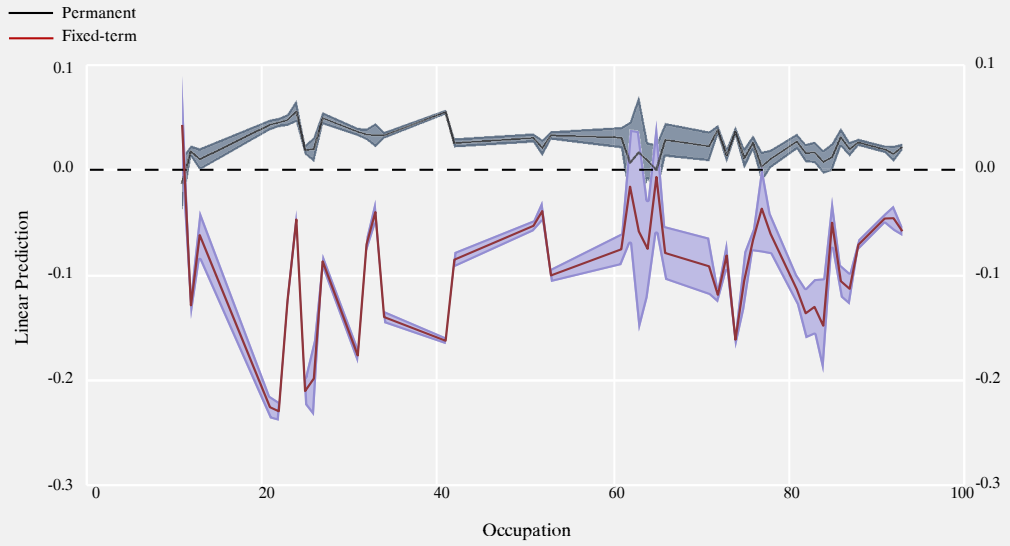
(predicted gender effects by age category with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

Chart 3 Contract wage gap by occupation, marginal effects

(predicted contract effects by occupation with 95% CIs)

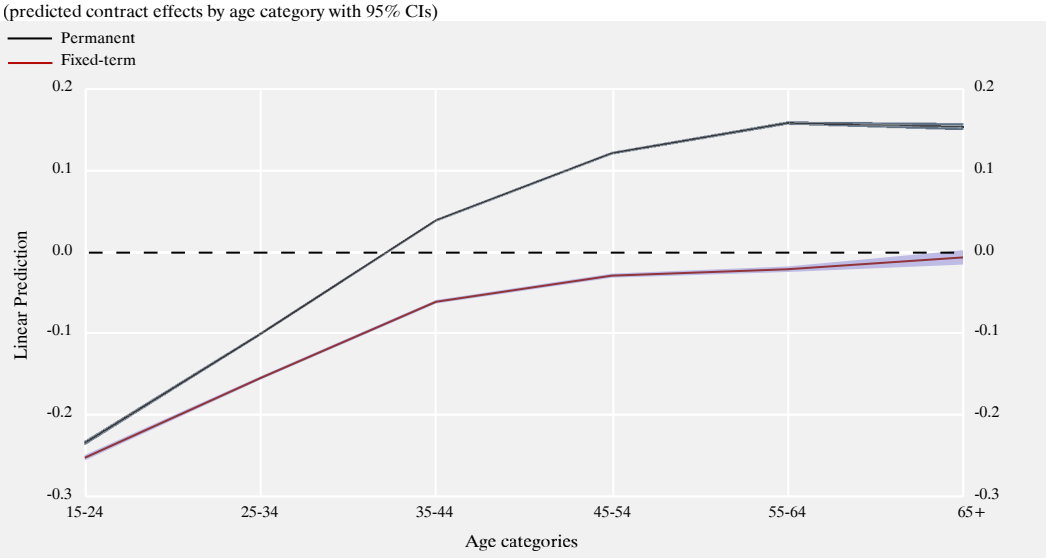


Note: The chart is based on post-estimation of marginal effects for our interaction variables.

that are more compatible with their responsibilities as the main providers of child care. Hospido et al. (2019), using personnel data for the European Central Bank (ECB) during the period 2003-2017, find that a wage gap between males and females in the ECB emerges a few years after their hiring despite their similar entry salaries and characteristics. One important driver of this result is the presence of children. They also find that the presence of children also influences the probability of applying for a promotion in the case of women. There-

Chart 4 Contract wage gap by age category, marginal effects

(predicted contract effects by age category with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

fore, all these career choices are likely to affect the career-salary profiles of women.

Turning to the wage gap due to contract type, we perform a similar exercise. In Chart 3 we see that working under a fixed-term contract implies a negative wage effect across almost all occupations. Similarly to the gender occupational effects, the effects of being on a fixed-term contract are, on average, stronger for high-skilled occupations and weaker for low-skilled occupations.[20]

Finally, in Chart 4 we see that the negative effects of being on a fixed-term contract increase with age. This is a plausible result, as tenure-related premia such as promotions are less likely to occur for employees on fixed-term contracts. In addition, wage floors (such as minimum wages) may be more binding for younger workers, thus compressing the negative wage effects of being on a fixed-term contract.[21]

5 CONCLUSIONS

By using a micro-aggregated dataset on full-time private sector employees, we analyse the importance of employer, employee and job characteristics in determining wages. Overall, we are able to explain about 86.5% of the observed wage variation in our data. Our results show that both employer and employee characteristics are important in determining wages. Furthermore, a good matching between employers and employees is also necessary for obtaining a higher wage.

While our results imply that one way for a worker to increase her wage is to change employer, they also imply that there is room for active policies to play an important role in increasing wages.

On the one hand, development policies can be important. Specifically, policies that allow firms to grow (such as lowering the administrative costs) will increase wages as —in general— large firms pay better than small ones. Also, policies that promote the development of

20 The results are in line with Paul et al. (2014) and Da Silva and Turrini (2015), who find that a considerable negative wage effect exists for the high-skilled. As such, their findings suggest that apart from a negative wage gap, there are also lower incentives to accumulate skills.

21 The findings of gender and contract wage gap by occupation and age category tend to be stronger in a population-weighted regression setting, see Appendix B, Charts B1-B4.

high value added sectors will have an impact on wages.[22] On the other hand, active labour market policies may also play an important role for increasing wages. Specifically, life-long learning, which enhances workers' mobility across occupations or allows them to obtain new skills in order to be promoted, will also have a significant impact on their wages.

Moreover, our results suggest that there is considerable negative wage discrimination towards younger people. In particular, to the extent that promotions (which will allow for occupational status changes) are tenure-related, they negatively affect the wages of younger people (up to the age of 44). As such, the phasing out of such policies and their replacement with skill-related promotions may have a strong impact on wages for younger people and also on the incentive to acquire skills.

There seems to be significant female wage discrimination, even after occupational differences are accounted for. This discrimination also seems to be larger for females in high-skilled occupations and prime age women. Thus, policies that will actively promote higher female wages, such as active mentoring for promotions or female quotas in leading positions, as well as policies that will allow a better family career balance of female employees, such as increased state funded pre- and primary school child care, increased flexibility in terms of working hours and/or teleworking possibilities, seem to have an important role to play in wage developments.[23]

Finally, there also seems to be wage discrimination in terms of contract type. Employees on fixed-term contracts seem to earn significantly less than ones in permanent positions. Moreover, this negative effect seems to be larger for high-skilled occupations and increasing with age. To the extent that this reflects initial screening costs of an individual in order to fill a permanent position, it is understandable. However, if fixed-term contracts are not used primarily in this manner, it will create lower incentives to accumulate skills and affect the productivity of the workforce. This aspect of the Greek labour market needs further research based on individual microdata, where individuals can be followed over time, in order to evaluate the probabilities of fixed-term contracts being converted into permanent positions.

22 See for example Bank of Greece (2020).
23 Hospido et al. (2019) show that decisive measures to reduce gender discrimination can be very effective in this regard.

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APPENDIX A

DATA DESCRIPTION

Table A1 Age categories

<15
15-24
25-34
35-44
45-54
55-64
65+

Table A2 Firm size categories

(number of employees)
0-10
11-50
51-250
251-500
501-1000
1001-1500
1501-2000
2001-2500
2501-3000
3001-3500
3501-4000
> 4000

Table A3 NUTS 2 regions

01	Eastern Macedonia and Thrace
02	Central Macedonia
03	Western Macedonia
04	Epirus
05	Thessaly
06	Ionian islands
07	Western Greece
08	Central Greece
09	Attica
10	Peloponnese
11	North Aegean
12	South Aegean
13	Crete

Table A4 Two-digit NACE Rev. 2 sectors of activity

01	Crop and animal production, hunting and related service activities
02	Forestry and logging
03	Fishing and aquaculture
05	Mining of coal and lignite
06	Extraction of crude petroleum and natural gas
07	Mining of metal ores
08	Other mining and quarrying
09	Mining support service activities
10	Manuf. of food products
11	Manuf. of beverages
12	Manuf. of tobacco products
13	Manuf. of textiles
14	Manuf. of wearing apparel
15	Manuf. of leather and related products
16	Manuf. of wood and of products of wood and cork, ex. furniture; Manuf. of articles of straw and plaiting materials
17	Manuf. of paper and paper products
18	Printing and reproduction of recorded media
19	Manuf. of coke and refined petroleum products
20	Manuf. of chemicals and chemical products
21	Manuf. of basic pharmaceutical products and pharmaceutical preparations
22	Manuf. of rubber and plastic products
23	Manuf. of other non-metallic mineral products
24	Manuf. of basic metals
25	Manuf. of fabricated metal products, except machinery and equipment
26	Manuf. of computer, electronic and optical products
27	Manuf. of electrical equipment
28	Manuf. of machinery and equipment n.e.c.
29	Manuf. of motor vehicles, trailers and semi-trailers
30	Manuf. of other transport equipment
31	Manuf. of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
36	Water collection, treatment and supply
37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
39	Remediation activities and other waste management services
41	Construction of buildings
42	Civil engineering
43	Specialised construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
53	Postal and courier activities
55	Accommodation
56	Food and beverage service activities
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
64	Financial service activities, except insurance and pension funding
65	Insurance, reinsurance and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities
68	Real estate activities
69	Legal and accounting activities
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator and other reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
84	Public administration and defence; compulsory social security
85	Education
86	Human health activities
87	Residential care activities
88	Social work activities without accommodation
90	Creative, arts and entertainment activities
91	Libraries, archives, museums and other cultural activities
92	Gambling and betting activities
93	Sports activities and amusement and recreation activities
94	Activities of membership organisations
95	Repair of computers and personal and household goods
96	Other personal service activities
97	Activities of households as employers of domestic personnel
98	Undifferentiated goods- and services-producing activities of private households for own use
99	Activities of extraterritorial organisations and bodies

Table A5 Two-digit (or lower) ISCO-88 occupations

11 (11)	Legislators and senior officials
12 (12)	Corporate managers
13 (13)	Managers of small enterprises
21X (21)	Physicists, mathematicians and related professions
21X (22)	Architects, engineers and related professionals
22 (23)	Life science and health professionals
23 (24)	Teaching professionals
24X (25)	Business professionals
24X (26)	Legal professionals
24X (27)	Other scientific, art and related professionals
31 (31)	Physical and engineering science associate professionals
32 (32)	Life science and health associate professionals
33 (33)	Teaching associate professionals
34 (34)	Other associate professionals
41 (41)	Office clerks
42 (42)	Customer services clerks
51X (51)	Personal services workers
51X (52)	Protective services workers
52 (53)	Models, salespersons and demonstrators
61X (61)	Field crop and vegetable growers
61X (62)	Tree and shrub crop growers
61X (63)	Mixed-crop growers
61X (64)	Market-oriented animal producers and related workers
61X (65)	Forestry and related workers
61X (66)	Fishery workers
61X (67)	Hunters and trappers
71X (71)	Extraction workers
71X (72)	Building trades workers
72X (73)	Metal workers
72X (74)	Machinery workers
73 (75)	Precision, handicraft, craft printing and related trades workers
74X (76)	Food processing and related trades workers
74X (77)	Wood treaters, cabinet-makers and related trades workers
74X (78)	Textile, garment and related trades workers
81 (81)	Stationary plant and related operators
82X (82)	Metal- and mineral-products machine operators
82X (83)	Chemical-, rubber- and plastic-products machine operators
82X (84)	Wood- and paper-products machine operators
82X (85)	Textile-, fur- and leather-products machine operators
82X (86)	Food and related products machine operators
82X (87)	Assemblers, other machine operators n.e.c.
83 (88)	Drivers and mobile plant operators
91 (91)	Sales and services elementary occupations
92 (92)	Agricultural, fishery and related labourers
93 (93)	Labourers in mining, construction, manufacturing and transport

Notes: Codes in the parentheses give the original classification codes that are based on ELSTAT's "ΣΤΕΠ-92" classification system. Correspondence to ISCO-88 by ELSTAT.

Table A6 Average occupational wages (logarithms)

Occupation – Two-digit (or lower) ISCO-88	
Legislators and senior officials	7.7
Corporate managers	7.6
Managers of small enterprises	7
Physicists, mathematicians and related professions	7.3
Architects, engineers and related professionals	7.5
Life science and health professionals	7.2
Teaching professionals	7
Business professionals	7.5
Legal professionals	7.7
Other scientific, art and related professionals	7.1
Physical and engineering science associate professionals	7.1
Life science and health associate professionals	6.9
Teaching associate professionals	6.9
Other associate professionals	7
Office clerks	6.9
Customer services clerks	6.8
Personal services workers	6.8
Protective services workers	6.7
Models, salespersons and demonstrators	6.7
Field crop and vegetable growers	6.8
Tree and shrub crop growers	6.7
Mixed-crop growers	6.8
Market-oriented animal producers and related workers	6.8
Forestry and related workers	6.7
Fishery workers	6.7
Extraction workers	7
Building trades workers	7
Metal workers	7
Machinery workers	7
Precision, handicraft, craft printing and related trades workers	6.9
Food processing and related trades workers	6.7
Wood treaters, cabinet-makers and related trades workers	6.8
Textile, garment and related trades workers	6.8
Stationary plant and related operators	7
Metal- and mineral-products machine operators	7
Chemical-, rubber- and plastic-products machine operators	6.9
Wood- and paper-products machine operators	6.9
Textile-, fur- and leather-products machine operators	6.8
Food and related products machine operators	6.8
Assemblers, other machine operators n.e.c.	6.9
Drivers and mobile plant operators	6.9
Sales and services elementary occupations	6.8
Agricultural, fishery and related labourers	6.7
Labourers in mining, construction, manufacturing and transport	6.7
Average	**7.0**
Standard deviation	**0.27**

Source: ERGANI and authors' calculations.

APPENDIX B

ADDITIONAL REGRESSION RESULTS

Table B1 Wage variance decomposition - Sectoral analysis

	Agricult-ure etc.	Mining etc.	Manu-facturing	Electricity	Water supply	Contruct-ion	Wholesale and retail trade	Trans-portation and storage	Accomo-dation and food services	Inform-ation and communic ations
R^2_{work}	0.195	0.278	0.303	0.219	0.314	0.252	0.242	0.330	0.264	0.352
R^2_{occ}	0.347	0.308	0.291	0.275	0.397	0.231	0.243	0.307	0.315	0.227
R^2_{main}	0.467	0.477	0.490	0.423	0.578	0.414	0.436	0.507	0.490	0.497
R^2_{cell}	0.638	0.639	0.624	0.556	0.686	0.569	0.577	0.640	0.587	0.608
Marginal contribution of characterisitics										
Occupation	**0.272**	0.199	0.187	0.204	**0.264**	0.162	0.194	0.177	**0.226**	0.145
Workplace	0.12	0.169	0.199	0.148	0.181	0.183	0.193	0.200	0.175	**0.27**
Joint contribution	0.075	0.109	0.104	0.071	**0.133**	0.069	0.049	**0.130**	0.089	0.082
Job cell	**0.171**	**0.162**	0.134	0.133	0.108	**0.155**	0.141	0.133	0.097	0.111
Unexplained	0.362	0.361	0.376	0.444	0.314	0.432	0.423	0.360	0.413	0.392
Observations	14,209	5,056	141,125	9,177	13,060	28,609	76,899	30,566	37,715	22,006

	Financial and insurance services	Real estate activities	Professional, scientific and technical activities	Administr-ative and support services	Public administr-ation, defence, etc.	Education	Human health and social work activities	Arts, entertain-ment and recreation	Other service activities
R^2_{work}	0.408	0.224	0.315	0.243	0.133	0.255	0.184	0.390	0.419
R^2_{occ}	0.265	0.335	0.264	0.325	0.281	0.177	0.236	0.216	0.302
R^2_{main}	0.557	0.482	0.490	0.447	0.385	0.400	0.391	0.505	0.550
R^2_{cell}	0.686	0.608	0.617	0.600	0.517	0.527	0.525	0.650	0.687
Marginal contribution of characterisitics									
Occupation	0.149	**0.258**	0.175	0.204	**0.252**	0.145	0.207	0.115	0.131
Workplace	**0.292**	0.147	**0.226**	0.122	0.104	0.223	0.155	**0.289**	**0.248**
Joint contribution	**0.116**	0.077	0.089	**0.121**	0.029	0.032	0.029	0.101	**0.171**
Job cell	0.129	0.126	0.127	**0.153**	0.132	0.127	0.134	**0.145**	0.137
Unexplained	0.314	0.392	0.383	0.400	0.483	0.473	0.475	0.350	0.313
Observations	11,496	5,099	34,785	31,191	23,875	15,123	38,683	16,983	19,838

Source: ERGANI and authors' estimations.
Notes: The table reports wage variance decomposition for major sectors of activity. The cells in bold font mark by characteristic the five highest marginal contributions across sectors. Results are based on estimating equations (1)-(4) by broad NACE sector.

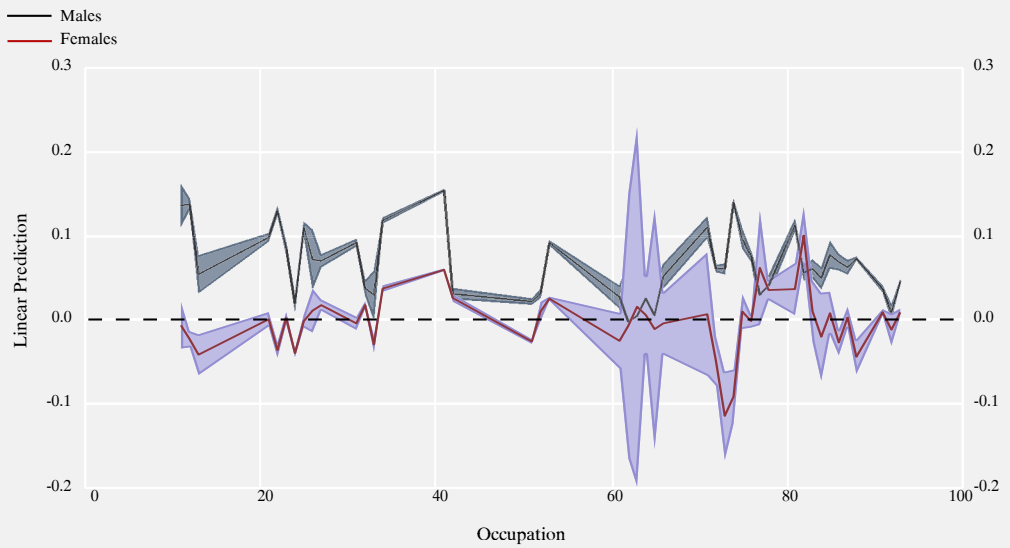
Table B2 Wage variance decomposition - Analysis by firm size

	1-10	11-50	51-250	251-500	501-1000	1001-1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000	>4000
R^2_{work}	0.190	0.203	0.203	0.248	0.253	0.290	0.362	0.541	0.265	0.233	0.082	0.205
R^2_{occ}	0.179	0.263	0.317	0.320	0.303	0.362	0.279	0.292	0.308	0.346	0.562	0.281
R^2_{main}	0.318	0.399	0.449	0.475	0.462	0.516	0.514	0.626	0.454	0.450	0.579	0.404
R^2_{cell}	0.511	0.556	0.567	0.601	0.610	0.652	0.647	0.744	0.588	0.614	0.645	0.504
Marginal contribution of characterisitics												
Occupation	0.128	0.196	**0.246**	**0.227**	0.209	**0.226**	0.152	0.085	0.189	**0.217**	**0.497**	0.199
Workplace	0.139	0.136	0.132	**0.155**	**0.159**	**0.154**	**0.235**	**0.334**	0.146	0.104	0.017	0.123
Joint contribution	0.051	0.067	0.071	0.093	0.094	**0.136**	**0.127**	**0.207**	**0.119**	**0.129**	0.065	0.082
Job cell	**0.193**	**0.157**	0.118	0.126	**0.148**	**0.136**	0.133	0.118	0.134	**0.164**	0.066	0.100
Unexplained	**0.489**	**0.444**	**0.433**	0.399	0.390	0.348	0.353	0.256	**0.412**	0.386	0.355	**0.496**
Observations	151,990	155,690	128,971	50,758	38,300	18,326	7,823	5,995	3,743	1,344	1,447	11,108

Source: ERGANI and authors' estimations.
Notes: The cells in bold font mark by characteristic the five highest marginal contributions across firm size category. Results are based on estimating equations (1)-(4) by firm size category.

Chart B1 Gender wage gap by occupation, population-weighted, marginal effects

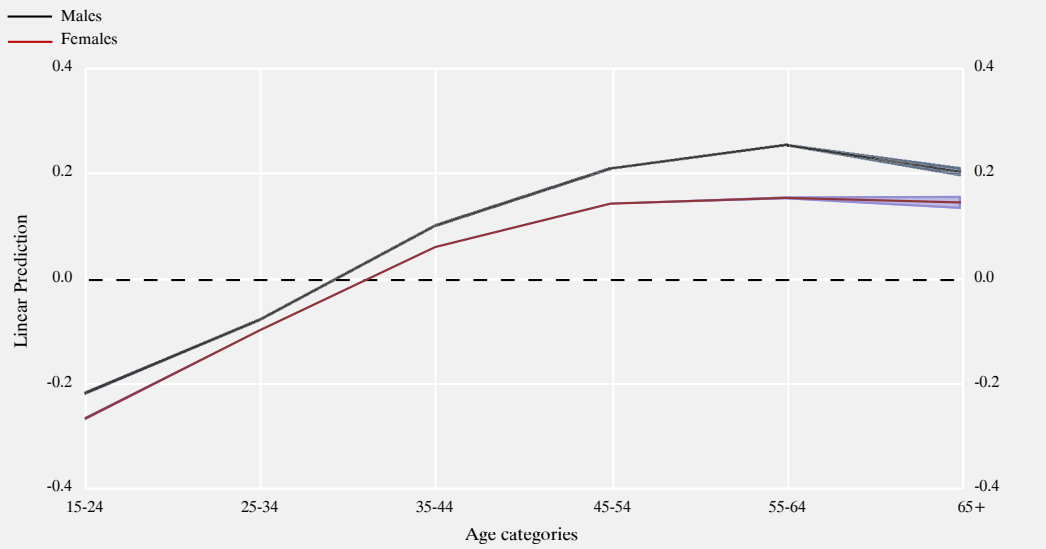
(predicted gender effects by occupation, population-weighted, with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

Chart B2 Gender wage gap by age category, population-weighted, marginal effects

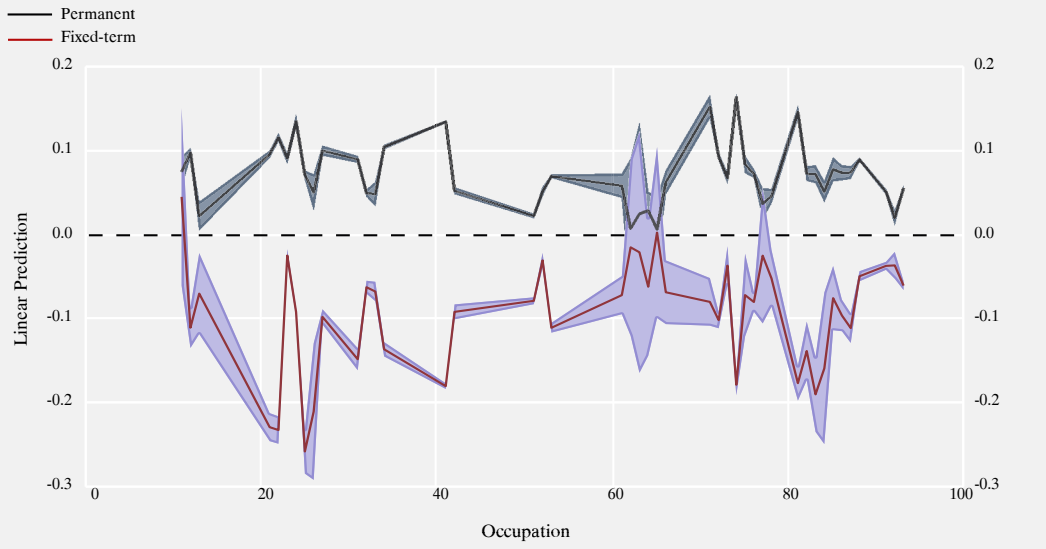
(predicted gender effects by age category, population-weighted, with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

Chart B3 Contract wage gap by occupation, population-weighted, marginal effects

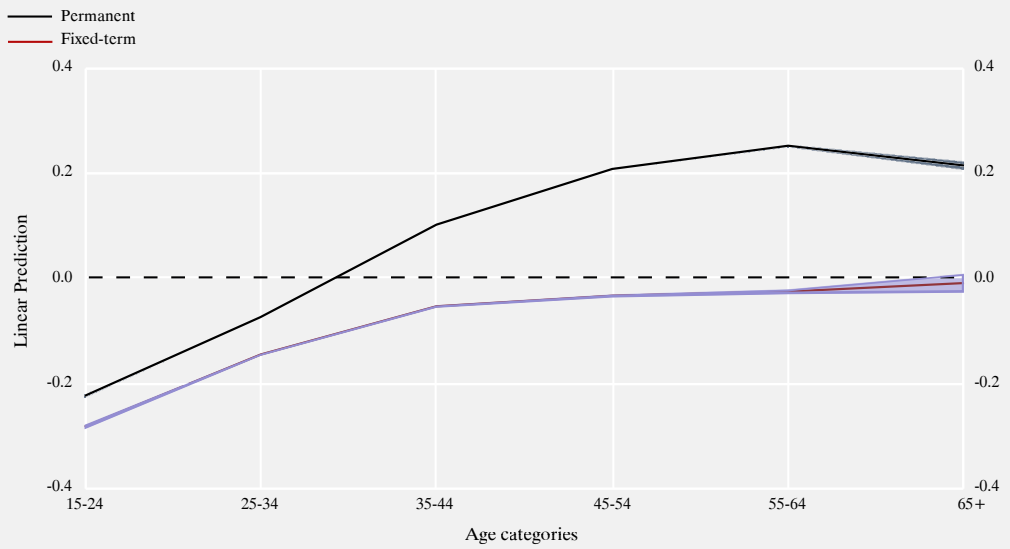
(predicted contract effects by occupation, population-weighted, with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.

Chart B4 Contract wage gap by age category, population-weighted, marginal effects

(predicted contract effects by age category, population-weighted, with 95% CIs)



Note: The chart is based on post-estimation of marginal effects for our interaction variables.