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SUPERVISORY JOBS IN THE GREEK LABOUR MARKET

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Abstract

The aim of this research was to analyze i) what characteristics make a supervisor ii) what characteristics affect supervisor versus non-supervisor wages and iii) what was the effect of crisis. The examination is based on Greek Labor Force Survey micro-data to study the period 2006-2016 -a period that starts before the great recession and ends in the last year of the recession. I use cross sectional analysis on the pooled sample by a "naïve" and a corrected for selection econometric model. By both models expected characteristics like education and experience increase wages and access to supervisory jobs while working in a small firm, contracts with less hours of work and discrimination based on gender and race characteristics have the opposite effect. I find differential crisis wage adjustments in magnitude and timing of supervisor and non-supervisor wages. The decrease in the probability of holding a supervisory job during crisis indicates that the crisis caused delayering in Greek workplaces.

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1. Introduction

The global economic downturn of the last decade has affected most countries of world and obviously affected the Greek economy. In the case of Greece, the recession was even more intense. Crisis appeared to the populace as a series of sudden reforms and austerity measures that affected supervisory and non-supervisory jobs differentially. Public cuts and the decentralization of wage bargaining affected both supervisors and non-supervisors, but the adjustment in non-supervisor wages was more sizeable due to minimum wage cuts.

There is a variety of studies in the literature that investigate labor allocation and wage-scale formation. The placement of professionals across different firms and establishments may contribute to differential access to supervisory jobs and wage premium. Initial placement in the labor market affects future career growth as some firms offer training and opportunities for upward mobility that subsequently lead to higher positions with higher returns. (Rumberger 1981). Supervisory jobs are considered to require higher level of education and skills than non-supervisory jobs and supervisor premium is linked to monitoring effectiveness which minimizes cost and increases productivity (Calvo and Wellisz 1979). However, while neoclassical economists postulate that human capital characteristics are important sorting mechanisms across supervisory jobs, according to institutional economist's discrimination based on race, gender, marital status attributes often prevent the most productive workers from getting access to senior jobs such as supervisory jobs and contribute to income inequality even across supervisory jobs.

Apart from static models, there are studies that use dynamic models to examine how delayering in workplaces changes the structure of the hierarchy and affects supervisory status and premium. In recent years the global crisis altered the Greek business environment and structure. During the crisis period more than 200.000 small and medium-sized enterprises closed (Matsaganis 2013). The slowdown in the number of SMEs that employ less supervisors, probably increased the supervisor share as a percentage of total employees. However, at the same time, the pressure for efficient decisions has increased, as well as on the larger businesses that survived during the crisis period, to minimize the negative crisis effect and response to the increased competitive environment. That is, there is a pressure for

delayering across businesses as literature suggests that delayering[1] of managerial functions increases firm's productivity especially in workplaces with higher human capital[2] (Caroli and Van Reenen 2001). Thus, I expect that the new organizational changes due to the crisis have a direct effect in the probability of holding a supervisory job and in the supervisor premium.

My research objectives are i) which personal and job features give access to supervisory jobs in Greece, ii) which and in what extend these characteristics contribute to supervisor versus non-supervisor wages and iii) what was the effect of the crisis, that is did the crisis indeed cause delayering?

In my model I include all individual and job characteristics that can influence wages and labor allocation both from demand and supply side. The examination is based on Greek Labor Force Survey micro-data. I use cross sectional analysis on the pooled sample by a "naïve" and a corrected for selection econometric model. In the corrected for selection model I include a variable which is called supervisor history and accounts if the individual has parents who work or have retired from the supervisor sector.

My study is organized as follows; In section 2, I present previous theoretical and empirical studies related to supervisory premium, labor allocation to supervisory jobs and delayering which is associated with crisis effect. The third section presents the data and graphs from raw data used in the empirical research. In section 4, I present the 'naïve' and corrected for selection model results and in the 5th section I discuss and compare the models static and dynamic results. Finally, all concluding remarks are presented in the final section.

2.Literature Review

Studies on the distribution of employees at the different hierarchical levels and the wages that each employee receives at each level include i) theoretical approaches that use a theoretical model and ii) empirical studies that use microeconomic data and econometric

[1] In any organization the functional role is divided into layers of management. Delayering is removal of some of the intermediate layers between the top management and lower layers to focus on operational efficiency and creates a flatter hierarchy with less supervisors.

[2]There is a good supply of highly qualified labor in Greece. Greece has the highest share of student-academic staff in tertiary education of the countries presented in Eurostat data (Appendix Figure A1)

techniques. These models explain what characteristics affect supervisor premium and status. Apart from static models, there are studies that use dynamic models to examine how delayering in workplaces change the structure of the hierarchy when there is a pressure for efficiency, and what are the effects in supervisory jobs and wages.

2.1 Literature on labor allocation and wage scale formation

2.1.1 Theoretical Literature

A common research question in the literature is why supervisors get higher wages than non-supervisors. There is a variety of theoretical papers that investigate the income inequality among managers and workers' differences in ability and talent through different hierarchical levels, and how labor is allocated in supervisory positions according to the observed human capital characteristics.

There are two lines of reasoning to explain observed wage variability, one of which relies on the supply-side determinants of wages (workers' characteristics such as education, tenure, age, sex) and the other on demand-side factors (employers' characteristics such as firm-plant size, span of control). Most theoretical models are based on two fundamental theories, the hierarchy theory and the human capital theory. The hierarchy theory emphasizes on the firm size, thus supervisors are paid more in large firms and in higher levels of hierarchy while according to human capital theory, supervisors are paid more because they are allocated in higher levels of hierarchy as a return to their higher human capital characteristics compared to non-supervisors. Thus models based on the theoretical background by combining both theories, predict that the wages of workers from different groups of occupations, educational categories, and seniority tiers are higher in some firms or industries than in others and that firms may have incentives to offer higher wages than their competitors in order to guarantee a low quit rate and attract many workers in a market characterized by the existence of frictions.

Focusing on the human capital theory, a possible explanation about the premium given to supervisors is that supervisors are rewarded more as a return to their human capital characteristics such as education. The human capital model based on neoclassical economic theory assumes that an educated population is a productive population. Based upon the work

of Schultz (1971), education is highly instrumental and necessary to improve production capacity of a population. Most economists agree that it is human resources of nations that determine the character of economic and social development. According to Psacharopoulos and Woodhall (1987) human resources are more active determinant of wealth of nations than capital and natural resources. In other human capital models, training is concerned to be a major factor of income increase. Becker (1962) suggests using a typical model of general human capital training that firms should deduct training costs from worker wages. If workers in larger firms receive training, they become more productive and they are promoted to jobs with higher job-responsibility and thus they earn higher wages.

Other economists try to explain this differential through hierarchy theory and firm size. This theory suggests that firm size influences positively the reward of those who have supervisory or administrative positions. Large firms require more workers to be supervised and require able professionals to mentor the subordinate workers and enhance firms' productivity and profits. In all these models, hierarchy is viewed as a coordination device. The study of hierarchic organization was proposed by Simon (1957) and was continued in his later studies. Organizational theorists such as Simon recognize the hierarchical nature of managerial control. They claim that the larger the organizations are, the higher the level one reaches in that hierarchy and so those in the higher level of this pyramid are expected to be paid more. Basic assumption is that the employees of a firm supervise employees on the level below and that the lowest-level employees are the only production workers. Hierarchical organization implies that supervisory jobs are more strongly correlated with firm size than production workers' wages. Simon does not clearly explain why the higher positions should be occupied by more able individuals. In his model salary and span of control are assumed to be exogenous to the firm and determined by contextual elements such laws and conventions aimed at protecting workers. Mayer (1960) demonstrated that workers who are supervised by a more able supervisor are more productive than those who are not mentored and thus the more productive individuals should be placed in higher layers of hierarchy. Beckman (1977) adds to the hierarchical model that firms choose the optimal span of control to mitigate the loss of control that happens in hierarchies, but salaries are still considered to be exogenous at the firm characteristics. In his model the productivity of a worker depends on the amount of supervision he receives and thus supervisors are more

productive than workers. He concluded that the average cost of managing declines with the size of the hierarchy. Geanakoplos and Milgrom (1991) analyze the optimal allocation of managerial time in order to coordinate the decisions of imperfectly informed employees. They find that there are supper additive returns to managers' speed in processing various kind of information.

Other models assume homogeneous managers and workers. Thus, differences in wages cannot be explained by differences in human capital according to these models but in differences in effort and ability among managers and production workers. Incentive issues for workers through salaries are introduced by Calvo and Wellisz (1979). In their paper they focus on monitoring and efficiency wages. They use a "loss control model" which explains that supervisors receive higher wages than production workers due to their ability of using a firm profit maximization technique. Monitoring effectiveness is an ability because it can minimize cost due to communication problems inside a firm and it can improve the productivity of subordinates thus, it becomes higher in higher levels of hierarchies which have wider spans of control. It follows that, the executive of a very large company is paid a very high salary not because the wage should reflect the associated prestige or because the large company can afford to offer large pay, but because it is optimal for a large company to hire a very able executive and to compensate him/her more. The authors explore the effect of the imposition of a minimum wage applying to the production workers, to find that surprisingly, up to a point, the higher the minimum wage, the larger the number of production workers that will be employed. But an increase in the minimum wage of production workers is disadvantageous to the supervisors. As the wage is raised, the optimal number, quality, and wage of supervisors' decline. In this models' equilibrium better monitoring is rewarded as it lowers the bill for all subordinates. Quian (1994) also models the two features of hierarchy, salaries and span of control through an efficiency wage model which is focused on effort of subordinates. When the subordinate is checked by his superior his effect is known precisely otherwise effort is not known at the superior. To mitigate such a problem, supervisors spend time in monitoring the effort exerted by their immediate subordinates. In the optimal hierarchy in which all managers and workers are identical, wages and efforts decrease as one moves from the top to the bottom of hierarchy. If loss of control is interpreted as a fall in the amount of effort, then loss of control increases as we

move at the bottom of hierarchy. The decreasing effort means that under the optimal wage scales, the higher tier managers exert more effort and lower tiers managers less effort, and the loss of control in the hierarchy is less in the upper levels of hierarchy, more in the lower levels, and mostly at the bottom. As the size of hierarchy increases, the marginal product of top managers increases. Top managers in a larger organization exert more effort and get more pay than their counterparts in a smaller organization.

Another line of research investigates the allocation of different talented managers and workers [3](heterogeneous) to previously established job positions, with implications for wage formation. (Rosen 1982; Waldman 1984; Gibbons and Waldman 1999). In this respect managers earn more due to differences in talent compared to production workers. Rosen analyzed the wages and job assignments of managers in a hierarchy. In this model of firm's maximization profit problem, each person is completely described by a vector of endowed latent skills indicating the amount of skill potentially supplied to each level of authority. In general equilibrium wages reflect marginal products. He argues that large wage payments to superior managers in large firms are sustained by corresponding increments of productivity rendering the observations squarely consistent with the marginal productivity theory of distribution (demand) and with the theory of rent (supply). Including the indivisibility of management-type decisions in the model implies a scale of economy as it improves productivity of all workers and minimizes firm costs. He finds that scale economy of management inputs requires that the most able personnel should be placed to top level positions in very large firms. More talented managers are more efficient users of time and economize it by employing more labor input and they get rewarded for this talent. Assigning persons of superior talent to top positions increases productivity more than the increments of their abilities because greater talent filters through the entire firm by a recursive chain of command technology. Gibbons and Waldman (1999) construct a model in which the wage is an increasing function of expected effective ability which increases with experience because of human capital accumulation. They predict that performance evaluations within a

[3] It is assumed that individuals' talent increases in the same direction with hierarchy level. Small differences in talent may imply large differences in earnings.

job level fall with experience because workers with higher expected ability are promoted into higher level jobs.

Differences in earnings can be explained by differences in productivity among workers and supervisors. If professionals with advanced skills are more productive and are placed in higher levels of hierarchy then they receive higher returns. Then we can see hierarchies as assignment and learning mechanisms that serve the objective of assigning individuals of higher ability to positions where they are more productive at. Sattinger (1979) generalizes the theory of differential rents in which the distribution of earnings depends on the distribution of capital among jobs and on the reserve prices of capital and labor. He focuses on assignment of workers to jobs based on skills. Both jobs' and workers' attributes matter for productivity. Workers with certain attributes are more productive at certain jobs than others and they select jobs' attributes to maximize their wage.

The fact that firm-size wage gaps increase with worker age is consistent with a model of hierarchical production and equilibrium matching. Garicano and Rossi-Hansberg (2004, 2006) use a model of information in their hierarchical matching model, in which firm size arises endogenously, and in equilibrium, larger firms have both abler managers and abler workers. Higher-ability workers become managers, and their abilities are amplified by supervising many workers. There is job-responsibility stratification: abler workers have higher responsibility levels. Thus, workers with more job responsibilities are abler, and for each job-responsibility level, workers at larger firms are abler. In the models' equilibrium, a worker of a given rank supervises more subordinates at a larger firm than at a smaller one.

2.1.2 Empirical Research

There is no shortage of econometric models and methods, researchers use in order to verify or reject economic theory. These studies use data mainly from labor surveys or from companies, which contain information about workers personal characteristics (sex, age, tenure, education, job seniority) and about their workplace (firm size, plant size) or from linked employer-employee data. Most researchers use panel grouped regression models using as the dependent variable the log of wage and, as independent variables personal and job characteristics in order to identify which of these are statistically significant in the explanation of the wage gap between supervisors and non-supervisors. Other models, such

as probit regression models, are used to identify which personal or firm characteristics are likely to increase more the probability of holding a supervisory job.

The importance of education and human capital has been tested in many studies. Studies in both the microeconomics and macroeconomics literature predict that investment in superior human capital generate better firm-level performance. Medoff and Abraham (1980) provide direct evidence concerning the relationship between experience and performance among managerial and professional employees doing similar work in two major U. S. corporations from manufacturing sectors, where the one sample contains a somewhat higher proportion of people with advanced degrees. They create a pre-company variable which measures the experience of employers before working to these companies. A maximum likelihood Multinomial logit model, and dummies which capture grade level, is used to estimate the effects of education, pre company experience, and company service on the probability of an individual's being in each salary category and in each performance category. They find that managerial and professional employees with more than average pre-company experience and company service have higher than average salaries and about 40 percent of the earnings differentials associated with pre-company experience and with company service occur within grade levels. With pre-company experience and company service held constant, individuals with advanced degrees receive substantially higher salaries than individuals with less education. In both companies, controlling for educational attainment and company service, there is a positive association between salary and pre-company experience, and, controlling for schooling and pre company experience, a positive association between salary and company service. Similar results are found by Bishop (1987) using data for wages and reported productivity from the personnel of 659 different firms (mainly managers), concluding that an additional 5 years of total experience raises both starting and later wage rates by 3.3%-3.5%, and an additional year of schooling raises relative wage rates by l.1%-l.2%.

One line of empirical research which has been largely studied is how firm size affects wage inequality. Empirical methods based on hierarchical theory have given evidence on why workers and mainly staff in higher levels of firms' hierarchy are rewarded better as the size of the firm or plant increases. Brown and Medoff (1989) include variables of job

characteristics in a wage equation to examine whether there is a reduction, or an elimination of the wage premium associated with employer size. As the data cover 27 different industries they control for industry dummies in wage regressions. With a distinction between managers and workers, they study whether the size effect is different among different occupations with different skills. They conclude that there is a positive relationship of firm size and wage inequality, a conclusion drawn by most studies. This size effect seems to be slightly larger for blue-collar occupations. Troske (1999) using employer-employee linked data asks the same research question and follows a similar econometric model. He finds that more skilled managers hire more skilled workers. The fact that large employers hire better workers and that both large employers and their employees are more likely to invest in firm-specific human capital can explain size-wage premium.

Meagler and Wilson (2004) use cross sectional Australian data to test empirically the hierarchy theory prediction that supervisors' wages are more strongly correlated with firm size than production workers' wage. The innovation of their paper is the usage of a supervisory dummy and its interaction with plant size. The survey contains information on workplace size and supervision, presenting a unique opportunity to investigate empirically the implications of hierarchy theories for wages in Australia. The sample is restricted to full-time (>24 hours) Australian male employees aged 18-65 years and the model was estimated with maximum likelihood interval regression. The dependent variable is earnings which is then explained by a group of regressors. The interaction of the supervisor dummy with plant size helps to control for the difference in size effect between supervisor and non-supervisors. Their empirical results give support for the basic insight from hierarchy theory, as the firm and plant-size effect are much larger for supervisors than non-supervisors.

Other researches introduce the idea of span of control into hierarchies and its relationship with wage inequalities among supervisors and workers**.** Fox (2009) constructs a measure of span of control which reflects the number of subordinates a supervisor supervises. In a Fox estimation model, there is a separation between white-collar (perform professional, managerial, or administrative work) and blue-collar workers (perform manual work). White collars advance with age in hierarchies and supervise other workers while blue-collars remain at the bottom and only some of them advance to white-collar positions over time.

The data come from two databases, the Swedish Employers' Federation for years 1970-1990 and the US Survey of Income and Program Participation. Swedish data include a measure of job assignment and Fox also constructs two measures of job responsibility, a directly recorded measure of rank within an occupation, as well as an ordinal measure of job responsibility constructed by ordering the mean wages of each job assignment. In US there is only one measure of job responsibility within an occupation. The focus of the research is how firm size increases with job responsibilities. Firm-size wage gaps increase with job responsibility for all Swedish white-collar works. The same happens for white and blue-collar workers of US with a single exception for US technicians versus engineers, for whom firm size wage gaps decline with job responsibility. Similarly, with Medoff-Abraham and Bishop, Fox finds that wage gap for white-collar workers increase with age because managers at larger firms supervise more as they age. His findings confirm Garicano and Rossi-Hansberg (2006) model prediction that for workers of the same job-responsibility level, spans of control are higher at larger firms. Another conclusion is that an increase in job responsibility of managerial employees leads to an increase to his/her earnings and this increase is larger in large firms.

Also, almost all hierarchical-production models find that workers with more labor inputs are assigned to jobs with more responsibility. Thus, the average wage in a job assignment/rank combination could be considered as an ordinal measure of that combination's responsibility. Calvo and Wellisz (1979) claim that workers who contribute more labor inputs are paid more, so the wage of a worker is an ordinal (but not cardinal) measure of ability. Smeets and Warzynski (2008) confirm empirically implications from hierarchical models such as Rosen (1982), Quian (1994). They find that wage inequality increases through hierarchical levels and that higher spans of control of supervisors are associated with higher wages. The firm rewards supervision tasks with higher salaries and uses wage differentiation within job levels. The authors explain these findings as evidence of learning and talent reallocations among job levels. This means that the more able managers supervise more workers and command higher wages because they can leverage their knowledge. Improved communication could explain that managers can better leverage their knowledge, solve more problems and supervise larger teams, according to the knowledge-based hierarchy model. In addition, a higher span of control increases the probability of a manager to be promoted.

Empirical evidence about these theories of hierarchy has mostly relied on survey data. Ortin-Angel and Salas-Fumas (2002) use survey data from 9,694 managers and six hierarchical levels from a repeated cross-section of 669 Spanish firms for the period 1990-1992. The data contains information about a managers' personal characteristics (education, age, job tenure) and a description of his/her job, hierarchical level and functional area inside the firm. The origin of the database is from Leonard (1990) and Gerhard and Milkovich (1990). Methodically, the authors test the explanatory power of human capital variables on the allocation of managers into the different hierarchical levels. The description of hierarchy simulates Baker's (1994) where hierarchies consist of job titles aggregated into levels related to the job's authority and place in the path of decision and careers are described as series of promotions to higher level jobs with higher rewards. Only managers in very top positions are assumed to compete for the job of CEO. Static data from managers belonging to many firms and jobs, in contradiction with Baker who uses one firm, allow interfirm comparisons and the introduction of small firms into the analysis. Consistent with Fox's findings, the authors find the same direction in the relation between span of control and wage. Firms allocate managers who are more talented to higher hierarchical positions, but talent increases at a decreasing rate as we move at the top levels of hierarchy. The positive association observed between managers' compensation and span of control obeys the fact that the ablest managers occupy higher hierarchical positions with larger span of control. Conclusions are also drawn about the explanatory power of human capital variables. Human capital adds little when there is control for levels and firms. However, half of the explanatory power of wage differences through different levels of hierarchy can be attributed to human capital endowments. Thus, theories that consider human capital variables as determinants of managers' differences in compensation and level of responsibility within organizations cannot be rejected with their data.

Valerie Smeets and Frederic Warzynski (2017) investigate how managerial compensation is related to span of control and career dynamics. Span of control is defined with the same way as in Fox's constructed combining information on job level and the chain of command. This is the most precise measure available in this literature. In their study they initially construct a theoretical model based on previous theoretical models which predicts that a managers' span of control should be positively related to the managers' ability level. They run a

traditional Mincerian regression of monthly wage over human capital variables (firm tenure and age in a quadric form) and job level variables and then a second regression adding the span of control as a manager and as a middle manager using employees' data from a large European firm operating in a high-tech manufacturing industry. Previous existing theories do not make predictions on the link between span of control and career dynamics. They find that increases in span of control are correlated with a wage increase and with the probability of a manager to be promoted.

Conclusions also have been drawn about the role of managerial ability. Abowd et al (1999) study how person and firm components influence compensation determination using French employees' data. In contradiction with the Troske's findings, Abowd et al found that unobserved from data ability is mostly managerial and larger firms hire workers with greater unobserved ability. Thus, large firms hire superior managers and compensate giving a premium for their ability. In contrast, in non-supervisory position this difference in ability does not receive a premium in larger firms. Following Rosen' approach, Tervio (2007) uses an assignment model (based on the "differential rents" model of Sattinger (1979)) whose basic assumption is that the distribution of labor earnings depends on the distribution of capital among jobs and on the reserve prices of capital and labor, by adding adjustable capital that is endogenously allocated between the matched pairs of firms and managers. In this model different types of indivisible units of production (managers and firms) are matched in fixed proportion. The basic simplifying assumption is that there is a competitive and frictionless labor market for executive ability, which is equally applicable in all companies, but is more productive at larger companies. For the empirical results Tervio use data on the 1000 largest publicly traded companies in US in 1994-2004. His research question is how chief-executives' payment can be explained by differences in talent and firm size. He concludes that plausible difference in managers' ability can generate high level differences among their wages especially in larger firms.

Mueller (2017) in a similar research paper on how wages vary between different job levels across firms and how they relate to firm performance, uses data of employees from the United Kingdom. He runs a Fama-Mackbeth Year fixed effects linear regression of wage using hierarchy level as an instrumental variable. He finds that there is a size effect only for

supervisor positions. Similarly, Green, Colin & Heywood, John S. and Theodoropoulos (2017) confirm that the size-effect is substantially larger for supervisors than for non-supervisors in Britain. Supervisory talent is rewarded only in large employers while those supervisors who do not have the required skills do not have an advantage if they move towards a larger employer. In another study of British managers from different fields, Geoffrey and Pete (1984) also find that firm size, as a proxy for managerial discretion, exhibits the expected positive relationship with earning. Firm size has a major impact for women managers who are employed in large organizations (500 persons or more) and women receive a higher return than men for the number of people for whom they are responsible. For male general managers, they find that firm size is relatively more important in determining earnings than for all other managers. Every 8 years in one's current occupation as a manager adds 5 per cent to earnings. Marital status raises earnings by an average of 14 per cent. For general, production, site, transport and retail managers, for over half of the male managers in the sample, training variables are related to their earnings.

Other researches focus not only on earning distribution but also on how there is an allocation of workers on supervisory and managerial positions across all occupations and country systems. Discrimination based on race, gender, age, marital status can often prevent the most productive workers from gaining access on high-paying jobs. Empirical researches have shown that men are more likely to hold positions of authority across all occupations even after controlling for human capital and job characteristics.

Rosenfeld (1998) uses data of surveys from different countries for men and women aged 20-60. Following a logistic regression model, he studies the probability of holding a supervisory job for men and women using human capital variables and firm size as explanatory variables. Across all countries in his study, men are significantly more likely to have supervisory authority. In addition, higher educational credentials and full-time employment increases the probability of having authority on the job. Older workers are more likely to have achieved a supervisory position and white collars are more likely to supervise others than blue collars. Marital status can also affect both women and men to hold supervisory position. At the same time, male authority advantage is less in countries highly segregated by industry.

Mitra (2003) uses data from NLSY for full-time professionals' men and women 33-41 years old. For the estimations, she uses a logistic regression of the probability of holding a supervisory position while the independent variables include individual's background, human and person capital, and job characteristics. The second stage of analysis includes a wage regression separated for men and women holding demographic, worker and job characteristics constant. The results from logit model for professionals pooled by gender show that men have a higher probability of holding supervisory positions. In addition, human capital variables play important role in the placement of men and women across supervisory positions. Education, experience and length of tenure are significantly and positively correlated with the probability of holding supervisory positions. Firm size also affects the chance of holding a supervisory position as the larger the firm is, the greater the probability of finding a supervisory position is. An interesting finding is that when there is control for all independent variables of the wage model, men supervisors earn 27% more wage than female supervisors. However, professional women who hold supervisory jobs earn higher returns on schooling and cognitive skills.

Wolf and Flingstein (1979) apply a multiple regression with a dummy dependent variable and decomposition techniques using data from the Wisconsin Study of social and Psychological Factors of a random sample of persons who were seniors in Wisconsin high school in 1957. Since the dependent variable is dichotomous, the estimated value produced by the model can be considered as the probability that the individual hold on authority position. They found that total work experience benefits men since many firms do not recruit male managers and supervisors internally, but they choose managers and supervisors who are currently employed in another firm. On the contrary, total tenure with the present employer may be more valuable for women in attaining supervisory jobs because women supervisors are not recruited from outside and are promoted to authority positions after having worked in the same firm for several years. Marital status and having a child do not have a significant effect in women authority status but the presence of a child has a positive effect on authority for men and thus it affects man's earnings.

Biagetti, Giangreco, Leonida, and Scicchitano (2020) try to measure the supervisor wage to supervision (WPS) attributed to each supervisor in different country systems and explain the

contextual reasons for the differences. Their empirical work is based on the EU-SILC database that holds information on individuals in 26 European countries and a non-parametric distribution of wages model. The authors select UK as the benchmark country because of the significant capability of the economy to attract skilled individuals. In most countries, supervisors have higher skills and schooling than production workers. Thus, differences in the distribution of wages are not only due to the supervisory position. The UK is the country where the supervisors are, on average, younger than production workers and has the largest difference, in terms of skills, between supervisors and production employees suggesting that it is more likely for skilled employees to facilitate into supervisory positions. In order to control for self-selection of skilled individuals into supervisory positions the log of wage is used among the regressors. The UK labor market is more attractive for supervisor due to the higher wages. Among the economies with the highest WPS, Ireland turns out to pay the highest average premium (23.4%), followed by the UK (23,2%) and Cyprus (20%). Results show that the economic context of a country explains over 10 per cent of the wage premium given to supervisors. Apart from Ireland, a supervisor working in the UK rather than in the country in which she/he holds nationality would earn a higher premium.

In summary, from all empirical studies mentioned above, we draw the following conclusions.

- Supervisors earn more when they work in larger establishments (especially males).
- Supervisors earn more when they have more job responsibility and more subordinates, they supervise.
- Ability and talent are rewarded for supervisors more than for non-supervisors.
- Human capital characteristics (marital status, experience, tenure) increase supervisor wage more than non-supervisor.
- Human capital variables play a significant role and increase the probability of a professional to hold a supervisory position.
- Men are more likely to hold a supervisory job and earn more when they have the same human capital characteristics with women.
- Schooling and cognitive skills contribute more to women than men to hold a supervisory job and earn more.

- White collar workers are more likely to hold a supervisory position than blue collar workers.
- There is a self-selection of skilled individuals into supervisory jobs especially in countries where supervisor premium is higher.

2.2 Literature on delayering and organizational changes

The current context of the intensification of the global crisis, determines that organizations need to initiate radical changes in their strategies. These changes should be sustained by proper government policies, to support enterprises to adapt and succeed to maintain their competitive advantages (Dinu 2010). The globalization facilitated the speed of the crisis effects. Empirical researches have shown that recent changes have been characterized by a trend towards less hierarchy and more flexible organizational forms. It is believed that these changes require a higher level of human capital (education, experience) since they need to deal effectively with increased uncertainty and job responsibility. (Caroli and Van Reenen 2001).

Whittington et al. (1999) examine those changes on a broad scale and empirically test whether European countries are restricting towards new patterns of organizing. They administrated a survey during 1996-1997 to elicit information directly from firms on recent changes. Their data include a sample of 1500 UK firms and a random sample of companies from Western Europe that comes from 2000 surveys. Their results suggest that in Europe there appears to be little geographical variance with most delayering reported in Northern Europe and in the German speaking countries. Northern European firms report relatively higher levels of both decentralization and strategic decision making as they are characterized by a relatively low degree of uncertainty compared to southern Europe. Increase in competition explain little of the variance of the organizational forms but significantly increases delayering. They find that stronger competitive pressure connected with the globalization of markets and the entry of new players have increasingly forced firms to eliminate intermediate hierarchical levels, in addition to adopting new organizational practices.

Acemoglu et al. (2007) analyze the relationship between the diffusion of new technologies and the decentralization of firms and the determinants of decentralization. The authors use

two French and one UK data set using a maximum Likelihood probit model. Dependent variable an indicator for whether there was a reduction in the number of layers in the managerial hierarchy between 1996 and 1998. Results show that the closer a firm is to the technology changes, the more likely it is to choose delayering. In addition, firms in heterogeneous environments and young firms are more likely to choose decentralization. Thus, their results suggest that the recent move toward more decentralized organizations may be driven, in part, by the rapid diffusion of new technologies and the increase in the number of young firms are associated with reduction of hierarchy levels. In addition, their empirical results showed a robust positive association of competition and decentralization, attributing this effect to the fact that competition may increase the value of information because falling behind competitors may be costly to firms and force managers who have superior information to have larger responsibility in order to take profit-maximizing decisions more often.

Literature suggests that a reduction of management levels can have both benefits and costs and the tradeoff between both will determine the extent to which firms will introduce organizational changes. In flatter hierarchies there are fewer total costs of monitoring associated with layers. As intermediate layers of control disappear, the related cost decreases (supervisor wages at these layers). In addition, less layers reduce the costs of information transfer and communication. Another positive effect is that firm can react better to market changes. Finally, delayering can increase productivity through motivation, satisfaction and delegation of higher responsibility to supervisors and greater participation of lower level staff. However, the absence of centralized management can arise risk of duplication of information. A related risk is that of increase in the occurrence of mistakes because of the less direct controls that are exercised in the course of the production process. In addition, fewer levels of management imply that new entrants cannot be promoted as often as before that can decrease employees' effort. (Sohr 2005). The following studies on the effects of delayering suggest that there are more positive than negative effects.

Bauer and Bender (2001) examine the effects of delayering on wages and firms' internal structure using employer-employee linked data for Germany. They use a panel regression model with dependent variable the mean log real daily wage and the log wage of past decades

using characteristics of establishments as explanatory variables. The results show that lowering the number of hierarchy levels between 1993 and 1995 affects wages in 1995 positively. The authors find that the flattering of the hierarchy structure of an establishment and the introduction of self-managed teams increases mean wages and widens the wage distribution especially at the upper parts while the transfer of responsibilities at the lower levels does not have significant effect on wages. These results support the hypothesis that in flatter organizations employees gain higher wages instead of promotion motivation and supervisors are paid more due to the larger span of control.

Shaw and Schneier (1993) make a survey including eight corporations, in order to make a sample with a wide variety of industries, geographic locations and sizes, that had delayered within the last five years. Companies respondents' most common-citied objectives by delayering were to speed decision making, improve communications, reduce costs, and increase the organization's responsiveness. The authors compared these firms with their respective industry peers, to find that firms that perform delayering have higher sales' growth, profit growth and productivity growth.

Littler, Wiesner and Dunford (2003) use a range of data from Australia, New Zeeland and South Africa focusing particularly on the larger organizations which employee 50 or more workers. In the survey managers respondents are asked whether the organization they work have performed delayering and which is the objective for delayering. They run a log linear model constructed with five factors- a set of survivor syndrome[4] variables, country, size, sector and nature of respondent, to capture all possible effects. The main objective of workplace by delayering was the same, to improve decision making. The authors find that there is a significant increase in workload within delayered organizations. Despite the work stress problems reported for middle managers, their research results show that most firms across all samples report significant productivity gains reported for middle managers. However, they found that the survivor syndrome deteriorated in delayered organizations.

[4] Survivor syndrome is associated with increased levels of job dissatisfaction and concern about job security and decreased levels of promotion opportunities, staff motivation, morale among staff and staff commitment

Kuhn and Dieter (2011) use a nationally representative data set of firms in Switzerland in order to examine empirically the direct performance effects of delayering. They apply ordinary least squares regressions and propensity score matching (PMS) to control for a potential selectivity bias in evaluating the treatment effects of a delayering program using as dependent variables a productivity measure and a profitability (efficiency) measure. The key independent variable is a dummy variable indicating whether a firm has reduced the number of hierarchical levels since 2000 (delayer). Other control variables refer to firm characteristics and market conditions. OLS results show that firms that have delayered are about 20% more productive and 10% more profitable (efficient) than firms having not. The authors suggest that on average the positive effects of delayering such as better information flow, faster and more complex decisions and intrinsic motivation of employees seem to outweigh the negative effects such as loss of knowledge and extrinsic motivation.

3. Data and Descriptive Statistics

3.1 Data

My empirical analysis is based on micro-data from the Greek Labor Force Survey (LFS). The Greek LFS is conducted quarterly by the National Statistical Service of Greece (ESYE) I use the second quarter as the representative of each year to study the period 2006-2016 -a period that starts before the great recession and ends in the last year of the recession. The study period starts in 2006 because this is the first year the LFS asks respondents about their supervisory status. The sample of the survey is 30.000 households and includes 80.000 observations approximately.

For the purpose of my econometric analysis, only those individuals classified as wage earners are utilized. Individuals who take part in the survey answer questions about their personal characteristics (such as the gender, age, level of schooling, work-experience, wage, marital status), their job characteristics (occupation, working hours, wages, part time or not, temporary or not) and their workplace characteristics (firm size). Starting in 2006 the question “do you have a supervisory role in your job?” is included in the questionnaire. The answer is yes or no and so I create a dummy variable which separates the sample in supervisors (those who answered yes) and non-supervisors (those who answered no).

3.2 Descriptive Statistics and Graphs

LFS data give information about the total net monthly wage income from the main job from which I construct a variable which measure net monthly wage, but this variable is not continuous. I divide this wage with the corresponding Consumer Price Index of each year in order to find the real wage which is the measure that I use so that l can compare my findings over time. Each individual wage belongs to one of the nine wage bundles of a 250-wage range. [5]For my analysis I construct a pseudo-continuous wage variable by taking the mean of the upper and lower bound of each wage bundle for each observation. I use log of wage instead of wage in regression for the interpretation of the results and to compare the net premium with raw premium. I also am interested in interpreting how a percentage change in independent variables affects the percentage change in the dependent variable.

I also use human capital variables which give information about individual characteristics. Data give information about educational type which asserts the highest educational completed course of education. According to these types a new variable education is constructed which measures the years of completed schooling. I also construct a variable which measures general experience in the labor market as the difference between the age a person finished schooling and the age at survey. These variables are considered to enhance access to higher level jobs (Rosenfeld 1998). The LFS data report a household identification number, a household-specific person ID and a variable that contains information of the relationship with the household head. There is also information about the marital status of every person from which I create a binary variable which defines whether the individual is married or not. Marriage and children have positive effects on men earnings. (Mitra 2003). For women this situation may represent possible constraints to career advancement. (Wolf and Flingstein 1979). Thus, I include marital status and presence of children in household in the model.

In addition, wage differentials can also be affected by occupational and industrial factors. Thus, I include job and employer characteristics as explanatory variables. For example, men

[5] The wage bundles from labor Force Survey are between 0-499, 500-699,700-799, 800-899, 900-999, 1000-1099, 1100-1299, 1300-1599, 1600-1749, and over 1980 for 2009-2011 and while for years 2012 and 2013 they are between 0-499, 500-699,700-799, 800-899, 900-999, 1000-1099, 1100-1199, 1200-1299 , 1300-1499 and over 1500.

and women supervisors may have an advantage/ disadvantage in several sectors or occupations. I also include whether the person is employed full time or part time. Part-timers are often not considered "regular workers" and lack access to supervisory jobs. Including firm size is also important in my model as it can affect both wages and the probability of being a supervisor. Working in a small firm may be an obstacle in getting promoted to a higher-level job. In addition, region can affect both employees' opportunities especially for women.

In total, the variables I use in my analysis as control variables are education and experience of its person, marital status, the presence of children and the weekly hours of work. I also control if the employee works on public sector, on part time job and on temporary job. I also use dummies which capture geographical regions, years, genders, firm's size, sectors and occupations. I have also constructed an instrument (supervisor history) variable which flags if the individual has parents who work or have retired as a supervisor.

Table 1 presents statistics which come from LFS data of all variables included in my empirical analysis. LFS data show differences for those who work as supervisors and non-supervisors and these differences change dynamically after 2009 crisis. In Table 1, I can see that most supervisors are in the public sector while non-supervisor's share in the public sector is lower and decreases during crisis. I observe that there is an increase in the share of women who work over the years both for supervisor and non-supervisor samples. Relative to non-supervisors, supervisors are more educated, experienced and more likely to be married or to have a child. In addition, the supervisors sample contains a lower share of temporary, foreign and part-time workers. Before and during crisis, there is an increase in average years of schooling, but average experience increased for non-supervisors and fell slightly for supervisors. The percent of non-supervisors working in small firms is double than that for supervisors, which reflects the fact that small firms decrease the opportunity of being a supervisor because small firms employ less than 10 workers, or they maybe family businesses which do not require other professionals to monitor or increased qualifications for monitoring. During the crisis I observe that less workers of both samples work in small firms. Although the crisis affects all sectors of business activity, small and medium sized enterprises are more vulnerable compared to large firms since they lack, in comparison, the

management mechanisms, the material and financial resources to deal with such unexpected events. This could be attributed to the reportedly higher competitiveness and stronger financial position of large firms before the crisis.

Table 1. Weighted means and frequency of selected variables by supervisory status and year

	Supervisors										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Real monthly wage	1488	1528	1550	1528	1519	1460	1258	1286	1240	1246	1292
Public Sector	0.54	0.55	0.52	0.52	0.51	0.53	0.47	0.50	0.52	0.54	0.51
female	0.26	0.29	0.3	0.31	0.31	0.29	0.31	0.31	0.32	0.33	0.33
Education (years)	15.02	15.36	15.42	15.46	15.56	15.75	15.73	15.88	16.7	16.59	16.97
Experience(years)	22.07	22.30	23.12	23.02	22.78	23.01	22.16	21.94	20.79	21.37	21.72
Married	0.74	0.76	0.75	0.74	0.74	0.74	0.71	0.72	0.69	0.70	0.71
Child(ren)	0.46	0.44	0.45	0.43	0.45	0.44	0.44	0.45	0.42	0.41	0.44
Non-Greek	0.02	0.01	0.02	0.02	0.016	0.02	0.02	0.02	0.02	0.02	0.018
Part-Time	0.01	0.01	0.01	0.01	0.003	0.1	0.02	0.03	0.02	0.02	0.02
Temporary	0.04	0.04	0.05	0.04	0.04	0.03	0.04	0.04	0.05	0.04	0.03
Small Firm	0.24	0.26	0.28	0.28	0.26	0.23	0.20	0.2	0.2	0.19	0.19
White collars	0.75	0.78	0.8	0.82	0.81	0.81	0.83	0.80	0.79	0.81	0.81
blue collars	0.17	0.14	0.13	0.11	0.11	0.09	0.09	0.09	0.08	0.08	0.09
Weekly Hours	41.18	40.61	41.31	41.00	41.39	40.87	41.55	41.84	42.22	41.68	42.28
Sup history	0.13	0.13	0.15	0.17	0.18	0.15	0.13	0.14	0.15	0.14	0.146
observations	1639	1607	1553	1594	1631	1333	1101	1009	948	933	1199
	Non-Supervisors										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Real monthly wage	1052	1048	1039	1073	1030	990.8	882.9	819.8	787.8	819.6	809.8
Public Sector	0.36	0.36	0.35	0.35	0.35	0.36	0.37	0.37	0.36	0.34	0.34
female	0.43	0.44	0.43	0.44	0.46	0.46	0.47	0.47	0.48	0.48	0.48
Education(years)	12.61	12.65	12.67	12.73	12.83	13.04	13.27	13.41	13.87	13.89	14.01
Experience(years)	19.97	20.23	20.33	20.21	20.52	20.92	21.00	21.16	20.53	20.83	21.13
Married	0.61	0.61	0.61	0.60	0.61	0.62	0.63	0.64	0.61	0.62	0.63
Child(ren)	0.39	0.39	0.37	0.38	0.38	0.4	0.4	0.41	0.4	0.39	0.4
Non-Greek	0.1	0.10	0.12	0.14	0.14	0.14	0.12	0.12	0.11	0.11	0.09
Part-time	0.05	0.05	0.05	0.06	0.07	0.07	0.09	0.11	0.11	0.11	0.12
Temporary	0.12	0.12	0.13	0.14	0.14	0.13	0.12	0.12	0.14	0.14	0.14
Small Firm	0.46	0.46	0.47	0.48	0.49	0.48	0.45	0.43	0.44	0.45	0.43
White collars	0.6	0.6	0.6	0.59	0.60	0.64	0.65	0.66	0.66	0.67	0.67
blue collars	0.39	0.39	0.39	0.39	0.38	0.35	0.33	0.33	0.33	0.32	0.31
Weekly Hours	39.43	39.31	39.58	39.27	39.03	38.75	38.52	38.18	38.2	38.32	38.36
Sup_history	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.04
observations	13.653	13244	13.165	13713	13.512	11,146	8031	7225	7557	8336	9328

That is, the crisis influenced negatively mainly small firms which either closed or downsized. Part time workers also increased. A negative effect in real wages is obvious and worse for non-supervisors. Through all years there is a decline in working hours for non-supervisors and an increase for supervisors, a fact which contributes to the higher wages of supervisors.

Supervisor sample contains larger share of white-collars and less of blue collars than non-supervisor sample. However, for both samples blue collar occupation since 2008 is shrinking while the opposite happens for white collar occupation. That's because many manufacturing jobs have been offshored due to technology and those remaining offer lower wages. This perhaps led to a shift of the type of work blue-collars perform since new white-collar IT jobs can be filled by displaced blue-collar workers

I would like to insist on the differences in wages between supervisors and non-supervisors and how crisis affected their salaries. Figure 1 illustrates large differences in real wages between supervisors and non-supervisors, however it is not clear how this difference evolves over time. As one can observe supervisors are rewarded about 400-500 euro more than non-supervisors in all years I examine. I observe that after crisis there is a wage reduction for both supervisors and non-supervisors. However, even after this reduction, supervisor wages remain in high levels. Wages in 2008-2009 are in the maximum level of all years with a pick in 2008 for supervisors and in 2009 for non-supervisors. At the beginning of the great recession in 2009 wages are still in high levels. However, the application of an internal devaluation strategy by early 2010 as a response to the financial downturn and the public crisis debt negatively affected wages. Thus, wages in Greece have been steadily declining since mid-2010 when the first Economic Adjustment Programme for Greece is applied which resulted in severe wage cuts. In figure 1 I observe the biggest change to take place in 2011 to the detriment of supervisors and non-supervisors, though the change seems to be more intensive for supervisors. This change could be related to the legislative interventions on the law of collective agreements in 2011 which altered the nature and institutional function of working contracts. The annulment of the principle of the most favorable provision according to which the business negotiation could only deviate in favor of the worker from the national agreement, resulted in a 11,3 percent and 11.1 per cent reduction in wages of supervisors and non-supervisors respectively. In addition, in table 1 we can see that most supervisors are in the public sector. So, supervisor wages are probably affected also by public sector wage cuts. (as are non-supervisor wages, but to a lesser degree, since less of them are public sector employees). During 2012, there is a 4 per cent decline in non-supervisor wages but an increase is observed for supervisors. In total, the larger wage reductions occurred from 2010 to 2013. During these three years, which was a painful time

for Greece's economy, the reductions were approximately 15,6 percent and 20,1 for supervisors and non-supervisors respectively. That is, the raw data indicate that the crisis effect was greater for non-supervisors. After 2014, although wages remain at low levels compared to 2006, they have only slight fluctuations and seem to stabilize.

However, this figure provides information about the wage levels, but we cannot clearly distinguish whether the wage gap between supervisors and non-supervisors increases or decreases over the years.

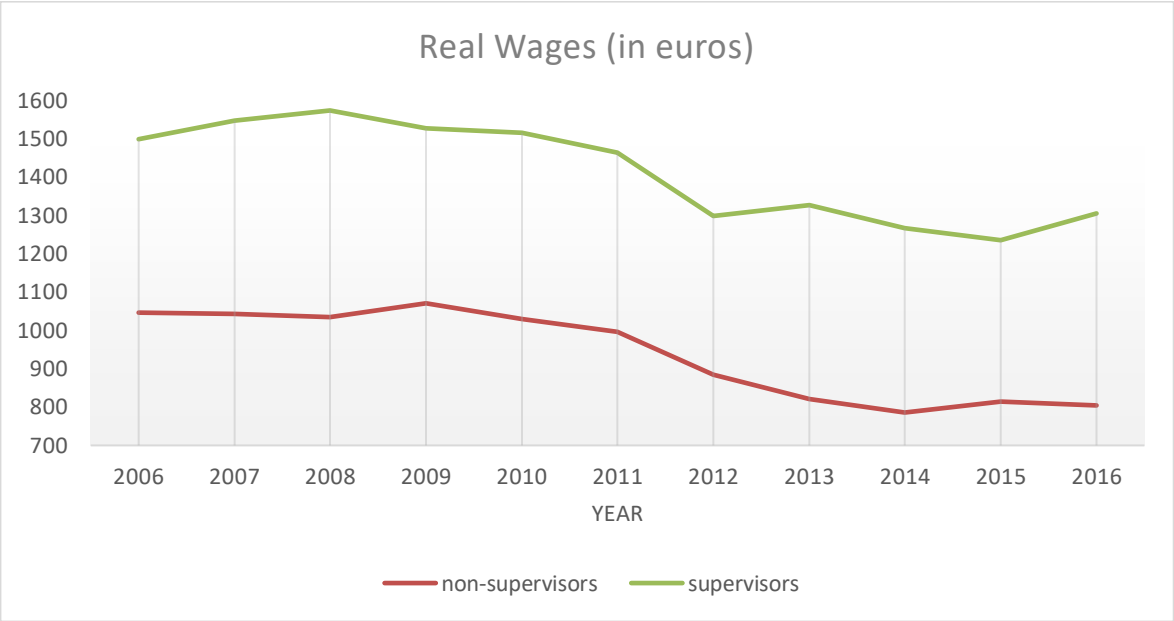

Figure 1. *Supervisor and non-supervisor wages over years 2006-2016*

For this purpose, figure 2 presents how the gap between supervisors and non-supervisors is evolving over time. The wage gap is expressed here as the percent of nonsupervisory wage that supervisors get as premium for being supervisors.[6] Using the full sample, I observe that there is not consistent movement in the gap. However, if I compare the pre-crisis and crisis periods, I could say that wage gap is larger after crisis. At the outbreak of crisis there was a 4.42 per cent increase in the wage gap. This gap increases the following years with a pick in 2013 where the wage gap is 61,7 per cent. The graph shows a steep slope from 2012 to 2013

[6] The exact formula is : $Wage\ Gap = \frac{Sup\_wage - NonSup\_Wage}{NonSup\_Wage}$

as there is a 14.9 per cent increase in supervisor premium. This abrupt change is related to the radical reduction in the monthly minimum wage that followed in 2012. For those above the age of 24, the reduction was from 751 to 586 (22%) and those under the age of 25 the reduction was from 751 to 510 (20%). This reduction influenced negatively only non-supervisor sample probably because it includes all low-wages workers. In total, between 2009-2013, the period when the largest wage reductions took place especially for non-supervisors, the reverse happened to the wage gap between supervisors and non-supervisors which increased as a benefit for those employed as supervisors. Thus, raw data show that the impact of crisis was worse for non-supervisors possibly due to minimum wage reduction.

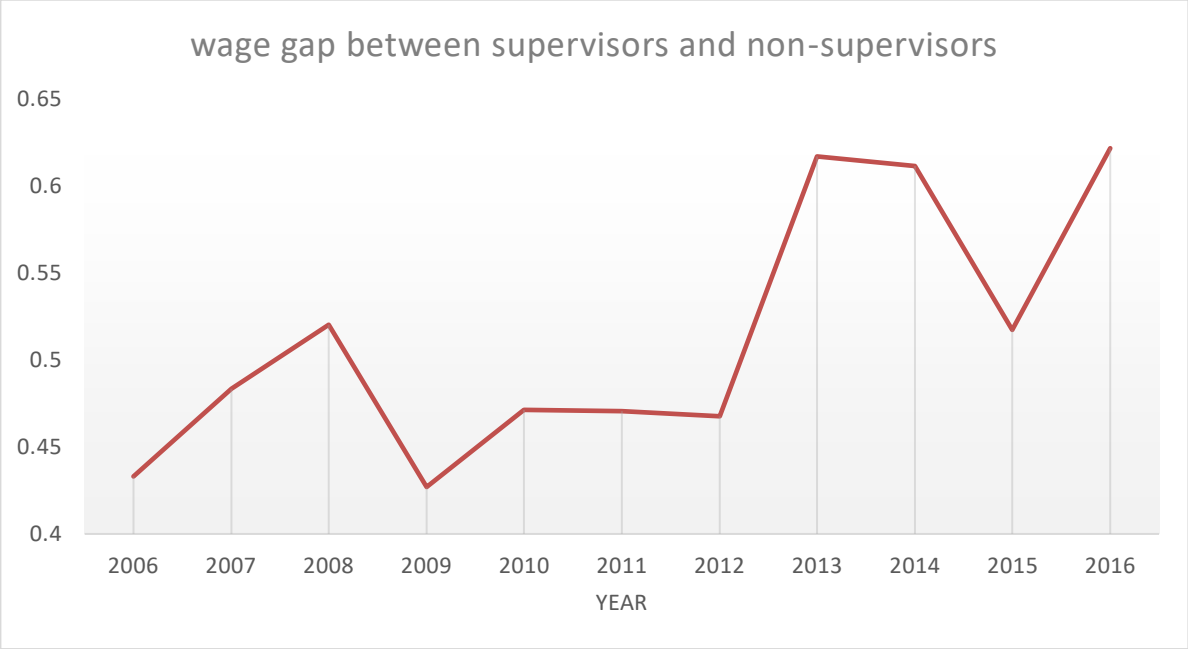

***Figure 2**: Supervisor Premium over years 2006-2016*

In figure 3, I plot the share of supervisors in total wage-employment. From 2011 to 2013 when the largest wage cuts took place, the share of supervisors increased by 3 % and reached 14,3%. One probable explanation could be that during the crisis supervisors were more necessary to firms in order to have a strategic planning, prepare contingency and recovery plans, and manage resources. In such difficult occasions, firms need managers able to make difficult decisions under pressure, using critical thinking skills, and demonstrate strong leadership and interpersonal skills to motivate and organize their teams. After 2013 when the most difficult period of the financial crisis had passed, there was a drop in the share of

supervisors, but this remains higher relative to the corresponding share in the pre-crisis period.

***Figure 3**: Supervisor share of total employees over 2006-2016*

4. Empirical Methods

In the empirical part I use the variables constructed with LFS data. I use the method of pooled cross-sectional analysis because the individuals who take part in the survey are different every year which rules out panel analysis and I want to examine which factors influence i) individuals' access to supervisory jobs and ii) the wage premium they get as supervisors.

I restrict the sample only to individuals who are characterized as wage earners aged 16-65. In order to address the first research question, I use a dummy variable called supervisor-status as described in the previous section, which will divide my sample into supervisors and non-supervisors. For the second research question I use the log of real monthly wage of workers and supervisors.

4.1 Probit model and least square model

As a first step, I want to examine which employee and job characteristics are related with the probability of being employed as a supervisor. The dependent variable of my model is whether the person is a supervisor or not. Most independent variables of my model are also

binary as they are based on the answers of the respondents yes or no. As the dependent variable is binary, estimation by the least square's method is not appropriate. Therefore, I choose to estimate a probit model, which is a binary probability model estimated using the maximum likelihood method and a regular probability function. Thus, I perform a probit regression where the dependent variable is a dummy variable equal to 1 if the employee is a supervisor and 0 if the employee is a non-supervisor. What I want to test is which personal characteristics make a supervisor. First, I estimate the model across the whole sample of 16-65 aged workers which consists of 133.457 observations. Then I divide the sample into men and women, and I repeat the exercise. I expect to find that years of schooling and labor market experience are positively associated with the likelihood of being supervisor. To confirm this expectation, the coefficients of these independent variables should be positive and statistically significant. On the contrary, the inverse should happen when an employee works in a small firm or occasionally.

The basic model I have estimated is the following probit model:

$$Prob(supervisor_{it}) = a_0 + a_1 X_{it} + a_2 D_r + a_3 D_s + a_4 D_O + a_5 D_t + e_{it} \quad (1.1)$$

Where i=1,2,…,133.457the index of each individual

D_r=index of 13 geographical regions of Greece

D_s=index of 19 sectors

D_o=index of 10 job occupations

D_t=index for years 2006-2016

X_{it} matrix of individual and job characteristics

And e_{it} the robust standard error term

Supervisor status takes the value 1 when the employee is a supervisor and 0 when the employee is not a supervisor. The individual control variables include years of education, employee age and its square, dummies for gender, marital status, born status, the existence of a child. Job characteristics controls include firm size, public (vs private status), two dummies capturing temporary (vs permanent) job, part time (vs full-time job), 19 sector dummies, 10 occupation dummies, hours of work and regional dummies.

I run estimations on the pooled sample and then separately for men and women to examine if supervisor characteristics differ by gender. In order to get more reliable interpretations of the differences observed in the characteristics of male and female supervisors, I test if there is statistically significant difference in the coefficients for men and women. I test the null hypothesis that the coefficients are equal. The rejection of the null hypothesis means that there is statistically significant difference between men and women.

However, there is a disadvantage in the interpretation of coefficients when I use probit models. Probit regression is a non-linear regression, therefore its results do not give me a precise sense of how the independent variables affect the dependent. Instead, the model shows only the direction of the influence (positive or negative). This problem can be corrected by calculating the marginal effects of the dependent variable. In this way, I have exactly the magnitude of the effect of each independent on the probability of holding a supervisor position. The signs of the margins of the independent variables indicate the direction of the relationship of the independent variable with the dependent and the coefficients show the magnitude of the result in percentage points.

As a next step, I want to analyze the characteristics that affect wages, the direction of relationship and the magnitude of the effect of each personal or job characteristic separately. For this purpose, I run a least square equation for every year and, I run a pooled cross section regression for the 11 years (2006-2016) including in total 133.457 observations and concerns variables which have been constructed by LFS data from 2006-2016 mentioned above.

First, I estimate the pooled by years and then separately for each year using the whole sample of workers which includes both supervisors and non-supervisors. I include to the independent variables mentioned above the supervisor dummy. I am interested to examine the net premium given to supervisors when I control for all other personal and job characteristics. I expect that the coefficient of the supervisor dummy is positive and statistically significant. As I observed from raw data, the premium given to supervisors is high, but I want to observe if supervisor wage is significantly higher even when all other characteristics are equal. I also run the OLS model separately for every year to examine how the wage gap evolved before and after crisis.

I estimate the model pooled cross-sectional wage model separately for supervisors and non-supervisors to expand on how these personal and work traits affect separately the wages of the two different job positions. I expect that returns to education and experience are higher for supervisors and working in a small firm decreases supervisor wage more. Then, I want to examine gender wage gap in supervisor and non-supervisor sample and to conclude in which sample there is greater inequality. Thus, for both supervisor and non-supervisor wage regressions I test statistical significance of coefficient between males and females.

Thus, I continue my empirical analysis by estimating a Mincerian wage equation of monthly wage over worker and job characteristics as follows

$$logW_{it} = a_0X_{it} + a_1D_r + a_2D_s + a_3D_t + a_4D_o + e_{it} \ (1.2)$$

Where W is the monthly wage of individual i at time t

Where i=1, 2,…,133.457 the index of each individual

X_{it} matrix of individual and job characteristics mentioned above

D_s, D_r, D_o, D_t pseudo-variable matrices for sector, geographical region, occupation and year respectively.

And e_{it} the robust standard error term

I estimate the Mincer equation (1.2) twice. The first time I include human capital variables (education, experience, experience squared) and the second time I do not. I want to examine how the returns to specific human capital characteristics vary across supervisor and non-supervisor samples. I expect that supervisors are rewarded more as a return to their higher human capital characteristics.

4.2 Corrected for selection endogenous model

The next part of empirical analysis includes a model which takes account for possible endogeneity between wages and the choice of supervisory position. This estimation is made by using an endogenous switching model. Similar models are used in Lee (1978) for union and non-union wage differentials and, Van der Gaag and Vijverberg (1988), Christopoulou and Monastiriotis (2014, 2016) for public-private sector. This model consists of two Mincer wage equations (one for supervisors and one for non-supervisors) and a “switching” equation

which determines the choice of worker to be a supervisory or non-supervisory job, with jointly dependent errors. This is a two-stage procedure, analogous to Heckman model. My estimation is by a full information maximum likelihood (FILM) method which fits the binary and continuous regression simultaneously and makes the appropriate error adjustments:

$$\ln W_{it} = \beta X_{\iota\tau} + \varepsilon_{\iota\tau} \ (2.1)$$

$$S_{it} = \gamma_{\iota}(\ln W_{it}, sup - \ln W_{it}, nonsup) + \gamma_2 Z_{\iota\tau} + u_{\iota\tau} \ (2.2)$$

Equation (2.1) is estimated both for supervisors and non-supervisor separately. W_{it} is the monthly wage of individual i in year t, X is a vector of control variables as described in the previous sections, β the respective returns and ε the random error. In equation (2.2) S_{it} is a latent variable that determines if person i works as a supervisor or not, the term ($\ln W_{it}, sup - \ln W_{it}, nonsup$) denotes the supervisor non-supervisor wage differential, Z is an instrument that influences the choice of position and u is the error term. I report estimates on the pooled sample of the above model separately by sex.

The assumption of this model is that the position (supervisory-or non) is endogenous to wages. That means that some unobserved characteristics that influence the probability to choose to be a supervisor or a non-supervisor could also influence the wage individual receives once he is employed. Neglecting this selectivity effect is likely to give a false picture of the relative earning positions both for those employed as supervisors and non-supervisors. If endogeneity is present the OLS estimates will be based. The simultaneous ML estimation corrects for this selection bias.

In my model, the position choice indicator supervisor takes value 1 if the individual is employed as a supervisor and 0 correspondently for non-supervisors. The exogenous variables in the wage equations are based on a typical Mincer's type specification and include such individual characteristics as education, experience, experience squared, marital status, regional dummies and job characteristics. In addition to these variables, the position selection equation (2.2) includes one variable which is called supervisor history which flags if the individual has parents who work or have retired as supervisors.

5. Empirical Results

5.1 Supervisors characteristics and wage determinants

In this section I present the results of the pooled cross-section analysis. Initially I have estimated a probit model of a workers' likelihood of being supervisor. The regression of my basic model has an extensive form, as it includes the most basic personal characteristics and job characteristics, dummies for the region, sectors and years which can affect the probability of holding an authority position. Table A1 of Appendix shows the estimated coefficients of the probit model for professionals pooled by gender and separately for men and women. As already mentioned, the probit regression is a non-linear regression, so coefficients estimates do not give us an accurate sense of how the independent variables affect the dependent, rather than showing the direction of their influence. That is, we see the signs of the coefficients of independent variables and we interpret the direction of results.

For this purpose, I have estimated the marginal effects of the probit model which show both the direction and magnitude of the effect of the independent variables on the probability of being a supervisor.

Table 2 results show that despite using detailed controls for worker and job characteristics, men have a statistically higher probability of holding supervisory jobs than women (column 1). That is, being a female is associated with 3,66 % points lower probability of holding a supervisory job. This is consistent with previously referred empirical findings. (Rosenfeld 1998, Mitra 2003). As expected, human capital variables play an important role in the placement of men and women across supervisory jobs. Employers in the public sector are 1.25% points less likely to hold a supervisory position compared to the private counterparts Education and experience significantly increase the probability of holding supervisory positions. Marital status affects positively supervisor status while the existence of a child does not have an impact. Workers of foreign nationality and of temporary contracts are less likely to hold a supervisory job while working in part-time jobs increases at 2.85% points the likelihood of being a supervisor. Firm size, as I expected, has also a significant impact on placement in supervisory jobs. The smaller the firm, the lower the probability of holding supervisory jobs. If one works in a small firm which employs 10 or less individuals, he/she

is 3,7 per cent points less likely to hold a supervisory job. As expected, increased weekly hours of work increase the likelihood of being supervisor.

Table 2. Margin Effects of probit Model pooled over 2006-2016

	Pooled Probit Marginal Effects			
	All (1)	Supervisor-Men (2)	Supervisor-Women (3)	Statistical significance (4)
Public Sector	-0.0125***	-0.0214***	-0.0021	3.42*
	[0.0033]	[0.004]	[0.0043]	0.0645
Female	-0.0366***	0	0	0
	[0.0021]			
Education	0.0118***	0.0138***	0.0088***	13.11***
	[0.0003]	[0.0005]	[0.0004]	(0.0003)
Experience	0.0069***	0.0075***	0.0058***	1.25
	[0.0004]	[0.0005]	[0.0005]	(0.3632)
Experience Squared	-0.0001***	-0.0001***	-0.0001***	0.13
	[0.0000]	[0.0000]	[0.0000]	(0.7214)
Married	0.0088***	0.0223***	-0.0022	49.01***
	[0.0026]	[0.004]	[0.0032]	(0.0000)
Child(ren)	-0.0025	-0.0007	-0.0073**	7.93***
	[0.0023]	[0.0034]	[0.0031]	(0.0049)
Non-Greek	-0.0553***	-0.0684***	-0.0332***	16.04***
	[0.0054]	[0.0071]	[0.0083]	(0.0001)
Part-Time	0.0285***	0.0268**	0.0358***	4.51**
	[0.0067]	[0.011]	[0.008]	(0.0338)
Temporary	-0.04***	-0.0466***	-0.0327***	0.04
	[0.0041]	[0.0057]	[0.0054]	(0.8368)
Small Firm	-0.0367***	-0.0493***	-0.0206***	20.93***
	[0.0022]	[0.0032]	[0.003]	(0.0000)
Weekly Hours	0.0039***	0.004***	0.0039***	7.62***
	[0.0002]	[0.0002]	[0.0002]	(0.0058)
Observations	133.467	75,139	58,318	
Mean	0.118	0.145	0.0847	

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets
*p<0.1, **p<0.05, ** p<0.01

As a follow up to my empirical analysis, I split my sample into men and women and then I compare the two models to examine the statistical significance of gender differences. Table 2 (columns 2 and 3) analyses the probability of holding supervisory jobs separately by gender. Column 4 presents the statistical significance of gender differences. Men working in the public sector are less likely to hold a supervisory position. For both women and men, education and experience positively and significantly affect placement in supervisory job. Each additional year of education and experience increase the probability of being supervisor by 1,34 and 0,7 % points for men and by 0.8 and 0.6 % points for women respectively. An

extra year of education benefits significantly more men in the placement in supervisory jobs. Unlike men being married has no positive impact for women in the allocation process while the existence of a child has a significant negative effect only for women. Being married increases the likelihood to hold a supervisory position for men by 2,23 % points while having a child does not have an effect. This is a bit surprising but maybe married men with or without children may work harder because of the need to support additional individuals (Duncan et al 1972). However, women with children may be restricted from some supervisory positions due to geographical mobility and restrictions on travel for work purposes. Workers of foreign nationality, especially men are less likely to hold a supervisory job. From demand side part timers' women are more likely to hold supervisory jobs than men. Working in a small firm has a negative effect both for women and men which is double for men. Men working in a small firm are 4.9% points less likely to have access in supervisory jobs while for women it is 2.1% points less likely. That is consistent with literature findings that firm size effect in finding supervisor jobs is larger for men. (Aparna Mitra 2003). As expected, increased weekly hours of work increase the likelihood of being supervisor. An extra hour of work increases more the probability of men to hold a supervisory job compared to women.

Overall the results show that (a) men are more likely to hold supervisory positions even after controlling for worker and job characteristics, (b) Working in larger firms increases significantly the probability of men holding supervisory positions compared to women.

In the following table, I present the coefficients of regional dummies separately for men and women and the statistical significance of gender differences. Easter Macedonia and Thrace are the reference areas. In all regions of Greece women have lower probabilities than men of having a job of supervisory authority except in Attica where I do not distinguish statistically significant difference among genders. The extent of this difference however varies. Thus, probably there is a statistical discrimination in hiring women into senior positions in more traditional and rural regions of Greece which are less segregated by industry.

Table 3. *Region Fixed Effects on probability of beeing supervisor for men and women*

	Pooled Probit marginal effects		
	Supervisor-Men (1)	Supervisor-Women (2)	Statistical significance (3)
Central Macedonia	0.0094*	-0.0003	25.84***
	[0.0053]	[0.0056]	(0.000)
West Macedonia	0.0035	-0.0136	55.06***
	[0.0079]	[0.0085]	(0.000)
Epirus	-0.003	-0.0216***	95.58***
	[0.0068]	[0.0067]	(0.000)
Thessalia	-0.0112	-.0358***	452.1***
	[0.0069]	[0.0079]	(0.0002)
Ionian Islands	0.0109	-0.0132	49.01***
	[0.0096]	[0.0095]	(0.000)
West Greece	-0.0053	-.0209194***	108.6***
	[0.0065]	[0.0068]	(0.0009)
Central Greece	0.0246***	-.0119239*	933.0***
	[0.0063]	[0.0069]	(0.0003)
Attica	**0.0069**	**0.0024**	**1.61**
	[0.005]	**[0.0053]**	**(0.205)**
Peloponnese	-0.0072	-0.0265	239.89***
	[0.0067]	[0.0071]	(0.000)
Northern Aegean	0.021***	0.0061	20.79***
	[0.0081]	[0.0094]	(0.000)
Southern Aegean	0.0164**	-0.004	26.42***
	[0.008]	[0.0084]	(0.000)
Crete	0.0113*	-0.01239	64.77***
	[0.0061]	[0.0062]	(0.000)
Observations	75,139	58,318	
Mean	0.144	0.0834	

This table includes region fixed effects which are omitted in table 2. Robust standard Errors in brackets, P-value in Parentheses
*p<0.1, **p<0.05, ** p<0.01

Then I look at whether employment in some sectors benefits or not access to supervisory jobs for men and women.

Table 4*. Sector Fixed Effects on probability of beeing supervisor for men and women*

	Pooled Probit Marginal Effects		
	Supervisor-Men (1)	Supervisor-Women (2)	Statistical significance (3)
Mining and Quarring	0.0229	-0.0046	0.12
	[0.0187]	[0.048]	(0.7273)
Manufacturing	0.0055	0.0063	0.02
	[0.0148]	[0.025]	(0.898)
Electricity,gas, Steam, Air-Conditioning Supply	0.018	-0.0202	1.94
	[0.0172]	[0.0292]	(16.68)

Water Supply	0.0289	-0.0094	0.98
	[0.0189]	[0.0315]	(0.3230)
Construction	-0.0014	0.0351	1.90
	[0.0153]	[0.0286]	(0.1686)
Wholesale and retail trade	-0.0162	0.0012	0.4
	[0.0149]	[0.0249	(0.5253)
Transportation and Storage	0.0168	0.0048	0.08
	[0.0155]	[0.0257]	(0.7735)
Accommodation and food service	0.0035	0.0238	1.01
	[0.0155]	[0.025]	(0.3143)
Information and communication	-0.0323**	0.0031	2.08
	[0.0162]	[0.026]	(0.1497)
Financial and insurance activities	0.0068	0.0187	0.42
	[0.0159]	[0.0251]	(0.5157)
Real estate	-0.0304*	-0.0074	0.69
	[0.017]	[0.0255]	(0.406)
Administarative and support activities	-0.0313*	-0.0142	0.17
	[0.0173]	[0.0257]	(0.6815)
Public administration and defense	-0.0103	0.0069	0.47
	[0.0152]	[0.025]	(0.4952)
Education	-0.1105***	-0.0579**	1.22
	[0.016]	[0.0253]	(0.2702)
Human Health and social work activities	-0.0346**	-0.0065	0.50
	[0.0159]	[0.0249]	(0.4777)
Arts, Entertainment and Recreation	-0.0249	0.0148	3.21*
	[0.0187]	[0.0263]	(0.0731)
Other service activities	0.0100	-0.0186	0.67
	[0.0177]	[0.0267]	(0.4139)
Activities of households	-0.1315***	-0.1171***	0.16
	[0.046]	[0.032]	(0.6888)
Observations	75,139	58,318	
Mean	0.144	0.0834	

This table includes sector fixed effects which are omitted in table 2. Robust standard Errors in brackets, P-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

The reference sector is agriculture, forestry and fishing. Across the two genders, I do not observe significant difference in the allocation of men and women across sectors. Few are the sectors that significantly affect the likelihood of being supervisor. Men working in the sector "information and communication" in the sector "real estate professional, scientific and technical activities", in the sector "administrative and support activities" and in the sector "health and social work activities" are about 3% points less likely to hold a supervisory job. The sector that is more negatively related to the supervisor job is the sector "activities of households as employers" both for men (13.15 points) and women (11.71%

points). In addition, for those working in the education sector it is 11.1% points and 5.8% points less likely to become a supervisor for men and women respectively.

***Table 5**. Occupation Fixed Effects on probability of beeing supervisor for men and women*

	Pooled Probit Marginal Effects		
	Supervisor-Men (1)	Supervisor-Women (2)	Statistical significance (3)
Managers	**0.1018*** **	**0.1085*** **	**3.13***
	[0.0103]	**[0.0146]**	**(0.0768)**
Proffessionals	-0.1192***	-0.0751***	0.45
	[0.0072]	[0.0119]	(0.5045)
Technicians	-0.1600***	-0.1243***	0.09
	[0.007]	[0.0118]	(0.7672)
Clerical Support Workers	-0.2063***	-0.1411***	0.38
	[0.0068]	[0.0116]	(0.5361)
Servise and Sales	-0.2073***	-0.1506***	0.01
	[0.0067]	[0.0123]	(0.9181)
Skilled agriculture, Foresty and fish	-0.2706***	-0.1937***	0.04
	[0.0199]	[0.0386]	(0.8422)
Craft Workers	-0.2391***	-0.1558***	0.51
	[0.0075]	[0.0169]	(0.4757)
Plant and Machine Opperators	-0.3183***	-0.1901***	2.34
	[0.0082]	[0.0169]	(0.1264)
Elementary Occupations	-0.3225***	-0.2192***	1.47
	[0.01]	[0.0141]	(0.2252)
Observations	0.1018***	0.1085***	3.13*
	[0.0103]	[0.0146]	(0.0768)
Mean	-0.1192***	-0.0751***	0.45
	[0.0072]	[0.0119]	(0.5045)

This table includes sector fixed effects which are omitted in table 2. Robust standard Errors in brackets, P-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

In table 5, I present the differences in allocation of supervisors among different occupations, compared to arm forced occupations. Again, I do not observe significant differences across genders. The only difference is observed in managerial occupations where females have higher probability in accessing supervisory jobs. The significantly negative coefficients of all occupations except manager occupation confirms that the occupation with the highest rate of supervisors is the manager occupation and then the reference occupation "army forced workers" follows. It should also be noted that the occupations with largest coefficient by absolute value, "Plant and machine Operators" and "elementary occupations" are those who contain the lower percentage of supervisors.

In the next section I start by estimating a single equation with OLS using the pooled data and including a supervisory position dummy (table 6).

Table 6. *Ols real log of wage regression pooled over 2006-2016*

Variables	OLS					
	All (1)	All (2)	SUPERVISORS (3)	SUPERVISORS (4)	NON-SUPERVISORS (5)	NON-SUPERVISORS (6)
Supervisor	0.1789***	0.1437***				
	0.0036	[0.0035]				
Public Sector	0.1471***	0.1111***	0.0609***	0.0114	0.1614	0.1273***
	0.0038	[0.0037]	0.0114	[0.0105]	0.004	[0.0040]
Female	-0.1023***	-0.0945***	-0.0964***	-0.0781***	-0.1018	-0.0950***
	0.0022	[0.0021]	0.0072	[0.0070]	0.0023	[0.0022]
Education		0.0179***		0.0256***		0.0168***
		[0.0004]		[0.0012]		[0.0004
Experience		0.0166***		0.0210***		0.0161***
		[0.0004]		[0.0013]		[0.0004]
Experience Squared		-0.0002***		-0.0003***		-0.0002***
		[0.0000]		[0.0000]		[0.0000]
Married	0.1179***	0.0451***	0.127***	0.0428***	0.1164***	0.0454***
	0,0025	[0.0027]	0.0081	[0.0083]	0.0025	[0.0028]
Child(ren)	0.0172***	0.0224***	0.0006	0.0197***	0.0167***	0.0225***
	0.0023	[0.0025]	0.0069	[0.0073]	0.0024	[0.0026]
Non-Greek	0.0959***	-0.0842***	-0.0669***	-0.0650**	-0.0965***	-0.0846***
	0.004	[0.0040]	0.0279	[0.0266]	0.004	[0.0040]
Part-Time	-0.5011***	-0.4884***	-0.4538***	-0.4301***	-0.5015982	-0.4888***
	0.0074	[0.0073]	0.0541	[0.0537]	0.0075379	[0.0074]
Temporary	-0.1631***	-0.1341***	-0.1196***	-0.0760***	-0.1669107	-0.1392***
	0.004	[0.0039]	0.0201	[0.0192]	0.0040496	[0.0040]
Small Firm	-0.081***	-0.0720***	-0.0872***	-0.0751***	-0.0774444	-0.0688***
	0.0002	[0.0022]	0.0078	[0.0075]	0.002339	[0.0023]
Weekly Hours	0.0076	0.0076***	0.0068***	0.0066***	0.0075142	0.0075***
	0.0002	[0.0002]	0.0006	[0.0005]	0.0002147	[0.0002]
Constant	6.4195	6.1048***	6.5551	6.0852***	6.463111	6.1594***
	0.0145	[0.0153]	0.0486	[0.0504]	0.0157809	[0.0166]
Observations	133,457	133,457	14,547	14,547	118,910	118,910
R-squared	0.5747	0.599	0.385	0.447	0.5537	0.578
Mean	1008	1008	1421	1421	952,6	952.6

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets
*p<0.1, **p<0.05, ** p<0.01

I estimate this with (column 2) and without (column 1) human capital controls. In the first case, the coefficient on the supervisory position dummy suggests a net supervisory premium of 14.39 %. I observe that without controlling for human capital variables (years of education and experience) the coefficient increases to 17.89 suggesting that supervisors have even higher wages as a return to human capital characteristics. Control variables carry the expected signs and factors such as education and labor market experience appear to increase wages significantly. Table 6 shows also the OLS wage regressions separately for supervisors and non-supervisors. As expected, education and experience lead to substantial wage premium for supervisors and non-supervisors. An extra year of schooling leads to a 2,5%

increase in supervisor wages and 1,7% increase in non-supervisors while one year of experience leads to a 1,7% and 1,61% increase to supervisor and non-supervisor wages correspondingly. (Column 4, 6)

Controlling for personal, human capital and job characteristics, women who hold supervisory positions earn 7.8% lower wages than men supervisors (column 4) while women non-supervisors earn 9.5% less than non-supervisors. I see that there is higher gender wage inequality in the non-supervisor sample. However, in column 3 of table 6 I see that without using human capital controls, women supervisors earn 9.6% less than men supervisors. Since male supervisors earn significantly higher wages than female supervisors one logical explanation may be that women supervisors earn differential returns on human capital skills than men.

Table 7 and 8 present the Mincerian Wage regression results by supervisor status and gender. [7]Observing the wage regressions separately for men and women who hold supervisory jobs (table 7 column 1 and 2) and statistical significance in coefficients' differences (column 3) the results show that professional women earn higher returns when they work in the public sector compared to men. An extra year of experience increases both men's and women's wages without significant differences. Results show that women do not face discrimination in their earnings attainment related to human capital skills. Women supervisors earn significantly higher returns on education compared with men. Marital status has double the positive effect for men supervisors than for women. Being Non-Greek is associated with a significant lower wage for men. Focusing on demand side variables, it seems apparent that both male and female supervisors receive higher wages at larger workplaces. As discussed in section 2, larger firms offer relatively more opportunities for training and promotions than small firms and there are more workers to supervise. In addition, the differential returns to firm size may also reflect differential job contents and skill requirements associated with supervisory jobs. An extra working hour positive effect is almost double for men compared to women.

[7] I have estimated the models using robust standard errors. When I estimate the same models by using clustered standard errors by region, there are little differences in the statistical significance of the explanatory variables. In table A4 in Appendix I have estimated the same models presented in table 7 and 8 using cluster by region standard errors.

Table 7. *Pooled Ols log of supervisor wage regression over 2006-2016 by gender*

	Pooled ols		
	Supervisor-Men (1)	Supervisor-Women (2)	Statistical significance (3)
Public Sector	-0.0003	0.0468***	23.54***
	[0.0129]	[0.0178]	(0.0000)
Education	0.0246***	0.0269***	3.39*
	[0.0014]	[0.0021]	(0.0658)
Experience	0.0213***	0.0200***	0.87
	[0.0016]	[0.0024]	(0.3512)
Experience Squared	-0.0003***	-0.0002***	0.55
	[0.0000]	[0.0001]	(0.4584)
Married	0.0560***	0.0235*	4.00**
	[0.0109]	[0.0129]	(0.0456)
Child(ren)	0.0125	0.0250*	0.23
	[0.0087]	[0.0137]	(0.6307)
Non-Greek	-0.0930***	-0.0034	33.19***
	[0.0332]	[0.0432]	(0.0000)
Part-Time	-0.4456***	-0.4359***	0.02
	[0.0602]	[0.0870]	(0.8809)
Temporary	-0.0606**	-0.1223***	2.24
	[0.0255]	[0.0255]	(0.1345)
Small Firm	-0.0681***	-0.0812***	0.68
	[0.0086]	[0.0135]	(0.4107)
Weekly Hours	0.0071***	0.0038***	8.27***
	[0.0006]	[0.0011]	(0.0040)
Constant	6.0614***	6.2800***	2.53
	[0.0571]	[0.1122]	(0.1118)
Observations	10,139	4,408	
R-Squared	0.437	0.455	
Mean	1470	1313	

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets, p-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

I then focus on gender wage differences of non-supervisor sample. I observe that in non-supervisor sample both women and men get a higher premium when they work on public sector which is higher for women. Thus, the public sector is less discriminatory against women. An extra year of experience is rewarded more for women non-supervisors. Firm size effect is the same for both males and females as working in a small firm is associated with 6.9% lower wages. The penalty for working in small firms is the same for men and women non-supervisors and an extra hour of work gives almost the same percentage reward.

As in table 7, married men are rewarded higher than married women. This could suggest that Greek employers consider men to have the role of "bread-earner" in the family. (cultural effect)

***Table 8**. Pooled Ols log of non-supervisor wage regression over 2006-2016 by gender*

	Pooled ols		
	Non-Supervisor-Men (1)	Non-Supervisor-Women (2)	Statistical significance (3)
Public Sector	0.1094***	0.1441***	21.89***
	[0.0054]	[0.0058]	(0.000)
Education	0.0162***	0.0175***	1.82
	[0.0005]	[0.0007]	(0.1775)
Experience	0.0154***	0.0180***	17.39***
	[0.0005]	[0.0006]	(0.000)
Experience Squared	-0.0002***	-0.0002***	31.75***
	[0.0000]	[0.0000]	(0.000)
Married	0.0643***	0.0282***	101.48***
	[0.0039]	[0.0039]	(0.0000)
Child(ren)	0.0276***	0.0084**	45.87***
	[0.0035]	[0.0038]	(0.0000)
Non-Greek	-0.1024***	-0.0610***	9.96
	[0.0048]	[0.0072]	(0.0016)
Part-Time	-0.4737***	-0.4873***	0.97
	[0.0115]	[0.0103]	(0.3247)
Temporary	-0.1346***	-0.1422***	0.23
	[0.0054]	[0.0058]	(0.6302)
Small Firm	-0.0691***	-0.0693***	0.00
	[0.0031]	[0.0034]	(0.9485)
Weekly Hours	0.0073***	0.0076***	0.43
	[0.0003]	[0.0003]	(0.5142)
Constant	6.1710***	6.0805***	5.79
	[0.0200]	[0.0376]	(0.0161)
Observations	65,000	53,910	
R-Squared	0.534	0.599	
Mean	1010	884.2	

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets, p-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

Differences in supervisor and non-supervisor wages structures deriving from OLS estimates may be subject to endogenous selection; that is, the non-random way in which individuals self-select into positions of employment. To account for selection, I apply an endogenous switching regression estimation and I use an instrument of the 'choice' of a supervisory position, which identifies whether a worker has parents employed or retired as a supervisor.

The exogenous variable 'supervisor history' accounts for selection. I assume that supervisor history affects position selection but not position specific wages. [8] The 'supervisor history' variable is highly significant statistically and in magnitude for both males and females and of higher magnitude for males. Men and women who have parents in a supervisory position have 38.9 and 31.4 per cent higher probability to hold a supervisory position, correspondingly. Having supervisor parents may signal family preference to supervisory positions or easier access through informal networks.

Other variables in the selection equation generally have the expected signs. It is expected that advantageous characteristics such as education and experience are assets for an individual, man or woman in order to be employed in high senior positions. Marital and family conditions seem to give an advantage in the selection of men to supervisory positions which again reflects that increased family responsibilities lead to higher effort for a promotion to a more high-level job which is associated with higher returns or a bias of employers towards "bread-winners" males. Inversely, the opposite effect for women may reflect that women, as secondary bread-earners, and because of the time they devote to children they are not favored. From the demand side, for both genders, working in temporary or part-time jobs significantly reduces the probability to be selected in supervisory positions, as such contracts are both with less hours of work and with less specialization. When controlling for selection, small firm size significantly reduces access to supervisory jobs especially for men.

Evidence of endogenous selection is strong both for men and women. The Wald test for the independence of the selection and wages estimations tests the null hypothesis of no endogeneity. In both cases Wald test returns a high significant statistic at 1 per cent. (for men x^2=214.79 and p-value=0.000 and for women x^2=320.77, p-value=0.000). The strong rejection of null hypothesis suggests that the endogenous regression switching model is more appropriate to draw conclusions than the OLS estimation model.

[8] In support of this assumption, table A3 in the Appendix, reports OLS regression estimates of the Mincer wage equations by gender and supervisor status where the instrument is added among the regressors. In all cases, the results show that, controlling for everything else, the instrument does not significantly predict wages.

Table 9. *Ols and FIML results for Supervisor and non-supervisor men pay structures*

	Pooled for Men					
	Naïve Model			Switching model		
Variables	Sup (1)	Non-Sup (2)	P(sup) (3)	Sup (1)	Non-Sup (2)	Selection (3)
Public Sector	-0.0003	0.1094***	-0.1269***	0.0153	0.1147***	-0.0187
	[0.0129]	[0.0054]	[0.0294]	[0.0111]	[0.0048]	[0.0259]
Education	0.0246***	0.0162***	0.0817***	0.0163*	0.0197***	0.0710***
	[0.0014]	[0.0005]	[0.0029]	[0.0098]	[0.0005]	[0.0030]
Experience	0.0213***	0.0154***	0.0443***	0.0162***	0.0175***	0.0433***
	[0.0016]	[0.0005]	[0.003]	[0.0060]	[0.0005]	[0.0028]
Experience Squared	-0.0003***	-0.0002***	-0.0005***	-0.0002***	-0.0002***	-0.0005***
	[0.0000]	[0.0000]	[0.0001]	[0.0001]	[0.0000]	[0.0001]
Married	0.0560***	0.0643***	0.1321***	0.0279	0.0716***	0.1528***
	[0.0109]	[0.0039]	[0.0235]	[0.0234]	[0.0036]	[0.0199]
Child(ren)	0.0125	0.0276***	-0.0041	0.0169**	0.0236***	0.0017
	[0.0087]	[0.0035]	[0.0201]	[0.0074]	[0.0032]	[0.0171]
Non-Greek	-0.0930***	-0.1024***	-0.4060***	-0.0485	-0.1113***	-0.3828***
	[0.0332]	[0.0048]	[0.0425]	[0.0652]	[0.0043]	[0.0363]
Part-Time	-0.4456***	-0.4737***	0.1588**	-0.3513***	-0.4576***	-0.3293***
	[0.0602]	[0.0115]	[0.0655]	[0.0937]	[0.0107]	[0.0815]
Temporary	-0.0606**	-0.1346***	-0.2757***	-0.0177	-0.1406***	-0.3289***
	[0.0255]	[0.0054]	[0.034]	[0.0574]	[0.0048]	[0.0354]
Small Firm	-0.0681***	-0.0691***	-0.2923***	-0.0365	-0.0766***	-0.2104***
	[0.0086]	[0.0031]	[0.0187]	[0.0329]	[0.0028]	[0.0163]
Weekly Hours	0.0071***	0.0073***	0.0235***	0.0045	0.0081***	0.0219***
	[0.0006]	[0.0003]	[0.0012]	[0.0029]	[0.0003]	[0.0011]
Sup History						0.3887***
						[0.1304]
R				-0.559	0.6723***	
				[0.5031]	[0.0307]	
Lamda				-0.1722	0.1986	
Constant	6.0614***	6.1710***	-2.6590***	6.1615***	6.2083***	-2.4437***
	[0.0571]	[0.0200]	[0.1149]	[0.2990]	[0.0182]	[0.1091]
Observations	10,139	65,000	75,139		75.139	
R-Squared	0.437	0.534				
Mean Wages	1470	1010				

Notes: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0 .1. Controls: sector dummies, occupation dummies, region dummies. The Wald test statistics [and corresponding p-values] for the independence of the selection equations are 169.48 [0.000]. Rho (ρ) is the correlation coefficient between the error terms in the selection equation and the relevant wage equation. Multiplying this with the standard deviation of the errors of the wage equation (σ_u) returns the coefficient on the inverse Mills ratio (λ), which shows whether selectivity impacts directly on individuals' wages. Since $\sigma_u>0$, the sign of the coefficient on λ is determined solely by ρ.

The coefficients rho in table 9 and 10 for men and women, respectively, indicate that the selection has a direct effect on non-supervisory position wages which is higher for women than men. The positive sign suggests that unobservable characteristics responsible for preference for supervisor jobs are associated with higher earnings in non-supervisor jobs.

Inversely, individuals with a preference for supervisory positions who manage to hold a supervisory job do not enjoy higher wage.

Despite the findings of significant selection effects, the selection corrected wage equations yield estimates which are broadly similar with the OLS results with only a few differences. The OLS and maximum likelihood results of the two wage equations are presented in table 9 for men and table 10 for women.

Concentrating on maximum likelihood results for males, I observe that only non-supervisors get a significantly high premium when they work in the public sector. Returns to education and experience are significantly different from zero and higher for non-supervisors. Married men with children get a premium in both positions, though this is significantly higher for non-supervisors. From the demand side, characteristics like part time, or temporary contract, or work in a small firm entail penalties especially for those working as non-supervisors. I observe that the firm size effect is more than double for non-supervisors in contrast with literature findings that the firm size effect is substantially larger for supervisors (Meager and Wilson 2004, Green, Colin, Theodoropoulos 2017)**.** Perhaps this indicates that small firms in Greece offer higher wages to supervisors in order to attract them as a return to their specialized organization and monitoring skills in order to increase productivity and competitiveness of the firm.

In the case of women, working in the public sector gives a significant 14.6 per cent wage premium for non-supervisors. In contrast to males, the maximum likelihood estimates show that women with children do not earn significantly higher wages than those without children counterparts. Only married women get a significant wage increase. Returns to education and experience are positive and significant. An extra year of education increases 14% more non-supervisor wage while an extra year of education increases 14.3 % more supervisor wage. Thus, experience premium is higher for non-supervisors while education premium is higher for supervisors. Being non-Greek does not entail a penalty for women supervisors, but it does for non-supervisors

A comparison of the OLS and FIML results reveals that, for both males and females, there are several differences in the supervisory position estimates. For both males and females,

allowing for correlation between the error terms in the wage and selection equation, leads to a small downward revision of education and experience coefficients in the supervisory positions and a small upward respectively in the non-supervisory positions. In the absence of the correlation, returns for supervisors would be slightly overestimated. Focusing on the firm size effect, when I allow for correlation firm size effect is larger for non-supervisors than supervisors for both males and females. While in the OLS results working in a small firm was associated with lower returns for supervisor women, in FIML results the opposite happens.

Table 10. *Ols and FIML results for Supervisor and non-supervisor women pay structures*

	Pooled for women					
	Naïve Model			Switching model		
Variables	Sup (1)	Non-Sup (2)	P(sup) (3)	Sup (1)	Non-Sup (2)	Selection (3)
Public Sector	0.0468***	0.1441***	-0.0168	0.0564***	0.1458***	0.0881***
	[0.0178]	[0.0058]	[0.0346]	[0.0155]	[0.0053]	[0.0304]
Education	0.0269***	0.0175***	0.0706***	0.0232***	0.0203***	0.0483***
	[0.0021]	[0.0007]	[0.0038]	[0.0017]	[0.0006]	[0.0035]
Experience	0.0200***	0.0180***	0.0469***	0.0172***	0.0196***	0.0368***
	[0.0024]	[0.0006]	[0.0038]	[0.0020]	[0.0005]	[0.0032]
Experience Squared	-0.0002***	-0.0002***	-0.0005***	-0.0002***	-0.0003***	-0.0005***
	[0.0001]	[0.0000]	[0.0001]	[0.0000]	[0.0000]	[0.0001]
Married	0.0235*	0.0282***	-0.0180	0.0228**	0.0270***	0.0139
	[0.0129]	[0.0039]	[0.0257]	[0.0107]	[0.0035]	[0.0205]
Child(ren)	0.0250*	0.0084**	-0.0586**	0.0158	0.0034	-0.0609***
	[0.0137]	[0.0038]	[0.0252]	[0.0104]	[0.0035]	[0.0201]
Non-Greek	-0.0034	-0.0610***	-0.2668***	0.0130	-0.0666***	-0.2831***
	[0.0432]	[0.0072]	[0.0671]	[0.0385]	[0.0066]	[0.0570]
Part-Time	-0.4359***	-0.4873***	0.2882***	-0.3671***	-0.4847***	-0.6500***
	[0.0870]	[0.0103]	[0.0645]	[0.0610]	[0.0092]	[0.0802]
Temporary	-0.1223***	-0.1422***	-0.2627***	-0.1116***	-0.1483***	-0.3648***
	[0.0255]	[0.0058]	[0.0433]	[0.0248]	[0.0052]	[0.0408]
Small Firm	-0.0812***	-0.0693***	-0.1658***	-0.0692***	-0.0740***	-0.1302***
	[0.0135]	[0.0034]	[0.0241]	[0.0103]	[0.0031]	[0.0190]
Weekly Hours	0.0038***	0.0076***	0.0311***	0.0022**	0.0078***	0.0198***
	[0.0011]	[0.0003]	[0.0020]	[0.0009]	[0.0003]	[0.0017]
Sup History						0.3141***
						[0.0823]
Rho				-0.2478	0.7875***	
				[1.6804]	[0.024]	
Lamda				-00704	0.2546	
Constant	6.2800***	6.0805***	-3.1790***	6.8396***	6.1433***	
	[0.1122]	[0.0376]	[0.2479]	[1.8585]	[0.0329]	
Observations	4,408	53,910	58.318		58.318	
R-Squared	0.455	0.599				
Mean Wages	1313	884.2				

Notes: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0 .1. Controls: sector dummies, occupation dummies, region dummies. The Wald test statistics [and corresponding p-values] for the independence of the selection equations are 290.17 [0.000]. Rho (ρ) is the correlation coefficient between the error terms in the selection equation and the relevant wage equation. Multiplying this with the standard deviation of the errors of the wage equation (σ_u) returns the coefficient on the inverse Mills ratio (λ), which shows whether selectivity impacts directly on individuals' wages. Since σ_u>0, the sign of the coefficient on λ is determined solely by p

5.2 The effect of the great recession

5.2.1 Temporal evolution of the probability of holding a supervisory job

In the second part of my analysis, I want to examine the crisis effects on the probability of being a supervisors and wages separately for men and women. As the period of my analysis is 2006-2016, I want to observe the differences before and during the crisis. For this purpose, I use 2006 as a benchmark. Using year dummies in the pooled cross-section models mentioned above, I show the graphs of year coefficients.

In the following graphs (4 and 5) I present the coefficients of the year dummies both from the "naïve" and from the endogenous switching model. It is obvious that the crisis is correlated with negative impacts on the probability of a worker being a supervisor but not all years. The crisis began in 2009, but the impact became apparent in the second half of the period. Most year dummies before 2014 have statistically insignificant coefficients, which means that the probability of being a supervisor did not significantly change in these years compared to 2006. However, the coefficients of years after 2013 are statistically significant. Especially 2015 is the year when the greatest negative impact is observed, and its coefficient is statistically significant at 1 per cent. Compared to naïve coefficients, when I correct for selection, I observe that the effects are even larger, and the coefficients are statistically significant at 1 per cent for all years after 2013. These graphs present the effect of crisis on the probability of being a supervisor for men and women correspondingly. Year dummies show some unobservable factor that is specific to each year and has a negative effect. I interpret this as "the crisis effect" (but it could be anything for which I do not control). Results show that the negative impacts of crisis in finding a supervisory position for men are obvious between 2013-2016.

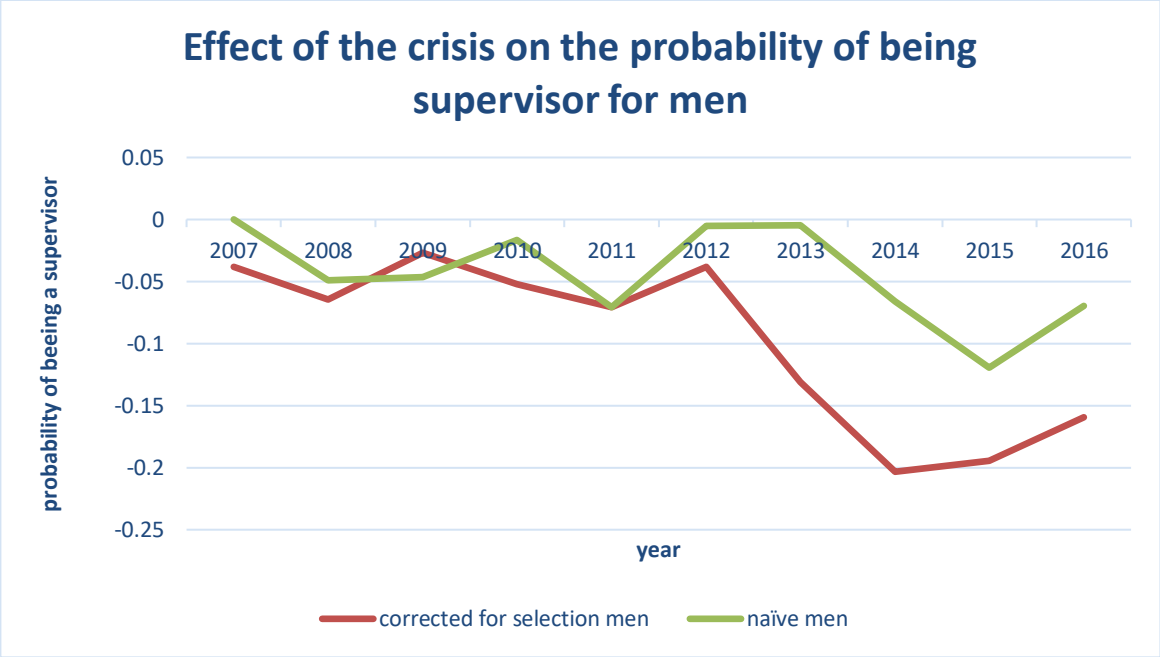

Figure 4 How crisis affected men to find a supervisory position between 2007-2016

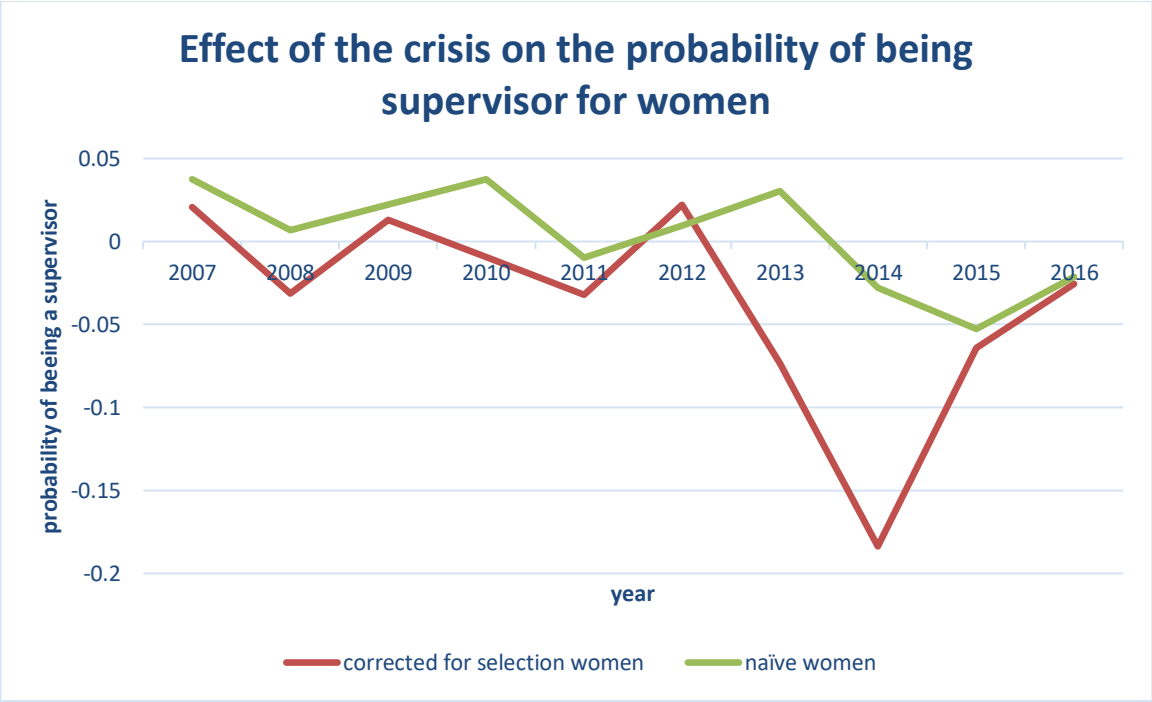

Figure 5 How crisis affected women to find a supervisory position between 2007-2016

Comparing the following two graphs of men and women I can see that some differences occur. From the probit model, naive coefficients suggest that women between 2007-2013

are slightly more likely to have access to supervisory positions compared to 2006 which may reflect that discrimination against women in accessing high-senior positions drops in the beginning of the crisis but this reverses as the crisis deepens.

However, differences are negligible as all coefficients statistically insignificant even at 10 per cent. When I correct for selection, I observe that there are statistically significant differences for all years except 2007,2009 and 2012 which can also be observed in the graph as the coefficient values are very close to zero. The graph shows obviously a steep negative slope from 2012 to 2014. Thus, 2013-2015 is a time period where it is more difficult to find a supervisory position both for men and women. The sharp decrease in the likelihood of being a supervisor in 2014 can be explained by the fact that during crisis many firms chose to dismiss supervisors instead of non-supervisors as their remuneration is significantly higher than non-supervisors. Employers may delegate supervisor responsibilities to non-supervisors or even they take over the supervision and monitoring themselves instead of paying professional staff. This decrease in probability of holding a supervisory also indicates competitive pressures associated with Greek crisis, that forced firms to eliminate intermediate hierarchical levels in order to increase efficiency and productivity (indication of delayering).

5.2.2 Raw and Net premium for supervisors over time

As a follow up to the analysis I want to show how wages were affected throughout the sample period and make a comparison of the regression results and the wage differential observed in raw data. I have estimated a single model equation of wage with OLS for every year between 2006-2016 including a supervisory dummy separately for males and females (results are in table A2 in the Appendix). The figure 6 shows how the coefficient of the supervisory position dummy for men and women evolved over time. The raw premium is constructed by the raw data and is expressed as the percentage of real non-supervisor' wage that the supervisor receives as an additional reward. Raw premium fluctuates between 33.4-46% and between 34.6-48.6% while net premium between 10.9-17.5% and between 9.6-20.1% for men and women respectively. That is, the estimated net supervisor position is about 30-38 per cent of the corresponding supervisor and non-supervisor wage differential observed in raw data. This indicates that over one third of the difference in mean wages

between the two work positions is due to differences in the returns to characteristics of the two positions. As I observe raw and net premium have a similar movement through time. There is an increase in raw and net premium until 2008 and then a sharp fall in 2009. After 2009 I observe a significant increase which suggests as that maybe after crisis supervisor's counseling role became even more important. Maybe the reduction in the number of supervisors leaded to a larger span of control and increase in job responsibility can be associated with a higher premium for supervisors as a motivation (Bauer and Bender 2001). I do not observe significant differences in raw and net premium between males and females.

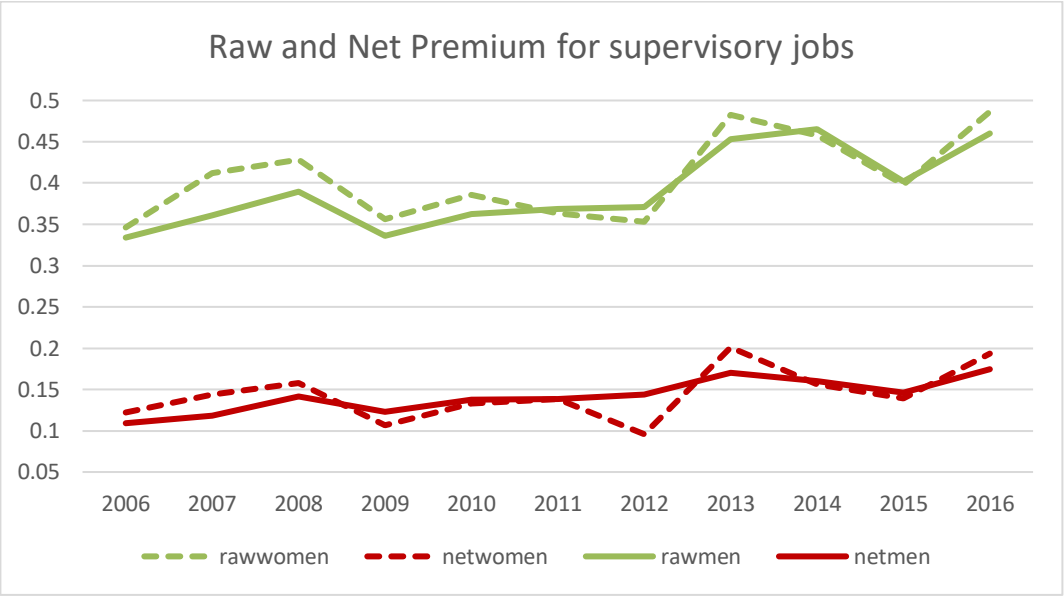

Figure 6: Raw and Net gap between Supervisors and Non-Supervisors

5.2.3 Effect of crisis on Supervisors and Non-Supervisors

Previously, I presented how the wage gap between Supervisors and Non-Supervisors has evolved over time and how it was affected by the crisis. Now I want to examine separately how wages were affected for the two samples by gender in order to have a clearer picture of the impact of crisis and to observe who was affected more. As the period of my analysis is between 2006-2016, I want to observe the differences in wages before and during the crisis using 2006 as a benchmark. Using year dummies in the pooled cross-section wage models (omitted from the tables), I present the charts of year coefficients and make all comparisons. Figure 7 and 8 illustrate coefficients of year dummies, that is the years 2006-2016 both from OLS wage and from endogenous corrected model.

Figure 7 presents year dummy coefficients of supervisor and non-supervisor wages by gender. I observe that before 2011 there is no statistically significant difference between men and women supervisor wages. However, in the case of non-supervisors, in 2009 there is a significant increase in wages and then a steady decline in male and female wages from 2010 to 2014. Specifically, in 2014 supervisor and non-supervisor wages supported the largest decline. It is obvious that there is larger decline of non-supervisor than supervisor wages for all years especially after 2012 compared to their levels in 2006. In 2012 wages of males' non-supervisors are 19 per cent lower while wages of males' supervisors are 17 per cent lower (than the omitted 2006 dummy). However, in 2014 there is statistically significant difference in year dummy coefficients of supervisor and non-supervisor men. Supervisor wages are 24,6 per cent lower while non supervisor wages are 33 per cent lower (compared to the reference year).

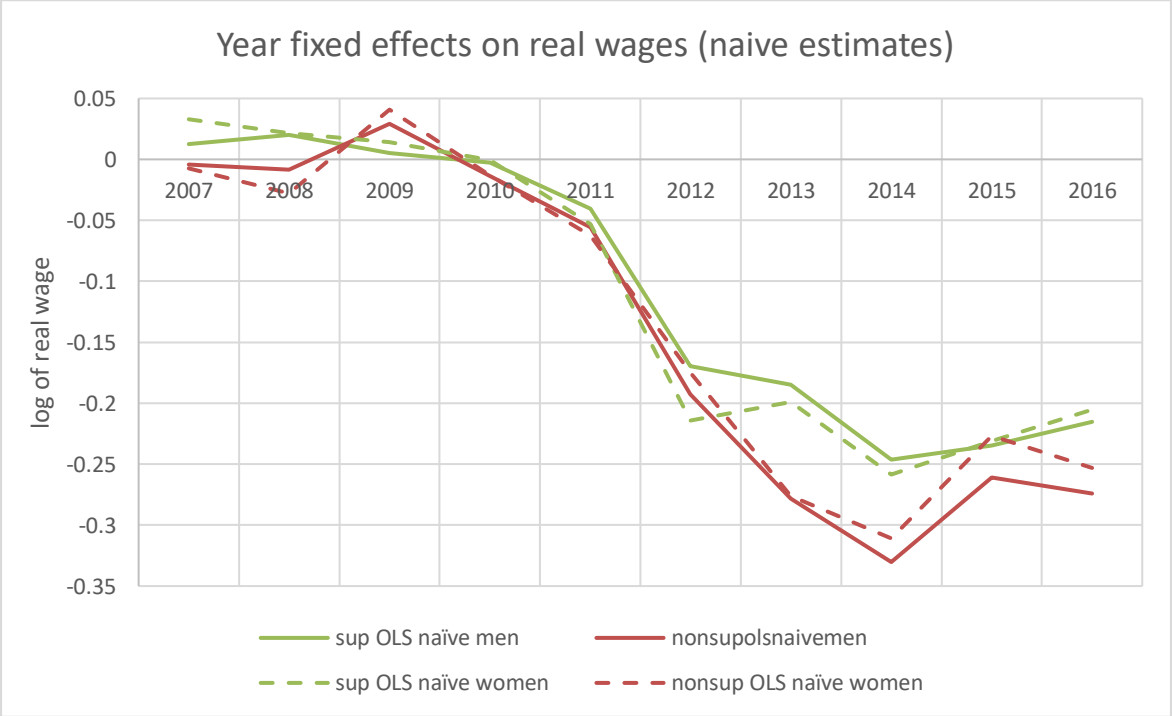

Figure 7: Effect of crisis for supervisor and non-supervisor wages of men and women by OLS model

As with OLS results, corrected for selection coefficients for men and women supervisors are statistically significant after 2011. Thus, supervisors' salaries begun to decline two years after crisis, and the decline is even greater until 2014. After 2014 supervisor wages remain at much lower levels than in 2006 but are slightly higher than in 2014. Wage cuts for non-

supervisors have begun a year earlier in relation to supervisors. It is obvious that male non-supervisor reductions are much more intense than those of supervisors. Especially, in 2014 male supervisor wages underwent a 24,7 per cent decline, where at the same time the decline for non-supervisors was 33,2 per cent. In the case of women, again reductions for non-supervisors were higher with an exception at 2012 where supervisor wage is 22.6 percent lower and non-supervisor wage is 17,3 per cent lower than in 2006.

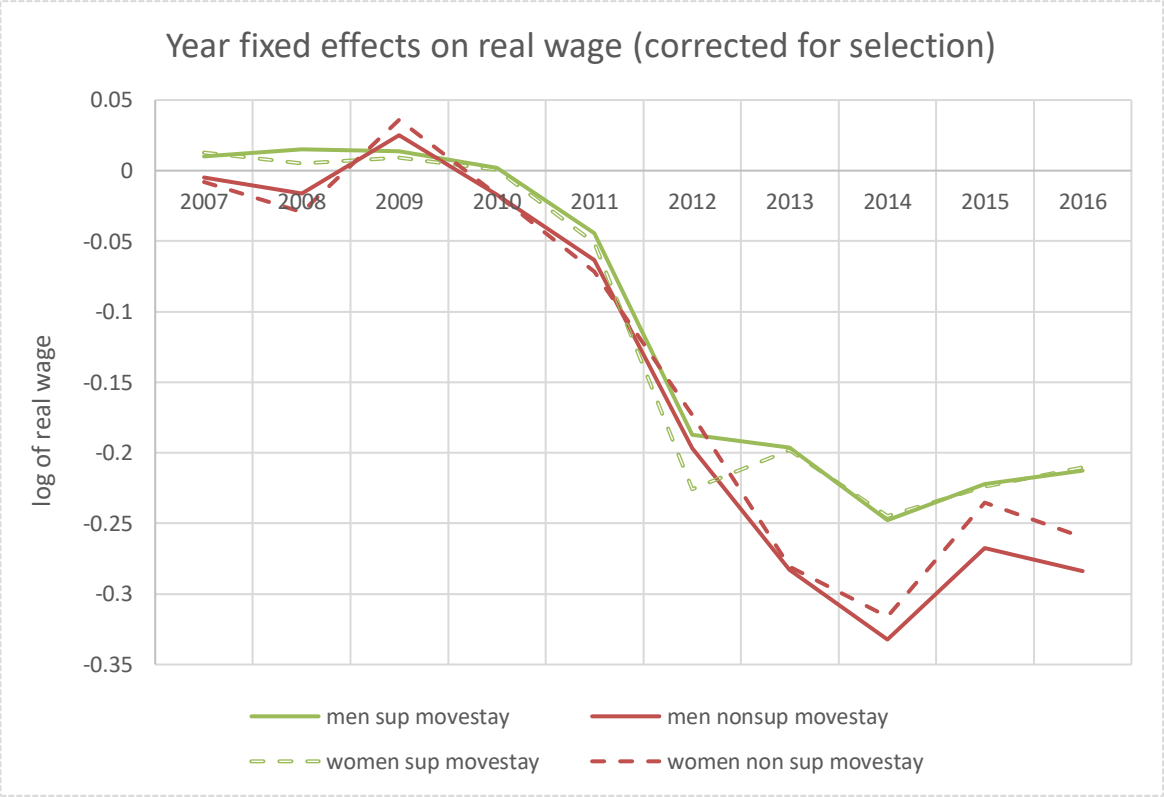

Figure 8: Effect of crisis for supervisor and non-supervisor wages of men and women by endogenous model

In total, I observe that even when I control for worker characteristics supervisor wages are also subject to less reductions than non-supervisors. Thus, while it is less likely to hold a supervisory job during crisis period compared to before, at the same time those that remain supervisors are more protected as their wages are less reduced than non-supervisors with the same qualifications, as a return to supervisor position. Also, men and women differences in the crisis effect is small.

6. Conclusion

In this research, I analyzed supervisors' characteristics and wage determinants and the effect of the great recession in supervisory status and premium. My empirical analysis is based on micro-data constructed with LFS data using the method of pooled cross-sectional analysis by a "naïve" and a switching model. I find that there is a significant wage premium associated with supervisory jobs which increased during the crisis period and a pressure for delayering associated with the crisis.

Switching Model' results for men show that there is a significant selection effect. Men with parents in supervisory positions have 38.9% higher possibility to hold a supervisory position. Years of education and experience, extra hours of work and marital status are advantageous in the selection of men to supervisory positions while working in part-time jobs, in temporary jobs, in small firms and being non-Greek are penalties for the selection in supervisory positions.

There is also a significant selection effect for females as women with parents in supervisory jobs are 31,4% more likely to hold supervisory jobs. Human capital characteristics, employment in the public sector, hours of work significantly increase selection to supervisory positions but unlike men the existence of a child significantly decrease the probability to hold a supervisory job. In addition, part-time and temporary-time contracts, employment in small firms and being foreign encounter significant barrier in accessing supervisory jobs.

Characteristics like education, experience, marital status, existence of a child and working in the public sector are associated with a higher wage premium while working part-time or temporary time, employment at small firms and being Non-Greek entail wage penalties both for supervisors and non-supervisors. These returns to job and worker characteristics are higher in absolute value for non-supervisors with an exception of the education return which is higher for females' supervisors. This suggests that wages of supervisors respond to soft characteristics which I do not control for. The selection has a direct effect on non-supervisory position wages which is higher for women than men. Unobservable characteristics responsible for preference for supervisor jobs are associated with higher earnings in non-

supervisor jobs while individuals with a preference for supervisory positions who manage to hold a supervisory job do not enjoy higher wage.

Results also show that there is a significant crisis effect which is different for supervisors and non-supervisors. In the second half of crisis period, there is an indication of delayering and efficiency improvement in Greek organizations as the probability of holding a supervisory job declined while the net premium given to supervisors increased probably as a return to the higher span of control and job responsibility to supervisory jobs that delayering caused. The significant wage cuts affected both supervisor and non-supervisor wages but in a larger scale non-supervisory wages due to the minimum-wage reduction. Thus, while crisis effect is negative for supervisor status, those that remain supervisors are more protected compared to non-supervisors as they receive a significant higher wage with lower reductions than a non-supervisor with the same qualifications, as a return to supervisor position. Also, there are no significant differences in the crisis effect for men and women.

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8.Literature Review Tables

Literature Table A1

Study	Authors	Research Question	data	Methodology	Variables	Main Results
"Experience, Performance, And Earnings	James L. Medoff-Katharine G. Abraham	Which is the relation between experience and performance among managerial and professional employers.	2 US manufactu-ring company's data for employees	Grouped linear Regression model Maximum likelihood Multinomial logit model Dummies: Grade level	Dependent: Earnings Independent: human capital Variables	▪pre-company experience ↑ income
"The Recognition and Reward of Employee Performance"	John Bishop	Which is the reward of an employer' productivity and how can it be recognized and measured.	US Bureau of Labor Statistics 1968-1970	Fixed effects linear regression model	Dependent: Starting wage, Latest wage Independent: workers' characteristics/productivity/ firm characteristics	▪Experience, education effect ↑starting/ latest wage
"The employer size-wage effect"	Charles Brown-James Medoff	Which are the explanations for firm size-wage relationship	ADS 1968-1982 PATC 1965-1982	Fixed effects city-year regression model	Dependent: log of earnings Independent: Worker characteristics/ Firm characteristics	▪positive relationship between firm size and wage ▪do not have clear answer for their research question
"Evidence on the employer size-wage premium from worker-establishment matched data"	Kenneth R. Troske	What are the possible explanations for the employer size wage premium	WECD 1990 LRD 1963,1967, 1972,1977, 1982&1889 USA	Grouped linear regression model	Dependent: log of wage Independent: employer/worker characteristics	▪More skilled managers hire more skilled workers' ▪Tradeoff between worker wage and level of supervision
"Different firm size effects on wages for supervisors and workers"	Kieron J. Meagher-Hugh Wilson	How wages vary across different firm sizes	OMA 1988 Australian male ages 18-65	maximum likelihood interval regression dummy :supervisor	Dependent: log of earnings Independent: personal characteristics/ plant size	▪Plant size effect: Double for supervisors ▪Firm size effect: Not explained by differential returns on standard variables

Literature table A2

Study	Authors	Research Question	data	Methodology	Variables	Main Results
"Firm-size Wage Gaps, Job Responsibility, and Hierarchical Matching"	Jeremy T. Fox	How firm size gap increases with job responsibility	SAF 1970-90 Sweden SIIP 1996-99 US	Grouped linear regression model	Dependent: log of wage Independent: firm size/ span of control/ job responsibility	▪Job responsibility effect ↑wage gaps ▪Span of control effect ↑managerial talent
"Performance, Career Dynamics and Span of Control"	Valerie Smeets , Michael Waldman, Frederic Warzynski	How span of control is related with career dynamics and performance	One large European manufact-uring firm 2006-2011	Grouped linear regression model Probit regression model	Dependent: log of wage, probability of promotion Independent: Human capital variables, span of control, performance	▪ higher span of control: ↑ wages ↑probability of promotion
"Too many theories, too few facts? What the data tell us about the link between span of control, compensation and career dynamics	Valerie Smeets-Frederic Warzynski	How managerial compensation is related to the span of control and career dynamics.	EU 1997-2004	Mincerian regression model Probit regression model	Dependent: Monthly Wage Independent: Human capital-job level Variables/span of control	▪Span of control effect: ↑career level ↑wage inequality
"High wage workers and high wage firms"	John M. Abowd-Francis Kramarz-David N. Margolis	How person and firm components influence compensation determination	EDP Men-women France	Grouped linear regression model	Dependent: log of annual compensation Independent: individual, firm characteristics	▪Person effects: Explain the most wage differential and firm size wage effect
"The difference that CEOs make: An Assignment Model Approach"	Marko Tervio	How CEO pay cam be explained by differences in talent and to what extend to firm size differences.	US 1994-2004	Firm size and managerial ability fixed Effects OLS estimation	Dependent: CEO payment Independent: Individual characteristics/firm characteristics	▪ability effect ▪firm size effect ↑CEO payment
"Within Firm Pay Inequality"	Holger M. Mueller-Paige P. Ouimet/Elena Simintzi	How wages vary between top- and bottom- level jobs across firms and how it is relted to firms performance	IDS 2004-2013 UK	Fama-Mackbeth Year fixed effects linear regression mode Instrument: hierarchy level	Dependent: wages Independent: Hierarchical level/ firm size	▪positive correlation for pay inequality-performance ▪non supervisor payment is invariant with size ▪size effect ↑supervisor returns

Literature Table A3

Study	Authors	Research Question	data	Methodology	Variables	Main Results
"Employer size and supervisor Earnings: Evidence from Britain"	Green, Colin, Heywood, John S., Theodoropou-los Nikolaos	How firm size influence supervisors' earnings	WERS 2013 BHPS Full time employers aged 18-65	Maximum likelihood interval regression model	Dependent: log hourly payment Independent: Personal Characteristics/ firm Size/	▪size effect larger for supervisors ▪supervisory skills are rewarded only in larger employers
"British managers: A study of their education, training, mobility and earnings"	Geoffrey Crockett-Peter Elias	What is the contribution of education, qualifications, mobility and earnings of people with managerial responsibilities	NTS Managers Men Ages 14-64 Women Ages 14-59 1975-1976 Britain	Ordinary Least Squares for Panel Dummy: sex, age	Dependent: Managers Earnings Independent: Personal Characteristics/ firm Size/ Span of Control	▪Qualification Effect ↑ echelons of management ▪hierarch effect ↑manager earnings
"Gender Differences in Supervisory Authority: Variation among Advanced Industrialized Democracies"	Rachel A. Rosenfeld	How characteristics of supervisors vary across countries	Surveys of different countries Ages 20-60 Men-women	Logistic Regression model	Dependent: probability of holding supervisory job Independent: Human capital characteristics/ firm characteristics	▪lower probability of women to hold a supervisory job
"Access to supervisory jobs and the gender wage gap among professionals"	Aparna Mitra	How men and women are allocated among supervisory jobs and which is the gender wage gap	NLSY Men-women Ages 33-41 1988	Logistic regression model, grouped linear regression model	Dependent: probability of holding supervisory job/earnings Independent: Individual's background/personal-human capital/job characteristics	▪human capital variables explain the allocation of supervisory jobs ▪firm size effect is mainly for men
"Sex and Authority in the Workplace: The Causes of Sexual Inequality"	Wendy C. Wolf, Neil D. Flingstein	Which are sex differences in holding a supervisory job and how it is related to sexual income inequality	Wisconsin Study of seniors in 1957 in Wisconsin school	Logistic regression model Multiple regression with a dummy variable	Dependent: Probability of having an authority Independent: Human capital characteristics/ firm characteristics	▪experience and having a child benefit more men ▪tenure benefits more women

9. APPENDIX

Table A1: Probit model pooled on 2006-2016

	Probit Pooled			
	All (1)	Men (2)	Women (3)	Statistical significance (4)
Public Sector	-0.0835***	-0.1269***	-0.0168	0.84
	[0.0224]	[0.0294]	[0.0346]	[0.3594]
Female	-0.2443***			
	[0.0139]			
Education	0.0788***	0.0817***	0.0706***	5.46
	[0.0023]	[0.0029]	[0.0038]	[0.0194]
Experience	0.0462***	0.0443***	0.0469***	6.60**
	[0.0024]	[0.003]	[0.0038]	[0.0102]
Experience Squared	-0.0005***	-0.0005***	-0.0005***	1.26
	[0.0001]	[0.0001]	[0.0001]	[0.2615]
Married	0.0591***	0.1321***	-0.0180	74.11***
	[0.0174]	[0.0235]	[0.0257]	[0.000]
Child(ren)	-0.0064	-0.0041	-0.0586**	11.22***
	[0.0157]	[0.0201]	[0.0252]	[0.0008]
Non-Greek	-0.3695***	-0.4060***	-0.2668***	24.97***
	[0.0361]	[0.0425]	[0.0671]	[0.000]
Part-Time	0.1905***	0.1588**	0.2882***	1.72
	[0.0447]	[0.0655]	[0.0645]	[0.1892]
Temporary	-0.2674***	-0.2757***	-0.2627***	0.07
	[0.0271]	[0.034]	[0.0433]	[0.7890]
Small Firm	-0.2448***	-0.2923***	-0.1658***	29.57***
	[0.0148]	[0.0187]	[0.0241]	[0.0000]
Weekly Hours	0.0260***	0.0235***	0.0311***	5.23
	[0.0010]	[0.0012]	[0.0020]	0.0222
Constant	-2.7233***	-2.6590***	-3.1790***	4.64
	[0.1056]	[0.1149]	[0.2479]	0.0313
Observations	133.457	75.139	58,318	
Mean	0.119	0.144	0.0847	

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets
*p<0.1, **p<0.05, ** p<0.01

Table A2: The effect of being a Supervisor to wages for years 2006-2016 by Least Squares Model

Least Squares Estimation for years 2006-2016											
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Supervisor	0.1094***	0.1254***	0.1432***	0.1137***	0.1337***	0.1371***	0.1300***	0.1838***	0.1571***	0.1455***	0.1824***
	[0.0097]	[0.0098]	[0.0102]	[0.0081]	[0.0075]	[0.0103]	[0.0137]	[0.0142]	[0.0166]	[0.0134]	[0.0118]
Public	0.1271***	0.1308***	0.1126***	0.0698***	0.0997***	0.1245***	0.0966***	0.0916***	0.1258***	0.1351***	0.1256***
	[0.0104]	[0.0110]	[0.0102]	[0.0095]	[0.0095]	[0.0114]	[0.0160]	[0.0171]	[0.0168]	[0.0132]	[0.0131]
Female	-0.1095***	-0.1082***	-0.1154***	-0.0981***	-0.0966***	-0.0997***	-0.0802***	-0.0890***	-0.0817***	-0.0783***	-0.0822***
	[0.0061]	[0.0062]	[0.0061]	[0.0057]	[0.0056]	[0.0063]	[0.0083]	[0.0091]	[0.0102]	[0.0074]	[0.0070]
Education	0.0165***	0.0170***	0.0178***	0.0157***	0.0169***	0.0203***	0.0191***	0.0231***	0.0166***	0.0168***	0.0180***
	[0.0011]	[0.0012]	[0.0011]	[0.0010]	[0.0011]	[0.0012]	[0.0017]	[0.0017]	[0.0016]	[0.0012]	[0.0010]
Experience	0.0173***	0.0169***	0.0180***	0.0147***	0.0164***	0.0147***	0.0144***	0.0238***	0.0154***	0.0159***	0.0162***
	[0.0010]	[0.0010]	[0.0010]	[0.0009]	[0.0009]	[0.0011]	[0.0016]	[0.0018]	[0.0018]	[0.0013]	[0.0012]
Experience Squared	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0003***	-0.0002***	-0.0002***	-0.0002***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Married	0.0359***	0.0443***	0.0499***	0.0364***	0.0335***	0.0522***	0.0331***	0.0552***	0.0798***	0.0514***	0.0400***
	[0.0077]	[0.0078]	[0.0076]	[0.0067]	[0.0068]	[0.0080]	[0.0109]	[0.0115]	[0.0124]	[0.0089]	[0.0086]
Child(ren)	0.0247***	0.0257***	0.0133*	0.0161***	0.0382***	0.0249***	0.0305***	0.0046	0.0103	0.0292***	0.0186**
	[0.0072]	[0.0074]	[0.0069]	[0.0062]	[0.0062]	[0.0074]	[0.0104]	[0.0104]	[0.0116]	[0.0081]	[0.0079]
Non-Greek	-0.0591***	-0.0599***	-0.0708***	-0.0988***	-0.0947***	-0.0961***	-0.0807***	-0.0835***	-0.1151***	-0.0874***	-0.0649***
	[0.0112]	[0.0115]	[0.0101]	[0.0092]	[0.0101]	[0.0113]	[0.0166]	[0.0196]	[0.0215]	[0.0144]	[0.0133]
Part-Time	-0.4175***	-0.4131***	-0.4395***	-0.4489***	-0.5400***	-0.5776***	-0.5634***	-0.5112***	-0.5324***	-0.3923***	-0.4511***
	[0.0248]	[0.0247]	[0.0240]	[0.0236]	[0.0222]	[0.0246]	[0.0284]	[0.0276]	[0.0301]	[0.0195]	[0.0187]
Temporary	-0.1391***	-0.1433***	-0.1526***	-0.1274***	-0.1617***	-0.1427***	-0.1164***	-0.1523***	-0.1117***	-0.0877***	-0.1380***
	[0.0114]	[0.0117]	[0.0106]	[0.0106]	[0.0112]	[0.0122]	[0.0185]	[0.0177]	[0.0172]	[0.0121]	[0.0120]
Small Firm	-0.0613***	-0.0632***	-0.0511***	-0.0446***	-0.0597***	-0.0680***	-0.0693***	-0.0928***	-0.1021***	-0.1088***	-0.1038***
	[0.0062]	[0.0061]	[0.0058]	[0.0057]	[0.0057]	[0.0064]	[0.0086]	[0.0100]	[0.0113]	[0.0079]	[0.0073]
Weekly Hours	0.0059***	0.0068***	0.0069***	0.0066***	0.0074***	0.0071***	0.0078***	0.0087***	0.0097***	0.0086***	0.0074***
	[0.0006]	[0.0006]	[0.0005]	[0.0005]	[0.0005]	[0.0006]	[0.0007]	[0.0009]	[0.0009]	[0.0007]	[0.0007]
Constant	6.2293***	6.0710***	6.0842***	6.2231***	6.0752***	6.0869***	6.0570***	5.7587***	5.6208***	5.7360***	5.8370***
	[0.0454]	[0.0444]	[0.0451]	[0.0412]	[0.0394]	[0.0479]	[0.0576]	[0.0635]	[0.0713]	[0.0532]	[0.0479]
Observations	15,292	14,851	14,718	15,307	15,143	12,479	9,132	8,234	8,505	9,269	10,527
R squared	0.516	0.522	0.537	0.532	0.603	0.629	0.568	0.606	0.591	0.619	0.636
Mean	1095	986.5	1024	1063	1080	1076	972.8	916.3	858.2	861.6	867

Estimations contain also region, sector, occupation and year dummies. Robust Standard Errors in brackets. *p<0.1, **p<0.05, ***p<0.01

Table A3: Pooled Ols log of wage regression over 2006-2016 by gender and supervisory status including the instrument among regressors.

	Pooled ols			
	Supervisor-Men (1)	Supervisor-Women (2)	Non-Supervisor Men (3)	Non-supervisor Women (4)
Sup_history	-0.0469	-0.0273	-0.0014	-0.0226
	[0.0381]	[0.0546]	[0.0152]	[0.0173]
Public Sector	-0.0002	0.0466***	0.1094***	0.1441***
	[0.0129]	[0.0179]	[0.0054]	[0.0058]
Education	0.0246***	0.0268***	0.0162***	0.0175***
	[0.0014]	[0.0020]	[0.0005]	[0.0007]
Experience	0.0210***	0.0198***	0.0154***	0.0179***
	[0.0016]	[0.0025]	[0.0005]	[0.0006]
Experience Squared	-0.0003***	-0.0002***	-0.0002***	-0.0002***
	[0.0000]	[0.0001]	[0.0000]	[0.0000]
Married	0.0552***	0.0230*	0.0643***	0.0280***
	[0.0109]	[0.0130]	[0.0039]	[0.0039]
Child(ren)	0.0125	0.0249*	0.0276***	0.0084**
	[0.0087]	[0.0137]	[0.0035]	[0.0038]
Non-Greek	-0.0938***	-0.0037	-0.1024***	-0.0611***
	[0.0332]	[0.0432]	[0.0048]	[0.0072]
Part-Time	-0.4441***	-0.4366***	-0.4737***	-0.4872***
	[0.0602]	[0.0871]	[0.0115]	[0.0103]
Temporary	-0.0611**	-0.1216***	-0.1346***	-0.1421***
	[0.0255]	[0.0256]	[0.0054]	[0.0058]
Small Firm	-0.0679***	-0.0813***	-0.0692***	-0.0694***
	[0.0086]	[0.0135]	[0.0031]	[0.0034]
Weekly Hours	0.0071***	0.0038***	0.0073***	0.0076***
	[0.0006]	[0.0012]	[0.0003]	[0.0003]
Constant	6.0671***	6.2829***	6.1711***	6.0819***
	[0.0572]	[0.1122]	[0.0200]	[0.0377]
Observations	10,139	4,408	65,000	53,910
R-Squared	0.437	0.455	0.534	0.599
Mean	1470	1313	1010	884.2

Estimations contain also region, occupation, sector and year dummies. Robust standard Errors in brackets, p-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

Table A4: Pooled Ols log of wage regression by supervisor status and gender(clustered standard errors on the region)

	Pooled ols			
	Supervisor-Men (1)	Supervisor-Women (2)	Non-Supervisor Men (3)	Non-supervisor Women (4)
Public Sector	-0.0003	0.0468***	0.1094***	0.1441***
	[0.0188]	[0.0142]	[0.0129]	[0.0102]
Education	0.0246***	0.0269***	0.0162***	0.0175***
	[0.0014]	[0.0014]	[0.0009]	[0.0004]
Experience	0.0213***	0.0200***	0.0154***	0.0180***
	[0.0016]	[0.0024]	[0.0004]	[0.0005]
Experience Squared	-0.0003***	-0.0002***	-0.0002***	-0.0002***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Married	0.0560***	0.0235*	0.0643***	0.0282***
	[0.0071]	[0.0110]	[0.0031]	[0.0020]
Child(ren)	0.0125**	0.0250	0.0276***	0.0084
	[0.0057]	[0.0217]	[0.0053]	[0.0065]
Non-Greek	-0.0930***	-0.0034	-0.1024***	-0.0610**
	[0.0288]	[0.0183]	[0.0131]	[0.0227]
Part-Time	-0.4456***	-0.4359***	-0.4737***	-0.4873***
	[0.0534]	[0.0358]	[0.0089]	[0.094]
Temporary	-0.0606*	-0.1223***	-0.1346***	-0.1422***
	[0.0298]	[0.0245]	[0.0106]	[0.0170]
Small Firm	-0.0681***	-0.0812***	-0.0691***	-0.0693***
	[0.0177]	[0.0076]	[0.0027]	[0.0027]
Weekly Hours	0.0071***	0.0038**	0.0073***	0.0076***
	[0.0005]	[0.0013]	[0.0008]	[0.0006]
Constant	6.0614***	6.2800***	6.1710***	6.0805***
	[0.0542]	[0.1236]	[0.0572]	[0.0773]
Observations	10,139	4,408	65,000	53,910
R-Squared	0.437	0.455	0.534	0.599
Mean	1470	1313	1010	884.2

Estimations contain also region, occupation, sector and year dummies. Clustered standard Errors on the region in brackets, p-value in Parentheses.
*p<0.1, **p<0.05, ** p<0.01

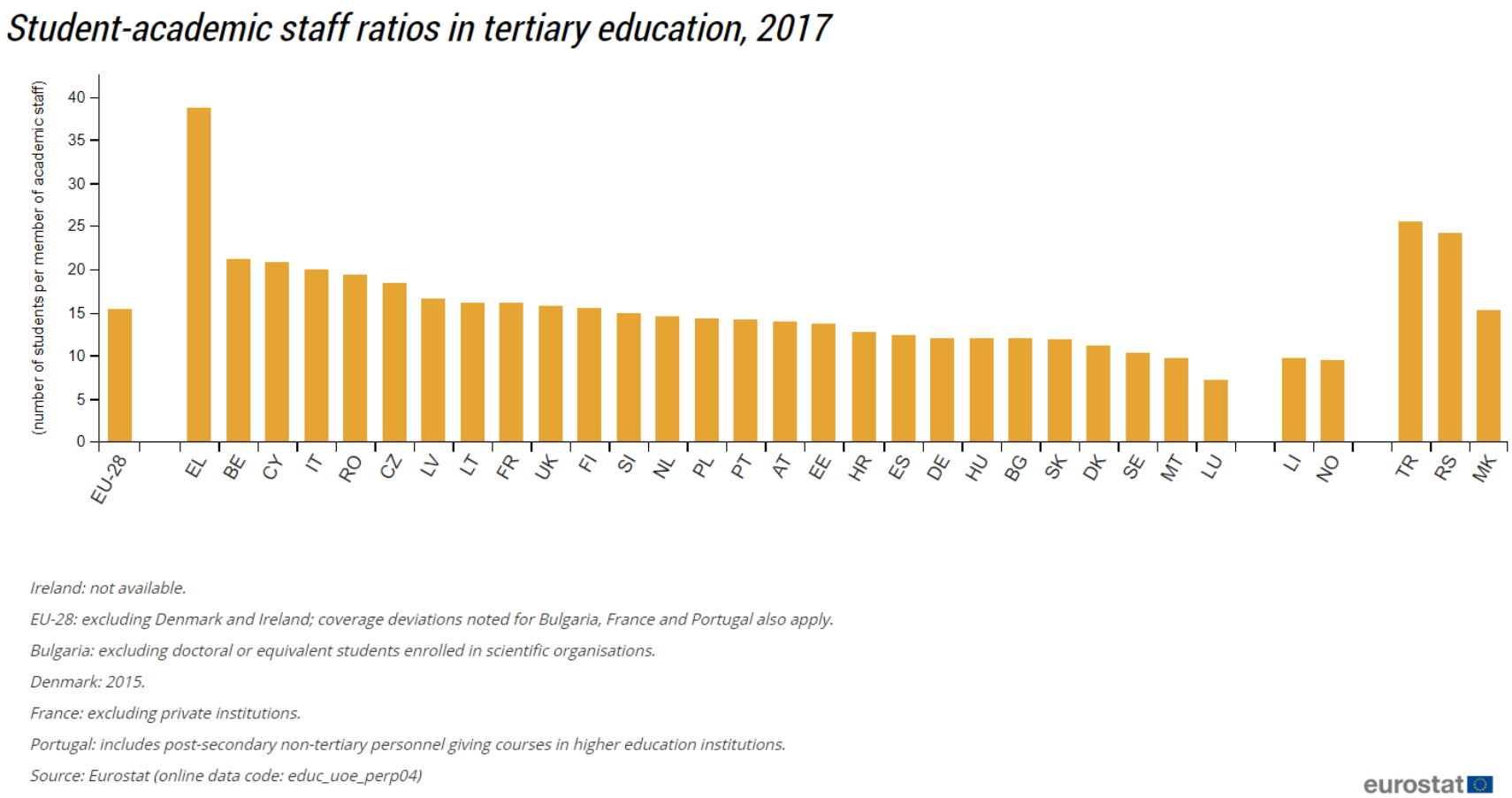

Figure A1: Student-academic ratio staff ratios in tertiary education