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The Evolution of the Gender Wage Gap in the Labour Market of Cyprus

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Η διαχρονική εξέλιξη του έμφυλου μισθολογικού χάσματος της Κύπρου

Λούης Ν. Χριστοφίδης και Παντελής Μισός

ΠΕΡΙΛΗΨΗ

Οι διαθέσιμες οικονομετρικές μελέτες για το Έμφυλο Μισθολογικό Χάσμα (EMX) που είναι εξ ολοκλήρου αφιερωμένες στην Κύπρο προηγούνται της ένταξης της χώρας μας στην Ευρωπαϊκή Ένωση (το 2004). Η παρούσα εργασία στοχεύει να καλύψει το χρονικό κενό μέχρι σήμερα, χρησιμοποιώντας λεπτομερή (4^α-ψήφια) στοιχεία από τις Διαρθρωτικές Έρευνες Απολαβών (ΔΕΑ) του 2006, 2010, 2014 και 2018. Ο στόχος αυτός πραγματοποιείται (α) απομονώνοντας το μερίδιο του EMX που μπορεί να εξηγηθεί από τα παραγωγικά χαρακτηριστικά των εργαζομένων (το *εξηγούμενο* EMX), λαμβάνοντας υπόψη (β) την ενδεχόμενη επίδραση του κατωτάτου μισθού στα επαγγέλματα που καθορίζονται από τη σχετική νομοθεσία, καθώς και (γ) τον τομέα απασχόλησης των εργαζομένων. Στην ΔΕΑ του 2006, το *ολικό* EMX υπολογίζεται ως 0.186 (μη σταθμισμένες) και 0.267 (σταθμισμένες) λογαριθμικές μονάδες μισθών, αρκετά χαμηλότερα, δηλαδή, από ό,τι στις προ-υπάρχουσες μελέτες για παλαιότερα έτη. Η πτωτική αυτή πορεία του *ολικού* EMX συνεχίζεται και τα επόμενα έτη, υπολογιζόμενο σε 0.169 (μη σταθμισμένες) και 0.197 (σταθμισμένες) μονάδες από τα δεδομένα της ΔΕΑ του 2010, και 0.160 (μη σταθμισμένες) και 0.124 (σταθμισμένες) μονάδες, από τα δεδομένα της ΔΕΑ του 2014. Κατά το 2018, το τελευταίο έτος για οποίο υπάρχουν διαθέσιμα δεδομένα, το *ολικό* EMX ήταν 0.100 (μη σταθμισμένες) και 0.103 (σταθμισμένες) λογαριθμικές μονάδες μισθών. Το *εξηγούμενο* EMX επίσης μειώθηκε με την πάροδο του χρόνου σε βαθμό που το 2018 να υπολογίζεται κοντά στο μηδέν, τόσο από τα σταθμισμένα όσο και από τα μη σταθμισμένα δεδομένα. Αυτό πιθανόν να υποδηλοί τη σύγκλιση των μεταβλητών (παραγωγικών χαρακτηριστικών) των ΔΕΑ, στις μέσες τους τιμές, τόσο για τους άνδρες όσο και για τις γυναίκες. Όντως, στα δεδομένα του 2018 παρατηρείται, κατά μέσο όρο, ότι (α) περισσότερες γυναίκες από ό,τι άνδρες είχαν ολοκληρώσει πανεπιστημιακή εκπαίδευση, (β) οι γυναίκες έχαιραν εξίσου μακρά ή μεγαλύτερη περίοδο εργοδότησης στον ίδιο εργοδότη, και (γ) είχαν συγκρίσιμο ιστορικό με τους άνδρες στην κατοχή συμβάσεων αορίστου χρόνου. Το υπόλοιπο, *ανεξήγητο*, μέρος του EMX του 2018, το οποίο στις 0.100 λογαριθμικές μονάδες μισθών ήταν περίπου ίσο με ολόκληρο το EMX, μπορεί να σχετίζεται με υπολειμματικές διακρίσεις, αλλά και με τη φύση των θέσεων εργασίας, τη δημιουργία

οικογένειας και τη λειτουργία της, καθώς και με τις πολιτικές συμφιλίωσης της εργασίας με την οικογένεια. Αυτά τα θέματα αποτελούν, επί του παρόντος, αντικείμενο σημαντικής ακαδημαϊκής προσοχής διεθνώς. Η μελέτη ολοκληρώνεται με μια ανασκόπηση των συμπερασμάτων της διεθνούς βιβλιογραφίας τα οποία δύνανται να προσφέρουν μαθήματα πολιτικής για την Κύπρο.

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The Evolution of the Gender Wage Gap in the Labour Market of Cyprus

Louis N. Christofides* and Pandelis Mitsis

Abstract

Until now, the only available econometric studies of the Gender Wage Gap (GWG) which are wholly devoted to Cyprus pre-date the country's accession to the European Union in 2004. This paper aims to fill the time-gap to the present, using 4-digit data from the 2006, 2010, 2014, and the latest 2018 Structure of Earnings Survey (SES). It does so, also (i) calculating the portion of the GWG which can be explained by productive characteristics, (ii) conditioning on a binary occupational fixed effect *at the 4-digit level* which captures the influence of the legal minimum wage (MW) in nine occupations, and (iii) controlling for possible industry fixed effects. In the 2006 SES, the unconditional GWG took a sizeable step down from previous Cyprus-specific estimates, to a new low of 0.186 (unweighted) and 0.267 (weighted) In wage points. It continued a downward path in 2010 to 0.169 (unweighted) and 0.197 (weighted) points, reaching 0.160 (unweighted data) and 0.124 (weighted) points in 2014, and 0.100 (unweighted) and 0.103 (weighted) In wage points in 2018. The *explained* portion of the overall GWG also declined over time, and by 2018 it was essentially zero for the unweighted and weighted data. This suggests that, by that time, the explanatory variables available in the SES for men and women had converged in their average values. Indeed, in 2018 and on average, (i) more women than men had attained university education, (ii) women held equally long or longer spells with the same employer, and (iii) had a comparable record with men in holding contracts of indefinite duration. The remaining, *unexplained* 2018 GWG portion, which at 0.100 In wage points was roughly equal to the GWG itself, may relate to residual discrimination, but also to the nature of jobs, family formation and its functioning, and to work/family reconciliation policies. These issues are now the subject of considerable academic attention, and the paper concludes with observations on the implications of this international work for Cyprus.

Keywords: Gender Wage Gap, Decompositions, Explained, Unexplained, work/family reconciliation policies.

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1. Introduction

The gender wage gap (GWG) has been receiving continued academic and policy attention in many countries. In the European Union (EU), gender equality has been enshrined in the Pillar of Social Rights Action Plan under Principle 2 on Gender Equality (European Commission 2021, p. 44), and in many other official documents (e.g. European Commission 2020, and European Union 2022). Cyprus joined the EU in 2004, and, on this twentieth anniversary of this event, it is fitting to check how its GWG has evolved over time. Estimates of the GWG in Cyprus and its decompositions have been carried out, but they pre-date 2004 and are not up to date. The aim of this paper is to record and try to understand the gender performance of Cyprus, past its accession to the EU, and as recently as possible.

The impact of accession to the EU and the concomitant increase of EU workers in Cyprus on the GWG cannot be easily separated from the general evolution of the country's societal norms and governmental policies. A number of institutional and educational initiatives in Cyprus facilitated reductions in the GWG, and Eurostat now reports that the 2023 average difference between male and female earnings in its raw survey data is 9.7% for Cyprus and 12.7% in the EU. While this *unconditional* relative record is pleasing, the information that it entails is not fully satisfactory because it does not consider the dependence of the GWG on 'productive characteristics', e.g. variables such as gendered education and labour market experience (to name but two obvious ones). To fully appreciate the policy relevance of these Eurostat figures for Cyprus, it is necessary to calculate the extent to which the unconditional GWG can be broken down into a portion that is due to differences in productive characteristics (the *explained* portion), and a remaining (*unexplained*) portion which may be due to unavailable (but relevant) variables, and to possible discrimination. The implications that flow from such decompositions for monitoring gender equality and concordance with EU policies depend on how a given unconditional GWG breaks down into these constituent parts. A GWG which (say) is entirely explained by a lower female educational achievement should trigger a review of existing educational policies and the societal mores which have led to them, while a GWG which is entirely unexplained should lead to a search for missing important variables that are not available in cross-sectional surveys¹, and/or discrimination.

¹ Examples of such variables include, inter alia, risk aversion (Kettlewell et al 2023), gender patterns of cognitive skills (Battisti et al. 2023), the prevailing patterns and location of jobs and female comparative advantage (Goldin 2014, Olivetti and Petrongolo 2014, Ngai and Petrongolo 2017, Mas and Pallais 2017, and Le Barbanchon et al. 2021), family formation (Zamberlan and Barbieri 2023), and work/family reconciliation policies (Kleven et al 2022, Blair and Posmanick 2023, Cortes and Pan 2023).

It is not the aim of this paper to carry out this exercise for the EU as a whole. Decompositions of the GWG for Cyprus have been made² but they are now dated. The purpose of this paper is to extend understanding of the size and composition of the GWG in Cyprus to as recent a date as suitable data will allow, and to bring out the directions in which efforts to reduce the remaining unexplained GWG should be directed.

The Cyprus Statistical Service (Cystat) has now made available, through the Economics Research Centre (ERC) at the University of Cyprus, *hitherto unavailable, economy wide, 4-digit data* from the Structure of Earnings Survey (SES) that pertain to 2006, 2010, 2014, and 2018. The 4-digit data make it possible to take into account an important feature of the labour market, namely the legally binding minimum wage (MW) mandated in nine *non-unionised* occupations³. Beyond (i) establishing the secular behaviour of the GWG and its components, it is also possible to (ii) comment on whether the minimum wage legislation for the nine female-dominated occupations secured a more beneficial GWG performance relative to the GWG in the remaining, *unionised*, occupations.

Section 2.1 discusses in general terms the working samples derived from the 4-digit cross-sectional SES surveys for the years 2006, 2010, 2014 and 2018; the extant 2-digit SES survey for 2002 is not detailed enough and too different for comparison purposes. Section 2.2 describes the characteristics of the available variables in these unweighted and weighted samples. Substantial differences between average wages in the MW and the remaining unionised sector for each gender exist and are outlined in section 2.3. In view of their importance for policy formation, these gaps should be the subject of further work, but this would lie beyond the focus of the current study. Section 3 outlines the econometric estimation and decomposition approach adopted. Section 4 discusses the results obtained for the crucial wage equations (section 4.1);

² Christofides and Pashardes (2000) used the Cyprus Survey of Household Expenditure and Income (CSHEI) for 1990/91 to measure an 'unconditional' GWG of 0.534 ln wage points, of which 0.323 ln points were explained by the available variables and 0.211 ln points remained unexplained. Christofides and Vrahimis (2009) used the CSHEI for 1990/91, 1996/97, and 2002/03 to reproduce the 1990/91 results in Christofides and Pashardes (2000), and to extend that study to 2002/03. In the 1996/97 and 2002/03 surveys, the 1990/91 unconditional total GWG dropped to 0.418 and 0.381 ln wage points respectively, with the explained component being 0.104, and 0.148 ln points respectively, the balance remaining unexplained. Based on a study of 26 European countries and the 2007 EU SILC data, Christofides et al. (2013) reported an unconditional GWG for Cyprus of 0.370 ln points, of which only 0.181 ln points could be explained by the variables in the survey, leaving an unexplained portion of 0.189 ln wage points. That study differed from the present one in terms of the common choices made for the 26-country 'working samples', reducing the comparability of the GWG estimates with those that specifically pertain to Cyprus.

³ These 4-digit, female-dominated, occupations were: salespersons; clerks; auxiliary healthcare staff; auxiliary staff in nurseries; auxiliary staff in crèches; auxiliary staff in schools; guards; caretakers working in clinics, private hospitals and nursing homes; and cleaners of corporate premises. Christofides and Mitsis (2023) explored the influence of the MW on earnings in these occupations. In other work for Cyprus, Mitsis (2013, 2015, and 2019) addressed the *impact* of the MW on other labour market outcomes.

it also presents the GWG decompositions for the four surveys (section 4.2) and investigates their robustness to changes in the specification of the wage equations that underlie the decompositions (section 4.3). Section 5 concludes and considers whether the decline of the GWG in Cyprus has, as is thought in some other countries, 'stalled', ending with observations on further work that might shed light on this issue.

2. The 'Working Samples'

2.1 Data and General Sample Issues in the 4-digit SES

The 'working samples' generated from the SES include full-time workers only, thus raising the comparability in the labour market of wages by gender. Part-time status is thought by unions to be a feature of 'poor jobs', and the percentage of these workers in the sample was only 1.6% in 2006 - rising to 5% and 4.8% by 2014 and 2018 respectively. Further working sample restrictions, many of which are pre-determined and not likely to raise serious selection issues, are that individuals must be aged 25-65, be citizens of Cyprus, the EU and third countries, and be employed in establishments with one or more employees. The working samples exclude trainees and employees who have agency over their earnings, such as the self-employed.

Gross monthly earnings (subtracting incomes received from additional shifts and overtime work) are used. A main reason to express and work with data in monthly (rather than hourly) terms is that these are more common reference points in the labour market. Indeed, only a small fraction of MW workers was paid by the hour: in 2006 all MW workers were paid monthly. In 2010 Guards were the only ones paid hourly and those observations were 3% of the MW workers. By 2014 Guards *and Cleaners* were paid hourly; Cleaners were a large group and, adding them to Guards, the two groups amounted to about 20% of the MW observations (Christofides and Mitsis 2023⁴). Those in the Union sector are likely to be paid monthly because the starting 'indicative salaries' specified in collective bargaining agreements are in monthly terms.

There is no reason (such as insufficiency of observations) to pool the four samples and, in view of the substantial changes that occurred between 2006 and 2018 (see footnote 6 below), pooling would impose binding and misleading coefficient equality restrictions across the four surveys. Such restrictions were rejected on statistical grounds in our earlier work. In addition, separate survey estimations provide

⁴ The work in Christofides and Mitsis (2023) was carried out with 4-digit data which were initially released *only for the nine MW occupations* listed in footnote 3 above. Through the ERC, it is now possible to use 4-digit data for the entire labour market. A minor correction to the data for the MW occupations was made by including category 4112 (Word Processor and Related Operations) to the list of MW occupations; this was inadvertently omitted from the data provided to us earlier.

information on the evolution of the GWG and its components over the decades spanned by this study.

The MW legislation mentioned above was designed to protect individuals in the only significant occupations that are not unionised; individuals in the remaining occupations of the labour market are thought to be ably represented by the large number of strong unions that exist in Cyprus. Beyond individuals from the nine MW occupations, the current working sample contains employees from *all* the remaining, unionised, occupations and industrial sectors of the economy (these are referred to, in short, as belonging to the category 'Union'). In the Union category, wages are determined in (non-legally binding) collective bargaining agreements which normally contain 'indicative' starting monthly wages. Since these cannot be compared to the administratively determined, legally binding, MW levels in the nine occupations, a different approach is needed in this study of the entire labour market. This is achieved by grouping occupations into two categories using the binary variable BMW: (i) those subject to the MW (BMW=1, determined with the aid of the 4-digit ISCO-08 SES data), and (ii) the remaining unionised occupations (BMW=0). In addition to the binary BMW variable, twelve industry fixed effects (NACE Rev. 2) are included. More details are provided below. The results that are fully reported are checked against simpler specifications which do not contain the BMW variable and the industry fixed effects. In the SES data, enhanced representativeness is sought through the SES-provided weights⁵, and weighted estimates of the wage equations are also obtained and used in constructing the GWG and its decompositions. The results based on the unweighted and weighted data provide a largely similar picture of the secular evolution of the GWG.

2.2. Descriptive Statistics

For the purposes of this paper, the important sample splits in the four surveys are those by gender. For the four SES of 2006, 2010, 2014, and 2018 the number of observations for men, women and in total are respectively (13,833, 10,892, 24,725); (15,743, 14,216, 29,959); (14,090, 13,927, 28,017); and (13,057, 13,030, 26,087). As a point of further interest, the number of individual observations subject to the MW, the number

⁵ We are grateful to Cystat for providing the following comments on the construction of these weights: "The data collected were weighted in order to produce the grossed-up results for enterprises and for employees. Design weights were obtained by taking the inverse of selection probabilities of enterprises and employees. The weight of the enterprise was based on the economic activity (Nace Rev.2 at the 2-digit level) and the size-group of the enterprise (Number of employees: 1-9, 10-49, 50-249, 250-499, 500-999, 1000+). The weight of each employee was: (weight of employee within the enterprise) x (weight of the enterprise), where the weight of the employee within the enterprise is equal to: (number of employees in enterprise) / (number of employees in sample). The weights for employees were then calibrated based on the Social Insurance Register for October 2018, based on the monthly earnings and the number of employees."

of observations in the Union sector, and their total, are as follows: (3,274, 21,451, 24,725); (7,251, 22,708, 29,959); (7,941, 20,076, 28,017); and (6,967; 19,120; 26,087). The smallest, 2006, survey did not contain Guards, Caretakers and Cleaners in the MW category because these occupations were not covered by the MW legislation until 2010. For 2006 only, these occupations were included in the 'Union' sector. Paid hours worked in the four surveys ranged between 167 and 174, with hours in the MW category only slightly higher than those in the unionised occupations. Information on hours was not needed in classifying observations into the binary BMW variable.

In the econometric wage estimations that follow and are used in the GWG decompositions, the available SES, relevant, variables are all used: Age and Age squared, Length of service, Gender, Managerial service, Temporary contract, Education, Size of enterprise, and Citizenship are all included as explanatory variables. Individuals in the Union sector are in general older, have longer service with the same employer, are much more likely to be male and to hold managerial positions, more likely to be in temporary positions (perhaps in anticipation of a permanent position in the preferred financial or public sector), much more likely to be university graduates employed in the public sector and the largest private enterprises, and only somewhat more likely to be Cypriot citizens. These characteristics explain to some extent the higher earnings noted below (see Table 1) for the Union relative to the MW occupations. However, the earnings gap between the broad MW and Union occupations is large and its determination calls for a dedicated, separate, study.

In the gendered wage equations, in addition to controlling for the personal and firm characteristics noted above, the binary variable BMW distinguishes the nine occupations covered by the MW legislation from the remaining Union ones, and twelve binary variables capture industry fixed effects (Manufacturing is the thirteenth, omitted, category).

Appendix Tables 1 and 2 provide detailed descriptive statistics (unweighted and weighted) for the variables in the first (2006) and last available (2018) SES, by gender. In each of these tables, some noteworthy differences exist between the unweighted and weighted means at a point in time. In addition, for each of the two categories (unweighted and weighted), important changes can be discerned between 2006 and 2018, mostly relating to the substantial increase of EU citizens in the labour market of Cyprus following entry into the EU's 'single market'. In the interests of economy, similar tables for 2010 and 2014 are not reported; these tend to chart intermediate changes in the means that lead them from their 2006 to their 2018 values.

While the above differences are striking, their origin and implications for the GWG are not clear. Consider first the gendered *difference* in earnings between the unweighted and weighted means in the same year. Appendix Table 1 for 2006 shows (col. 1 minus col. 3 for men, and col. 2 minus col.4 for women) substantially higher mean earnings in the unweighted than the weighted data (by €356 for men and €427 for women). In this early SES, the higher values for the unweighted data may be due to the sampling of the newly arrived, generally unskilled, EU citizens from low-wage new member states. In row 7, Appendix Table 1, the proportion of Other EU Citizens is 2% unweighted and 5% weighted for males, and 2% unweighted and 4% weighted for females. In the early stages of entry into the EU single market, unskilled labour from low-income EU member states entered the needy Cyprus labour market *without* restrictions. Often, men gravitated into the construction industry and women into the relatively lower paying retail trade and hospitality industries - see Appendix Tables 3 to 6. It is conceivable that when more weight is given to the unskilled EU newcomers to the Cyprus labour market, many of whom are female and employed in trade, hotels, and restaurants, the GWG may be higher in the weighted data.

By 2018 (Appendix Table 2), the unweighted and weighted proportions of male and female EU citizens are considerably higher and more similar to each other than in 2006 (16% and 17% for men, and 13% and 16% for women, respectively). The gendered *difference* in earnings between the unweighted and weighted means in Appendix Table 2 for 2018 is, at €174 and €199 respectively, considerably lower. Though this is not explicitly shown in the data of Appendix Table 2, impressionistic evidence suggests that many more EU newcomers of both genders had attained university education, were holding challenging positions, often in EU offices and international companies, and were aware of EU gender and other policies. To the extent that they were more likely to be chosen in the unweighted data, and their skills more similar to those of their Cypriot colleagues, the unweighted and weighted GWG in 2018 may have converged. We return to these issues below.

2.3 Monthly Earnings by Gender in the MW and Union Sectors

Table 1 below presents the SES average regular (i.e. excluding overtime and shift payments) monthly earnings in each of the four-survey working data sets, broken down by gender and the two occupational areas of interest, namely the minimum wage occupations (BMW=1) and those in the remaining, unionised, areas (BMW=0) where earnings are based on collective bargaining agreements. For the purposes of this specific section and to conserve space, it is sufficient to consider only the unweighted data: with the need to distinguish between the MW and Union occupations established,

the unweighted and weighted gendered wage equations and their decompositions will both carry forward the BMW variable – as well as the industry fixed effects.

Table 1 contains a convenient summary of average wages and the *unconditional* GWG [(Male-Female)/Male]100 in the SES working samples, read vertically within each survey year. These are listed for All occupations in column 1, the BMW=1 occupations in column 2, and the unionised occupations (BMW=0) in column 3. For each gender and for the TOTAL, the gap between the average wage in the unionised (BMW=0) and MW (BMW=1) areas, is similarly expressed as a percentage of the Union values in column 4, Table 1, headed [(U-MW)/U]100. In the last row of each survey year, the overall (TOTAL) average wage for that survey year is noted. The GWG, shown in column 1, row 3 of Table 1 for the entire labour market, is the subject of what follows, while the Union-MW Gap in col. 4, Table 1, suggests taking into account this occupational difference in the wage equations that are estimated, whether unweighted or weighted; this is done through the binary variable BMW.

In the MW occupations, a pattern of a declining GWG is noted in column 2, Table 1: the GWG was 24.5%, 21.0%, 12.0% and 12.7% in 2006, 2010, 2014, and 2018, respectively. It is interesting that in the Union occupations (column 3, Table 1) the GWG is much lower than in the MW sector in 2006 (10.3% rather than 24.5%), considerably lower during 2010 and 2014 (0.6% and 6.1% rather than 21.0% and 12.0%, respectively), and marginally negative in 2018 (-2.3% rather than 12.7%). The negative GWG under Union in the 2018 SES may reflect the protection afforded during the Cyprus Crisis⁶ to low earners who were more likely to be female. The minimum wage improved in-work earnings for employed individuals in the nine MW covered occupations; it is interesting, but beyond the scope of this paper, that a better GWG was achieved in all four years in the Union sector through collective bargaining.

In what follows, the estimated gendered wage equations are conditioned on the binary variable BMW and the industry fixed effects, as well as the explanatory variables noted in section 2.2. The predictions of these equations form the basis for the decomposition of the estimated GWG into a portion that can be explained by the average differences of the explanatory variables in the wage equations for men and women, and a remaining, unexplained, portion that is reflected in the estimated coefficients on the

⁶ In 2012, a very severe banking crisis that occurred in the context of no fiscal latitude, caused the government to seek external financial assistance. A provisional understanding with the International Monetary Fund, the European Central Bank, and the European Commission was reached at the end of 2012. It was implemented, through a Memorandum of Understanding (MoU), by a newly elected government in 2013, and the first austerity measures were taken in 2013. Although Cyprus exited the MoU in 2016, many of the MoU policies continued past that point.

explanatory variables for men and women. The latter might arise because of missing relevant variables, and/or possible discrimination.

TABLE 1
MW and Union Average Monthly Wages and Gaps, by Total, Gender, and Occupation

SES Year	Occupational Group			Union - MW Gap in %
	All Occupations	MW Occupations	Union Occupations	[(U-MW)/U]100
2006				
Male	2,215	1,737	2,252	22.9%
Female	1,872	1,312	2,019	35.0%
GWG	15.5%	24.5%	10.3%	
TOTAL	2,063	1,442	2,158	33.2%
2010				
Male	2,556	1,776	2,652	33.0%
Female	2,157	1,403	2,636	46.8%
GWG	15.6%	21.0%	0.6%	
TOTAL	2,367	1,492	2,646	43.6%
2014				
Male	2,078	1,422	2,192	35.1%
Female	1,719	1,251	2,058	39.2%
GWG	17.3%	12.0%	6.1%	
TOTAL	1,899	1,296	2,139	39.4%
2018				
Male	2,115	1,400	2,244	37.6%
Female	1,885	1,222	2,295	46.8%
GWG	10.9%	12.7%	-2.3%	
TOTAL	2,000	1,273	2,265	43.8%

Source: Unweighted SES data and authors' calculations. The unconditional GWG is calculated vertically for each occupational sector (MW and Union) in each survey. The Union-MW occupational sector gap [(U-MW)/U]100 is calculated horizontally for each gender and for TOTAL within each survey year.

3. Empirical Approach

The unconditional GWG presented in policy discussions and Table 1, is the difference between the average gross earnings of men and women expressed as a percentage of the earnings of men. It does not net out the factors which, at least partially, explain the observed wage differences between men and women. To allow for the contribution of the variables that are likely to influence the evolution of the GWG, as well as entrenched occupational and sectoral/industry wage differentials, it is necessary to estimate appropriately defined wage equations. These estimates are then used to decompose the difference between the predicted average ln earnings of men and

women into an explained and an unexplained component, using decompositions at the mean⁷. The explained portion informs about explanatory variables and policies that may reduce the GWG, while the unexplained component suggests a search for missing explanatory variables and indications of possible discrimination. We pay particular attention to the total and the explained portion of the GWG (for a relevant discussion, see Jann 2008).

Wages are assumed to depend on individual and labour market characteristics, and on wage policies. The functional form of the wage equation for each gender in matrix notation is:

$$W = X\beta + u \quad (1)$$

where W is the natural logarithm (ln) of the monthly earnings of each worker, and X contains data on worker and job characteristics, as well as occupational and industrial/sectoral fixed effects. The k explanatory variables in the $n \times k$ matrix X include a constant, Age and Age squared, the Length of service with the current employer in years, whether an observation involves Managerial duties or none (the omitted base class), whether the worker is on a contract of Indefinite duration or a limited one (the omitted category), Citizenship in the categories EU, Other, or Cypriot (the omitted base class), Educational level in the categories Primary, Higher (i.e. college), Highest (i.e. university), and Secondary (the omitted base class), the number of employees in the firm between 50-249 (Size B), 250-999 (Size C), 1000 or more (Size D), and 1-49 (Size A, which is the omitted base class), and individual occupational and industrial/sectoral fixed effects as follows: An individual's employment in a 4-digit occupation that is subject to the pre-2023 minimum wage⁸ is indicated by the binary variable BMW taking the value of unity, while for all the remaining (Union) observations the value of BMW is equal to zero. The variable Union is omitted. Thirteen sectoral binary variables identify individual observations which are drawn from the sectors Mining, Electricity, Construction, Trade, Transport, Hotels and Restaurants, Financial Services, Real Estate, Public Administration, Education, Health Services, Other Services, and Manufacturing (the omitted base class). The $k \times 1$ β vector refers to the population coefficients appropriate to each variable, and u is an error term with classical properties.

⁷ By a property of OLS the predicted and actual earnings means are equal. Lemieux (2002) considers comparisons at points of wage distributions other than the mean.

⁸ A national minimum wage was implemented on January 1, 2023. It now covers all economic occupations and sectors, with the exception of domestic, maritime, agricultural and livestock workers – see MLSI (2023).

The Oaxaca-Ransom (1994) decomposition divides the overall average GWG into a component explained by the gender average differences in the observed characteristics weighted by $\hat{\beta}^N$ (first term on the RHS of eq. 2), and an unexplained component (second plus third terms on the RHS of eq. 2) that builds on the different market valuation of the included variables, as measured by the estimated coefficients, weighted by the appropriate average matrix \bar{X} . The decomposition is performed as follows:

$$\bar{W}^M - \bar{W}^F = (\bar{X}^M \hat{\beta}^M - \bar{X}^F \hat{\beta}^F) = (\bar{X}^M - \bar{X}^F) \hat{\beta}^N + \bar{X}^M (\hat{\beta}^M - \hat{\beta}^N) + \bar{X}^F (\hat{\beta}^N - \hat{\beta}^F) \quad (2)$$

where \bar{W}^M and \bar{W}^F are the average (ln) earnings of male and female workers, respectively, \bar{X}^M and \bar{X}^F are the average values of the observed characteristics by gender, $\hat{\beta}^M$ and $\hat{\beta}^F$ are the estimated OLS coefficients from separate wage regressions for male and female workers, and $\hat{\beta}^N$ are ‘gender-neutral’ coefficients from a regression which uses the entire male and female sample (a ‘pooled’ regression). The use of $\hat{\beta}^N$ in eq. (2) avoids the dependence of the explained component (first term in eq.2) on the male or female coefficients inherent in earlier decompositions. As recommended by Jann (2008), a Female binary variable is included in the pooled regressions for the sole purpose of estimating the estimated coefficients on other variables, which are used in the construction of the explained component, in an unbiased way. The last two terms in eq. (2) estimate the ‘Male Advantage’ and ‘Female Disadvantage’ respectively: they are the difference (in the two brackets respectively) between (i) the male coefficients and the neutral vector times \bar{X}^M , and (ii) the neutral vector and the female coefficients times \bar{X}^F , respectively. The Total GWG on the LHS of eq. (2) and the explained component on the RHS of eq. (2) are reported in detail (in ln wage points). The remaining RHS components in eq. (2), i.e. the Male Advantage and Female Disadvantage, can be grouped into an ‘unexplained’ component. As shown in eq. (3),

$$Unexplained = Total - Explained = (\bar{X}^M \hat{\beta}^M - \bar{X}^F \hat{\beta}^F) - (\bar{X}^M - \bar{X}^F) \hat{\beta}^N. \quad (3)$$

The two terms on the RHS of eq. (3) add up to the Male Advantage plus Female Disadvantage in eq. (2), when terms involving \bar{X}^M and \bar{X}^F are grouped.

4. Results Obtained

4.1 Wage Equations

During the period studied, very substantial financial, structural, and macroeconomic changes occurred. Following accession to the EU in 2004, the 2006 SES reflects a period of optimism, characterized by falling interest rates, strong GDP growth of 4.7%,

and low inflation of 2.4%. By the time of the 2010 SES, in the immediate aftermath of the International Crisis and the Cyprus Stock Market crash during 2008 and 2009, GDP growth and the labour market had cooled (the 2010 GDP growth rate was 2% and the Unemployment Rate 6.3%). Following the 2010 SES, the conditions that led to the devastating Cyprus Crisis of 2012-2016 (bad bank management of strong liquidity inflows, and fiscal excesses) were beginning to take hold. The 2014 SES was conducted under the 2013 Memorandum of Understanding (MoU), which imposed a bail-in on two systemic banks, closed one of them, overrode collective bargaining agreements, and led to a severe recession. GDP growth in 2014 was -1.8% and the Unemployment Rate rose to 16.1%. By the time of the final SES survey in 2018, Cyprus had exited the MoU (2016), but efforts for further structural reforms continued, and the usual wage-setting process had not been re-established. Because of these distinct economic profiles, this section proceeds with the most flexible use of the SES data, viz. separate estimation for each survey – see also section 2.1, third paragraph.

Considering the space required to report all the estimations that have been carried out, the main wage equations (unweighted with fixed effects) are reported in Appendix Tables 3 to 6 for the SES of 2006, 2010, 2014, and 2018, respectively. The unweighted and weighted wage equation results are similar. For the reasons detailed in the robustness section 4.3 below, and in view of their similarity, the weighted tables analogous to Appendix Tables 3 to 6 are not presented in full but their gist is reported and discussed below. Section 4.2 presents the detailed decomposition results for the main case of unweighted regression with fixed effects. The main features of the decomposition findings, including the pre-accession results on the GWG, are illustrated in Figure 1. One element of Figure 1 (the top, dotted, line) refers to the weighted fixed effects results, but these are not discussed until section 4.3. The implications of using unweighted and weighted wage regressions, with and without fixed effects, for the GWG are brought together and contrasted in the robustness section 4.3 (see Table 3).

In the unweighted, fixed effect, ln wage regressions, the goodness of fit for men, women, and both genders in Appendix Tables 3-6 is very high, despite the cross-sectional nature of the SES samples. The R^2 statistics range from 0.613 in the 2018 equation for men, to 0.794 in the 2006 wage equation for women. A drop in R^2 occurs during the Cyprus Crisis and its aftermath in the 2014 and 2018 surveys. In general, economic variables have coefficients comparable in sign and significance to those expected in the literature: Age, Length of Service, Managerial Position (relative to none), and Indefinite Contract (relative to finite-term contracts), Education (relative to the High School omitted class), and Size of Enterprise (relative to the omitted class of

'Less than 50 employees'), all carry the expected positive coefficients (except for men and the pooled sample of the 2018 SES). Relative to High School graduates, primary Education carries a penalty and University Education a large premium; these tend to be statistically significant at the 1% level. In the last two SES surveys, employees at the largest firms (see for example the pooled results) experience a noteworthy drop in their advantage relative to the size category immediately below (both vis-s-vis the omitted class), perhaps because of attempts during the Cyprus Crisis to scale down wages at the highest end of the wage distribution. However, their coefficients remain positive and statistically significant at the 1% level.

Individuals in the omitted Cypriot citizenship category, tend to earn significantly more than other EU citizens, except for EU men in 2018, whose higher rewards are significant at the 1% level – see section 2.2, last paragraph. This may be because the Cyprus Crisis brought to the fore the need for top management and other specialised skills which were only available in other Member States. The large number of generally unskilled workers from third countries (whose proportion is relatively constant over the four surveys) tend to earn significantly less than Cypriots, except for men during the Cyprus Crisis which, in 2014, brought to the fore several specialised needs, such as those in information technology.

The coefficient on the binary variable BMW for the nine occupations covered by the minimum wage is consistently negative and significant at the 1% level, capturing the disadvantage of these occupations relative to those in the unionised sector. The smallest disadvantage is for men in 2006 (-0.133 ln wage points) and the largest also for men in 2018 (-0.208 ln wage points). This coefficient reflects and controls for the gap between earnings in the Union and MW sectors, measured horizontally in Table 1, and it allows for a clearer definition of the estimated coefficients on other variables.

The NACE Rev. 2 fixed industry effects are relative to the Manufacturing omitted class. For these fixed effects, the fine 4-digit classification in the SES data reveals interesting patterns which may reflect (i) industrial hazards, and/or (ii) the power of specific unions. These coefficients are initially examined in the pooled regressions, which abstract from gender. Notable among them is (i) Mining, whose coefficient exceeds that in Manufacturing by as much as 0.540 ln wage points in 2018 and is always statistically significant at the 1% level. In the other SES surveys, the coefficient on this binary variable is always among the top three in size. Another industrial sector which involves occupational hazards is Construction, whose coefficient ranks in the top five before the Cyprus Crisis but loses this standing in the 2014 and 2018 surveys. The coefficient on Financial Services is the highest before the Cyprus Crisis, and the second highest in

the 2014 and 2018 surveys. This is not a reflection of occupational hazards. It is widely understood that the union of bank employees (which also represents employees at the Central Bank of Cyprus) is very powerful and has managed to secure high rewards for its members. Even during the Cyprus Crisis, when one systemic bank was closed, this union avoided worse outcomes for its members (the coefficient on its advantage relative to manufacturing, slipped from first in size during 2006-2010 to only second during the 2014-2018 SES). Another industry for which its coefficient always ranks among the top three in terms of size and statistical significance at the 1% level is Education. Here, too, strong unions are very active.

It is noteworthy that Public Administration, which is widely viewed as a privileged workplace⁹, does not rank higher in terms of the above analysis of the Pooled regression coefficients. Indeed, the coefficient in the pooled regression for 2018 is -0.066 ln wage points, statistically significant at the 1% level. During the Cyprus Crisis, substantial pay cuts were imposed on the highest paid, while low-paid employees, who were generally female, were protected. This raises an advantage for female Public Administration workers relative to the Manufacturing omitted class, where the private sector firms restrained and reduced wages severely, even for the low-paid.

Once the coefficient on Public Administration is examined by gender, it is always the case that female employees in this sector do considerably better than their female colleagues in Manufacturing. The high-earning males, who have a smaller public administration premium than their female colleagues, did worse during the 2014 and 2018 SES (-0.04 and -0.142 respectively, both significantly different from zero at the 1% level). Thus, relative to Manufacturing, the female fixed effect coefficients are generally positive and statistically significant, while the male ones are mixed positive and negative and often statistically significant at the 1% level.

4.2 The GWG and its Decomposition

The unweighted wage equations in Appendix Tables 3 to 6 were used to implement the procedures in section 3. The ln wage average difference between Men and Women (the econometric analogue to the GWGs reported in Table 1) is decomposed along the lines described in section 3. Of special interest is the broad breakdown of the GWG

⁹ It should be noted that Public Administration is narrower than the public sector: In a merged, four-survey sample, a public sector identifier (which is present in these surveys) picks up 23,622 observations, of which only 8,967 are also in public administration. The remaining observations are mainly in education, health, and other social activities. While employees in education are generally more highly paid than those in manufacturing, some heterogeneity exists with respect to the other two industries, suggesting that, as is done in the wage equations of the Appendix, it is preferable to control for the individual industries of employment than for the public sector as a whole.

into the explained portion given by $(\bar{X}^M - \bar{X}^F)\hat{\beta}^N$ in eq. (2), and the unexplained portion given in eq. (3). Netting out the explained gap from the GWG modifies and may reduce policy concern for the GWG because, by identifying the contribution of individual regressors to the explained part, it can focus gender policy on particular areas where gender outcomes can be improved with targeted measures, distinct from dealing with discrimination. Indeed, the explained part can be decomposed into all its constituent elements, providing detailed insights. This approach is followed in the discussion below.

The unexplained component typically leads to a discussion of variables which have been omitted or have been unavailable (see footnote 1), as well as possible discrimination. In this spirit, this component is reported and discussed in terms of its implications for further work.

Table 2 presents the decompositions results, based on the ln wage equations in Appendix Tables 3 to 6, by SES year. In the top three rows, the average ln wages for men, women, and the difference between them are presented. The latter is the econometric GWG to be explained; it parallels the GWG reported in raw, unconditional, form in Table 1. In the next section of Table 2, the contributions of the individual variables to the explained expression $(\bar{X}^M - \bar{X}^F)\hat{\beta}^N$ are reported. These add up to the explained GWG at the bottom of Table 2. The unexplained component in eq. (3) is shown in the penultimate row of Table 2, and the sum of the explained and unexplained components in the last row of Table 2 equals the difference between male and female ln earnings at the top of Table 2 (row 3).

Table 2, row 3, indicates that the unweighted GWG declines over time from 0.186 ln wage points in 2006, to 0.169, 0.160, and 0.100 ln wage points in 2010, 2014, and 2018, respectively. The explained portion, while it is statistically significantly different from zero in 2010 and 2014, is never higher than the 0.06 ln wage points attained in 2010. Of course, this is 36% $((0.06/0.169)100)$ of the total GWG, which is high by later SES standards. Indeed, during the 2014 and 2018 SES which include the Cyprus Crisis, the size of the explained effect declines to 0.053 and 0.002 ln wage points (in 2014 and 2018 respectively). This is not surprising, in view of the substantial interventions in the wage-setting mechanisms that occurred during this period. The individual elements of the explained components, shown in the middle part of Table 2 are small and add up to the figures shown at the bottom of Table 2¹⁰.

¹⁰ The constituent parts of the explained component in the middle part of Table 2 consist largely of third decimal point terms which are often statistically significant at the 1% level. Age and Age squared have cancelling effects. Length of service with the same employer has a somewhat higher contribution to the

TABLE 2
Decomposition Results for the GWS and Detail of its Explained Component by Survey Year

	2006	2010	2014	2018
Mean In Male Earnings	7.579***	7.696***	7.484***	7.499***
Mean In Female Earnings	7.393***	7.527***	7.324***	7.400***
Difference in In Means M-F	0.186***	0.169***	0.160***	0.100***
<u>Variables Contributing to the Explained Gender Wage Gap (EGWG):</u>				
Age	0.069***	0.051***	0.008	0.007
Age Squared	-0.058***	-0.042***	-0.010**	-0.008*
Length of Service	0.031***	0.027***	0.010***	-0.002
Managerial Position	0.015***	0.024***	0.026***	0.017***
Indefinite Contract	0.000***	0.001***	0.000	0.000
Citizenship:				
Other EU Citizens	0.000	0.001***	0.000	0.000
Third Countries	0.000	0.000	0.000	0.000
Educational Level:				
Primary (Elementary)	-0.007***	-0.006***	-0.002***	-0.003***
Higher (College)	-0.008***	0.004***	-0.004***	0.001**
Highest (University)	-0.043***	-0.030***	-0.022***	-0.036***
Size of the Enterprise (Personnel):				
10 – 249	0.005***	0.005***	0.014***	0.011***
50 – 999	0.009***	0.004***	-0.004***	0.005***
1000 or more	-0.016***	-0.011***	-0.011***	-0.015***
Sector of Economic Activity:				
Mining	0.001***	0.001***	0.000	0.000*
Electricity	0.002***	0.004***	0.001***	0.000
Construction	0.016***	0.011***	0.004***	0.004***
Trade	0.000	0.000	0.001**	0.002***
Transport	0.007***	0.008***	0.007***	0.002***
Hotels & Restaurants	0.000*	0.000	0.001***	0.002***
Financial Services	-0.012***	-0.009***	-0.006***	-0.007***
Real Estate	0.000	-0.003***	0.001	-0.001**
Public Administration	0.004***	0.000	0.001***	-0.001***
Education	-0.029***	-0.029***	-0.007***	-0.022***
Health Services	0.001	-0.006***	-0.006***	0.004***
Other Services	0.001***	0.000**	0.001***	0.001**
BMW=1 Occupations	0.020***	0.055***	0.048***	0.042***
Explained GWG:	0.008	0.060***	0.053***	0.002
Unexplained GWG:	0.178***	0.109***	0.107***	0.097***
EGWG + UGWG	0.186***	0.169***	0.160***	0.100***

Source: SES 2006, 2010, 2014, and 2018 and authors' calculations.

explained portion, but one which diminishes to insignificance by 2018. Managerial Position would justify a consistent and significant (at the 1% level) addition to the explained GWG of between 0.015 and 0.026 In wage points. Finally, the BMW variable would explain a positive, statistically significant (at the 1% level) addition to the explained GWG, because the mean value of the occurrence of a BMW=1 observation for females in \bar{X}^F is two to three times as high as that for men in \bar{X}^M , and the coefficient on BMW in the pooled sample used in the expression $(\bar{X}^M - \bar{X}^F)\hat{\beta}^N$ is negative. For example, in 2018, the expression for the BMW contribution would add $(0.152-0.382) \times (-0.183) = 0.042$ In wage points to the explained part of GWG – as shown in Table 2.

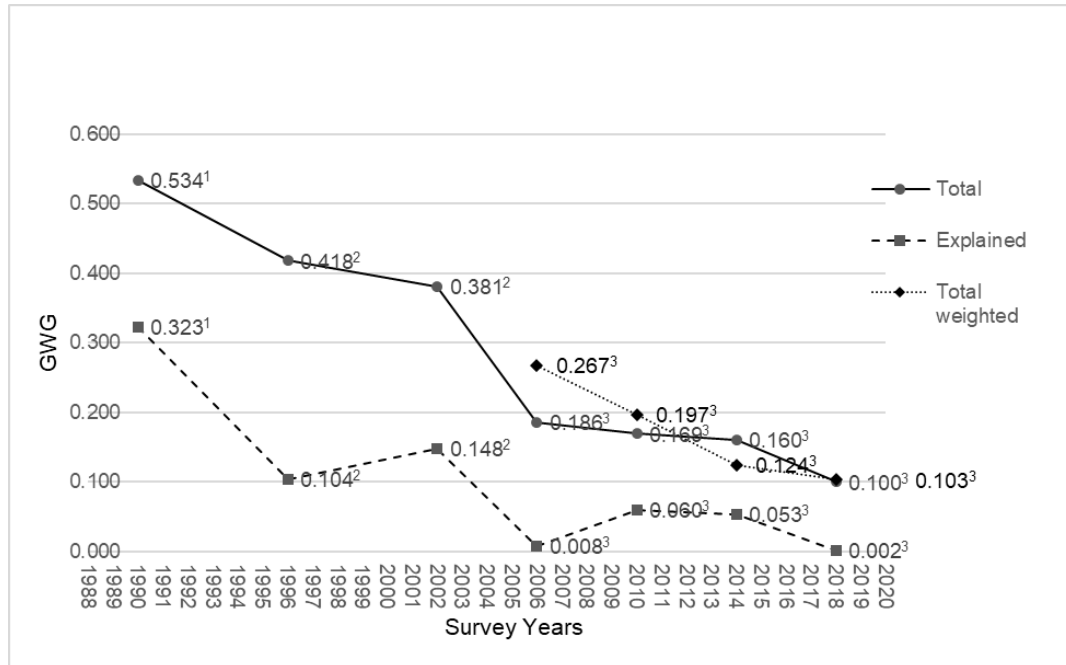
Figure 1 shows the secular evolution of the unweighted total GWG (solid line), the unweighted explained component (broken line), and the unweighted unexplained component which is measured by the area between the two lines (the small, dotted, line which refers to the total *weighted* GWG will be discussed in the following section). All three measures decline over the period 2006 to 2018. The superscript 1 on the indicated numbers in Figure 1 refers to extant results for 1990 in Christofides and Pashardes (2000); the superscript 2 refers to the 1996 and 2002 results in Christofides and Vrahimis (2009); finally, the superscript 3 refers to results in the present paper for the four SES years. The explained component has been downplayed by the improvement in the female productive characteristics which have brought the average value of the explanatory matrix for females very close to that for males, thus reducing the difference between them in the first term of eq. (2)¹¹. By the time of the last SES (which may still include temporary effects from the Cyprus Crisis), a GWG of about 0.100 ln wage points remains almost entirely unexplained.

Whether the decline of the GWG in Cyprus has ‘stalled’, as asserted for the US by Blair and Posmanick (2023), is not clear. The Cyprus Crisis and the suspension of regular wage-setting may have influenced the GWG; in particular, the relative protection of the low-paid who were more likely to be women may have exerted a downward influence on the GWG which may prove temporary. Nevertheless, the main message of the recent international literature on the GWG is that variables involving the nature of work, family formation, childbearing and rearing, and work/family reconciliation policies, have a role to play in explaining the *remaining* GWG, without necessarily ruling out the possibility of remaining discrimination. The paper by Christofides et al. (2013) on the 26 European countries captured by the 2007 EU SILC, found that countries with very long maternity leaves tended to distance women from the workplace, leading to missed opportunities and higher GWG outcomes. The studies noted in footnote 1, consider the features of jobs that make it easier or more difficult for women to participate effectively in the labour force. Without ruling out a possible role for discrimination,

¹¹ As examples of this convergence, consider how the *average values* for men and women (not provided in table form) of the following explanatory variables in Appendix Tables 3 to 6 (the average values are not reported in table form) have changed between 2006 and 2018. *Length of Service*, in years: for men, it was 12.626 and fell to 10.080 years (a decline of 2.546 years), while that for women was 10.996 and fell to 10.191 (a decline of 0.805 years); from a lower length of service in 2006 it declined less and became higher than that for men in 2018. *Proportion in Managerial Position*, binary: for men it was 0.289 and fell to 0.262, while that for women was 0.232 and fell to 0.210; a decline in both cases, but of 0.027 for men and a smaller decline of 0.022 for women. *Proportion with Indefinite contracts*, binary: for men it was 0.962 and fell to 0.888, and for women it was 0.951 and fell to 0.913; as a result of a smaller decline for women, more women than men had an indefinite contract in 2018, a reversal from 2006. Finally, *Proportion with Highest Education*, binary: for men it was 0.265 and rose to 0.351, while for women it was 0.371 and rose to 0.462; that is, the proportion of women with university education, which was already higher than that for men in 2006, rose more than that for men by 2018. All four changes signal a strengthened or superior position for women in 2018 than in 2006.

exploring the causes of the unexplained 2018 GWG component will need to net out the influence of the nature of jobs and the role of the work/family reconciliation realities, in Cyprus as elsewhere. Some further comments appear in the Conclusion.

FIGURE 1
Evolution of the GWG in Cyprus: Total and Explained



4.3 Some Robustness Checks

The 4-digit SES supplies weights, whose construction is outlined in general terms in Cystat's quotation in footnote 5. The intent is to achieve a version of data representativeness; this reduces or even obviates the need for sample selection procedures. In the case of the unweighted data, the results pertain to the 'working sample' which was selected with particular and largely predetermined criteria in mind, such as focusing on individuals who are likely to be in relatively stable occupational positions (due to age) and without incentives to under declare their earnings (as would be the case in occupations where agency is possible). Since there is some value in the weighted results, albeit with the need to speculate as to possible differences that may emerge, Appendix Tables 3 to 6 were re-estimated using weighted regressions as a check. To conserve space, these are not reported in detail.

The goodness of fit of the weighted equations was lower than the unweighted ones by approximately ten percentage points in R^2 . A few unexpected (in view of the unweighted results and a general knowledge of the Cyprus labour market) coefficient estimates can be discerned. Contracts of Indefinite duration, which generally indicate 'better' jobs and have significant positive coefficients in the unweighted results, are not

as well-defined in the weighted results. Also, the coefficient on female third country nationals, which would be expected to be negative and is always so in the unweighted results at the 5% level or better, is never significant after 2006 and it is positive in 2014 and 2018. In general, however, the descriptive narrative that was provided for the unweighted results in section 4.2 continues to hold. It is for these reasons that more space was devoted to the unweighted results in the appendix; the difference between the unweighted and weighted results obtained (which are not large) are discussed below.

Before turning to these, the inclusion of occupational and industrial fixed effects may be thought of as raising questions of endogeneity. Clearly, during the long process of individual professional choice and maturation, earnings would play a role and endogeneity might be pronounced. The view here, however, is that at the point of recording individual information for the ages and occupations selected to be in the 'working samples', many, if not all, decisions by most respondents would be pre-determined. Nevertheless, the wage equations without the BMW binary variable and the twelve industry/sectoral fixed effects were re-estimated. The overwhelming statistical importance of the fixed effects in the Appendix Tables 3 to 6 meant that dropping them reduced the goodness of fit substantially, and distorted the overall usefulness of the wage equations for the decompositions that follow. The main impact of dropping the fixed effects from the wage equations on the implied decompositions is a small decline in the role of the explained component. This suggests that the prevailing occupational and industrial wage patterns do contribute to the 'explanation' of the GWG. Because of space constraints, we do not discuss the wage equation results without the BMW and industry fixed effects any further.

Table 3 provides a comparative summary of the unweighted and weighted decompositions, with and without the fixed effects. With very few exceptions (mostly relating to the role of the explained component, as in Table 2), the elements of these decompositions are statistically significant at the 1% level. The secular decline in the total GWG is present in all four specifications. The modest contribution of the explained component and dominance of the unexplained component is also evident in all decompositions. For the reasons explained above and to conserve space, emphasis was given to the unweighted wage equations which contain fixed effects, i.e. the top of Table 3.

However, because the weighted specification in the third cell of Table 3 is also reasonable and because it indicates a slightly different negative path for the total GWG, Figure 1 presents, in the top dotted line, the weighted total GWG. The main difference

between the top two lines for the total GWG is that the 2006 and 2010 values are higher in the weighted specifications than the unweighted ones (0.267 rather than 0.186 In wage points, and 0.197 rather than 0.169 In wage points in 2006 and 2010, respectively). The descriptive statistics in section 2.2 and Appendix Table 1, indicate that the 2006 weighted proportion of EU citizens is twice as high as that in the unweighted data. The heavier 2006 weighted concentration of EU women than men in Trade and in Hotels and Restaurants¹² may explain the higher value for the 2006 weighted GWG because these are likely to be very low paying jobs, and unskilled EU men were more likely to be in Construction (15% for men and 2% for women in Appendix Table 1), an industry where pay is much higher than in retail trade and hospitality – see Appendix Tables 3 to 6. In the 2010 SES data descriptions, the weighted proportions are also considerably higher for men and women (15% for each gender) as contrasted to the unweighted proportions (8% for men and 9% for women). Sampling and skill considerations may also explain the higher weighted than unweighted 2010 GWG value – a 2010 descriptive table like Appendix Table 1 is not reported.

In the 2014 survey, the weighted total GWG (0.124 In points) lies below the unweighted one (0.160 In points), and by 2018 the GWG are practically identical at 0.100 and 0.103 In wage points, respectively. The comparison of the proportions of Other EU Citizens between 2006 and 2018 in the Appendix Tables 1 and 2 provides some clues as to the convergence between the unweighted and weighted GWG, especially for 2018. The proportion of Other EU citizens increased continuously, and by 2018 the difference between the unweighted and weighted proportions is, respectively, down to 1% point for men (16% rather than 17%) and 3% points for women (13% rather than 16%). In addition, the higher proportion of Other EU citizens in the labour market of Cyprus appears to contain many more skilled men and women. Thus, sampling and skill considerations provide a possible explanation for the convergence of the unweighted and weighted GWG – for further discussion, see section 2.2. The secular pattern of the unweighted and weighted GWG is so similar, that reporting both sets of results strengthens confidence in the overall information provided.

¹² In Appendix Table 1, the following rows should be noted for men and women respectively. Construction (11% and 2% unweighted and 15% and 2% weighted). Trade (7% and 7% unweighted and 17% and 19% weighted). Hotels and Restaurants (2% and 4% unweighted and 8% and 13% weighted). Of particular note are the proportions for the BMW variable of men and women which signifies, respectively, membership in the nine minimum wage occupations (7% and 21% unweighted and 11% and 34% weighted). The gendered proportions for BMW by unweighted and weighted status are especially enlightening as to the reasons for the possible divergence in the unweighted and weighted GWG and the conjectured role of Other EU Citizens. A similar reasoning may explain the 2010 gap in the GWG between unweighted and weighted estimates. By 2018, the sampling differences between the unweighted and weighted proportions are very small – see the text.

The explained weighted estimates are not plotted in Figure 1 as they are close to the unweighted ones and would spoil the clarity of this figure; they are available in the summary Table 3 below.

TABLE 3
Decompositions: Unweighted and Weighted, With and Without Fixed Effects

	2006	2010	2014	2018
<i>Unweighted (MW, IND)</i>				
Total	0.186***	0.169***	0.160***	0.100***
Explained	0.008	0.060***	0.053***	0.002
Unexplained	0.178***	0.109***	0.107***	0.097***
<i>Unweighted (No MW, IND)</i>				
Total	0.186***	0.169***	0.160***	0.100***
Explained	-	0.015***	-0.001	-
Unexplained	0.204***	0.154***	0.161***	0.146***
<i>Weighted (MW, IND)</i>				
Total	0.267***	0.197***	0.124***	0.103***
Explained	0.051***	0.043***	0.023**	0.008
Unexplained	0.216***	0.154***	0.102***	0.095***
<i>Weighted (No MW, IND)</i>				
Total	0.267***	0.197***	0.124***	0.103***
Explained	-0.002	-0.021*	-	-
Unexplained	0.269***	0.218***	0.155***	0.126***

Source: Authors' calculations based on the four SES surveys.

5. Concluding Comments

Early studies of the gender wage gap (GWG) in Cyprus revealed a very large gap between the ln wages of men and women (0.534 ln wage points for 1990 in Figure 1). The *lowest* of these, for 2002, just before the first Structure of Earnings (SES) data used in the current study, showed a total GWG of 0.381 ln wage points, of which 0.148 ln points (or 39% of the gap) could be explained by productive characteristics. Cyprus acceded to the EU in 2004 and the first useable SES for 2006 afforded an opportunity to check progress, emphasizing that, if any could be ascertained, it could not be attributed specifically to the EU accession. Many institutional and policy changes were taking place at about the same time, perhaps in anticipation of, or the actual entry into, the EU, and a large number of other EU citizens began to flow into the labour market of Cyprus in an unrestricted way.

Four SES data sets (for 2006, 2010, 2014 and 2018) are studied. On the way, a substantial pay gap between non-unionised occupations and those which were subject to the minimum wage is ascertained. The 4-digit SES data made it possible to control for the observations that should be subject to the minimum wage and those which were

not. A 4-digit ISCO-08 control (the binary variable BMW), along with (NACE Rev. 2) industry effects, and the available SES productive characteristics, are used to estimate the wage equations needed to calculate the GWG and its decomposition into an explained and an unexplained component.

The 2006 data reveal a sizeable drop in the total GWG relative to its 2002, pre-accession, level (to a new level of 0.186 ln wage points in unweighted data, and 0.267 points when weights are used). Of these 2006 gaps, only 0.008 and 0.051 ln points can be explained in the unweighted and weighted data respectively. The weighted data reveal a larger total, and a larger explained portion (19% of the 0.267 total GWG), which is lower than in the pre accession data (top paragraph of this section). The proportion in the unweighted data is even lower at 4% or $(0.008/0.186)100$.

In the next three 2010, 2014 and 2018 SES, a downward trend in the unweighted GWG continues to 0.169, 0.160, and 0.100 ln wage points respectively, of which only 0.060, 0.053 and 0.002 ln wage points can be explained, respectively. In the weighted data, the total GWG is somewhat higher (0.197 ln points) in the 2010 survey, lower (0.124 ln points) in 2014, and practically equal to the unweighted total GWG (0.103) by 2018. The explained portion for the three surveys is similar to the unweighted figures, both converging to practically zero by 2018.

In summary, since the accession of Cyprus into the EU, the unweighted and weighted estimates of the GWG have converged and declined to a level which is lower than the EU27 average. The role of accession in this decline is not established in this paper. Accession itself entailed the realisation that the EU gender policies were valuable, and that they should be followed. Many institutional, governmental, and societal initiatives facilitated the decline in the GWG to a lower level. A massive influx of Other EU Citizens into the labour market of Cyprus (their weighted proportions in 2006 are 5% for men and 4% for women, and by 2018 these increase to 17% and 16% respectively), is also likely to have played a role in this decline.

Turning to the composition of the GWG, on average, women in Cyprus have improved their record in education, labour market quality of participation, and the other productive characteristics *that are available* and enter the wage equations as explanatory variables. The new level of their productive characteristics is roughly equal to that for men (footnote 11); this convergence drives the explained portion in eq. (2) close to zero. The 2018 weighted and unweighted data both suggest a GWG of about 0.100 ln wage points, comparable to the 2023 Eurostat figure in the Introduction, but this study now shows that this figure cannot be explained by the productive

characteristics in the SES. Exploring the remaining GWG now involves either missing variables (footnote 1), or remaining discrimination - for a survey of the evidence on remaining discrimination within workplaces, see Forth and Theodoropoulos (2022, pp. 9-10).

It is for similar reasons that the international literature is now exploring the role of variables which are not generally included in publicly available surveys. Attention is focussed on family formation, childbearing and rearing, work/family reconciliation policies and the nature of jobs. Some evidence of their relevance is available. Using 2007 EU SILC data from a large number of European countries, Christofides et al. (2013) conclude that, while an index of five work/family reconciliation policies has a strong negative impact on the unexplained GWG, this result is driven by policies other than the product of the length and generosity of maternity leave. The individual contribution of the maternity variable is actually positive (but significant only at the 10% level). It is possible that, in countries with extremely long and generous maternity leaves, a long time spent away from the labour market may have deleterious effects on individual mothers and hence the GWG. Note that the other four policies in the index (formal childcare for children under 3, the availability of part-time work, flexibility for family reasons at work, and the availability of leave for family reasons) all have individually negative effects on the unexplained GWG, which are statistically significant at the 1% level. In that study, Cyprus has below average values for the maternity leave variable, suggesting that its maternity policy is not likely to cause a high value for the unexplained GWG. On the other hand, it has below average values for the other four policies which reduce the unexplained GWG. This suggests that lowering the unexplained GWG in Cyprus may be more effectively achieved by focussing on the four other policies in the index of work/family reconciliation policies. That overly generous family friendly policies can have an adverse effect on the GWG is also noted in the recent survey of the international literature by Forth and Theodoropoulos (2023).

The extended family in Cyprus continues to have an important role: (i) it encourages the labour force participation of female offspring by providing baby-sitting and other helpful services, and (ii) it preserves and strengthens familial connections across generations which are pleasant in themselves and may serve parents well in later life¹³:

¹³ The provision of 'free' services by the extended family may slow down the decline of the GWG relative to a system of market outcomes. Female jobseekers may be willing to accept lower wages if they do not have to face the market cost of day care and other related services. A positive relation between female labour force participation, which is high in Cyprus, and the GWG may exist. On these issues, see Olivetti and Petrongolo (2008).

Despite the time-cost imposed on parents, the welfare implications for the families which continue to be voluntarily so engaged are likely to be positive.

The search for other forces that could reduce the unexplained GWG below its 2018 level will continue. The Covid-19-induced work-from-home phenomenon, and the increased job flexibility that this entails, is likely to further facilitate the participation of women in the labour market and may produce more favourable employment outcomes for them. International work on this possibility has begun. More data for Cyprus on the variables that have been implicated will help determine how much residual discrimination, if any, may remain.

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Appendix

Appendix Tables 1 and 2 report descriptive statistics for the unweighted and weighted 2006 and 2018 SES respectively. To conserve space, similar tables for 2010 and 2014 are not reported; they bridge the time gap in terms of the proportion of Other EU Citizens. These grow over time to the 2018 levels reported in Appendix Table 2.

The wage equations in Appendix Tables 3 to 6 below form the basis of the decomposition procedures discussed in Section 3 of the main text. Each of Appendix Table 3 to 6 presents \ln wage equations for the samples identified in its columns (Male, Female, and Pooled). The estimated coefficients on continuous variables such as Age, Age Squared and Length of Service show the impact on \ln wage; the coefficients on binary variables, including BMW, express the effect of each characteristic on \ln monthly earnings, *relative to the \ln earnings of the reference group* (e.g. Cypriots who finished secondary school, and who were employed on a temporary basis, in the Manufacturing industry, in firms with 1-49 employees, and in occupations that were not covered by the minimum wage legislation (i.e. were unionised, as noted by the BMW=0 observations). The symbols (***), (**), and (*) denote significance at the 1%, 5%, and 10% level, respectively, throughout the tables in this paper.

Appendix Table 1: Characteristics of Workers in 2006 – Sample Averages

Sample Means	Unweighted		Weighted	
	Male Workers	Female Workers	Male Workers	Female Workers
Average Monthly Earnings (€):	2,215	1,872	1,859	1,445
Age (years):	44	41	42	41
Length of Service (years):	13	11	9	9
Managerial Position:	29%	23%	25%	16%
Indefinite Contract:	96%	95%	96%	96%
Citizenship:				
Cypriot (#)	95%	95%	89%	90%
Other EU Citizens	2%	2%	5%	4%
Third Countries	3%	3%	6%	6%
Educational Level:				
Primary (Elementary)	20%	14%	26%	17%
High (Lyceum) (#)	44%	34%	42%	42%
Higher (College)	10%	14%	11%	18%
Highest (University)	27%	37%	21%	23%
Size of the Enterprise (Personnel):				
1 – 49 (#)	17%	17%	50%	47%
50 – 249	28%	24%	23%	23%
250 – 999	28%	21%	14%	11%
1000 or more	27%	38%	13%	18%
Sector of Economic Activity:				
Mining	0%	0%	0%	0%
Manufacturing (#)	11%	9%	16%	12%
Electricity	4%	1%	2%	0%
Construction	11%	2%	15%	2%
Trade	7%	7%	17%	19%
Transport	11%	6%	8%	6%
Hotels and Restaurants	2%	4%	8%	13%
Financial Services	7%	10%	5%	8%
Real Estate	5%	5%	6%	9%
Public Administration	25%	19%	12%	10%
Education	8%	21%	4%	11%
Health Services	5%	13%	2%	8%
Other Services	4%	3%	4%	3%
BMW=1 Occupations	7%	21%	11%	34%
Number of Observations:	13,833	10,892	13,833	10,892

Source: Authors' calculations using the Structure of Earnings Survey (SES) data of 2006. The sample consists only of workers in the age range of 25-65, employed on a fulltime basis. The data are presented by gender. The symbol # refers to the excluded category when estimating earnings equations (i.e., the 'reference group').

Appendix Table 2: Characteristics of Workers in 2018 – Sample Averages

Sample Means	Unweighted		Weighted	
	Male Workers	Female Workers	Male Workers	Female Workers
Average Monthly Earnings (€):	2,115	1,885	1,941	1,686
Age (years):	43	43	44	42
Length of Service (years):	10	10	8	9
Managerial Position:	26%	21%	29%	19%
Indefinite Contract:	89%	91%	92%	90%
Citizenship:				
Cypriot (#)	80%	84%	78%	80%
Other EU Citizens	16%	13%	17%	16%
Third Countries	4%	3%	5%	4%
Educational Level:				
Primary (Elementary)	11%	7%	14%	9%
High (Lyceum) (#)	43%	36%	42%	37%
Higher (College)	11%	10%	10%	14%
Highest (University)	35%	46%	34%	41%
Size of the Enterprise (Personnel):				
1 – 49 (#)	14%	12%	53%	42%
50 – 249	24%	18%	22%	25%
250 – 999	38%	35%	15%	16%
1000 or more	24%	35%	11%	17%
Sector of Economic Activity:				
Mining	0%	0%	0%	0%
Manufacturing (#)	9%	5%	11%	7%
Electricity	2%	0%	2%	0%
Construction	14%	2%	14%	2%
Trade	12%	14%	18%	16%
Transport	9%	5%	12%	6%
Hotels and Restaurants	8%	10%	11%	15%
Financial Services	4%	7%	5%	9%
Real Estate	9%	10%	11%	14%
Public Administration	16%	14%	8%	8%
Education	7%	17%	4%	12%
Health Services	5%	12%	2%	8%
Other Services	4%	4%	3%	3%
BMW=1 Occupations	15%	38%	14%	40%
Number of Observations:	13,057	13,030	13,057	13,030

Source: Authors' calculations using the Structure of Earnings Survey (SES) data of 2018. The sample consists only of workers in the age range of 25-65, employed on a fulltime basis. The data are presented by gender. The symbol # refers to the excluded category when estimating earnings equations (i.e., the 'reference' group).

Appendix Table 3: OLS Estimates of In Wage Equations for 2006 – Unweighted

	Male Regression	Female Regression	Pooled Regression
Coefficients			
Age	0.045***	0.026***	0.033***
Age Squared	0.000***	0.000***	0.000***
Length of Service	0.016***	0.022***	0.019***
Managerial Position	0.266***	0.234***	0.259***
Indefinite Contract	0.119***	0.002	0.042***
Citizenship:			
Other EU Citizens	0.048*	-0.048**	0.001
Third Countries	-0.004	-0.095***	-0.042***
Educational Level:			
Primary (Elementary)	-0.074***	-0.205***	-0.119***
Higher (College)	0.191***	0.124***	0.169***
Highest (University)	0.408***	0.356***	0.402***
Size of the Enterprise (Personnel):			
50 – 249	0.103***	0.136***	0.116***
250 – 999	0.092***	0.167***	0.121***
1000 or more	0.090***	0.213***	0.145***
Sector of Economic Activity:			
Mining	0.251***	0.306***	0.318***
Electricity	0.065***	0.216***	0.087***
Construction	0.124***	0.228***	0.178***
Trade	0.042***	0.052***	0.041***
Transport	0.124***	0.170***	0.148***
Hotels & Restaurants	-0.089***	0.094***	-0.022*
Financial Services	0.277***	0.453***	0.355***
Real Estate	0.072***	0.196***	0.111***
Public Administration	0.027***	0.156***	0.062***
Education	0.136***	0.323***	0.232***
Health Services	-0.087***	0.106***	-0.010
Other Services	0.006	0.144***	0.059***
BMW=1 Occupations	-0.133***	-0.144***	-0.149***
Female			-0.178***
Constant	5.833***	6.100***	6.111***
Number of Observations	13,833	10,892	24,725
R-squared	0.683	0.794	0.730
Adjusted R-squared	0.682	0.794	0.730

Source: SES 2006 and authors' calculations using Stata.

Appendix Table 4: OLS Estimates of In Wage Equations for 2010 – Unweighted

	Male Regression	Female Regression	Pooled Regression
Coefficients			
Age	0.046***	0.024***	0.034***
Age Squared	0.000***	0.000***	0.000***
Length of Service	0.015***	0.021***	0.017***
Managerial Position	0.359***	0.319***	0.349***
Indefinite Contract	0.113***	0.063***	0.075***
Citizenship:			
Other EU Citizens	-0.106***	-0.096***	-0.108***
Third Countries	-0.019	-0.112***	-0.064***
Educational Level:			
Primary (Elementary)	-0.092***	-0.237***	-0.154***
Higher (College)	0.147***	0.105***	0.114***
Highest (University)	0.404***	0.312***	0.370***
Size of the Enterprise (Personnel):			
50 – 249	0.086***	0.082***	0.086***
250 – 999	0.091***	0.101***	0.090***
1000 or more	0.047***	0.120***	0.084***
Sector of Economic Activity:			
Mining	0.190***	0.429***	0.263***
Electricity	0.080***	0.248***	0.108***
Construction	0.098***	0.217***	0.146***
Trade	0.016	-0.014	-0.012
Transport	0.125***	0.222***	0.159***
Hotels & Restaurants	-0.056***	0.062***	-0.017
Financial Services	0.333***	0.437***	0.371***
Real Estate	0.058***	0.210***	0.111***
Public Administration	0.033***	0.215***	0.100***
Education	0.198***	0.363***	0.271***
Health Services	0.086***	0.196***	0.105***
Other Services	0.046	0.148***	0.077***
BMW=1 Occupations	-0.186***	-0.190***	-0.196***
Female			-0.109***
Constant	5.912***	6.291***	6.215***
Number of Observations	15,743	14,216	29,959
R-squared	0.683	0.774	0.723
Adjusted R-squared	0.683	0.774	0.723

Source: SES 2010 and authors' calculations using Stata.

Appendix Table 5: OLS Estimates of In Wage Equations for 2014 – Unweighted

	Male Regression	Female Regression	Pooled Regression
Coefficients			
Age	0.049***	0.038***	0.042***
Age Squared	0.000***	0.000***	0.000***
Length of Service	0.017***	0.022***	0.019***
Managerial Position	0.316***	0.304***	0.314***
Indefinite Contract	0.065***	0.017	0.040***
Citizenship:			
Other EU Citizens	-0.012	-0.046***	-0.029***
Third Countries	0.168***	-0.038**	0.060***
Educational Level:			
Primary (Elementary)	-0.141***	-0.164***	-0.153***
Higher (College)	0.125***	0.116***	0.126***
Highest (University)	0.363***	0.299***	0.339***
Size of the Enterprise (Personnel):			
50 – 249	0.223***	0.131***	0.183***
250 – 999	0.208***	0.123***	0.160***
1000 or more	0.158***	0.125***	0.132***
Sector of Economic Activity:			
Mining	0.421***	0.587***	0.486***
Electricity	0.030*	0.210***	0.084***
Construction	-0.009	0.148***	0.050***
Trade	-0.081***	-0.042***	-0.072***
Transport	0.084***	0.145***	0.115***
Hotels & Restaurants	-0.086***	0.043***	-0.030***
Financial Services	0.284***	0.416***	0.349***
Real Estate	0.034**	0.215***	0.114***
Public Administration	-0.040***	0.149***	0.036***
Education	0.138***	0.263***	0.199***
Health Services	-0.028**	0.116***	0.043***
Other Services	0.132***	0.130***	0.129***
BMW=1 Occupations	-0.207***	-0.154***	-0.175***
Female			-0.107***
Constant	5.717***	5.918***	6.898***
Number of Observations	14,090	13,927	28,017
R-squared	0.614	0.706	0.656
Adjusted R-squared	0.613	0.706	0.656

Source: SES 2014 and authors' calculations using Stata.

Appendix Table 6: OLS Estimates of In Wage Equations for 2018 – Unweighted

	Male Regression	Female Regression	Pooled Regression
Coefficients			
Age	0.042***	0.035***	0.040***
Age Squared	0.000***	0.000***	0.000***
Length of Service	0.015***	0.019***	0.016***
Managerial Position	0.333***	0.304***	0.322***
Indefinite Contract	-0.014	0.023**	-0.009
Citizenship:			
Other EU Citizens	0.044***	-0.044***	0.007
Third Countries	0.037*	-0.068***	-0.007
Educational Level:			
Primary (Elementary)	-0.061***	-0.088***	-0.066***
Higher (College)	0.125***	0.098***	0.102***
Highest (University)	0.351***	0.302***	0.328***
Size of the Enterprise (Personnel):			
50 – 249	0.232***	0.131***	0.186***
250 – 999	0.241***	0.152***	0.193***
1000 or more	0.137***	0.145***	0.137***
Sector of Economic Activity:			
Mining	0.550***	0.547***	0.540***
Electricity	-0.069***	0.171***	-0.009
Construction	-0.031**	0.089***	0.029***
Trade	-0.121***	0.007	-0.096***
Transport	-0.013	0.163***	0.040***
Hotels & Restaurants	-0.186***	0.062***	-0.105***
Financial Services	0.195***	0.352***	0.241***
Real Estate	0.028*	0.247***	0.102***
Public Administration	-0.142***	0.091***	-0.066***
Education	0.122***	0.340***	0.217***
Health Services	-0.131***	0.071***	-0.057***
Other Services	0.031	0.225***	0.091***
BMW=1 Occupations	-0.208***	-0.162***	-0.183***
Female			-0.097***
Constant	5.984***	5.940***	6.034***
Number of Observations	13,057	13,030	26,087
R-squared	0.613	0.748	0.674
Adjusted R-squared	0.612	0.747	0.674

Source: SES 2018 and authors' calculations using Stata.